Washington State Department of Transportation

SR 520 Bridge Replacement and HOV Program

Medina to SR 202: Eastside Transit and HOV Project

FINAL WETLAND MITIGATION REPORT

Medina to SR 202: Eastside Transit and HOV Project

Prepared for

Washington State Department of Transportation
&
FHWA

April 26, 2010

Washington State Department of Transportation

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April 26, 2010

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Executive Summary

The Washington State Department of Transportation (WSDOT) is proposing to improve State Route (SR) 520 between Evergreen Point Road (just east of the east shore of Lake Washington) and 1 mile past the SR 202 interchange. The project will be referred to as the Medina to SR 202: Eastside Transit and HOV Project. Improvements will include highway widening, interchange improvements, and increased high-occupancy vehicle (HOV) capacity. With the exception of restriping, no construction activity or road improvements will occur east of Interstate Highway 405 (I-405); therefore, this area was excluded from the study area. The study area is roughly 200 feet around the limits of construction, from Lake Washington to near I-405.

The Medina to SR 202: Eastside Transit and HOV Project is located in sections 24, 19, and 20 in Township 25 North, Range 5 East, and includes portions of the municipalities of Medina, Hunts Point, Yarrow Point, Clyde Hill, Kirkland, Bellevue, and Redmond.

Existing Wetland in the Project Area

Forty-one wetlands were identified in the project vicinity, covering approximately 95 acres. These wetlands were rated according to the Department of Ecology (Ecology) rating system (Hruby 2004). One of the identified wetlands was rated Category I (~75 acres), three wetlands were rated Category II (~2.75 acres), 15 wetlands were rated Category III (~15.1 acres), and the remaining 22 wetlands were rated Category IV (~2.3 acres).

When classified by vegetation type, 24 of the wetlands are dominated by emergent vegetation, and four are scrub/shrub dominated, and five are forested wetland communities. The remaining eight wetlands have multiple vegetation types.

Wetland functions vary greatly in the study area. Most of the wetlands are relatively small and located immediately adjacent to SR 520. These wetlands generally have limited potential for water quality or hydrologic function and low habitat diversity, and so provide low levels of function overall. A few wetlands that are larger, have multiple vegetation classes, and are associated with larger streams or Lake Washington. These wetlands provide greater levels of function.

Wetland Impacts

The Medina to SR 202: Eastside Transit and HOV Project will permanently fill approximately 6.77 acres of wetlands in the Eastside project area. Filled areas will include approximately 0.01

acre of Category I wetland, approximately 0.26 acre of Category II wetlands; approximately 4.56 acres of Category III wetlands; and approximately 1.94 acres of Category IV wetlands. An additional 0.14 acre of short-term temporary wetland impacts and 0.11 acre of long-term temporary wetland impacts will also result from construction of the project and the associated facilities.

Twenty-three of the 41 wetlands in the project area will be completely filled as a result of roadway widening for the Medina to SR 202: Eastside Transit and HOV Project. These wetlands are generally small (19 wetlands are less than 0.25 acre, and the remaining four are between 0.48 acre and 2.06 acres in size) and are associated with the SR 520 right of way. Another nine wetlands will be partially filled (0.01 to 62 percent). Six of these nine partially-filled wetlands are 0.45 acre or less in size, two are between 1.8 and 2.2 acres in size, and one is over 75 acres in size.

The project will also temporarily clear a portion of two forested wetlands (YBN-1 and YCN-4A) and a portion of two emergent wetland (YBS-1 and YCS-5), causing 0.11 acre and 0.14 acre of temporary long-term impacts and temporary short-term impacts, respectively.

Wetland Mitigation

The Medina to SR 202: Eastside Transit and HOV Project will provide compensatory mitigation for all the project wetland impacts in two locations, one on-site and one off-site. On-site mitigation will take place at the Yarrow Creek Mitigation Site in the project corridor. The Yarrow Creek Mitigation Site will provide the following:

- Restoration/creation of 0.52 acre of upland to forested riparian wetland.
- Rehabilitation of 0.63 acre of disturbed riparian wetlands to forested riparian wetland.
- Restoration of 0.82 acre of upland to wetland and rehabilitation of 0.57 acre of disturbed riparian wetland that will serve as regulatory buffers.
- Enhancement of 0.63 acre of disturbed riparian upland along Yarrow Creek to upland riparian forest.

Off-site mitigation will take place at the Keller Mitigation Site in Redmond, Washington. The off-site compensatory mitigation will provide the following:

- Rehabilitation of 25.48 acres of formerly agricultural wetlands to forested and scrub/shrub wetland.

- Rehabilitation of 3.56 acres of formerly agricultural wetlands to wetland forest within the regulatory buffers.
- Enhancement of 1.52 acres of disturbed riparian upland along Bear Creek to upland forest.

This final mitigation proposal includes wetland restoration/creation, rehabilitation and wetland/buffer enhancement activities that are sufficient to meet federal, state, and local regulatory requirements.

The proposed mitigation sites will be monitored for 10 years. Monitoring, contingency, and site management plans are provided and will be used to adaptively manage the mitigation site.

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Acronyms and Abbreviations

CFR	Code of Federal Regulations
CWA	Clean Water Act
Ecology	Washington State Department of Ecology
ESO	Environmental Services Office
FHWA	Federal Highway Administration
GIS	Geographic Information System
HGM	hydrogeomorphic
HOV	high-occupancy vehicle
I-5	Interstate 5
I-90	Interstate 90
KCDNRP	King County Department of Natural Resources and Parks
MAP	Multi-Agency Permitting
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
PEM	palustrine emergent
PFO	palustrine forested
PSS	palustrine scrub-shrub
SEPA	State Environmental Policy Act
SR	State Route
TESC	temporary erosion sediment control
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington State Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation
WRIA	Water Resource Inventory Area

Chapter 1. Introduction

The Washington State Department of Transportation (WSDOT) is proposing to construct the Medina to SR 202: Eastside Transit and HOV Project to meet Eastside growth projections and relieve congestion by improving transit and high-occupancy vehicle (HOV) operations along the SR 520 corridor, east of Lake Washington. The project includes building a complete HOV system between Evergreen Point Road and 108th Avenue NE and re-striping the existing HOV lanes from the outside lanes to the inside between the 108th Avenue NE interchange and SR 202 in Redmond (Figure 1).

The portion of the project between Evergreen Point Road and 108th Avenue NE was originally part of the SR 520 Bridge Replacement and HOV Project. However, on June 18, 2008, the Federal Highway Administration (FHWA) authorized WSDOT to develop the Medina to SR 202: Eastside Transit and HOV Project as an independent project. The project will impact wetlands during construction.

This report identifies the project's permanent and temporary impacts to wetlands and describes the mitigation strategy for the project. Permanent impacts discussed in this report result from wetland fill required for the widened roadway and accessory facilities, and temporary impacts result from clearing related to construction access. The mitigation strategy includes minimization and avoidance measures and a proposal for compensatory mitigation for the unavoidable permanent and temporary impacts of the project. The discussion in this report focuses on the project's off site compensatory mitigation elements.

A separate report, the *Medina to SR 202: Eastside Transit and HOV Project Final Streams Mitigation Report* (WSDOT 2010a), has been prepared to discuss streams impacts resulting from this project and mitigation for these impacts. The final streams mitigation report also discusses other (non-fill) impacts to on-site wetlands resulting from the stream mitigation, including stream conversion to wetlands, wetland conversion to stream, and buffer conversions.

This report will be used in part to obtain the following permits:

- U.S. Army Corps of Engineers (USACE)-Clean Water Act (CWA) Section 404, Individual Permit.
- Washington State Department of Ecology (Ecology)-CWA Section 401, Water Quality Certification.

- Washington State Department of Fish and Wildlife (WDFW)-Hydraulic Permit Approval.
- City of Medina-Shoreline Substantial Development Permit and Critical Areas Review.
- Town of Hunts Point-Shoreline Substantial Development Permit and Critical Areas Review.
- City of Kirkland-Shoreline Critical Areas Review.
- City of Bellevue-Critical Areas Review.

Observed conditions are discussed in the Medina to SR 202: Eastside Transit and HOV Project Environmental Assessment: Wetland Assessment Report (WSDOT 2009a). This mitigation report addresses project impacts and their mitigation. The following documents and guidelines were used in preparation of this report:

- Medina to SR 202: Eastside Transit and HOV Project Environmental Assessment: Wetland Assessment Report (WSDOT 2009a).
- Medina to SR 202: Eastside Transit and HOV Project Environmental Assessment: Stream Assessment Report (WSDOT 2009b).
- WSDOT Wetland Mitigation Guidelines – (WSDOT 2010b).
- Wetlands in Washington State, Volume 1 (Sheldon et al., 2005).
- Wetlands in Washington State, Volume 2 (Granger et al., 2005).
- Wetland Mitigation in Washington State, Part 1 (Ecology et al., 2006a).
- Wetland Mitigation in Washington State, Part 2 (Ecology et al., 2006b).

WSDOT is coordinating technical and planning efforts for the Medina to SR 202: Eastside Transit and HOV Project through two teams: The Mitigation Core Team and the Mitigation Technical Group.

The Mitigation Core Team is led by Shane Cherry, and serves as a steering group for mitigation planning activities. The Mitigation Core Team is multi-disciplinary, composed of engineers, planners, and biologists from WSDOT HQ Environmental Services, WSDOT's Environmental Services Office (ESO), and private consulting companies. The Mitigation Planning Working Group includes (or has included) the following individuals: Bill Leonard (WSDOT, initiation through 12/07), Paul Fendt (Parametrix, initiation through 3/08), Ken Sargent (Headwaters Environmental Consulting), Michelle Meade (WSDOT), Phil Bloch (WSDOT), Shane Cherry

(Cherry Creek Environmental), Jeff Meyer (Parametrix), Gretchen Lux (WSDOT, 12/2007 to present), Beth Peterson (HDR, 12/2007 to present), and Bill Bumback (Jones & Stokes).

The Wetland Mitigation Technical Group is led by Ken Sargent, and provides technical detail and policy guidance to team members conducting analysis and preparing wetland mitigation planning products. This group consists of Bill Leonard (WSDOT, initiation through 12/07), Paul Fendt (Parametrix, initiation through 3/08), Ken Sargent (Headwaters Environmental Consulting, Inc.), Michelle Meade (WSDOT), Phil Bloch (WSDOT), Shane Cherry (Cherry Creek Environmental), Jeff Meyer (Parametrix), Gretchen Lux (WSDOT, 12/2007 to present), Beth Peterson (HDR, 12/2007 to present), Pat Togher (HDR), and Bill Bumback (Jones & Stokes).

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Chapter 2. Proposed Project

This chapter describes the key elements of the proposed project.

2.1 Location

The Medina to SR 202: Eastside Transit and HOV Project extends from the east shore of Lake Washington (Evergreen Point Road) to 1.0 miles past the SR 202 Interchange (Figure 1). SR 520 passes through Medina, Hunts Point, Yarrow Point, Clyde Hill, Kirkland, Bellevue, and Redmond, and is located in sections 24, 19, and 20 in Township 25 North, Range 5 East.

The assessed study area consists of the SR 520 project right of way, on either side of the project footprint from the eastern perimeter of Lake Washington to approximately I-405 on the east. The study area east of I-405 extending to the eastern terminus will be restricted to the edge of pavement for restriping and, therefore, is not included in this report. Figure 2 (sheets 1 through 6) show an overview of the how the project will affect streams and wetlands within the project corridor.

The project lies within the Cedar-Sammamish Watershed (Water Resource Inventory Area [WRIA]) 8. Major watersheds in the project area include the Cedar River – Lake Washington watershed and the Sammamish Watershed. Streams in the project area drain to Lake Washington or the Sammamish River, directly to the river or to the river via Lake Sammamish.

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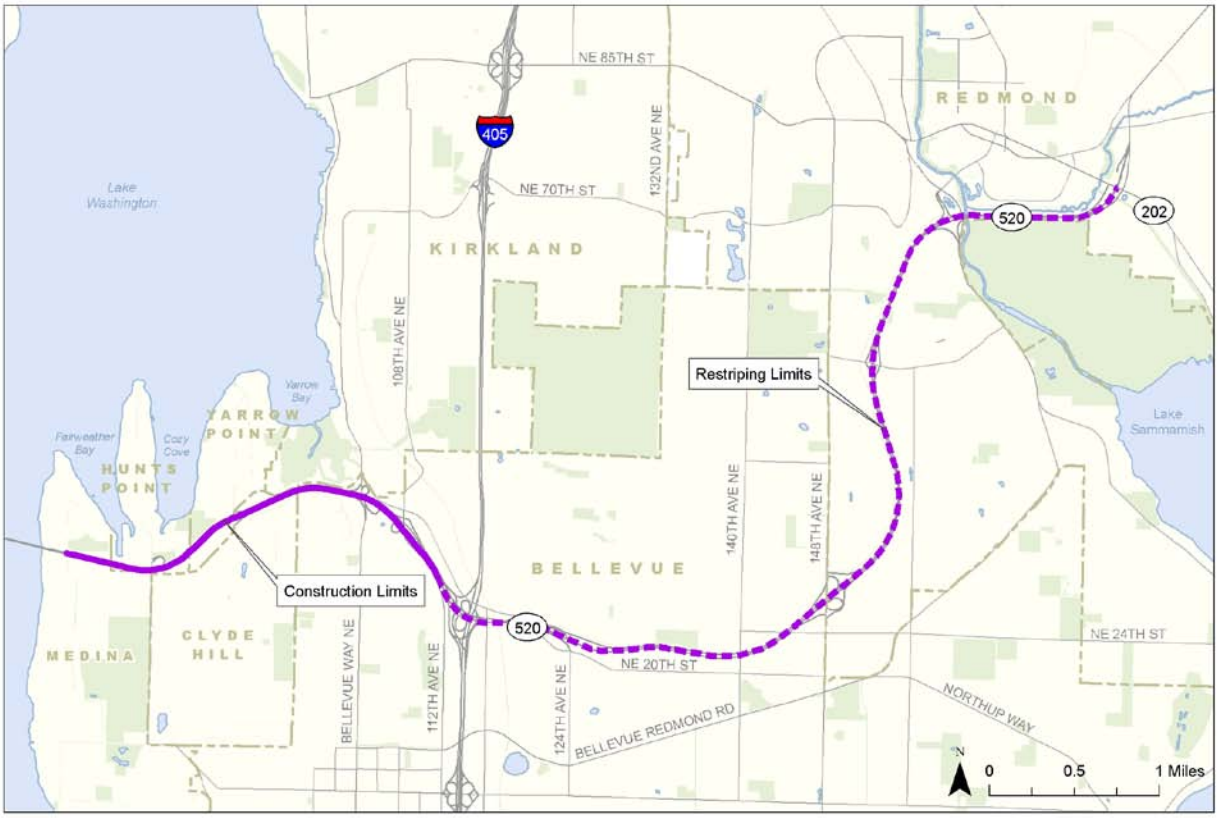
Figure 1. Project Vicinity Map



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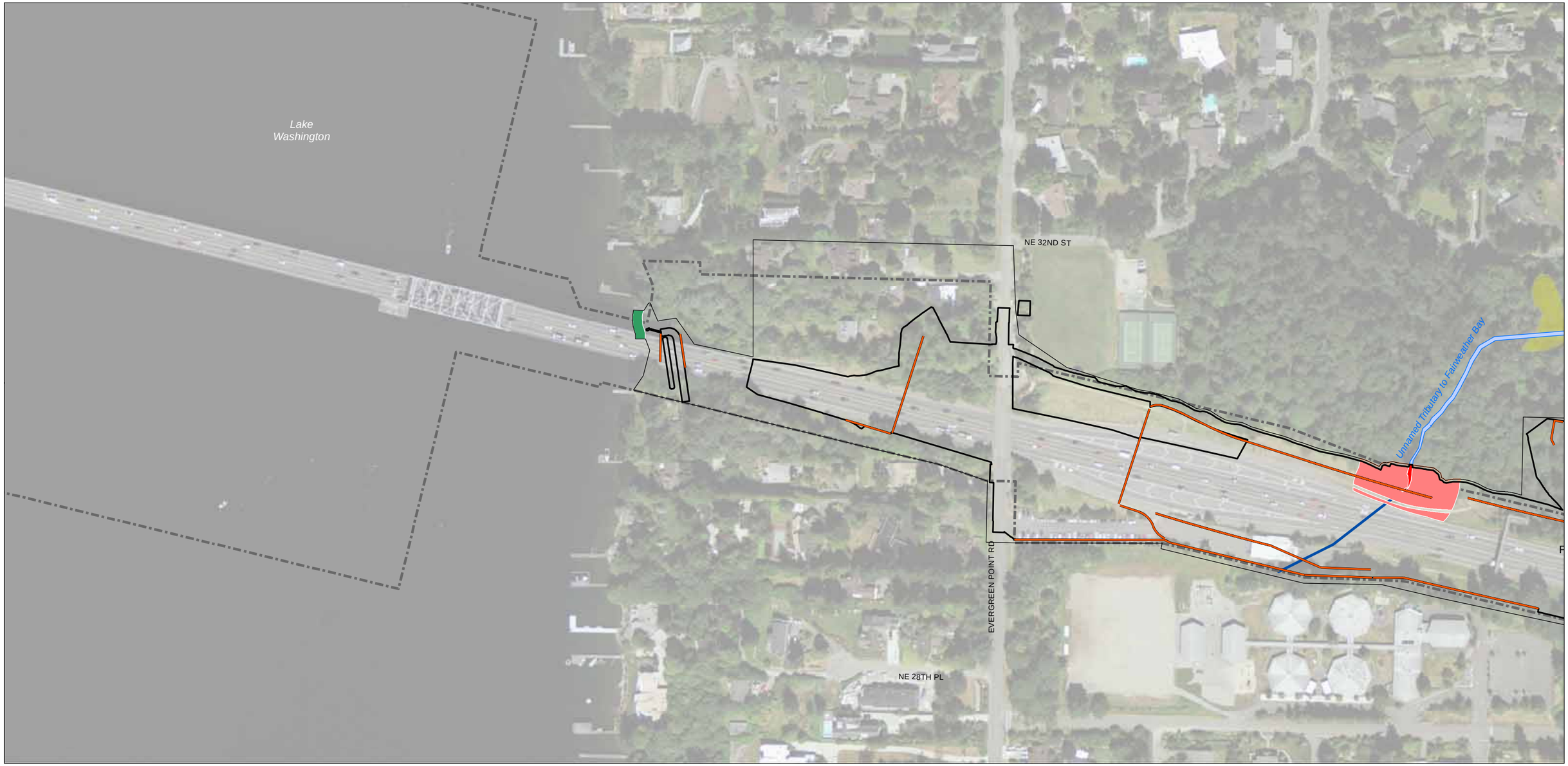

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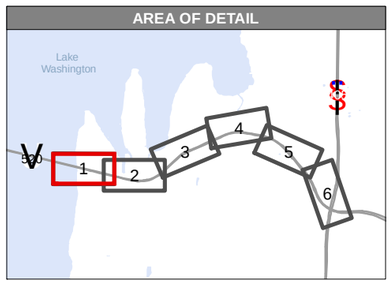

Wetland Vegetation Class

- L2AB
- PFO
- PSS
- PEM

- Proposed Retaining Wall
- Culvert
- Stream Channel
- Stream Channel Buffer
- Jurisdictional Boundary
- Existing Right of Way

Proposed Feature

- Permanent Footprint
- Proposed Culvert
- Proposed Stream
- Temporary Footprint

Impact Type

- Permanent Stream Self Mitigating
- Wetland Rehabilitation
- Wetland Creation
- Short Term-Temp Wetland Impact
- Long Term-Temp Wetland Impact
- Temporary Lake WA Impact
- Permanent Stream Buffer Impact
- Permanent Stream Buffer Impact - Conv. to Prop Stream
- Permanent Stream Impact
- Permanent Wetland Buffer Impact
- Permanent Wetland Buffer Impact - Conv. to Prop Stream
- Permanent Wetland Impact
- Stream Conversion to Wetland
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- Temporary Stream Impact
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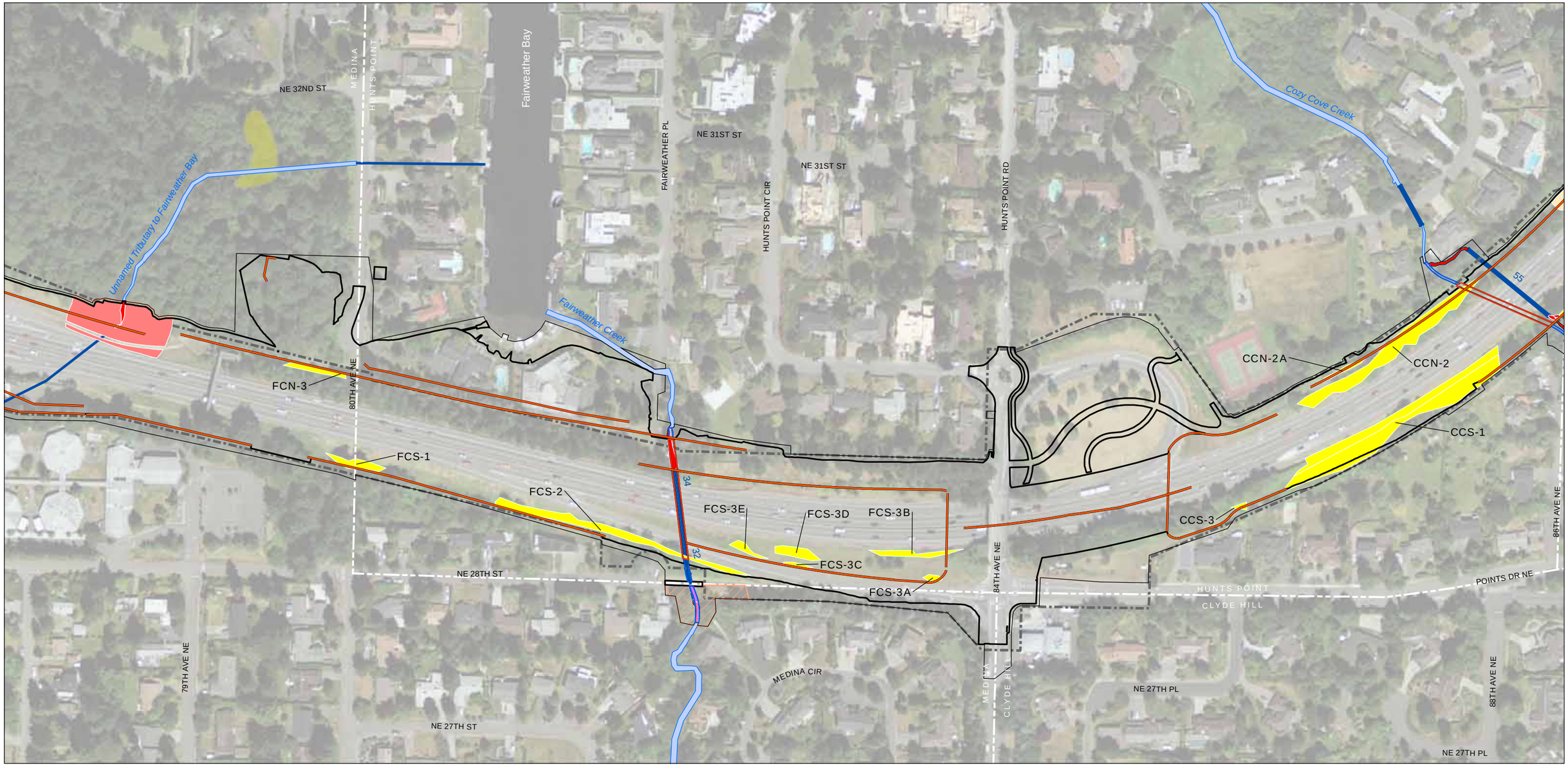
0 250 500 Feet

Source: WSDOT (2005) Aerial Imagery (2008) GIS Data (Wetlands), King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91), vertical datum for layers is NAVD88.

Figure 2. **Wetlands and Streams in the Project Corridor Plate 1**

Medina to SR 202: Eastside Transit and HOV Project



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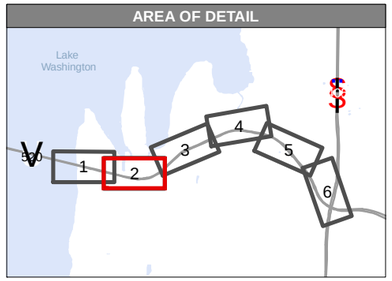

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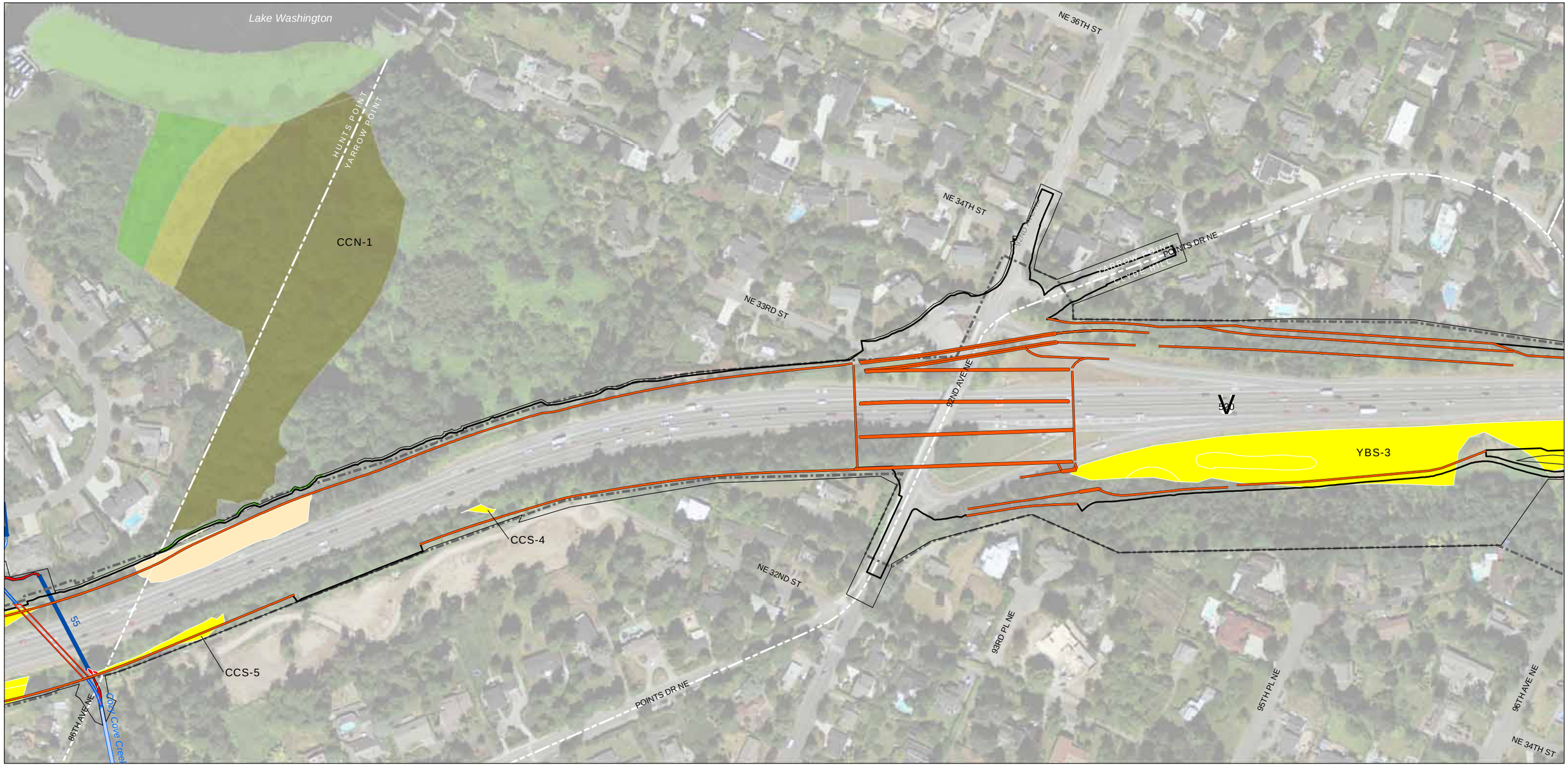
Figure 2. **Wetlands and Streams in the Project Corridor Plate 2**

Medina to SR 202: Eastside Transit and HOV Project



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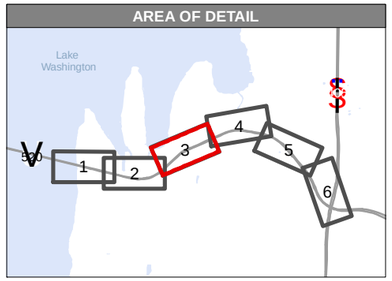

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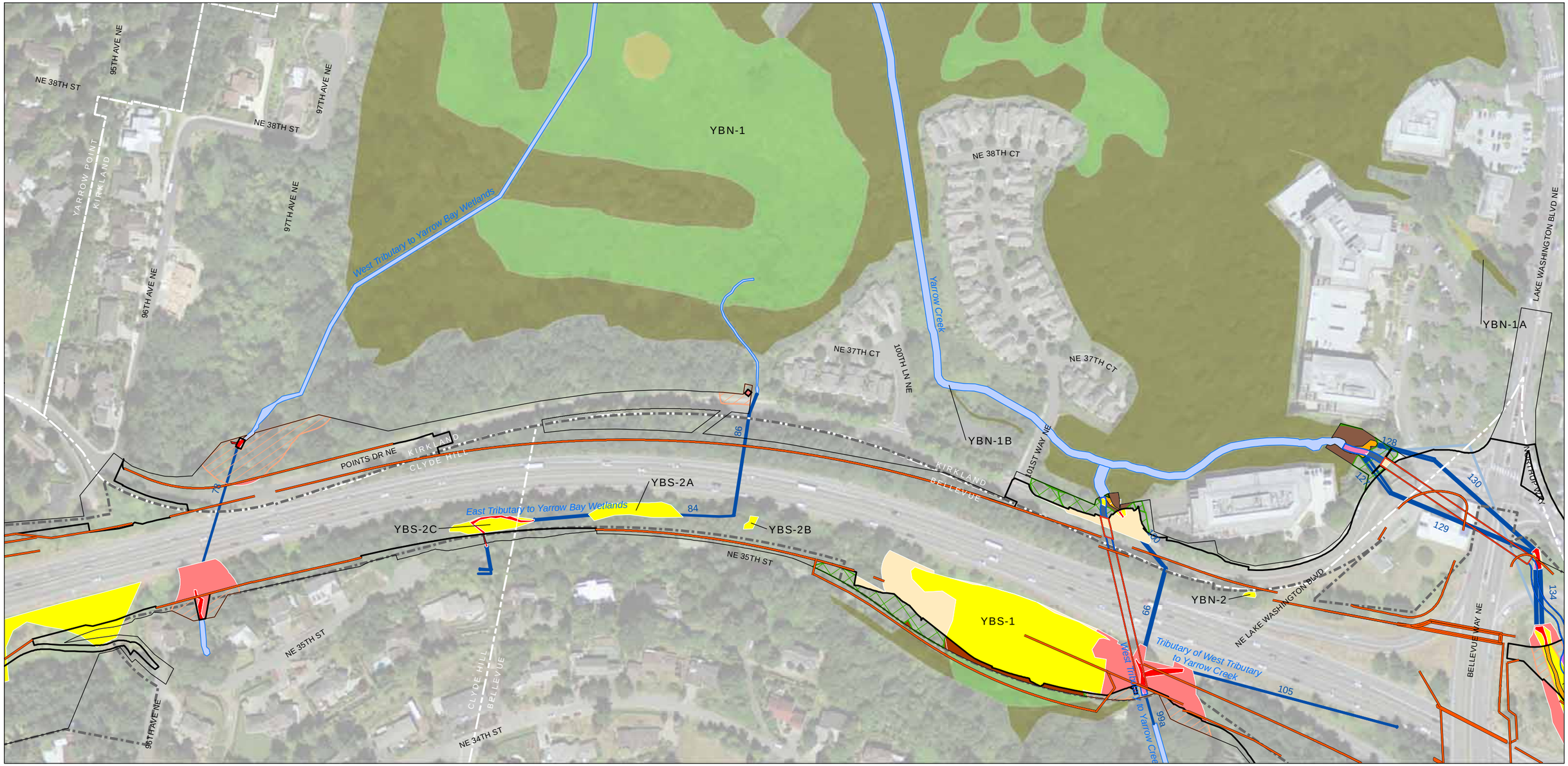
Figure 2. **Wetlands and Streams in the Project Corridor**
Plate 3

Medina to SR 202: Eastside Transit and HOV Project



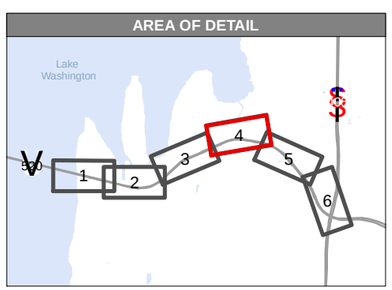


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Figure 2. **Wetlands and Streams in the Project Corridor**
Plate 4

Medina to SR 202: Eastside Transit and HOV Project

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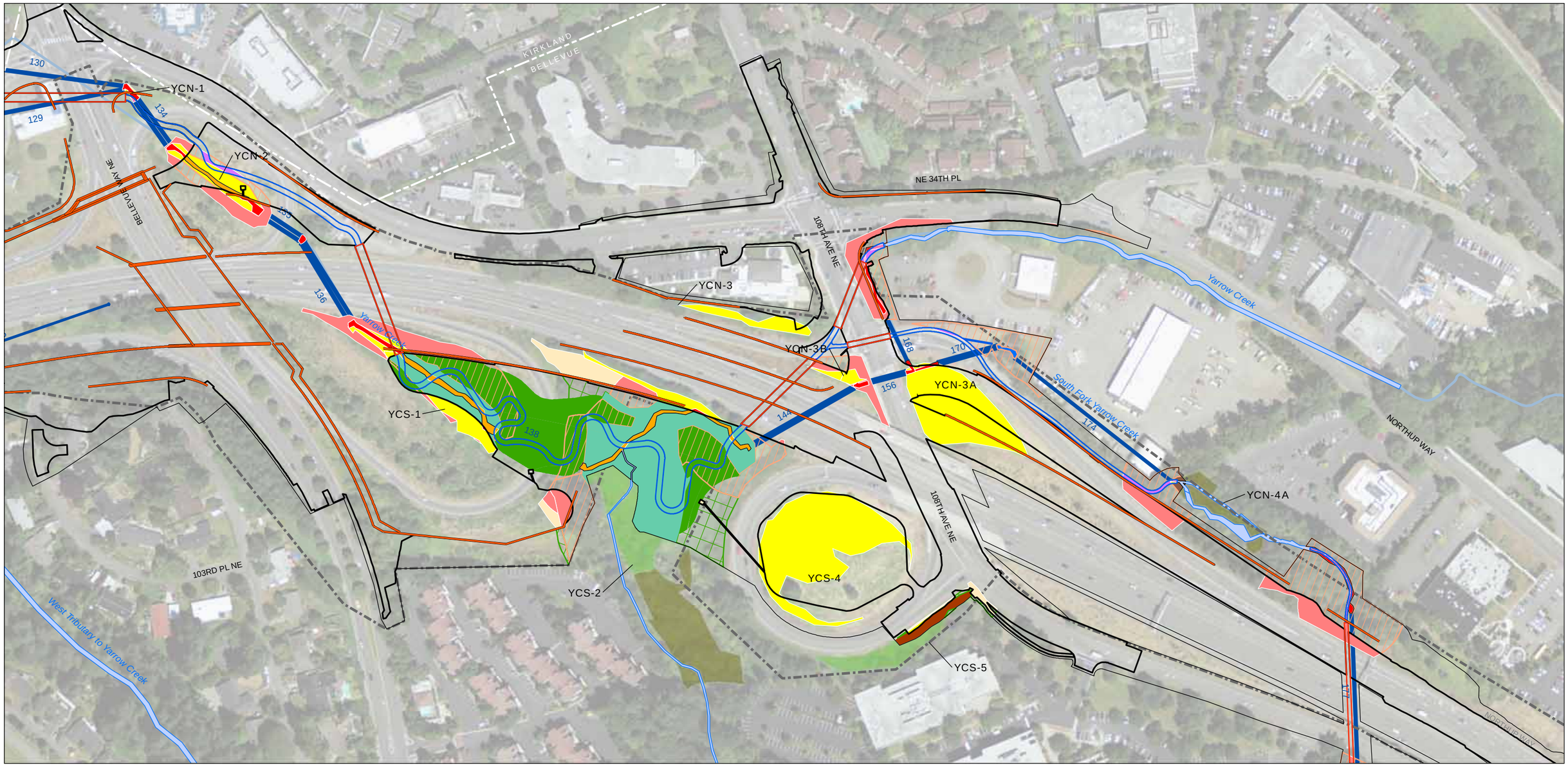

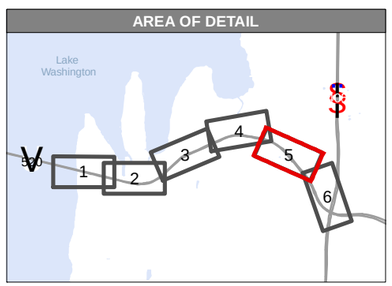

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Figure 2. **Wetlands and Streams in the Project Corridor**
Plate 5

Medina to SR 202: Eastside Transit and HOV Project

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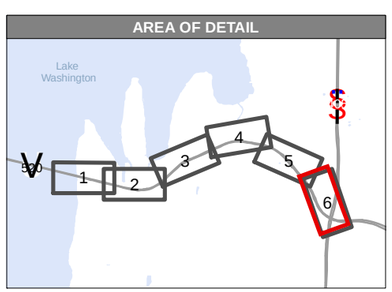

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- Stream Channel
- Stream Channel Buffer
- Jurisdictional Boundary
- Existing Right of Way

Proposed Feature

- Permanent Footprint
- Proposed Culvert
- Proposed Stream
- Temporary Footprint

Impact Type

- Permanent Stream Self Mitigating
- Wetland Rehabilitation
- Wetland Creation
- Short Term-Temp Wetland Impact
- Long Term-Temp Wetland Impact
- Temporary Lake WA Impact
- Permanent Stream Buffer Impact
- Permanent Stream Buffer Impact - Conv. to Prop Stream
- Permanent Stream Impact
- Permanent Wetland Buffer Impact
- Permanent Wetland Buffer Impact - Conv. to Prop Stream
- Permanent Wetland Impact
- Stream Conversion to Wetland
- Temporary Stream Buffer Impact
- Temporary Stream Impact
- Temporary Wetland Buffer Impact
- Temporary Wetland Impact

0 250 500 Feet

Source: WSDOT (2005) Aerial Imagery (2008) GIS Data (Wetlands), King County (2008) GIS Data (Streams, Streets, Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91), vertical datum for layers is NAVD88.

Figure 2. **Wetlands and Streams in the Project Corridor**
Plate 6

Medina to SR 202: Eastside Transit and HOV Project

2.2 Purpose and Description

The Washington State Department of Transportation (WSDOT) is proposing to construct the Medina to SR 202: Eastside Transit and HOV Project to reduce transit and HOV travel times and to enhance travel time reliability, mobility, access, and safety for transit and HOVs in rapidly growing areas along the SR 520 corridor east of Lake Washington. Figure 1 shows the project vicinity. The project includes building a complete HOV system between Evergreen Point Road and 108th Avenue NE and restriping the existing HOV lanes from the outside lanes to the inside between the 108th Avenue NE interchange and SR 202 in Redmond.

The portion of the project between Evergreen Point Road and 108th Avenue NE was previously part of the SR 520 Bridge Replacement and HOV Project. However, on June 18, 2008, the Federal Highway Administration (FHWA) authorized WSDOT to develop the Medina to SR 202: Eastside Transit and HOV Project as an independent project. The project limits extend approximately 8.5 miles along SR 520 from the east shore of Lake Washington (vicinity of Evergreen Point Road) to the interchange with SR 202 in Redmond.

The proposed Medina to SR 202: Eastside Transit and HOV Project will include the improvements described below.

SR 520 Improvements from Lake Washington to I-405

- Construct a new eastbound HOV lane from Evergreen Point Road to the existing eastbound HOV lane west of the I-405 interchange. This improvement will complete the currently discontinuous HOV network on the Eastside and improve travel time reliability for buses and carpools.
- Relocate the existing westbound HOV lane to the inside shoulder from Evergreen Point Road to I-405. This change will enhance safety by eliminating the need for merging vehicles to weave across the faster-moving HOV lanes to reach the general-purpose lanes.
- Construct a lid with an inside transit stop over SR 520 at Evergreen Point Road.
- Construct a new lid and modify the existing half-diamond interchange at 84th Avenue NE.
- Construct a new lid with an inside transit stop over SR 520 at 92nd Avenue NE and modify the existing interchange.

- Reconfigure the existing interchange at Bellevue Way NE.
- Construct new HOV direct-access ramps at 108th Avenue NE. This improvement will connect SR 520 with 108th Avenue NE, eliminating the need to connect to the South Kirkland Park-and-Ride via local streets.
- Add a bike/pedestrian path from Lake Washington to approximately 108th Avenue NE. This improvement will facilitate non-motorized use of SR 520, provide transit connections for bikes and pedestrians, and complement the existing non-motorized transportation network on the Eastside.

SR 520 Improvements from I-405 to SR 202

- Restripe existing eastbound and westbound HOV lanes to the inside shoulder. This change will enhance safety by eliminating the need for merging vehicles to weave across the faster-moving HOV lanes to reach the general-purpose lanes.

Other Improvements

- Provide sound walls between Evergreen Point Road and 108th Avenue NE.
- Provide retaining walls and storm-water management system improvements.
- Improve stream habitat by realigning portions of the Yarrow Creek channel and shortening some culverts.
- Improve fish passage culvert crossings to restore fish passage and open up habitat that was previously inaccessible to salmon and other fish species.
- Mitigate the project's effects on wetlands and streams at a site or sites as determined through future negotiations with permitting agencies.

2.3 Project Schedule

WSDOT anticipates that project construction will begin during the winter of 2010 and conclude prior to the proposed opening of Evergreen Point Bridge in 2014.

2.4 Responsible Parties

WSDOT will administer the contract for roadway improvements, which will include the construction of the mitigation components of the project. The monitoring and site management of the mitigation site will be the responsibility of WSDOT for 10 years. WSDOT will be responsible for the site for perpetuity.

Chapter 3. Wetland Impact Assessment

This chapter summarizes the landscape setting, the existing conditions of the wetlands to be impacted, and the assessment of impacts to wetlands and functions related to the proposed project. **Wetland impacts are based on preliminary design as of 12/30/2009.**

3.1 Landscape Setting

3.1.1. Watershed Context

The project site is in the Puget Sound trough, which is broad lowland located between the western Cascades and the Olympic Peninsula with a history of extensive glaciations. Glacial processes created the landforms in this region and provide base material for the soils. The landforms of the region typically comprise a series of north-south trending ridges and valleys showing the direction of glacial advance. During their advances and retreats, the glaciers deposited a thick layer of unsorted material, including clays, silts, sands, gravels, and boulders. This material is commonly called till, which can be several thousands of feet thick in some areas (Alt and Hyndman 1984). More recently, rivers, streams, and lakes occupied the low-lying areas, depositing loose materials. Stream-deposited materials (alluvium) and lakebed (lacustrine) deposits break down over time forming the soils of the region. Some of the soils are poorly drained or impede infiltration of water, leading to the formation of wetlands. These soils are considered to be hydric (wetland) soils. Other more freely-draining soil types (called non-hydric soils) support upland habitats. Within these two general soil groups, there are a number of individual soil series or types that occur.

The Medina to SR 202: Eastside Transit and HOV Project is located within Water Resources Inventory Area (WRIA) 8, the Cedar River/Sammamish drainage (Kerwin 2001). Lake Washington and its numerous tributary streams are the dominant water features in the project area, and Puget Sound is located to the west of the project.

Vegetation in the project area is described as the western hemlock forest zone in Natural Vegetation of Oregon and Washington (Franklin and Dyrness 1988). Western hemlock and western red cedar are the dominant upland forest species in this zone, although Douglas-fir is also very common.

The hills and valleys of the Eastside provide numerous locations that support the development of wetlands. Larger wetland complexes developed in the more sheltered bays of Lake Washington, and along the many tributary streams in the area (Yarrow Creek is a notable example in the project area). Groundwater seeps on the slopes of the stream valley also provide a stable source of hydrology that supports wetland development, as do the numerous low-lying depressions in the uplands between stream drainages.

Streams provide habitat for spawning and rearing of fish species native to the area, and the associated wetlands provide water quality, flood control, and habitat functions that support this fish habitat. The stream corridors also provide habitat for invertebrates, amphibians, birds, and mammals, and serve as migratory corridors for these species. The seep and depressional wetlands provide habitat connections in the surrounding uplands that enhance the movement of wildlife between drainages.

3.1.2. Land Use History

The project is located in a major urban corridor, and includes portions of the municipalities of Medina, Hunts Point, Clyde Hill, Yarrow Point, Kirkland, and Bellevue. Many of these areas were developed as residential communities in the mid-twentieth century, after the construction of the Lake Washington Floating Bridge (Interstate 90 [I-90], constructed 1940) and the Evergreen Point Bridge (SR 520, constructed 1963) provided access between Seattle and the Eastside (WSDOT 2009a).

Following the initial development of these areas, ongoing urban and suburban development has continued to cause physical change to the watershed through changes in land cover and through increased water withdrawals (Kerwin 2001). In addition, the introduction of non-native fauna and flora has significantly changed the biology of the Lake Washington ecosystem (Kerwin 2001).

The majority of the lands within the project vicinity have been developed. This development has resulted in loss and alteration of wetlands, which is common in urbanized environments. The majority of the remaining wetlands are within parks or other areas that are marginally developable, such as slopes that are difficult to develop, stream sides, relatively small depressions, or areas immediately adjacent to Lake Washington. These remaining wetlands are typically small (except those associated with Yarrow Bay). Buffers are either narrow and disturbed by human activities, or entirely absent. Migratory corridors are largely fragmented by roads and developed parcels.

3.2 Existing Conditions of Wetlands and Buffers to be Impacted

Summaries of observed conditions for each wetland and buffer that will be impacted are provided in the Wetland Impacts Summary Sheets (see Section 3.8). Refer also to the Medina to SR 202: Eastside Transit and HOV Project Environmental Assessment: Wetland Assessment Report (WSDOT 2009a) for additional detail about each wetland, including rating forms and field data forms.

Wetlands were classified using:

- United States Fish and Wildlife Service (USFWS) system (Cowardin et al. 1979).
- Hydrogeomorphic Classification system (Hruby 2004).
- *Washington State Wetlands Rating System for Western Washington* (Hruby 2004).
- Medina Code, Title 18, Environment, Chapter 18.12, Article II (Ord. 784 § 2, 2005, Revised 5/2005, retrieved 2/13/2009).
- Hunts Point Code, Title 16 Environment, Chapter 16.05.330 and 16.15 (Ord. 337 § 2, 1998, retrieved 2/13/09).
- Clyde Hill Code, Title 18 State Environmental Policy Act (SEPA), Chapter 18.04.300 (Ord. 641 § 1, 1990, retrieved 2/13/2009).
- Yarrow Point, Morningside Park and Wetherill Nature Preserve critical areas, (Ord. 387, Not codified, information retrieved 2/13/2009).
- Kirkland Zoning Code, Chapter 90 Drainage Basins (2002, retrieved 2/13/2009).
- Bellevue Land Use Code, Title 20, Critical Area Overlay District Part 20.25H and Part 20.50 (Ordinance 5680, dated 6/26/2006, retrieved 2/13/2009).

The condition of wetlands and buffers was qualitatively assessed using the guidance provided in *Washington State Wetlands Rating System for Western Washington* (Hruby 2004). Wetland and buffer impacts were assessed using the guidance provided in WSDOT's Wetland and Buffer Impact Assessment Guidance (updated 4/16/2008). The following criteria were evaluated in determining impacts to wetlands and buffers:

- Dominant land use (e.g., agriculture, residential, commercial, industrial).
- Dominant buffer vegetation type (tree, shrub, herb, vine, un-vegetated).
- Estimated percent cover of invasive plants by species.

3.3 Permanent Wetland Impacts

Permanent impacts result in the permanent loss of wetland, waters of the United States, and/or waters of the state (Ecology et al., 2006). Permanent impacts associated with the Medina to SR 202: Eastside Transit and HOV Project will include widening the roadway surface from four lanes to six lanes, improving existing on- and off-ramps, replacing existing bridges, and adding or expanding storm-water facilities at 11 locations to treat runoff from existing and new road surfaces.

These activities will permanently fill approximately 6.77 acres of wetlands in the Medina to SR 202: Eastside Transit and HOV Project corridor. Impacts by wetland are listed in Table 1 and shown in the Wetland Impact Plan Sheets (Figure 2). Detailed descriptions of the impacts to individual wetlands are provided in Appendix A. Impacts summarized by wetland classification are presented in Table 2.

The category of permanent impacts to wetlands also includes indirect impacts. Indirect impacts result from activities inside or outside the wetland that do not result in a direct loss of wetland area, but that do affect wetland function. Examples of situations where indirect effects to wetlands may result include: sedimentation from upslope construction, changes in surface or sub-surface water movement, changes in animal movement patterns, loss of forested buffer, or loss of so much of an affected wetland area that the remaining portion no longer provides the same level of wetland function.

In some cases, WSDOT has determined that the indirect effects are sufficient to consider the entire wetland to be filled. For the Medina to SR 202: Eastside Transit and HOV Project, the threshold for this determination is where more than 2/3 (~66%) of the wetland has been filled, and the remaining wetland area is so small that the functional capacity has been diminished considerably.

Table 1. Wetland Size, Classification, and Area Impacted by the Proposed Project

Wetland[a]	Wetland Classification				Wetland Size (acres)	Wetland Impact Areas[e] (acres)			
						Permanent Impact		Temporary	
	Cowardin[b]	HGM[c]	Ecology[c]	Local Jurisdiction[d]		Permanent	Percent affected	Long Term	Short Term
Fairweather Creek Drainage									
FC Park	Scrub-shrub	Slope	IV	(NA) Medina	0.2	-	0	-	-
FCN-3	Emergent	Slope	IV	(NA) Hunts Point	0.3	0.03	10	-	-
FCS-1	Emergent	Depressional Outflow	IV	(NA) Hunts Point/ Medina	0.04	0.04	100	-	-
FCS-2	Emergent	Slope	IV	(NA) Hunts Point	0.15	0.15	100	-	-
FCS-3A	Emergent	Slope	IV	(NA) Hunts Point	0.01	0.01	100	-	-
FCS-3B	Emergent	Slope	IV	(NA) Hunts Point	0.04	0.04	100	-	-
FCS-3C	Emergent	Slope	IV	(NA) Hunts Point	0.01	0.01	100	-	-
FCS-3D	Emergent	Slope	IV	(NA) Hunts Point	0.04	0.04	100	-	-
FCS-3E	Emergent	Slope	IV	(NA) Hunts Point	0.02	0.02	100	-	-

Wetland[a]	Wetland Classification				Wetland Size (acres)	Wetland Impact Areas[e] (acres)			
						Permanent Impact		Temporary	
	Cowardin[b]	HGM[c]	Ecology[c]	Local Jurisdiction[d]		Permanent	Percent affected	Long Term	Short Term
Cozy Cove Drainage									
CCN-1	Forested, Scrub-shrub, Emergent, Littoral-aquatic bed	Lake Fringe, Depressional Outflow	III	III Hunts Point, Yarrow Point	8.4	-	0	-	-
CCN-2	Emergent	Depressional Closed	III	(NA) Hunts Point	0.25	0.25	100	-	-
CCN-2A	Forested	Depressional Closed	III	(NA) Hunts Point	0.02	0.02	100	-	-
CCS-1	Scrub-shrub, Emergent	Slope	IV	(NA) Hunts Point	0.48	0.48	100	-	-
CCS-2	Emergent	Slope	IV	(NA) Hunts Point	0.07	0	0	-	-
CCS-3	Emergent	Slope	IV	(NA) Hunts Point	0.1	0.01	10	-	-
CCS-4	Scrub-shrub	Slope	IV	(NA) Yarrow Point	<0.1	0.01	10	-	-
CCS-5	Forested, Emergent	Slope	III	(III/NA) Clyde Hill	0.09	0.09	100	-	-

Wetland[a]	Wetland Classification				Wetland Size (acres)	Wetland Impact Areas[e] (acres)			
						Permanent Impact		Temporary	
	Cowardin[b]	HGM[c]	Ecology[c]	Local Jurisdiction[d]		Permanent	Percent affected	Long Term	Short Term
Yarrow Bay Drainage									
YBN-1	Forested, Scrub-shrub, Emergent, Littoral-aquatic bed	Lake fringe, Riverine, Depressional Outflow	I	1 Kirkland	75.81	0.01	0.01	0.10	-
YBN-1A	Forested, Scrub-shrub	Riverine	III	3 Kirkland	0.08	-	0	-	-
YBN-1B	Forested	Depressional Outflow	III	3 Kirkland	0.04	-	0	-	-
YBN-2	Scrub-shrub	Slope	IV	IV Bellevue	0.01	0.01	100	-	-
YBS-1	Forested, Emergent	Slope	III	III Bellevue	1.86	1.14	61.29	-	0.07
YBS-2A	Emergent	Depressional Closed	III	III Bellevue	0.11	0.11	100	-	-
YBS-2B	Emergent	Slope	IV	IV Bellevue	0.01	0.01	100	-	-
YBS-2C	Scrub-shrub	Riverine	III	III/NA Bellevue/ Clyde Hill	0.07	0.07	100	-	-
YBS-3	Forested, Emergent	Slope	III	NA Clyde Hill	2.06	2.06	100	-	-

Wetland[a]	Wetland Classification				Wetland Size (acres)	Wetland Impact Areas[e] (acres)			
	Cowardin[b]	HGM[c]	Ecology[c]	Local Jurisdiction[d]		Permanent Impact		Temporary	
						Permanent	Percent affected	Long Term	Short Term
Yarrow Creek Drainage									
YCN-1	Emergent	Riverine	III	III Bellevue	0.01	0.01	100	-	-
YCN-2	Emergent	Riverine	III	III Bellevue	0.13	0.13	100	-	-
YCN-3	Emergent	Depressional Outflow	IV	IV Bellevue	0.11	0.11	100	-	-
YCN-3A	Emergent	Riverine, Slope	III	III Bellevue	0.63	0.63	100	-	-
YCN-3B	Forested, Scrub-shrub	Riverine	III	III Bellevue	0.04	0.04	100	-	-
YCN-4A	Forested	Riverine	II	II Bellevue	0.23	0.01	4.35	0.01	-
YCN-5	Emergent	Slope	IV	IV Bellevue	0.50	-	0	-	-
YCN-6	Emergent	Slope	IV	IV Bellevue	0.18	-	0	-	-
YCN-7	Forested	Riverine	IV	IV Bellevue	0.01	-	0	-	-
YCN-8	Forested	Riverine	IV	IV Bellevue	0.01	-	0	-	-

Wetland[a]	Wetland Classification				Wetland Size (acres)	Wetland Impact Areas[e] (acres)			
	Cowardin[b]	HGM[c]	Ecology[c]	Local Jurisdiction[d]		Permanent Impact		Temporary	
						Permanent	Percent affected	Long Term	Short Term
YCS-1	Emergent	Riverine	II	II Bellevue	0.36	0.16	35.56	-	-
YCS-2	Forested, Emergent	Riverine, Slope	II	II Bellevue	2.17	0.09	4.15	-	-
YCS-4	Emergent	Depressional Outflow	IV	IV Bellevue	0.97	0.97	100	-	-
YCS-5	Emergent	Depressional Outflow	III	III Bellevue	0.29	0.01	3.45	-	0.07
YC S-6	Emergent	Slope	IV	IV Bellevue	0.23	-	0	-	-
Total					**96.35**	**6.77**	**7.03**	**0.11**	**0.14**

[a] Wetland names refer to the drainage (for example, FC=Fairweather Creek), location of the wetland relative to SR 520 (N for north, S for south), and a numeric identifier.

[b] Cowardin, et al. (1979) or National Wetland Inventory (NWI) Class based on vegetation.

[c] Ecology rating according to Hruby (2004).

[d] Local ratings based on City of Medina Code, Chapter 18.12, Article II; City of Hunts Point Code, Chapters 16.05.330 and 16.15; City of Clyde Hill Code, Chapter 18.04.300; City of Yarrow Point, Morningside Park and Wetherill Nature Preserve critical areas; City of Kirkland Zoning Code, Chapter 90 Drainage Basins; City of Bellevue Land Use Code, Critical Area Overlay District Part 20.25H and Part 20.50.

[e] Wetland impacts based on design as of 12/30/2009.

Note: Some of the wetlands shown in this table have no impacts. The information on these wetlands has been included to provide consistency with other project documents, and to show wetlands that were avoided by the project.

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Table 2. Permanent Wetland Impact Summary by Classification

Wetland Classification	Class [a,b,c]	Affected Wetland Area [d] (acres)	Percent of Affected Wetland Area **
USFWS (Cowardin et al. 1979)	PEM	6.04	89.22
	PSS	0.41	6.06
	PFO	0.32	4.73
	Total	**6.77**	
Washington Department of Ecology (Hruby 2004)	I	0.01	0.15
	II	0.26	3.84
	III	4.56	67.36
	IV	1.94	28.66
	Total	**6.77**	
Medina Rating (May 2005)	I		
	II		
	III		
	IV	0.02	0.30
	Total	**0.02**	
Hunts Point Rating (does not have critical areas regulations)	I		
	II		
	III	0.27	3.99
	IV	0.81	11.96
	Total	**1.08**	
Clyde Hill Rating (does not have critical areas regulations)	I	0	
	II	0	
	III	2.16	31.91
	IV	0	
	Total	**2.16**	
Yarrow Point Rating (October 2006)	I	0	
	II	0	
	III		
	IV	0.01	0.15
	Total	**0.10**	

Wetland Classification	Class [a,b,c]	Affected Wetland Area [d] (acres)	Percent of Affected Wetland Area **
Kirkland Rating (July 2008)	1	0.01	0.15
	2		
	3		
	4		
	Total	**0.01**	
Bellevue Rating (March 2008)	I	0	
	II	0.42	6.20
	III	1.97	29.10
	IV	1.10	16.25
	Total	**3.49**	
Hydrogeomorphic Class	Depressional closed	0.38	5.61
	Depressional outflow	1.13	16.69
	Lake fringe/depressional	0.01	0.15
	Slope	4.11	60.71
	Riverine	0.42	6.20
	Riverine/Slope	0.72	10.64
	Total	**6.77**	

[a] Vegetation classes are based on Cowardin, et al. (1979).

[b] Ecology rating and HGM classification according to Hruby (2004).

[c] Local ratings based on City of Medina Code, Chapter 18.12, Article II; City of Hunts Point Code, Chapters 16.05.330 and 16.15; City of Clyde Hill Code, Chapter 18.04.300; City of Yarrow Point, Morningside Park and Wetherill Nature Preserve critical areas; City of Kirkland Zoning Code, Chapter 90 Drainage Basins; City of Bellevue Land Use Code, Critical Area Overlay District Part 20.25H and Part 20.50.

[d] Wetland impacts based on design as of 12/30/2009.

Permanently filled areas total 6.77 acres, and will include approximately 0.01 acre of Category I wetland (forested); approximately 0.26 acre of Category II wetlands (0.25 acre emergent, 0.01 acre forested); approximately 4.56 acres of Category III wetlands (0.30 acre forested, 0.09 acre scrub-shrub, and 4.17 acres emergent); and approximately 1.94 acres of Category IV wetlands (0.32 acre scrub-shrub and 1.62 acres emergent).

The Medina to SR 202: Eastside Transit and HOV Project will completely fill 23 wetlands (FCS 1, FCS-2, FCS 3A through 3E, CCN-2, CCN-2A, CCS 1, CCS 5, YBN 2, YBS-2A through 2C, YBS-3, YCN-1, YCN-2, YCN-3, YCN-3A and 3B, YCN-4 and YCN-4). The filling of most of these wetlands is a direct result of widening SR 520. Eleven of these wetlands are slope wetlands, six are depressional wetlands, four are riverine, and one wetland includes both riverine and slope hydrogeomorphic (HGM) classes. Most of these wetlands are small (19 are 0.25 acre or less) and were likely formed as a result of the original construction of SR 520. The remaining four wetlands that will be completely filled are between 0.48 acre and 2.06 acres in size.

Nine wetlands (FCN-3, CCS-3, CCS-4, YBN-1, YBS-1, YCN-4A, YCS-1, YCS-2, and YCS-5) will have from 0.01 to 62 percent of their area filled (Table 1). Two of these wetlands are riverine systems, four are slope, one is riverine and slope, one is depressional outflow, and one includes lake fringe, riverine, and depressional outflow HGM classes. Of these nine partially-filled wetlands, six are 0.45 acre or less in size, two are between 1.8 and 2.2 acres in size, and one is over 75 acres in size.

Summarizing the permanent fill effects by HGM class, the Medina to SR 202: Eastside Transit and HOV Project will fill 4.11 acres of slope wetland, 0.42 acre of riverine wetland, 0.38 acre of depressional closed wetland, 1.13 acres of depressional outflow wetland, and 0.73 acre of wetland with two or more HGM classes (riverine and slope or lake fringe and depressional).

In addition to the permanent fill effects, loss of a portion of the forested buffer of Wetland CCN-1 may cause a loss of some function in the affected portion of CCN-1. The functions most likely to be affected are primarily habitat, since light, noise, and other disturbance may reach farther into Wetland CCN-1 than is currently the case. Water quality and hydrologic functions in Wetland CCN-1 are not expected to be affected by this loss of forested buffer, since the Medina to SR 202: Eastside Transit and HOV project will provide stormwater treatment. Since runoff from the existing SR 520 roadway is not treated, the project is expected to provide for an improvement over current conditions. Additional discussion of wetland buffer impacts is provided in Section 3.5.

3.4 Temporary Wetland Impacts

Temporary impacts are direct impacts to wetlands that do not result in permanent filling of the wetlands. Typically, temporary impacts are restored following construction or over some period of time afterwards. These impacts can be further divided into long-term and short-term temporary impacts.

Long-term temporary impacts are those temporary impacts where the effects of the impact can be restored over time, but not within a year or so (Ecology et al. 2006a). An example of long-term temporary impact would be clearing of trees in a wetland. Short-term temporary impacts are where functions can be restored relatively soon, generally within one year (Ecology et al. 2006a). An example of this would be clearing of emergent vegetation.

Temporary impacts for the Medina to SR 202: Eastside Transit and HOV Project result from construction-related access; the temporary impacts will include temporary clearing (but not grading), and soil disturbance will be minimized. The total temporary impact will be approximately 0.25 acre. Short-term temporary impacts will total 0.14 acre, and will occur in portions of Wetlands YBS-1 and YCS-5 dominated by non-native emergent vegetation (reed canarygrass). As a result, these impacts will be classified as short-term temporary impacts. The remaining 0.11 acre of the temporary impact will occur in a forested portion of Wetlands YBN-1 and YCN-4A, and will be classified as long-term permanent impacts. Temporary impacts are listed by wetland in Table 1 and shown in the Wetland Impact Plan Sheets (Figure 2). Detailed descriptions of the impacts to individual wetlands are provided in Appendix A.

3.5 Wetland Buffer Impacts

The primary purpose of buffers is to protect and maintain the wide variety of functions and values provided by wetlands (or other aquatic areas). Functions provided by wetland buffers include: sediment removal; phosphorous and nitrogen removal; toxic removal (bacteria, metals, pesticides); microclimate influence; habitat maintenance; screening adjacent disturbances (noise, light, etc.); and habitat connectivity. Factors that affect the performance of buffer functions include vegetation characteristics, slopes, soils, and buffer width and length (Sheldon et. al., 2005).

Many of the buffers in the Medina to SR 202: Eastside HOV and Transit Project study area consist of mowed grasses, which serve primarily to filter stormwater runoff and control erosion.

3.5.1. Permanent

Permanent impacts to buffers generally result from the actual loss of vegetated buffer areas. In the case of roadway construction, this loss may result from the construction of paved road surfaces, adjacent roadbed or prism, bridges, and associated facilities (such as stormwater treatment facilities and conveyances).

As of the writing of this report, Medina to SR 202: Eastside Transit and HOV Project will permanently affect the buffers of five wetlands (Wetland CCN-1, YBN-1, YBS-1, YCS-2, and YCS-5), resulting from the total 1.14 acres of impact (Table 3). This total includes 0.14 acre of Category I wetland buffer, and 0.80 acre of Category III wetland buffer. An additional 0.014 acre of the buffer of YCS-2 (Category III) and 0.016 acre of the buffer of YBN-1 (Category I) will be converted to stream as part of the stream mitigation. Affected buffers are shown in Figure 2 and listed in Table 3.

3.5.2. Temporary

Temporary buffer impacts occur where construction work will extend beyond the permanent footprint of the project. This includes temporary work areas and easements. Temporary buffer impacts will affect the same five wetland buffers as the permanent buffer impacts, and will total 0.86 acre. This total includes 0.19 acre of Category I wetland buffer, and 0.67 acre of Category III wetland buffer. These temporary buffer impacts are listed in Table 3 (below).

Table 3. Wetland Buffer Size, Classification, and Area Impacted by the Proposed Project

Wetland [a]	Wetland Classification		Buffer Width [b] (feet)	Buffer Impact Area (acres) [c]	
	Ecology [a]	Local Jurisdiction [b] (City)		Permanent	Temporary
Cozy Cove drainage					
CCN-1	III	III Hunts Point,	80	0.02	
CCN-1	III	III Yarrow Point	80	0.45	0.02
Yarrow Bay					
YBN-1	I	1 Kirkland	100	0.14	0.19
YBS-1	III	III Bellevue	60	0.30	0.18
Yarrow Creek					
YCS-2	III	II Bellevue	110	0.20	0.45
YCS-5	III	III Bellevue	60	0.03	0.02
Total				**1.14**	**0.86**

[a] Hruby (2004).

[b] Local ratings and buffers based on City of Hunts Point Code, Chapter 18.04.300; City of Yarrow Point, Morningside Park and Wetherill Nature Preserve critical areas; City of Kirkland Zoning Code, Chapter 90 Drainage Basins; City of Bellevue Land Use Code, Critical Area Overlay District Part 20.25H and Part 20.50.

[c] Buffer impacts based on design as of 12/30/2009.

3.6 Wetland Functions Impacted

The functions and values of delineated wetlands within the project area were qualitatively evaluated using the *Washington State Wetlands Rating System for Western Washington* (Hruby 2004). The method uses a field worksheet, which assesses a wetland based on the presence of certain environmental characteristics. In the Ecology rating method, wetland functions are divided into three subsets: water quality functions, hydrologic functions, and habitat functions.

In order for a wetland to provide a particular function in this system, the wetland must have not only the capability to provide a function, but the opportunity to provide it. For example, a particular wetland may have the physical attributes to provide a particular function (e.g., dense emergent vegetation to filter sediments), but may not have the opportunity to provide it (no

sediment-laden waters are entering the wetland). Both the water quality and hydrologic function subsets assess the capacity and the opportunity to provide these functions.

The potential and opportunity to provide three functions (water quality, hydrology, and habitat) were assessed for each wetland using the Ecology worksheet (Hruby 2004). The scores from the Ecology rating system were converted to a qualitative rating of “High,” Moderate,” or “Low” as outlined in the Focus Sheet - Using the Wetland Rating System in Compensatory Mitigation (Hruby 2008). For water quality and hydrologic opportunity, as well as special characteristics, the function is either present (“X”) or not present (“-”). Wetlands were considered to have special characteristics if they had education or scientific value or were unique or had some heritage value. Function scores for the wetlands are shown in Appendix A, and additional details can be found in the Medina to SR 202: Eastside Transit and HOV Project Environmental Assessment: Wetland Assessment Report. (WSDOT 2009a).

Most wetlands in the project areas scored low to moderate for water quality, hydrologic, and habitat functions (Table 4). Exceptions include Wetland CC N-1, which scored high for habitat potential, YB N-1 (high for water quality potential and habitat potential), YB N-1A, (high for hydrologic function potential), YC N4a (high for hydrologic function potential), and Wetland YC S-2 (high for hydrologic function potential).

The depressional wetlands in the project area have the potential to improve water quality because of their proximity to SR 520 and residential development, the presence of vegetation to trap pollutants, and closed nature of some of the wetlands. These depressional wetlands generally have a limited ability to reduce flooding and stream degradation due to their small size and location in the watershed, and were also rated low for habitat potential and opportunity due to the limited number of habitat features and low structural diversity.

Riverine wetlands in the study area can provide storage for overbank flows in Yarrow Creek, and their vegetation can trap pollutants. As a result, these wetlands rate slightly higher than depressional wetlands for water quality and hydrologic functions. Riverine wetlands in the project area generally have a low to moderate habitat function.

Since slope wetlands do not retain large amounts of water, these wetlands have limited potential to provide water quality function and hydrologic functions, and scores for these functions are correspondingly low. The generally low habitat diversity also limits habitat function, with the exception of Wetlands YBS-1 and YBS-3, which provide greater structural habitat.

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Table 4. Functions and Values of the Existing Wetlands.

Function/ Value [a]	Wetland																																									
	FC Park	FCN-3	FCS-1	FCS-2	FCS-3A	FCS-3B	FCS-3C	FCS-3D	FCS-3E	CCN-1	CCN-2	CCN-2A	CCS-1	CCS-2	CCS-3	CCS-4	CCS-5	YBN-1	YBN-1A	YBN-1B	YBN-2	YBS-1	YBS-2A	YBS-2B	YBS-2C	YBS-3	YCN-1	YCN-2	YCN-3	YCN-3A	YCN-3B	YCN-4A	YCN-5	YCN-6	YCN-7	YCN-8	YCS-1	YCS-2	YCS-4	YCS-5	YCS-6
Water Quality Functions																																										
Potential	M	L	M	M	-	L	-	-	L	M	M	M	L	L	M	L	M	H	M	M	L	M	M	L	M	M	M	M	M	M	H	M	L	L	L	L	M	M	M	M	L
Opportunity	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hydrologic Functions																																										
Potential	M	-	L	L	-	-	L	-	-	M	M	M	L	-	-	M	L	M	H	M	M	L	M	L	M	L	M	M	M	M	M	H	-	-	L	M	M	H	L	M	-
Opportunity	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	X	X	-	-	-	-	-	-	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Habitat Functions																																										
Potential	L	L	L	L	L	L	L	L	L	M	L	L	L	L	L	-	L	H	L	L	L	L	L	L	L	L	L	L	L	L	M	M	L	L	L	M	M	M	L	L	L
Opportunity	M	M	L	L	L	L	L	L	L	M	L	L	M	L	L	L	M	M	M	L	L	M	M	M	M	M	M	M	M	M	M	L	L	L	L	L	M	M	L	M	L
Special Characteristics																																										
Educational or Scientific Value	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uniqueness and Heritage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] "L" means that the function is of lower quality.
"M" means that the function is of moderate quality.
"H" means the function is of higher quality.
"X" means the function is present.
"-" means that the function is not present.

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Chapter 4. Mitigation Strategy

The mitigation strategy described in this chapter involves avoidance, minimization of wetland impacts, and compensatory mitigation for unavoidable wetland impacts.

Federal Executive Order 11990 (42 F.R. 26961, May 1977) requires all federal agencies, as they carry out specific agency responsibilities, to consider wetland protection as an important part of their policies. This includes minimizing the destruction, loss, or degradation of wetlands, and preserving and enhancing the natural beneficial values of wetlands.

Wetlands, streams, and other sensitive resources in the project vicinity are protected by Section 404 of the Clean Water Act (CWA), which regulates placement of fill in Waters of the United States. The U.S. Army Corps of Engineers (USACE) is the responsible agency for implementing permits under Section 404 of the CWA.

Wetland mitigation is regulated under Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (33 Code of Federal Regulations [CFR] Parts 325 and 332, April 10, 2008), hereafter referred to as the Federal Rule on Compensatory Mitigation. The Federal Rule on Compensatory Mitigation was developed by the USACE and the U.S. Environmental Protection Agency (USEPA), and improves and consolidates existing regulations and guidance, to establish equivalent standards for all types of mitigation under the CWA Section 404 regulatory program.

Activities that affect wetlands and streams may also require a water quality certification (CWA Section 401), a federal law that is implemented at the state level by the Washington State Department of Ecology (Ecology). Ecology reviews projects for compliance with state water quality standards and makes permitting and mitigation decisions based on the nature and extent of impacts, and the type and quality of wetlands/streams being affected.

The U.S. Department of Transportation (USDOT) seeks to assure the protection, preservation, and enhancement of the nation's wetlands to the fullest extent practicable during the planning, construction, and operation of transportation facilities and projects (USDOT Order 5660.1A; Executive Order 11990, 1978). WSDOT projects that receive federal funding are subject to this order, including the SR 520 Bridge Replacement and HOV Program. Project-level design, environmental review, and permitting for the project include avoidance, minimization,

restoration, and compensation of wetland loss in accordance with the Clean Water Act Section 404(b)(1) guidelines shown in 40 CFR part 230.

Washington State Executive Order 89-10 mandates that actions and activities of state agencies achieve a goal of "no net loss" of wetlands. In recognition of the Wetland Executive Order, WSDOT has adopted a "no net loss" agency policy. The SR 520 Bridge Replacement and HOV Program and the Medina to SR 202: Eastside Transit and HOV Project will be consistent with that policy.

Washington State Executive Order 90-04 requires all state agencies to rigorously enforce their existing authorities to assure wetlands protection and to promote and support mitigation in the order of decreasing preference from avoidance to compensatory mitigation.

Wetland mitigation guidance jointly prepared by the USACE and the Ecology as found in *Wetland Mitigation in Washington State, Part 1: Agency Policies and Guidance* (Ecology et al., 2006a) and *Wetland Mitigation in Washington State, Part 2: Developing Mitigation Plans* (Ecology et al., 2006b). These documents provide information on impact assessment, wetland mitigation ratios, buffer mitigation ratios, and wetland buffer requirements.

Ecology Shorelands and Environmental Assistance Focus Sheet, Using the Wetland Rating System in Compensatory Mitigation (Hruby 2008) outlines the constraints in using the Washington State Wetlands Rating System when estimating changes in wetland function for wetland mitigation.

The mitigation proposed for the Medina to SR 202: Eastside Transit and HOV Project has been designed to meet the requirements of the Federal Rule on Compensatory Mitigation and to be consistent with federal and state "no net loss" policies. The project has also been designed to meet the mitigation sequencing, compensation, reporting and monitoring requirements typically used in WSDOT projects.

4.1 Avoidance and Minimization of Wetland Impacts

WSDOT has avoided and minimized impacts to wetlands and wetland buffers to the greatest extent practicable. Total avoidance was not possible due to the location of the project along the existing road rights of way and the constraints associated with safety and design guidelines. Impacts were minimized primarily through site-specific design techniques including steeper side slopes, installing guardrail, and infiltrating stormwater along fill slopes rather than excavating

wetland areas for stormwater treatment. Compensatory mitigation will replace wetland area and functions lost as a result of the remaining unavoidable impacts.

During the design phase, WSDOT considered and implemented refinements to the design where feasible to avoid impacts to existing wetlands, streams and buffers. Specific Impact Avoidance Measures used to avoid impacts include the following:

- Multiple design revisions were made in the area between Bellevue Way and 108th Avenue NE to reduce impact to wetland streams and buffers. The roadway alignment was shifted to the north, the space between eastbound and westbound lanes was compressed, and a wall was designed along the south side of the roadway. These changes limit the width of the roadway, resulting in a reduction in impacts to wetlands, streams, and buffers.
- Noise walls were sited to avoid wetlands and streams. The noise walls are to be located close to the road between the culvert end and the edge of pavement at all culvert locations. At other locations along the corridor, the noise walls were designed to be placed further up the hillside and out of wetlands.
- Miscellaneous roadway structures, such as pullouts for maintenance and location of sign footings, were located in upland areas to avoid wetlands and streams.
- A fiber optic cable runs along the eastern section of the project, from approximately Bellevue Way to I-405. The cable is in need of replacement and is currently located outside of the pavement edge and runs through existing wetlands. The new fiber optic cable alignment will be routed under the roadway shoulder to avoid wetland impacts.

Specific impact minimization measures to reduce wetland, stream and buffer impacts were accomplished through specific design modifications such as the following:

- The off-ramp from eastbound SR 520 to Bellevue Way NE will be removed and no replacement will be built. This removal reduces the amount of wetland and buffer impacts resulting from the project, eliminating the need for four culverts and allowing these areas to be converted to open channel.
- Retaining walls were used in several locations to reduce the width of the roadway; specifically:
- Northup Way and 33rd Place (reduced impacts to Yarrow Creek).
- WSDOT Maintenance Facility at 108th Avenue NE (reduced impacts to South Fork Yarrow Creek and Wetland YCN-4A).

- South side of SR 520, from Bellevue Way and 108th Avenue NE (reduced impacts to Yarrow Creek and Wetlands CS-1 and YCS-2, potential for wider floodplain).
- Several culvert lengths were shortened and several culvert alignments were adjusted resulting in a reduced impact to stream channels.
- Direct impacts to streams were minimized by constructing stormwater outfalls outside of the ordinary high water mark (OHWM) of the stream channels.
- Clearing limits will be delineated with orange barrier fencing prior to commencing clearing activities wherever clearing is proposed in or adjacent to a stream/wetland or its buffer.

Overall, the avoidance and minimization efforts have resulted in reduction of 1.42 acres in permanent impacts to wetlands. Table 5 identifies the specific avoidance and minimization efforts for the Medina to SR 202: Eastside Transit and HOV Project. The table is organized by watershed; measures used to minimize impacts for each wetland are identified in the table, as well as the area and nature of the impacts avoided.

Table 5. Wetland Impacts Avoided, Minimized for the Medina to SR 202: Eastside Transit and HOV Project

Wetland	Wetland Classification		Avoidance/ Minimization Measures	Permanent Wetland Impact Reduced (acres)
	Ecology [a]	Local Jurisdiction [b] (City)		
Cozy Cove				
CCN-1	III	III Hunts Point, Yarrow Point	Limiting footprint to existing develop areas avoids impacts to this wetland	
Yarrow Bay				
YBN-1	I	1 Kirkland	Replacement culvert reduces culvert length and avoids permanent impacts to this wetland	
YBN-1A	III	3 Kirkland	Limiting footprint to existing develop areas avoids impacts to this wetland	
YBN-1B	III	3 Kirkland	Design avoids impacts to this wetland	
YBS-1	III	III Bellevue	Use of retaining wall	0.20
Yarrow Creek				
YCN-2	III	III Bellevue	Reduced size of stormwater facility	0.09
YCN-3A	III	III Bellevue	Reconfigured/refined design for off-ramp	0.20
YCN-4A	II	II Bellevue	Design avoids impacts to this wetland	0.03
YCS-1	II	II Bellevue	Use of retaining wall and revised stormwater pond design	0.33
YCS-2	II	II Bellevue	Use of retaining wall	0.14
YCS-4	IV	IV Bellevue	Refined design footprint	0.30
YCS-5	III	III Bellevue	Reconfigured/reduced footprint of on-ramp	0.14
Total				**1.42**

Note: Wetland impacts based on design as of 12/30/2009.

[a] Ecology rating and HGM classification according to Hruby (2004).

[b] Local ratings based on City of Bellevue Land Use Code, Critical Area Overlay District Part 20.25H and Part 20.50.

4.2 Compensatory Mitigation

4.2.1. Landscape Approach to Mitigation

The Mitigation Team (described in Chapter 1) identified wetland mitigation candidate sites using a hierarchical selection process based on the watersheds in the project areas. The process is intended to provide a list of sites that have potential to provide not only mitigation appropriate to the level of project impacts, but also have potential to provide benefits that extend beyond the site boundaries. Examples of these benefits include addressing limiting factors at the watershed level and providing critical linkages in habitat corridors.

The following bullets describe key steps in the mitigation site selection process (a more detailed description is provided in Appendix G).

- The eastside study area includes the area from Juanita Creek Basin on the north to Interstate 90 (I-90) on the south, and Lake Sammamish drainage on the east, and includes portions of the cities of Bellevue, Kirkland, and Redmond.
- A review of documents, aerial photography, and public geographic information system (GIS) layers for WRIA 8 was conducted for the eastside study area. Sites were also added based on input from regulatory agencies, team members, and the City of Bellevue.
- In order to select the most appropriate potential wetland mitigation sites, The Mitigation Team identified nine broad parameters that would define the best sites for the master list of potential sites. These nine parameters are divided into two categories: opportunity parameters and risk parameters. ‘The “opportunity set” includes: size, mitigation type, special characteristics (e.g., sites with high restoration potential, palustrine and riverine habitats), location, and cost. The “risk set” includes: availability, hydrology, hazardous waste, and cultural resources.
- The parameters were applied in a series of steps referred to as screening and paring.
- Site screening was performed in two steps. The initial screening focused more on risk factors to eliminate high-risk sites quickly. The second screening focused on opportunities.
- Paring was performed in five steps. Pares 1-3 were aimed at removing high-risk sites and sorting the primary list to identify the best sites for further analysis. Pare 4 was based on property owners’ willingness to sell. Pare 5 consisted of a detailed on-site analysis of the top five sites based on both opportunities and risks. The results of Pare 5 were presented

to the Mitigation Technical Working Group for consultation and selection of the top sites for the purchase process.

- Generally, the sorting identified the sites with the greatest mitigation potential. The remaining sites were moved to a backup list. In this process, candidate sites that are sorted to the backup list can be moved back to the primary list (or vice versa) as the project design and permit process evolve and as the criteria for mitigation change.
- Final site selection was based on the amount of mitigation available at the sites, suitability of the mitigation, and incorporated input from the Multi-Agency Permitting (MAP) Team, and local jurisdictions.

4.2.2. Proposed Wetland Mitigation

Mitigation for Permanent Impacts

The proposed project will adversely impact a total of 7.35 acres of palustrine and riverine wetland area (6.77 acres of permanent, 0.25 acre of temporary). Most of the affected wetlands in the project area are Category III and IV, with smaller impacts to Category II and Category I wetlands. These impacts will reduce or eliminate water quality, hydrologic, and habitat functions in the affected wetlands and watersheds.

To meet the requirements of federal, state, and local regulations and policies, WSDOT proposes wetland restoration/creation and rehabilitation at two mitigation sites. On-site, the project will restore/create 0.52 acre of forested wetland and rehabilitate 0.63 acre of disturbed riparian wetlands at the Yarrow Creek Mitigation Site. An additional 0.82 acre of wetland restoration/creation and 0.57 acre of wetland rehabilitation (1.39 acres total) will be performed within regulatory buffers.

Off-site, the project will rehabilitate 28.98 acres of Category II Riverine/Depressional flow-through wetland and enhance 1.52 acres riparian upland at the Keller Mitigation Site. The proposed rehabilitation is expected to provide or exceed the same type and level of wetland functions as those impacted by the project.

In addition to the wetland impacts, the project will affect 2.0 acres of the buffers of seven wetlands (1.14 acres of permanent impact, 0.86 acre of temporary impact). Mitigation for impacts to buffers resulting from the project will take the form of buffers appropriate to protect the expected wetland functions at the Keller Mitigation Site. Appropriate buffer widths for the site are discussed below

Mitigation Ratios

The guidance in *Wetland Mitigation in Washington State Part 1: Agency Policies and Guidance* (Ecology 2006a) provides typical compensatory mitigation ratios for wetlands. Table 6 provides a summary of the mitigation needs for the Medina to SR 202: Eastside Transit and HOV Project and based on these standard mitigation ratios for rehabilitation.

Table 6. Mitigation Needs for Permanent Impacts from the Medina to SR 202: Eastside Transit and HOV Project

Direct Wetland Impacts [a]		Wetland Area*	
Ecology Wetland Category	**Area (acres)**	**Mitigation Ratio (Rehabilitation)**	**Area (in acres)**
Category IV	1.94	3:1	5.82
Category III	4.56	4:1	18.24
Category II	0.26	6:1	1.56
Category I	0.01	12:1	0.12
Total	**6.77**		**25.74**

[a] Wetland impact areas are based on the design as of 12/30/2009.

* Ecology (2006a).

Mitigation for Temporary Impacts

Construction-related activities for the Medina to SR 202: Eastside Transit and HOV Project will temporarily impact 0.25 acre of wetland. Long-term temporary impacts totaling 0.11 acre will occur in forested portions of Wetland YBN-1 (0.10 acre) and YCN-4A (0.01 acre). Short-term temporary impacts totaling 0.14 acre will occur in Wetlands YBS-1 (0.07 acre) and YCS-5 (0.07 acre).

Construction activities will include clearing of vegetation to allow access. Temporary impact areas will not be graded, and soil disturbance in the access areas will be minimized. Following construction, the temporarily impacted areas will be revegetated with appropriate native species. The revegetation will include woody vegetation in areas where woody vegetation is being cleared, and appropriate emergent vegetation in the existing emergent wetland areas. Temporary impact areas will be monitored to determine that the desired vegetation type has been re-established.

Short-term Temporary Impacts

Emergent wetlands subject to short term temporary impacts (Wetlands YBS-1 and YCS-5) will be revegetated with appropriate native emergent grass species and monitored to determine that the desired vegetation type has been re-established.

Long-term Temporary Impacts

Long-term temporary impacts to wetlands require compensation, but at lower ratios than for permanent impacts (Ecology 2006a). The guidance recommends one quarter of the typical ratios for permanent impacts. Table 7 summarizes the compensatory mitigation needs for temporary long-term impacts resulting from the project.

Table 7. Mitigation Needs for Long – Term Temporary Impacts from the Medina to SR 202: Eastside Transit and HOV Project.

Ecology Wetland Category	Area (acres)[a]	Permanent Impact Ratio (see Table 6)	Temporary Impacts mitigated at ¼ of permanent impact ratios	Proposed Rehabilitation Area (acres)
Category II	0.01	6:1	1.5:1	0.015
Category I	0.1	12:1	3:1	0.30
Total	**0.11**			**0.315**

[a] Wetland impact areas are based on the design as of 12/30/2009.

* Ecology (2006).

Compensatory mitigation at the approved ratios will be provided as part of the overall compensatory mitigation. In addition to the compensatory mitigation described in Table 7, the following on-site measures will also be satisfied:

- No grading is expected to take place, and hydric soils will not be moves or stockpiled. Soil disturbance will be minimized.
- Surface and groundwater patterns are expected to be unaffected by these impacts.
- Disturbed wetland and buffer areas will be revegetated with native woody wetland species.

- Disturbed wetland and buffer areas will be monitored and maintained for a period of 10 years.
- No hydroseeding is expected in these areas. If hydroseeding is determined to be necessary or desirable, the seed mix will be provided in the final design.

Temporary buffer impacts will be addressed on-site through revegetation with appropriate native vegetation and monitoring (3 and 4 above).

Total Mitigation Needs

Table 8 summarizes the overall mitigation needs for the Medina to SR 202: Eastside Transit and HOV Project, as estimated in Tables 6 and 7 using the standard rehabilitation ratios. Potential mitigation available for the project is also shown.

Table 8. Overall Mitigation Needs for the Medina to SR 202: Eastside Transit and HOV Project and Potential Mitigation.

	Overall Mitigation Need	Restoration /Creation* available on-site	Rehabilitation onsite	Rehabilitation off-site	Buffer mitigation off-site
		0.52	0.63	25.48	0.15
Total	26.05	26.78*			

*. Wetland restoration/creation is typically provides mitigation at ½ of the ratios for rehabilitation.

Based on the current level of design, the total wetland mitigation need for the project (including both permanent and long-term temporary impacts) is 26.05 acres. The proposed compensatory mitigation provides 26.78 acres of compensatory mitigation for the project. This includes 0.52 acre of wetland creation on-site, which would provide for mitigation at a ½ of the ratio used for rehabilitation. Compensatory mitigation in excess of actual project needs will be reserved as a contingency measure, and may be considered by the team and agencies as mitigation for unanticipated impacts that may occur during Medina to SR 202: Eastside Transit and HOV Project.

Buffer Mitigation

While buffer impacts will not be mitigated for directly, the proposed wetland mitigation will provide appropriate buffers for protecting the functions at the mitigation sites.

Buffers at the Yarrow Creek Mitigation Site have been established as 100 feet along SR 520 and 50 feet from the turn around, which receives limited use. The onsite buffers include 0.82 acre of wetland creation, 0.57 acre of wetland rehabilitation, and 0.63 acre of upland buffer that will be enhanced with riparian upland forest.

The buffer width proposed for the Keller site will be 110 feet, as recommended for moderate intensity land use (Ecology 2006a). Buffers at this width will provide 3.56 acres of regulatory buffer, all of which will be within the wetland rehabilitation area. An additional 1.52 acres of existing riparian upland along Bear Creek will be enhanced.

The total buffer area to be provided at the two mitigation sites is 4.95 acres.

Introduction to the proposed mitigation

The proposed compensatory mitigation will consist of two components: mitigation on-site along Yarrow Creek, and off-site mitigation at the Keller Mitigation Site. The two sites are shown in Figure 3, and described in the following chapters.

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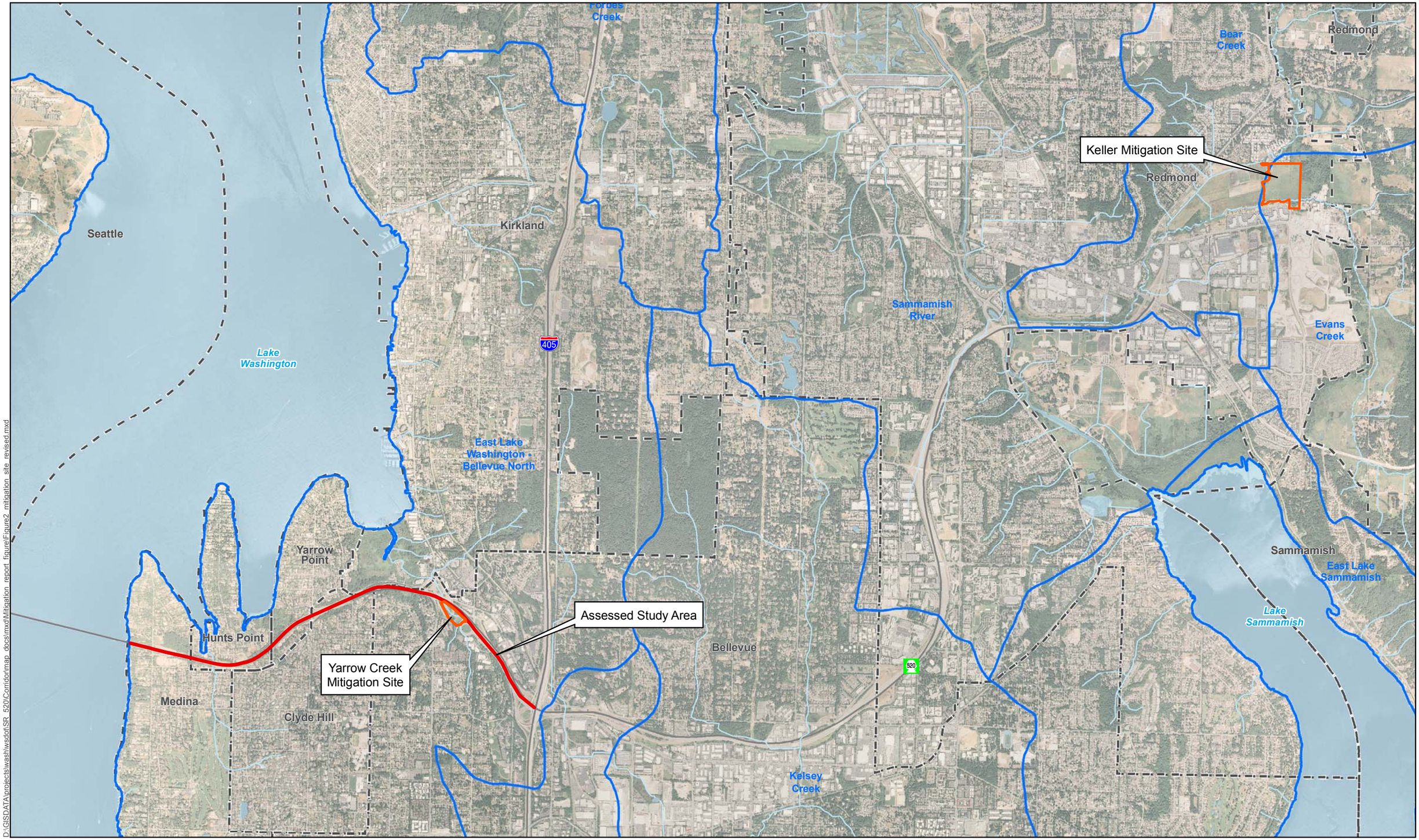

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Legend

- Proposed Mitigation Site
- Municipal Boundary
- Watershed Boundary
- Water Body
- Study Area
- Stream

Figure 3
Location of Mitigation Site

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Chapter 5. Keller Compensatory Mitigation Site

This chapter describes the key elements of the proposed off-site compensatory mitigation site.

5.1 Site Location

The Keller Mitigation Site is located northeast of the intersection of Avondale Road and Union Hill Road in Redmond, Washington. The site is within portions of six parcels (0125059051, 0125059131, 0125059021, 0625069151, 0625069013, and 0625069035) in Section 1, Township 25 North, Range 5 East and Section 6, Township 25 North, Range 6 East. These parcels total approximately 117 acres, and comprise the proposed location of The Lake Washington/Sammamish Watershed Wetland Mitigation Bank.

The proposed Keller Mitigation Site occupies portions of two parcels (0625069013, and 0625069035) along the east end of the larger site. It is approximately 31.6 acres in size, and is bounded by Bear Creek on the east and Evans Creek on the south (Figure 3). The Keller Mitigation Site would be removed from The Lake Washington/Sammamish Watershed Wetland Mitigation Bank, while the areas to the west of Bear Creek would remain part of the bank. The Keller Mitigation Site will be designed consistent with the bank's overall design goals.

5.2 Landscape Perspective

5.2.1. Landscape Position

The Keller Mitigation Site is located within the Bear Creek Basin of Washington Resource Inventory Area (WRIA) 8, the Lake Washington- Cedar/Sammamish Watershed. The site is within a flat, broad floodplain bounded on the east by Bear Creek (a tributary to the Sammamish River), and on the south by Evans Creek at its confluence with Bear Creek. Stream channels and floodplains on the site have been largely channelized as a result of historic agricultural uses and ongoing and site maintenance activities.

5.2.2. Ecological Connectivity

The Keller Mitigation Site is located at the confluence of Evans Creek and Bear Creek. Forested and emergent wetlands are found along Evans Creek, on the parcels immediately adjoining the

eastern boundary of the Keller Mitigation Site. There is also a connection to forested uplands in Jonathan Hartman Park; however, the connection to this habitat is interrupted by Avondale Road, so the benefit is mostly hydrologic support to Bear Creek. The historic stream and wetland network has been disrupted by placement of ditches, drain tiles, and the clearing of vegetation.

The Keller Mitigation Site has been identified as an important potential mitigation site within the Bear Creek Basin (King County et al, 2005) and has also been identified as a priority site for preservation of natural view corridors in the City of Redmond Comprehensive Plan (City of Redmond 2005). Other open space areas and mitigation projects already constructed in the Bear Creek Basin include:

- The Bear Creek Rehabilitation Project mitigation, located near the confluence of Bear Creek and the Sammamish River in Redmond.
- Evans Creek Natural Area approximately four miles east of the City of Redmond in unincorporated King County (King County Department of Natural Resources and Parks [KCDNRP]).
- Kathryn C. Lewis Natural Area, located approximately four miles east of the City of Redmond in unincorporated King County (KCDNRP).
- Bear and Evans Creek Greenway/Perrigo Community Park.
- Arthur Johnson Park.
- Farrel McWhirter Park.
- Juel Community Park.
- Redmond Watershed Preserve.
- Marymoor Park/Lake Sammamish.

The Keller Mitigation Site also provides an important open space linkage between the stream habitats in Bear and Evans Creeks, and the Bear and Evans Creek Greenway/Perrigo Community Park. Improving habitat at the Keller Mitigation Site will not only maintain the connection between these resources, but will provide greater cover for wildlife using this connection and improve foraging opportunities in the area.

5.2.3. Historic and Current Land Use

During the early part of the 20th century, the hillside west of Avondale Road was logged, and logs were floated from the Keller Mitigation Site downstream to the Sammamish River by way

of a constructed canal. The canal was filled in near Bear Creek, and the remnant remains as one of the farm field ditches. Following the logging of the area, the Keller Mitigation Site was used for dairying. Bank erosion was severe due to continual stream crossings by dairy cattle and also from unrestricted access to the streams for watering. Drainage ditches on the property were constructed in the early part of the last century, and have been maintained periodically to the present time. Sub-surface drainage was also installed during the early days of the dairy operation, and many of these drain tiles are currently functional. Dairy operations were suspended in the 1980s.

Currently, the fields west and north of Bear Creek are being farmed for cut flowers, pumpkins, corn, and other vegetables. The fields east of Bear Creek and north of Evans Creek have been farmed for hay in recent years. Periodic mowing has resulted in a dominance of herbaceous species on the site (Habitat Banc NW, 2008). Surrounding land uses include residential properties to the north and west, commercial/office to the southwest, industrial uses to the southeast, and vacant land to the east. The property has recently been rezoned (November 18, 2008, Ord. 2426) by the City of Redmond to Bear Creek Design District Zone Performance Area 2 (wetland mitigation banking).

5.3 Rationale for Site Selection

As described in Section 4.2.2 and Appendix G, the Keller Mitigation Site was identified in a multi-stage, hierarchical selection process. This site was selected due to its large size, availability, and potential for wetland and stream rehabilitation.

The functional value of the site also played a significant role in its selection. Factors that substantiate the functional value that the rehabilitation at the Keller Mitigation Site would provide include:

- Past agricultural activities at the Keller Mitigation Site have removed the native vegetation and installed drain tiles and ditches to more effectively remove water from the site. Removing the drainage ditches and drain tiles has a high likelihood of restoring natural hydrologic processes.

- The Keller Mitigation Site is in a relatively unique position in the landscape. It sits at the confluence of two streams in a disturbed basin along the urban fringe. As a result, the site provides rare potential for mitigation that can benefit both the wetlands on-site and the associated streams.

- Several potential mitigation activities were identified for the Keller Mitigation Site in *The Final Lake Washington and Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan* (King County et al. 2005). Aspects of several of these projects are accomplished in the proposed mitigation (see Section 5.6.2).

- Wetland mitigation is consistent with the City of Redmond's Comprehensive Plan designation and current zoning for the site.

5.4 Mitigation Site Existing Conditions

The following sections provide a summary of the existing conditions at the Keller Mitigation Site.

5.4.1. Uplands

Uplands on the site are limited. They occur primarily on a narrow band (~50 to 100 feet wide) along the east bank of Bear Creek. Soils maps show the entire area as hydric soils (Hydric soils list for Washington State, Natural Resources Conservation Service [NRCS] 2009, http://soils.usda.gov/use/hydric/lists/state.html). Vegetation in these upland areas consists of disturbance tolerant grasses and forbs typical of pastures.

5.4.2. Wetlands

The following section provides a summary of wetland conditions at the Keller Mitigation Site is shown in Table 9. Detailed information regarding wetland vegetation, site hydrology, soils, functions and buffer conditions will be provided in the *Draft Wetland Assessment Report Medina to SR 202: Eastside Transit and HOV Project Keller Wetland Mitigation Site* (WSDOT 2010c).

Wetlands were field-delineated in the summer of 2009. The majority of the site was determined to be wetland based on the presence of hydric soils, vegetation adapted to saturated soil conditions, and indicators of wetland hydrology. The site is currently fallow and dominated largely by agricultural and invasive grasses indicative of its past use for agriculture.

Wetland functions at the Keller Mitigation Site were evaluated using the Washington State wetland rating system for Western Washington – Revised (Hruby 2004) and the Wetland Functions Characterization Tool for Linear Projects (BPJ) (WSDOT, 2000). Details of this

evaluation are provided in the Draft Wetland Assessment Report (WSDOT 2010c). Additional discussion of wetland function is provided in Section 5.6.

5.4.3. Wildlife Habitat and Use

While the wetland complex has multiple vegetation types and hydrologic regimes that provide habitat diversity, the habitat on the Keller Mitigation Site is far more limited due to its past agricultural use. Hydrologic regimes are limited to the seasonally/occasionally inundated areas along Evans Creek and a seasonally saturated zone. Vegetation structure is low (largely emergent habitat with a few patches of shrubs and individual trees along Bear and Evans Creek). Most areas of the site are dominated by non-native agricultural grasses and/or invasive grass species.

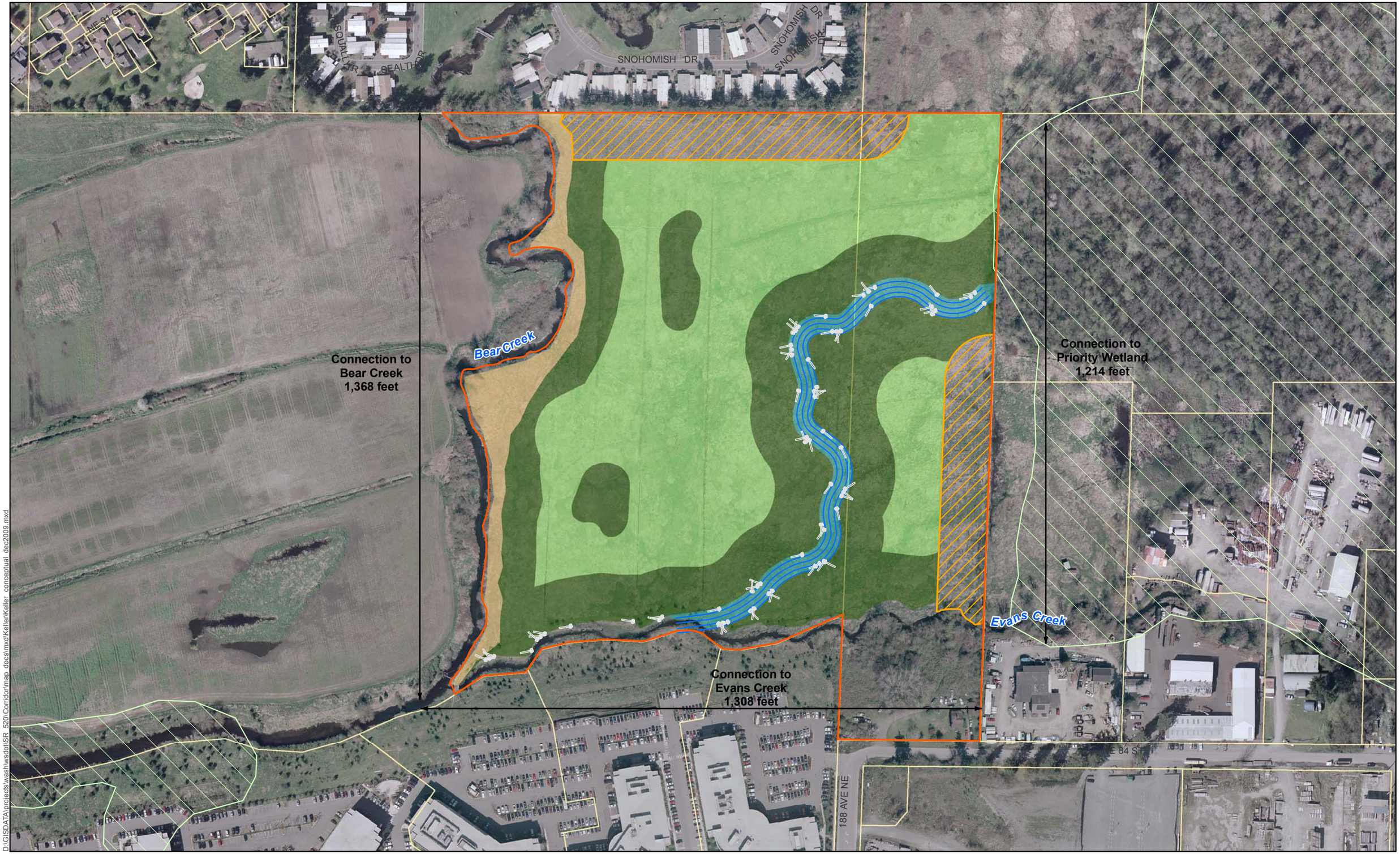
Due to the limited habitat structure, the species that can be expected on the site are likely to be dominated by disturbance-tolerant species adapted to urbanized areas and the surrounding environs, as well as various avian species. Bear and Evans Creeks and the agricultural ditches on the site provide habitat for fish, including salmonids in some cases. Detailed information on habitat type and potential usage is provided in the *Draft Wetland Assessment Report Medina to SR 202: Eastside Transit and HOV Project Keller Wetland Mitigation Site* (WSDOT 2010c).

5.5 Mitigation Site Design

Mitigation at the Keller Mitigation Site will consist of activities to rehabilitate approximately 30.56 acres of farmed wetland and upland associated with Bear and Evans creeks. Of the total acreage, 25.48 acres will be proposed as wetland mitigation area, and 3.56 acres will provide a protective buffer. An additional 1.52 acres of disturbed riparian upland will be enhanced. Specific on-site activities will include construction of a new side channel; blocking existing ditches; removing/breaking drain tile lines; reconnecting Evans Creek with the associated floodplain; controlling invasive species; establishing native shrub communities; providing additional shading for the new side channel and existing stream channels; and creating greater habitat structure and diversity. Figure 4 illustrates the proposed mitigation for the Keller Mitigation Site.

Table 9. Site 31: Keller Mitigation Site Wetland Summary

Location	Keller Mitigation Site	
 Site 31, facing southeast from Avondale Road	**Local Jurisdiction**	City of Redmond
	WRIA	WRIA 8
	Wetland size	~90 acres
	Ecology Rating (Hruby 2004)	II
	City of Redmond Rating	II
	City of Redmond Buffer Width	100 feet
	Wetland Size	Undetermined
	Cowardin Classification	Palustrine Emergent
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	32
	Habitat Score	21
	Total Score	**69**
Dominant Vegetation	Vegetation is dominated by agricultural species and pasture grasses.	
Soils	Soils are mapped as Puget Silty clay loam (hydric) throughout most of the site and Sultan silt loam (non-hydric, but with hydric inclusions) along Bear Creek.	
Hydrology	Adjacent to Bear and Evans Creeks. Water regimes have been modified as part of past agricultural activities (ditching and drain tiling).	
Rationale for Local Rating	Water quality functions are limited by past agricultural uses and effective draining of the site, which reduces depressions that can trap water. The past agricultural uses have also limited vegetation structure and complexity, reducing habitat quality.	
Functions of Entire Wetland	Although dense herbaceous vegetation is present, the wetland provides low water quality function due to the limited number of depressions that can trap water and retain it. Hydrologic function scored high due to the width of the wetland relative to Evans Creek and the presence of dense vegetation. Limited vegetation structure and interspersion, low species diversity, and relatively disturbed buffers result in a moderate habitat score. Note that some habitat features are present in the forested portion of the wetland (offsite), but on-site habitat function is extremely low due to the emergent character of the site and the dominance of invasive species.	
Buffer Condition	Mixture of agricultural uses, maintained road edges, and fallow areas.	



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N

1 inch = 200 feet

0 100 200 Feet

Legend

- Forested Riparian Wetland Planting Area
- Scrub/Shrub Planting Area
- Upland Forest Planting Area
- Streamside Planting Area
- Wet Forested Buffer Planting Area
- Approximate Location of Priority Wetland
- Study Area
- Parcel
- Proposed Channel
- Large Woody Debris

Figure 4
Keller Site: Mitigation Plan

Medina to SR 202: Eastside Transit and HOV Project

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5.5.1. Site Hydrology

Wetland hydrology at the Keller Mitigation Site is influenced by overflows from Evans Creek. Elevated groundwater levels to the north and east may also be a significant component to site hydrology. Currently, surface water drains through the site and into Evans Creek via agricultural ditches and drain tiles.

Disruption of the agricultural ditches and drain tiles will establish hydrologic conditions at the site at or near the surface of the rehabilitated wetland for sufficient duration to meet the USACE requirements for jurisdictional wetlands. Specifically, rehabilitated wetland areas must have surface saturation for 30 consecutive days during the growing season for three or more years out of five years throughout the monitoring period. Alternative methods of determining suitable levels of saturation (such as matching conditions in reference wetlands) may be used in years of non-typical precipitation. A formal wetland delineation will also be conducted at Year 10 to determine the extents of on-site wetlands.

A field visit in March 2009 found water levels varying across the site. The easternmost areas associated with Evans Creek and Ditch 6 were inundated with up to 1 foot of water. According to the consultants for the landowner, these areas have been ponded into the summer months in some recent years. The north-central portion of the site had no surface water and ditch bottoms appeared dry, indicating that the ditches and drain tiles in this area may be functional. The areas immediately to the east of Bear Creek were also dry during the March 2009 field visit, likely due to their slightly higher elevation. All areas of the site were dry during the period of June 2009 through October 22, 2009.

Stream Flow

Stream flow for Evans Creek was estimated using flow data collected from the Union Hill Road Stream Gauge (Appendix D). Data was collected by the U.S. Geological Survey (USGS) from 1955 to 1977, and by King County from 1988 through the present. Peak recurrence interval flow rates were calculated using a Log Pearson III Distribution. Table 10 lists these flows.

Table 10. Stream Flow Data Summary for Evans Creek

Recurrence Interval	Peak Flow (in cubic feet per second)
2 Year	122
5 Year	171
10 Year	203
25 Year	243
50 Year	273
100 Year	302
200 Year	331

The proposed bank full channel within the Keller property is designed to convey between the 2-year and 5-year recurrence interval flow, similar to the existing Evans Creek bank full channel capacity. Existing channel cross sections and bottom elevations at start and end are the same as those in the existing Evans Creek channel.

Additional gauge data has been collected at the confluence of Evans and Bear Creek by the Northeast Sammamish Sewer and Water District. At this time, the data collected is too limited to use for design purposes, but in the future as additional data is available, it can be used to refine the design.

Groundwater

WSDOT has installed 20 groundwater wells to evaluate hydrology on the Keller Mitigation Site. Data from that groundwater monitoring and other information related to hydrology will be used to evaluate hydrology for final site design (PS&E).

5.5.2. Invasive Species Control Strategy

Reed canarygrass is also the dominant invasive species present at the Keller Mitigation Site. The presence of this species likely reflects the past agricultural activities at the site, nutrient levels in the ground and in the waters of Bear Creek and Evans Creek, sedimentation levels, runoff character, seed bank, and existing rhizome bank. Due to the presence of seed sources both upstream of the site on Bear and Evans Creeks and throughout the region, reed canarygrass is expected to persist at the Keller Mitigation Site indefinitely. The performance criteria measures for invasive vegetation presented in Chapter 7 take this factor into account.

The strategy for control of reed canarygrass at the Keller Mitigation Site will include both short-term and long-term measures to control invasive species. The proposed short-term measures are mowing and herbicide application to suppress the existing reed canarygrass population prior to planting. Smothering invasive species with mulch around the plantings or spread as a sheet over portions of the site would provide additional short-term control after planting. The proposed long-term control measure is shading with densely planted native trees and shrubs,

Short-Term Reed Canarygrass Control Measures

These activities will take place in the dry season. Prior to the initial planting, short term control measures will take place throughout the site. These measures will also be used at selected locations as the site matures.

- Mowing will be used to stress the reed canarygrass and to prepare the vegetation for herbicide application. Mowing will commence at the beginning of the dry season prior to the appearance of seeds on reed canarygrass (Wisconsin Reed Canary Grass Management Working Group 2009). The grass will be mowed again prior to herbicide application in August. Standard mowing equipment may be used where feasible. Where the terrain is uneven or hummocky or where native plants are present in substantial quantities, gas-powered string trimmers may be used.
- Herbicide will be applied in areas where reed canarygrass is dominant. Herbicide application will use chemicals specifically approved for aquatic use. Application will be conducted in August and again in September when carbohydrates in the grass are being translocated from the aboveground parts to the roots. This will provide the best possible control of belowground roots and rhizomes (Antieau 1998; Tu 2004; Reinhardt and Galatowitsch 2004).
- Spot spraying of herbicide may be used immediately prior to planting, if necessary.

- Mulch is effective in smothering reed canarygrass when distributed across the entire site (Antieau 1998). Mulch also provides value to the site by preserving erodible soils and providing additional organic matter. Mulching of all woody plantings is proposed as part of the mitigation plan. Sheet mulching may be used over larger areas that are above spring flood elevations.

Long-Term Reed Canarygrass Control Measures

- Dense plantings of native woody species will create shade that will reduce reed canarygrass biomass (USDA NRCS 2001). The plantings will also serve to effectively compete with reed canarygrass (Antieau 1998, USDA NRCS 2001, Tu 2004), and improve wildlife habitat function at the site. Dense woody plantings on the site will incorporate coniferous trees as a significant component. Coniferous trees are particularly effective in shading reed canarygrass (Antieau 1998), and are an important component of the mitigation design.

Ongoing Maintenance

- Ongoing maintenance will be required. Maintenance activities will include limited mowing of reed canarygrass, hand removal where necessary, herbicide application, and replacement planting as applicable. A significant decrease in ongoing maintenance activities should be expected when woody plant cover reaches approximately 50 percent (Wisconsin Reed Canary Grass Management Working Group 2009).

5.5.3. Grading Design

As of the writing of this final mitigation plan, a site survey has been completed and detailed topographic information is available. However, detailed hydrologic information is not yet available for the Keller Mitigation Site (see Section 5.5.1). As more complete hydrologic data becomes available, this information will be used to revise the grading plans and will be incorporated into future designs for the site and any supporting reports.

The wetland rehabilitation strategy includes grading to fill ditches and disconnect drain tiles and establish a new side channel connected to Evans Creek (see 5.5.4). Other grading activities may include lowering high spots, and creating micro-topographic variations on portions of the site. Final grades will be established consistent with wetland hydrology requirements for the rehabilitated wetland areas, and may be adjusted for desired habitats based on more detailed hydrologic data.

Note that construction activities at the Keller Mitigation Site will require a temporary access road and a temporary bridge over Evans Creek to allow construction equipment to access the site.

Assuming a one-lane bridge and access road through the wetland of 15-foot width, and a two-lane access through the wetland and Evans Creek buffers to allow entry and egress, the expected area includes approximately 0.02 acre of long-term temporary wetland impact and 0.08 acre of temporary stream and wetland buffer impacts.

5.5.4. Off Channel Habitat Design

The 2004 Stream Habitat Restoration Guidelines: Final Draft (Saldi-Caromile, K., et al. 2004) identifies a number of recommendations for stream habitat restoration. Among the recommendations addressing fish habitat isolation, three are relevant to the mitigation at the Keller Site:

- Remove floodplain or other fill that isolates the habitat.
- Remove drainage systems that lower the local water table and drain nearby wetlands and ponds.
- Stop dredging or otherwise manipulating the channel, and remove artificial constraints on the channel (e.g., bank armor, channel lining, road crossings).

The text also notes that "If the loss of habitat connectivity cannot be attributed to a direct cause, it is likely that the processes that naturally create and maintain the isolated habitat or the connection to that habitat have been disturbed. Restoration of habitat connectivity will require identification of disturbed processes (e.g., delivery of wood and sediment to the stream, stream flow regime) and the root cause(s) of their disturbance."

In order to assist in achieving these overall watershed goals, the Keller Mitigation Site design includes the following actions:

1. Filling the existing ditches that rapidly move water out of the on-site wetland. Filling these areas would result in a loss of approximately 0.14 acre of potentially usable fish habitat.
2. Enhancing the existing Bear Creek riparian uplands with an upland forested habitat type. Coniferous trees are included in the planting scheme.
3. Enhancing the existing habitat on the north side of the Evans Creek channel with additional large woody debris (LWD), from the mouth of the new channel to the confluence with Bear Creek (~580 linear feet). The current proposal is for 11 key pieces with minimum diameter of 12 inches and a minimum length of 24 feet. These key pieces

will be supplemented with smaller pieces of woody debris to reach a total of approximately 43 pieces.

4. Removing structures that confine the existing channel of Evans Creek. These structures include a concrete embankment and log structure on north bank of Evans Creek (immediately east of Ditch 4), and the existing concrete footbridge near the confluence with Bear Creek. The design may need to maintain access to the existing stream gauge at the bridge location.
5. Improving the riparian zone of Evans Creek with additional native woody plantings.
6. Creating a natural side channel to serve as backwater habitat for Evans Creek, this will include approximately 0.82 acre of potential fish habitat.
   - The proposed side channel will be approximately 1,423 feet long with a slope of 0.13 percent, the bankfull width will be 25 feet; the stream depth will be approximately 2 feet. This will allow a cross-sectional area of 50 square feet.
   - In-stream habitat elements will include meanders with associated pools. The channel bed will be over-excavated and the silt soils will be supplemented with stream gravels of appropriate size. Note that the slope will not likely support stream gravel suitable for fish spawning.
   - Large woody debris for the side channel has been incorporated at a rate of 3.6 key pieces per hundred feet. This rate results in a minimum of 52 key pieces. The current mitigation plan (see Appendix E) proposed 54 key pieces of large woody debris, and will slightly exceed that rate. Key pieces will have a minimum diameter of 12 inches and a minimum length of 24 feet. These key pieces will be supplemented with smaller pieces of woody debris to reach a total of 14.1 pieces per 100 linear feet of stream (approximately 200 pieces total).
   - Plantings of shrub and forested vegetation types will be included on the site.
   - The final side channel has been designed to be consistent with the City of Redmond's future goal to relocate Evans Creek main stem north of the Keller Mitigation Site.

The preliminary designs for the side channel can be seen in Figure 4 and in Appendix E.

5.5.5. Planting Design

Planting areas for the wetland rehabilitation area will consist of three zones: a streamside planting zone, a scrub/shrub planting zone, and a forested riparian wetland zone. Planting zones are shown in Figure 4, and species lists, community composition, and proposed plant spacing for

these zones are presented in Table 11. Note that the composition of the planting zones and boundaries may change based on more detailed hydrologic data and revisions to the grading design.

The streamside planting zone will extend from the water edge to the bank full width. The plantings for this zone will consist primarily of live willow stakes, supplemented with shade-tolerant native sedges and rushes. A forested riparian zone will extend outward approximately 110 feet from the bank full width of Bear Creek, Evans Creek, and the proposed side channel (Figure 4). The forested riparian zone will consist of a mixture of wetland trees and shrubs. The plantings include canopy and sub-canopy species. Canopy species selected include both fast-growing and more slow-growing species, as well as both deciduous and coniferous species. Several small pockets of this habitat have been included within the wetland shrub zone described below. The scrub/shrub planting occupies the areas between the forested zones (Figure 4). Shrubs have been selected from species common in the areas that are tolerant to full sun and to a broad range of hydrologic conditions.

Species for all planting have been selected with consideration for light tolerance, suitability to expected hydrologic conditions at the site (occasional shallow inundation to seasonal saturation), and ability to provide forage and cover for wildlife. Trees and shrubs will be arranged into irregular groups by species, and intermixed on the edges to create a more diffuse transition between species. Additional modifications to the species selected may be made as additional site design information (particularly hydrology data) becomes available.

Table 11. Planting List for Wetland Rehabilitation Area

Common Name	Scientific Name	Indicator Status	Community Composition	Plant Spacing (in feet on center)
Streamside Planting				
Live Stakes				
Scouler's willow	*Salix scouleriana*	FAC	50%	1
Sitka willow	*Salix sitchensis*	FACW	50%	1
Emergents				
Sawbeak sedge	*Carex stipata*	OBL	33%	2
Small fruited bulrush	*Scirpus microcarpus*	OBL	33%	2
Slough sedge	*Carex obnupta*	OBL	33%	2
Scrub/shrub Wetland				
Black hawthorn	*Crataegus douglasii*	FAC	5%	4
Black twinberry	*Lonicera involucrata*	FAC+	10%	4
Nootka rose	*Rosa nutkana*	FAC	5%	4
Red-osier dogwood	*Cornus sericea*	FACW+	30%	4
Salmonberry	*Rubus spectabilis*	FAC+	15%	4
Scouler's willow	*Salix scouleriana*	FAC	5%	4
Sitka willow	*Salix sitchensis*	FACW	10%	4
Pacific ninebark	*Physocarpus capitatus*	FACW-	15%	4
Peafruit rose	*Rosa pisocarpa*	FAC	5%	4
Forested Riparian Wetland				
Trees				
Black cottonwood	*Populus balsamifera ssp.*	FAC	10%	8-12'
Cascara	*Rhamnus purshiana*	FAC-	5%	8-12'
Oregon ash	*Fraxinus latifolia*	FACW	30%	8-12'
Pacific willow	*Salix lucida var. lasiandra*	FACW+	15%	8-12'
Red alder	*Alnus rubra*	FAC	15%	8-12'
Sitka spruce	*Picea sitchensis*	FAC	15%	8-12'
Western red cedar	*Thuja plicata*	FAC	20%	8-12'
Shrubs				
Black twinberry	*Lonicera involucrata*	FAC+	10%	4
Nootka rose	*Rosa nutkana*	FAC	30%	4
Red-osier dogwood	*Cornus sericea*	FACW+	25%	4
Salmonberry	*Rubus spectabilis*	FAC+	35%	4

5.5.6. Habitat Features

Habitat features appropriate to the target plant communities, wildlife species, and site conditions will be incorporated into the mitigation design. Habitat features to be incorporated will include some or all the following:

- Downed logs
- Standing snags (some snags may incorporate osprey nesting platforms constructed according to WDFW guidance)
- Brush piles
- Bat boxes

Quantities and placement of habitat features will be shown in the final mitigation design.

5.5.7. Buffers and Uplands

Buffers will account for approximately 3.56 acres of the proposed Keller Mitigation Site; all of this area is within the jurisdictional wetland boundary. The buffer plantings will be composed of a wet forested buffer planting zone. This zone is shown in Figure 4 and plant species, composition and spacing are shown in Table 12. The wet forested buffer planting is located on the north and east sides of the Keller Mitigation Site, and extends 110 feet from the site boundaries. Species selected for this area and community composition are identical to the riparian forested zone above, but planting densities are higher to provide greater screening.

An upland forested zone includes a 1.52-acre area along the east bank of Bear Creek (Figure 4). Species were selected for this area based on the expected low soil moisture and anticipated high light levels. The planting for this area includes canopy and sub-canopy communities. The canopy includes deciduous and coniferous tree species, and the sub-canopy consists of deciduous shrub species tolerant to a broad variety of light availability. Planting densities in the upland forest planting are consistent with those proposed for the wetland plantings, rather than the higher densities proposed for buffer screening.

Table 12. Planting List for Wet Forested Buffer and Upland Forested Planting Areas at Keller Mitigation Site

Common Name	Scientific Name	Indicator Status	Community Composition	Plant Spacing (in feet on center)
Wet Forested Buffer				
Trees				
Species and community composition are as shown in Table 11 for riparian zones and forested pockets. Increased planting densities are shown at right.				6
Shrubs				
Species and community composition are as shown in Table 11 for riparian zones and forested pockets. Increased planting densities are shown at right.				3
Upland Forested				
Trees				
Big leaf maple	*Acer macrophyllum*	FACU	20%	8-12’
Black cottonwood	*Populus balsamifera ssp. Trichocarpa*	FAC	15%	8-12’
Douglas fir	*Pseudotsuga menziesii*	FACU	30%	8-12’
Red alder	*Alnus rubra*	FAC	20%	8-12’
Western red cedar	*Thuja plicata*	FAC	15%	8-12’
Shrubs				
Baldhip rose	*Rosa gymnocarpa*	FACU	15%	4’
Beaked hazelnut	*Corylus cornuta*	FACU	20%	4’
Common snowberry	*Symphoricarpos albus*	FACU	25%	4’
Red elderberry	*Sambucus racemosa*	FACU	5%	4’
Serviceberry	*Amelanchier alnifolia*	FACU	15%	4’
Thimbleberry	*Rubus parviflorus*	FAC-	15%	4’
Vine maple	*Acer circinatum*	FAC-	5%	4’

5.5.8. Site Protection

The following site protection measures will be implemented as part of the mitigation plan:

- The Keller Mitigation Site will have long-term protective measures put in place, such as deed restrictions, conservation easements, or Native Growth Protection Easements.

- The north and east sides of the site will be fenced using three wire (non-barbed) fence. This style of fence allows wildlife to pass through easily.

- Access to the site will be fenced and gated.
- Appropriate signs will be placed along the fence at 200-foot intervals.

5.5.9. Implementation Schedule

A complete implementation schedule for this mitigation has not yet been developed. However, the following tentative schedule is expected for the site:

Ongoing Studies and Benchmarks (Pre-Construction):

- Shallow groundwater monitoring (in process)
- Wetland delineation (complete)
- Functional assessment
- Soil studies
- Wetland boundary verification (USACE)
- Site procurement
- Permit applications
- Permit approval

Construction Activities (Year 1):

- Shallow groundwater monitoring
- Implementation of invasive species control plan
- Installation of Temporary Erosion and Sediment Control (TESC) measures
- Excavation of new channels and associated areas for Evans Creek
- Blocking ditches
- Removing or breaking of drain tiles
- Initial plantings

Construction Activities (Year 2):

- Implementation of invasive species control plan
- Complete planting
- Preparation of as-built drawings

- Initial monitoring of site

A more comprehensive implementation schedule will be developed as the project design advances.

5.6 Ecological Benefits

5.6.1. Wetland Functions

The proposed mitigation at the Keller Mitigation Site is expected to substantially improve water quality, hydrologic, and habitat functions. Functional attributes of the mitigation wetlands that will be improved and added compared to the existing impacted wetlands are listed below.

Improved Functional Attributes:

- Reduce prevalence of invasive species
- Increase plant diversity by replanting with native species
- Increase vertical and horizontal habitat complexity
- Provide additional habitat features

New Functional Attributes:

- Create natural side channel configuration
- Reconnect Evans Creek and wetlands/floodplains
- Create corridors of riparian habitat to shade new side channel
- Provide shading that assists in maintaining low water temperatures desirable for fish habitat

Functional Lift

The Keller Mitigation Site provides a unique opportunity for wetland mitigation due to its relatively large size, past agricultural activities, mitigation type, and its location in the urban fringe. The site has, in fact, been identified as a potential mitigation site for many years, and was initially included in the proposed Lake Washington/Sammamish Watershed Wetland Mitigation Bank. The Keller Mitigation site and associated portions of Bear and Evans Creek have also identified in the WRIA 8 Chinook Salmon Conservation Plan as the location for several projects for the preservation of listed salmon species in the watershed (King County et al. 2005).

In order to determine the adequacy of wetland mitigation, wetland regulators use a wetland assessment to classify the performance of wetland functions before and after the mitigation. The

degree of improvement in a wetland function is commonly referred to as functional lift. There are a number of methods that can be used to assess functional lift, but most are suitable only for smaller sites (Ecology et al. 2006a). Since the Keller Site is a large mitigation site, most of these methods are not appropriate. The *Washington State Wetland Rating System for Western Washington Revised* (Hruby 2004) can be used to assess wetland functions on larger sites; however the scores from this system cannot be used to characterize the change in functions that occur in a small part of a larger wetland (Hruby 2008). Since the Keller Mitigation Site affects only a portion of a larger wetland system (although a large part), the methods outlined in the Ecology system are also not entirely applicable.

In light of these limitations, WSDOT (in consultation with the agencies) has developed a description of functional lift at the Keller Mitigation Site. The description is based on the three functions used in both the *Washington State Wetland Rating System for Western Washington Revised* and *Wetland in Washington State Volume 1: A Synthesis of the Science* (Sheldon et al. 2005). These three wetland functions (water quality, hydrologic function, and habitat function) are described for current and proposed conditions at the Keller Site using the suite of physical characteristics identified by Sheldon et al. (2005). The analysis indicates that the Keller Mitigation Site provides functional lift in the three functions over large areas of the Keller Mitigation Site.

The following section includes the detailed description of the wetland function characteristics at the Keller Mitigation Site and the proposed improvements. Table 13 provides a summary of the functional lift at the Keller Mitigation site.

Table 13. Functional Lift Resulting from the Proposed Wetland Rehabilitation at Keller Mitigation Site

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Water Quality			
Sediment removal	Relatively low residence time due to drainage features. Absence of dense woody vegetation to slow flows.	Remove drainage features to retard drainage on-site (~20.8 acres affected). Plant dense woody vegetation to retard flows (29.0 acres).	Increase in function in approximately 29.0 acres.
Phosphorous removal			
Nitrogen removal			
Metal and toxic organic removal			
Pathogen removal			No change.
Hydrologic			
Peak flow reduction	Approximately 29 acres within OHWM have potential for overbank flows; vegetation does not significantly decrease flow velocities.	No change in overbanking area. Filling drainage ditches and removing drain tiles will assist in retarding runoff. Increase in woody vegetation over 29 acres will reduce velocities	Retard flows on approximately 20.8 acres. Increase in potential to reduce velocities affecting peak flows, ~29.0 acres.
Erosion reduction	Limited vegetation to reduce flow velocities (0.26 acre woody vegetation, mostly on south bank of Evans Creek).	Dense woody vegetation on ~ 29 acres.	
Groundwater recharge	Not provided by wetland.	Not provided by wetland.	No change
Habitat			
Structural complexity	Limited plant diversity, habitat features largely absent, limited interspersion of vegetation types and plant types.	Nineteen native wetland species proposed, habitat structures included in design, multiple vegetation types proposed with higher degree of plant type and vegetation type interspersion.	Increase in structural complexity over ~ 29 acres.

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Abundant food sources	Emergent vegetation dominated by non-native species provides limited sources of food.	Addition of ~22 species of fruit or seed-bearing plants (15 in wetland and seven in the associated uplands.	Increase in available food sources over 29 acres.
Connectivity to other natural resources	Wetland provides connection between off-site habitats and Bear and Evans Creeks.	Connection to be maintained; additional woody cover proposed.	Woody cover will benefit some species, depending on habitat needs.
Moist and moderate microclimate	Drainage features convey water off the site more rapidly than natural conditions. Emergent vegetation provides little temperature moderation.	Remove drainage features to retard drainage on-site (~20.8 acres affected). Plant dense woody vegetation to retard flows (29.0 acres)	Hydrologic changes retard drainage (~20.8 acres affected). ~29 acres of shading provides additional temperature control.

Water Quality Function

Wetland in Washington State Volume 1: A Synthesis of the Science (Sheldon et al. 2005) describes the primary mechanisms for water quality improvement in wetlands. These mechanisms are sediment removal, phosphorous removal, nitrogen removal, metal and toxic organic removal, and pathogen removal.

Residence time is an important factor in water quality improvement, since it provides greater potential for particulates to settle (Sheldon et al. 2005). Residence time at the Keller Mitigation Site is currently limited on a large portion of the site by the presence of artificial drainage features and the absence of woody vegetation. Within the southeast corner of the site, standing water remains over approximately 10 acres associated with slightly lower topography and the high-water influence of Evans Creek. Water flows onto the site from the northeast and is effectively drained to Evans Creek by the existing network of drainage ditches and tiles. Removing these ditches and drain tiles is expected to increase residence time of inundation in approximately 20.8 acres at the Keller Mitigation Site. The proposed side channel will also increase the number of meanders in the rehabilitated wetland, which is also an important characteristic for sediment removal in riparian wetlands (Sheldon et al. 2005).

Wetlands that effectively trap sediments are also effective at removing phosphorous. Additionally, these wetlands are effective at removing toxic materials that are bound to sediment particles or that form insoluble particles and settle (Sheldon et al. 2005). Nitrate removal also increases with retention time (Sheldon et al. 2005). Sediment removal at the Keller Mitigation Site is expected to increase with the increase in residence time. The removal of phosphorous, nitrogen, and toxics is likewise expected to increase.

Probably the most important mechanism for removing pathogenic bacteria from surface water is detention, which is a function of residence time (Sheldon et al. 2005). The addition of woody vegetation to Evans Creek and the proposed side channel is expected to reduce flow velocities, which will result in an increase in residence time. This increased residence time may assist in pathogen removal at the Keller Mitigation Site.

Changes proposed to site hydrology are expected to extend retention time, improving sediment, phosphorous, nitrogen and toxic material removal at the Keller Mitigation Site. The area of improved water quality function encompasses approximately 20.8 acres of wetland to the north and west of the new channel. This area includes approximately 1.96 acres which are within regulatory buffer. Existing wetland vegetation on the site is dominated by reed canarygrass, which provides some water quality function. The anticipated improvements to water quality

function on the site are based on increased residence time more than conversion of the vegetation community.

Hydrologic Function

Sheldon et al. (2005) describes three physical processes associated with hydrologic function: reducing peak flows; reducing erosion; and recharging groundwater.

In riverine wetland in western Washington, the major characteristic judged to reduce peak flows is the storage provided by overbank areas (Sheldon et al. 2005). Approximately 29.0 acres of the Keller Mitigation Site has been determined to be within the ordinary high water mark of Evans Creek, based on the Ecology method. Since no large areas of excavation are planned at the Keller Mitigation Site, the overall storage volume at the Keller Mitigation Site is not expected to change substantially. However, removal of existing drainage features is expected to retard drainage at the site in approximately 20.8 acres, and the additional woody vegetation in approximately 29 acres of the site is expected to reduce water velocities throughout the wetland. These changes in water velocities on-site are expected to have a positive effect on downstream peak flows.

The major process by which wetlands reduce downstream erosion is by slowing the velocity of water flowing downstream. Frictional resistance of vegetation is one of the components on which velocity depends (Sheldon et al. 2005). In riverine wetlands in western Washington, the major characteristic that reduces erosion is the amount of woody vegetation present that can provide a barrier to water flows (Sheldon et al. 2005). Woody vegetation comprises only 0.26 acre on the Keller Mitigation Site, most of which is located on the south side of Evans Creek. The proposed rehabilitation will provide an additional ~29 acres of high density woody plantings within the OHWM of Evans Creek. As the vegetation matures it is expected to decrease water velocities on the site and reduce potential for erosion.

Groundwater recharge occurs only in a subset of depressional wetlands and some riverine wetlands that impound and hold surface water (Sheldon et al. 2005). The portion of Wetland A located in the Keller Mitigation Site does not appear to impound water. Since no grading of this nature is proposed, the performance of this characteristic is not expected to change.

Habitat Function

Characteristics that make wetlands important as habitat include structural complexity, connectivity to other natural resources, abundant food sources, and moist and moderate microclimate (Sheldon et al. 2005).

Structural complexity is a term used to represent the variety of characteristics that increase the number of niches for wildlife (Sheldon et al. 2005). These characteristics include plant species richness, presence of physical habitat features (e.g. open water areas, rocks), interspersion of vegetation types, and interspersion of plant types (Sheldon et al. 2005). The Keller Mitigation Site currently has very limited plant diversity and interspersion of vegetation types (WSDOT 2010c). Physical habitat features are also largely absent. As a result, the overall level of structural complexity at the Keller Mitigation Site is low.

The proposed rehabilitation improves structural complexity in several ways. The construction of the new channel, filling existing drainage ditches, and removal of drain tiles is expected to retard drainage at the site and to extend the duration of water retention within the occasionally flooded areas to the north and west of the new channel. These changes will affect approximately 20.8 acres of the site. The planting palette for the wetland includes 16 native woody species and three native emergent species. The upland forested area will include four additional tree species and seven additional shrub species. These plantings taken as a whole will increase the number of native plant species present on the site from 15 to 30. The planting design incorporates three vegetation types with longer, sinuous edges, resulting in much greater complexity than is currently present at the site. The presence of the uplands area along also provides desirable refugia during high water events, and increases the degree of hydrologic interspersion at the site. Interspersion of plant types will be further increased by grouping the plantings by species, and inter-mixing the species at the edges of the planting groups. A variety of habitat features (such as downed logs, standing snags, brush piles, and bat boxes) will also be incorporated into the site design. These design elements will significantly increase the structural complexity of 29 acres of wetland and 1.5 acres of associated upland at the Keller Mitigation Site.

The Keller Mitigation Site is located at the confluence of Evans and Bear Creek. This location connects off -site portions of Wetland A located to the north and east of the Keller Mitigation Site to these two riparian corridors. Thus, the location provides good connectivity for species that are not dependant on canopy cover. The proposed mitigation will provide a wider and more natural connection between the forested areas to the north and east and Bear and Evans Creeks. The proposed changes will benefit species that require canopy structure, but may have negative effects for other species, depending on their specific habitat needs.

Wetlands on the Keller Mitigation Site are dominated by non-native grass species. As a result, the site provides limited food sources. The proposed design for the Keller Mitigation Site includes approximately 22 fruiting or seed-bearing tree and shrub species that will provide additional sources of food for wildlife. These species will be planted throughout the site,

providing an additional ~29 acres of food source in the wetland and 1.5 in the associated uplands.

The presence of water and thick vegetation results in a microclimate that is generally more moist and has milder temperature extremes that the surrounding areas. These provide a habitat that is desirable to many species (Sheldon et al. 2005). The presence of drainage ditches and drain tiles rapidly convey water off the site, reducing the site' available moisture at the beginning of the dry season. The absence of woody vegetation tends to increase the temperatures on the site and also increases potential evaporation. The proposed rehabilitation of the Keller Mitigation Site would remove the ditches and drain tiles, with the intent of retaining water on the site for longer periods. The proposed planting palette also provides vegetation which on maturity, will provide some 29.0 acres of additional shading in the wetland. These changes in the site hydrology and shading are expected to enhance the moisture present on the site and moderate any temperature extremes.

5.6.2. Stream and Riparian Functions

Construction of the proposed mitigation at the Keller Mitigation Site will require filling of the agricultural drainage ditches on the site. These drainage ditches currently provide approximately 0.14 acre of potentially usable fish habitat. The habitat is composed of accessible portions of agricultural ditches that are relatively narrow and have steep sided banks. The vegetation along the banks of the ditches is predominantly invasive grasses that do not provide significant shading and clog the ditch substrate in some areas. Additional data on these areas is provided in *Draft Wetland Assessment Report Medina to SR 202: Eastside Transit and HOV Project Keller Wetland Mitigation Site* (WSDOT 2010c).

Although the project is intended as compensatory wetland mitigation and not as mitigation for impacts to fish habitat, the proposed mitigation at the Keller Mitigation Site is expected to provide a number of benefits related to streams and riparian areas. As a result, the existing fish habitat areas and functions at the site will not be lost. These potential benefits to stream/riparian function and fish habitat include:

- Create a new side/backwater channel in a natural configuration
- Increase off channel habitat at the Keller Mitigation Site from 0.14 acre present in the existing agricultural ditches to 0.82 acre in a naturally configured channel
- Rehabilitate riparian vegetation zones along new channel with dense woody plantings to provide shade and a source for woody debris recruitment

- Provide additional large woody debris in the existing Evans Creek channel and the new side channel

King County et al. (2005) also identifies measures to improve habitat for salmonids in the specific areas of WRIA 8. The general guidelines in this report identified the restoration of riparian function, particularly riparian revegetation and potential for large woody debris recruitment as important projects. Table 14 identifies specific habitat improvement projects from this document and indicates how the proposed design addresses these goals.

5.6.3. Buffer Functions

Buffers for the site have been designed in accordance with USACE and Ecology Joint Guidance to provide adequate protection for the wetland functions at the Keller Mitigation Site. The following benefits are expected to occur:

- Improved screening of wetland from off-site activities
- Control of invasive species
- Improved habitat function through replanting with appropriate native trees and shrubs

Table 14. Comparison of Projects Identified in WRIA 8 Chinook Salmon Conservation Plan with Activities Proposed at the Keller Mitigation Site

Identified Project[1]	Design component at Keller Mitigation Site
N208: Evans/Bear Creek Restoration: In-channel restoration is needed in Bear Creek and Evans Creak through the former dairy farm at the confluence; RM 1.25 to RM 2.5 on Bear Creek and RM 1.2 to RM 4.6 on Evans Creek (Same as Keller Farm). Reconfigure channel where it has been widened due to past farm practices, enhance riparian area, add LWD, and replant.	The proposed mitigation design includes enhanced riparian vegetation zones with dense woody plantings and additional large woody debris.
Seen by local experts as one of the largest opportunities for habitat restoration in Bear Creek. Creation of a wetland mitigation bank is an option here if can be done in a way that meet both wetland and stream restoration needs.	The proposed design is consistent with overall goal of long-term mitigation
Continue Bear and Evans Creeks Greenway project to protect and restore key riparian lands, particularly the former dairy farm at the confluence of Bear and Evans creeks (City of Redmond project).	The proposed design extends and improves habitat functions in the open space associated with Evans Creek.
N211 Evans/Bear Creek Restoration – In-channel restoration through the former dairy farm (spans reaches 4 and 5).	Proposed side channel increases existing off channel habitat from 0.14 acre to 0.82 acre. The design is also consistent with future plans to relocate Evans Creek.
N212 Install buffer strips to reduce fine sediments (spans reaches 4 and 5).	The proposed design includes enhanced riparian vegetation along Bear and Evans Creek and along the proposed side channel.
N213 Protect floodplain and wetland areas adjacent to Keller Farm property (spans Reaches 4 and 5). High value to Salmonids, Moderate ease of implementation	The proposed design preserved the existing floodplain and improves the connection of Evans Creek with the floodplain
N432 Evans Creek Relocation Study: Study feasibility of relocating Evans Creek to the North, away from industrial area. Potential project elements would include: increasing buffer, connecting wetlands to creek, adding stormwater facilities to improve water quality, adding LWD to increase channel complexity. Some of the property that creek would be relocated to is owned by the City of Redmond.	Design of the side channel is consistent with goals of relocating Evans Creek to the north. The side channel has been designed with sufficient capacity to contain the Evans Creek main stem.

[1] King County et al. (2005).

Chapter 6. Yarrow Creek Compensatory Mitigation Site

This chapter describes the key elements of the on-site portion of the proposed compensatory mitigation. The reader should note that although in-stream components of the design will be outlined, the discussion in this report is directed towards wetland mitigation. A detailed description of the stream mitigation components of this site is provided in the *Medina to SR 202: Eastside Transit and HOV Project Final Streams Mitigation Plan* (WSDOT 2010a).

6.1 Site Location

The Yarrow Creek Site is located within the SR 520 project corridor, on the south side of SR 520, east of Bellevue Way NE. The site is within WSDOT-owned rights of way. The Yarrow Creek Mitigation Site is within Section 20 of Township 25 North, Range 5 East in the City of Bellevue, Washington.

The site is roughly triangular, and encompasses the areas east of Bellevue Way NE westward to the on-ramp from 108th Avenue NE, and north to SR 520. The proposed site includes the existing ramp from eastbound SR 520 to northbound Bellevue Way NE/Lake Washington Boulevard NE. The main stem of Yarrow Creek flows through the site from east to west. A small tributary (East Tributary to Yarrow Creek) enters Yarrow Creek from the south within the Yarrow Creek Mitigation Site. Beyond the Yarrow Creek Mitigation Site, Yarrow Creek flows under SR 520 and Bellevue Way NE, entering Lake Washington at Yarrow Bay.

6.2 Landscape Perspective

6.2.1. Landscape Position

The Yarrow Creek Mitigation Site is located within the Yarrow Creek subbasin, a stream in the Washington Resource Inventory Area (WRIA) 8, the Lake Washington-Cedar/Sammamish Watershed. The Yarrow Creek Mitigation Site is located in the lower reach of Yarrow Creek. The surrounding landscape slopes downward from the south and east towards Lake Washington. This slope is divided by SR 520. The Yarrow Creek Mitigation site itself slopes from south to north, with SR 520 forming the northern boundary of the site.

The channels of Yarrow Creek and East Tributary to Yarrow Creek within the Yarrow Creek Mitigation Site are relatively straight and somewhat incised. As a result, these streams are not well connected to their respective floodplains. The floodplain wetlands associated with Yarrow Creek are bisected by the steep fill slope of the SR 520 off-ramp. Yarrow Creek passes through this fill slope in a culvert.

6.2.2. Ecological Connectivity

The Yarrow Creek Mitigation Site is located within a dense urbanized area in the City of Bellevue. There are limited connections to natural areas, since the site is surrounded by urban development and roads. Yarrow Creek and East Tributary to Yarrow Creek run through the site,providing connections between a number of relatively isolated habitats upstream, and connecting these habitats with Lake Washington.

Although the connections to off-site habitats are limited, the Yarrow Creek corridor is an important connection to the remaining habitat fragments in this urbanized area. The proposed mitigation will maintain existing connections and create new habitat that is relatively rare in the area.

6.2.3. Historic and Current Land Use

Historically, the lower reach of Yarrow Creek was a peat bog. The reach was gradually channelized as farming become more prevalent in the area and the water level of Lake Washington was lowered in the early 1900s. From the 1940s through the present, the area experienced increasing suburban development. The area became part of the right of way for SR 520 during the early 1960s.

Land uses surrounding the Yarrow Creek Mitigation Site include the existing SR 520 roadway to the north, high density multi-family residential parcels to the west and south, and an office/commercial development to the east. A narrow section of forested wetland extends southward off the site.

Currently, the Yarrow Creek Mitigation Site is zoned by the City of Bellevue as multi-family residential, medium density (City of Bellevue Comprehensive Plan, North Bellevue Subarea Plan, http://www.bellevuewa.gov/comprehensive_plan.htm). However, proposed improvements in the SR 520 corridor are noted in the City's Eastside Transportation Facilities Plan.

6.3 Rationale for Site Selection

As described in Section 4.2.2 and Appendix G, the mitigation for the project was identified in a multi-stage, hierarchical selection process. While the Yarrow Creek Site is not large enough to provide all of the mitigation required for the project, it does meet two important criteria. First, the Yarrow Creek Site is located in close proximity to the impacted wetlands. Secondly, the Yarrow Creek Site is within the WSDOT-owned right of way, and is part of the proposed stream mitigation (see the final streams mitigation report [WSDOT 2010a] for more details on the stream restoration). The Yarrow Creek Mitigation Site was selected based on the significance of these two criteria.

6.4 Mitigation Site Existing Conditions

The following sections provide a summary of the existing conditions at the Yarrow Creek Mitigation Site.

6.4.1. Uplands

Uplands on the site are limited. They occur primarily on a narrow band (~50 to 100 feet wide) along the outer edges of Wetlands YCS-1 and YCS-2. Portions of the associated uplands are dominated by SR 520 to the north and the off-ramp from eastbound SR 520 to Bellevue Way NE/ Lake Washington Boulevard, which surrounds Wetland YCS-1. Soils in this area are mapped as urban lands, Norma sandy loam, and Alderwood gravelly sandy loam. Norma sandy loam is a hydric soil, (Hydric soils list for Washington State, Natural Resources Conservation Service [NRCS] 2009, http://soils.usda.gov/use/hydric/lists/state.html). Alderwood soils can also support the presence of wetland under some circumstances due to a consolidated substrate that can retain water on the surface (Snyder et al. 1973). Vegetation in these upland areas consists of

reed canarygrass, Himalayan blackberry, red-osier dogwood, and Oregon ash in the buffer of Wetland YCS-1, and Douglas-fir and black cottonwood in the southern buffer of Wetland YCS-2 (WSDOT 2009a). Additional information regarding these uplands can be found in the *Medina to SR 202: Eastside Transit and HOV Project Environmental Assessment: Wetland Assessment Report* (WSDOT 2009a).

6.4.2. Wetlands

The following section provides a summary of wetland conditions at the Yarrow Creek Mitigation Site. Two wetlands were identified on the Yarrow Creek Mitigation Site, YCS-1 and YCS-2 (see also Tables 15 and 16). Detailed information regarding wetland vegetation, site hydrology, soils, functions and buffer conditions is provided in the *Medina to SR 202: Eastside Transit and HOV Project Environmental Assessment: Wetland Assessment Report* (WSDOT 2009a).

Wetlands YCS-1 and YCS-2 were field-delineated in August 2007 and November 2006, respectively. The wetland boundaries were determined based on the presence of hydric soils, vegetation adapted to saturated soil conditions, and indicators of wetland hydrology. The Yarrow Creek Mitigation Site is currently fallow and existing vegetation is dominated by reed canarygrass.

Wetland functions at the Yarrow Creek Mitigation Site were evaluated using the Ecology rating method (Hruby 2004). Details of this evaluation are provided in the *Medina to SR 202: Eastside Transit and HOV Project Environmental Assessment: Wetland Assessment Report* (WSDOT 2009a). Additional discussion of wetland function is provided in Section 6.6.

Table 15. Yarrow Creek Mitigation Site, Wetland YCS-1 Wetland Summary

Location	Yarrow Creek S-1	
In median of SR 520 off-ramp loop to Bellevue Way NE.	**Local Jurisdiction**	Bellevue
	WRIA	WRIA 8
	Wetland Size	0.45 acre
	Ecology Rating (Hruby 2004)	II
	City of Bellevue Rating	II
	City of Bellevue Buffer Width	75
	Cowardin Classification	Palustrine Emergent
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	22
	Habitat Score	14
	Total Score	**52**
Dominant Vegetation	This emergent wetland is dominated by reed canarygrass, Himalayan blackberry, bentgrasses, and red alder.	
Soils	Silt loam, very dark gray (10YR 3/1), with redoximorphic concentrations over sandy loam greenish black (10Y 2.5/1).	
Hydrology	Overbank flow from Yarrow Creek supports the hydrology of this wetland.	
Rationale for Local Rating	The City of Bellevue uses the Ecology rating system. YCS-1 is rated a Category II using the Ecology rating system because it provides moderate water quality, hydrologic, and habitat functions (WSDOT 2009a).	
Functions of Entire Wetland	YCS-1 has moderate water quality function due to its ungrazed herbaceous vegetation and depressions that can trap runoff from adjoining roads. Hydrologic function is also moderate due to the ungrazed herbaceous vegetation and wetland width relative to Yarrow Creek. Since the wetland has two hydroperiods, two Cowardin classes, and two special habitat features, habitat function was rated moderate.	
Buffer Condition	The buffer of YCS-1 is disturbed because it is located in the median of the SR 520 off-ramp to Bellevue Way NE. Dominant vegetation is reed canarygrass, Himalayan blackberry, red-osier dogwood, and Oregon ash.	

Table 16. Yarrow Creek Mitigation Site, Wetland YCS-2 Wetland Summary

Location	Yarrow Creek S-2	
 Southwest of SR 520 and between the off-ramp to Bellevue Way NE and the on-ramp from 108th Avenue NE	**Local Jurisdiction**	Bellevue
	WRIA	WRIA 8
	Wetland Size	2.17 acres
	Ecology Rating (Hruby 2004)	II
	City of Bellevue Rating	II
	City of Bellevue Buffer Width	110
	Cowardin Classification	Palustrine Forested, Emergent
	HGM Classification	Riverine, slope
	Wetland Rating System Pts.	
	Water Quality Score	20
	Hydrologic Score	26
	Habitat Score	20
	Total Score	**66**
Dominant Vegetation	The northern portion is emergent and dominated by reed canarygrass. The southern portion of the wetland is forested. Species present include salmonberry, Pacific willow, red alder, Himalayan blackberry, and rose spirea.	
Soils	Silt loam, very dark grayish brown (2.5Y 3/2), with strong brown (7.5YR 4/6) redoximorphic concentrations.	
Hydrology	Overbank flow from Yarrow Creek and East Tributary to Yarrow Creek supports the hydrology of this wetland.	
Rationale for Local Rating	The City of Bellevue uses the Ecology rating system. YCS-2 is rated a Category II. It provides moderate water quality and habitat functions, and high hydrologic functions (WSDOT 2009a).	
Functions of Entire Wetland	The streams and forested vegetation in YCS-2 provide moderate water quality function. Overbank storage for the streams and the woody vegetation (along East Fork) to reduce water velocities support high hydrologic function. The presence of multiple vegetation classes, multiple hydroperiods, habitat interspersion, special habitat features, and connections to other habitats provide moderate habitat function.	
Buffer Condition	The buffer of Wetland YCS-2 is forested and dominated by Douglas-fir and black cottonwood. It is narrow in most places (approximately 10 feet), but is up to 50 feet wide in some areas.	

6.4.3. Wildlife Habitat and Use

Wetlands along Yarrow Creek include a mixture of vegetation types and hydroperiods that improve habitat diversity. While the existing wetlands have multiple vegetation types and hydrologic regimes that provide habitat diversity, the habitat quality and usability is limited by past disturbance, the proximity to major roads, and the lack of adequate screening.

Due to the disturbed nature of the Yarrow Creek Site and the proximity of SR 520 and other major roads, the species expected on the site are primarily disturbance-tolerant species adapted to urbanized areas. Yarrow Creek and East Fork Yarrow Creek provide potential habitat for fish, including salmonids. Additional information on habitat type and potential usage is provided in the *Medina to SR 202: Eastside Transit and HOV Project Environmental Assessment: Wetland Assessment Report* (WSDOT 2009a).

6.5 Mitigation Site Design

The mitigation at the Yarrow Creek Mitigation Site will restore or create 1.34 acres of riparian wetland (0.52 of which will serve as compensatory mitigation) and rehabilitate approximately 1.2 acres of riparian wetland (0.63 acre of which will serve as compensatory mitigation). Portions of the wetland creation/restoration (0.82 acre) and rehabilitation (0.57 acre) will be used to provide appropriate buffer functions for the Yarrow Creek Site. Approximately 0.63 acre of existing upland riparian and wetland buffer will also be created or enhanced. Figure 5 illustrates the proposed mitigation for the Yarrow Creek Mitigation Site.

Wetland restoration and rehabilitation activities will include: removing upland fill to create wetlands; relocating the main stem or Yarrow Creek (and the confluence of East Tributary Yarrow Creek) into a more natural channel; grading the areas associated with the new channel to restore natural floodplain function and rehabilitate the associated wetlands; controlling invasive species; establishing native tree and shrub communities; providing additional shading for the stream channels; and creating greater habitat structure and diversity.

Stream mitigation-related goals are discussed in the *Medina to SR 202: Eastside Transit and HOV Project Final Streams Mitigation Plan* (WSDOT 2010a). The stream-related goals represent mitigation for stream impacts (not wetland impacts). A summary of these goals is presented below to provide context. The following points summarize the proposed benefits:

- Remove the road fill associated with two abandoned SR 520 ramps, and daylight Yarrow Creek within these areas.
- Realign two reaches of Yarrow Creek (approximately 2,000 feet of stream channel) and 700 feet of the South Fork Yarrow Creek (South Fork joins the main stem of Yarrow Creek upstream of the Yarrow Creek Mitigation Site).
- Restore habitat complexity and stream functions within the realigned reaches to provide higher quality fish habitat than currently exists. Improvements will include improvements to channel morphology, floodplain connectivity, and installation of large woody debris in numbers that will emulate natural forested conditions.
- These enhancements will result in a substantial increase in the quantity of available fish habitat, and create a substantial net increase in the quality of available fish habitat within the project limits.

D:\GISDATA\projects\wash\wsdot\SR_520\Corridor\map_docs\mxd\Mitigation_report_figure\Figure5_Onsite_Mitigation.mxd

N

1 inch = 100 feet

0 100 200 Feet

Legend

- Wetland Creation
- Wetland Rehabilitation
- Stream Conversion to Wetland
- Buffer Enhancement
- Buffer
- Proposed Culvert
- Proposed Stream
- Permanent Footprint
- Temporary Footprint
- Parcel

Figure 5
Yarrow Creek Mitigation Plan

Medina to SR 202: Eastside Transit and HOV Project

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6.5.1. Site Hydrology

Wetland hydrology at the Yarrow Creek Site is influenced by overflows from Yarrow Creek and East Tributary to Yarrow Creek and a high groundwater table. Based on field observations, it appears that groundwater from the upslope areas to the south likely plays a significant role in the hydrology of this system. Both of the streams on the site appear to have been ditched and or straightened in the past.

The Yarrow Creek Site will be graded to remove upland fill and provide a better connection between the existing wetland and Yarrow Creek. The proposed stream elevation is at roughly the same elevation as the existing stream channel, and the channel has greater stream length on the site. Grading to create the floodplain for Yarrow Creek and to create and rehabilitate wetlands will lower this area to elevations similar to the existing wetland boundary. As a result, the mitigation is expected to maintain hydrologic conditions at or near the surface of the created and rehabilitated wetland areas for sufficient duration to meet the USACE requirements for jurisdictional wetlands.

Created and rehabilitated wetland areas will have surface saturation for 30 consecutive days during the growing season for three or more years out of five years throughout the monitoring period. Alternative methods of determining suitable levels of saturation (such as matching conditions in reference wetlands) may be used in years of non-typical precipitation. A formal wetland delineation will also be conducted at Year 10 to determine the extents of on-site wetlands.

Stream Flow

Stream flow modeling was used in the design of the stream channel. This modeling was also used to help assure frequent overbank flooding from the stream to the wetlands (WSDOT 2010c). The floodplain wetlands at the Yarrow Creek Mitigation Site have been designed to be inundated by stream flow at any flow greater than the bank full event (approximately 1.8 years).

Groundwater

Groundwater is assumed to be a significant hydrologic input to the Yarrow Creek Mitigation Site. A map of the groundwater wells on-site and data are provided in Appendix D. Groundwater wells were monitored monthly from March 2009 to March 2010. Near the east edge and highest part of the site, the lowest water level in a well (#H262p-08) was measured at an elevation of 49.2 feet. The closest wetland edge is at an elevation of 45 feet. Near the middle of the site, the lowest water level in a well (#H261p-08) was measured at an elevation of 42.1 feet. The closest

wetland edge was at an elevation of 42 feet. This and the other groundwater data collected at the site indicate that the wetland areas will meet the criteria for wetland hydrology. WSDOT will use this and future groundwater data to further evaluate hydrology and to complete the final design.

6.5.2. Invasive Species Control Strategy

Reed canarygrass is a dominant invasive species present at the Yarrow Creek Mitigation Site. The presence of this species reflects the past development and grading activities and associated disturbance agricultural activities, nutrient levels in the runoff from adjacent roads and development, sedimentation levels, seed bank, and existing rhizome bank. Due to the presence of seed sources both upstream of the site and throughout the region, reed canarygrass is expected to persist at the Yarrow Creek Mitigation Site indefinitely. The performance criteria and measures for invasive vegetation presented in Chapter 7 take this factor into account.

The site preparation for the Yarrow Creek Mitigation Site will include grading and removal of portions of the topsoil to remove reed canarygrass seeds and rhizomes. The strategy for control of reed canarygrass will include both short-term and long-term measures, as described in Section 5.5.2, and summarized below.

Short-Term Reed Canarygrass Control Measures

- Mowing
- Herbicide
- Mulching

Long-Term Reed Canarygrass Control Measures

- Dense plantings of native woody species

Ongoing Maintenance

- Mowing of reed canarygrass
- Hand removal where necessary

- Herbicide application
- Replacement planting as applicable

6.5.3. Grading Design

The Yarrow Creek Mitigation Site's design will include grading throughout the site (Appendix E). The majority of the grading activity will result from the removal of the abandoned highway ramps and associated upland fill. This grading is part of the wetland and floodplain creation and plans to daylight portions of Yarrow Creek.

A smaller amount of grading will be required to relocate the channel of Yarrow Creek in a more natural configuration. The confluence of East Fork Yarrow Creek with the main stem would also be moved during this grading.

Additional grading will be necessary to re-establish the connections between Yarrow Creek and its associated wetlands and floodplains and to remove the seed source for invasive species. Some portions of the floodplain will also be graded slightly higher to help form the meanders.

Final grades will be established consistent with wetland hydrology requirements for the rehabilitated and created wetland areas, and may be adjusted for desired habitats based on more detailed hydrologic data.

6.5.4. Yarrow Creek Channel Design

A detailed discussion of the Yarrow Creek channel design the improvements to stream and riparian function at the Yarrow Creek Mitigation Site is provided in *Medina to SR 202: Eastside Transit and HOV Project Final Streams Mitigation Plan* (WSDOT 2010a). Although they are not directly related to the wetland mitigation, the stream design elements are summarized below to provide context for the site.

- Yarrow Creek will be realigned into a longer channel and four existing culverts will be removed.
- The design will incorporate large woody debris and log jams.
- Habitat features (e.g. snags and coarse woody debris) will be installed in the floodplain.

A schematic of the current channel layout is shown in Figure 5 and plans are included in Appendix E.

6.5.5. Planting Design

Planting areas for the Yarrow Creek Mitigation Site will consist of four distinct plant associations, the boundaries of which are based on the expected site hydrology. These four planting areas are: the wetland restoration planting, a low floodplain planting (Type 1), an upper floodplain planting (Type 2), and the stream buffer planting.

The wetland restoration planting will consist of species appropriate to the proposed wetland hydrology and soils. The low floodplain terrace planting (Type 1) will consist of live stake willow species installed directly adjacent to the creek. This planting will help stabilize the creek channel, provide shading and encourage recruitment of small woody debris. The upper floodplain terrace planting (Type 2) includes willow species and a wider variety of trees and shrubs capable of withstanding occasional periods of inundation. Higher outlying areas will be planted with tree and shrub species that can tolerate drier conditions. The stream buffer area includes upland areas and will be planted with a mix of native tree and shrub species arranged in natural patterns to support and enhance riparian ecology, provide shade, and provide terrestrial habitat and recruitment of woody debris. Planting zones are shown in Figure 4, and species lists, community composition, and proposed plant spacing for these zones are presented in Table 17.

Species for all planting have been selected with consideration for light tolerance, suitability to expected hydrologic conditions at the site, and ability to provide forage and cover for wildlife. Trees and shrubs will be arranged into irregular groups by species, and intermixed on the edges to create a more diffuse transition between species. Additional modifications to the species selected may be made as additional site design information becomes available.

Table 17. Planting List for Yarrow Creek Mitigation Site

Common Name	Scientific Name	Indicator Status	Community Composition	Plant Spacing (in feet on center)
Wetland Restoration Planting				
Trees				
Red alder	*Alnus rubra*	FAC	25%	4’
Oregon ash	*Fraxinus latifolia*	FACW	20%	4’
Sitka spruce	*Picea sitchensis*	FAC	15%	4’
Black cottonwood	*Populus balsamifera*	FAC	15%	4’
Cascara	*Rhamnus purshiana*	FAC-	10%	4’
Western red cedar	*Thuja plicata*	FAC	15%	4’
Shrubs				
Red-osier dogwood	*Cornus sericea*	FACW+	15%	4’
Black twinberry	*Lonicera involucrata*	FAC+	15%	4’
Pacific ninebark	*Physocarpus capitatus*	FACW-	15%	4’
Clustered rose	*Rosa pisocarpa*	FAC	15%	4’
Hooker’s willow	*Salix hookerana*	FACW-	15%	4’
Sitka willow	*Salix sitchensis*	FACW	15%	4’
Rose spirea	*Spiraea douglasii*	FAC	10%	4’
Floodplain Planting Type 1				
Shrubs				
Red-osier dogwood	*Cornus sericea*	FACW+	30%	3’
Pacific willow	*Salix lucida var. lasiandra*	FACW+	20%	3’
Scouler’s willow	*Salix scoulerana*	FAC	20%	3’
Sitka willow	*Salix sitchensis*	FACW	30%	3’
Floodplain Planting Type 2				
Trees				
Red alder	*Alnus rubra*	FAC	20%	12’
Oregon ash	*Fraxinus latifolia*	FACW	15%	12’
Sitka spruce	*Picea sitchensis*	FAC	15%	12’
Black cottonwood	*Populus balsamifera*	FAC	15%	12’
Pacific willow	*Salix lucida var. lasiandra*	FACW+	20%	12’
Western red cedar	*Thuja plicata*	FAC	15%	12’
Shrubs				
Red-osier dogwood	*Cornus sericea*	FACW+	15%	4’
Black twinberry	*Lonicera involucrata*	FAC+	15%	4’
Pacific ninebark	*Physocarpus capitatus*	FACW-	15%	4’
Clustered rose	*Rosa pisocarpa*	FAC	15%	4’

Common Name	Scientific Name	Indicator Status	Community Composition	Plant Spacing (in feet on center)
Hooker's willow	*Salix hookerana*	FACW-	15%	4'
Sitka willow	*Salix sitchensis*	FACW	15%	4'
Rose spirea	*Spiraea douglasii*	FAC	10%	4'
Stream and Buffer Planting				
Trees				
Vine maple	*Acer circinatum*	FAC-	20%	12'
Bigleaf maple	*Acer macrophyllum*	FACU	15%	12'
Red alder	*Alnus rubra*	FAC	10%	12'
Oregon ash	*Fraxinus latifolia*	FACW	10%	12'
Bitter cherry	*Prunus emarginata*	FACU	10%	12'
Douglas fir	*Pseudotsuga menziesii*	FACU	15%	12'
Scouler's willow	*Salix scoulerana*	FAC	5%	12'
Western red cedar	*Thuja plicata*	FAC	15%	12'
Shrubs				
Serviceberry	*Amelanchier alnifolia*	FACU	5%	4'
Red-osier dogwood	*Cornus sericea*	FACW+	10%	4'
Beaked hazelnut	*Corylus cornuta*	FACU	5%	4'
Mock orange	*Philadelphus lewisii*	NL	10%	4'
Pacific ninebark	*Physocarpus capitatus*	FACW-	10%	4'
Red-flowering currant	*Ribes sanguinium*	NI	5%	4'
Nootka rose	*Rosa nutkana*	FAC	10%	4'
Thimbleberry	*Rubus parviflorus*	FAC-	10%	4'
Red elderberry	*Sambucus racemosa*	FACU	10%	4'
Common snowberry	*Symphicarpos albus*	FACU	25%	4'

6.5.6. Habitat Features

Constructed habitat elements such as brush piles, perch poles, snags, and coarse woody debris can provide habitat for small mammals, amphibians, reptiles, predatory species, and passerine-sized birds, primary excavating species (e.g., pileated woodpeckers), and bats. In addition, wood structures can host a variety of insects, which, in turn, will benefit a number of insectivorous surface-feeding species.

Habitat features appropriate to the target plant communities, wildlife species, and site conditions have been incorporated into the mitigation design. One or more of the following habitat features are to be incorporated into the site design:

- Brush piles – installed in upland or dry riparian areas to mimic dense thickets caused by fallen trees (toppled trees create clumped, horizontal structures in the understory vegetation).
- Raptor perch poles – installed in upland or dry riparian areas to replace or augment vertical structures.
- Snags – installed in uplands, wetlands, and riparian zones to provide decadent vertical wood elements typical of a mature forest.
- Coarse woody debris – installed in uplands, wetlands, and riparian zones (outside of bankfull width) to mimic toppled trees which create structure, water retention, and organic soil inputs as well as the habitat complexity usually present in forested sites.

Quantities and placement of habitat features will be shown in the final mitigation plan sheets.

6.5.7. Site Protection

The following site protection measures will be implemented as part of the mitigation plan:

- The Yarrow Creek Mitigation Site shall be protected in perpetuity as it remains in WSDOT right of way. Impacts related to any future improvements in the corridor will require additional permits.
- The south side of the site will be fenced using three wire (non-barbed) fence. This style of fence allows wildlife to pass through easily.
- Access to the site will be fenced and gated.
- Appropriate signs will be placed along the fence at 200-foot intervals.

6.5.8. Implementation Schedule

A complete implementation schedule for this proposed mitigation has not yet been developed. However, the following tentative schedule is expected for the site:

Ongoing Studies and Benchmarks (Pre-Construction):

- Soil studies
- Permit applications
- Permit approval
- Plans, specifications, and estimates (PS&E)

Construction Activities:

- Shallow groundwater monitoring
- Installation of Temporary Erosion and Sediment Control (TESC) measures
- Implementation of invasive species control plan
- Excavation of new channels and associated areas for Yarrow Creek
- Installation of plantings
- Preparation of as-built drawings
- Initial monitoring of site

A more comprehensive implementation schedule will be developed as the project design advances.

6.6 Ecological Benefits

6.6.1. Wetland Functions

The Yarrow Creek Mitigation Site is expected to substantially improve hydrologic and habitat functions in the riparian wetlands associated with Yarrow Creek. The list below displays functional attributes of the mitigation wetlands that will be improved and added compared to the existing impacted wetlands.

Improved Functional Attributes:

- Reduce prevalence of invasive species
- Increase plant diversity by replanting with native species
- Increase vertical and horizontal habitat complexity
- Provide additional habitat features

New Functional Attributes:

- Create additional wetland area
- Joins Wetlands YCS-1 and YCS-2 into a single complex; his creates greater potential for habitat and water quality functions
- Reconnect wetland to Yarrow Creek, increasing opportunities for water quality and hydrologic functions

Functional Lift

The Yarrow Mitigation Site also provides a rare unique opportunity for wetland mitigation. Nestled in a highly urbanized watershed, the site has the unusual potential to restore wetland area by removing infrastructure, while at the same time supporting a suite of mitigation activities to improve the performance of wetland and stream functions.

Functional lift for the Yarrow Creek Mitigation Site was assessed using the same descriptive process described for the Keller Mitigation Site. This method is based on the wetland functions identified in the *Washington State Wetland Rating System for Western Washington Revised* (Hruby 2004) and the set of physical characteristics defined in the best available science (Sheldon et al. 2005). Based on this description, the Yarrow Mitigation Site provides functional lift in the three wetland functions over the majority of the area of the site.

The following section includes the detailed description of the wetland function characteristics at the Yarrow Creek Mitigation Site and the proposed improvements. Table 18 provides a summary of the expected functional lift at the site.

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Table 18. Functional Lift Resulting from the Proposed Wetland Rehabilitation at Yarrow Creek Mitigation Site

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Water Quality			
Sediment removal	Relatively low residence time due to flashy character of stream. Absence of dense woody vegetation in Yarrow Creek to slow flows.	Yarrow Creek to be connected to associated wetlands. Woody debris jams added to Yarrow Creek, Dense woody vegetation planted to retard flows (2.54 acres of wetland).	Increase in function in approximately 2.54 acres.
Phosphorous removal			
Nitrogen removal			
Metal and toxic organic removal			
Pathogen removal			No change.
Hydrologic			
Peak flow reduction	Approximately 2.62 acres have potential for overbank flows; emergent vegetation does not significantly decrease flow velocities.	Additional floodplain areas added where uplands are removed. Connection to overbanking area improved by lowering floodplain to just below 2-year flood elevation. Filling drainage ditches and removing drain tiles will assist in retarding runoff. Increase in woody vegetation over 2.54 acres will reduce velocities.	1.34 acres of created wetlands. Flows slowed on approximately 1.2 acres of rehabilitated wetland. Increase in potential to reduce velocities affecting peak flows, ~ 2.54 acres of vegetated wetland.
Erosion reduction	Limited vegetation to reduce flow velocities (little or no woody vegetation on the banks of Yarrow Creek).	Dense woody vegetation planted along 2.54 acres of streambanks and floodplains.	
Groundwater recharge	Role of wetland in performing this function is unclear.	Not expected to be affected by this function.	No change.

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Habitat			
Structural complexity	Limited plant diversity, habitat features largely absent, limited interspersion of vegetation types and plant types.	Thirteen native wetland species proposed, habitat structures included in design, multiple vegetation types proposed with higher degree of plant type and vegetation type interspersion.	Increase in structural complexity over 2.54 acres.
Abundant food sources	Emergent vegetation dominated by non-native species provides limited sources of food.	Addition of 24 species of fruit or seed-bearing plants (12 in wetland and 12 in the associated uplands.	Increase in available food sources over 2.54 acres.
Connectivity to other natural resources	Wetlands provide connection between off-site habitats and Yarrow Creek.	Connection to be maintained. Wetland YCS-1 and YCS-2 will be connected by new wetland.	Improved connection between on-site wetlands.
Moist and moderate microclimate	Drainage features convey water off the site more rapidly than natural conditions. Emergent vegetation provides little temperature moderation.	Additional wetland habitat added to system. Restored Yarrow Creek in natural channel will have greater length on-site and greater contact with associated wetlands. Dense woody vegetation planted to retard flows (2.54 acres).	Gain of 1.34 acres of moist microclimate. Hydrologic changes may increase moisture available at the site (~2.54 acres affected). 2.54 acres of shading provides additional temperature control.

Water Quality Function

The primary mechanisms for water quality improvement in wetlands are sediment removal, phosphorous removal, nitrogen removal, metal and toxic organic removal, and pathogen removal (Sheldon et al. 2005).

Residence time is an important factor in water quality improvement, since it provides greater potential for particulates to settle (Sheldon et al. 2005). Residence time at the Yarrow Creek Mitigation Site is currently limited by the area of the wetland subject to overbank flooding, the relative absence of woody vegetation near Yarrow Creek, and the relatively short stream length in the wetlands. The proposed Yarrow Creek Mitigation Plan will create new riparian wetlands that provide additional overbank storage area. The plan will also add woody debris that will assist in lowering water velocities, and increase the length of Yarrow Creek and the number of meanders in the channel. These factors are expected to result in improvement in the sediment removal characteristics of the wetlands at the Yarrow Creek Mitigation Site.

These improvements in water quality function are expected to extend to other water quality mechanisms that are dependant of sediment retention, namely the removal of phosphorous, nitrogen, and toxics (Sheldon et al. 2005). Reduced flow velocities in Yarrow Creek are not likely to effect pathogen removal; however the increase in residence time may provide some benefit.

Hydrologic Function

The physical processes associated with hydrologic function are reduced peak flows, reduced erosion, and groundwater recharge (Sheldon et al. 2005).

The major characteristic of riverine wetland in western Washington judged to reduce peak flows is the storage provided by overbank areas (Sheldon et al. 2005). The Yarrow Creek Mitigation Site will add approximately 1.34 acres of overbank storage in the project area. Since the Medina to SR 202: Eastside Transit and HOV Project will provide treatment for all of the stormwater from the project, the new overbank storage capacity provided at the Yarrow Creek Mitigation Site would benefit the Yarrow Creek watershed as a whole.

The proposed project will also add 2.54 acres of woody vegetation along the stream channel and in the floodplain, and approximately 72 key pieces of large woody debris in the channel. Since woody vegetation and large woody debris in streams are major components in the reduction of erosion in riparian systems in western Washington (Sheldon et al. 2005), the addition of these

elements is expected to provide a significant improvement in reducing erosion on the site and downstream.

Groundwater recharge occurs in riparian wetlands only where the wetlands impound and hold surface water (Sheldon et al. 2005). The riparian wetlands in the Yarrow Creek Mitigation Site do not currently appear to impound water. Since no impounding areas are proposed on the site, the performance of this characteristic is not expected to change.

Habitat Function

Characteristics that make wetlands important as habitat include structural complexity, connectivity to other natural resources, abundant food sources, and the presence of a moist and moderate microclimate (Sheldon et al. 2005).

Important elements of structural complexity include plant species richness, the presence of physical habitat features (e.g., open water areas, rocks), interspersion of vegetation types, and interspersion of plant types (Sheldon et al. 2005). The Yarrow Creek Mitigation Site currently has limited plant diversity and habitat features are largely absent. Interspersion of habitat types and plant communities varies between the site's two wetlands, but is greater in Wetland YCS-2, primarily due to forested habitat off-site. As a result, the overall level of structural complexity at the Yarrow Creek Mitigation site varies from low to moderate, depending on the location (WSDOT 2009a).

The proposed rehabilitation will improve structural complexity by connecting the two existing wetlands, creating a more sinuous stream channel, and planting shrub and forested vegetation types with complex edges. Interspersion can be further increased by grouping the planting by species, and inter-mixing the species at the edges of the planting groups. A variety of physical habitat structures (such as standing snags, brush piles, raptor perch poles and coarse woody debris) will also be added to the site. Overall, the Yarrow Creek Mitigation Site will create 1.34 acres of new wetland habitat and significantly increase the structural complexity of the 1.20 acres of rehabilitated wetlands.

The Yarrow Creek Mitigation Site is located in a densely-developed suburban area immediately adjoining SR 520. As a result, buffers are small, and connections to other terrestrial habitats are limited. The location of the site along Yarrow Creek does provide some habitat connectivity, since aquatic animals can access the site via the stream. The proposed mitigation will connect Wetlands YCS-1 and YCS-2, increasing the areas of habitat available and decreasing fragmentation. This will also allow for enhanced buffer areas compared to the current conditions.

Wetlands on the Yarrow Creek Mitigation Site are dominated by non-native grasses that provide limited food sources. The proposed mitigation includes 24 fruiting or seed-bearing tree and shrub species that will provide additional sources of food for wildlife. These species will be planted throughout the site, providing additional foraging habitat in 1.34 acres of newly created wetland area, and in 1.20 acres of rehabilitated wetland.

A moist microclimate with milder temperature extremes than the surrounding areas is a desirable habitat for many species (Sheldon et al. 2005). The straightened character of Yarrow Creek at the mitigation site and the absence of woody vegetation reduce residence time and increase exposure. The result is a reduction in the site's capacity to maintain this desirable moist and temperate microclimate. The proposed mitigation activities at the site will increase the length of Yarrow Creek on-site and the stream's connection to the associated floodplain. The proposed woody vegetation will (on maturity) provide shading for the wetlands. These changes in site hydrology and shading are expected to retain moisture on the site longer than current conditions, and assist in moderating temperature extremes. These benefits are expected to occur in 1.20 acres of rehabilitated wetland and 1.34 acres of created wetland.

6.6.2. Stream and Riparian Functions

A detailed discussion of the existing conditions in streams in the project area and the improvements to stream and riparian function at the Yarrow Creek Mitigation Site is provided in *Medina to SR 202: Eastside Transit and HOV Project Final Streams Mitigation Plan* (WSDOT 2010a).

6.6.3. Buffer Functions

Buffers for the Yarrow Creek Mitigation Site have been designed in accordance with USACE and Ecology Joint Guidance to provide adequate protection for the site's wetland functions. The following benefits are expected to occur:

- Improved screening of wetland from off-site activities
- Control of invasive species
- Improved habitat function through replanting with appropriate native trees and shrubs
- Improved potential for woody debris recruitment.

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Chapter 7. Mitigation Goals, Objectives, and Performance Criteria

The Washington State Department of Transportation (WSDOT) uses goals and objectives to guide mitigation design and construction. Goals and objectives typically are based on area or function. Goals describe the overall intent of mitigation efforts; objectives describe individual components of the mitigation site in detail. Performance measures and standards are the benchmarks that define success for each objective and direct adaptive management. These measures and standards describe specific on-site characteristics that indicate whether the mitigation site meets an objective. They also guide the management of the mitigation site with intermediate benchmarks. Performance standards are also used to evaluate compliance with regulatory permits during the monitoring period. Contingency plans describe what actions can be taken to correct site deficiencies.

WSDOT uses the adaptive management process to improve mitigation success. Adaptive management is a process through which changes to mitigation activities, maintenance procedures, or monitoring protocols are developed based on the successes or failures in other mitigation projects. These changes are then incorporated into the current mitigation projects. Information from ongoing monitoring further directs subsequent site management activities. WSDOT will monitor the site for up to 10 years and perform maintenance, as necessary, to achieve the mitigation performance standards. As part of the adaptive management process, mid-course corrections may be necessary if the site develops in ways that were not anticipated during design and permitting of the project. These mid-course corrections require coordination with regulators, and may, in some cases, require negotiation of revised performance standards.

7.1 Goals

The Medina to SR 202: Eastside Transit and HOV Project will use a comprehensive mitigation plan to mitigate for 6.77 acres of permanent wetland fill, 0.11 acre of long-term temporary wetland clearing, and permanent impacts to 1.14 acres of permanent wetland buffer loss. The mitigation plan will incorporate the following elements:

Off-site mitigation at the Keller Mitigation Site

- Rehabilitating 25.48 acres of wetlands – improving hydrologic functions and increasing aquatic habitat connectivity, structure, and interspersion.

- Rehabilitating 3.56 acres of wetland to function as buffers, converting this area from pasture to forested wetland.
- Enhance 1.52 acres of riparian upland with native upland forest vegetation.

On-site mitigation at the Yarrow Creek Mitigation Site

- Restoring/creating 0.52 acre of new forested wetland.
- Restoring/creating 0.82 acre of new forested wetland to serve as regulatory buffer.
- Rehabilitating 0.63 acre of existing disturbed emergent wetland to forested riparian wetland.
- Rehabilitating 0.57 acre of existing disturbed emergent wetland to serve as regulatory buffer.
- Enhance 0.63 acre of disturbed riparian and wetland buffer to forested upland.

7.2 Objectives

Off-site Objectives

Rehabilitate the wetland at the Keller Mitigation Site

- KR1: Rehabilitate hydrologic functions by improving the connection to Evans Creek, creating a more natural channel configuration, filling agricultural drainage ditches and removing drain tiles, thus increasing the wetland's ability to receive flood waters, which will decrease peak flows and downstream flooding.
- KR2: Improve hydrologic and water quality function with vegetative roughness within the rehabilitated wetland.
- KR3: Improve wetland wildlife habitat by altering the existing wetland to support a diverse native wetland plant community.
- KR4: Provide wildlife habitat by constructing habitat features: snags, downed logs, and brush piles.

Enhance buffers and riparian uplands at the Keller Mitigation Site

- KE1: Improve upland wildlife habitat adjacent to a wetland by converting ~3.56 acres of pasture (predominantly wetland) into a more complex wetland forest community.
- KE2: Preserve and enhance 1.52 acres of existing Bear Creek riparian uplands.

- KE3: Screen wetland from nearby human activities.
- KE4: Provide wetland wildlife habitat by constructing habitat features: snags, downed logs, and brush piles.

On-site Objectives

Create/restore wetland at the Yarrow Creek Mitigation Site

- YC1: Create additional wetland by removing upland fill.
- YC2: Improve hydrologic and water quality function with vegetative roughness within the rerehabilitated wetland.
- YC3: Improve wetland wildlife habitat by altering the existing wetland to support a diverse native wetland plant community.
- YC4: Provide wildlife habitat by constructing habitat features: snags, downed logs, and brush piles.

Rehabilitate wetland at the Yarrow Creek Mitigation Site

- YR1: Rehabilitate hydrologic functions by improving the connection to Yarrow Creek, creating a more natural channel configuration, thus increasing the wetland's ability to receive flood waters, which will decrease peak flows and downstream flooding.
- YR2: Improve hydrologic and water quality function with vegetative roughness within the rerehabilitated wetland.
- YR3: Improve wetland wildlife habitat by altering the existing wetland to support a diverse native wetland plant community.
- YR4: Provide wildlife habitat by constructing habitat features: snags, downed logs, and brush piles.

Enhance buffers at the Yarrow Creek Mitigation Site

- YB1: Improve upland wildlife habitat adjacent to a wetland.
- YB2: Screen wetland from nearby human activities.
- YB3: Provide wetland wildlife habitat by constructing habitat features: snags, downed logs, and brush piles.

7.3 Performance Criteria

The performance standards described below provide benchmarks for measuring progress of the goals and objectives of the mitigation site. Mitigation activities are intended to meet these performance standards within 10 years. The performance standards are based on function characteristics described in *Method for Assessing Wetland Functions* (Hruby et al., 1999a and 1999b) or other approved methods. These performance standards measure structural attributes that serve as indicators of wetland functions. Methods to monitor each performance standard are described in general terms.

7.3.1. Hydrologic Performance

The hydrologic performance standards document and verify that wetland area and ground elevations are established according to the criteria specified during the design. The hydrologic performance standards also assure that the wetlands retain the planned volume of water to reduce peak flows during flooding events. Retention of floodwaters also allows sediments and associated pollutants to settle in the wetland, thus improving water quality. These hydrologic performance standards directly relate to Objectives KR1, YC1, YC2, and YR1.

Performance Measures

Year 1

As-built condition is consistent with the proposed grading plan.

Years 1, 3, 5, and 7

The soils in the rehabilitated wetland will be saturated to the surface, or standing water will be present within 12 inches of the surface for at least four consecutive weeks (10 percent) of the growing season in years when rainfall meets or exceeds the 30-year average.

Performance Standard

Year 10

Wetlands at the mitigation sites will be delineated using currently approved methods.

- The Keller Mitigation Site will contain at least 29.04 acres of rehabilitated wetland.

- The Yarrow Creek Site will contain 2.54 acres of wetland, including both restored/created wetland and rehabilitated wetland.

7.3.2. Wetland and Riparian Upland Vegetation

The performance criteria for wetland vegetation document the establishment of wetland plant communities. The performance standards below relate to Objectives KR2, KR3, KE2, YC2, YC3, YR2, YR3, YB1, and YB2.

Performance Measures

Year 1

Native, wetland (facultative and wetter) woody species (planted and volunteer) will achieve an average density of at least four plants per 100 square feet in the scrub-shrub and forested communities of the rehabilitated wetland.

In the streamside planting area, emergent native wetland vegetation (planted and volunteer) will provide at least 25 percent cover. Gravel stream bed areas will not be included in the cover assessment.

Year 3

Native, wetland (facultative and wetter) woody species (planted and volunteer) will achieve an average density of at least four plants per 100 square feet in the scrub-shrub and forested communities of the rehabilitated wetland.

In the streamside planting area, emergent native wetland vegetation (planted and volunteer) will provide at least 50 percent cover. Gravel stream bed areas will not be included in the cover assessment.

Year 5

Aerial cover of native, wetland (facultative and wetter) woody species will be at least 35 percent in the scrub-shrub and forested communities of the rehabilitated wetland. Desirable native species colonizing portions of the site will be included in the aerial cover.

In the streamside planting area, emergent native wetland vegetation (planted and volunteer) will provide at least 50 percent cover. Gravel stream bed areas will not be included in the cover assessment.

Year 7

Aerial cover of native, wetland (facultative and wetter) woody species will be at least 50 percent in the scrub-shrub and forested communities of the rehabilitated wetland. Desirable native species colonizing portions of the site will be included in the aerial cover.

In the streamside planting area, emergent native wetland vegetation (planted and volunteer) will provide at least 50 percent cover. Gravel stream bed areas will not be included in the cover assessment.

All years

Washington State and King County listed Class A Noxious Weeds indentified on the site shall be eradicated.

King County listed Class B and C Weeds identified on the site shall be controlled. Control of noxious weeds means to prevent all seed production and to prevent the dispersal of all propagative parts capable of forming new plants.

Noxious Weeds listed by King County as Non-Designate including reed canarygrass, non-native blackberries and Scot's broom will not exceed 25 percent aerial cover in rehabilitated wetlands and riparian uplands.

Performance Standard

Year 10

Aerial cover of native woody species will be at least 70 percent in the scrub-shrub and forested communities in the rehabilitated wetland. Desirable native species colonizing portions of the site will be included in the aerial cover.

In the streamside planting area, emergent native wetland vegetation (planted and volunteer) will provide at least 50 percent cover. Gravel stream bed areas will not be included in the cover assessment.

7.3.3. Buffer Vegetation Performance

The buffer vegetation performance criteria documents the establishment of a plant community that: 1) provides habitat for native wildlife; 2) screens wetland wildlife from human activity; and 3) provides vegetative roughness to slow floodwaters and allow the deposition of sediment and associated pollutants. The buffer woody vegetation performance criteria directly relate to Objectives KE1, KE2, KE3, YB1, and YB2.

Performance Measures

Year 1 and Year 3

Native woody species (planted and volunteer) will achieve an average density of at least four plants per 100 square feet in the upland buffer.

Year 5

Aerial cover of native woody species (planted and volunteer) will be at least 30 percent in the upland buffer.

Year 7

Aerial cover of native woody species (planted and volunteer) will be at least 40 percent in the upland buffer.

All years

Washington State and King County listed Class A Noxious Weeds indentified on the site shall be eradicated.

King County listed Class B and C Weeds identified on the site shall be controlled. Control of noxious weeds means to prevent all seed production and to prevent the dispersal of all propagative parts capable of forming new plants.

Noxious Weeds listed by King County as Non-Designate including reed canarygrass, non-native blackberries and Scot's broom will not exceed 25 percent aerial cover in buffers.

Performance Standards

Year 10

Aerial cover of native woody species will be at least 50 percent in the upland buffer.

7.3.4. Habitat Structure Performance Criteria

Wildlife structures such as snags, downed logs, and brush piles will be designed to provide immediate habitat for wildlife. The habitat structure performance criteria directly relate to Objectives KR4, KE4, YC4, YR4 and YB3.

Performance Standards

Year 1

Habitat structures installation will be verified and an as-built plan will document that all habitat structures were installed.

7.4 Monitoring

WSDOT staff (or their designated representatives) will monitor the mitigation site for 10 years after installation. If all the performance standards are achieved in less than 10 years, WSDOT may terminate monitoring with approval of the review agencies.

Quantitative monitoring will be completed and documented 1, 3, 5, 7, and 10 years after initial acceptance of the mitigation construction. The site should be evaluated during the summer following plant installation to assess survival rates and document the presence of non-native invasive species. The WSDOT HQ Wetland Assessment and Monitoring Program (or their designated representatives) will also complete informal (qualitative) assessments of the mitigation site in years 2, 4, 6, and 8 for adaptive management purposes only.

Quantitative monitoring will be designed to determine if the performance measures or performance standards have been met. Monitoring reports will be submitted for review and comment to the recipients listed in Table 19 by the month of April following the formal monitoring activities conducted the previous year.

Table 19. Monitoring Report Recipients

Permitting Agency or Organization	Contact Name and Address
U.S. Army Corps of Engineers	
Department of Ecology	
WDFW	
Municipal governments as appropriate, possibly including: Medina Hunts Point Clyde Hill Yarrow Point Kirkland Bellevue Redmond	

WSDOT has established a comprehensive set of monitoring methods used to monitor mitigation sites. The actual methods used to monitor each site are documented in annual monitoring reports prepared by WSDOT's Wetland Assessment and Monitoring Program based in the Environmental Services Office in Olympia, Washington, or their designated representatives.

7.5 Contingency Plan

WSDOT anticipates the mitigation goals will be accomplished with the construction and installation of the mitigation design as shown on the grading and planting plans. Contingency actions, however, may be needed to correct unforeseen problems. Contingency revisions typically require coordination with the permitting agencies.

As necessary, contingency measures (site management or revisions to performance criteria with permitting agency agreement) will be implemented to meet performance measures and standards. The following describes potential situations that may occur and the potential contingencies that can be implemented to correct the problem. Because not all site conditions can be anticipated, the contingencies discussed below do not represent an exhaustive list of potential problems or remedies.

7.5.1. Hydrology

Hydrologic problems occurring on a mitigation site are typically the result of either insufficient water or excessive water. Insufficient water can occur seasonally during drought conditions or can be a long-term problem. Long-term problems can be the result of altered surface water flows for mitigation sites reliant on surface water flows as the primary source of hydrology. For groundwater-driven mitigation sites, typical long-term hydrologic problems that result in either excessive or insufficient hydrology can occur from a design based on insufficient groundwater data, the establishment of incorrect final grade elevations, or an unperceived soil condition that alters groundwater flows. Hydrologic contingency measures will be implemented based on observed conditions or monitoring data. Steps to address insufficient or excessive hydrology are the following:

- Clearly identify the source of the problem.
- Consult with the Mitigation Design Team, including members of Biology, Landscape Architecture, and Hydrology, and the resource agencies to determine an appropriate course of action.

7.5.2. Vegetation

Problems related to vegetation include plant mortality and poor growth resulting in low plant cover. These problems could be the result of insufficient site management, particularly watering in the first few growing seasons, animal browse, competition from invasive species, incorrect plant selection, altered site conditions, and vandalism. Contingencies for plant mortality and poor plant cover may include the following:

- Plant replacement – Additional planting may be required to meet plant survival and plant cover requirements. Plant species will be evaluated in relation to site conditions to determine if plant substitutions will be required.
- Weed control – Control of non-native invasive species may be required to meet survival and plant cover requirements. Weed control methods could include mechanical or hand control, mulching, or herbicide application.
- Herbivore control – If plant survival or vegetation cover standards are not met because of animal browsing, the wildlife responsible will be identified and appropriate control measures will be attempted. This could include plant protection, fence installation, or the use of repellents. However, some pestilent and invasive wildlife species are difficult to avoid. Implementing precautionary measures with design and placement will minimize unwanted species but likely not eliminate them. Wildlife damage and manipulation to

plantings and structures should be expected to occur and, with exceptions, it may be necessary to accept the situation and allow the vegetation to mature under these conditions. Occasionally it may be necessary to dissuade or exclude destructive wildlife species.

Native species such as beaver may initially create a perception of damaging effects on the expected outcome of a mitigation site; however, the site modifications that result from their activities can create functions and habitats suited to several other species. The following additional measures are proposed as potential contingencies for beaver-induced failure to meet vegetation performance standards:

- Replace plants.
- Plant less preferable species.
- Adjust plant species and/or communities.
- Install temporary fenced enclosures around some of the forested and/or shrub communities.
- Control and reduce the cover of reed canarygrass and non-native blackberry in order to enhance establishment of native plant species.

- Vandalism – To prevent vegetation disturbance from vandalism, fence installation and sensitive area signage will be installed.

7.5.3. Wildlife Structures

Wildlife structures will be installed during construction activities and will be monitored to verify presence or absence. The contingency for wildlife structures is to replace or repair missing or damaged structures. If habitat structures become vandalized, are missing, or are functionally damaged, they will be repaired or replaced as necessary.

7.6 Site Management

WSDOT (or their designated representatives) will manage the site annually for the first 10 years. Site management activities shall include noxious weed control and may include mulching, fertilizing, supplemental watering, maintaining access, repairing damage from vandals, correcting erosion or sedimentation problems, or litter pickup. During the first year, supplemental watering of buffers and seasonally saturated wetland areas will occur during July, August, and September to assure, at a minimum, the equivalent of normal rainfall levels and no periods of drought (no rainfall or watering) longer than three weeks.

Reed canarygrass dominates the watershed and suppression/control of this invasive plant will require careful site preparation and active site management. While complete elimination of reed canarygrass from the mitigation site may not be possible, it should be managed sufficiently to ensure survival of the native planted species until they can effectively compete.

If Japanese knotweed is found at the mitigation site during monitoring, WSDOT (or their designated representatives) will promptly remove the stems above ground and chemically treat it to facilitate elimination of roots and rhizomes below ground.

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Appendix A—Wetland Impact Summaries

The impacts to wetlands and associated functions that would result from the proposed project are summarized in the sheets that follow. Please refer to Figure 2, Plates 1-6 for wetland locations and impact areas.

Table A-1. Wetland FC Park Impact Summary.

Wetland Impacts Summary Sheet North of SR 520, just south of NE 32nd Street in Fairweather Nature Preserve		
	Local Jurisdiction	Medina
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction **Rating**	IV
	Local Jurisdiction Buffer Width	35 feet
	Wetland Size	0.19 acre
	Cowardin Classification	PSS
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	8 8 12 **28**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0 acres (0% of Wetland FC Park) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Dominant species in this scrub-shrub wetland include western redcedar (*Thuja plicata*), Pacific ninebark (*Physocarpus capitatus*), twinberry honeysuckle (*Lonicera involucrata*), rose spirea (*Spiraea douglasii*), and creeping buttercup (*Ranunculus repens*).	
Soils Series Impacted	No soil samples were taken due to limited access.	
Hydrology Impacted	Wetland FC Park is supported by groundwater.	
Wetland Functions Impact Summary		
Water Quality	The Medina to SR 202: Eastside Transit and HOV Project will have no impact on water quality functions.	
Hydrologic	The project will have no impact on hydrologic functions.	
Habitat	The project will have no impact on habitat functions.	

Table A-2. Wetland FCN-3 Impact Summary.

Wetland Impacts Summary Sheet North of SR 520, adjacent to the bicycle/pedestrian path and near the end of 80th Avenue NE.		
	Local Jurisdiction	Medina
	WRIA	8
	Ecology Rating (Hruby, 2004)	IV
	Local Jurisdiction **Rating**	IV
	Ecology **Buffer Width**	50 feet
	Wetland Size	0.027 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	1 0 9 **10**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.03 acres (100% of Wetland FCN-3) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Emergent wetland dominated by assorted grasses including bentgrasses (*Agrostis* sp.) and creeping buttercup. It is regularly mowed.	
Soils Series Impacted	Gravelly loam, very dark grayish brown (10YR 3/2), with redoximorphic concentrations over clay loam (2.5Y 5/1) with redoximorphic concentrations.	
Hydrology Impacted	Groundwater seepage.	

Wetland Functions Impact Summary	
Water Quality	FCN-3 has low potential to improve water quality because most of the herbaceous vegetation is mowed, and there no opportunity to improve water quality Filling Wetland FCN-3 will result in a loss of this (low) water quality improvement potential.
Hydrologic	Wetland FCN-3 has There is no potential or opportunity to reduce flooding or erosion. This function would not be affected.
Habitat	FCN-3 has a low potential, and moderate opportunity for habitat due to the limited habitat diversity. All habitat function will be lost for FCN-3.

Table A-3. Wetland FCS-1 Impact Summary.

Wetland Impacts Summary Sheet In the right-of-way south of SR 520 and just east of the pedestrian walkway over SR 520.		
	Local Jurisdiction	Medina/Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction **Rating**	IV/NA
	Local/Ecology **Buffer Width**	35/50 feet
	Wetland Size	0.04 acre
	Cowardin Classification	PEM
	HGM Classification	Depressional Outflow
	Wetland Rating System Pts.	
	Water Quality Score	14
	Hydrologic Score	5
	Habitat Score	7
	Total Score	**26**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.04 acres (100% of Wetland FCS-1)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Vegetation in FCS-1 is dominated by creeping buttercup, reed canarygrass, and bentgrasses.	
Soils Series Impacted	Loam, very dark grayish brown (10YR 3/2), with redoximorphic concentrations over silt loam (2.5YR 6/2) with redoximorphic concentrations.	
Hydrology Impacted	The wetland receives storm water runoff from SR 520.	

Wetland Functions Impact Summary	
Water Quality	FCS-1 has persistent ungrazed vegetation and a moderate potential to improve water quality. It also has the opportunity to improve water quality due to its location. This water quality potential and opportunity will be lost when the wetland is filled.
Hydrologic	The wetland has low potential to minimize flooding and erosion, but no opportunity. Hydrologic potential for FCS-1 will also be lost.
Habitat	The wetland has low habitat value (both opportunity and potential); however, it is connected to an upland forest area. Both habitat area and connectivity to the upland forest habitat will be lost.

Table A-4. Wetland FCS-2 Impact Summary.

Wetland Impacts Summary Sheet In the right-of-way south of SR 520 and along the off-ramp to 84th Avenue NE.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction **Rating**	NA
	Ecology Buffer Width	50 feet
	Wetland Size	0.15 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	2
	Habitat Score	8
	Total Score	**26**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.15 acres (100% of Wetland FCS-2)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Emergent wetland dominated by reed canarygrass, bentgrasses, and field horsetail (*Equisetum arvense*), with some panicled bulrush (also called small-fruited bulrush, *Scirpus microcarpus*).	
Soils Series Impacted	Gravelly loam, dark grayish brown (10YR 4/2), with redoximorphic concentrations over clay loam (2.5YR 6/2) with redoximorphic concentrations.	
Hydrology Impacted	Hydrology was assumed based on soils and best professional judgment.	
Wetland Functions Impact Summary		
Water Quality	FCS-2 has the opportunity to improve water quality because it is adjacent to SR 520 and has moderate potential because it has dense, ungrazed vegetation over most of its area. Water quality functions provided by this wetland would be lost when this area is filled and wetland vegetation is removed.	
Hydrologic	The wetland likely receives floodwater from Fairweather Creek but vegetation is not rigid; therefore, it has low opportunity to improve hydrologic conditions but does not have the potential. Opportunity to provide hydrologic function would be lost when this wetland is filled.	
Habitat	The wetland has some connectivity to upland forest, but low habitat potential and opportunity. All habitat functions would be lost in this area.	

Table A-5. Wetland FCS-3A Impact Summary.

Wetland Impacts Summary Sheet The FCS-3 wetlands are between SR 520 and the eastbound off-ramp to 84th Avenue NE.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction **Rating**	NA
	Ecology Buffer Width	50 feet
	Wetland Size	0.01 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	0 0 6 **6**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.01 acres (100% of Wetland FCS-3A) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Emergent wetland dominated by bentgrass and common rush (*Juncus effusus*).	
Soils Series Impacted	Clay loam, black (10YR 2/1) over loamy sand, very dark grayish brown (2.5Y 3/2) with redoximorphic concentrations.	
Hydrology Impacted	Groundwater seepage, may be the result of the SR 520 roadcut.	

Wetland Functions Impact Summary	
Water Quality	FCS-3A has the opportunity to improve water quality because it is located between SR 520 and the off-ramp to 84th Avenue NE, but no potential due to the slope. As a result, no performance of this function will be lost.
Hydrologic	This wetland does not have the potential or opportunity to reduce flooding or erosion due to its size and location in the landscape. As a result, no performance of this function will be lost.
Habitat	All of the FCS-3 (A to E) wetlands provide low habitat functions. Habitat functions provided by this wetland will be lost.

Table A-6. Wetland FCS-3B Impact Summary.

Wetland Impacts Summary Sheet The FCS-3 wetlands are between SR 520 and the eastbound off-ramp to 84th Avenue NE.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction **Rating**	NA
	Ecology Buffer Width	50 feet
	Wetland Size	0.04 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	4
	Hydrologic Score	0
	Habitat Score	7
	Total Score	**11**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.04 acres (100% of Wetland FCS-3B)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Predominantly bentgrass and common rush.	
Soils Series Impacted	Clay loam, black (10YR 2/1) over loamy sand, very dark grayish brown (2.5Y 3/2) with redoximorphic concentrations.	
Hydrology Impacted	Groundwater seep may be the result of the SR 520 roadcut.	

Wetland Functions Impact Summary	
Water Quality	Wetland FCS-3B has a low potential to improve water quality because it is on a slope. It has the opportunity to improve water quality because it is located between SR 520 and the off-ramp to 84th Avenue NE. The potential to provide this function will be lost.
Hydrologic	These wetlands do not have the potential or opportunity to reduce flooding or erosion due to their size and location in the landscape. As a result, this function would not be reduced.
Habitat	All of the FCS-3 (A to E) wetlands provide low habitat functions. Habitat functions provided by this wetland will be lost.

Table A-7. Wetland FCS-3C Impact Summary.

Wetland Impacts Summary Sheet The FCS-3 wetlands are between SR 520 and the eastbound off-ramp to 84th Avenue NE.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction **Rating**	NA
	Ecology Buffer Width	50 feet
	Wetland Size	0.01 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	0
	Hydrologic Score	2
	Habitat Score	7
	Total Score	**9**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.01 acres (100% of Wetland FCS-3C)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Emergent wetland dominated by bentgrasses.	
Soils Series Impacted	Silt loam, very dark brown (10YR 2/2), over loamy sand olive gray (5Y 4/2) with redoximorphic concentrations, over greenish gray (10BG 5/1) with redoxymorphic concentrations.	
Hydrology Impacted	Groundwater seepage, may be the result of the SR 520 roadcut.	

Wetland Functions Impact Summary	
Water Quality	FCS-3C does not have the potential to improve water quality because it is too steep and vegetation is mowed. It has the opportunity to improve water quality because it is located between SR 520 and the off-ramp to 84th Avenue NE.
Hydrologic	FCS-3C has a low potential to reduce flooding or erosion because it has small surface depressions that can retain water. It does not have the opportunity to reduce flooding or erosion due to its size and location in the landscape. Filling of the wetland with its small depressions would result in a loss of potential to perform hydrologic function.
Habitat	FCS-3C has low habitat function. Habitat functions provided by this wetland will be lost.

Table A-8. Wetland FCS-3D Impact Summary.

Wetland Impacts Summary Sheet The FCS-3 wetlands are between SR 520 and the eastbound off-ramp to 84th Avenue NE.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction **Rating**	NA
	Ecology Buffer Width	50 feet
	Wetland Size	0.04 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	0
	Hydrologic Score	0
	Habitat Score	6
	Total Score	**6**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.04 acres (100% of Wetland FCS-3D)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Bentgrasses	
Soils Series Impacted	Silt loam, very dark brown (10YR 2/2), over loamy sand olive gray (5Y 4/2) with redoximorphic concentrations, over greenish gray (10BG 5/1) with redoxymorphic concentrations.	
Hydrology Impacted	Groundwater seepage, may be the result of the SR 520 roadcut.	

Wetland Functions Impact Summary	
Water Quality	FCS-3D does not have the potential to improve water quality because it does not have sufficiently dense vegetation and it is too steep. It has the opportunity to improve water quality because it is located between SR 520 and the off-ramp to 84th Avenue NE. Opportunity to provide water quality improvements would be lost.
Hydrologic	These wetlands do not have the potential or opportunity to reduce flooding or erosion due to their size and location in the landscape. As a result, this function would not be affected.
Habitat	FCS-3D provides low habitat functions. Habitat functions provided by this wetland will be lost.

Table A-9. Wetland FCS-3E Impact Summary.

Wetland Impacts Summary Sheet The FCS-3 wetlands are between SR 520 and the eastbound off-ramp to 84th Avenue NE.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction **Rating**	NA
	Ecology Buffer Width	50 feet
	Wetland Size	0.02 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	2
	Hydrologic Score	0
	Habitat Score	6
	Total Score	**8**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.02 acres (100% of Wetland FCS-3E)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Emergent wetland dominated by bentgrasses.	
Soils Series Impacted	Silt loam, very dark brown (10YR 2/2), over loamy sand olive gray (5Y 4/2) with redoximorphic concentrations, over greenish gray (10BG 5/1) with redoxymorphic concentrations.	
Hydrology Impacted	Groundwater seepage, may be the result of the SR 520 roadcut.	

Wetland Functions Impact Summary	
Water Quality	FCS-3E has a low potential to improve water quality because the slope is relatively flat and vegetation is mowed. It has the opportunity to improve water quality because it is located between SR 520 and the off-ramp to 84th Avenue NE. Both potential and opportunity to provide this function would be lost.
Hydrologic	These wetlands do not have the potential or opportunity to reduce flooding or erosion due to their size and location in the landscape, so the project would not result in a direct loss of this function.
Habitat	FCS-E provides low habitat functions. These habitat functions will be lost when FCS-3E is filled.

Table A-10. Wetland CCN-1 Impact Summary.

Wetland Impacts Summary Sheet On the north side of SR 520, at the southeast edge of Wetherill Park		
	Local Jurisdiction	Hunts Point/Yarrow Point
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction **Rating**	Sensitive Area/III
	Ecology Buffer Width	80 feet
	Wetland Size	8.4 acres
	Cowardin Classification	PFO, PSS, PEM, L2AB
	HGM Classification	Lake-Fringe, Depressional Outflow
	Wetland Rating System Pts.	
	Water Quality Score	14
	Hydrologic Score	10
	Habitat Score	23
	Total Score	**47**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0 acres (0% of Wetland CCN-1) 0
Buffer Impacts	Permanent Temporary	0.47 0.02
Dominant Vegetation Impacted	Dominant species include Oregon ash, Pacific willow (*Salix lucida lasiandra*), and black cottonwood in PFO areas. Scrub-shrub and emergent components contain creeping buttercup, bentgrasses, Himalayan blackberry, and purple loosestrife (*Lythrum salicaria*).	
Soils Series Impacted	Loam, very dark grayish brown (10YR 3/2), with redoximorphic concentrations over clay loam gray (10YR 5/1).	
Hydrology Impacted	Wetland receives runoff from developed area to the west and SR 520, as well as Lake Washington.	

Wetland Functions Impact Summary	
Water Quality	There is no direct loss of water quality function. Loss of buffer could affect the quality of water entering CCN-1, however stormwater from SR 520 will be treated and will no longer enter CCN-1 directly. As a result, water quality functions are not expected to be significantly degraded.
Hydrologic	No loss of hydrologic function is expected.
Habitat	Loss of wetland buffer may slightly reduce desirability of habitat through loss of structure and decreased screening from light and noise in the narrow area nearest SR 520.

Table A-11. Wetland CCN-2 Impact Summary.

Wetland Impacts Summary Sheet North of SR 520 and south of the bicycle/pedestrian path, west of Cozy Cove Creek.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction **Rating**	NA
	Buffer Width	80 feet
	Wetland Size	0.25 acre
	Cowardin Classification	PEM
	HGM Classification	Depressional Closed
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	16
	Habitat Score	7
	Total Score	**39**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.25 acres (100% of Wetland CCN-2)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Bentgrasses, with smaller quantities of Oregon ash, Himalayan blackberry, and common rush.	
Soils Series Impacted	Loam, very dark grayish brown (10YR 3/2), with redoximorphic concentrations over gravelly clay loam gray (10Y 5/1) with redoximorphic concentrations.	
Hydrology Impacted	Receives water from runoff from SR 520.	

Wetland Functions Impact Summary	
Water Quality	CCN-2 has moderate potential to improve water quality and opportunity to provide this function. Water quality improvement functions provided by Wetland CCN-2 will be lost.
Hydrologic	The wetland has moderate potential and opportunity to reduce flooding and erosion due to its location. This potential hydrologic function will be lost.
Habitat	The wetland has low potential and opportunity for habitat, although it is connected to other wetlands and habitats. Habitat area in Wetland CCN-2 and connection to other habitats along Cozy Cove Creek will be lost.

Table A-12. Wetland CCN-2A Impact Summary.

Wetland Impacts Summary Sheet North of SR 520 and the bicycle/pedestrian path, on the opposite side of the path of CCN-2.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction **Rating**	NA
	Buffer Width	80 feet
	Wetland Size	0.02 acre
	Cowardin Classification	PFO
	HGM Classification	Depressional Closed, Slope
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	10
	Habitat Score	7
	Total Score	**33**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.02 acres (100% of Wetland CCN-2A)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Forested wetland dominated by Oregon ash, Himalayan blackberry, reed canarygrass, bentgrasses, giant horsetail (*Equisetum telmateia*), and common rush.	
Soils Series Impacted	Loam, dark grayish brown (10YR 4/2), with redoximorphic concentrations over gravelly sandy loam, dark grayish brown (2.5Y 4/2), with redoximorphic concentrations.	
Hydrology Impacted	Storage of runoff from SR 520 and bicycle/pedestrian path	
Wetland Functions Impact Summary		
Water Quality	CCN-2A has moderate potential and opportunity to improve water quality. This water quality function will be lost when Wetland CCN2A is filled.	
Hydrologic	CCN-2A has moderate potential to reduce flooding and erosion and opportunity due to its location. This hydrologic function would be lost.	
Habitat	CCN-2A has low potential and opportunity for habitat, but does have connections to other wetlands and habitats. Habitat area in Wetland CCN-2A and connectivity to Cozy Cove Creek will be lost.	

Table A-13. Wetland CCS-1 Impact Summary.

Wetland Impacts Summary Sheet In right-of-way south of SR 520 and southwest of Cozy Cove Creek.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	NA
	Ecology **Buffer Width**	50 feet
	Wetland Size	0.48 acre
	Cowardin Classification	PSS, PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	8
	Hydrologic Score	6
	Habitat Score	13
	Total Score	**27**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.48 acres (100% of Wetland CCS-1)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Wetland is scrub-shrub on the southern edge and is dominated by red-osier dogwood (*Cornus sericea*) and Himalayan blackberry. The emergent component is dominated by reed canarygrass, field horsetail, and fringed willowherb (*Epilobium ciliatum*).	
Soils Series Impacted	Loam, very dark grayish brown (10YR 3/2), over loam dark grayish brown (10YR 4/2).	
Hydrology Impacted	Groundwater seepage from the slope.	

Wetland Functions Impact Summary	
Water Quality	CCS-1 has low potential to improve water quality because it has dense woody vegetation for half of its area and minimal slope. Opportunity is also present. This water quality function would be lost.
Hydrologic	CCS-1 has low potential to reduce flooding and erosion due to its slope morphology, however small surface depressions provide some potential storage for nearby Cozy Cove Creek. This water storage component would be lost when Wetland CCS-1 is filled.
Habitat	CCS-1 has low potential for habitat even though it has two vegetation classes and three hydroperiods. Its opportunity to provide habitat is moderate due to its habitat features and connection to other wetlands. Habitat functions in Wetland CCS-1 and connectivity to Cozy Cove Creek would be lost when the wetland is filled.

Table A-14. Wetland CCS-2 Impact Summary.

Wetland Impacts Summary Sheet In right-of-way south of SR 520 and east of the 84th Avenue NE overpass.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	NA
	Ecology **Buffer Width**	50 feet
	Wetland Size	0.07 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	10
	Hydrologic Score	0
	Habitat Score	6
	Total Score	**16**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0 (0% of Wetland CCS-2)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Vegetation is dominated by bentgrasses, tall fescue (*Festuca arundinacea*), and giant horsetail.	
Soils Series Impacted	Loam, black (10 YR 2/1), over sandy loam dark gray (10YR 4/1) with redoxymorphic concentrations.	
Hydrology Impacted	Storage of runoff from SR 520 and Wetland CCS-1.	

Wetland Functions Impact Summary	
Water Quality	CCS-2 has low potential to improve water quality because it has dense, uncut herbaceous vegetation over half of its area and minimal slope. It has the opportunity to improve water quality because untreated storm water is discharged to the wetland. The limited performance of this function would be lost when Wetland CCS-2 is filled.
Hydrologic	CCS-2 does not have the potential or opportunity to reduce flooding or stream erosion because the vegetation is mowed and it does not drain to a river or stream that has flooding problems. No performance of this function would be lost.
Habitat	CCS-2 provides has two hydroperiods present and provides minimal habitat. It is connected to other habitats, but the connections are disturbed. Emergent habitat in Wetland CCS-2 would be lost as would potential connections to other nearby habitats.

Table A-15. Wetland CCS-3 Impact Summary.

Wetland Impacts Summary Sheet In right-of-way south of SR 520 and east of the 84th Avenue NE overpass. It is just southeast of Wetland CCS-2.		
	Local Jurisdiction	Hunts Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	NA
	Ecology **Buffer Width**	50 feet
	Wetland Size	0.01 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	14 0 7 **21**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.01 acres (10% of Wetland CCS-3) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Himalayan blackberry, bentgrasses, creeping buttercup, and common rush.	
Soils Series Impacted	Loam with gravel, dark gray (2.5 Y 4/1), over gravelly loam dark gray (2.5Y 4/1) with redoximorphic concentrations.	
Hydrology Impacted	Storage of runoff from residential area and possibly groundwater component.	
Wetland Functions Impact Summary		
Water Quality	Wetland CCS-3 has a moderate potential and the opportunity to improve water quality because there is herbaceous vegetation over most of the wetland and it is close to SR 520. This potential for water quality improvement will be lost.	
Hydrologic	This wetland has no potential or opportunity to reduce flooding or erosion, so this function would not be affected.	
Habitat	There are few habitat features in this wetland. It is connected to other wetlands although the connections are disturbed. Habitat area in the affected portion of Wetland CCS-3.	

Table A-16. Wetland CCS-4 Impact Summary.

Wetland Impacts Summary Sheet In the right-of-way east of SR 520 and west of NE 32nd Street, where 32nd Street parallels SR 520.		
	Local Jurisdiction	Yarrow Point
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Ecology **Buffer Width**	50 feet
	Wetland Size	0.1 acre
	Cowardin Classification	PSS
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	6 6 5 **17**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.01 acres (10% of Wetland CCS-4) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Dominated by Himalayan blackberry, but common ladyfern (*Athyrium felix-femina*) and common velvet grass (*Holcus lanatus*) are also present.	
Soils Series Impacted	Loam, very dark grayish brown (10YR 3/2), with redoximorphic concentrations over gravelly loam (2.5Y 5/3).	
Hydrology Impacted	Groundwater seep is the source of water for the wetland.	

Wetland Functions Impact Summary	
Water Quality	CCS-4 has low potential to improve water quality although it has dense vegetation that could trap sediments, and it has the opportunity due to its location in the landscape. Performance of water quality function in the affected portion of Wetland CCS-4 would be lost.
Hydrologic	CCS-4 has moderate potential to improve water quality because it has dense uncut rigid vegetation, but it does not have the opportunity. Potential for this function in the affected portion of CCS-4 would be lost.
Habitat	CCS-4 has low opportunity and no potential to provide habitat due to its location in the landscape and lack of connection to other habitats. Habitat area in the affected portion of Wetland CCS-4.

Table A-17. Wetland CCS-5 Impact Summary.

Wetland Impacts Summary Sheet In the right-of-way southeast of SR 520 and east of Cozy Cove Creek and 86th Avenue NE.		
	Local Jurisdiction	Clyde Hill
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	NA
	Ecology **Buffer Width**	80 feet
	Wetland Size	0.090 acre
	Cowardin Classification	PFO, PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	6
	Habitat Score	12
	Total Score	**34**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.090 acres (100% of Wetland CCS-5)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Himalayan blackberry, Pacific willow, red alder, common ladyfern, reed canarygrass, and giant horsetail.	
Soils Series Impacted	Loam, very dark gray (10YR 3/1), over sandy loam very dark grayish brown (10YR 3/2) with redoximorphic concentrations.	
Hydrology Impacted	A high groundwater table is the source of water.	

Wetland Functions Impact Summary	
Water Quality	Wetland CCS-5 has a moderate potential and the opportunity to improve water quality. It has dense, ungrazed herbaceous vegetation over most of its area and is relatively flat. Performance of this function would be lost when Wetland CCS-5 is filled.
Hydrologic	CCS-5 has the opportunity but low potential to reduce flooding and erosion. Opportunity and potential to provide this function would be lost.
Habitat	The wetland provides low potential for habitat but moderate opportunity for habitat. Its primary feature is that it is an urban natural open space and is connected with other habitats, although those connections are disturbed. Wetland habitat in Wetland CCS-5 and connectivity to nearby habitats would be lost.

Table A-18. Wetland YBN-1 Impact Summary.

Wetland Impacts Summary Sheet North of SR 520 and Points Drive NE and west of Lake Washington Boulevard.		
	Local Jurisdiction	Kirkland
	WRIA	8
	Ecology Rating (Hruby 2004)	I
	Local Jurisdiction Rating	1
	Local Jurisdiction Buffer Width	100 feet
	Wetland Size	75.81 acres
	Cowardin Classification	PFO, PSS, PEM, L2AB
	HGM Classification	Lake-Fringe, Riverine, Depressional Outflow
	Wetland Rating System Pts.	
	Water Quality Score	28
	Hydrologic Score	16
	Habitat Score	28
	Total Score	**72**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.01 acres (0.01 % of Wetland YBN-1) 0.10
Buffer Impacts	Permanent Temporary	0.14 0.19
Dominant Vegetation Impacted	Wetland YBN-1 is dominated primarily by forested and emergent vegetation. There is a small amount of scrub-shrub and aquatic bed vegetation. Red alder, black cottonwood, paper birch (*Betula papyrifera*), Himalayan blackberry, salmonberry (*Rubus spectabilis*), reed canarygrass, Japanese knotweed (*Polygonum cuspidatum*), spotted ladysthumb, fringed willowherb, and field horsetail. Also, mannagrass (*Glyceria* spp.), American skunk cabbage (*Lysichiton americanus*), water-cress (*Nasturtium officinale*), waterparsley (*Oenanthe sarmentosa*), and American white waterlily (*Nymphaea odorata*) are present.	
Soils Series Impacted	The wetland had a range of soil characteristics such as very dark grayish brown (10YR 3/2), silt loam, over very dark gray (10YR 3/1), silt loam. Other soil textures and colors are also found throughout the wetland.	
Hydrology Impacted	The primary source of water is Yarrow Creek; the wetland also receives water from culverts that convey runoff from the south and east. Lake Washington also provides water, although it is not the main source. Water from the wetland flows into Lake Washington.	
Wetland Functions Impact Summary		
Water Quality	The proposed permanent and temporary impacts of the project will result in permanent and temporary loss of vegetation the assists in water quality functions. BMPs will be used to minimize the temporary effects, and water treatment associate with the project will minimize permanent impacts.	
Hydrologic	Permanent and temporary impacts are not expected to significantly affect hydrologic function.	
Habitat	Permanent impacts will result in the loss of a small area of habitat. Temporary clearing may result in a change in habitat type while plantings mature.	

Table A-19. Wetland YBN-1A Impact Summary.

Wetland Impacts Summary Sheet YBN-1A is located along the riparian corridor of Cochran Springs Creek, which is culverted under Lake Washington Boulevard north of SR 520 and Points Drive NE.		
	Local Jurisdiction	Kirkland
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	3
	Local Jurisdiction Buffer Width	50 feet
	Wetland Size	0.08 acre
	Cowardin Classification	PFO, PSS
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	16 13 11 **40**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0 acres (0% of Wetland YBN-1A) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	This forested scrub-shrub wetland is dominated by Himalayan blackberry, Pacific willow, and giant horsetail.	
Soils Series Impacted	Silt loam, black (10YR 2/1), over sandy loam very dark greenish gray (10Y 3/1).	
Hydrology Impacted	Cochran Springs Creek flows through the wetland and provides water to the wetland by overbank flow.	
Wetland Functions Impact Summary		
Water Quality	No impacts to water quality functions for YBN-1A.	
Hydrologic	No impacts to flood storage or erosion control potential in YBN-1A.	
Habitat	No impacts to habitat function in Wetland YBN-1A.	

Table A-20. Wetland YBN-1B Impact Summary.

Wetland Impacts Summary Sheet North of SR 520 and Points Drive NE, just south of the West Tributary to Yarrow Creek and west of 101st Way NE, which is the entrance to a condominium complex.		
	Local Jurisdiction	Kirkland
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	3
	Local Jurisdiction Buffer Width	50 feet
	Wetland Size	0.04 acre
	Cowardin Classification	PFO
	HGM Classification	Depressional Outflow
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	14 10 7 **31**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0 acres (0% of Wetland YBN-1B) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	This forested wetland is dominated by Pacific willow and bentgrasses.	
Soils Series Impacted	Duff over gravelly silt loam, very dark gray (2.5Y 3/1), over sand dark greenish gray (10Y 4/1) over silt loam black (10YR 2/1).	
Hydrology Impacted	YBN-1B is fed by a high groundwater table and precipitation.	
Wetland Functions Impact Summary		
Water Quality	No impacts to water quality functions for YBN-1B.	
Hydrologic	No impacts to flood storage or erosion control potential in YBN-1B.	
Habitat	No impacts to habitat function in Wetland YBN-1B.	

Table A-21. Wetland YBN-2 Impact Summary.

Wetland Impacts Summary Sheet Between the on-ramp to SR 520 from Lake Washington Boulevard and Points Drive NE.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Local Jurisdiction Buffer Width	None (under 2,500 sq ft)
	Wetland Size	0.01 acre
	Cowardin Classification	PSS
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	8 6 6 **20**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.01 acres (100% of Wetland YBN-2) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Red alder, red-osier dogwood, salmonberry, cutleaf blackberry, Indian plum, Himalayan blackberry, and field horsetail.	
Soils Series Impacted	Gravelly loam, very dark grayish brown (10YR 3/2), over loam grayish brown (2.5Y 5/2), and dark grayish brown (2.5Y 4/2) over loam greenish gray (10Y 5/1).	
Hydrology Impacted	Runoff flow reduction.	
Wetland Functions Impact Summary		
Water Quality	YBN-2 has low potential to improve water quality, although it has some dense woody vegetation and is flat. It has the opportunity to improve water quality because it is located between an on-ramp to SR 520 and Points Drive NE. Both opportunity and potential to provide water quality improvement would be lost.	
Hydrologic	YBN-2 has moderate potential to reduce flooding and erosion because it has dense uncut woody vegetation over most of its area. However, it does not have the opportunity to reduce flooding and erosion. All potential for this function would be lost.	
Habitat	YBN-2 has low potential and opportunity to provide habitat. Habitat area in this wetland would be lost.	

Table A-22. Wetland YBS-1 Impact Summary.

Wetland Impacts Summary Sheet South of SR 520 and west of the West Tributary to Yarrow Creek.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	III
	Local Jurisdiction Buffer Width	60 feet
	Wetland Size	1.86 acres + (wetland extends outside of the study area)
	Cowardin Classification	PFO, PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	14
	Hydrologic Score	2
	Habitat Score	15
	Total Score	**31**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	1.14 acres (61.3% of Wetland YBS-1)
	Temporary	0.07
Buffer Impacts	Permanent	0.30
	Temporary	0.18
Dominant Vegetation Impacted	Reed canarygrass in emergent area; Sitka willow (*Salix sitchensis*) in the forested area.	
Soils Series Impacted	Loam, very dark grayish brown (10YR 3/2), over loam dark grayish brown (2.5Y 4/2) with redoximorphic concentrations.	
Hydrology Impacted	Groundwater seeps.	
Wetland Functions Impact Summary		
Water Quality	YBS-1 has moderate potential and the opportunity to improve water quality because it has dense, ungrazed herbaceous vegetation over most of its area and it is located close to urban and residential areas. Much of the water quality function in this wetland would be lost.	
Hydrologic	YBS-1 has low potential to reduce flooding and erosion, although it has surface depressions that can hold water. It has the opportunity to reduce flooding and erosion because it retains hillside seepage. The majority of Wetland YBS-1's capacity to attenuate flooding would be lost.	
Habitat	YBS-1 has low potential and moderate opportunity to provide habitat because it is large, has two hydroperiods, has a forested Cowardin class, and has some special habitat features. Most habitat function in this wetland would be lost.	

Table A-23. Wetland YBS-2A Impact Summary.

Wetland Impacts Summary Sheet South of SR 520 and north of NE 35th Street. East of the West Tributary to Yarrow Creek and Wetland YBS-1.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	III
	Local Jurisdiction Buffer Width	60 feet
	Wetland Size	0.11 acre
	Cowardin Classification	PEM
	HGM Classification	Depressional Closed
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	20 10 11 **41**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.11 acres (100% of Wetland YBS-2A) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Red alder, reed canarygrass, red elderberry, and giant horsetail.	
Soils Series Impacted	Loam, very dark grayish brown (10YR 3/2), over loam dark grayish brown (2.5Y 4/2) over loam light olive gray (5Y 6/2) with redoximorphic concentrations.	
Hydrology Impacted	Runoff from SR 520 and a residential area, possibly groundwater.	
Wetland Functions Impact Summary		
Water Quality	YBS-2A has moderate potential to improve water quality because it has no outlet, has persistent ungrazed vegetation throughout, and has some seasonal ponding. It has the opportunity to improve water quality because it is within 150 feet of SR 520 and residential areas. Both potential and opportunity for water quality improvement would be lost when Wetland YBS-2A is filled.	
Hydrologic	YBS-2A has moderate potential to reduce flooding and erosion because it does not have an outlet and the area of the basin is less than 10 times the area of the wetland. It does not have the opportunity to reduce flooding or erosion. All flood storage potential in YBS-2A would be lost.	
Habitat	The primary habitat feature is that it is connected to at least three other wetlands and the connections between them are relatively undisturbed. YBS-2A has a low potential and moderate opportunity to provide habitat. The habitat area in YBS-2a and connection to nearby habitats and East Tributary to Yarrow Bay would be lost.	

Table A-24. Wetland YBS-2B Impact Summary.

Wetland Impacts Summary Sheet South of SR 520 and west of the West Tributary to Yarrow Creek and Wetland YBS-1.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Local **Buffer Width**	0 feet[a]
	Wetland Size	0.01 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	4
	Hydrologic Score	2
	Habitat Score	11
	Total Score	**17**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.01 acres (100% of Wetland YBS2B)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Emergent wetland is dominated by common ladyfern, giant horsetail, and bigleaf maple.	
Soils Series Impacted	Clay loam, yellowish brown (10YR 5/6), with redoximorphic concentrations over clay loam gray (5Y 5/1) with redoximorphic concentrations.	
Hydrology Impacted	Runoff and possibly groundwater.	

Wetland Functions Impact Summary	
Water Quality	Wetland YBS-2B has dense woody vegetation over half of its area but it has low potential to improve water quality. It has the opportunity to improve water quality because it is near residential and urban areas. Opportunity and dense woody vegetation would be lost in this wetland.
Hydrologic	Wetland YBS-2B has surface depressions that can retain water but a low potential to reduce flooding and erosion. It does not have the opportunity to reduce flooding and erosion because of its location in the landscape. Limited hydrologic function present in this wetland would be lost.
Habitat	The wetland has some habitat value because there are at least three wetlands within a half mile and the connections are relatively undisturbed. It has low potential and moderate opportunity to provide habitat. Habitat area and connectivity provided by Wetland YBS-2B would be lost.

Table A-25. Wetland YBS-2C Impact Summary.

Wetland Impacts Summary Sheet South of SR 520 and north of NE 35th Street. West of the West Tributary to Yarrow Creek and Wetland YBS-1.		
	Local Jurisdiction	Bellevue/Clyde Hill
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	III/NA
	Local Jurisdiction Buffer Width	60/80 feet
	Wetland Size	0.07 acre
	Cowardin Classification	PSS
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	16 22 10 **48**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.07 acre (100% of Wetland YBS-2C) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Salmonberry, climbing nightshade (*Solanum dulcamara*), and common ladyfern.	
Soils Series Impacted	Silt loam black (10YR 2/1).	
Hydrology Impacted	Small stream, runoff and groundwater.	
Wetland Functions Impact Summary		
Water Quality	Wetland YBS-2C has moderate potential to improve water quality because it has ungrazed herbaceous plants and depressions that can trap sediment during a flood event. It has the opportunity to improve water quality because it is near residential and urban areas. All water quality function associated with Wetland YBS-2C would be lost.	
Hydrologic	YBS-2C has moderate potential to reduce flooding and erosion because it has herbaceous plants for more than two-thirds of its area, and it is wide relative to the size of the stream running through it. It has the opportunity to reduce flooding and erosion because there are structures downstream that could be damaged by flooding. Hydrologic functions associated with Wetland YBS-2C would be lost.	
Habitat	YBS-2C has low potential and a moderate opportunity to provide habitat because it is adjacent to a stream and within a half mile of other wetlands, although the connections are disturbed. Habitat area in YBS-2C and habitat connectivity to habitats along East Tributary to Yarrow Bay would be lost.	

Table A-26 . Wetland YBS-3 Impact Summary.

Wetland Impacts Summary Sheet In the right-of-way south of SR 520 and east of the on-ramp from 92nd Avenue NE.		
	Local Jurisdiction	Clyde Hill
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	NA
	Ecology **Buffer Width**	80 feet
	Wetland Size	2.06 acres
	Cowardin Classification	PFO, PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	2
	Habitat Score	13
	Total Score	**31**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	2.06 acres (100% of Wetland YBS-3)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Bentgrasses, red alder, field horsetail, and fringed willowherb.	
Soils Series Impacted	Silt loam, very dark grayish brown (10YR 3/2), over fine sandy loam dark grayish brown (2.5Y 4/2) with redoximorphic concentrations.	
Hydrology Impacted	High groundwater table.	

Wetland Functions Impact Summary	
Water Quality	YBS-3 has moderate potential to improve water quality because it has dense, ungrazed herbaceous vegetation over most of its area and is fairly flat. It has the opportunity to improve water quality because it is adjacent to SR 520 and downslope of a residential area. Performance of this function is limited by the slop HGM class if this wetland. Both potential and opportunity to provide water quality functions would be lost.
Hydrologic	YBS-3 has low potential and no opportunity to reduce flooding or erosion. It has some surface depressions that can retain water. Storage capacity for surface water would be lost.
Habitat	YBS-3 provides some habitat value because it has three hydroperiods and there are at least three wetlands within a half mile, although the connections are disturbed. It has low potential and moderate opportunity to provide habitat. Habitat area in YBS-3 and connectivity would be lost.

Table A-27. Wetland YCN-1 Impact Summary.

Wetland Impacts Summary Sheet East of Bellevue Way NE, south of Northup Way, and north of an on-ramp to SR 520.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	III
	Local Jurisdiction Buffer Width	60 feet
	Wetland Size	0.01 acre
	Cowardin Classification	PEM
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	16 18 7 **41**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.01 acres (100% of Wetland YCN-1) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Reed canarygrass and Himalayan blackberry.	
Soils Series Impacted	Silt loam, very dark gray (10YR 3/1), over silt loam very dark grayish brown (10YR 3/2) with redoximorphic concentrations.	
Hydrology Impacted	Yarrow Creek runs through the wetland.	

Wetland Functions Impact Summary	
Water Quality	YCN-1 has moderate potential to improve water quality because it has ungrazed herbaceous vegetation over most of its area and it has depressions that can trap sediment during a storm event. It has the opportunity to improve water quality because it is located between an on-ramp to SR 520, Bellevue Way NE, and Northup Way. Potential and opportunity to provide water quality improvement be lost when YCN-1 is filled.
Hydrologic	YCN-1 has moderate potential to reduce flooding and erosion because it has herbaceous plants for most of its area. It has the opportunity to reduce flooding and erosion because there are structures downstream that can be damaged by flooding. Much of the hydrologic function in YCN-1 would be lost.
Habitat	YCN-1 low potential and moderate opportunity to provide habitat. It has moderate opportunity because it is connected through disturbed connections to other wetlands and habitat types. Both potential and opportunity to provide habitat functions would be lost in the affected area.

Table A-28. Wetland YCN-2 Impact Summary.

Wetland Impacts Summary Sheet Wetland YCN-2 is located in the median of the westbound SR 520 on-ramp from Bellevue Way NE.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	III
	Local Jurisdiction Buffer Width	60 feet
	Wetland Size	0.13 acre
	Cowardin Classification	PEM
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	22
	Habitat Score	10
	Total Score	**48**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.13 acres (100% of Wetland YCN-2)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Reed canarygrass.	
Soils Series Impacted	Very silty loam, very dark grayish brown (10YR 3/2), over silt loam very dark gray (10YR 3/1) with redoximorphic concentrations.	
Hydrology Impacted	Overbank flow from Yarrow Creek.	

Wetland Functions Impact Summary	
Water Quality	YCN-2 has moderate potential to improve water quality because it has ungrazed herbaceous vegetation over most of its area. YCN-2 has the opportunity to improve water quality because it is located in the median of the SR 520 on-ramp from Bellevue Way NE. Both potential and opportunity to provide water quality functions would be lost in the affected portion of YCN-2. Remaining portions of the wetland would continue to provide this function.
Hydrologic	YCN-2 has moderate potential to reduce flooding and erosion because it has herbaceous plants over most of its area. It has the opportunity to reduce flooding and erosion because it is located upstream of structures that can be damaged by flooding. Some hydrologic functions will be lost, however the remaining portions of YCN-2 will continue to provide this function.
Habitat	Wetland YCN-2 has low potential and moderate opportunity to provide habitat. It is located near other wetlands, although the connections between them are disturbed. Some habitat area in YCN-2 would be lost.

Table A-29. Wetland YCN-3 Impact Summary.

Wetland Impacts Summary Sheet Immediately northeast of SR 520 off-ramp to 108th Avenue NE.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Local Jurisdiction Buffer Width	40 feet
	Wetland Size	0.11 acre
	Cowardin Classification	PEM
	HGM Classification	Depressional Outflow
	Wetland Rating System Pts.	
	Water Quality Score	12
	Hydrologic Score	6
	Habitat Score	8
	Total Score	**26**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.11 acres (100% of Wetland YCN-3)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Reed canarygrass, broadleaf cattail (*Typha latifolia*), and cutleaf blackberry (*Rubus laciniatus*).	
Soils Series Impacted	Silt loam, very dark brown (10YR 2/2), with redoximorphic concentrations and loamy sand dark greenish gray (10GY 4/1).	
Hydrology Impacted	Storage/retention for runoff from a roadside ditch, which is fed by SR 520.	

Wetland Functions Impact Summary	
Water Quality	Wetland YCN-3 has a moderate potential to improve water quality because herbaceous plants cover most of the wetland. It has the opportunity to improve water quality because untreated storm water discharges into the wetland. Water quality potential and opportunity would be lost.
Hydrologic	Wetland YCN-3 has a low potential to reduce flooding and erosion. It has the opportunity to reduce flooding and erosion because there are human structures downstream that could be damaged by flooding. Both opportunity and potential to provide hydrologic function would be lost.
Habitat	Wetland YCN-3 has low potential and opportunity to provide habitat; its main characteristics are that it has multiple hydroperiods and has disturbed conenctions to other habitats. Habitat functions associated with YCN-3 and some connection to nearby habitats would be lost when the wetland is filled.

Table A-30. Wetland YCN-3A Impact Summary.

Wetland Impacts Summary Sheet East of SR 520 and 108th Avenue NE and southwest of the SR 520 off-ramp to 108th Avenue NE.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	III
	Local Jurisdiction Buffer Width	60 feet
	Wetland Size	0.63 acre
	Cowardin Classification	PEM
	HGM Classification	Riverine, Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	16 18 13 **47**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.63 acres (100% of Wetland YCN-3A) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Reed canarygrass, mowed grasses, and Himalayan blackberry.	
Soils Series Impacted	Silt loam, very dark gray (10YR 3/1), with redoximorphic concentrations, occasional cobbles.	
Hydrology Impacted	Overbank storage for Yarrow Creek	

Wetland Functions Impact Summary	
Water Quality	Wetland YCN-3A has moderate potential because it has emergent cover over most of its area. Untreated storm water discharges into the wetland provide the opportunity to improve water quality. Loss of this vegetation would result in a loss of water quality function, however, runoff from SR 520 will be treated in this area before discharge.
Hydrologic	Wetland YCN-3A has moderate potential to reduce flooding and erosion because it has emergent plants for more than two-thirds of its area. It has the opportunity to reduce flooding and erosion because there are human structures and natural resources downstream that could be damaged by flooding. A portion of the hydrologic function would be lost in this wetland.
Habitat	Wetland YCN-3A has a low potential to provide habitat, although it has multiple hydroperiods. It has a moderate opportunity to provide habitat because it is connected to other habitats. Habitat area in this wetland would be lost.

Table A-31. Wetland YCN-3B Impact Summary.

Wetland Impacts Summary Sheet Northeast of SR 520, west of 108th Avenue NE, and south of on-ramp to SR 520.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	III
	Local Jurisdiction Buffer Width	60 feet
	Wetland Size	0.04 acre
	Cowardin Classification	PFO, PSS
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	18
	Habitat Score	14
	Total Score	**48**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.04 acres (100% of Wetland YCN-3B)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	The western portion of this wetland is forested and the eastern portion is scrub-shrub. It is dominated by reed canarygrass, red alder, rose spirea, black cottonwood, and grasses.	
Soils Series Impacted	Loamy sand gray (10YR 5/1) with redoximorphic concentrations.	
Hydrology Impacted	Overbank flow from Yarrow Creek.	

Wetland Functions Impact Summary	
Water Quality	Wetland YCN-3B has moderate potential to improve water quality because it has trees and shrubs for most of the wetland area. It has the opportunity to improve water quality because a culvert discharges into the area that drains developed areas. Both potential and opportunity for water quality functions would be lost in Wetland YCN-3B.
Hydrologic	Wetland YCN-3B has moderate potential to reduce flooding or erosion because it has trees and shrubs for most of its area. It has the opportunity to reduce flooding and erosion because there are human structures and natural resources downstream that could be damaged by flooding. All hydrologic function provided by Wetland YCN-3B would be lost.
Habitat	Wetland YCN-3B has moderate potential and opportunity to provide habitat because it contains special habitat features and it is connected to other habitats. Habitat functions associated with Wetland YCN-3B would be lost.

Table A-32. Wetland YCN-4A Impact Summary.

Wetland Impacts Summary Sheet Northeast of SR 520 and off-ramp to 108th Avenue NE. The South Fork of Yarrow Creek runs through Wetland YCN-4A.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	II
	Local Jurisdiction Rating	II
	Local Jurisdiction Buffer Width	75 feet
	Wetland Size	0.23 acre
	Cowardin Classification	PFO
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score	20
	Hydrologic Score	26
	Habitat Score	13
	Total Score	**59**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.01 acres (4.35% of Wetland YCN-4A) 0.01
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Salmonberry, black cottonwood, Himalayan blackberry, and red alder.	
Soils Series Impacted	Silt loam, dark gray (N 4/1), with redoximorphic concentrations and loamy sand with redoximorphic concentrations.	
Hydrology Impacted	Overbank flow from South Fork of Yarrow Creek	
Wetland Functions Impact Summary		
Water Quality	Wetland YCN-4A has moderate potential to improve water quality because it has trees and shrubs over most of its area. It has the opportunity to improve water quality because the stream linked to the wetland drains an area with raised levels of toxic compounds and nutrients. Some water quality functions (e.g. sediment retention and nutrient sequestration) will be affected by loss of vegetation.	
Hydrologic	Wetland YCN-4A has a high potential to reduce flooding or erosion because it provides overbank storage and has trees and shrubs for most of its area. It has the opportunity to reduce flooding and erosion because there are human structures and natural resources downstream that could be damaged by flooding. The project is expected to have limited effect on this function.	
Habitat	Wetland YCN-4A has a moderate potential to provide habitat because it has multiple hydroperiods, contains special habitat features, and is connected to other habitats. Opportunity is relatively low due to adjacent development. Habitat area will be lost permanently.	

Table A-33. Wetland YCN-5 Impact Summary.

Wetland Impacts Summary Sheet East of SR 520 and west of the ramp from I-405 to SR 520.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Local Jurisdiction Buffer Width	40 feet
	Wetland Size	0.50 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	2 0 5 **7**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0 acres (0% of Wetland YCN-5) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Bentgrass and red fescue (*Festuca rubra*).	
Soils Series Impacted	Sandy loam over clay loam to clay gray (10YR 5/1) with redoximorphic concentrations.	
Hydrology Impacted	Runoff from the SR 520 on-ramp.	
Wetland Functions Impact Summary		
Water Quality	There are no proposed impacts to Wetland YCN-5.	
Hydrologic	There are no proposed impacts to Wetland YCN-5.	
Habitat	There are no proposed impacts to Wetland YCN-5.	

Table A-34. Wetland YCN-6 Impact Summary.

Wetland Impacts Summary Sheet In between on-ramps and off-ramps to SR 520 and I-405.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Local Jurisdiction Buffer Width	40 feet
	Wetland Size	0.18 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	2
	Hydrologic Score	0
	Habitat Score	5
	Total Score	**7**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0 acres (0% of Wetland YCN-6)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Bentgrasses, red fescue, and reed canarygrass.	
Soils Series Impacted	Clay loam, dark gray (10YR 4/1), over clay loam gray (10YR 6/1) with redoxymorphic concentrations.	
Hydrology Impacted	Wetland YCN-6 is supported by highway runoff.	

Wetland Functions Impact Summary	
Water Quality	No impacts to YCN-6 are proposed.
Hydrologic	No impacts to YCN-6 are proposed.
Habitat	No impacts to YCN-6 are proposed.

Table A-35. Wetland YCN-7 Impact Summary.

Wetland Impacts Summary Sheet West of I-405 and west of 115th Ave NE along Yarrow Creek.		
No Picture	**Local Jurisdiction**	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Local Jurisdiction Buffer Width	0 feet[a]
	Wetland Size	0.01 acre
	Cowardin Classification	PFO
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score	4
	Hydrologic Score	12
	Habitat Score	11
	Total Score	**27**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0 acres (0% of Wetland YCN-7)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Panicled bulrush, wild mint (*Mentha arvensis*), red alder, and bigleaf maple.	
Soils Series Impacted	Sand very dark brown (10YR 2/2).	
Hydrology Impacted	Overbank storage for Yarrow Creek and runoff.	

Wetland Functions Impact Summary	
Water Quality	No impacts to YCN-7 are proposed.
Hydrologic	No impacts to YCN-7 are proposed.
Habitat	No impacts to YCN-7 are proposed.

Table A-36. Wetland YCN-8 Impact Summary.

Wetland Impacts Summary Sheet		
No Picture	**Local Jurisdiction**	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Local Jurisdiction Buffer Width	0 feet[a]
	Wetland Size	0.01 acre
	Cowardin Classification	PFO
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score	0
	Hydrologic Score	4
	Habitat Score	8
	Total Score	**12**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0 acres (0% of Wetland YCN-8)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Salmonberry, red alder, and bigleaf maple.	
Soils Series Impacted	Sandy loam, very dark gray (2.5Y 3/1), over sand dark grayish brown (2.5Y 4/2), over sand olive brown (2.5Y 4/3).	
Hydrology Impacted	Overbank storage for Yarrow Creek and runoff.	

Wetland Functions Impact Summary	
Water Quality	No impacts to YCN-8 are proposed.
Hydrologic	No impacts to YCN-8 are proposed.
Habitat	No impacts to YCN-8 are proposed.

Table A-37. Wetland YCS-1 Impact Summary.

Wetland Impacts Summary Sheet In median of SR 520 off-ramp loop to Bellevue Way NE.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	II
	Local Jurisdiction Rating	II
	Local Jurisdiction Buffer Width	75 feet
	Wetland Size	0.36 acre
	Cowardin Classification	PEM
	HGM Classification	Riverine
	Wetland Rating System Pts.	
	Water Quality Score	16
	Hydrologic Score	22
	Habitat Score	14
	Total Score	**52**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.16 acres (35.6% of Wetland YCS-1)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	This emergent wetland is dominated by reed canarygrass, Himalayan blackberry, bentgrasses, and red alder.	
Soils Series Impacted	Silt loam, very dark gray (10YR 3/1), with redoximorphic concentrations over sandy loam greenish black (10Y 2.5/1).	
Hydrology Impacted	Overbank storage for Yarrow Creek.	

Wetland Functions Impact Summary	
Water Quality	YCS-1 has moderate potential to improve water quality because it has ungrazed herbaceous plants over most of its area and contains some depressions that can trap water. It has the opportunity to improve water quality because it is in the median of the SR 520 off-ramp that exits to Bellevue Way NE. Stream and wetland mitigation will temporarily affect water quality functions, but will result in an improvement in overall improvement in function and additional wetland area.
Hydrologic	YCS-1 has moderate potential to reduce flooding and erosion because it has herbaceous vegetation for most of its area and it is about 5 to 10 times wider than the stream channel. It has the opportunity to reduce flooding and erosion because of its location along Yarrow Creek. Some of the hydrologic function associated with YCS-1 would be lost, but function in the remaining portion of the wetland will be improved by the stream and wetland mitigation. New wetland will also be added to this system.
Habitat	YCS-1 has low potential and moderate opportunity to provide habitat. It has two hydroperiods and two Cowardin classes, as well as two special habitat features. Some habitat functions would be permanently lost, but improvements to the stream and wetland habitat will result in a significant improvement in the remaining portions and the addition of new wetland area.

Table A-38. Wetland YCS-2 Impact Summary.

Wetland Impacts Summary Sheet Southwest of SR 520 and between the off-ramp to Bellevue Way NE and the on-ramp from 108th Avenue NE.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	II
	Local Jurisdiction Rating	II
	Local Jurisdiction Buffer Width	110 feet
	Wetland Size	2.17 acres
	Cowardin Classification	PFO, PEM
	HGM Classification	Riverine, Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	20 26 20 **66**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0.09 acres (4.15% of Wetland YCS-2) 0
Buffer Impacts	Permanent Temporary	0.20 0.45
Dominant Vegetation Impacted	The southern portion of the wetland is forested and dominated by salmonberry, Pacific willow, red alder, Himalayan blackberry, and rose spirea. The northern portion is emergent and dominated by reed canarygrass.	
Soils Series Impacted	Silt loam, very dark grayish brown (2.5Y 3/2), with strong brown (7.5YR 4/6) redoximorphic concentrations.	
Hydrology Impacted	Overbank storage for East Tributary to Yarrow Creek.	
Wetland Functions Impact Summary		
Water Quality	Wetland YCS-2 has moderate potential to improve water quality because it has trees and shrubs over two-thirds of the wetland. It has the opportunity to improve water quality because the stream that is linked to the wetland drains an area with raised levels of toxic compounds and nutrients. A small portion of water quality functions would be permanently lost, however the extensive stream and wetland mitigation in this wetland will result in an overall improvement in water quality function and creation of new wetland area.	
Hydrologic	Wetland YCS-2 has high potential to reduce flooding and erosion because it provides overbank storage and has vegetation over all of its area that would lower water velocities during a flood. It has the opportunity to reduce flooding and erosion because there are structures downstream that can be damaged by flooding. Stream and wetland mitigation are expected to improve erosion protection and water storage in the wetland.	
Habitat	Wetland YCS-2 has moderate potential and opportunity to provide habitat because it has multiple vegetation classes, multiple hydroperiods, habitat interspersion, special habitat features, and it is connected to other habitats. Wetland habitat area would be permanently lost, but additional habitat will be added. habitat structure will be improved by the stream mitigation plantings, and connectivity to YCS-1 will be inproved.	

Table A-39. Wetland YCS-4 Impact Summary.

Wetland Impacts Summary Sheet In the median of the SR 520 on-ramp from 108th Avenue NE.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Local Jurisdiction Buffer Width	40 feet
	Wetland Size	0.97 acre
	Cowardin Classification	PEM
	HGM Classification	Depressional Outflow
	Wetland Rating System Pts.	
	Water Quality Score	8
	Hydrologic Score	16
	Habitat Score	5
	Total Score	**29**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent	0.97 acres (100% of Wetland YCS-4)
	Temporary	0
Buffer Impacts	Permanent	0
	Temporary	0
Dominant Vegetation Impacted	Reed canarygrass.	
Soils Series Impacted	Sandy loam with cobble very dark gray (10YR 3/1).	
Hydrology Impacted	Runoff from the SR 520 off-ramp.	

Wetland Functions Impact Summary	
Water Quality	Wetland YCS-4 has low potential to improve water quality because, although it has persistent vegetation, it is mowed occasionally. It has the opportunity to improve water quality because untreated storm water discharges into the wetland. All water quality improvement function would be lost.
Hydrologic	Wetland YCS-4 has moderate potential to reduce flooding and erosion because it can store water during wet periods and the area of the basin is less than 10 times the area of the unit. It has the opportunity to reduce flooding and erosion because it drains to a stream that has flooding problems. All hydrologic function in this wetland would be lost.
Habitat	Wetland YCS-4 has low potential and opportunity to provide habitat because it has minimal habitat features and is located in the middle of a circular on-ramp to SR 520. All habitat area and connectivity associated with YCS-4 would be lost.

Table A-40. Wetland YCS-5 Impact Summary.

Wetland Impacts Summary Sheet South of SR 520 and south of the SR 520 on-ramp from 108th Avenue NE west of 112th Avenue NE.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	III
	Local Jurisdiction Rating	III
	Local Jurisdiction Buffer Width	60 feet
	Wetland Size	0.29 acre
	Cowardin Classification	PEM
	HGM Classification	Depressional Outflow
	Wetland Rating System Pts.	
	Water Quality Score	18
	Hydrologic Score	20
	Habitat Score	10
	Total Score	**48**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary (short-term)	0.01 acres (3.45% of Wetland YCS-5) 0.07
Buffer Impacts	Permanent Temporary	0.003 0.002
Dominant Vegetation Impacted	Reed canarygrass, rose spirea, and Pacific willow.	
Soils Series Impacted	Sandy silt loam, very dark gray (10YR 3/1), with redoximorphic concentrations.	
Hydrology Impacted	Storage of runoff from the SR 520 on-ramp to the north and from the parking lot to the south.	

Wetland Functions Impact Summary	
Water Quality	Wetland YCS-5 has moderate potential to improve water quality because it has persistent vegetation over half of its area and seasonal ponding occurs over at least half of its area. It has the opportunity to improve water quality because untreated storm water discharges into the wetland. A portion of the storage capacity and vegetation that provides water quality improvement will be lost.
Hydrologic	Wetland YCS-5 has moderate potential to reduce flooding and erosion because it can store water during a wet period and the area of the basin is 10 to 100 times the area of the wetland. It has the opportunity to reduce flooding and erosion because it drains into a stream that has flooding problems. Hydrologic functions in the affected portion of YCS-5 would be lost.
Habitat	Wetland YCS-5 has a low potential and moderate opportunity to provide habitat because it has multiple hydroperiods and is connected to other habitats. A small portion of the habitat in this wetland would be lost.

Table A-41. Wetland YCS-6 Impact Summary.

Wetland Impacts Summary Sheet Between SR 520 and on-ramp and off-ramp to SR 520 near I-405.		
	Local Jurisdiction	Bellevue
	WRIA	8
	Ecology Rating (Hruby 2004)	IV
	Local Jurisdiction Rating	IV
	Local Jurisdiction Buffer Width	40 feet
	Wetland Size	0.23 acre
	Cowardin Classification	PEM
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score Hydrologic Score Habitat Score **Total Score**	2 0 5 **7**

Wetland and Buffer Impact Summary		
Wetland Impacts	Permanent Temporary	0 acres (0% of Wetland YCS-6) 0
Buffer Impacts	Permanent Temporary	0 0
Dominant Vegetation Impacted	Bentgrasses, red fescue, and reed canarygrass.	
Soils Series Impacted	Clay loam, dark gray (10YR 4/1), over clay loam, yellowish brown (10YR 5/6), with redoximorphic concentrations.	
Hydrology Impacted	Runoff from the SR 520 off-ramp to I-405.	
Wetland Functions Impact Summary		
	.	
Water Quality	There are no proposed impacts to Wetland YCS-6.	
Hydrologic	There are no proposed impacts to Wetland YCS-6.	
Habitat	There are no proposed impacts to Wetland YCS-6.	

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Appendix B—Mitigation Site Wetland Memo

See *DRAFT WETLAND ASSESSMENT REPORT Medina to SR 202: Eastside Transit and HOV Project - Keller Wetland Mitigation Site* (January 2010*)*

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Appendix C—Boring Logs

To be provided in Final Report

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Appendix D—Hydrology Data

Peak Flow Calculations
Evans Creek, Near Union Hill Road, Redmond, WA

Evans Creek Stream Gage Data

Yearly Peak Streamflow:

Water Year	Date	Flow (cfs)	
1956	Dec. 22, 1955	145	Data from USGS (ABOVE MOUTH) NEAR REDMOND, WA Gage Location: King County, Washington Hydrologic Unit Code 17110012 Latitude 47°40'31", Longitude 122°04'48" NAD27 Drainage area 13.00 square miles Gage datum 50.00 feet above sea level NGVD29
1957	Feb. 26, 1957	136	
1958	Jan. 17, 1958	103	
1959	Jan. 25, 1959	127	
1960	Dec. 16, 1959	137	
1961	Nov. 25, 1960	106	
1962	Jan. 07, 1962	67	
1963	Feb. 05, 1963	70	
1964	Jan. 01, 1964	89	
1965	Jan. 30, 1965	146	
1966	Jan. 08, 1966	135	
1967	Jan. 20, 1967	120	
1968	Dec. 26, 1967	108	
1969	Jan. 07, 1969	176	
1970	Jan. 27, 1970	125	
1971	Dec. 07, 1970	103	
1972	Mar. 06, 1972	211	
1973	Dec. 27, 1972	154	
1974	Jan. 17, 1974	160	
1975	Jan. 14, 1975	155	
1976	Dec. 05, 1975	222	
1977	Jun. 01, 1977	82	
1988	Mar., 1988	93.8	Data from King County Site 18a - Evans Creek @ Union Hill Road Stream Gauge(Recording) Easting: 1333015 Northing: 248735 Instantaneous Max. flows used; calculated based on 15 minute continuous data
1989	Mar., 1989	75	
1990	Jan., 1990	231	
1991	Apr., 1991	150	
1992	Feb., 1992	120	
1993	Apr., 1993	75	
1994	Mar., 1994	63	
1995	Feb., 1995	95	
1996	Feb., 1996	350	
1997	Mar., 1997	199	
1998	Jan., 1998	76	
1999	Nov., 1998	128.63	
2000	Nov., 1999	123.04	
2001	Apr., 2001	40	
2002	Nov., 2001	143.04	
2003	Mar., 2003	106.69	
2004	Jan., 2004	145.21	
2005	Dec., 2004	92.27	
2006	Jan., 2006	157.48	
2007	Dec., 2006	82.32	
2008	Dec., 2007	198.54	
2009	Jan., 2009	151.73	

Flow Summary:	
Recurrence Interval	Peak Flow (cfs)
2-yr	122.0042992
5-yr	170.7186975
10-yr	202.7244301
25-yr	242.8863673
50-yr	272.5133666
100-yr	301.8147101
200-yr	331.2996257

Peak Flow Calculations
Evans Creek Near Union Hill Road, Redmond, WA

Log Pearson III Distribution
Reference: Hammer, M and K. MacKichan, 1981. Hydrology and Quality of Water Resources. John Wiley.

USGS 12124000 EVANS CREEK (ABOVE MOUTH) NEAR REDMOND, WA
King County Site 18a - Evans Creek @ Union Hill Road Stream Gauge(Recording)

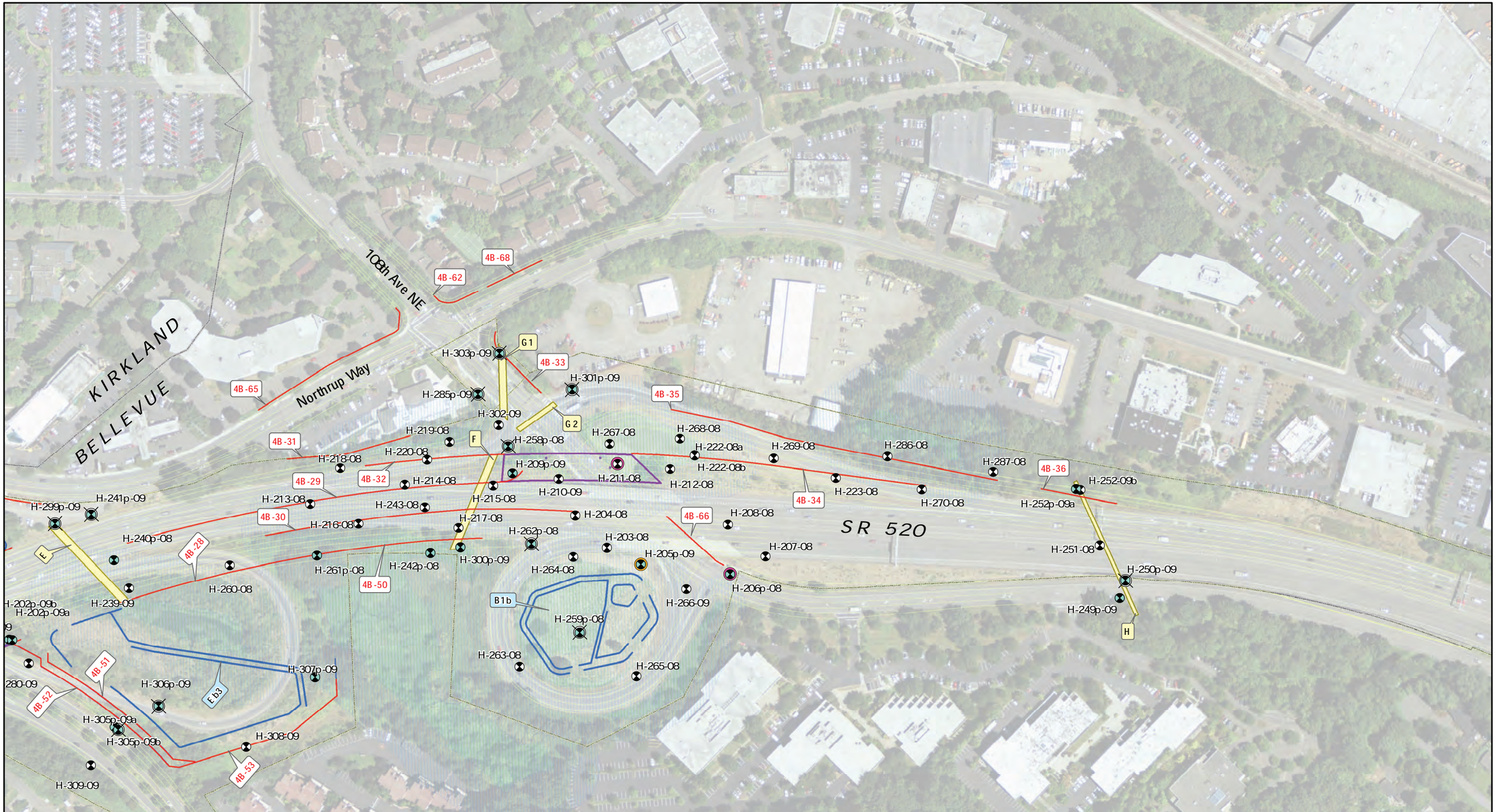
	Date	Peak Flow (cfs)	Log Q	Log Q^2	Log Q^3
1	Dec. 22, 1955	145	2.161368002	4.671512	10.09686
2	Feb. 26, 1957	136	2.133538908	4.551988	9.711844
3	Jan. 17, 1958	103	2.012837225	4.051514	8.155038
4	Jan. 25, 1959	127	2.103803721	4.42599	9.311414
5	Dec. 16, 1959	137	2.136720567	4.565575	9.755358
6	Nov. 25, 1960	106	2.025305865	4.101864	8.307529
7	Jan. 07, 1962	67	1.826074803	3.334549	6.089136
8	Feb. 05, 1963	70	1.84509804	3.404387	6.281427
9	Jan. 01, 1964	89	1.949390007	3.800121	7.407919
10	Jan. 30, 1965	146	2.164352856	4.684423	10.13874
11	Jan. 08, 1966	135	2.130333768	4.538322	9.668141
12	Jan. 20, 1967	120	2.079181246	4.322995	8.988289
13	Dec. 26, 1967	108	2.033423755	4.134812	8.407825
14	Jan. 07, 1969	176	2.245512668	5.042327	11.32261
15	Jan. 27, 1970	125	2.096910013	4.397032	9.22018
16	Dec. 07, 1970	103	2.012837225	4.051514	8.155038
17	Mar. 06, 1972	211	2.324282455	5.402289	12.55645
18	Dec. 27, 1972	154	2.187520721	4.785247	10.46783
19	Jan. 17, 1974	160	2.204119983	4.858145	10.70793
20	Jan. 14, 1975	155	2.190331698	4.797553	10.50823
21	Dec. 05, 1975	222	2.346352974	5.505372	12.91755
22	Jun. 01, 1977	82	1.913813852	3.662683	7.009694
23	Mar., 1988	93.8	1.972202838	3.889584	7.671049
24	Mar., 1989	75	1.875061263	3.515855	6.592443
25	Jan., 1990	231	2.36361198	5.586662	13.2047
26	Apr., 1991	150	2.176091259	4.735373	10.3046
27	Feb., 1992	120	2.079181246	4.322995	8.988289
28	Apr., 1993	75	1.875061263	3.515855	6.592443
29	Mar., 1994	63	1.799340549	3.237626	5.825592
30	Feb., 1995	95	1.977723605	3.911391	7.73565
31	Feb., 1996	350	2.544068044	6.472282	16.46593
32	Mar., 1997	199	2.298853076	5.284725	12.14881
33	Jan., 1998	76	1.880813592	3.53746	6.653302
34	Nov., 1998	128.63	2.10934227	4.449325	9.385149
35	Nov., 1999	123.04	2.090046322	4.368294	9.129936
36	Apr., 2001	40	1.602059991	2.566596	4.111841
37	Nov., 2001	143.04	2.155457501	4.645997	10.01425
38	Mar., 2003	106.69	2.028123715	4.113286	8.342252
39	Jan., 2004	145.21	2.161996525	4.674229	10.10567
40	Dec., 2004	92.27	1.965060521	3.861463	7.588008
41	Jan., 2006	157.48	2.197225406	4.827799	10.60776
42	Dec., 2006	82.32	1.915505362	3.669161	7.028297
43	Dec., 2007	198.54	2.297848018	5.280106	12.13288
44	Jan., 2009	151.73	2.181071458	4.757073	10.37552

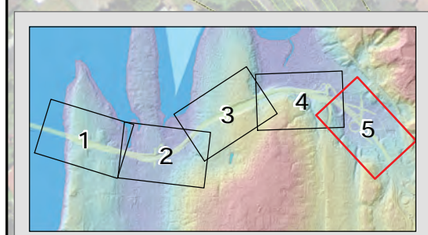
N	44		
Sum of Log Q^n	91.66885616	192.3133	406.1894
Average	2.083383095		
Standard Deviation	0.176002357		
Skew	-0.103382376		
Regional Skew	0		
Weighted Skew	-0.026190202		

				K from Table 6-28			
Recurence Interval	**K**	**log Q**	**Q (cfs)**		**K (0)**	**K(-.1)**	**K (-0.0717)**
2	0.017	2.086375135	122.0042992	2	0	0.01662	0.011917
5	0.846	2.232281089	170.7186975	5	0.84162	0.84611	0.8448
10	1.27	2.306906088	202.7244301	10	1.28155	1.27037	1.27353
25	1.716	2.38540314	242.8863673	25	1.75069	1.7158	1.72567
50	2	2.435387809	272.5133666	50	2.05375	1.99973	2.01502
100	2.252	2.479740403	301.8147101	100	2.32635	2.25258	2.254256
200	2.482	2.520220945	331.2996257				

From Figure 6-7
Equation 6-65: Weighted skew = G(N-25)/75 since regional skew=0
log Qp = avg(log Q) + KS

K Values found here, based on Skew coefficient:





LEGEND

Completed Explorations

- Exploration
- Observation Well / Vibrating Wire Piezometer

Field Testing

- Shear Wave Velocity
- Pressurementer
- Slug Test

Project Features

- Retaining Walls
- Stormwater Facilities
- Bridges/Piers
- Culverts
- Maintenance Facility
- Alignment
- Right of Way
- City Boundary
- Creeks
- Wetland
- Wetland Buffer

NOTES

1. All explorations surveyed with the exceptions of H-288-09, H-289-09, and H-290-09. These explorations located with resource grade GPS with an accuracy of (+/-) 1m.
2. Alignment, wetland, and feature data provided by WSDOT (dated 05/29/09).

0 100 200 Feet

SR 520 Bridge Replacement and HOV Program
Medina to SR 202:
Eastside Transit and HOV Project

SITE AND EXPLORATION PLAN

September 2009 | 21-1-20624-079

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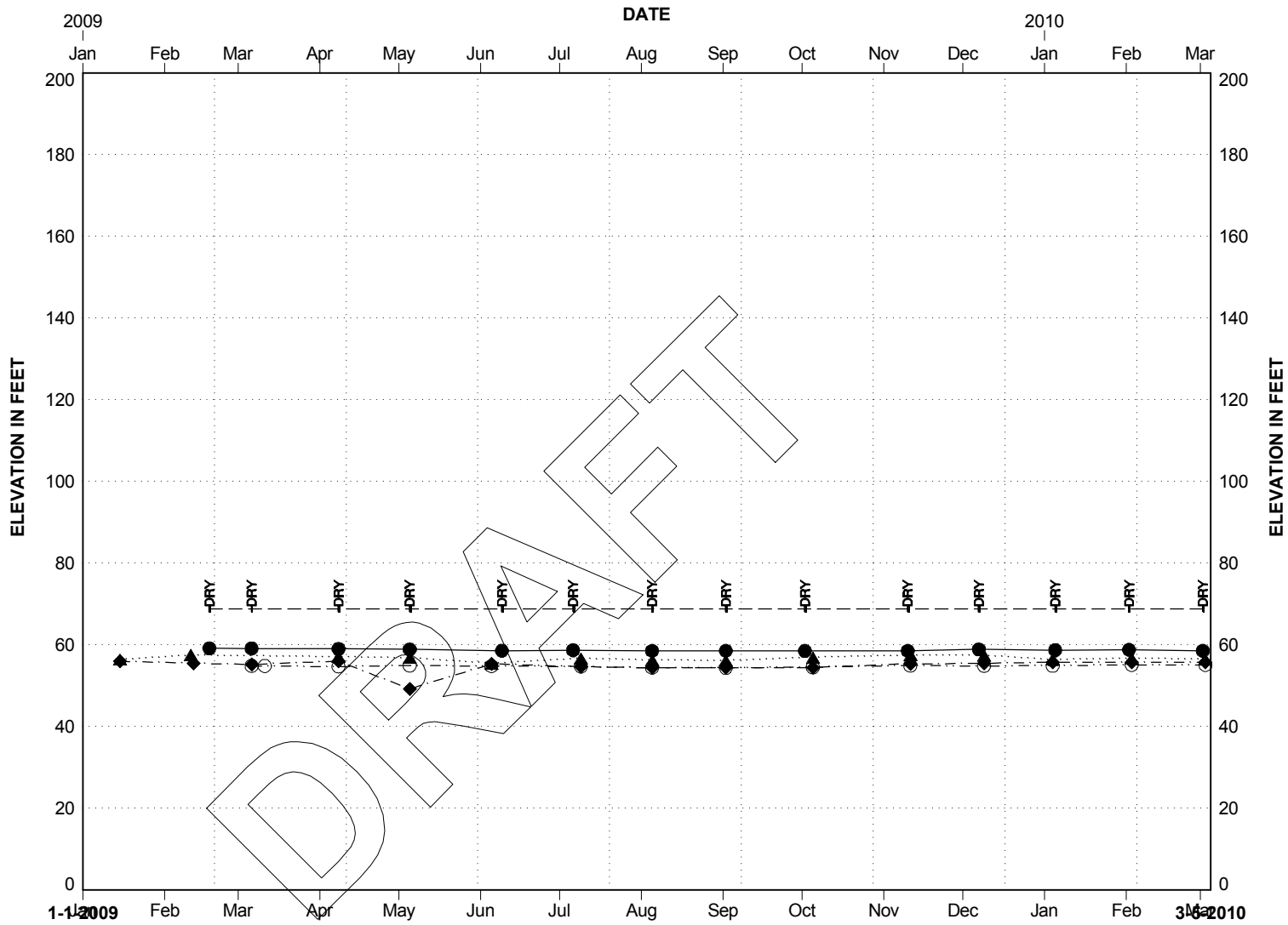
EXHIBIT 2
Sheet 5 of 5



NOTE:

Read Point Depth or Elevation *(as listed in legend table at right)* is equal to the depth or elevation of the tip of the vibrating wire pressure (VWP) transducer or the bottom of the screen of the observation well (OW). Measured groundwater elevations less than these values are considered as "Dry".

Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	Water Level Elevation (feet) High
H-202p-09a VWP1	40	44.2	58.5	59.2
H-202p-09b OW1	15.4	68.8	Dry	Dry
H-205p-09 OW1	90.7	-40.3	55.4	57.5
H-206p-08 OW1	29.9	26.3	49.2	56.0
H-209p-09 OW1	102.4	-44.3	54.4	55.1

SR 520 Bridge Replacement and HOV Program
Medina to SR 202
Eastside Transit and HOV Project

WATER LEVEL READINGS

March 2010 21-1-20624-364

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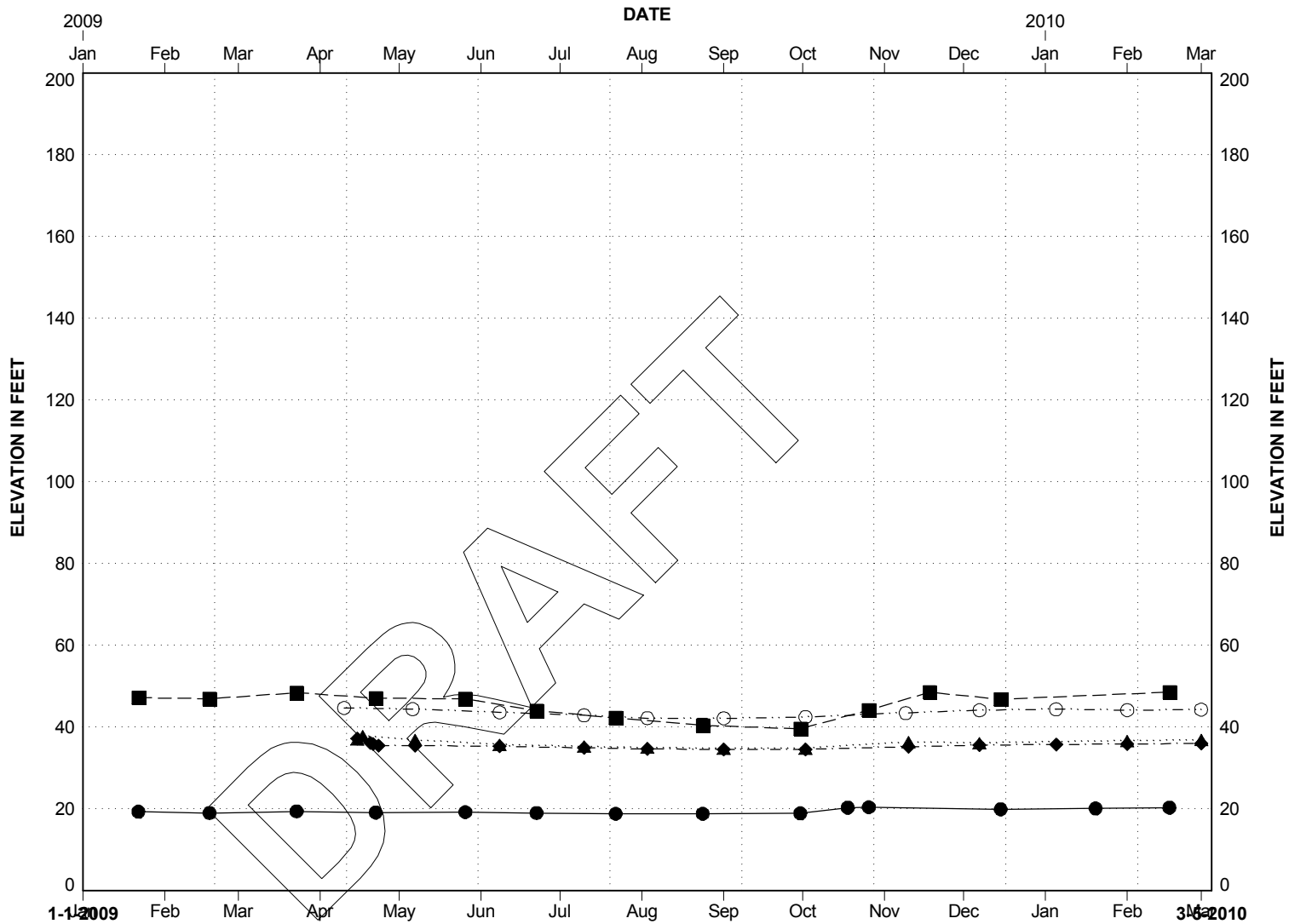
FIG.

WSDOT

FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



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Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
H-20p-06 OW1			18.5	20.4
H-21p-06 OW1			39.6	48.6
H-224p-09 OW1	44.6	-3.5	34.7	37.8
H-225p-09 OW1	30.3	12.6	34.5	37.2
H-228p-09 VWP1	40.4	8.6	42.2	44.7

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WATER LEVEL READINGS

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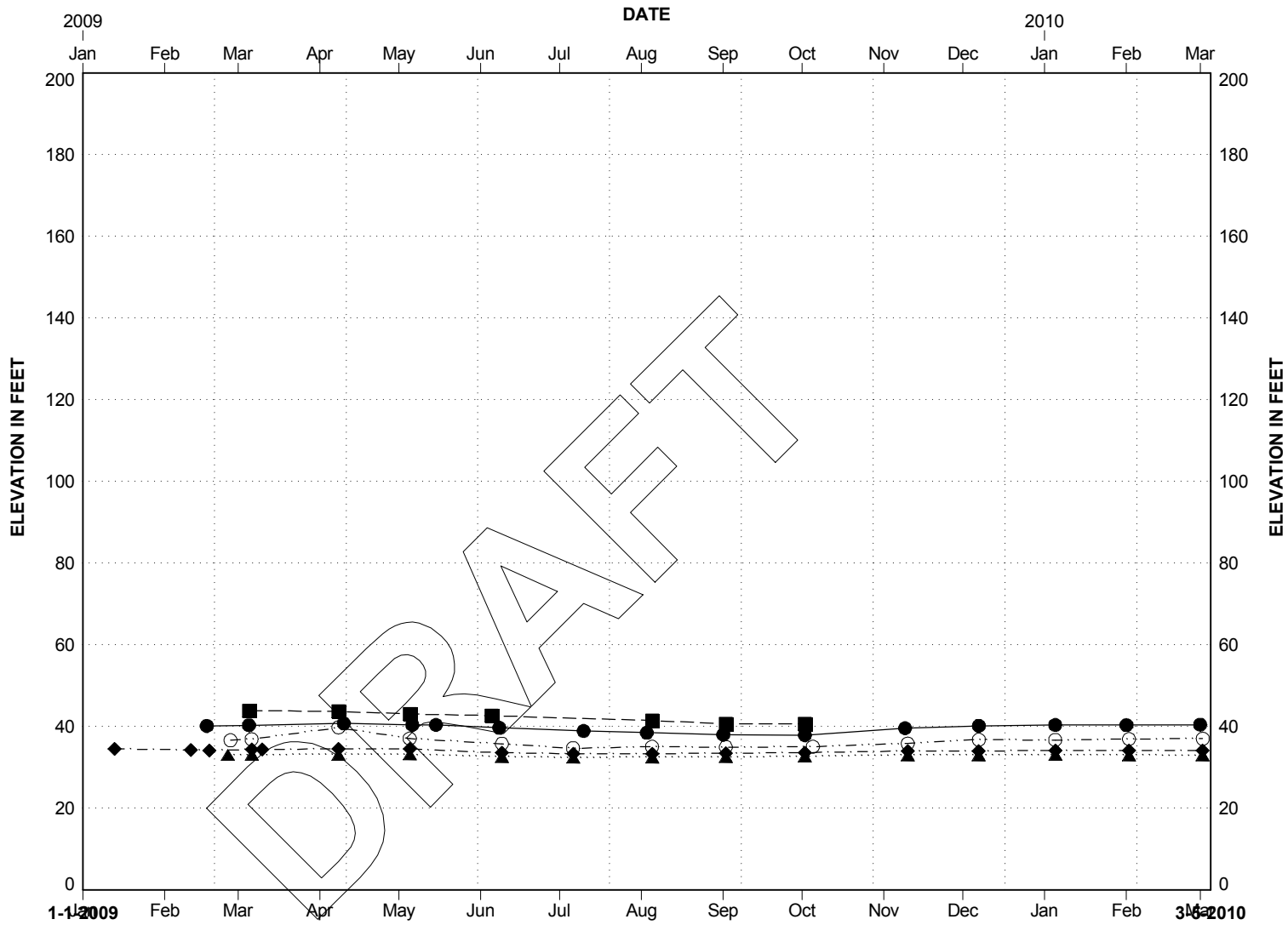
FIG.

WSDOT

FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

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Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
H-230p-08 OW1	43.8	-1.4	37.9	40.8
H-232p-09 OW1	36.8	27.7	40.7	43.9
H-235p-09 OW1	30.1	13.2	32.4	33.2
H-236p-08 OW1	25.8	18.7	33.4	34.5
H-238p-09 OW1	22.4	34.2	34.7	39.8

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Medina to SR 202
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WATER LEVEL READINGS

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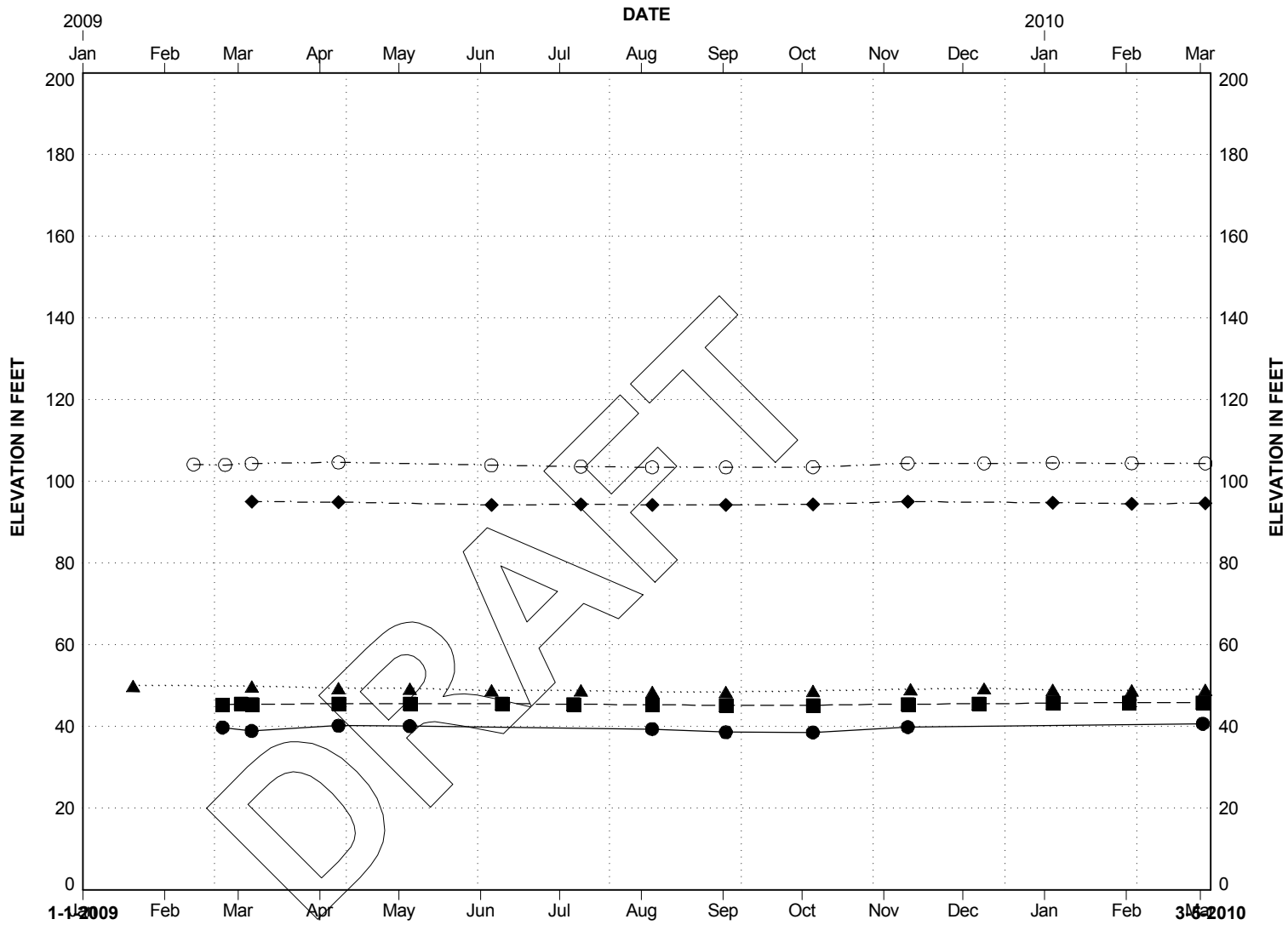
FIG.

WSDOT

FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

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Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
H-240p-08 OW1	23.1	28.3	38.6	40.7
H-241p-09 OW1	75.2	-16.5	45.2	45.9
H-242p-08 VWP1	37	7.1	48.5	49.9
H-249p-09 VWP1	28	80.0	94.2	95.1
H-250p-09 OW1	30.1	80.0	103.4	104.7

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WATER LEVEL READINGS

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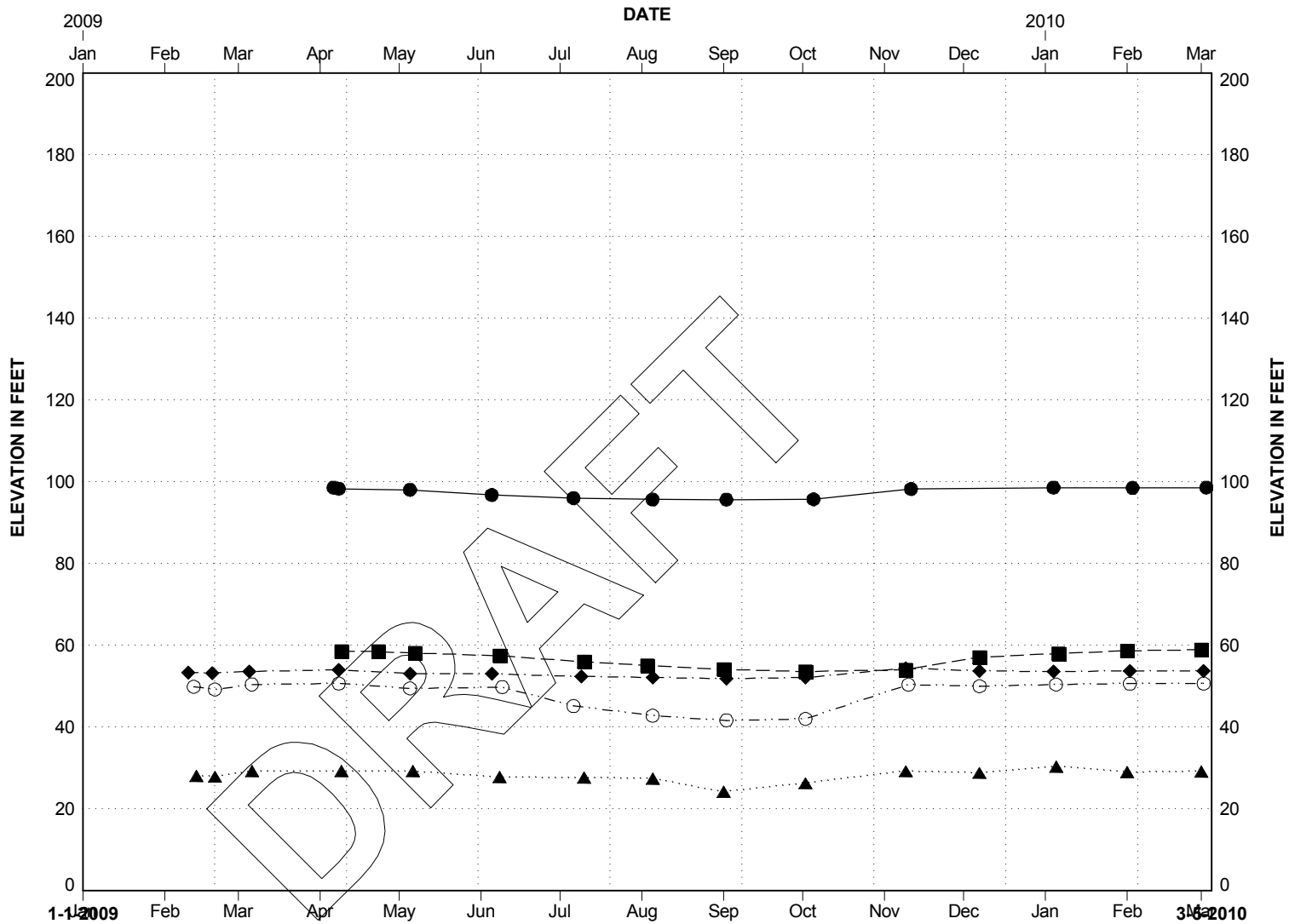
FIG.

WSDOT

FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

Read Point Depth or Elevation *(as listed in legend table at right)* is equal to the depth or elevation of the tip of the vibrating wire pressure (VWP) transducer or the bottom of the screen of the observation well (OW). Measured groundwater elevations less than these values are considered as "Dry".

Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
H-252p-09a OW1			95.7	98.6
H-253p-09 OW1	35.2	30.7	53.6	58.9
H-254p-08 OW1	14.7	18.8	24.2	30.4
H-255p-08 OW1	33.3	36.3	51.8	54.4
H-256p-08 OW1	16.3	34.9	41.7	50.7

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Medina to SR 202
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WATER LEVEL READINGS

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FIG.

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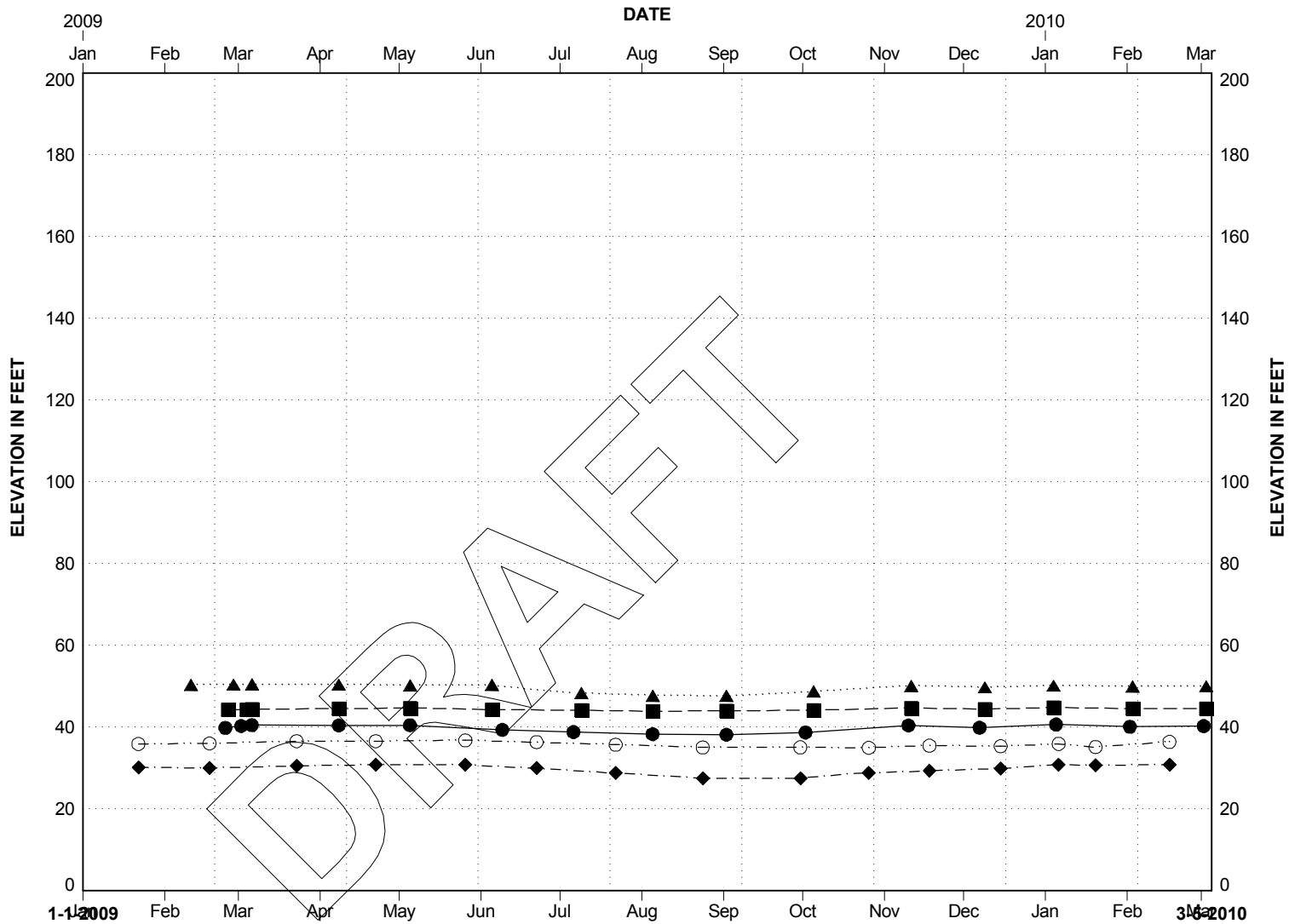
FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

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Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
H-257p-08 OW1	25.8	22.5	38.1	40.6
H-258p-08 OW1	21.5	31.4	43.9	44.8
H-259p-08 OW1	18.7	32.1	47.7	50.5
H-25p-07 OW1	32.7	0.2	27.4	30.8
H-25p-07 VWP1	48	-15.1	32.6	37.0

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Medina to SR 202
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WATER LEVEL READINGS

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FIG.

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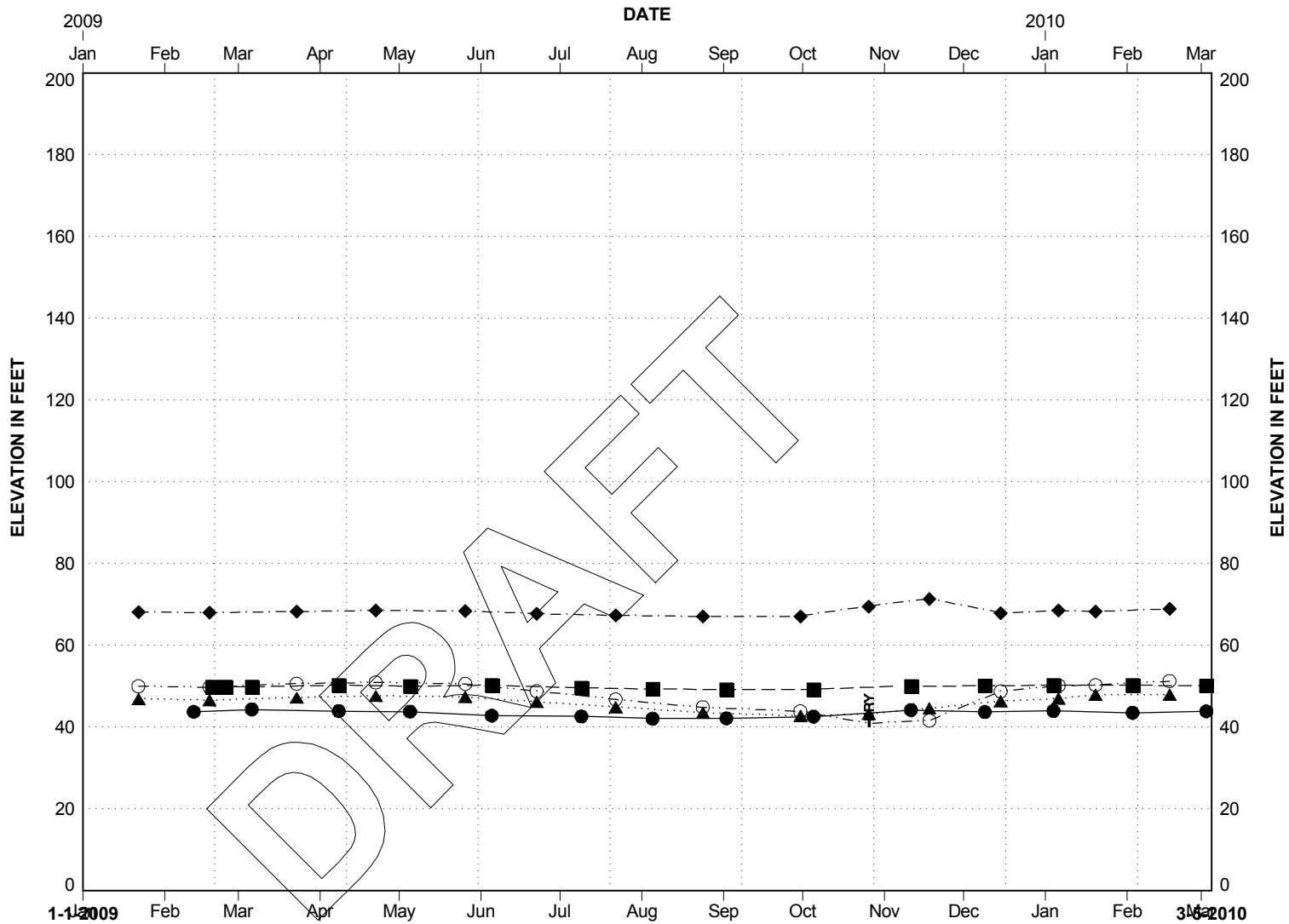
FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

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	Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
—●—	H-261p-08 VWP1	19.5	26.3	42.1	44.3
—■—	H-262p-08 OW1	19.3	47.2	49.2	50.3
···▲···	H-26p-08 OW1			42.7	47.9
—◆—	H-26p-08 VWP1	20	66.0	66.9	71.3
—○—	H-26p-08 VWP2	45	41.0	Dry	51.3

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Medina to SR 202
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WATER LEVEL READINGS

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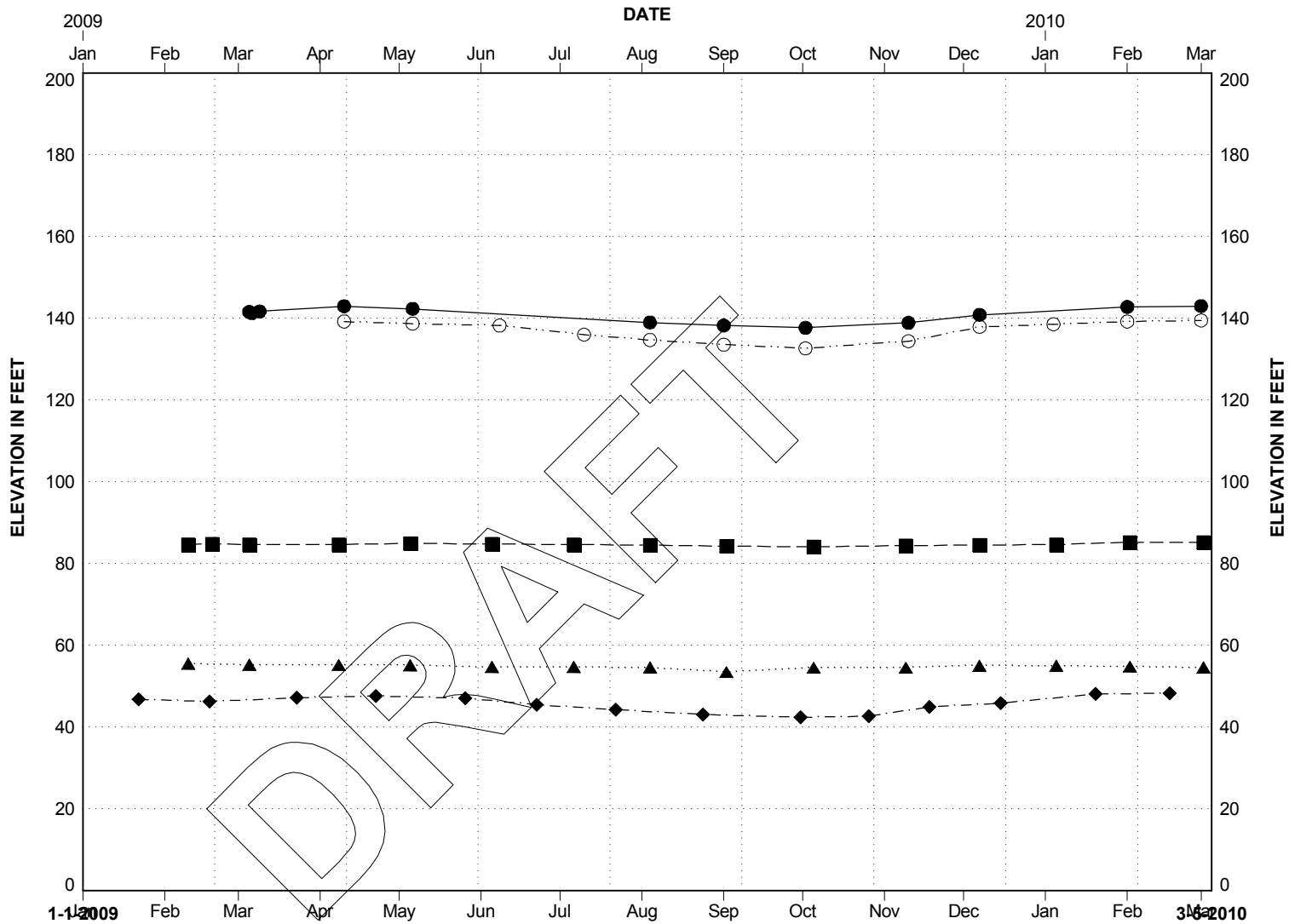
FIG.

WSDOT

FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

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Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
H-277p-09 OW1	39	123.2	137.7	143.0
H-279p-09 OW1	48.3	84.1	84.2	85.2
H-279p-09 VWP1	106	26.4	53.5	55.5
H-27p-07 OW1	44.8	15.2	42.4	48.2
H-281p-09 OW1			132.7	139.5

SR 520 Bridge Replacement and HOV Program
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WATER LEVEL READINGS

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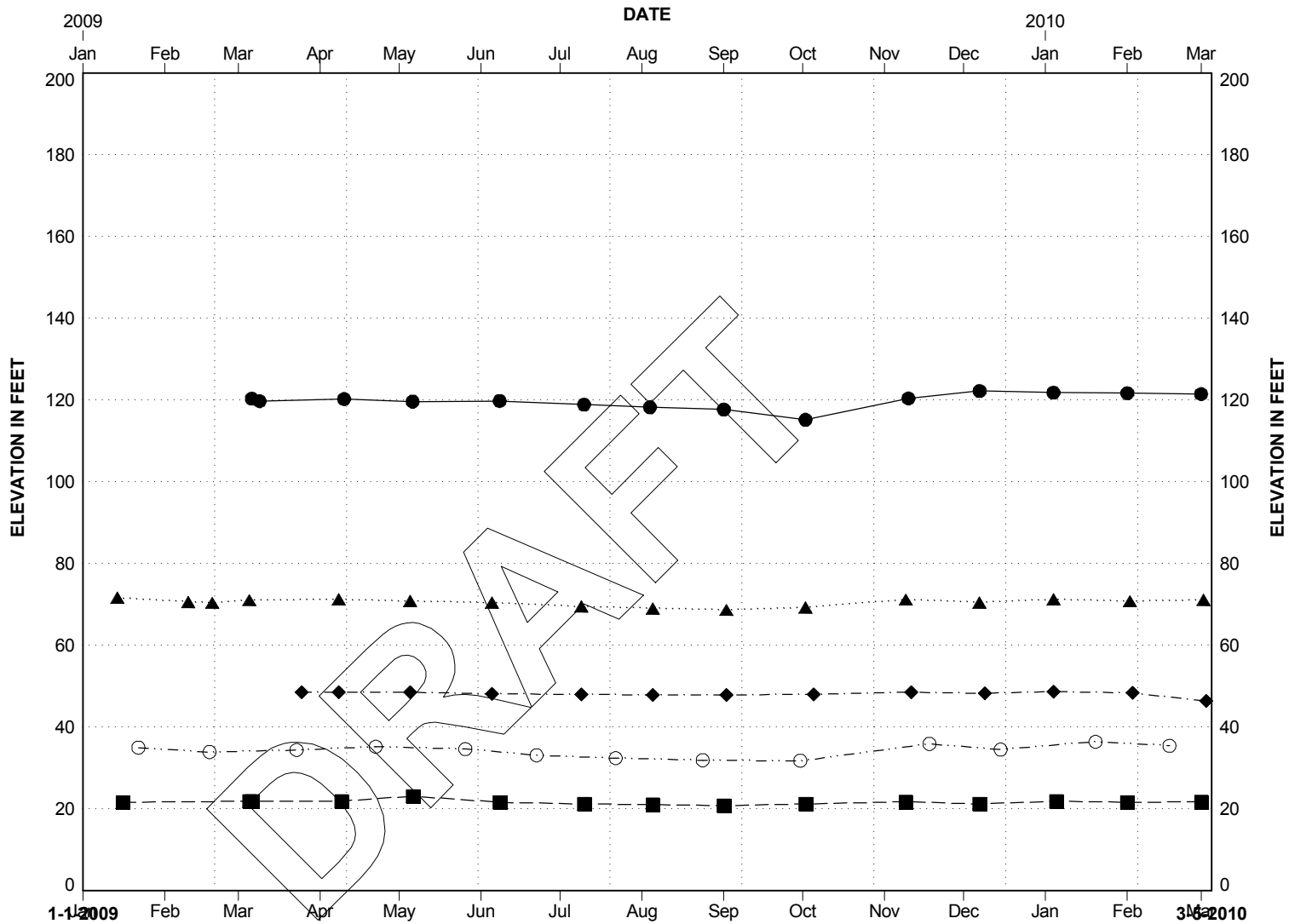
FIG.

WSDOT

FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

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Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
H-282p-09 OW1	52.6	107.1	115.2	122.2
H-283p-08 OW1	20.1	1.1	20.8	23.1
H-284p-08 OW1	28.2	44.6	68.7	71.6
H-285p-09 OW1	20.4	34.3	46.4	48.6
H-28p-08 OW1	18.5	21.5	27.6	36.4

SR 520 Bridge Replacement and HOV Program
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WATER LEVEL READINGS

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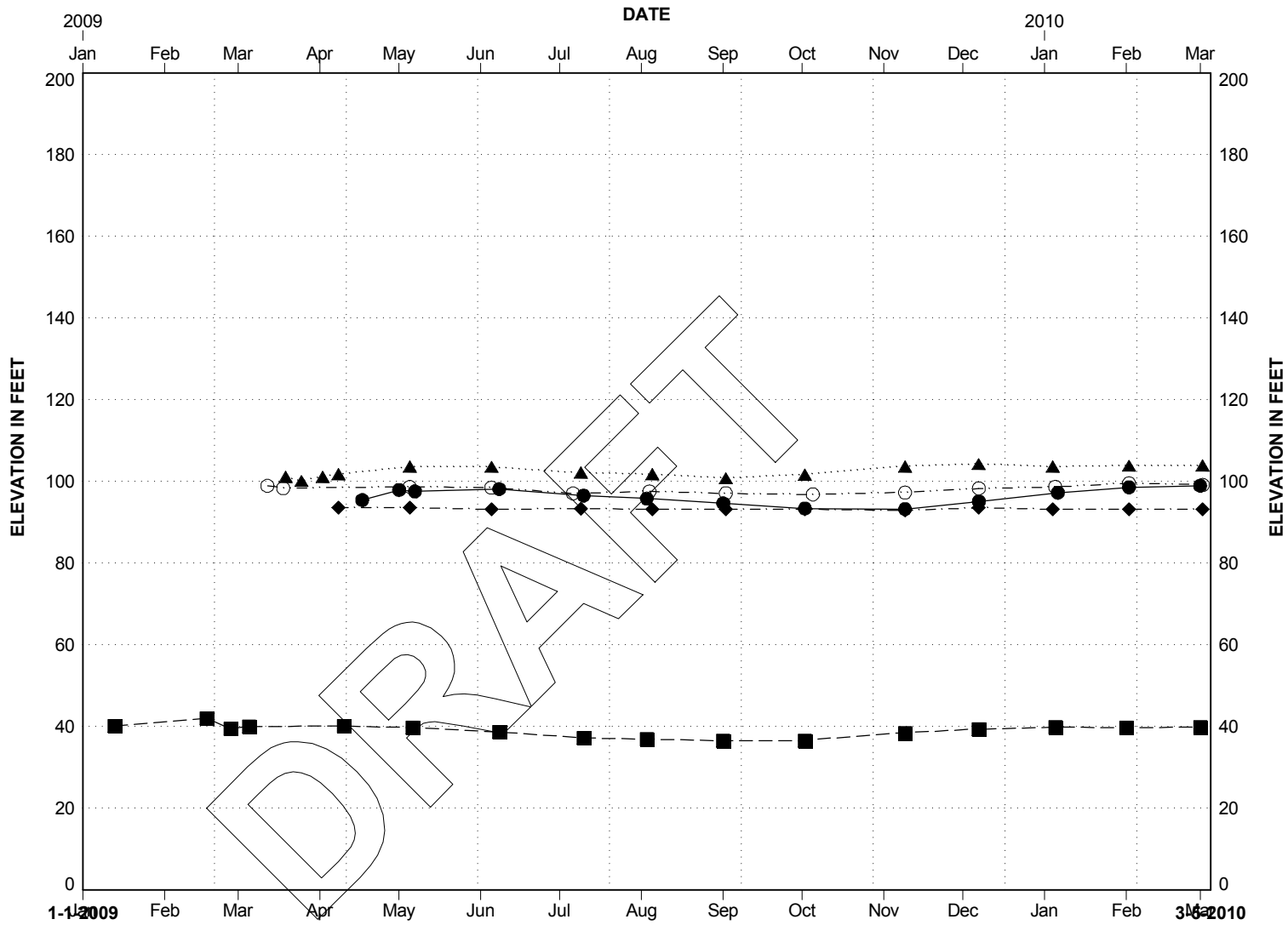
FIG.

WSDOT

FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

Read Point Depth or Elevation *(as listed in legend table at right)* is equal to the depth or elevation of the tip of the vibrating wire pressure (VWP) transducer or the bottom of the screen of the observation well (OW). Measured groundwater elevations less than these values are considered as "Dry".

Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
H-292p-09 OW1	43.4	81.6	93.2	99.0
H-293p-08 OW1	19.4	23.2	36.5	41.9
H-296p-09 OW1	26.3	99.2	100.1	104.3
H-296p-09 VWP1	53	72.4	93.0	93.7
H-298p-09 OW1	33	81.1	96.8	99.6

SR 520 Bridge Replacement and HOV Program
Medina to SR 202
Eastside Transit and HOV Project

WATER LEVEL READINGS

March 2010 21-1-20624-364

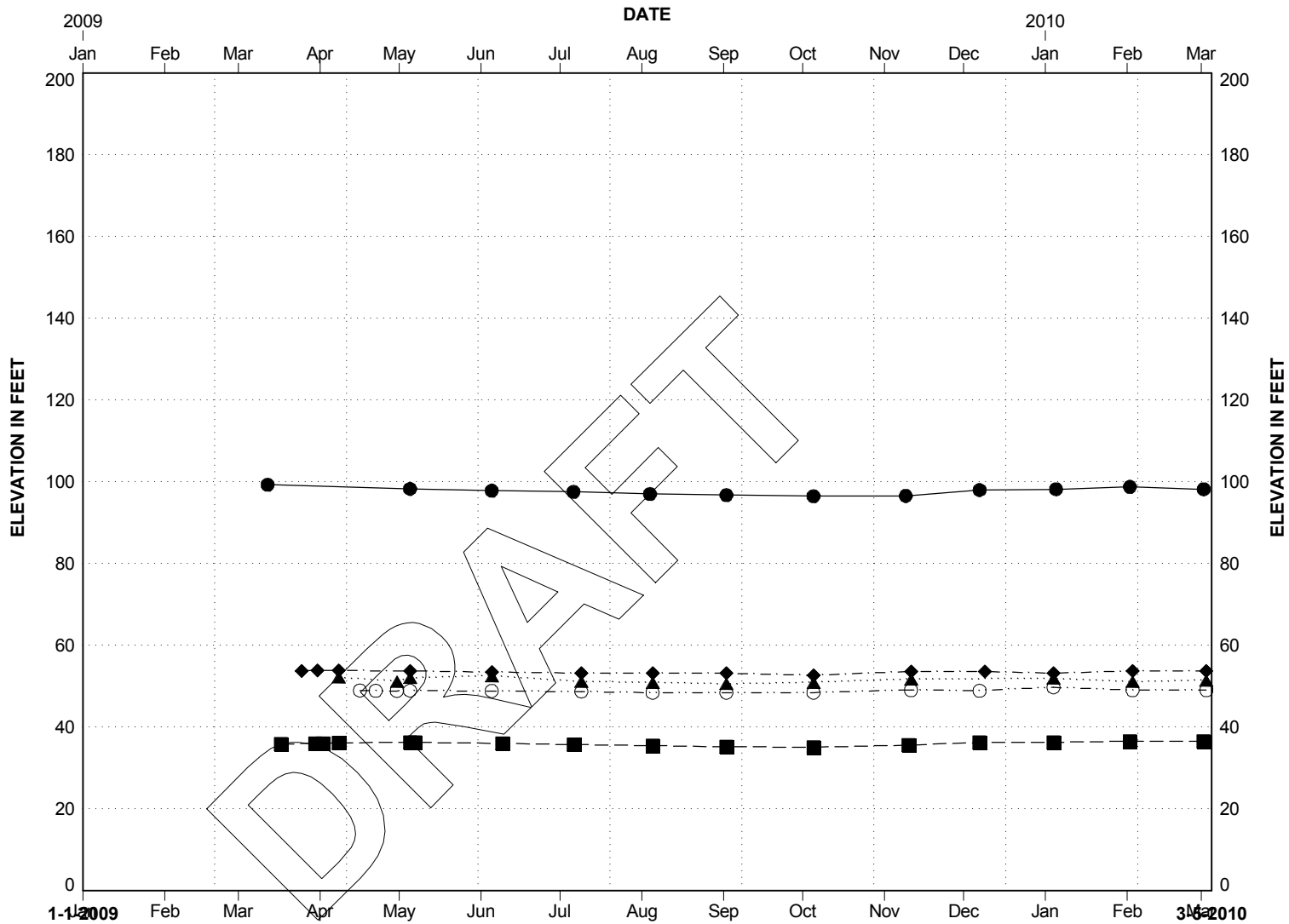
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG.

WSDOT

FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

Read Point Depth or Elevation *(as listed in legend table at right)* is equal to the depth or elevation of the tip of the vibrating wire pressure (VWP) transducer or the bottom of the screen of the observation well (OW). Measured groundwater elevations less than these values are considered as "Dry".

Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	Water Level Elevation (feet) High
H-298p-09 VWP1	58.6	55.5	96.5	99.3
H-299p-09 OW1	34.2	18.8	35.0	36.6
H-300p-09 OW1	38.9	6.0	50.6	52.5
H-301p-09 OW1	35.5	17.7	52.7	53.9
H-303p-09 OW1	22.7	27.5	48.4	49.7

SR 520 Bridge Replacement and HOV Program
Medina to SR 202
Eastside Transit and HOV Project

WATER LEVEL READINGS

March 2010 21-1-20624-364

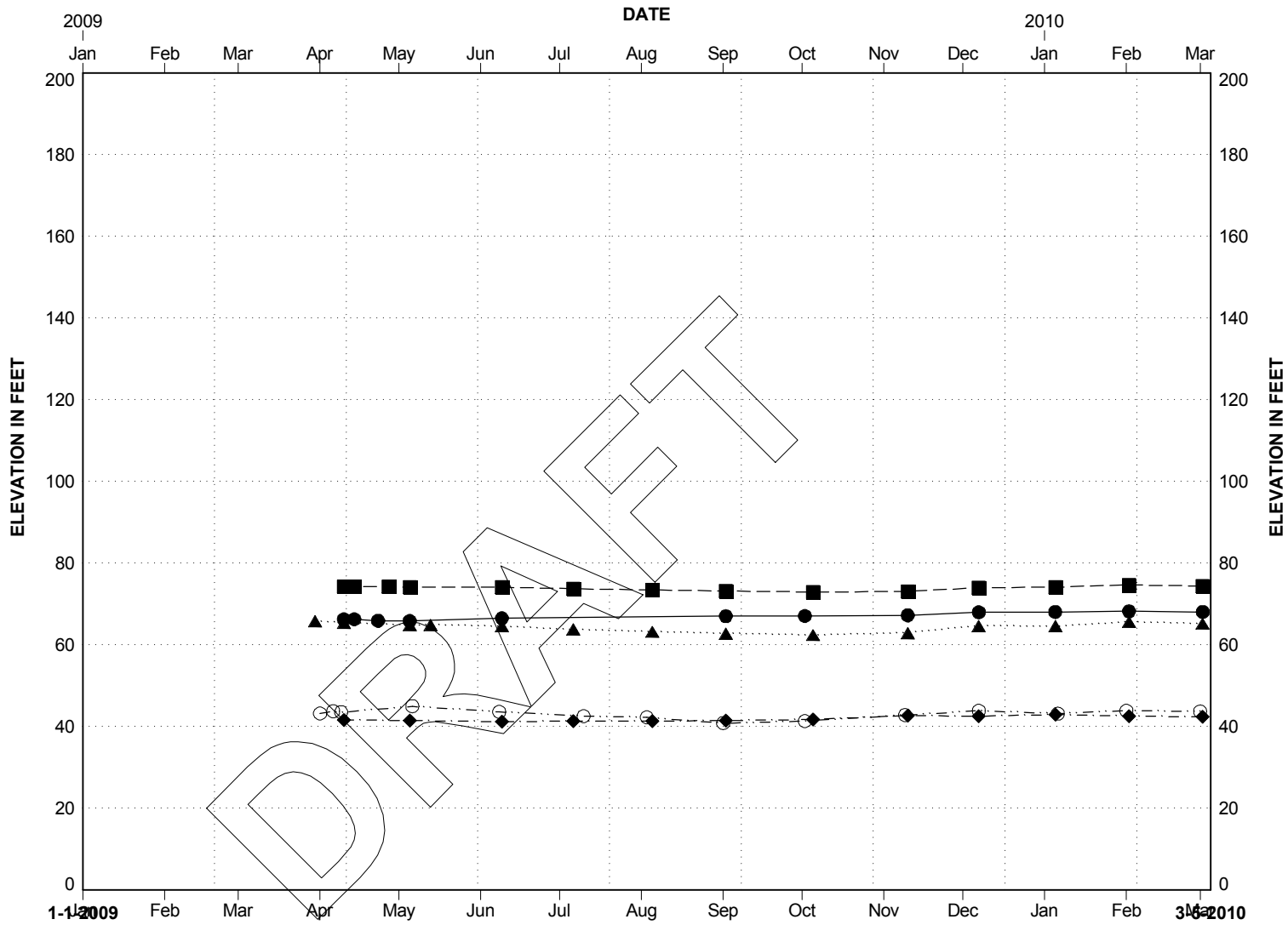
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG.

WSDOT

FIG.

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10



NOTE:

Read Point Depth or Elevation *(as listed in legend table at right)* is equal to the depth or elevation of the tip of the vibrating wire pressure (VWP) transducer or the bottom of the screen of the observation well (OW). Measured groundwater elevations less than these values are considered as "Dry".

Well Identification	Read Point Depth (feet)	Read Point Elev. (feet)	Water Level Elevation (feet) Low	High
H-305p-09a VWP1	129.5	-14.8	65.9	68.2
H-305p-09b OW1	56	59.0	72.9	74.6
H-306p-09 OW1			62.4	65.8
H-307p-09 VWP1	40	30.0	41.2	42.9
H-310p-09 OW1	29.9	13.2	40.9	45.0

SR 520 Bridge Replacement and HOV Program
Medina to SR 202
Eastside Transit and HOV Project

WATER LEVEL READINGS

March 2010 21-1-20624-364

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG.

WSDOT

GW PLOT ELEV NO WELL LOG 21-20624.GPJ SHAN WIL.GDT 3/8/10

FIG.

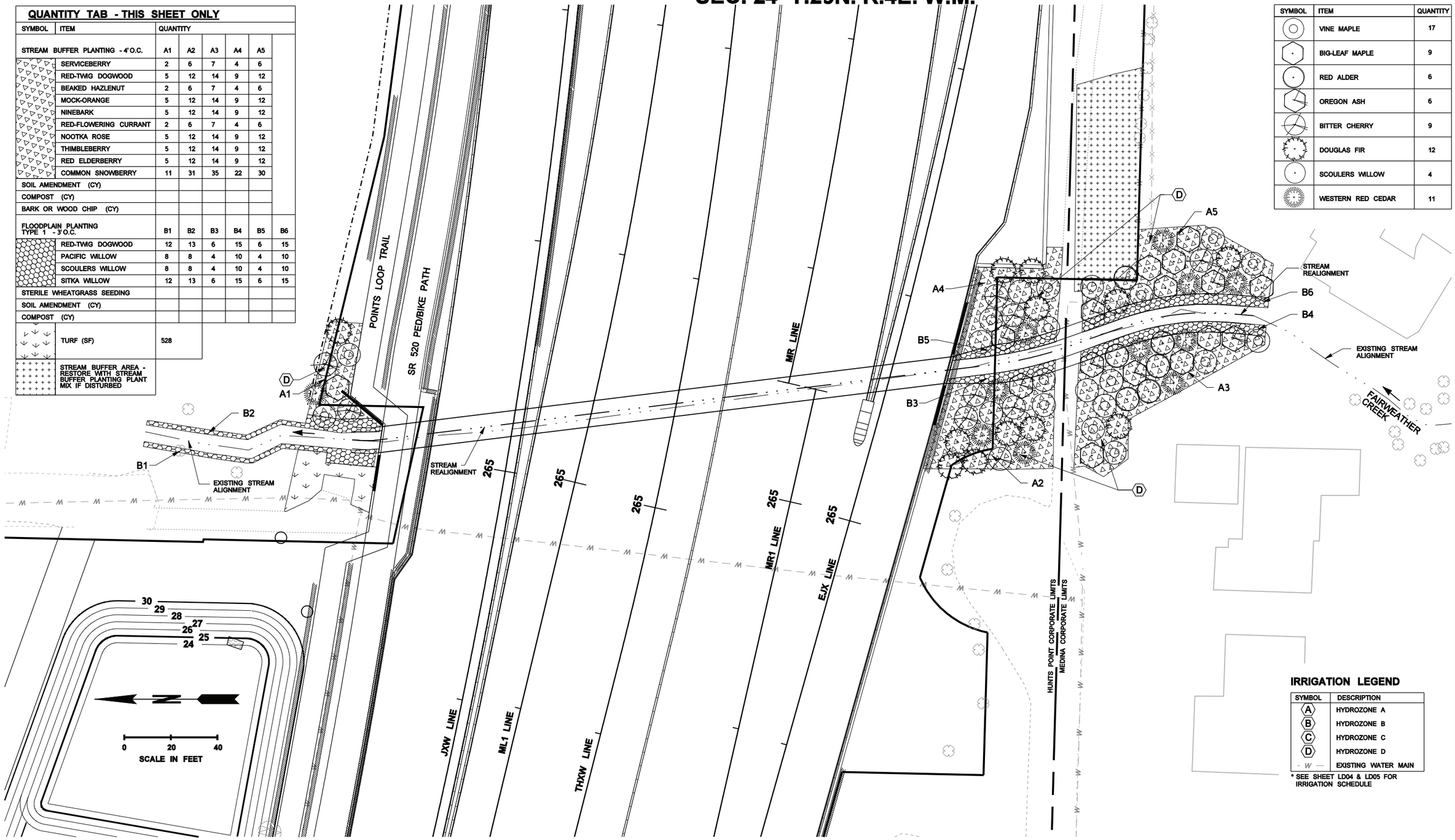
Appendix E—Mitigation Site Plan Sheets

SEC. 24 T.25N. R.4E. W.M.

QUANTITY TAB - THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY					
	STREAM BUFFER PLANTING - 4' O.C.	A1	A2	A3	A4	A5	
	SERVICEBERRY	2	6	7	4	6	
	RED-TWIG DOGWOOD	5	12	14	9	12	
	BEAKED HAZLENUT	2	6	7	4	6	
	MOCK-ORANGE	5	12	14	9	12	
	NINEBARK	5	12	14	9	12	
	RED-FLOWERING CURRANT	2	6	7	4	6	
	NOOTKA ROSE	5	12	14	9	12	
	THIMBLEBERRY	5	12	14	9	12	
	RED ELDERBERRY	5	12	14	9	12	
	COMMON SNOWBERRY	11	31	35	22	30	
	SOIL AMENDMENT (CY)						
	COMPOST (CY)						
	BARK OR WOOD CHIP (CY)						
	FLOODPLAIN PLANTING TYPE 1 - 3' O.C.	B1	B2	B3	B4	B5	B6
	RED-TWIG DOGWOOD	12	13	6	15	6	15
	PACIFIC WILLOW	8	8	4	10	4	10
	SCOULERS WILLOW	8	8	4	10	4	10
	SITKA WILLOW	12	13	6	15	6	15
	STERILE WHEATGRASS SEEDING						
	SOIL AMENDMENT (CY)						
	COMPOST (CY)						
	TURF (SF)	528					
	STREAM BUFFER AREA - RESTORE WITH STREAM BUFFER PLANTING PLANT MIX IF DISTURBED						

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	17
	BIG-LEAF MAPLE	9
	RED ALDER	6
	OREGON ASH	6
	BITTER CHERRY	9
	DOUGLAS FIR	12
	SCOULERS WILLOW	4
	WESTERN RED CEDAR	11



IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
- W -	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

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DATE	4/22/2010
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DESIGNED BY	J. SWENSON
ENTERED BY	M. GURRAD
CHECKED BY	S. WESSMAN
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. LENZI

REVISION | DATE | BY

REGION NO. 10 | STATE WASH | FED.AID PROJ.NO.

JOB NUMBER

CONTRACT NO. | LOCATION NO.

PRELIMINARY
NOT FOR CONSTRUCTION

P.E. STAMP BOX DATE

P.E. STAMP BOX DATE

Washington State Department of Transportation

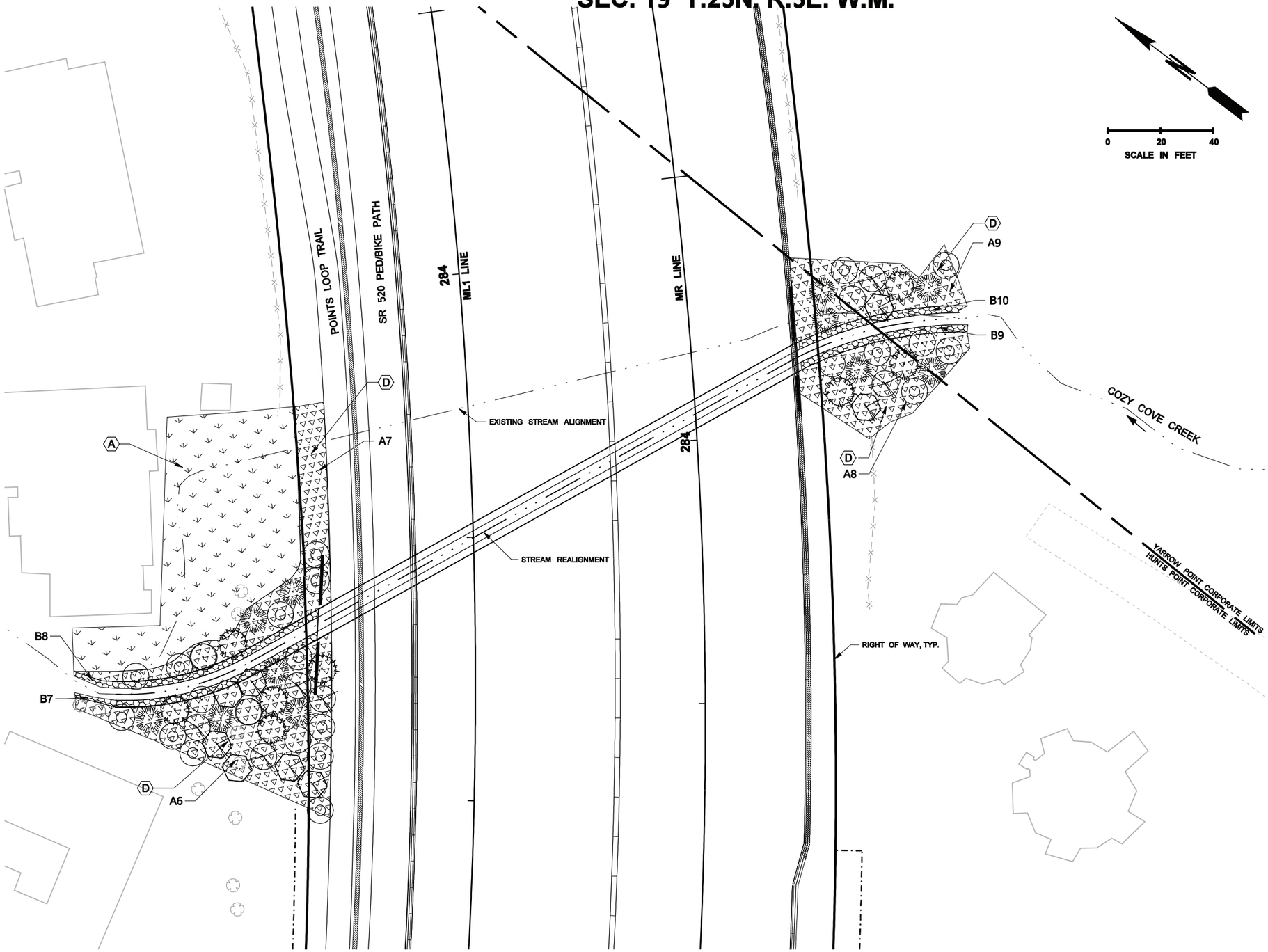
SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
FAIRWEATHER CREEK

STREAM PLANTING/IRRIGATION PLAN

FPA26

SHEET OF SHEETS

SEC. 19 T.25N. R.5E. W.M.



QUANTITY TAB - THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY			
	STREAM BUFFER PLANTING - 4' O.C.	A6	A7	A8	A9
	SERVICEBERRY	9	5	5	4
	RED-TWIG DOGWOOD	18	10	10	9
	BEAKED HAZLENUT	9	5	5	4
	MOCK-ORANGE	18	10	10	9
	NINEBARK	18	10	10	9
	RED-FLOWERING CURRANT	9	5	5	4
	NOOTKA ROSE	18	10	10	9
	THIMBLEBERRY	18	10	10	9
	RED ELDERBERRY	18	10	10	9
	COMMON SNOWBERRY	46	26	25	22
SOIL AMENDMENT (CY)					
COMPOST (CY)					
BARK OR WOOD CHIP (CY)					
FLOODPLAIN PLANTING TYPE 1 - 3' O.C.		B7	B8	B9	B10
	RED-TWIG DOGWOOD	10	10	6	6
	PACIFIC WILLOW	7	7	4	4
	SCOULERS WILLOW	7	7	4	4
	SITKA WILLOW	10	10	6	6
STERILE WHEATGRASS SEEDING					
SOIL AMENDMENT (CY)					
COMPOST (CY)					
	TURF (SF)	5,416			

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	17
	BIG-LEAF MAPLE	2
	RED ALDER	2
	OREGON ASH	6
	BITTER CHERRY	6
	DOUGLAS FIR	8
	SCOULERS WILLOW	5
	WESTERN RED CEDAR	11

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
- W -	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

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DATE	4/22/2010
PLOTTED BY	BeanJ
DESIGNED BY	J. SWENSON
ENTERED BY	M. GURRAD
CHECKED BY	S. WESSMAN
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. LENZI

REVISION | DATE | BY

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

PRELIMINARY
NOT FOR CONSTRUCTION

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

Washington State Department of Transportation

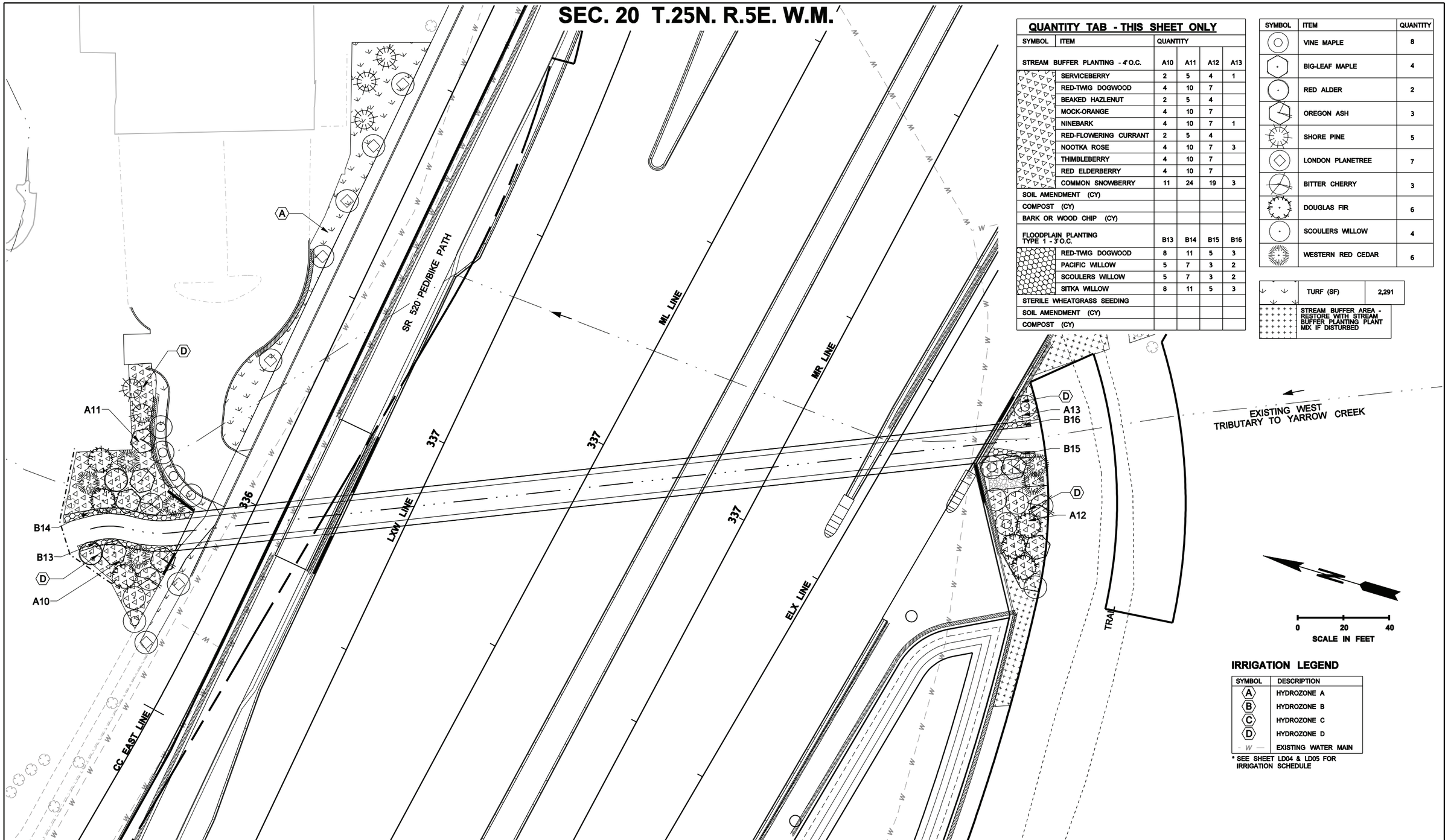
SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
COZY COVE CREEK

STREAM PLANTING/IRRIGATION PLAN

FPB26

SHEET OF SHEETS

SEC. 20 T.25N. R.5E. W.M.



QUANTITY TAB - THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY			
	STREAM BUFFER PLANTING - 4' O.C.	A10	A11	A12	A13
	SERVICEBERRY	2	5	4	1
	RED-TWIG DOGWOOD	4	10	7	
	BEAKED HAZLENUT	2	5	4	
	MOCK-ORANGE	4	10	7	
	NINEBARK	4	10	7	1
	RED-FLOWERING CURRANT	2	5	4	
	NOOTKA ROSE	4	10	7	3
	THIMBLEBERRY	4	10	7	
	RED ELDERBERRY	4	10	7	
	COMMON SNOWBERRY	11	24	19	3
	SOIL AMENDMENT (CY)				
	COMPOST (CY)				
	BARK OR WOOD CHIP (CY)				
	FLOODPLAIN PLANTING TYPE 1 - 3' O.C.	B13	B14	B15	B16
	RED-TWIG DOGWOOD	8	11	5	3
	PACIFIC WILLOW	5	7	3	2
	SCOULERS WILLOW	5	7	3	2
	SITKA WILLOW	8	11	5	3
	STERILE WHEATGRASS SEEDING				
	SOIL AMENDMENT (CY)				
	COMPOST (CY)				

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	8
	BIG-LEAF MAPLE	4
	RED ALDER	2
	OREGON ASH	3
	SHORE PINE	5
	LONDON PLANETREE	7
	BITTER CHERRY	3
	DOUGLAS FIR	6
	SCOULERS WILLOW	4
	WESTERN RED CEDAR	6

	TURF (SF)	2,291
	STREAM BUFFER AREA - RESTORE WITH STREAM BUFFER PLANTING PLANT MIX IF DISTURBED	

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
W	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

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DATE	4/22/2010
PLOTTED BY	BeanJ
DESIGNED BY	J. SWENSON
ENTERED BY	M. GURRAD
CHECKED BY	S. WESSMAN
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. LENZI

REVISION | DATE | BY

REGION NO. 10 | STATE WASH | FED.AID PROJ.NO.

JOB NUMBER

CONTRACT NO. | LOCATION NO.

PRELIMINARY
NOT FOR CONSTRUCTION

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

Washington State
Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
WEST TRIBUTARY TO YARROW CREEK

STREAM PLANTING/IRRIGATION PLAN

FPC26

SHEET
OF
SHEETS

SEC. 20 T.25N. R.5E. W.M.

QUANTITY TAB - THIS SHEET ONLY

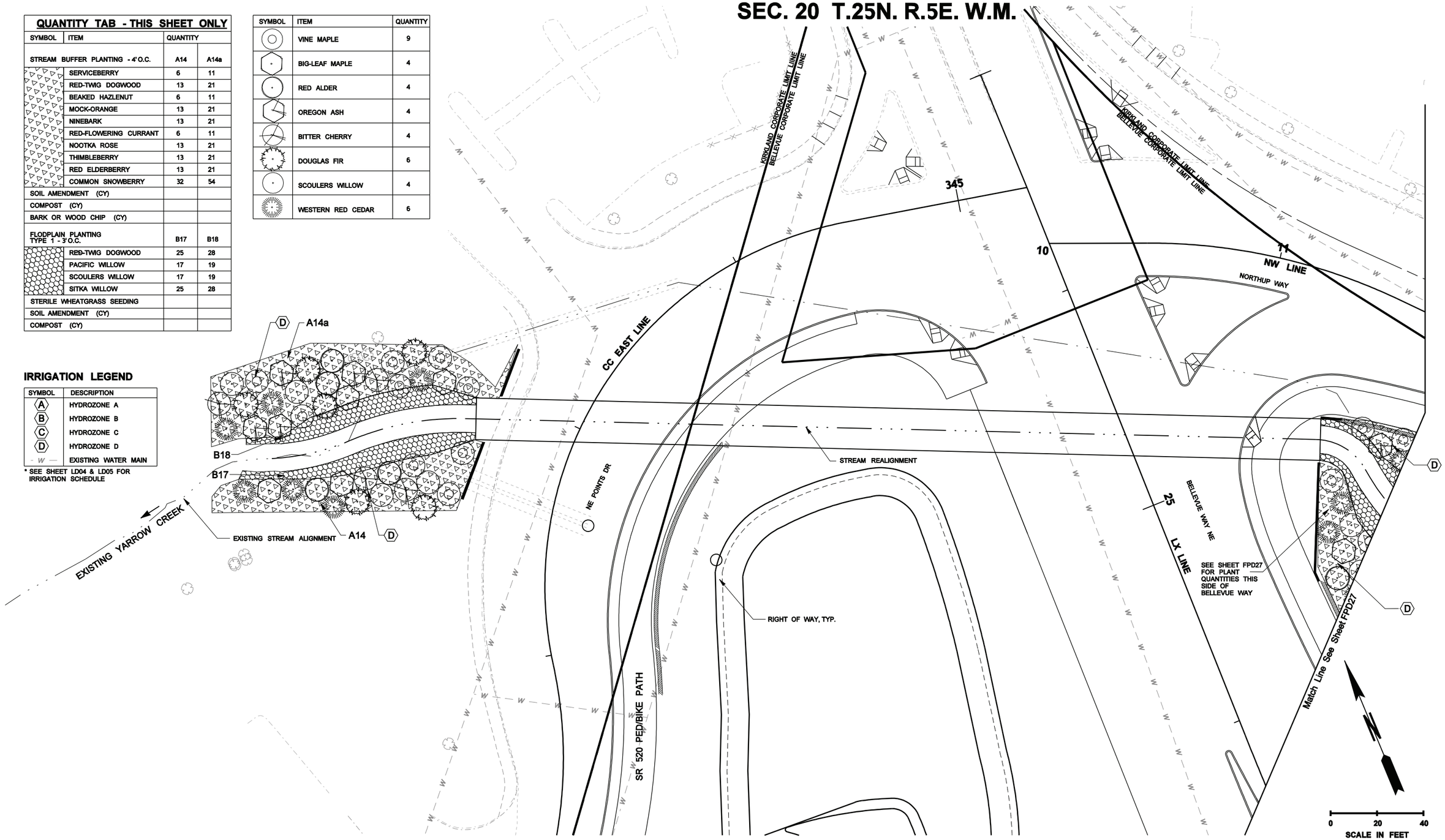
SYMBOL	ITEM	QUANTITY	
	STREAM BUFFER PLANTING - 4' O.C.	A14	A14a
	SERVICEBERRY	6	11
	RED-TWIG DOGWOOD	13	21
	BEAKED HAZLENUT	6	11
	MOCK-ORANGE	13	21
	NINEBARK	13	21
	RED-FLOWERING CURRANT	6	11
	NOOTKA ROSE	13	21
	THIMBLEBERRY	13	21
	RED ELDERBERRY	13	21
	COMMON SNOWBERRY	32	54
	SOIL AMENDMENT (CY)		
	COMPOST (CY)		
	BARK OR WOOD CHIP (CY)		
	FLODPLAIN PLANTING TYPE 1 - 3' O.C.	B17	B18
	RED-TWIG DOGWOOD	25	28
	PACIFIC WILLOW	17	19
	SCOULERS WILLOW	17	19
	SITKA WILLOW	25	28
	STERILE WHEATGRASS SEEDING		
	SOIL AMENDMENT (CY)		
	COMPOST (CY)		

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	9
	BIG-LEAF MAPLE	4
	RED ALDER	4
	OREGON ASH	4
	BITTER CHERRY	4
	DOUGLAS FIR	6
	SCOULERS WILLOW	4
	WESTERN RED CEDAR	6

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
— W —	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE



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DESIGNED BY	J. SWENSON				CONTRACT NO.		LOCATION NO.
ENTERED BY	M. GURRAD						
CHECKED BY	S. WESSMAN						
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. LENZI	REVISION	DATE	BY			

PRELIMINARY
NOT FOR CONSTRUCTION

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

Washington State
Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
YARROW CREEK

STREAM PLANTING/IRRIGATION PLAN

FPD26

SHEET
OF
SHEETS

SEC. 20 T.25N. R.5E. W.M.

HABITAT FEATURES LEGEND

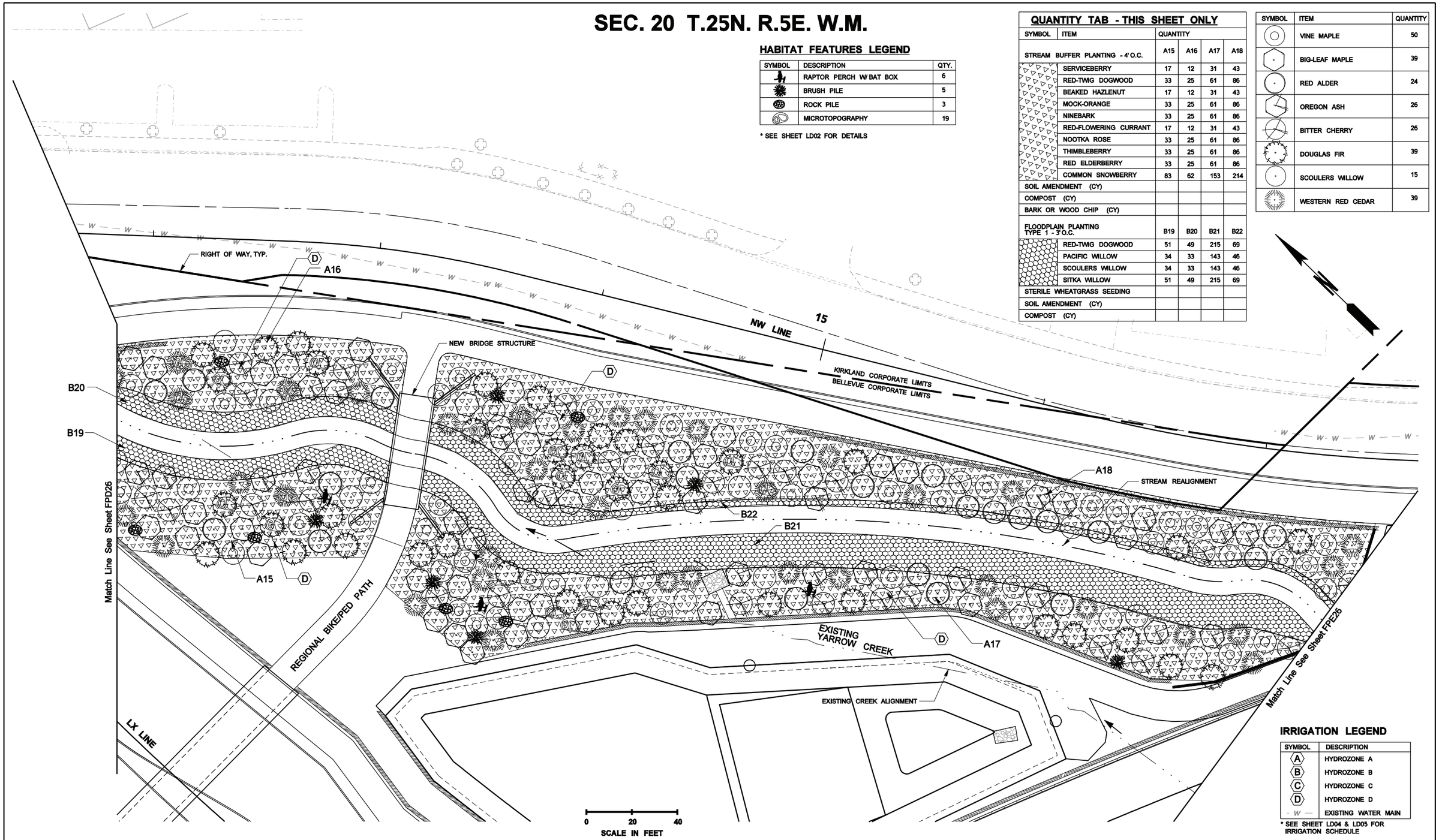
SYMBOL	DESCRIPTION	QTY.
	RAPTOR PERCH W/ BAT BOX	6
	BRUSH PILE	5
	ROCK PILE	3
	MICROTOPOGRAPHY	19

* SEE SHEET LD02 FOR DETAILS

QUANTITY TAB - THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY			
	STREAM BUFFER PLANTING - 4' O.C.	A15	A16	A17	A18
	SERVICEBERRY	17	12	31	43
	RED-TWIG DOGWOOD	33	25	61	86
	BEAKED HAZLENUT	17	12	31	43
	MOCK-ORANGE	33	25	61	86
	NINEBARK	33	25	61	86
	RED-FLOWERING CURRANT	17	12	31	43
	NOOTKA ROSE	33	25	61	86
	THIMBLEBERRY	33	25	61	86
	RED ELDERBERRY	33	25	61	86
	COMMON SNOWBERRY	83	62	153	214
SOIL AMENDMENT (CY)					
COMPOST (CY)					
BARK OR WOOD CHIP (CY)					
FLOODPLAIN PLANTING TYPE 1 - 3' O.C.		B19	B20	B21	B22
	RED-TWIG DOGWOOD	51	49	215	69
	PACIFIC WILLOW	34	33	143	46
	SCOULERS WILLOW	34	33	143	46
	SITKA WILLOW	51	49	215	69
STERILE WHEATGRASS SEEDING					
SOIL AMENDMENT (CY)					
COMPOST (CY)					

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	50
	BIG-LEAF MAPLE	39
	RED ALDER	24
	OREGON ASH	26
	BITTER CHERRY	26
	DOUGLAS FIR	39
	SCOULERS WILLOW	15
	WESTERN RED CEDAR	39



IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
- W -	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

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DESIGNED BY	J. SWENSON					
ENTERED BY	M. GURRAD					
CHECKED BY	S. WESSMAN			CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	D. EDWARDS					
REGIONAL ADM.	J. LENZI	REVISION	DATE	BY		

PRELIMINARY
NOT FOR CONSTRUCTION

DATE
P.E. STAMP BOX

DATE
P.E. STAMP BOX

Washington State Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
YARROW CREEK

STREAM PLANTING/IRRIGATION PLAN

FPD27

SHEET OF SHEETS

SEC. 20 T.25N. R.5E. W.M.

QUANTITY TAB-THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY	
	STREAM BUFFER PLANTING - 4' O.C.	A19	A20
	SERVICEBERRY	46	54
	RED-TWIG DOGWOOD	93	108
	BEAKED HAZLENUT	46	54
	MOCK-ORANGE	93	108
	NINEBARK	93	108
	RED-FLOWERING CURRANT	46	54
	NOOTKA ROSE	93	108
	THIMBLEBERRY	93	108
	RED ELDERBERRY	93	108
	COMMON SNOWBERRY	232	271
	SOIL AMENDMENT (CY)		
	COMPOST (CY)		
	BARK OR WOOD CHIP (CY)		
	FLOODPLAIN PLANTING TYPE 1 - 3' O.C.	B23	B24
	RED-TWIG DOGWOOD	57	57
	PACIFIC WILLOW	38	38
	SCOULERS WILLOW	38	38
	SITKA WILLOW	57	57
	STERILE WHEATGRASS SEEDING		
	SOIL AMENDMENT (CY)		
	COMPOST (CY)		

	FLOODPLAIN PLANTING TYPE 2 - 4' O.C.	C1	C2	C3
	RED-TWIG DOGWOOD	53	95	95
	TWINBERRY	53	95	95
	NINEBARK	53	95	95
	CLUSTERED ROSE	53	95	95
	HOOKERS WILLOW	53	95	95
	SITKA WILLOW	53	95	95
	DOUGLAS SPIREA	35	63	63
	STERILE WHEATGRASS SEEDING			
	SOIL AMENDMENT (CY)			
	COMPOST (CY)			

	WETLAND RETORATION PLANTING TYPE 2 - 4' O.C.	D1
	RED-TWIG DOGWOOD	50
	TWINBERRY	50
	NINEBARK	50
	CLUSTERED ROSE	50
	HOOKERS WILLOW	50
	SITKA WILLOW	50
	DOUGLAS SPIREA	33
	STERILE WHEATGRASS SEEDING	
	SOIL AMENDMENT (CY)	
	COMPOST (CY)	

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	54
	BIG-LEAF MAPLE	27
	RED ALDER	46
	OREGON ASH	56
	SITKA SPRUCE	31
	BLACK COTTONWOOD	24
	BITTER CHERRY	34
	DOUGLAS FIR	43
	CASCARA	4
	PACIFIC WILLOW	24
	SCOULERS WILLOW	26
	WESTERN RED CEDAR	75

HABITAT FEATURES LEGEND

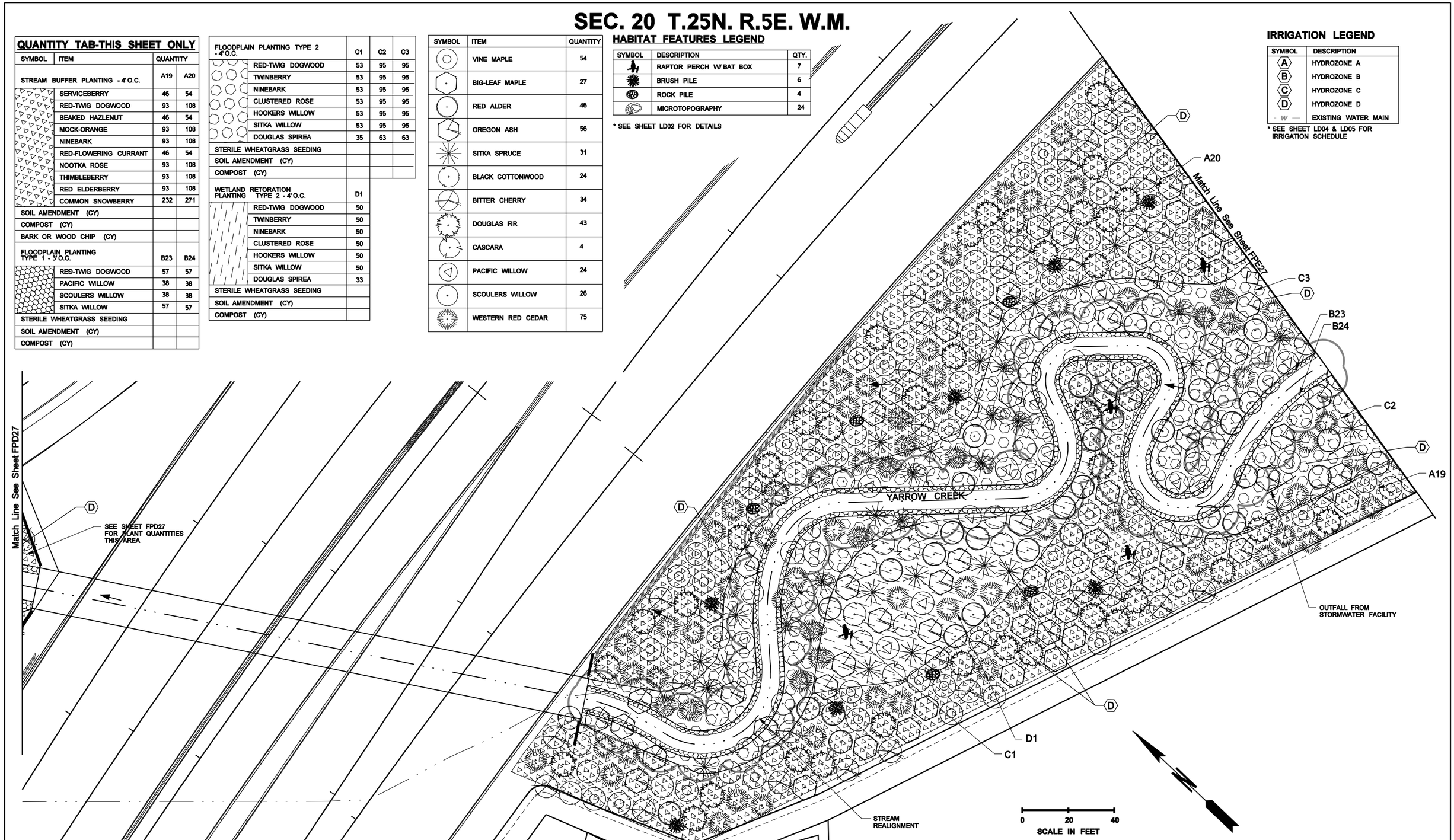
SYMBOL	DESCRIPTION	QTY.
	RAPTOR PERCH W/BAT BOX	7
	BRUSH PILE	6
	ROCK PILE	4
	MICROTOPOGRAPHY	24

* SEE SHEET LD02 FOR DETAILS

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
- W -	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE



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DESIGNED BY	J. SWENSON				
ENTERED BY	M. GURRAD				
CHECKED BY	S. WESSMAN				
PROJ. ENGR.	D. EDWARDS	AD4– MODIFY HATCH TYPE OF FLOODPLAIN 1	06/22/2010	MG	
REGIONAL ADM.	J. LENZI	REVISION	DATE	BY	

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

PRELIMINARY
NOT FOR CONSTRUCTION

DATE
P.E. STAMP BOX

DATE
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Washington State Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
YARROW CREEK

STREAM PLANTING/IRRIGATION PLAN

FPE26

SHEET OF SHEETS

HABITAT FEATURES LEGEND

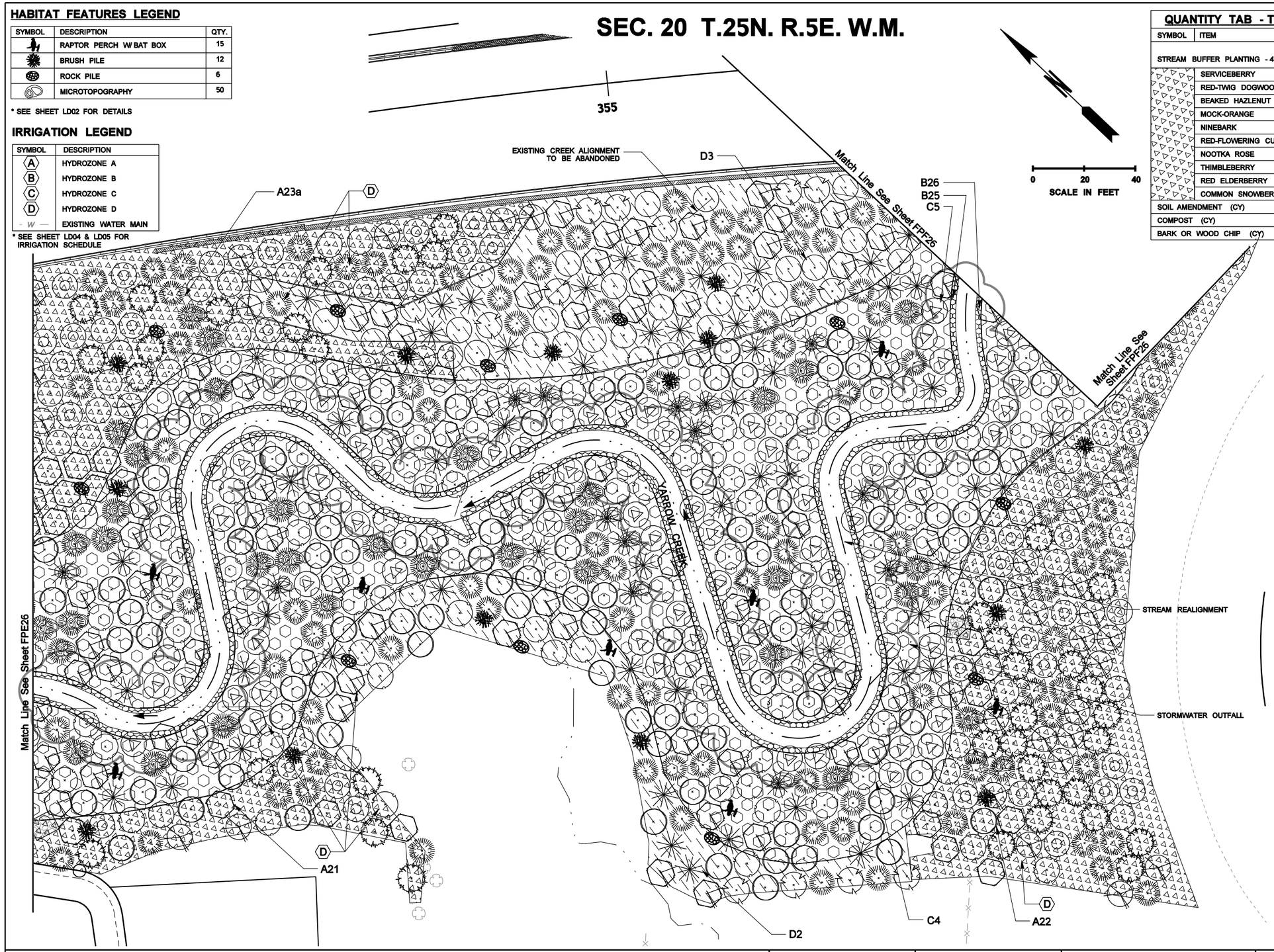
SYMBOL	DESCRIPTION	QTY.
	RAPTOR PERCH W/ BAT BOX	15
	BRUSH PILE	12
	ROCK PILE	6
	MICROTOPOGRAPHY	50

* SEE SHEET LD02 FOR DETAILS

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
— W —	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE



QUANTITY TAB - THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY		
	STREAM BUFFER PLANTING - 4' O.C.	A21	A22	A23a
	SERVICEBERRY	11	52	32
	RED-TWIG DOGWOOD	21	104	63
	BEAKED HAZLENUT	11	52	32
	MOCK-ORANGE	21	104	63
	NINEBARK	21	104	63
	RED-FLOWERING CURRANT	11	52	32
	NOOTKA ROSE	21	104	63
	THIMBLEBERRY	21	104	63
	RED ELDERBERRY	21	104	63
	COMMON SNOWBERRY	53	261	158
SOIL AMENDMENT (CY)				
COMPOST (CY)				
BARK OR WOOD CHIP (CY)				

	FLOODPLAIN PLANTING TYPE 1 - 3' O.C.	B25	B26
	RED-TWIG DOGWOOD	77	79
	PACIFIC WILLOW	52	52
	SCOULERS WILLOW	52	52
	SITKA WILLOW	77	79
STERILE WHEATGRASS SEEDING			
SOIL AMENDMENT (CY)			
COMPOST (CY)			
	FLOODPLAIN PLANTING TYPE 2 - 4' O.C.	C4	C5
	RED-TWIG DOGWOOD	285	213
	TWINBERRY	285	213
	NINEBARK	285	213
	CLUSTERED ROSE	285	213
	HOOKERS WILLOW	285	213
	SITKA WILLOW	285	213
	DOUGLAS SPIREA	190	142
STERILE WHEATGRASS SEEDING			
SOIL AMENDMENT (CY)			
COMPOST (CY)			
	WETLAND RETORATION PLANTING TYPE 2 - 4' O.C.	D2	D3
	RED-TWIG DOGWOOD	56	117
	TWINBERRY	56	117
	NINEBARK	56	117
	CLUSTERED ROSE	56	117
	HOOKERS WILLOW	56	117
	SITKA WILLOW	56	117
	DOUGLAS SPIREA	37	78
STERILE WHEATGRASS SEEDING			
SOIL AMENDMENT (CY)			
COMPOST (CY)			

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	42
	BIG-LEAF MAPLE	13
	RED ALDER	88
	OREGON ASH	112
	SITKA SPRUCE	86
	BLACK COTTONWOOD	75
	BITTER CHERRY	35
	DOUGLAS FIR	32
	CASCARA	14
	PACIFIC WILLOW	85
	SCOULERS WILLOW	65
	WESTERN RED CEDAR	124

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DESIGNED BY	J. SWENSON
ENTERED BY	M. GURRAD
CHECKED BY	S. WESSMAN
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. LENZI

REVISION	DATE	BY
AD4– MODIFY HATCH TYPE OF FLOODPLAIN 1	06/22/2010	MG

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

PRELIMINARY
NOT FOR CONSTRUCTION

DATE
P.E. STAMP BOX

DATE
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Washington State Department of Transportation

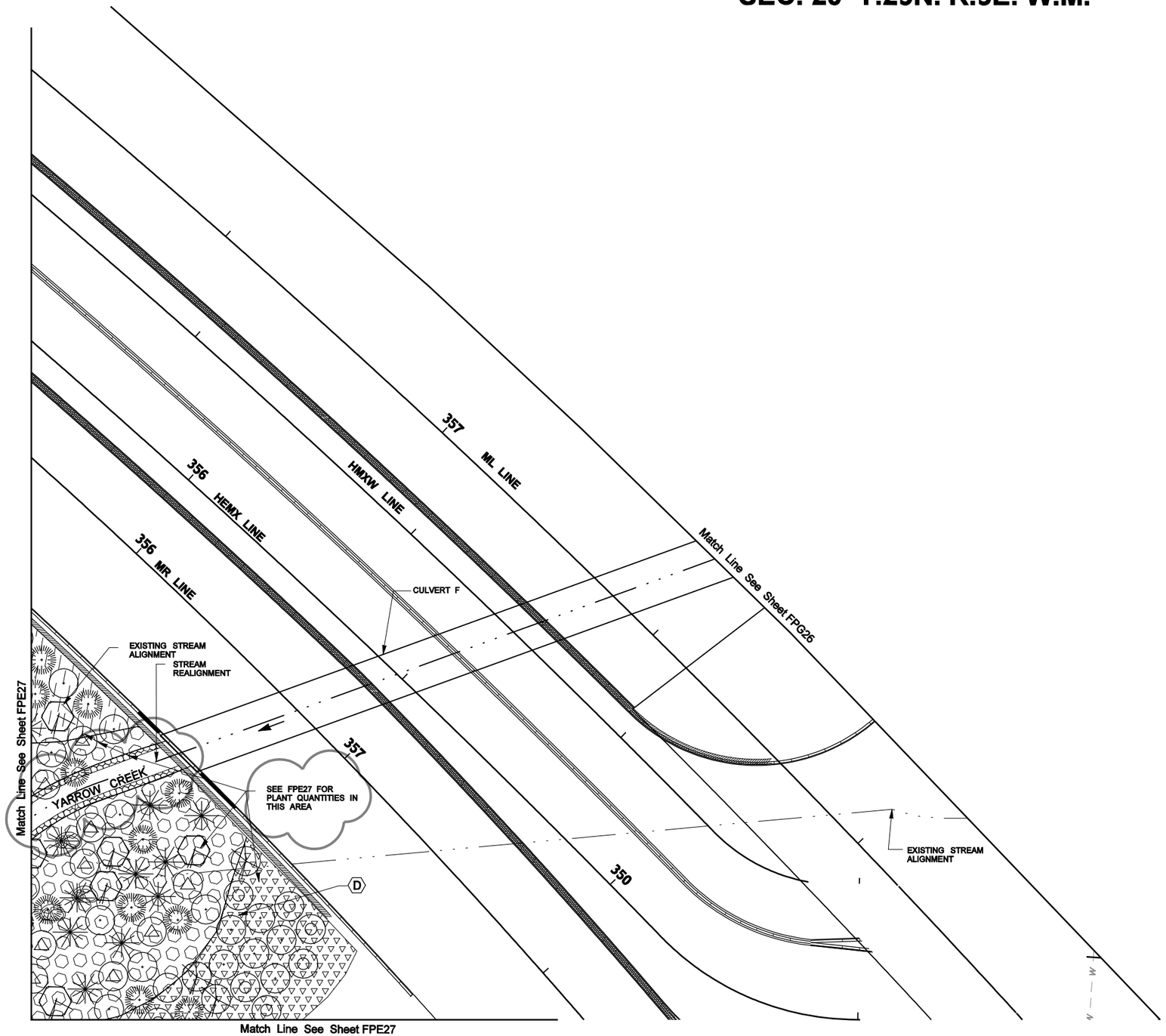
SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
YARROW CREEK

STREAM PLANTING/IRRIGATION PLAN

FPE27

SHEET OF SHEETS

SEC. 20 T.25N. R.5E. W.M.



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0 20 40
SCALE IN FEET

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
— W —	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

HABITAT FEATURES LEGEND

SYMBOL	DESCRIPTION	QTY.
	RAPTOR PERCH W/ BAT BOX	2
	BRUSH PILE	1
	ROCK PILE	1
	MICROTOPOGRAPHY	8

* SEE SHEET LD02 FOR DETAILS

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DATE	6/22/2010						
PLOTTED BY	sawatzf				JOB NUMBER		
DESIGNED BY	J. SWENSON						
ENTERED BY	M. GURRAD						
CHECKED BY	S. WESSMAN	AD4– CHANGED REFERENCE SHEET	06/22/2010	MG	CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	D. EDWARDS	AD4– MODIFY HATCH TYPE OF FLOODPLAIN 1	06/22/2010	MG			
REGIONAL ADM.	J. LENZI	REVISION	DATE	BY			

PRELIMINARY
NOT FOR CONSTRUCTION

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Washington State
Department of Transportation

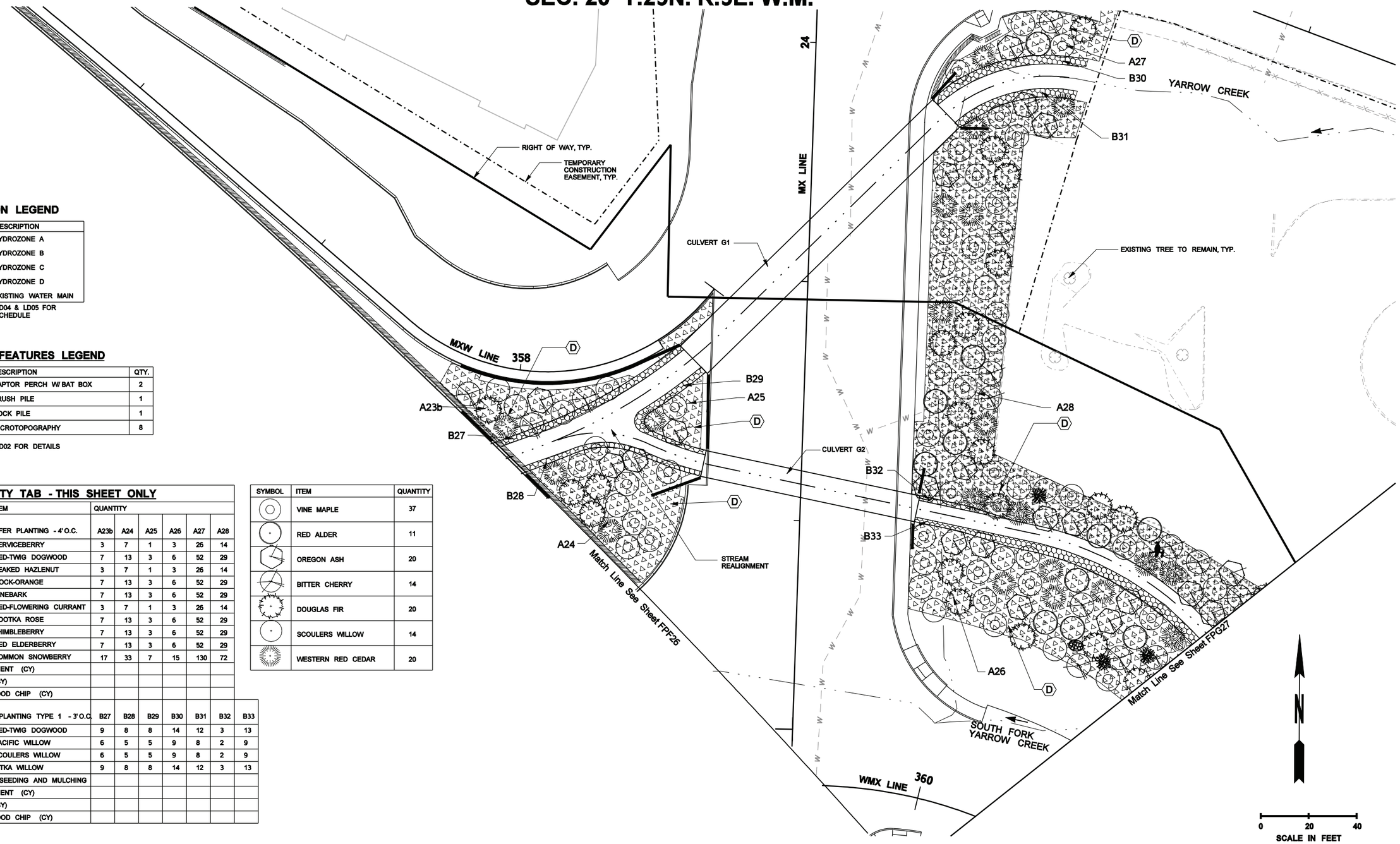
SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
YARROW CREEK & SOUTH FORK YARROW CREEK

STREAM PLANTING/IRRIGATION PLAN

FPF26

SHEET
OF
SHEETS

SEC. 20 T.25N. R.5E. W.M.



IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
- W -	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

HABITAT FEATURES LEGEND

SYMBOL	DESCRIPTION	QTY.
	RAPTOR PERCH W/ BAT BOX	2
	BRUSH PILE	1
	ROCK PILE	1
	MICROTOPOGRAPHY	8

* SEE SHEET LD02 FOR DETAILS

QUANTITY TAB - THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY					
	STREAM BUFFER PLANTING - 4' O.C.	A23b	A24	A25	A26	A27	A28
	SERVICEBERRY	3	7	1	3	26	14
	RED-TWIG DOGWOOD	7	13	3	6	52	29
	BEAKED HAZLENUT	3	7	1	3	26	14
	MOCK-ORANGE	7	13	3	6	52	29
	NINEBARK	7	13	3	6	52	29
	RED-FLOWERING CURRANT	3	7	1	3	26	14
	NOOTKA ROSE	7	13	3	6	52	29
	THIMBLEBERRY	7	13	3	6	52	29
	RED ELDERBERRY	7	13	3	6	52	29
	COMMON SNOWBERRY	17	33	7	15	130	72
	SOIL AMENDMENT (CY)						
	COMPOST (CY)						
	BARK OR WOOD CHIP (CY)						

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	37
	RED ALDER	11
	OREGON ASH	20
	BITTER CHERRY	14
	DOUGLAS FIR	20
	SCOULERS WILLOW	14
	WESTERN RED CEDAR	20

	FLOODPLAIN PLANTING TYPE 1 - 3' O.C.	B27	B28	B29	B30	B31	B32	B33
	RED-TWIG DOGWOOD	9	8	8	14	12	3	13
	PACIFIC WILLOW	6	5	5	9	8	2	9
	SCOULERS WILLOW	6	5	5	9	8	2	9
	SITKA WILLOW	9	8	8	14	12	3	13
	WET NATIVE SEEDING AND MULCHING							
	SOIL AMENDMENT (CY)							
	COMPOST (CY)							
	BARK OR WOOD CHIP (CY)							

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PLOTTED BY	BeanJ
DESIGNED BY	J. SWENSON
ENTERED BY	M. GURRAD
CHECKED BY	S. WESSMAN
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. LENZI

REVISION | DATE | BY

REGION NO. 10 | STATE WASH | FED.AID PROJ.NO.

JOB NUMBER

CONTRACT NO. | LOCATION NO.

PRELIMINARY
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Washington State Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
YARROW CREEK & SOUTH FORK YARROW CREEK

STREAM PLANTING/IRRIGATION PLAN

FPG26

SHEET OF SHEETS

SEC. 20 T.25N. R.5E. W.M.

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
W	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

SYMBOL	ITEM	QUANTITY
	BUFFER ENHANCEMENT PLANTING - 4' O.C.	
	UNDER-PLANTING FOR ENHANCEMENT OR DISTURBANCE	E1
	SERVICEBERRY	4
	RED-TWIG DOGWOOD	8
	BEAKED HAZLENUT	4
	MOCK-ORANGE	8
	NINEBARK	8
	RED-FLOWERING CURRANT	4
	NOOTKA ROSE	8
	THIMBLEBERRY	8
	RED ELDERBERRY	8
	COMMON SNOWBERRY	21
	STERILE WHEATGRASS SEEDING	
	SOIL AMENDMENT (CY)	
	COMPOST (CY)	
	BARK OR WOOD CHIP (CY)	

QUANTITY TAB - THIS SHEET ONLY

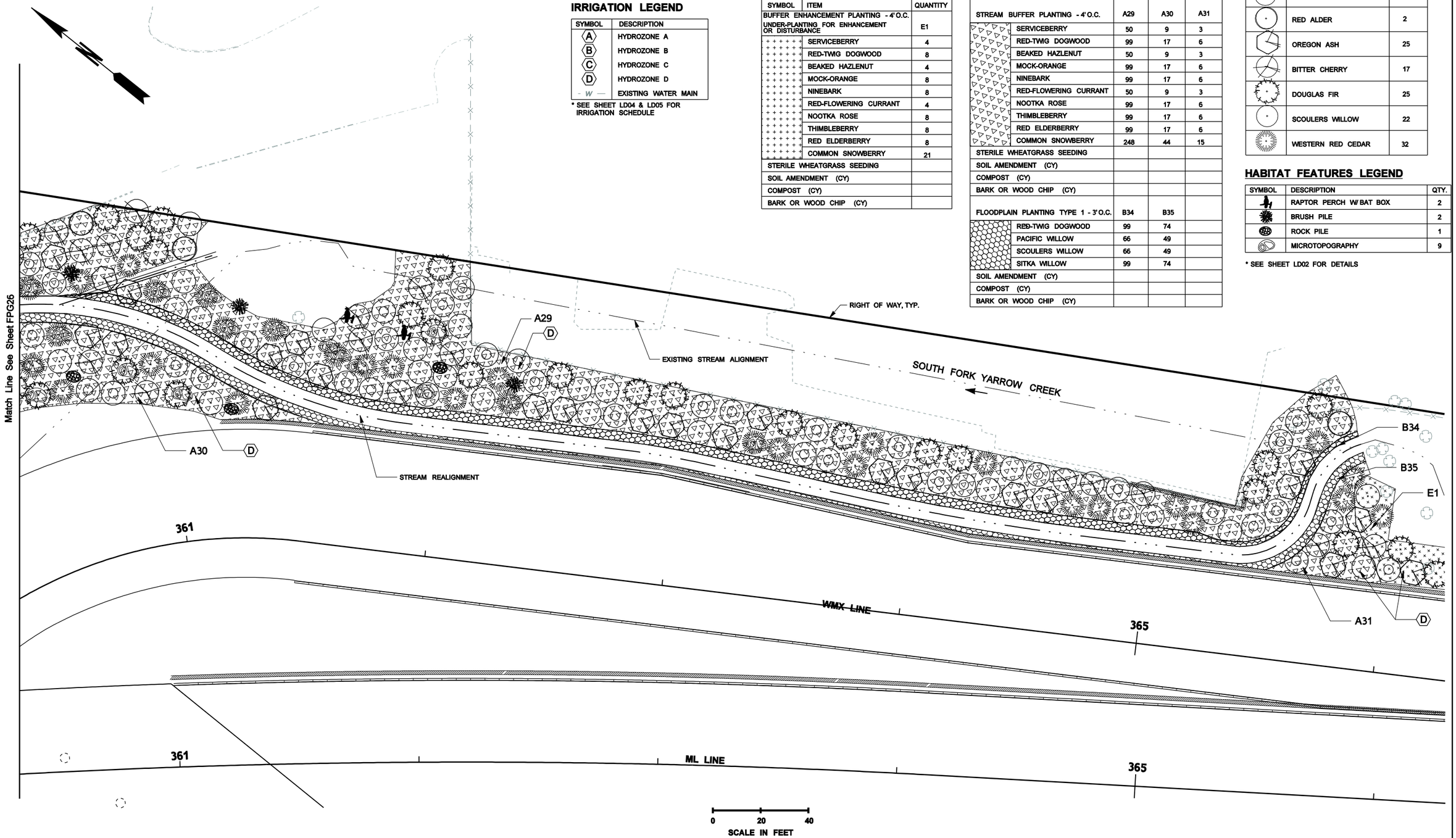
SYMBOL	ITEM	QUANTITY		
	STREAM BUFFER PLANTING - 4' O.C.	A29	A30	A31
	SERVICEBERRY	50	9	3
	RED-TWIG DOGWOOD	99	17	6
	BEAKED HAZLENUT	50	9	3
	MOCK-ORANGE	99	17	6
	NINEBARK	99	17	6
	RED-FLOWERING CURRANT	50	9	3
	NOOTKA ROSE	99	17	6
	THIMBLEBERRY	99	17	6
	RED ELDERBERRY	99	17	6
	COMMON SNOWBERRY	248	44	15
	STERILE WHEATGRASS SEEDING			
	SOIL AMENDMENT (CY)			
	COMPOST (CY)			
	BARK OR WOOD CHIP (CY)			
	FLOODPLAIN PLANTING TYPE 1 - 3' O.C.	B34	B35	
	RED-TWIG DOGWOOD	99	74	
	PACIFIC WILLOW	66	49	
	SCOULERS WILLOW	66	49	
	SITKA WILLOW	99	74	
	SOIL AMENDMENT (CY)			
	COMPOST (CY)			
	BARK OR WOOD CHIP (CY)			

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	40
	RED ALDER	2
	OREGON ASH	25
	BITTER CHERRY	17
	DOUGLAS FIR	25
	SCOULERS WILLOW	22
	WESTERN RED CEDAR	32

HABITAT FEATURES LEGEND

SYMBOL	DESCRIPTION	QTY.
	RAPTOR PERCH W/ BAT BOX	2
	BRUSH PILE	2
	ROCK PILE	1
	MICROTOPOGRAPHY	9

* SEE SHEET LD02 FOR DETAILS



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DESIGNED BY	J. SWENSON
ENTERED BY	M. GURRAD
CHECKED BY	S. WESSMAN
PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. LENZI

REVISION	DATE	BY

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

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NOT FOR CONSTRUCTION

DATE
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DATE
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Washington State Department of Transportation

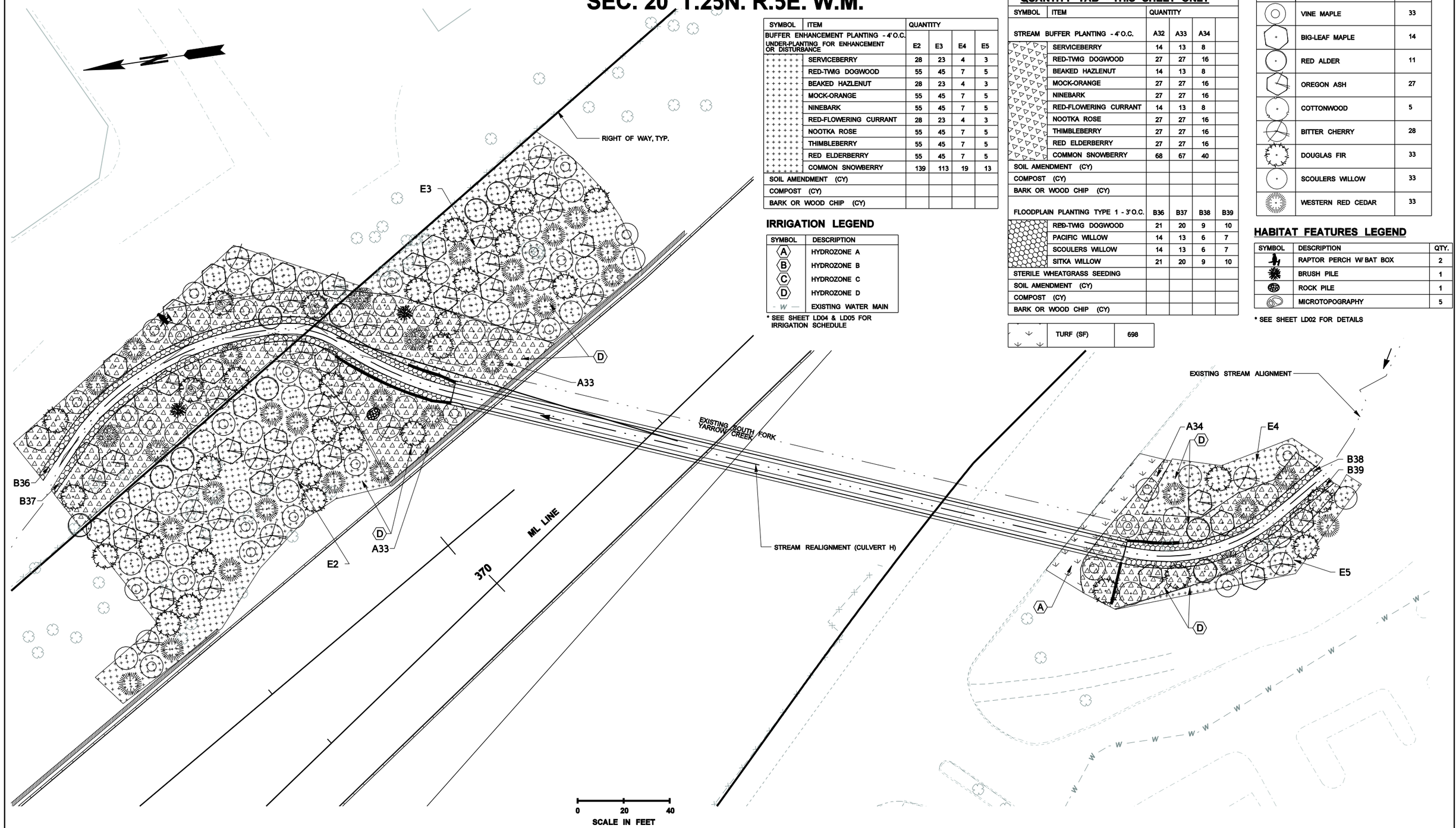
SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
SOUTH FORK YARROW CREEK

STREAM PLANTING/IRRIGATION PLAN

FPG27

SHEET OF SHEETS

SEC. 20 T.25N. R.5E. W.M.



SYMBOL	ITEM	QUANTITY			
	BUFFER ENHANCEMENT PLANTING - 4' O.C. UNDER-PLANTING FOR ENHANCEMENT OR DISTURBANCE	E2	E3	E4	E5
	SERVICEBERRY	28	23	4	3
	RED-TWIG DOGWOOD	55	45	7	5
	BEAKED HAZLENUT	28	23	4	3
	MOCK-ORANGE	55	45	7	5
	NINEBARK	55	45	7	5
	RED-FLOWERING CURRANT	28	23	4	3
	NOOTKA ROSE	55	45	7	5
	THIMBLEBERRY	55	45	7	5
	RED ELDERBERRY	55	45	7	5
	COMMON SNOWBERRY	139	113	19	13
SOIL AMENDMENT (CY)					
COMPOST (CY)					
BARK OR WOOD CHIP (CY)					

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
W	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

QUANTITY TAB - THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY			
	STREAM BUFFER PLANTING - 4' O.C.	A32	A33	A34	
	SERVICEBERRY	14	13	8	
	RED-TWIG DOGWOOD	27	27	16	
	BEAKED HAZLENUT	14	13	8	
	MOCK-ORANGE	27	27	16	
	NINEBARK	27	27	16	
	RED-FLOWERING CURRANT	14	13	8	
	NOOTKA ROSE	27	27	16	
	THIMBLEBERRY	27	27	16	
	RED ELDERBERRY	27	27	16	
	COMMON SNOWBERRY	68	67	40	
SOIL AMENDMENT (CY)					
COMPOST (CY)					
BARK OR WOOD CHIP (CY)					
	FLOODPLAIN PLANTING TYPE 1 - 3' O.C.	B36	B37	B38	B39
	RED-TWIG DOGWOOD	21	20	9	10
	PACIFIC WILLOW	14	13	6	7
	SCOULERS WILLOW	14	13	6	7
	SITKA WILLOW	21	20	9	10
STERILE WHEATGRASS SEEDING					
SOIL AMENDMENT (CY)					
COMPOST (CY)					
BARK OR WOOD CHIP (CY)					

	TURF (SF)	698

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	33
	BIG-LEAF MAPLE	14
	RED ALDER	11
	OREGON ASH	27
	COTTONWOOD	5
	BITTER CHERRY	28
	DOUGLAS FIR	33
	SCOULERS WILLOW	33
	WESTERN RED CEDAR	33

HABITAT FEATURES LEGEND

SYMBOL	DESCRIPTION	QTY.
	RAPTOR PERCH W/ BAT BOX	2
	BRUSH PILE	1
	ROCK PILE	1
	MICROTOPOGRAPHY	5

* SEE SHEET LD02 FOR DETAILS

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PLOTTED BY	GurradM					
DESIGNED BY	J. SWENSON				JOB NUMBER	
ENTERED BY	M. GURRAD					
CHECKED BY	S. WESSMAN				CONTRACT NO.	LOCATION NO.
PROJ. ENGR.	D. EDWARDS					
REGIONAL ADM.	J. LENZI	REVISION	DATE	BY		

PRELIMINARY
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Washington State
Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
SOUTH FORK YARROW CREEK (CULVERT H)

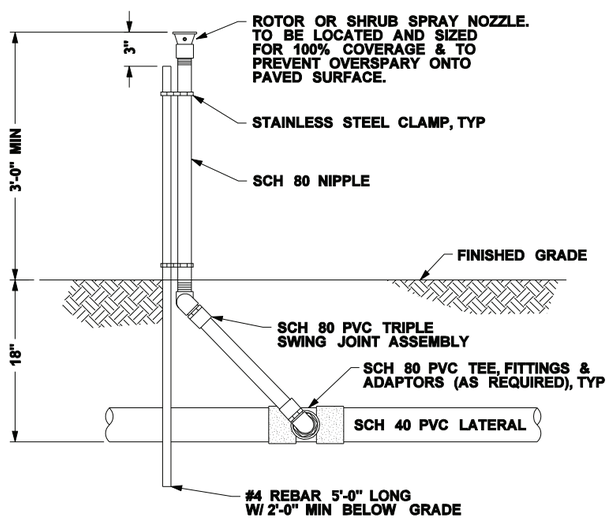
STREAM PLANTING/IRRIGATION PLAN

FPH26

SHEET
OF
SHEETS

IRRIGATION SCHEDULE

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
A	HYDROZONE A - LAWN & FLOWER BEDS	B	HYDROZONE B - HIGHER WATER USE	C	HYDROZONE C - MEDIUM WATER USE	D	HYDROZONE D - LOW WATER USE
DESCRIPTION: - DESIGN AND INSTALL PERMANENT UNDERGROUND IRRIGATION SYSTEM FOR LAWN AND FLOWER BEDS. - SYSTEM SHALL BE AUTOMATIC WITH REMOTE COMPUTER CONTROL AND 120 VOLT SERVICE.		DESCRIPTION: - DESIGN AND INSTALL PERMANENT UNDERGROUND IRRIGATION SYSTEM FOR HIGHER WATER USE PLANTING TYPES. - SYTSTEM SHALL BE AUTOMATIC WITH REMOTE COMPUTER CONTROL AND 120 VOLT SERVICE.		DESCRIPTION: - PERMANENT UNDERGROUND IRRIGATION SYSTEM FOR MEDIUM WATER USE PLANTS. - SYSTEM SHALL BE AUTOMATIC WITH REMOTE COMPUTER CONTROL AND 120 VOLT SERVICE.		DESCRIPTION: - DESIGN AND INSTALL TEMPORARY OR PERMANENT, ABOVE AND UNDERGROUND AUTOMATIC IRRIGATION FOR NATIVE AND LOW WATER USE PLANTS REQUIRING A THREE YEAR PLANT ESTABLISHMENT PERIOD. - SYSTEM SHALL USE BATTERY OR LINE VOLTAGE ACTUATED VALVES AND CONTROLLERS. - OVERHEAD SPRAYS, ROTORS OR DRIP TYPE IRRIGATION SHALL BE USED.



IRRIGATION HEAD RISER

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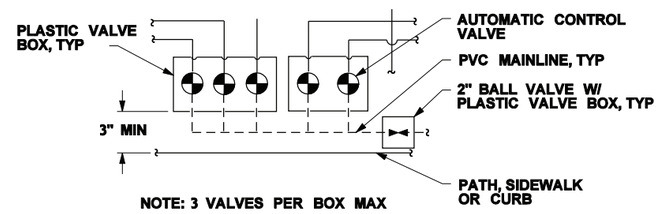

TYPICAL VALVE CLUSTER

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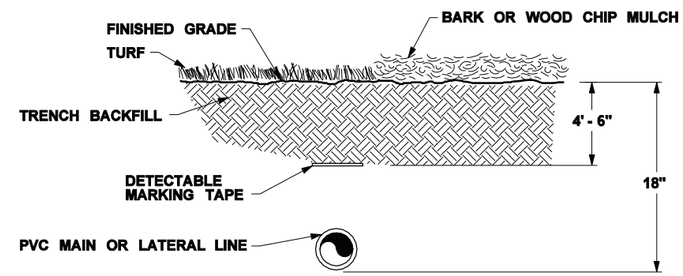

DETECTABLE MARKING TAPE INSTALLATION

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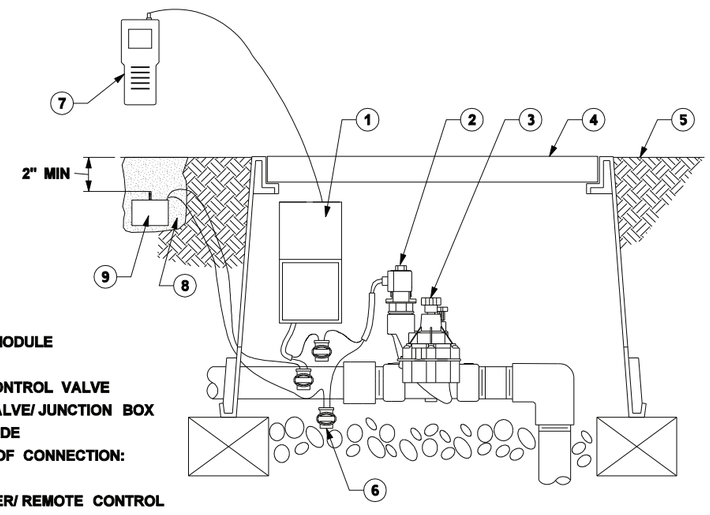
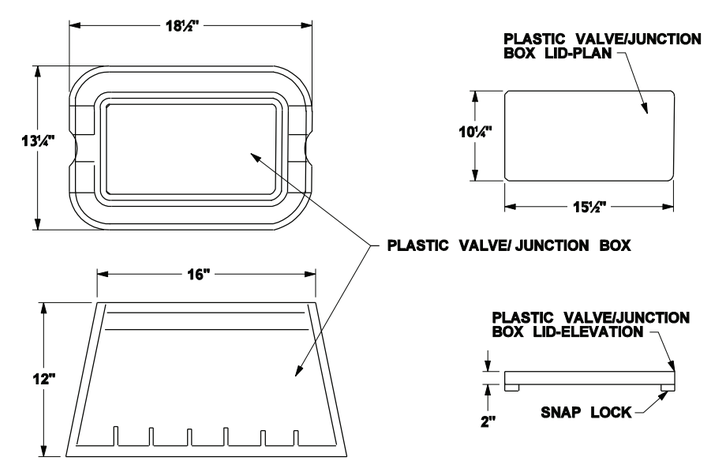


1. CONTROL MODULE
2. SOLENOID
3. REMOTE CONTROL VALVE
4. PLASTIC VALVE/ JUNCTION BOX
5. FINISH GRADE
6. WATERPROOF CONNECTION: (1 OF 3)
7. TRANSMITTER/ REMOTE CONTROL
8. SAND, BACKFILL FOR DRAINS
9. RAIN SENSOR SHUT-OFF DEVICE

BATTERY-OPERATED CONTROLLER W/ FIELD TRANSMITTER

NOT TO SCALE



NOTE:
ALL BOXES AND LIDS SHALL BE BLACK IN COLOR.
USE EXTENSION BOXES WHERE REQUIRED TO ACHIEVE NECESSARY DEPTH.
CLUSTER BOXES WHEN PRACTICABLE.

PLASTIC VALVE / JUNCTION BOX

SINGLE VALVE, BALL VALVE AND WIRE SPLICE INSTALLATIONS

NOT TO SCALE

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DATE	4/22/2010					
PLOTTED BY	BeanJ				JOB NUMBER	
DESIGNED BY	J. SWENSON					
ENTERED BY	M. VYPLEL					
CHECKED BY	S. WESSMAN				CONTRACT NO.	LOCATION NO.
PROJ. ENGR.	D. EDWARDS					
REGIONAL ADM.	J. LENZI	REVISION	DATE	BY		

PRELIMINARY
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Washington State Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV

IRRIGATION SCHEDULE & DETAILS

LD01

SHEET OF SHEETS

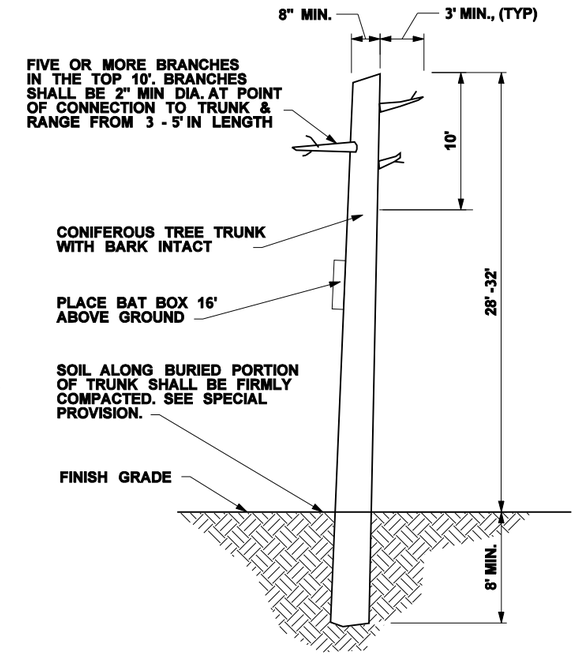
PLANT MATERIAL LIST

BOTANICAL NAME	COMMON NAME	QUANTITY	SIZE	ROOT CONDITION	REMARKS
TREES					
ACER CIRCINATUM	VINE MAPLE	325	6' HT.	B & B	WELL-BRANCHED, NO SHEARED TREES
ACER MACROPHYLLUM	BIG-LEAF MAPLE	124	1" CAL.	B & B	WELL-BRANCHED, NO SHEARED TREES
ALNUS RUBRA	RED ALDER	201	1" CAL.	B & B	
FRAXINUS LATIFOLIA	OREGON ASH	285	1" CAL.	B & B	
PICEA SITCHENSIS	SITKA SPRUCE	35	4' HT.	B & B	FULL, WELL-BRANCHED
PINUS CONTORTA	SHORE PINE	5	4' HT.	B & B	FULL, WELL-BRANCHED
PLATANUS X ACERIFOLIA	LONDON PLANETREE	7	3" CAL.	B & B	WELL-BRANCHED, LIMBED UP TO 6' HEIGHT
POPULUS TRICHOCARPA	BLACK COTTONWOOD	104	1" CAL.	B & B	
PRUNUS EMARGINATA	BITTER CHERRY	188	1" CAL.	B & B	
PSUEDOTSUGA MENZIESII	DOUGLAS FIR	254	4' HT.	B & B	FULL, WELL-BRANCHED
RHAMNUS PURSIANA	CASCARA	18	1" CAL.	B & B	
SALIX LASIANDRA	PACIFIC WILLOW	109	6' HT.	B & B	
SALIX SCOULERIANA	SCOULERS WILLOW	180	6' HT.	B & B	
THUJA PLICATA	WESTERN RED CEDAR	375	4' HT.	B & B	FULL, WELL-BRANCHED
SHRUBS					
AMELANCHIER ALNIFLOIA	SERVICEBERRY	652	12" HT.	#1 CONT.	
CORNUS SERICEA	RED-TWIG DOGWOOD	2165	12" HT.	#1 CONT.	
CORYLUS CORNUTA	BEAKED HAZLENUT	652	12" HT.	#1 CONT.	
LONICERA INVOLUCRATA	TWINBERRY	866	12" HT.	#1 CONT.	
PHILADELPHUS LEWSII	MOCK-ORANGE	1299	12" HT.	#1 CONT.	
PHYSOCARPUS CAPITATUS	NINEBARK	2166	12" HT.	#1 CONT.	
RIBES SANGUINEUM	RED-FLOWERING CURRANT	652	12" HT.	#1 CONT.	
ROSA NUTKANA	NOOTKA ROSE	1302	12" HT.	#1 CONT.	
ROSA PISOCARPUS	CLUSTERED ROSE	866	12" HT.	#1 CONT.	
RUBUS PARVIFLORUS	THIMBLEBERRY	1299	12" HT.	#1 CONT.	
SALIX HOOKERIANA	HOOKERS WILLOW	866	12" HT.	#1 CONT.	
SALIX SITCHENSIS	SITKA WILLOW	866	12" HT.	#1 CONT.	
SAMBUCUS RACEMOSA	RED ELDERBERRY	1299	12" HT.	#1 CONT.	
SPIREA DOUGLASII	DOUGLAS SPIREA	576	12" HT.	#1 CONT.	
SYMPHORICARPOS ALBUS	COMON SNOWBERRY	2929	12" HT.	#1 CONT.	
LIVE STAKES					
CORNUS SERICEA	RED-TWIG DOGWOOD	1980	36" LENGTH	LIVE STAKE	SEE INSTALLATION DETAIL THIS SHEET
SALIX LASIANDRA	PACIFIC WILLOW	740	36" LENGTH	LIVE STAKE	
SALIX SCOULERIANA	SCOULERS WILLOW	740	36" LENGTH	LIVE STAKE	
SALIX SITCHENSIS	SITKA WILLOW	1114	36" LENGTH	LIVE STAKE	

NOTES:
1. SEE STREAM PLANTING NOTES THIS SHEET

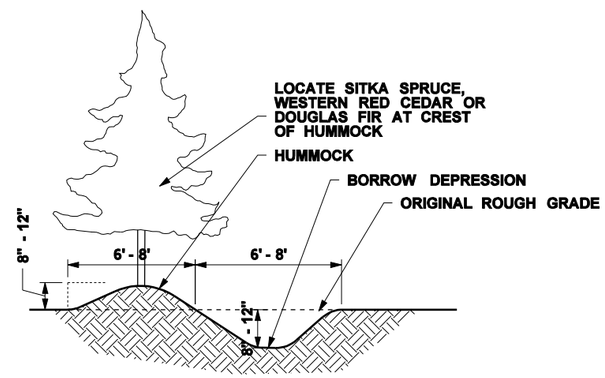
STREAM PLANTING NOTES

1. IF A CONFLICT OCCURS BETWEEN THE AMERICAN STANDARD FOR NURSERY STOCK AND THESE SPECIFICATIONS, THEN THESE SPECIFICATIONS SHALL APPLY.
2. SPECIFICATIONS FOR SIZE AND CONDITION ARE MINIMUM.
3. ALL PLANT MATERIALS SHALL BE NURSERY GROWN STOCK.
4. PLANTS SHALL BE RANDOMLY MIXED THROUGHOUT EACH PLANTING AREA AS APPROVED BY THE ENGINEER. PLANT SHRUBS IN A SINGLE SPECIES GROUPINGS OF 5 - 12 PLANTS EACH.
5. SEE PLANT SETBACK CHART FOR TREE AND SHRUB SETBACKS.
6. STAKE AND SECURE ALL TREES WITHIN 48 OF PLANTING.
7. SAVE AND PROTECT EXISTING DESIRABLE VEGETATION PER SECTION 1-07.16(2) IN THE STANDARD SPECIFICATIONS.
8. ALL FLOODPLAIN AND WETLAND RESTORATION PLANTING AREAS SHALL BE SEEDED WITH STERILE WHEATGRASS SEED PRIOR TO PLANT INSTALLATION, SEE SPECIAL PROVISIONS FOR RATE.
9. BARK OR WOOD CHIP MULCH SHALL NOT BE INSTALLED IN FLOODPLAIN AND WETLAND RESTORATION PLANTING AREAS.
10. CONTRACTOR SHALL REMOVE ALL STABILIZED CONSTRUCTION ENTRANCE TEMPORARY ACCESS ROADS AND RESTORE OTHER TEMPORARILY DISTURBED AREAS AS DIRECTED BY PROJECT ENGINEER UPON COMPLETION OF WORK.
11. CONTRACTOR SHALL RESTORE ANY ADDITIONAL IMPACTS MADE TO STREAM BUFFER AREAS NOT SHOWN ON THESE PLANS.



RAPTOR PERCH

NOT TO SCALE



MICRO TOPOGRAPHY - HUMMOCK

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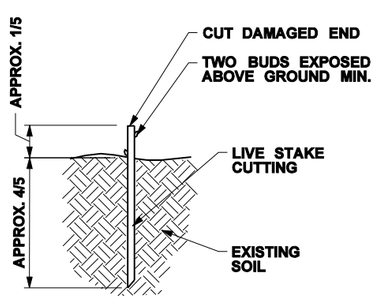
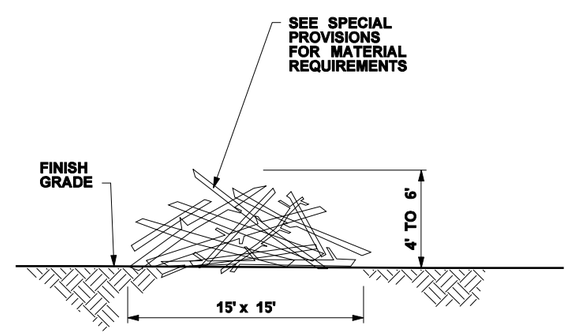


LIVE STAKE PLANTING NOTES

1. SEE PLANT MATERIAL LIST FOR SIZE AND TYPE OF LIVE STAKE.
2. DO NOT USE AXE OR SLEDGE FOR DRIVING OF LIVE STAKES.
3. IN HARD GROUND USE AN IRON BAR OR STAR DRILL TO PREPARE THE HOLES FOR THE LIVE STAKE.
4. DO NOT STRIP BARK OR BRUISE LIVE STAKES DURING INSTALLATION.
5. FILL VOID AROUND CUTTING WITH SOIL.

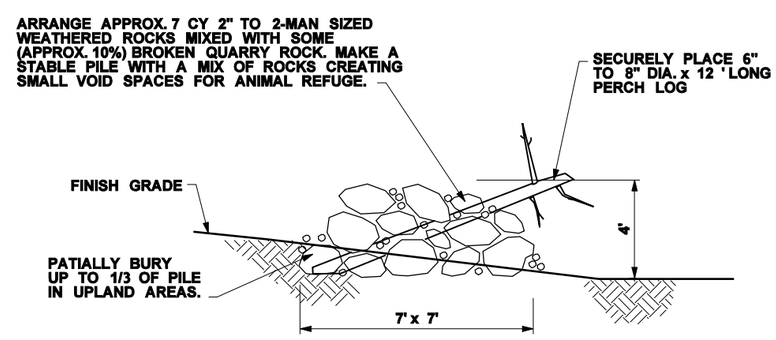
TYPICAL LIVE STAKE INSTALLATION

NOT TO SCALE



BRUSH PILE DETAIL

NOT TO SCALE



ROCK PILE DETAIL

NOT TO SCALE

Projstd

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ENTERED BY	M. VYPLEL						
CHECKED BY	S. WESSMAN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. LENZI	REVISION	DATE	BY			

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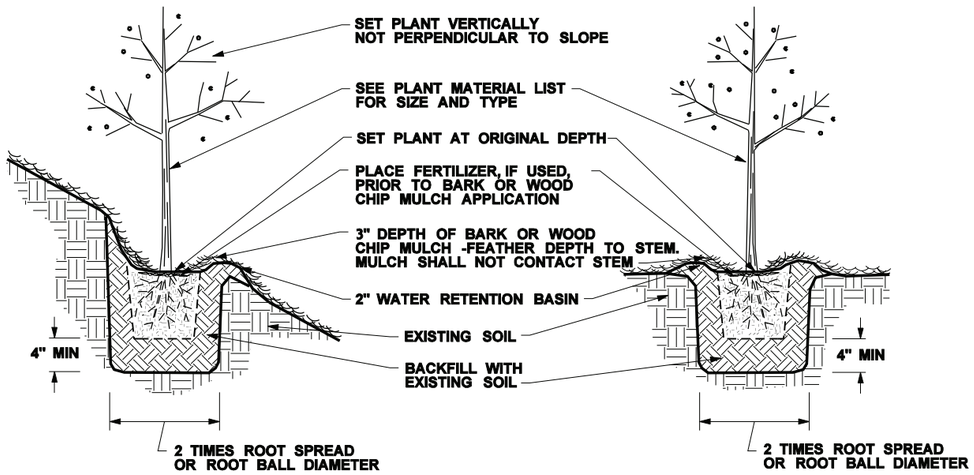
Washington State Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV

LANDSCAPE, PLANTING DETAILS

LD02

SHEET OF SHEETS



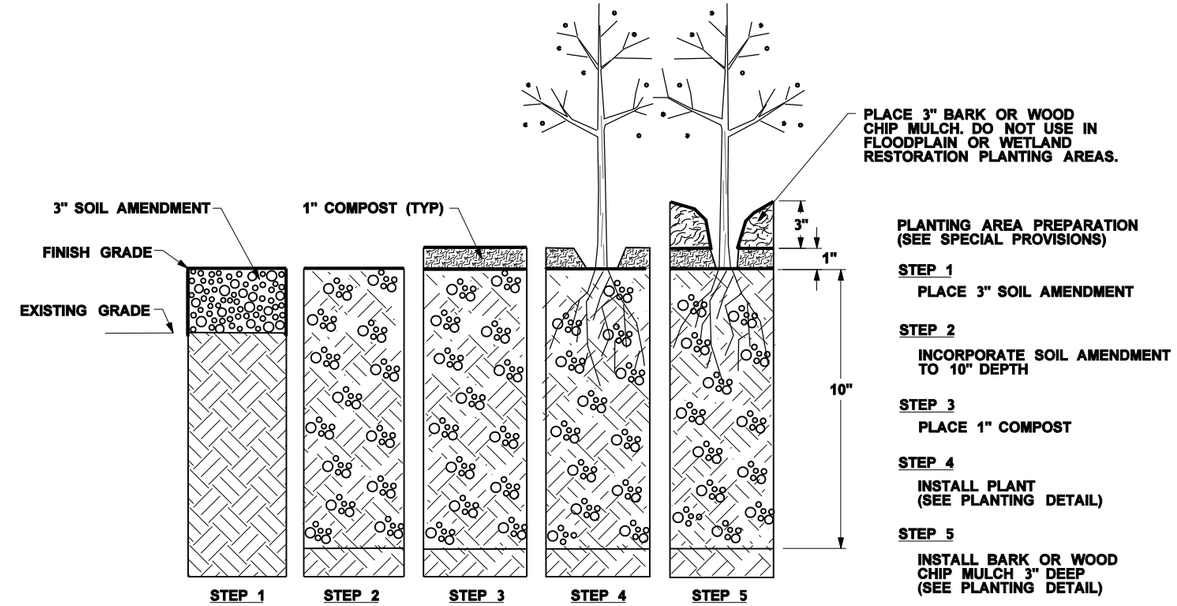
*NOTE: BARK OR WOOD CHIP MULCH SHALL BE PLACED IN 12" RADIUS AROUND EACH PLANT WHEN PLANTED IN SEEDED OR GRASS AREAS.

TREE & SHRUB PLANTING ON SLOPE

BARE ROOT AND CONTAINER — NOT TO SCALE

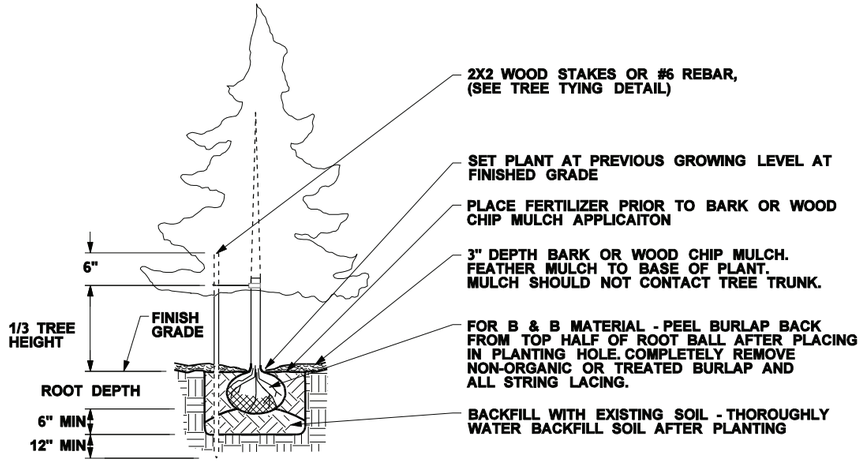
TREE & SHRUB PLANTING

BARE ROOT AND CONTAINER — NOT TO SCALE



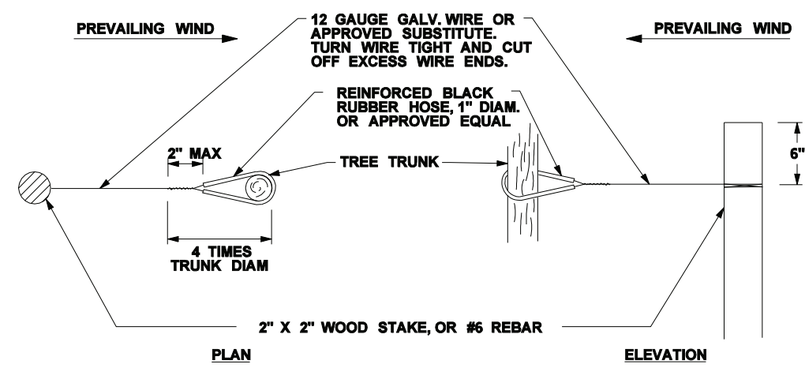
PLANTING AREA SOIL PREPARATION - SEQUENCE OF WORK

SECTION VIEW — NOT TO SCALE



TREE PLANTING AND STAKING

FOR 4' CONIFERS AND 1" CAL. DECIDUOUS TREES - ELEVATION — NOT TO SCALE



TREE TYING

NOT TO SCALE

Projstd

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ENTERED BY	J. SWENSON						
CHECKED BY	S. WESSMAN				CONTRACT NO.		LOCATION NO.
PROJ. ENGR.	D. EDWARDS						
REGIONAL ADM.	J. LENZI	REVISION	DATE	BY			

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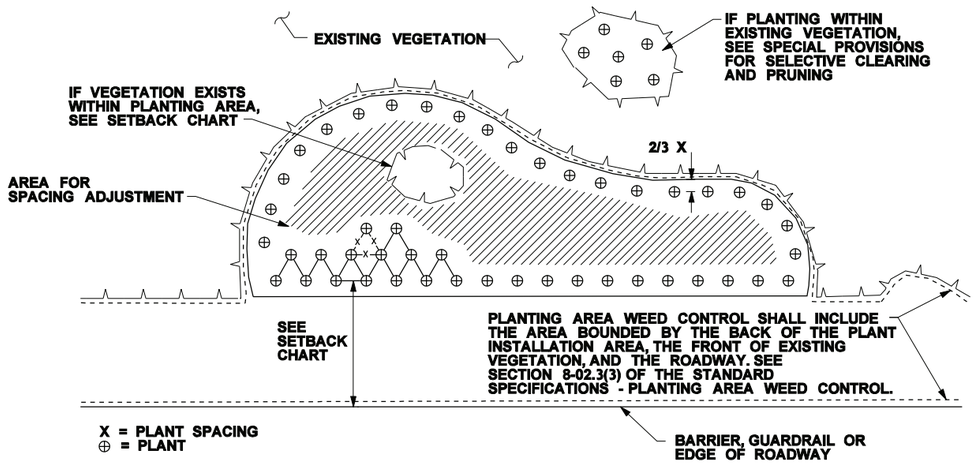
Washington State
Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV

LANDSCAPE, PLANTING DETAILS

LD03

SHEET
OF
SHEETS



PLANTING AREA LAYOUT, SETBACK, AND WEED CONTROL

NOT TO SCALE

	GUARDRAIL BARRIER	EDGE OF ROADWAY	PATHS, TRAILS	WALL	FENCE	SIGNS	EXISTING TREE, TRUNK	EXISTING VEGETATION MASS
EVERGREEN TREE	15'	15'	10'	8'	8'	15'	15'	10'
EVERGREEN TREE (COLUMNAR)	6'	6'	6'	6'	6'	12'	12'	10'
SHADE TREE	10'	10'	5'	8'	8'	15'	15'	10'
ORNAMENTAL/NATIVE DECIDUOUS TREE	6'	6'	5'	5'	5'	12'	12'	10'
MEDIUM AND LARGE SHRUBS - GREATER THAN 3' TALL	5'	5'	5'	3'	3'	6'	10'	10'
SMALL SHRUB - LESS THAN 3' TALL	3'	5'	3'	2'	3'	2'	10'	10'
GROUND COVER AND VINES	6"	5'	2'	6"	6"	2'	2'	10'

TYPICAL SETBACKS FOR CENTER OF PLANT MATERIAL UNLESS OTHERWISE DIRECTED BY THE ENGINEER DURING LAYOUT AND STAKING OF PLANT LOCATIONS. DISTANCE NOTED IS TO STEM OR TRUNK OF PLANT.
THIS CHART SUPPLEMENTS SECTION 8.02.3(7) OF THE STANDARD SPECIFICATIONS.
ALDER, COTTONWOOD AND BIG LEAF MAPLE SHALL BE KEPT A MIN. OF 70' FROM EDGE OF STATE HIGHWAY.
SHOULDER AREAS LESS THAN 5' WIDE SHALL BE PLANTED WITH GROUNDCOVER AND VINE PLANTINGS ONLY.

PLANT MATERIAL SETBACK CHART

Projstd

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PROJ. ENGR.	D. EDWARDS
REGIONAL ADM.	J. LENZI

REVISION | DATE | BY

REGION NO. 10 | STATE WASH | FED.AID PROJ.NO.

JOB NUMBER

CONTRACT NO. | LOCATION NO.

PRELIMINARY
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Washington State Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV

LANDSCAPE, PLANTING DETAILS

LD04

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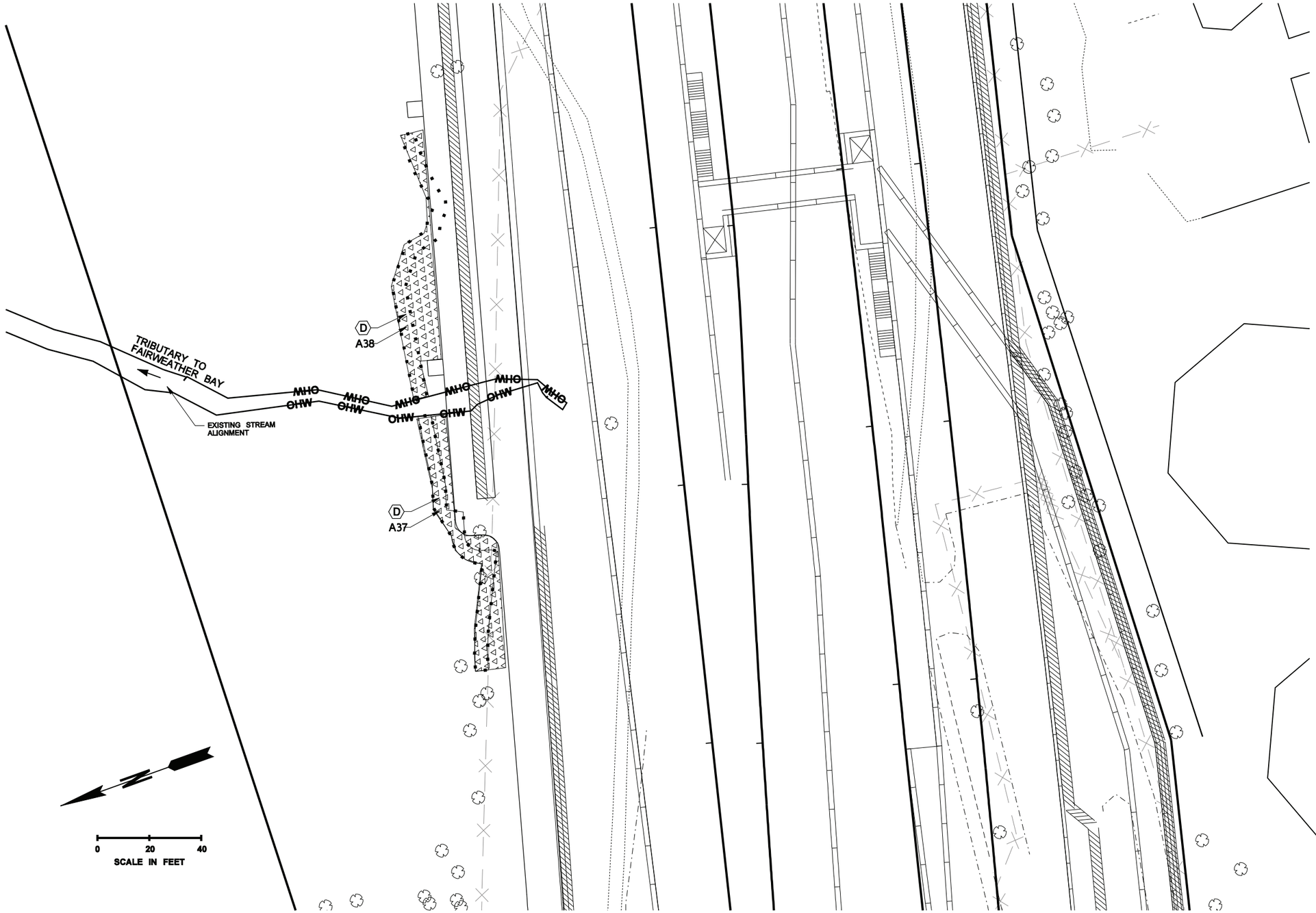

QUANTITY TAB - THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY	
	STREAM BUFFER PLANTING - 4' O.C.	A37	A38
	SERVICEBERRY	3	3
	RED-TWIG DOGWOOD	6	6
	BEAKED HAZLENUT	3	3
	MOCK-ORANGE	6	6
	NINEBARK	6	6
	RED-FLOWERING CURRANT	3	3
	NOOTKA ROSE	6	6
	THIMBLEBERRY	6	6
	RED ELDERBERRY	6	6
	COMMON SNOWBERRY	15	15
SOIL AMENDMENT (CY)			
COMPOST (CY)			
BARK OR WOOD CHIP (CY)			

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
- W —	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

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DESIGNED BY						
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CHECKED BY						
PROJ. ENGR.						
REGIONAL ADM.		REVISION	DATE	BY		

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

PRELIMINARY
NOT FOR CONSTRUCTION

P.E. STAMP BOX DATE

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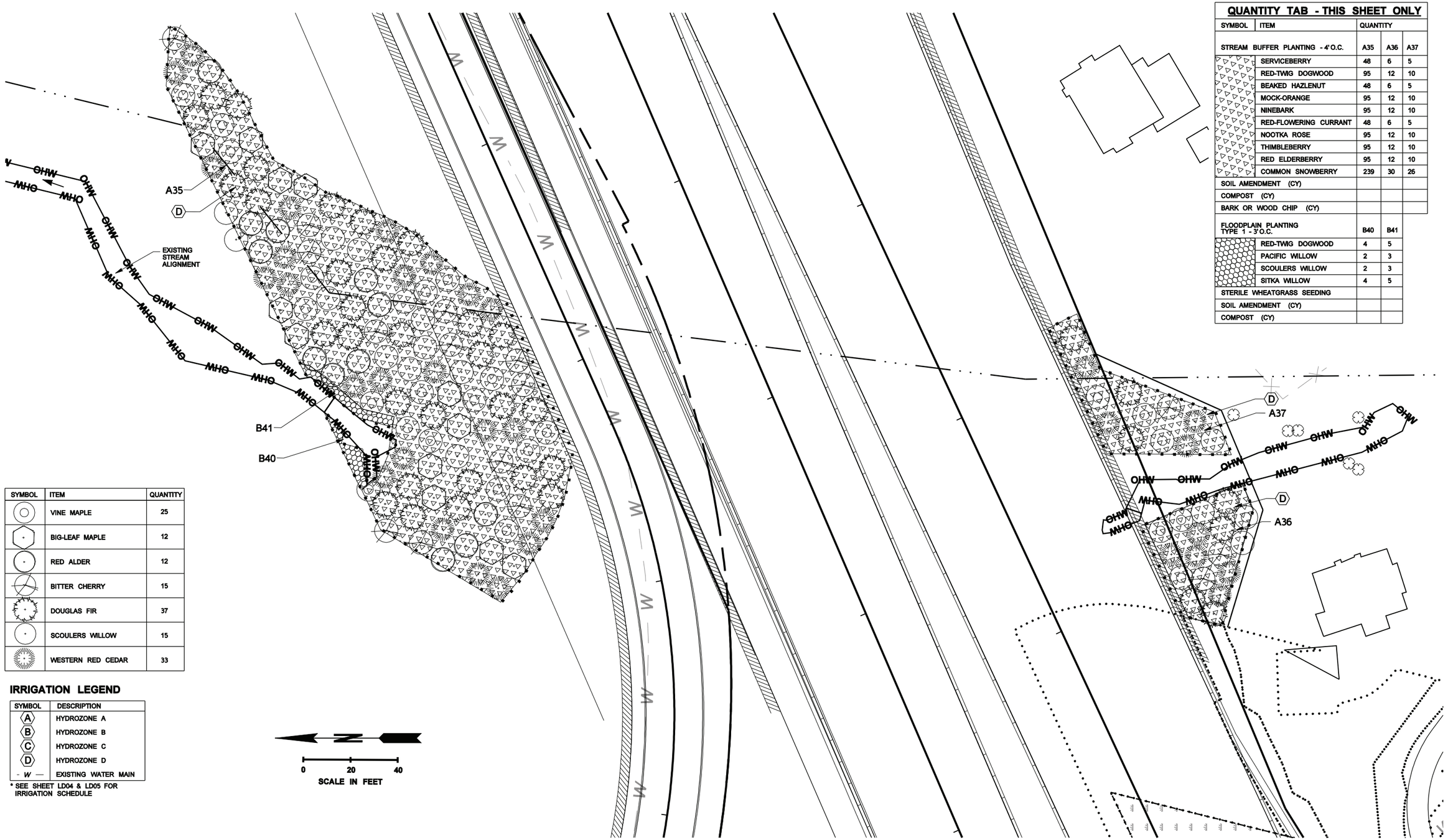
Washington State Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
TRIBUTARY TO FAIRWEATHER BAY

STREAM PLANTING

LS113

SHEET OF SHEETS



QUANTITY TAB - THIS SHEET ONLY

SYMBOL	ITEM	QUANTITY		
	STREAM BUFFER PLANTING - 4' O.C.	A35	A36	A37
	SERVICEBERRY	48	6	5
	RED-TWIG DOGWOOD	95	12	10
	BEAKED HAZLENUT	48	6	5
	MOCK-ORANGE	95	12	10
	NINEBARK	95	12	10
	RED-FLOWERING CURRANT	48	6	5
	NOOTKA ROSE	95	12	10
	THIMBLEBERRY	95	12	10
	RED ELDERBERRY	95	12	10
	COMMON SNOWBERRY	239	30	26
	SOIL AMENDMENT (CY)			
	COMPOST (CY)			
	BARK OR WOOD CHIP (CY)			
	FLOODPLAIN PLANTING TYPE 1 - 3' O.C.	B40	B41	
	RED-TWIG DOGWOOD	4	5	
	PACIFIC WILLOW	2	3	
	SCOULERS WILLOW	2	3	
	SITKA WILLOW	4	5	
	STERILE WHEATGRASS SEEDING			
	SOIL AMENDMENT (CY)			
	COMPOST (CY)			

SYMBOL	ITEM	QUANTITY
	VINE MAPLE	25
	BIG-LEAF MAPLE	12
	RED ALDER	12
	BITTER CHERRY	15
	DOUGLAS FIR	37
	SCOULERS WILLOW	15
	WESTERN RED CEDAR	33

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
A	HYDROZONE A
B	HYDROZONE B
C	HYDROZONE C
D	HYDROZONE D
- W —	EXISTING WATER MAIN

* SEE SHEET LD04 & LD05 FOR IRRIGATION SCHEDULE

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DESIGNED BY						
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CHECKED BY					CONTRACT NO.	LOCATION NO.
PROJ. ENGR.						
REGIONAL ADM.		REVISION	DATE	BY		

PRELIMINARY
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P.E. STAMP BOX DATE

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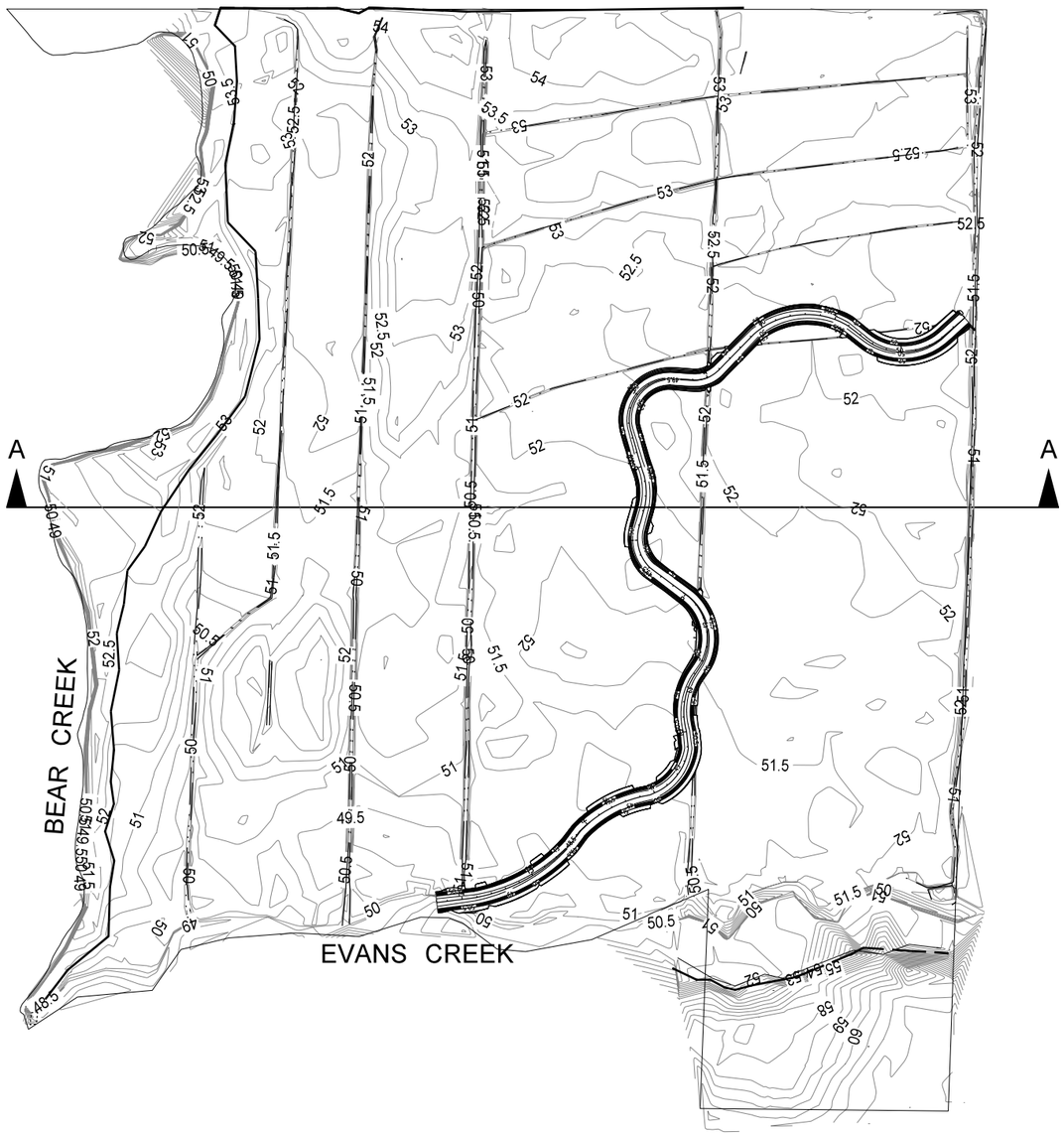
Washington State Department of Transportation

SR 520
MEDINA TO SR 202 VICINITY
EASTSIDE TRANSIT AND HOV
WEST TRIBUTARY TO YARROW WETLANDS

STREAM PLANTING

LS114

SHEET OF SHEETS



LEGEND:

EXISTING CONTOUR
PROPOSED CONTOUR

0 100 200
SCALE IN FEET

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REGIONAL ADM.		REVISION	DATE	BY		

REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

PRELIMINARY
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DATE
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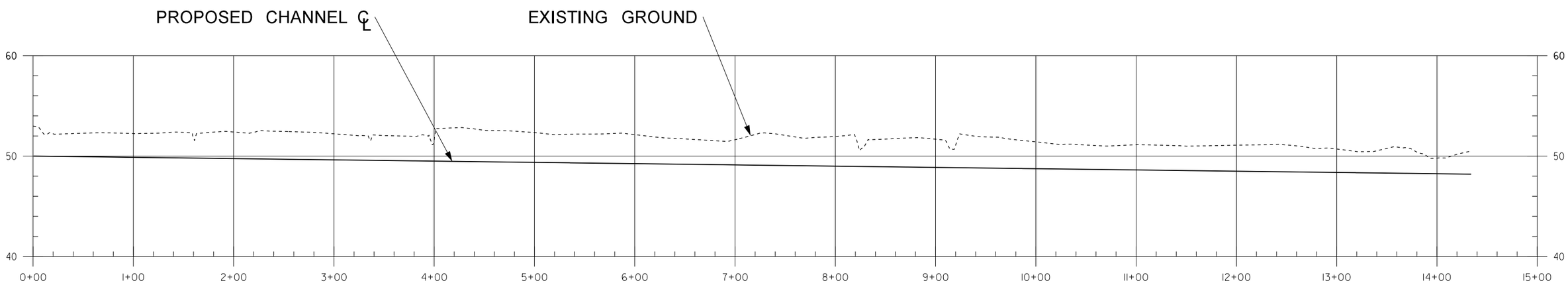
DATE
P.E. STAMP BOX

Washington State
Department of Transportation

E1 - KELLER MITIGATION SITE
MEDINA TO SR 202: EASTSIDE
TRANSIT AND HOV PROJECT

GRADING PLAN

SHEET
OF
SHEETS



CHANNEL PROFILE

NOTE:

1. POOLS WILL BE CONSTRUCTED AT EACH CHANNEL MEANDER.

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PROJ. ENGR.						
REGIONAL ADM.		REVISION	DATE	BY		

PRELIMINARY

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DATE

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DATE

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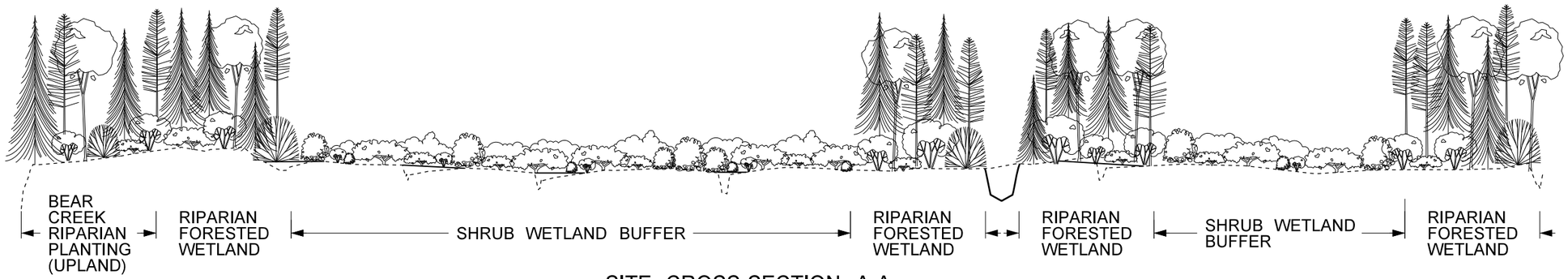
Washington State Department of Transportation

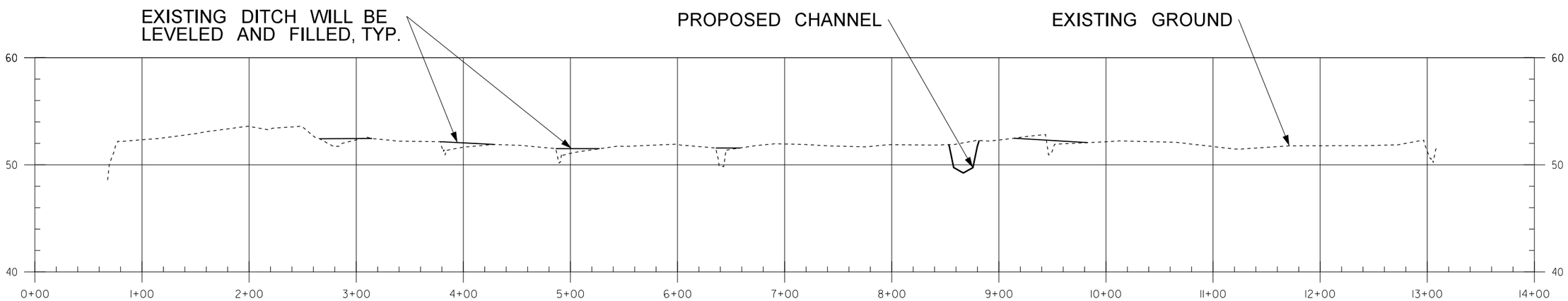
E2 - KELLER MITIGATION SITE MEDINA TO SR 202: EASTSIDE TRANSIT AND HOV PROJECT

PROPOSED CHANNEL PROFILE

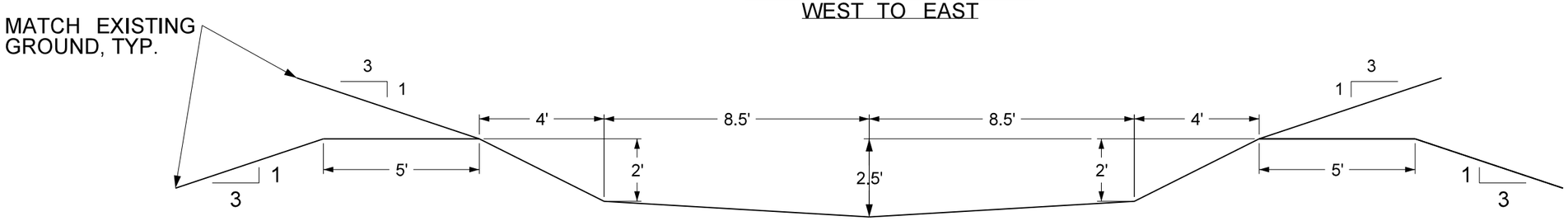
SHEET OF SHEETS



SITE CROSS-SECTION A-A
WEST TO EAST



SITE CROSS-SECTION A-A
WEST TO EAST



TYPICAL CHANNEL CROSS-SECTION

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REGION NO.	STATE	FED.AID PROJ.NO.
10	WASH	
JOB NUMBER		
CONTRACT NO.		LOCATION NO.

PRELIMINARY
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DATE
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Washington State
Department of Transportation

E3 - KELLER MITIGATION SITE
MEDINA TO SR 202: EASTSIDE
TRANSIT AND HOV PROJECT

PROPOSED SECTIONS

SHEET
OF
SHEETS

Appendix F—Wetland Rating Form for Anticipated Mitigation Site Conditions at the end of Monitoring

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Wetland name or number 31 (post-construction)

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 – Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct. 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): Keller Mitigation Site Date of site visit: 6/3/2009

Rated by: MD/PJT Trained by Ecology? Yes X No____ Date of training: March 2008

SEC: 6 TWNSHP: 25N RNGE: 6E Is S/T/R in Appendix D? Yes____ No X

Map of wetland unit: Figure 1.2 **Estimated size** 28.5 ac. in study area ~93 acres total wetland size

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland: I X **II**____ **III**____ **IV**____

Category I =	Score > 70	Score for Water Quality Functions	16
Category II =	Score 51 - 69	Score for Hydrologic Functions	32
Category III =	Score 30 – 50	Score for Habitat Functions	25
Category IV =	Score < 30	TOTAL Score for Functions	73

Category based on SPECIAL CHARACTERISTCS of Wetland I____ **II**____ **Does not apply** X

Final Category (choose the "highest" category from above) I

Summary of basic information about the wetland unit.

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		**Depressional**	
Natural Heritage Wetland		**Riverine**	X
Bog		**Lake-fringe**	
Mature Forest		**Slope**	
Old Growth Forest		**Flats**	
Coastal Lagoon		**Freshwater Tidal**	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Does the wetland being rated meet any of the criteria below? If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands that Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered **animal or plant** species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered **animal** species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category 1 Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		X
SP4. *Does the wetland unit have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands in to those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number 31 (post-construction)

Classification of Vegetated Wetlands for Western Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides (i.e. except during floods)?
   NO – go to 2 **YES** – the wetland class is **Tidal Fringe**
   If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?
   YES – Freshwater Tidal Fringe **NO – Saltwater Tidal Fringe (Estuarine)**
   *If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is a Saltwater Tidal Fringe it is rated as an **Estuarine** wetland.* Wetlands that were call estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p. _____).

2. The entire wetland unit is flat and precipitation is only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.
   NO – go to 3 **YES** – The wetland class is **Flats**
   If your wetland can be classified as a "Flats" wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland meet both of the following criteria?
   N The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) where at least 20 acres (8ha) in size;
   N At least 30% of the open water area is deeper than 6.6 (2 m)?
   NO – go to 4 **YES** – The wetland class is **Lake-fringe (Lacustrine Fringe)**

4. Does the entire wetland meet all of the following criteria?
   Y The wetland is on a slope *(slope can be very gradual).*
   N The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
   N The water leaves the wetland **without being impounded**?
   NOTE: *Surface water does not pond in these types of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).*
   NO – go to 5 **YES** – The wetland class is **Slope**

5. Does the entire wetland meet all of the following criteria?
   Y The unit is in a valley or stream channel where it gets inundated by overbank flooding from that stream or river.
   Y The overbank flooding occurs at least once every two years.
   NOTE: *The riverine unit can contain depressions that are filled with water when the river is not flooding..*
   NO – go to 6 **YES** – The wetland class is **Riverine**

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time of the year. This means that any outlet, if present is higher than the interior of the wetland.
   NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland located in a very flat area with no obvious depression and no overbank flooding. The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.
   No – go to 8 YES – The wetland class is Depressional

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit, classify the wetland using the class that represents more than 90% of the total area.

HGM Classes within the wetland unit being rated	*HGM Class to Use in Rating*
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine along stream within boundary	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Wetland name or number 31 (post-construction)

R	Riverine and Freshwater Tidal Fringe Wetlands	Points (only 1 score per box)
	WATER QUALITY FUNCTIONS – Indicators that wetland functions to improve water quality.	
R 1	**Does the wetland have the potential to improve water quality?** *(see p.52)*	
	R 1.1 Area of surface depressions within the riverine wetland that can trap sediments during a flooding event: • Depressions cover > 3/4 area of wetland....points = 8 • Depressions cover > 1/2 area of wetland....points = 4 **(If depressions > 1/2 of area of unit draw polygons on aerial photo or map)** • Depressions present but cover < 1/2 area of wetland....points = 2 • No depressions present....points = 0	**Figure ___** 2
	R 1.2 Characteristics of the vegetation in the unit (areas with >90% cover at person height): • Trees or shrubs > 2/3 area of the unit....points = 8 • Trees or shrubs > 1/3 area of the wetland....points = 6 • Ungrazed, herbaceous plants > 2/3 area of unit....points = 6 • Ungrazed herbaceous plants > 1/3 area of unit....points = 3 • Trees, shrubs, and ungrazed herbaceous < 1/3 area of unit....points = 0 **Aerial photo or map showing polygons of different vegetation types**	**Figure ___** 6
	Add the points in the boxes above	8
R 2	**Does the wetland have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* ___ Grazing in the wetland or within 150 ft ___ Untreated stormwater discharges to wetland ___ Tilled fields or orchards within 150 ft. of wetland ___ A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging X Residential, urban areas, golf courses are within 150 ft. of wetland ___ The river or stream linked to the wetland has a contributing basin where human activities have raised levels of sediment, toxic compounds or nutrients in the river water above standards for water quality. ___ Other ___ **YES** multiplier is 2 **NO** multiplier is 1	*(see p. 53)* Multiplier 2
◆	**TOTAL – Water Quality Functions** Multiply the score from R1 by R2; then ***add score to table on p. 1***	16
	HYDROLOGIC FUNCTIONS – Indicators that wetland functions to reduce flooding and stream erosion.	
R 3	**Does the wetland have the potential to reduce flooding and erosion?**	*(see p.54)*
	R 3.1 Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of unit) / (average width of stream between banks).* • If the ratio is more than 20....points = 9 • If the ratio is between 10 – 20....points = 6 • If the ratio is 5- <10....points = 4 • If the ratio is 1- <5....points = 2 • If the ratio is < 1....points = 1 **Aerial photo or map showing average widths**	**Figure ___** 9
	R 3.2 Characteristics of vegetation that slow down water velocities during floods: *Treat large woody debris as "forest or shrub". Choose the points appropriate for the best description. (polygons need to have >90% cover at person height NOT Cowardin classes):* • Forest or shrub for > 1/3 area OR herbaceous plants > 2/3 area....points = 7 • Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area....points = 4 • Vegetation does not meet above criteria....points = 0 **Aerial photo or map showing polygons of different vegetation types**	**Figure ___** 16
	Add the points in the boxes above	
R 4	**Does the wetland have the opportunity to reduce flooding and erosion?** Answer YES if the wetland is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* X There are human structures and activities downstream (roads, buildings, bridges, farms) that can be damaged by flooding. ___ There are natural resources downstream (e.g. salmon redds) that can be damaged by flooding ___ Other ___ *(Answer NO if the major source of water to the wetland is controlled by a reservoir or the wetland is tidal fringe along the sides of a dike)* **YES** multiplier is 2 **NO** multiplier is 1	*(see p.57)* Multiplier 2
◆	**TOTAL – Hydrologic Functions** Multiply the score from R3 by R4; then ***add score to table on p. 1***	32

Comments:

Wetland name or number 3

L	Lake-fringe Wetlands	Points
	WATER QUALITY FUNCTIONS – Indicators that the wetland unit functions to improve water quality.	(only 1 score per box)
L 1	**Does the wetland unit have the potential to improve water quality?** *(see p.59)*	
	L 1.1 Average width of vegetation along the lakeshore (use polygons of Cowardin classes): • Vegetation is more than 33 ft. (10m) wide ..... points = 6 • Vegetation is more than 16 ft.(5m) wide and < 33 ft ..... points = 3 • Vegetation is more than 6 ft. (2m) wide and < 16 ft ..... points = 1 • Vegetation is less than 6 ft. wide ..... points = 0 **Map of Cowardin classes with widths marked**	**Figure ___**
	L 1.2 Characteristics of the vegetation in the wetland: *Choose the appropriate description that results in the highest points, and do not include any open water in your estimate of coverage. The herbaceous plants can be either the dominant form or as an understory in a shrub or forest community. These are not Cowardin classes. Area of Cover is total cover in the unit, but it can be in patches. NOTE: Herbaceous does not include aquatic bed.* • Cover of herbaceous plants is > 90% of the vegetated area ..... points = 6 • Cover of herbaceous plants is > 2/3 of the vegetated area ..... points = 4 • Cover of herbaceous plants is > 1/3 of the vegetated area ..... points = 3 • Other vegetation that is not aquatic bed or herbaceous covers > 2/3 of the unit ..... points = 3 • Other vegetation that is not aquatic bed in > 1/3 vegetated area ..... points = 1 • Aquatic bed cover and open water > 2/3 of the unit ..... points = 0 **Map with polygons of different vegetation types**	**Figure ___**
	Add the points in the boxes above	
L 2	**Does the wetland have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in the lake water, or polluted surface water flowing through the unit to the lake. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* ____ Wetland is along the shores of a lake or reservoir that does not meet water quality standards ____ Grazing in the wetland or within 150 ft ____ Polluted water discharges to wetland along upland edge ____ Tilled fields or orchards within 150 ft. of wetland ____ Residential or urban areas are within 150 ft. of wetland ____ Parks with grassy areas that are maintained, ballfields, golf courses (all within 150 ft. of lake shore) ____ Power boats with gasoline or diesel engines use the lake ____ Other _____ **YES** multiplier is 2 **NO** multiplier is 1	*(see p.61)* Multiplier _____
◆	**TOTAL – Water Quality Functions** Multiply the score from L1 by L2; then ***add score to table on p. 1***	
	HYDROLOGIC FUNCTIONS – Indicators that wetland functions to reduce shoreline erosion.	
L 3	**Does the wetland have the potential to reduce shoreline erosion?**	*(see p.62)*
	L 3 Average width and characteristics of vegetation along the lakeshore *(do not include aquatic bed): (choose the highest scoring description that matches conditions in the wetland)* • 3/4 of distance is shrubs or forest at least 33 ft. (10m) wide ..... points = 6 • 3/4 of distance is shrubs or forest at least 6 ft. (2m) wide. ..... points = 4 • 1/4 of distance is shrubs or forest at least 33 ft. (10m) wide ..... points = 4 • Vegetation is at least 6 ft. (2m) wide (any type except aquatic bed) ..... points = 2 • Vegetation is less than 6 ft. (2m) wide (any type except aquatic bed) ..... points = 0 **Aerial photo or map with Cowardin vegetation classes**	**Figure ___**
	Record the points in the boxes above	
L 4	**Does the wetland have the opportunity to reduce erosion?** Are there features along the shore that will be impacted if the shoreline erodes? *Note which of the following conditions apply.* ____ There are human structures and activities along the upland edge of the wetland (buildings, fields) that can be damaged by erosion. ____ There are undisturbed natural resources along the upland edge of the wetland (e.g. mature forests, other wetlands) that can be damaged by shoreline erosion. ____ Other _____ **YES** multiplier is 2 **NO** multiplier is 1	*(see p. 64)* Multiplier _____
◆	**TOTAL – Hydrologic Functions** Multiply the score from L3 by L4; then ***add score to table on p. 1***	

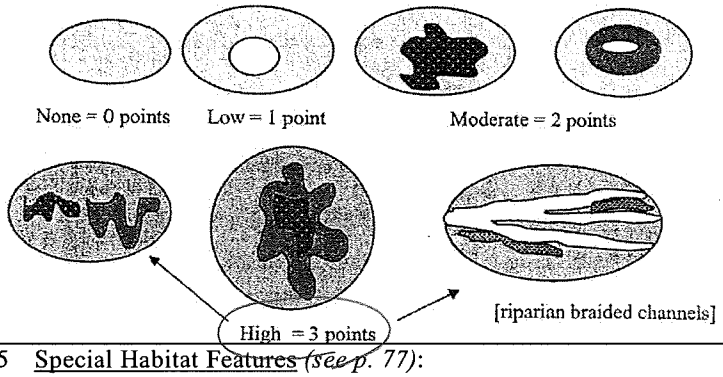
Comments:

Wetland name or number 3

S	Slope Wetlands	Points
	WATER QUALITY FUNCTIONS – Indicators that wetland functions to improve water quality.	(only 1 score per box)
S 1	**Does the wetland have the potential to improve water quality?**	*(see p.64)*
	S 1.1 Characteristics of average slope of unit: • Slope is 1% or less *(a 1% slope has a 1 ft. vertical drop in elevation for every 100 ft. horizontal distance)* .....points = 3 • Slope is 1% - 2% .....points = 2 • Slope is 2% - 5% .....points = 1 • Slope is greater than 5% .....points = 0	
	S 1.2 The soil 2 inches below the surface (or duff layer) is clay, organic *(Use NRCS definitions).* **YES** = 3 points **NO** = 0 points	
	S 1.3 Characteristics of the vegetation in the wetland that trap sediments and pollutants: *Choose the points appropriate for the description that best fits the vegetation in the wetland. Dense vegetation means you have trouble seeing the soil surface (>75% cover), and uncut means not grazed or mowed and plants are higher than 6 inches.* • Dense, uncut, herbaceous vegetation > 90% of the wetland area .....points = 6 • Dense, uncut, herbaceous vegetation > 1/2 of area .....points = 3 • Dense, woody, vegetation > 1/2 of area. .....points = 2 • Dense, uncut, herbaceous vegetation > 1/4 of area .....points = 1 • Does not meet any of the criteria above for vegetation .....points = 0 **Aerial photo or map with vegetation polygons**	**Figure ___**
	Total for S 1 *Add the points in the boxes above*	
S 2	**Does the wetland have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* ____ Grazing in the wetland or within 150 ft ____ Untreated stormwater discharges to wetland ____ Tilled fields, logging, or orchards within 150 ft. of wetland ____ Residential, urban areas, or golf courses are within 150 ft. upslope of wetland ____ Other _____ **YES** multiplier is 2 **NO** multiplier is 1	*(see p. 67)* Multiplier _____
◆	**TOTAL – Water Quality Functions** Multiply the score from S1 by S2; then ***add score to table on p. 1***	
	HYDROLOGIC FUNCTIONS – Indicators that wetland functions to reduce flooding and stream erosion.	
S 3	**Does the wetland have the potential to reduce flooding and stream erosion?**	*(see p.68)*
	S 3.1 Characteristics of vegetation that reduce the velocity of surface flows during storms: *Choose the points appropriate for the description that best fits conditions in the wetland (stems of plants should be thick enough (usually > 1/8in), or dense enough to remain erect during surface flows).* • Dense, uncut, **rigid** vegetation covers > 90% of the area of the wetland .....points = 6 • Dense, uncut, **rigid** vegetation> 1/2 area of wetland .....points = 3 • Dense, uncut, **rigid** vegetation > 1/4 area. .....points = 1 • More than 1/4 of area is grazed, mowed, tilled, or vegetation is not rigid .....points = 0	
	S 3.2 Characteristics of slope wetland that holds back small amounts of flood flows. The slope has small surface depressions that can retain water over at least 10% of its area. **YES** = 2 points **NO** = 0 points	
	Add the points in the boxes above	
S 4	**Does the wetland have the opportunity to reduce flooding and erosion?** Is the wetland in a landscape position where the reduction in water velocity it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows? *Note which of the following conditions apply.* ____ Wetland has surface runoff that drains to a river or stream that has flooding problems ____ Other _____ *(Answer NO if the major source of water is controlled by a reservoir (e.g. wetland is a seep that is on the downstream side of a dam)* **YES** multiplier is 2 **NO** multiplier is 1	*(see p. 70)* Multiplier _____
◆	**TOTAL – Hydrologic Functions** Multiply the score from S3 by S4; then ***add score to table on p. 1***	

Comments:

Wetland name or number 31 (Post - Construction)

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS – Indicators that wetland functions to provide important habitat.	Points (only 1 score per box)
H 1 Does the wetland have the potential to provide habitat for many species?	
H 1.1 Vegetation structure *(see P. 72)*: *Check the types of vegetation classes present (as defined by Cowardin) – Size threshold for each class is 1/4 acre or more than 10% of the area if unit is smaller than 2.5 acres.* ___ Aquatic Bed X Emergent plants X Scrub/shrub (areas where shrubs have > 30% cover) X Forested (areas where trees have > 30% cover) *If the unit has a forested class check if:* X The forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon. *Add the number of vegetation types that qualify. If you have:* **Map of Cowardin vegetation classes** 4 structures or more .....points = 4 2 structures .....points = 1 3 structures .....points = 2 1 structure.....points = 0	**Figure ___** 4
H 1.2 Hydroperiods *(see p.73)*: *Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or 1/4 acre to count (see text for descriptions of hydroperiods).* ___ Permanently flooded or inundated X Seasonally flooded or inundated X Occasionally flooded or inundated ___ Saturated only X Permanently flowing stream or river in, or adjacent to, the wetland ___ Seasonally flowing stream in, or adjacent to, the wetland ___ **Lake-fringe wetland .....= 2 points** ___ **Freshwater tidal wetland.....= 2 points** 4 or more types present points = 3 3 or more types present ....points = 2 2 types present ..... points = 1 1 type present..... points = 0 **Map of hydroperiods**	**Figure ___** 2
H 1.3 Richness of Plant Species *(see p. 75)*: Count the number of plant species in the wetland that cover at least 10 ft^2 *(different patches of the same species can be combined to meet the size threshold)* *You do not have to name the species. Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle.* If you counted: > 19 species.....points = 2 5 – 19 species .....points = 1 < 5 species.....points = 0 List species below if you want to: _____ _____ _____ _____	2
H 1.4 Interspersion of Habitats *(see p. 76)*: Decided from the diagrams below whether interspersion between Cowardin vegetation (described in H1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  None = 0 points Low = 1 point Moderate = 2 points High = 3 points [riparian braided channels] Note: If you have 4 or more classes or 3 vegetation classes and open water, the rating is always "high". **Use map of Cowardin classes.**	**Figure ___** 3
H 1.5 Special Habitat Features *(see p. 77)*: *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* X Large, downed, woody debris within the wetland (> 4 in. diameter and 6 ft. long) X Standing snags (diameter at the bottom > 4 inches) in the wetland ___ Undercut banks are present for at least 6.6 ft. (2m) and/or overhanging vegetation extends at least 3.3 ft. (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft. (10m) X Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* X At least 1/4 acre of thin-stemmed persistent vegetation or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ___ Invasive plants cover less than 25% of the wetland area in each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	4
H 1 TOTAL Score – potential for providing habitat *Add the points in the column above*	15

Wetland name or number 3| (past - construction)

H 2	Does the wetland have the opportunity to provide habitat for many species?	(only 1 score per box)
	H 2.1 Buffers *(see P. 80)*: *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed".* ____ 100m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 95% of circumference. No structures are within the undisturbed part of buffer (relatively undisturbed also means no grazing, no landscaping, no daily human use).. ..... **points = 5** ____ 100m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference ..... **points = 4** ____ 50m (170 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 95% circumference ..... **points = 4** ____ 100m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference ..... **points = 3** ____ 50m (170 ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference ..... **points = 3** **If buffer does not meet any of the criteria above:** _X_ No paved areas (except paved trails) or buildings within 25m (80 ft) of wetland > 95% circumference. Light to moderate grazing or lawns are OK..... **points = 2** ____ No paved areas of buildings within 50m of wetland for > 50% circumference. Light to moderate grazing or lawns are OK ..... **points = 2** ____ Heavy grazing in buffer..... **points = 1** ____ Vegetated buffers are < 2m wide (6.6 ft) for more than 95% circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland) ..... **points = 0** ____ Buffer does not meet any of the criteria above..... **points = 1** **Arial photo showing buffers**	**Figure ___** 2
	H 2.2 Corridors and Connections *(see p. 81)* H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft. wide, has at least a 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? *(Dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor).* **YES = 4 points** (go to H 2.3) **NO** = go to H 2.2.2 H. 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50 ft. wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR a Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? **YES = 2 points** (go to H 2.3) **NO** = go to H 2.2.3 H. 2.2.3 Is the wetland: • Within 5 mi (8km) of a brackish or salt water estuary OR • Within 3 miles of a large field or pasture (> 40 acres) OR **YES** = 1 point • Within 1 mile of a lake greater than 20 acres? **NO** = 0 points	2

Comments:

Wetland name or number 31 (post-construction)

	H 2.3 Near or adjacent to other priority habitats listed by WDFW (see p. 82): *(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)* Which of the following priority habitats are within 330 ft. (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.* ____ **Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre). ____ **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report p. 152*). ____ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock. ____ **Old-growth/Mature forests:** (Old-growth west of Cascade crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. (Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west of the Cascade crest. ____ **Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158*). X **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. ____ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161*). ____ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources. ____ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report: pp. 167-169 and glossary in Appendix A).* ____ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human. ____ **Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft. ____ **Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs. X **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long. If wetland has **3 or more** priority habitats = **4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat = **1 point** No habitats = 0 points Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)	3
	H 2.4 Wetland Landscape: *Choose the **one** description of the landscape around the wetland that best fits (see p. 84)* • There are at least 3 other wetlands within 1/2 mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development ..... points = 5 • The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within 1/2 mile ..... points = 5 • There are at least 3 other wetlands within 1/2 mile, BUT the connections between them are disturbed..... points = 3 • The wetland fringe on a lake **with** disturbance and there are 3 other lake-fringe wetlands within 1/2 mile..... points = 3 • There is at least 1 wetland within 1/2 mile..... points = 2 • There are no wetlands within 1/2 mile ..... points = 0	3
	H 2 TOTAL Score – opportunity for providing habitat *Add the scores from H2.1, H2.2, H2.3, H2.4*	10
	TOTAL for H 1 from page 8	15
◆	**Total Score for Habitat Functions** Add the points for H 1 and H 2; then ***record the result on p. 1***	25

Comments:

Wetland name or number 31 (post-construction)

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

	Wetland Type – *Check off any criteria that apply to the wetland. Circle the Category when the appropriate criteria are met.*	
SC1	**Estuarine wetlands?** *(see p.86)* Does the wetland unit meet the following criteria for Estuarine wetlands? ✓ The dominant water regime is tidal, ___ Vegetated, and ✓ With a salinity greater than 0.5 ppt. **YES** = Go to SC 1.1 **NO** X	
	SC 1.1 Is the wetland unit within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? **YES** = Category I **NO** = go to SC 1.2	**Cat. 1**
	SC 1.2 Is the wetland at least 1 acre in size and meets at least two of the following conditions? **YES** = Category I **NO** = Category II ___ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp,. are only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category 1. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. ___ At least 3/4 of the landward edge of the wetland has a 100 ft. buffer of shrub, forest, or un-grazed or un-mowed grassland ___ The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual Rating I/II**
SC2	**Natural Heritage Wetlands** *(see p. 87)* Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland being rated in a Section/Township/Range that contains a natural heritage wetland? *(This question is used to screen out most sites before you need to contact WNHP/DNR.)* S/T/R information from Appendix D X or accessed from WNHP/DNR web site ___ **YES** ___ Contact WNHP/DNR (see p. 79) and go to SC 2.2 **NO** X SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as a site with state threatened or endangered plant species? **YES** = Category 1 **NO** ___ not a Heritage Wetland	**Cat I**
SC3	**Bogs** *(see p. 87)* Does the wetland **(or any part of the unit)** meet both the criteria for soils and vegetation in bogs? Use the key below to identify if the wetland is a bog. ***If you answer yes you will still need to rate the wetland based on its function.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of soil profile? (See Appendix B for a field key to identify organic soils)? **YES** = go to question 3 **NO** = go to question 2 2. Does the wetland have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? **YES** = go to question 3 **NO** = is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? **YES** = Is a bog for purpose of rating **NO** = go to question 4 NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. 4. Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine. WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)*? **YES** = Category I **NO** = Is not a bog for purpose of rating	**Cat. I**

Wetland name or number YCS-1/2 (post)

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 – Updated July 2006 to increase accuracy and reproducibility among users

Name of wetland (if known): YCS-1/S-2 (combined wetland Date of site visit: –

Rated by: P. Tagher/M. Dalzell Trained by Ecology? Yes ✓ No____ Date of training: 5/05

SEC: 20 TWNSHP: 25N RNGE: 5E Is S/T/R in Appendix D? Yes____ No X

Map of wetland unit: Figure_____ Estimated size 2.54 ac

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland: I____ II ✓ **III____ IV____**

Category I =	Score > 70
Category II =	Score 51 - 69
Category III =	Score 30 – 50
Category IV =	Score < 30

Score for Water Quality Functions	20
Score for Hydrologic Functions	26
Score for Habitat Functions	21
TOTAL Score for Functions	67

Category based on SPECIAL CHARACTERISTCS of Wetland I____ II____ Does not apply X

Final Category (choose the "highest" category from above") II

Summary of basic information about the wetland unit.

Wetland Unit has Special Characteristics	
Estuarine	
Natural Heritage Wetland	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	

Wetland HGM Class used for Rating	
Depressional	
Riverine	X
Lake-fringe	
Slope	X
Flats	
Freshwater Tidal	
Check if unit has multiple HGM classes present	X

Does the wetland being rated meet any of the criteria below? If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands that Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered **animal or plant** species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered **animal** species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category 1 Natural Heritage Wetlands (see p. 19 of data form).		
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		
SP4. *Does the wetland unit have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands in to those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number YCS-1/2 (post)

Classification of Vegetated Wetlands for Western Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides (i.e. except during floods)?
   NO – go to 2 **YES** – the wetland class is **Tidal Fringe**
   If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?
   YES – Freshwater Tidal Fringe **NO – Saltwater Tidal Fringe (Estuarine)**
   *If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is a Saltwater Tidal Fringe it is rated as an **Estuarine** wetland.* Wetlands that were call estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p. _____).

2. The entire wetland unit is flat and precipitation is only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.
   NO – go to 3 **YES** – The wetland class is **Flats**
   If your wetland can be classified as a "Flats" wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland meet both of the following criteria?
   _____ The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) where at least 20 acres (8ha) in size;
   _____ At least 30% of the open water area is deeper than 6.6 (2 m)?
   NO – go to 4 **YES** – The wetland class is **Lake-fringe (Lacnstrine Fringe)**

4. Does the entire wetland meet all of the following criteria?
   _____ The wetland is on a slope *(slope can be very gradual)*.
   _____ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
   _____ The water leaves the wetland **without being impounded**?
   NOTE: *Surface water does not pond in these types of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).*
   NO – go to 5 **YES** – The wetland class is **Slope**

5. Does the entire wetland meet all of the following criteria?
   _____ The unit is in a valley or stream channel where it gets inundated by overbank flooding from that stream or river.
   _____ The overbank flooding occurs at least once every two years.
   NOTE: *The riverine unit can contain depressions that are filled with water when the river is not flooding..*
   NO – go to 6 **YES** – The wetland class is **Riverine**

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time of the year. This means that any outlet, if present is higher than the interior of the wetland.
   NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland located in a very flat area with no obvious depression and no overbank flooding. The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.
   No – go to 8 YES – The wetland class is Depressional

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit, classify the wetland using the class that represents more than 90% of the total area.

HGM Classes within the wetland unit being rated	*HGM Class to Use in Rating*
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine along stream within boundary	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

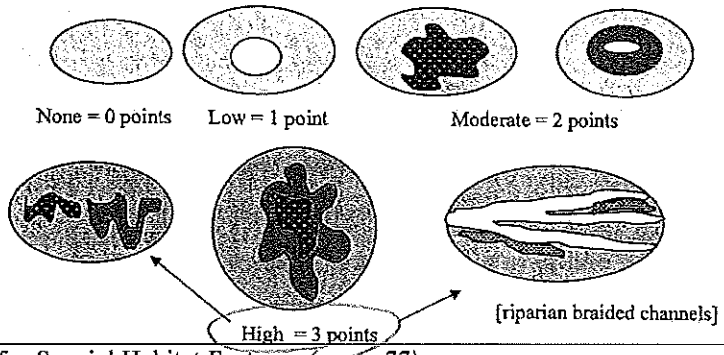
If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Wetland name or number YCS-1/2 (post)

R	Riverine and Freshwater Tidal Fringe Wetlands	Points (only 1 score per box)
	WATER QUALITY FUNCTIONS – Indicators that wetland functions to improve water quality.	
R 1	**Does the wetland have the potential to improve water quality?** *(see p.52)*	
	R 1.1 Area of surface depressions within the riverine wetland that can trap sediments during a flooding event: • Depressions cover > 3/4 area of wetland ..... points = 8 • Depressions cover > 1/2 area of wetland ..... points = 4 **(If depressions > 1/2 of area of unit draw polygons on aerial photo or map)** • Depressions present but cover < 1/2 area of wetland. ..... points = 2 • No depressions present ..... points = 0	**Figure** 2
	R 1.2 Characteristics of the vegetation in the unit (areas with >90% cover at person height): • Trees or shrubs > 2/3 area of the unit ..... points = 8 • Trees or shrubs > 1/3 area of the wetland ..... points = 6 • Ungrazed, herbaceous plants > 2/3 area of unit ..... points = 6 • Ungrazed herbaceous plants > 1/3 area of unit ..... points = 3 • Trees, shrubs, and ungrazed herbaceous < 1/3 area of unit ..... points = 0 **Aerial photo or map showing polygons of different vegetation types**	**Figure** ___ 8
	Add the points in the boxes above	10
R 2	**Does the wetland have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* ___ Grazing in the wetland or within 150 ft ___ Untreated stormwater discharges to wetland ___ Tilled fields or orchards within 150 ft. of wetland X A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging X Residential, urban areas, golf courses are within 150 ft. of wetland X The river or stream linked to the wetland has a contributing basin where human activities have raised levels of sediment, toxic compounds or nutrients in the river water above standards for water quality. ___ Other ___ **YES** multiplier is 2 **NO** multiplier is 1	*(see p. 53)* Multiplier 2
◆	**TOTAL – Water Quality Functions** Multiply the score from R1 by R2; then ***add score to table on p. 1***	20
	HYDROLOGIC FUNCTIONS – Indicators that wetland functions to reduce flooding and stream erosion.	
R 3	**Does the wetland have the potential to reduce flooding and erosion?**	*(see p.54)*
	R 3.1 Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of unit) / (average width of stream between banks).* • If the ratio is more than 20 ..... points = 9 • If the ratio is between 10 – 20 ..... points = 6 • If the ratio is 5- <10 ..... points = 4 • If the ratio is 1- <5 ..... points = 2 • If the ratio is < 1 ..... points = 1 **Aerial photo or map showing average widths**	**Figure** ___ 6
	R 3.2 Characteristics of vegetation that slow down water velocities during floods: *Treat large woody debris as "forest or shrub". Choose the points appropriate for the best description. (polygons need to have >90% cover at person height NOT Cowardin classes):* • Forest or shrub for > 1/3 area OR herbaceous plants > 2/3 area ..... points = 7 • Forest or shrub for > 1/10 area OR herbaceous plants > 1/3 area ..... points = 4 • Vegetation does not meet above criteria ..... points = 0 **Aerial photo or map showing polygons of different vegetation types**	**Figure** ___ 7
	Add the points in the boxes above	13
R 4	**Does the wetland have the opportunity to reduce flooding and erosion?** Answer YES if the wetland is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. *Note which of the following conditions apply.* X There are human structures and activities downstream (roads, buildings, bridges, farms) that can be damaged by flooding. X There are natural resources downstream (e.g. salmon redds) that can be damaged by flooding ___ Other ___ *(Answer NO if the major source of water to the wetland is controlled by a reservoir or the wetland is tidal fringe along the sides of a dike)* **YES** multiplier is 2 **NO** multiplier is 1	*(see p.57)* Multiplier 2
◆	**TOTAL – Hydrologic Functions** Multiply the score from R3 by R4; then ***add score to table on p. 1***	26

Comments:

Wetland name or number YCS-1/2 (post)

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS – Indicators that wetland functions to provide important habitat.	Points (only 1 score per box)
H 1 Does the wetland have the potential to provide habitat for many species?	
H 1.1 Vegetation structure *(see P. 72)*: *Check the types of vegetation classes present (as defined by Cowardin) – Size threshold for each class is 1/4 acre or more than 10% of the area if unit is smaller than 2.5 acres.*	**Figure ___**
___ Aquatic Bed X Emergent plants X Scrub/shrub (areas where shrubs have > 30% cover) X Forested (areas where trees have > 30% cover) *If the unit has a forested class check if:* X The forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon. *Add the number of vegetation types that qualify. If you have:* **Map of Cowardin vegetation classes** 4 structures or more.....points = 4 3 structures.....points = 2 2 structures.....points = 1 1 structure.....points = 0	4
H 1.2 Hydroperiods *(see p.73)*: *Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or 1/4 acre to count (see text for descriptions of hydroperiods).*	**Figure ___**
___ Permanently flooded or inundated — 4 or more types present points = 3 X Seasonally flooded or inundated — 3 or more types present....points = 2 ___ Occasionally flooded or inundated — 2 types present.....points = 1 X Saturated only — 1 type present.....points = 0 X Permanently flowing stream or river in, or adjacent to, the wetland ___ Seasonally flowing stream in, or adjacent to, the wetland ___ **Lake-fringe wetland.....= 2 points** ___ **Freshwater tidal wetland.....= 2 points** **Map of hydroperiods**	2
H 1.3 Richness of Plant Species *(see p. 75)*: Count the number of plant species in the wetland that cover at least 10 ft^2 *(different patches of the same species can be combined to meet the size threshold)* *You do not have to name the species. Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle.* If you counted: > 19 species ..... points = 2 5 – 19 species ..... points = 1 < 5 species ..... points = 0 List species below if you want to:	2
H 1.4 Interspersion of Habitats *(see p. 76)*: Decided from the diagrams below whether interspersion between Cowardin vegetation (described in H1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.	**Figure ___**
 Note: If you have 4 or more classes or 3 vegetation classes and open water, the rating is always "high". **Use map of Cowardin classes.**	3
H 1.5 Special Habitat Features *(see p. 77)*: *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.*	
X Large, downed, woody debris within the wetland (> 4 in. diameter and 6 ft. long) X Standing snags (diameter at the bottom > 4 inches) in the wetland ___ Undercut banks are present for at least 6.6 ft. (2m) and/or overhanging vegetation extends at least 3.3 ft. (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft. (10m) ___ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ___ At least 1/4 acre of thin-stemmed persistent vegetation or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ___ Invasive plants cover less than 25% of the wetland area in each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	2
H 1 TOTAL Score – potential for providing habitat *Add the points in the column above*	13

Wetland name or number Ycs-1/2 (post)

H 2	Does the wetland have the opportunity to provide habitat for many species?	(only 1 score per box)
	H 2.1 Buffers *(see P. 80)*: *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed".* ____ 100m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 95% of circumference. No structures are within the undisturbed part of buffer (relatively undisturbed also means no grazing, no landscaping, no daily human use).. .....**points = 5** ____ 100m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference.....**points = 4** ____ 50m (170 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 95% circumference.....**points = 4** ____ 100m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference.....**points = 3** ____ 50m (170 ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference .....**points = 3** **If buffer does not meet any of the criteria above:** ____ No paved areas (except paved trails) or buildings within 25m (80 ft) of wetland > 95% circumference. Light to moderate grazing or lawns are OK.....**points = 2** ____ No paved areas of buildings within 50m of wetland for > 50% circumference. Light to moderate grazing or lawns are OK.....**points = 2** ____ Heavy grazing in buffer.....**points = 1** ____ Vegetated buffers are < 2m wide (6.6 ft) for more than 95% circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland).....**points = 0** X Buffer does not meet any of the criteria above .....**points = 1** **Arial photo showing buffers**	**Figure ___** /
	H 2.2 Corridors and Connections *(see p. 81)* H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft. wide, has at least a 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? *(Dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor).* **YES = 4 points** (go to H 2.3) **NO** = go to H 2.2.2 H. 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50 ft. wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR a Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? **YES = 2 points** (go to H 2.3) **NO** = go to H 2.2.3 H. 2.2.3 Is the wetland: • Within 5 mi (8km) of a brackish or salt water estuary OR • Within 3 miles of a large field or pasture (> 40 acres) OR **YES** = 1 point • Within 1 mile of a lake greater than 20 acres? **NO** = 0 points	/

Comments:

Wetland name or number YCS-1/2 (post)

	H 2.3 Near or adjacent to other priority habitats listed by WDFW (see p. 82): Which of the following priority habitats are within 330 ft. (100m) of the wetland? *NOTE: the connections do not have to be relatively undisturbed. These are DFW definitions. Check with your local DFW biologist if there are any questions.* X **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. ____ **Aspen Stands:** Pure or mixed stands of aspen greater than 0.8 ha (2 acres) ____ **Cliffs:** Greater than 7.6m (25 ft) high and occurring below 5000 ft. ____ **Old-growth forests:** (Old growth west of Cascade Crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings, with at least 20 trees/ha (8 trees/acre) > 81cm (32 in) dbh or > 200 years of age. ____ **Mature forests:** Stands with average diameters exceeding 53cm (21 in) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 – 200 years old west of the Cascade Crest. ____ **Prairies:** Relatively undisturbed areas (as indicated by dominance of native plants) where greases and/or forbs form the natural climax plant community. ____ **Talus:** Homogenous areas of rock rubble ranging in average size 0.15 – 2.0m (0.5 – 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs. ____ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages. ____ **Oregon white Oak:** Woodlands stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%. X **Urban Natural Open Space:** A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other *priority habitats*, especially those that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and is surrounded by urban development. ____ **Estuary/Estuary-like:** Deepwater tidal habitats and adjacent tidal wetlands, usually semi-enclosed by land but with open, partly obstructed or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines there is appreciable dilution of sea water. Estuarine habitat extends upstream and landward to where ocean-derived salts measure less than 0.5 ppt. during the period of average annual low flow. Includes both estuaries and lagoons. ____ **Marine/Estuarine Shorelines:** Shorelines include the intertidal and subtidal zones of beaches, and may also include the backshore and adjacent components of the terrestrial landscape (e.g., cliffs, snags, mature trees, dunes, meadows) that are important to shoreline associated fish and wildlife and that contribute to shoreline function (e.g., sand/rock/log recruitment, nutrient contribution, erosion control). If wetland has 3 or more priority habitats .= 4 points If wetland has 1 priority habit ...= 1 point If wetland has 2 priority habitats .....= 3 points No habitats.....= 0 points Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. (Nearby wetlands are addressed in question H 2.4).	3
	H 2.4 Wetland Landscape: *Choose the **one** description of the landscape around the wetland that best fits (see p. 84)* • There are at least 3 other wetlands within 1/2 mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development.....points = 5 • The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within 1/2 mile .....points = 5 • There are at least 3 other wetlands within 1/2 mile, BUT the connections between them are disturbed.....points = 3 • The wetland fringe on a lake **with** disturbance and there are 3 other lake-fringe wetlands within 1/2 mile.....points = 3 • There is at least 1 wetland within 1/2 mile.....points = 2 • There are no wetlands within 1/2 mile .....points = 0	3
	H 2 TOTAL Score – opportunity for providing habitat *Add the scores from H2.1, H2.2, H2.3, H2.4*	8
	TOTAL for H 1 from page 8	13
◆	**Total Score for Habitat Functions** Add the points for H 1 and H 2; then ***record the result on p. 1***	21

Comments:

Wetland name or number YCS-1/2 (post)

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

	Wetland Type – *Check off any criteria that apply to the wetland. Circle the Category when the appropriate criteria are met.*	
SC1	**Estuarine wetlands?** *(see p.86)* Does the wetland unit meet the following criteria for Estuarine wetlands? ____ The dominant water regime is tidal, ____ Vegetated, and ____ With a salinity greater than 0.5 ppt. **YES** = Go to SC 1.1 **NO** ____	
	SC 1.1 Is the wetland unit within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? **YES** = Category I **NO** = go to SC 1.2	**Cat. 1**
	SC 1.2 Is the wetland at least 1 acre in size and meets at least two of the following conditions? **YES** = Category I **NO** = Category II ____ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp,. are only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category 1. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. ____ At least 3/4 of the landward edge of the wetland has a 100 ft. buffer of shrub, forest, or un-grazed or un-mowed grassland ____ The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual Rating I/II**
SC2	**Natural Heritage Wetlands** *(see p. 87)* Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland being rated in a Section/Township/Range that contains a natural heritage wetland? *(This question is used to screen out most sites before you need to contact WNHP/DNR.)* S/T/R information from Appendix D _____ or accessed from WNHP/DNR web site ✓ **YES** ____ Contact WNHP/DNR (see p. 79) and go to SC 2.2 **NO** ____ SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as a site with state threatened or endangered plant species? **YES** = Category 1 **NO** X not a Heritage Wetland	**Cat I**
SC3	**Bogs** *(see p. 87)* Does the wetland **(or any part of the unit)** meet both the criteria for soils and vegetation in bogs? Use the key below to identify if the wetland is a bog. ***If you answer yes you will still need to rate the wetland based on its function.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of soil profile? (See Appendix B for a field key to identify organic soils)? **YES** = go to question 3 **NO** = go to question 2 2. Does the wetland have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? **YES** = go to question 3 **NO** = is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? **YES** = Is a bog for purpose of rating **NO** = go to question 4 NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. 4. Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine. WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)*? **YES** = Category I **NO** = Is not a bog for purpose of rating	**Cat. I**

Wetland name or number YCS-1/2 (post)

SC4	**Forested Wetlands** *(see p. 90)* Does the wetland have at least 1 acre of forest that meet one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its function.* ____ **Old-growth forests**: (west of Cascade Crest) Stands of at least two three species forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm or more). NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. ____ **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have an average diameters (dbh) exceeding 21 inches (53 cm); crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. **YES** = Category I **NO** = X not a forested wetland with special characteristics	**Cat. I**
SC5	**Wetlands in Coastal Lagoons** *(see p. 91)* Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? ____ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks. ____ The lagoon in which the wetland is located contains surface water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom.)* **YES** = Go to SC 5.1 **NO** X not a wetland in a coastal lagoon SC 5.1 Does the wetland meet all of the following three conditions? ____ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing) and has less than 20% cover of invasive plant species (see list of invasive species on p. 74). ____ At least 3/4 of the landward edge of the wetland has a 100 ft. buffer of shrub, forest, or un-grazed or un-mowed grassland. ____ The wetland is larger than 1/10 acre (4350 square ft.) **YES** = Category I **NO** = Category II	**Cat. I** **Cat. II**
SC6	**Interdunal Wetlands** *(see p. 93)* Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? **YES** = Go to SC 6.1 **NO** X not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its functions.*** In practical terms that means the following geographic areas: • Long Beach Peninsula -- lands west of SR 103 • Grayland-Westport -- lands west of SR 105 • Ocean Shores-Copalis – lands west of SR 115 and SR 109 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is one acre or larger? **YES** = Category II **NO** = go to SC 6.2 SC 6.2 Is the wetland between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? **YES** = Category III	**Cat. II** **Cat. III**
◆	**Category of wetland based on Special Characteristics** *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered **NO** for all types enter "Not Applicable" on p. 1	N/A

Comments:

Wetland name or number 31 (post-construction)

SC4	**Forested Wetlands** *(see p. 90)* Does the wetland have at least 1 acre of forest that meet one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its function.* ____ **Old-growth forests**: (west of Cascade Crest) Stands of at least two three species forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm or more). NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. ____ **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have an average diameters (dbh) exceeding 21 inches (53 cm); crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. **YES** = Category I (**NO**) X not a forested wetland with special characteristics	**Cat. I**
SC5	**Wetlands in Coastal Lagoons** *(see p. 91)* Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? N The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks. N The lagoon in which the wetland is located contains surface water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom.)* **YES** = Go to SC 5.1 (**NO**) X not a wetland in a coastal lagoon SC 5.1 Does the wetland meet all of the following three conditions? ____ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing) and has less than 20% cover of invasive plant species (see list of invasive species on p. 74). ____ At least 3/4 of the landward edge of the wetland has a 100 ft. buffer of shrub, forest, or un-grazed or un-mowed grassland. ____ The wetland is larger than 1/10 acre (4350 square ft.) **YES** = Category I **NO** = Category II	**Cat. I** **Cat. II**
SC6	**Interdunal Wetlands** *(see p. 93)* Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? **YES** = Go to SC 6.1 (**NO**) N not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its functions.*** In practical terms that means the following geographic areas: • Long Beach Peninsula -- lands west of SR 103 • Grayland-Westport -- lands west of SR 105 • Ocean Shores-Copalis – lands west of SR 115 and SR 109 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is one acre or larger? **YES** = Category II **NO** = go to SC 6.2 SC 6.2 Is the wetland between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? **YES** = Category III	**Cat. II** **Cat. III**
◆	**Category of wetland based on Special Characteristics** *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered **NO** for all types enter "Not Applicable" on p. 1	N/A

Comments:

Appendix G—Site Selection Methods and Results

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1.1 Introduction

This appendix summarizes the site selection process for candidate wetland mitigation sites in the Medina to SR 202: Eastside Transit and HOV Project. It is intended to provide the reader with a comprehensive overview of how appropriate mitigation sites were selected.

The appendix is divided into two sections: methods and results. The methods section describes the process for selecting a preliminary list of sites and winnowing out the most desirable sites for mitigation. The results section shows the end products of this winnowing process. Tables and figures have been used to illustrate the data where necessary.

1.2 Methods

1.2.1. Site Selection parameters

The Mitigation Team identified nine broad parameters that would define the best sites for the master list of potential mitigation sites. These nine parameters are divided into two sets: (1) opportunity parameters, and (2) risk parameters.

The "opportunity set" consists of five parameters: size, mitigation type, location, special characteristics, and cost. The Mitigation Team used site size to determine the potential for sites to provide a significant portion of the project's mitigation needs, and mitigation type (as determined by the joint federal and Washington State guidance [Ecology et al. 2006]), and to determine which sites were most likely to provide the required mitigation value. The location parameter identified the mitigation site's location in a Water Resource Inventory Area (WRIA), sub-watershed, and local jurisdiction, and the site's proximity to the affected wetlands. The Mitigation Team used the special characteristics parameter to identify any key features that might need to match those of the affected site or follow specific regulatory guidance. Examples include hydrogeomorphic class, hydroperiod, and habitat type. The cost parameter will primarily be used during the final portion of the site analysis and will be based on assessed tax values (early in the site analysis process) or professional assessment (later in the site analysis process).

The "risk set" includes four parameters: availability, hydrology, hazardous materials, and cultural resources. The availability parameter addresses the risk of losing a site. It is common to lose a site during the mitigation process due to development, sale, or an unwilling seller. The hydrology parameter addresses the risk of failure due to insufficient water on the site; sufficient water is critical to wetland creation, rehabilitation, or re-establishment. The Mitigation Team considered only those sites with a high probability of providing sufficient wetland hydrology. Hazardous materials sites pose a high risk of site contamination and high costs, and received more thorough scrutiny. Sites with documented cultural resources were eliminated from further consideration to avoid negative effects on these resources resulting from construction.

1.2.2. Site Selection Process

To identify candidate mitigation sites for the Medina to SR 202: Eastside Transit and HOV Project, the Mitigation Team used a hierarchical selection process based on the watersheds in the project area. The initial boundaries of the area under consideration for candidate sites for the combined corridor project included all of the Cedar-Sammamish WRIA 8. This area was subdivided into the east side of Lake Washington (for the Medina to SR 202: Eastside Transit and HOV Project) and the west side of Lake Washington (for the I-5 to Medina: Bridge Replacement and HOV Project). This allowed the Mitigation Team to focus on candidate mitigation sites in closer proximity to the project's effects.

The limits for the study area for the Medina to SR 202: Eastside Transit and HOV Project included much of the Greater Lake Washington Watershed, extending from the Sammamish River basin on the north to southern boundaries of the Cities of Bellevue and Issaquah, including the Cities of Bothell, Kirkland, Kenmore, Mercer Island, Sammamish, Redmond, and unincorporated King County. The drainage basins searched at this stage included East Lake Washington/Bellevue North, East Lake Washington/Bellevue Middle, Yarrow Creek, Mercer Slough, Kelsey Creek, Bear Creek and Evans Creek. Additional preliminary sites were identified for the Sammamish River, East Lake Sammamish, West Lake Sammamish, East Lake Washington/Bellevue South, Forbes Creek, Juanita Bay, Juanita Creek, East Lake Washington/Kenmore South, Issaquah Creek, Tibbetts Creek, North Creek, Swamp Creek, Coal Creek, and Lower Cedar River drainages. These sites were put on a backup list because of their distance from the Project. These sites could be reviewed in more detail if an insufficient number of quality sites cannot be developed from those sites in closer proximity to the impacts.

Selection of candidate sites within this study area was based on a review of existing information and supplemented with sites identified by local agency staff. These two processes are described in greater detail below.

Review of Existing Information

The Mitigation Team reviewed public documents, maps, and geographic information system (GIS) layers, including information on the soils, hydrology, topography, land use, wetlands, and streams in selected areas of the watershed. Data sources included the following:

- Chinook Salmon Conservation Plan – WRIA 8 (February 2005)
- Puget Sound Nearshore Project Priorities (December 2007)
- *Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Near Term Action Agenda for Salmon Habitat Conservation* (August 2002)
- *Enhancing Transportation Delivery Through Watershed Characterization: I-405/SR 520 Study* (December 2004)
- *SR 520 Bridge Replacement and HOV Project EIS: Light Intensity Analysis Technical Memorandum* (March 3, 2006)

- *SR 520 Bridge Replacement and HOV Project EIS: 6-Lane Alternative: Initial Wetland Mitigation Plan* (May 17, 2006)
- *SR 520 Bridge Replacement and HOV Project Draft EIS and Appendix E* (August 18, 2006)
- WSDOT and King County GIS layers including critical areas, parcels, parks, trails, water system-related data, land use, and zoning (data acquired from WSDOT 2008)
- Aerial Photography (October 22nd, 2006)
- County Assessor tax parcel information (data acquired from WSDOT, 2006)
- National Wetlands Inventory (NWI) (U.S. Fish and Wildlife Service)

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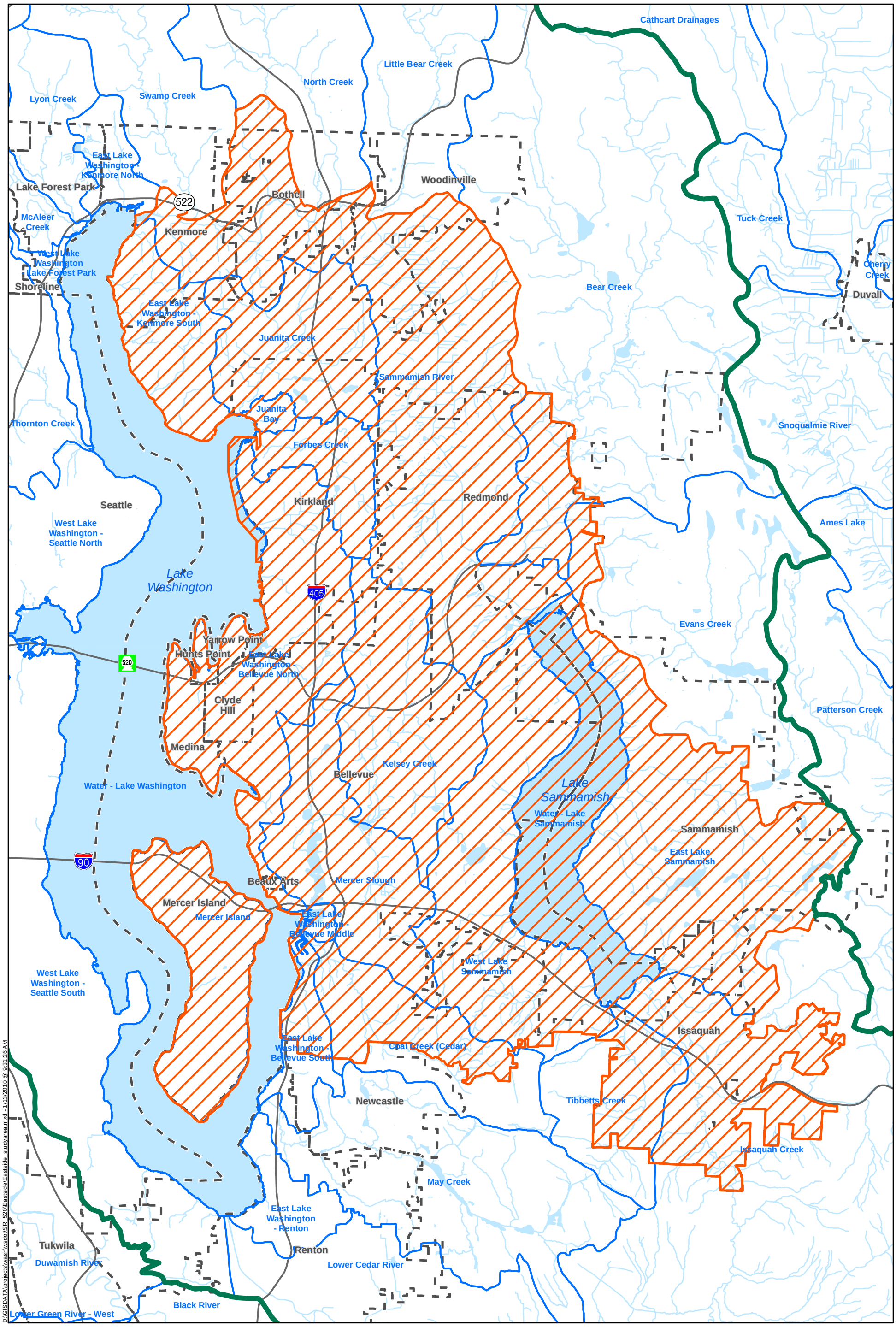

N

0 1 2
Miles

Legend
Study Area
Municipal Boundary
Watershed Boundary
WRIA Boundary
Water Body
Stream

Figure 1: Study Area Map

Washington State Department of Transportation

SR520 Bridge Replacement and HOV Program
Medina to SR 202: Eastside Transit and HOV Project

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Input from Agencies and Cities

WSDOT established a forum to facilitate early coordination with regulatory agencies and tribes. The Resource Agency Coordination Process (RACP) committee is an interagency committee whose members include WSDOT, USACE, Ecology, Washington State Department of Fish and Wildlife, Muckleshoot Indian Tribe, National Oceanic and Atmospheric Administration, National Parks Service, United States Fish and Wildlife Service (USFWS), City of Medina, City of Bellevue, and the City of Seattle. This standing committee serves as an early permit coordination group to consider a wide range of issues pertaining to the environmental process including effect evaluation and mitigation. The RACP began May 1, 2008 in an effort to provide timely, upfront and coordinated review of the project effects and anticipated permit requirements. Regulatory agencies provided input to the list of potential sites through the RACP coordination efforts.

The Mitigation Team also incorporated sites provided by City of Bellevue Parks Department staff through their involvement with the Medina to SR 202: Eastside Transit and HOV Project, and through a meeting with the Mitigation Team. Additional sites were added by biologists on the Mitigation Team with extensive experience in the project area through the Medina to SR 202: Eastside Transit and HOV Project and other local projects.

Potential Site List

Based on the review of information and local agency input, the Mitigation Team developed a list of potential sites within the study area. This master list includes sites that have potential to provide compensatory mitigation for effects related to the Medina to SR 202: Eastside Transit and HOV Project. The master list is divided into three sub-lists:

- The *A list* contains the best sites with low risk, based on preliminary screening criteria. The A list is sorted based on the preference criteria to determine the preferred sites.

- The *B list* contains good sites with low risk. If the A list is reduced following more detailed site analysis or unsuccessful purchase negotiations, then sites from the B list may be used to repopulate the A list. Also, as the project or regulatory requirements become more defined or change, the selection criteria for the A list could change, re-ordering the sites on the A and B lists.

- The *D list* contains high-risk sites that would require additional detailed analysis in order to be listed on the A or B list.

The Mitigation Team has maintained all of the candidate sites on the master list to document the site selection process and to provide flexibility for changes in design or regulatory process.

1.2.3. Screening

Site screening was performed in two steps. The initial screening focused on risk factors and avoiding clearly unfeasible sites. The second screening focused on opportunities. The screening process was intended to identify sites that would provide more than 10 times the needed mitigation.

Screen 1

The initial screening used five parameters to determine suitability of the site. These five parameters are size, the proximity of the proposed mitigation site to the project impacts, presence of existing development on the site, appropriate site hydrology, and an absence of obvious hazardous waste generating facilities at the site. These criteria were evaluated in the office based on existing data sources. Sites passing the screening criteria were sorted to the A list. A more detailed description of the parameters and the criteria used to determine them is presented in Table 1.

Table 1. Screen 1 Criteria and Data Sources

Parameter	Criteria	Information sources
Size	Sites must consist of parcels greater than two acres.	WSDOT GIS parcel dataset (2008).
Proximity to Impacts	Sites to be located in Greater Lake Washington and Cedar River Watersheds.	WSDOT GIS data.
Site Availability	Developed sites (industrial, commercial, residential) not considered.	Aerial photographs (WSDOT GIS data 2006).
Limited risk of failure due to site hydrology	Site must have high potential for appropriate hydrology as indicated by topography, mapped hydric soils, and/or surface waters.	USDA NRCS Soil Mapping; National Wetland Inventory; Local Wetland Inventories.
Absence of hazardous wastes	No visible hazardous waste generating facilities; Industrial sites, auto yards, gas station, etc. rejected.	Aerial photographs (WSDOT GIS data 2006).

For the purposes of this screening, the tax assessed value of all parcels was assumed to be relatively equivalent and low.

Screen 2

For the second screening, the Mitigation Team screened sites based on the site size. The size threshold of five acres or more was based on the projects mitigation needs. Candidate sites that met the criteria for size, special characteristics, and location were placed in the A list, and those with lower mitigation potential were placed on the B list. A more detailed description of the parameters and criteria is provided in Table 2.

Table 2. Screen 2 Criteria and Data Sources

Parameter	Criteria	Information sources
Site size	Sites over five acres.	WSDOT GIS parcel dataset (2008); National Wetland Inventory; Aerial photographs (WSDOT GIS data 2006).
Special characteristics	Sites with high restoration potential and large area retained.	National Wetland Inventory; local wetland inventories.
Location	Priority given to: Westside: Sites in Seattle; Eastside: City of Bellevue sites in Yarrow, Kelsey, Mercer, and Phantom Creek Drainages; Adjacent sub-watersheds including Lake Sammamish; City of Kirkland shorelines and associated drainages, Sammamish River, Issaqiah Creek, and Bear Creek on A-List but lower priority.	Local mapping.

1.2.4. Paring

The paring process is intended to reduce the number of mitigation sites but still maintain the best sites, providing a wide array of mitigation options. Paring consisted of a five-part process that culled the master list to the best sites for possible acquisition, and sorted the master list to the three sub-lists (see Section 3.3). Pares 1 through 3 removed high-risk sites and sorted the A list to identify the best sites for further analysis. Pares 4 and 5 (not completed at the time of this report) are focused on detailed site analysis and are intended to identify the five best sites. The remaining sites from each pare were moved to the B list. In this process, candidate sites that are sorted to the B list can be moved back to the A list (or vice versa) as the project design and permit process evolve and as the criteria for mitigation change. A summary of the paring process is shown in Table 3.

Table 3. Mitigation Site Selection Summary

	Pare 1	Pare 2	Pare 3	Pare 4	Pare 5	Verify Selection
		Office	Drive by	Site Availability	Field analysis	Final analysis
Opportunity/Benefits						
Size (fewest sites needed)						
Potential mitigation type		Re-establishment & rehabilitation preferred Creation = ~100% of a total mitigation site ok	Verify and resort A-list. Preliminary Pare to 5 best sites. Others to B list		Conduct detailed reconnaissance level analysis for 5 best sites and estimate mitigation credit. Retain sites with 20% of total mitigation credits for selection Recommend top 3 sites To Mitigation Planning WG for selection and purchase process	Collaborative selection of top 3 sites.
Special characteristics		Desired habitats: Eastside: riverine Seattle: lacustrine fringe	Verify		Verify	
Location		Must fit with local jurisdictions; Others to B list	Verify		Verify	
Cost					Rough Comp from Real Estate Office	Professionally Assessed Value
Risk Factors						
Availability (Risk of loss of site)	Evaluate local restrictions based on agricultural and farm preservation lands. 4f parks areas may be have consistent management plans		Verify	For five best sites preliminary contact with owner. Obtain Right of entry. B–list if denied. Evaluate willingness to sell. B-list unwilling sellers. If less than 5 sites left, elevate top sites from B-list for ROE contact.		WSDOT negotiation with Seller – Identify Easements. If negotiations are successful proceed with detailed conceptual mitigation plan. If negotiations are not successful return to Pare 5 for more sites.
Hydrology (Risk of Failure)			Reliable source of hydrology based on field characteristics – B-list sites with unreliable hydrology to B -list		Evaluate hydrology in the field. B -list sites with unreliable hydrology	
Hazardous Waste	Review Ecology's Toxics Cleanup Program and UST databases D list cleanup sites and LUST sites		Verify		Visual and informal site check for Hazardous Waste	
Cultural Resources	Check Cultural Resource mapping D list mapped burial, village or ritual sites.		Verify D-list sites that require excavation other than fill		Informal site check for cultural resources D-list sites that require excavation other than fill.	

Pare 1

During Pare 1, the Mitigation Team evaluated the candidate sites based on a review of existing databases and regulations. The criteria that were evaluated included (a) the local land use regulations/site management plans for candidate sites, and (b) databases showing hazardous materials and (c) cultural resources. Sites failing the local regulation parameter were moved to the B list. Those sites that did not meet the hazardous materials were either evaluated in greater detail or moved to the D list. Those locations with cultural sites present were moved to the D list. Details of the parameters and the criteria used for them are shown in Table 4.

Table 3. Pare 1 Criteria and Data Sources

Parameter	Criteria	Information Sources
Size	Sites must consist of parcels greater than two acres.	WSDOT GIS parcel dataset (2008).
Site availability (regulations)	Evaluate local restrictions based on agricultural and farm preservation lands. Section 4(f) parks areas must have consistent management plans.	Local regulations (city and county); management plans for individual sites.
Absence of hazardous materials	No visible hazardous materials generating facilities. Industrial sites, auto yards, gas station, etc., rejected. Sites requiring cleanup and leaking underground storage tank (LUST) sites are reviewed in greater detail or moved to D list.	The Washington State Department of Ecology's (Ecology's) Toxics Cleanup Program and Leaking Underground Storage Tank (LUST) databases (2009).
Absence of known cultural resources	No cultural sites known. Locations with a cultural site present are moved to D list.	Department of Archaeology and Historic Preservation data (2009).

Pare 2 and 3

Pare 2 (the office evaluation of mitigation opportunities) and Pare 3 (the field review that conforms opportunity and assesses risks at the sites) were combined into a single review. The combination of these two pares reduces the wasted effort at candidate sites that are unsuitable, provide minimal potential for mitigation, or that have been recently developed. The field review also allowed the Mitigation Team to add additional sites to the candidate which would have been done in the initial field review (not performed for the SR 520 Corridor Mitigation Site selection process).

Office Review

Initial sorting of the candidate sites was based on opportunity based parameters. The parameters used were potential mitigation type, special characteristics, and location (Table 5). In order to analyze these parameters, The Mitigation Team developed composite maps for each of the candidate sites using the Arc/Info GIS. The mapped data included parcels, wetlands and streams based on existing inventories, maps of hydric soils, and aerial photography. The Mitigation Team used these maps to determine the potential mitigation on the candidate sites. The maps also served as the basis for the field verification and site review.

Field Review

The Mitigation Team evaluated the sites in the field to verify the assumed wetland boundaries and sources of hydrology, proposed mitigation types, the presence of special characteristics, location (in this case adjacent land use and regulatory assumptions), availability, and the absence of obvious hazardous waste or cultural resource issues. All of the candidate sites were evaluated from publicly accessible rights-of-way. Wetland boundaries and sources of hydrology were assessed based on the presence of visibly identifiable characteristics such as wetland vegetation (e.g. willow species, soft rush, sedges, etc.) and indications of wetland hydrology (e.g., visible channels or areas of existing saturation or inundation, nearby streams or seeps, contributing watershed area). More detailed studies (e.g. test borings, installation of piezometers) would need to be performed during the design process to accurately assess the potential hydrology of the sites. Proposed mitigation types, the presence of special characteristics, current landuse on the sites and in the adjoining areas, and the presence of hazardous waste were likewise determined based on visible indicators observed from public rights-of-way. Table 5 lists the criteria and data sources for this pare.

To further refine the potential mitigation type, determine site suitability, and rank the sites, the candidate sites were rated in the field using the Washington State Wetland Rating System for Western Washington - Revised, Washington State Department of Ecology Publication # 04-06-025 (Hruby 2004). This system assigns wetlands a rating of quality (1 through 4) based on the landscape position, source of hydrology, and the performance of three functions (water quality, hydrologic function, and habitat function). These data served as a baseline to determine potential mitigation type and the potential for increase in ecological function at each of the candidate sites.

Each prospective wetland mitigation site was also assessed using the Washington State Department of Transportation (WSDOT) Wetland Mitigation Site Evaluation Matrix (WSDOT 2008). WSDOT's Wetland Mitigation Matrix evaluates sites based on the physical setting, biological/watershed criteria, site success/risk criteria, and site constructability/cost criteria. These four areas receive separate scores. Scores were used to assess accuracy of the potential mitigation type and the potential sources of hydrology.

Following the field review, the potential mitigation activities (e.g. creation, re-establishment, rehabilitation, and/or enhancement) from suitable candidate sites were digitized and areas were calculated areas in Arc/Info. The Team then used the results of these calculations to determine potential credits per site, and the candidate sites were sorted based on the resulting credits per site. Candidate sites passing the Pare 2/Pare 3 were sorted for further evaluation.

Table 4. Pare 2 Criteria and Data Sources

Parameter	Criteria	Information sources
Pare 2		
Potential mitigation Type	Retain sites with mitigation types in the following order of preference: 1. Re-establishment and rehabilitation; 2. Creation; and 3. Enhancement. Connectivity to other habitat is also desirable.	Aerial photographs (WSDOT GIS data 2006); digitized information the Mitigation Team analyzed in Arc/Info.
Special Characteristics	Desired habitats: riverine.	Aerial photographs (WSDOT GIS data 2006); digitized information that the Mitigation Team analyzed in Arc/Info; information from local inventories.
Location	Must fit with local jurisdictions; Others to B list.	Aerial photographs (WSDOT GIS data 2006).
Pare 3		
Potential mitigation type	Consistent with proposed mapping from Pare 2.	Pare 2 GIS analysis.
Special characteristics	Confirm desired habitat.	Field review.
Location	Confirm consistency with adjoining land use (record recent changes in land use).	Field review.
Availability	Verify compliance of proposed action with status/plan for public areas.	Field review.
Hydrology	Confirm reliable source of hydrology.	Field review.
Hazardous waste	Confirm absence of waste sources on-site.	Field review.
Cultural resources	Confirm absence of cultural resources on-site.	Field review.

Pare 4

Pare 4 was based on the potential for risk due to the loss of the site. The results of this pare were based on preliminary contact with the owner (or owners) of the top five candidate sites. Evaluation criteria

included the ability to obtain right-of-entry and the willingness of the owners to sell the candidate site. If the Mitigation Team was unable to obtain right-of-entry or the owner was unwilling to sell, the candidate site was moved back to the B list. If less than five sites remained at the end of Pare 4, the Mitigation Team would move up the top sites from the A list for right-of-entry contact.

Pare 5

Pare 5 consisted of a detailed on-site analysis of the top five sites. The evaluation included assessment of both opportunities and risks (see Table 6 for criteria and data sources). The Mitigation Team presented the field evaluation results to the Mitigation Planning Working Group for consultation and selection of the top sites for the purchase process.

The Mitigation Planning Working Group consists of Bill Leonard (WSDOT, initiation through December 2007), Paul Fendt (Parametrix, initiation through March 2008), Ken Sargent (Headwaters Environmental Consulting), Michelle Meade (WSDOT), Phil Bloch (WSDOT), Shane Cherry (Cherry Creek Environmental), Jeff Meyer (Parametrix), Gretchen Lux (WSDOT, December 2007 to present), Beth Peterson (HDR, December 2007 to present), Pat Togher (HDR, April 2008 to present), and Bill Bumback (Jones & Stokes).

Table 6. Pare 5 Criteria and Data Sources

Parameter	Criteria	Information Sources
Potential mitigation type	Recommend top to Mitigation Planning Working Group for selection and purchase process.	On-site comprehensive field review.
Special characteristics	Verify/identify unique or unusual habitats and species.	On-site comprehensive field review.
Location	Verify jurisdictional and land use parameters.	On-site comprehensive field review.
Cost	Assess parcel costs based on rough comparables from real estate office.	Review of candidate site by real estate office.
Hydrology	Verify site hydrology.	On-site comprehensive field review.
Hazardous materials	Visually confirm absence of materials sources on-site.	On-site comprehensive field review (visual assessment).
Cultural resources	Visually confirm absence of cultural resources on-site.	On-site comprehensive field review (visual assessment).

Field analysis also included an assessment of the sites' habitat functions, its ability to ability to produce specific hydrologic regimes and functions, and potential construction techniques needed to achieve mitigation, along with relative costs and feasibility.

1.3 Results

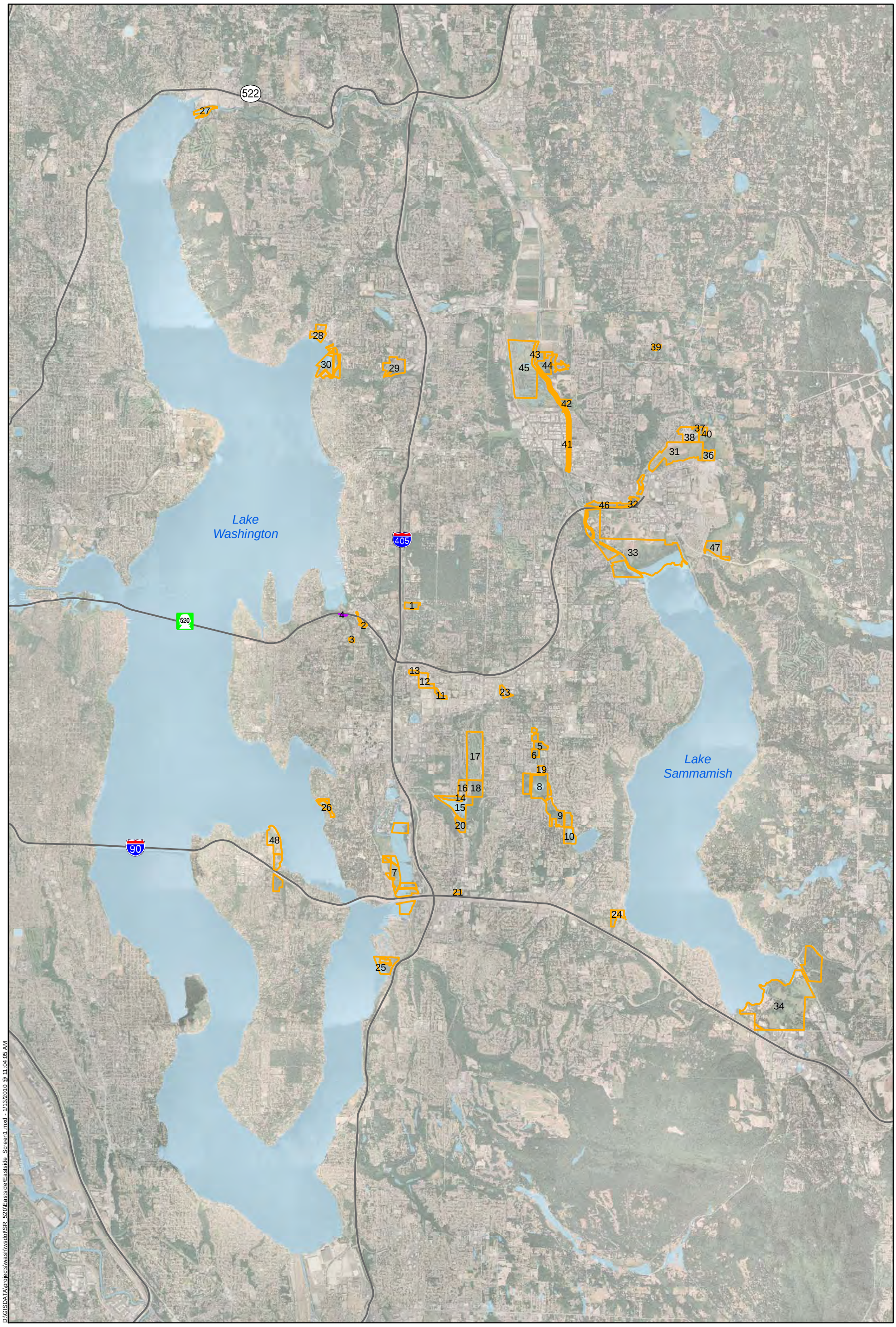
The initial list included 47 sites one the eastside of Lake Washington. This initial candidate list and supporting information has been retained, and additional sites can be added to the list for consideration at any time. The planning and screening framework will be shared with regulatory agencies and the Tribes as part of early agency coordination. Initial work completed to this point is intended to document the planning and screening framework to date. However, no firm decisions have been made regarding mitigation sites at this time. The Mitigation Team may modify this process, and perhaps identify additional viable candidate sites, as a result of coordination with resource agencies and the tribes.

1.3.1. Screen 1

The Mitigation Team analyzed the list of candidate sites using the Screen 1 criteria. Of the 46 candidate sites initially considered, 45 candidate sites passed the Screen 1 criteria, and one failed. The site that met the Screen 1 criteria are listed in the Wetland Mitigation Site Selection List for SR 520 Corridor Project, Screen 1 list (included in Appendix A), and the locations are shown in Figure 2. The site that failed was put on the D list, and the remaining sites on the list proceeded to the Screen 2 process.

1.3.2. Screen 2

The Mitigation Team further evaluated the 45 candidate sites from Screen 1. Of these 45 sites, 41 candidate sites met the Screen 2 criteria. A detailed list of the sites that met the criteria is provided in the Screen 2 list (Appendix A), and the site locations are shown on Figure 3. The seven candidate sites that did not pass were moved to the D list and will not be considered further unless the mitigation needs change.



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Pass
Fail

Figure 2
Potential/Candidate Mitigation Sites
Screen 1

Washington State
Department of Transportation

SR520 Bridge Replacement and HOV Program
Medina to SR 202: Eastside Transit and HOV Project

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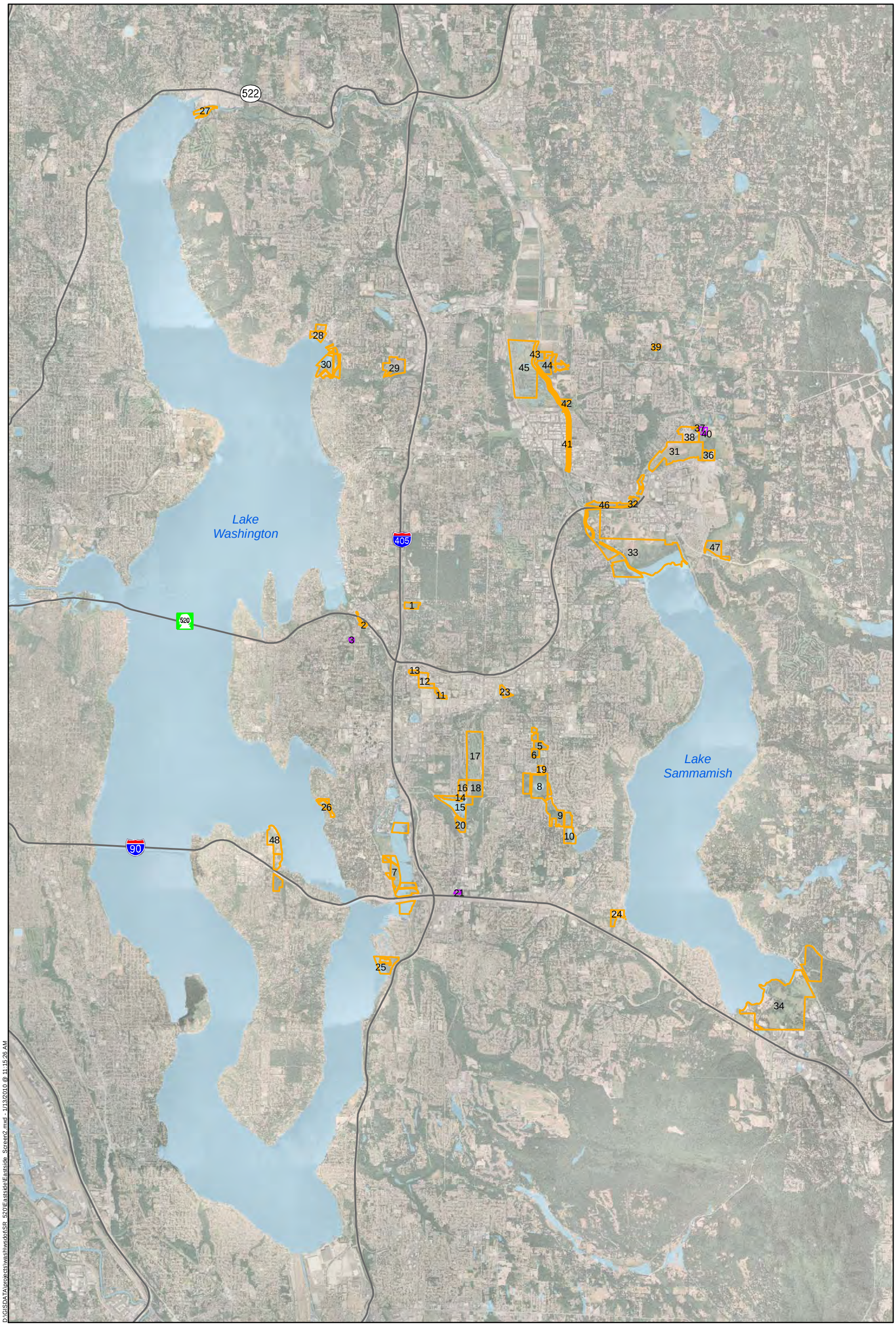

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Miles

Legend
Pass
Fail

Figure 3
Potential/Candidate Mitigation Sites
Screen 2

Washington State
Department of Transportation

SR520 Bridge Replacement and HOV Program
Medina to SR 202: Eastside Transit and HOV Project

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1.3.3. Pare 1

During Pare 1, the Mitigation Team evaluated the 41 candidate sites remaining after Screen 2. Two of the 41 sites failed the Pare 1 criteria. One site (Marymoor Park) failed for cultural reasons, the other (Kelsey Creek area) failed because it is listed in the hazardous waste site database. The two failed sites were moved to the D list, and the remaining 39 candidate sites continued to the Pare 2 evaluation. These 39 sites are shown in Figure 4, and descriptions are provided in the Pare 1 List (Appendix A).

1.3.4. Pares 2 & 3

The Mitigation Team evaluated the 39 candidate sites using the Pare 2 and Pare 3 criteria (see Figure 5). Twenty-nine sites were moved to the B list due limited mitigation opportunities. The remaining ten sites were further evaluated for suitability and availability and sorted in descending order of size, and moved on to Pare 4.

1.3.5. Pare 4

Ten sites were considered for Pare 4 (see Figure 6). Four of the prospective sites for Pare 4 are publicly owned (three by City of Bellevue or Bellevue Parks, and one by Washington State Parks). It was assumed that if the proposed mitigation for these sites did not conflict with current site use, was consistent with the master plans for these areas, and did not require a change of ownership, that there would be no opposition from the owners. Based on this assumption these four sites were advanced to Pare 5 for further evaluation. The single privately owned site (Keller) has been proposed as the location of a mitigation bank, and the owners have had the parcels rezoned for this use. Additional contacts were made to determine whether the owner would consider sale of a portion of the site. Based on the results of these contacts, the Keller Site was also advanced to Pare 5 for further evaluation.

1.3.6. Pare 5

Five sites were considered for Pare 5 (see Figure 7). Pare 5 activities consisted of a site visit to verify physical limitations of the sites (topography, hydrology, hazardous materials and cultural resources) and to review special habitats present and potential mitigation opportunities. Site visits for the City of Bellevue sites were conducted with Bellevue City Parks Staff. The site visit to the Keller parcel was conducted with a representative of the owner.

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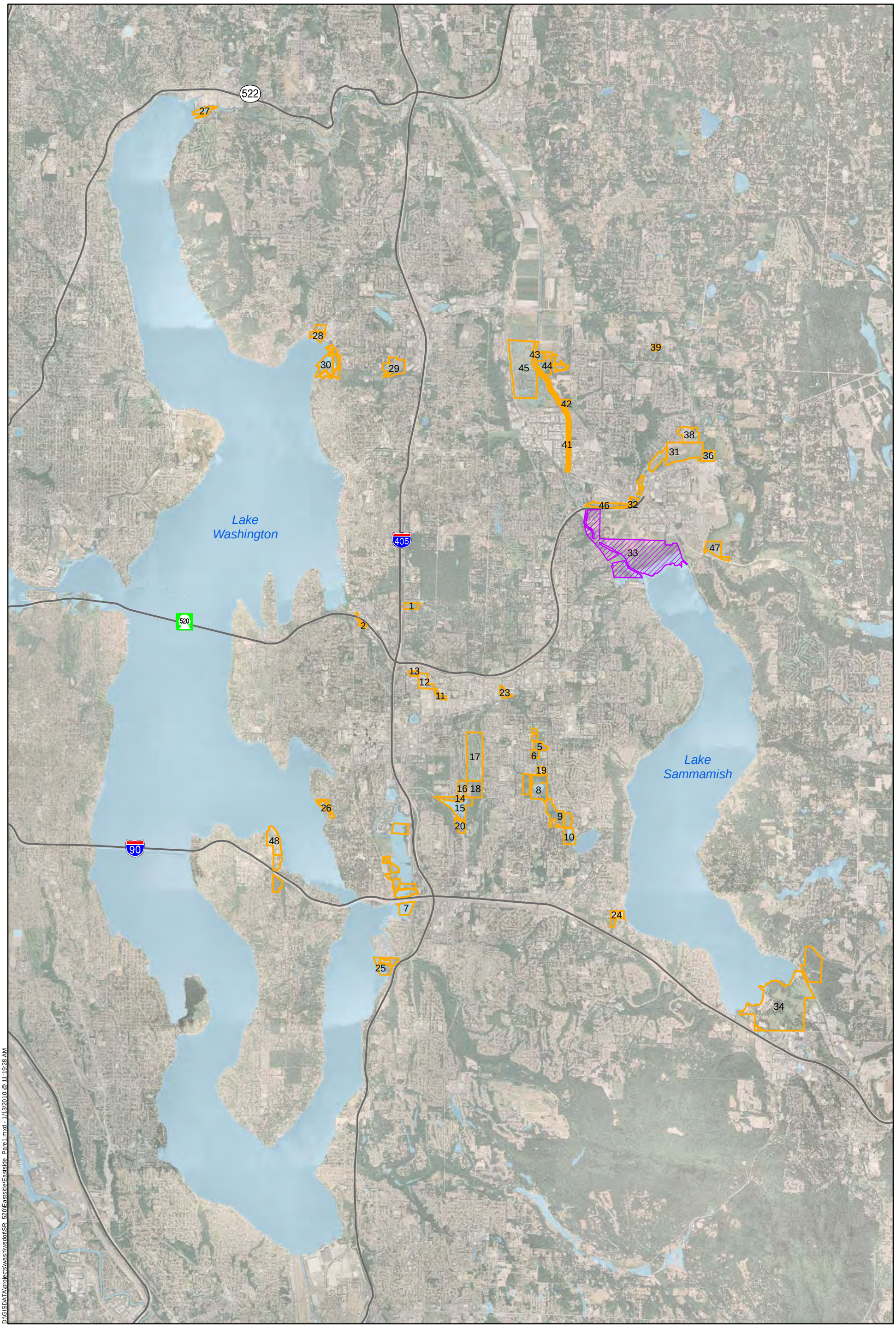

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Legend
A-List
B-List

Figure 4
Potential/Candidate Mitigation Sites
Pare 1

Washington State
Department of Transportation

SR520 Bridge Replacement and HOV Program
Medina to SR 202: Eastside Transit and HOV Project

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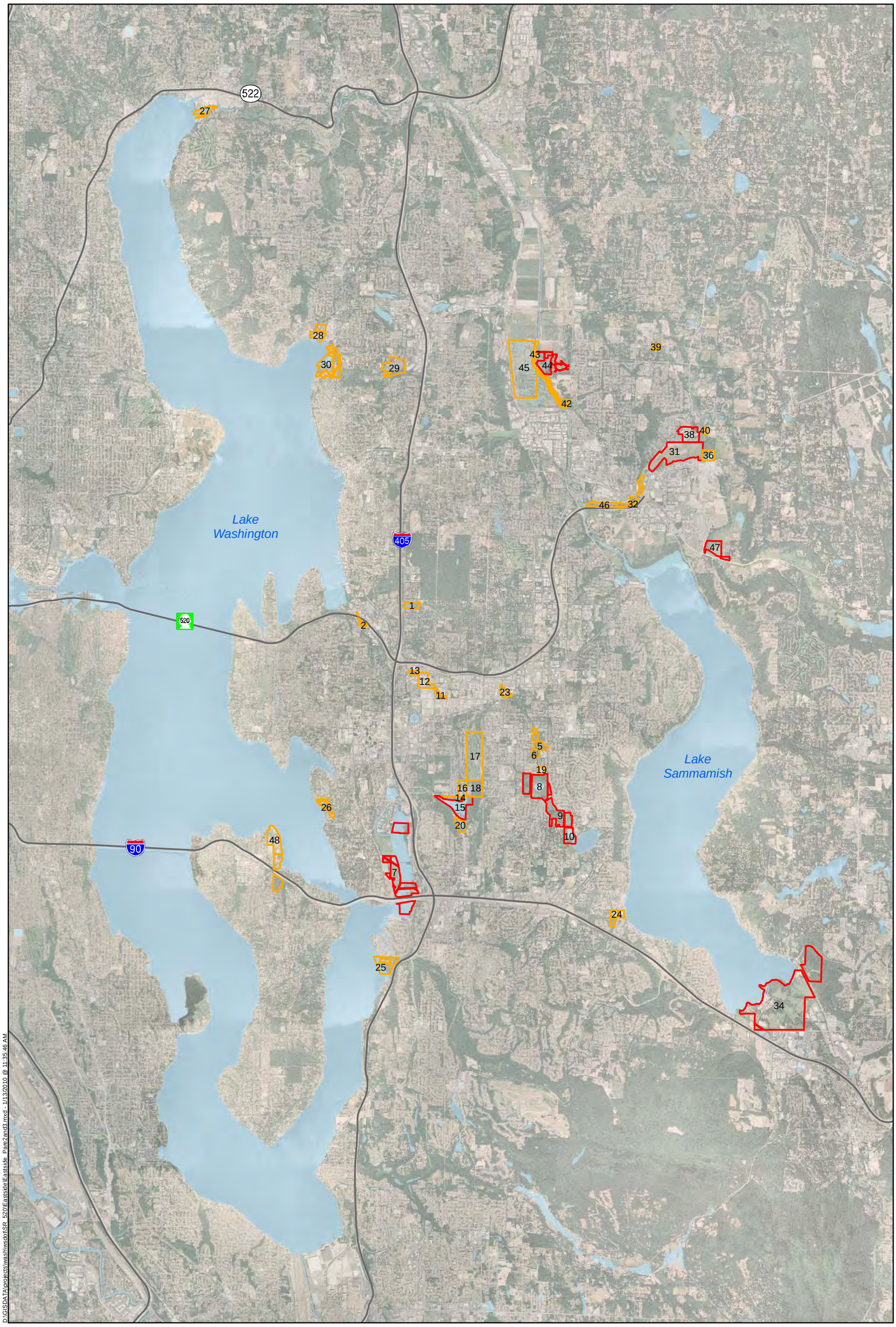

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Legend
A-List
B-List

Figure 5
Potential/Candidate Mitigation Sites
Pare 2 and 3

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Medina to SR 202: Eastside Transit and HOV Project

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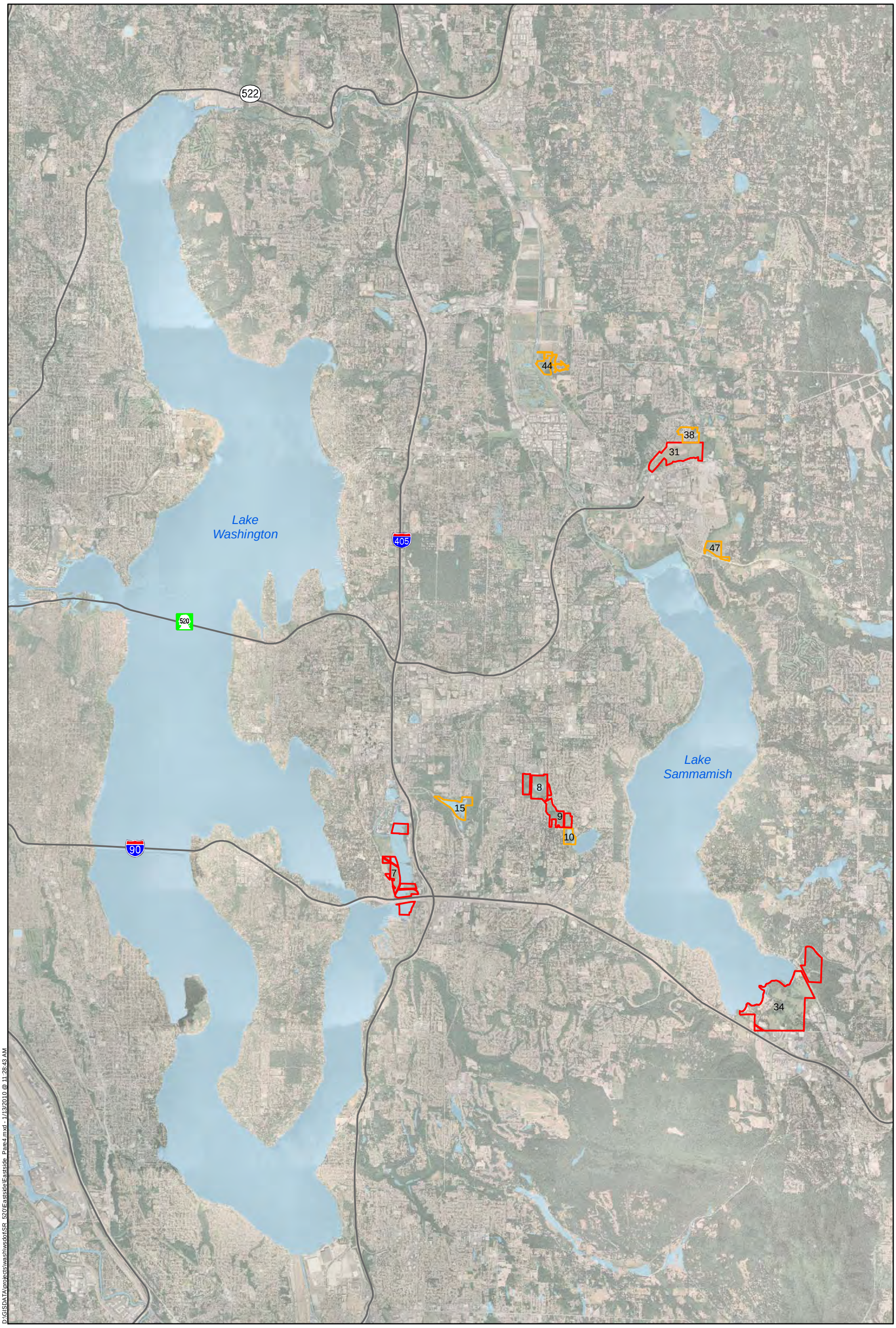

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Miles

Legend
A-List
B-List

Figure 6
Potential/Candidate Mitigation Sites
Pare 4

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SR520 Bridge Replacement and HOV Program
Medina to SR 202: Eastside Transit and HOV Project

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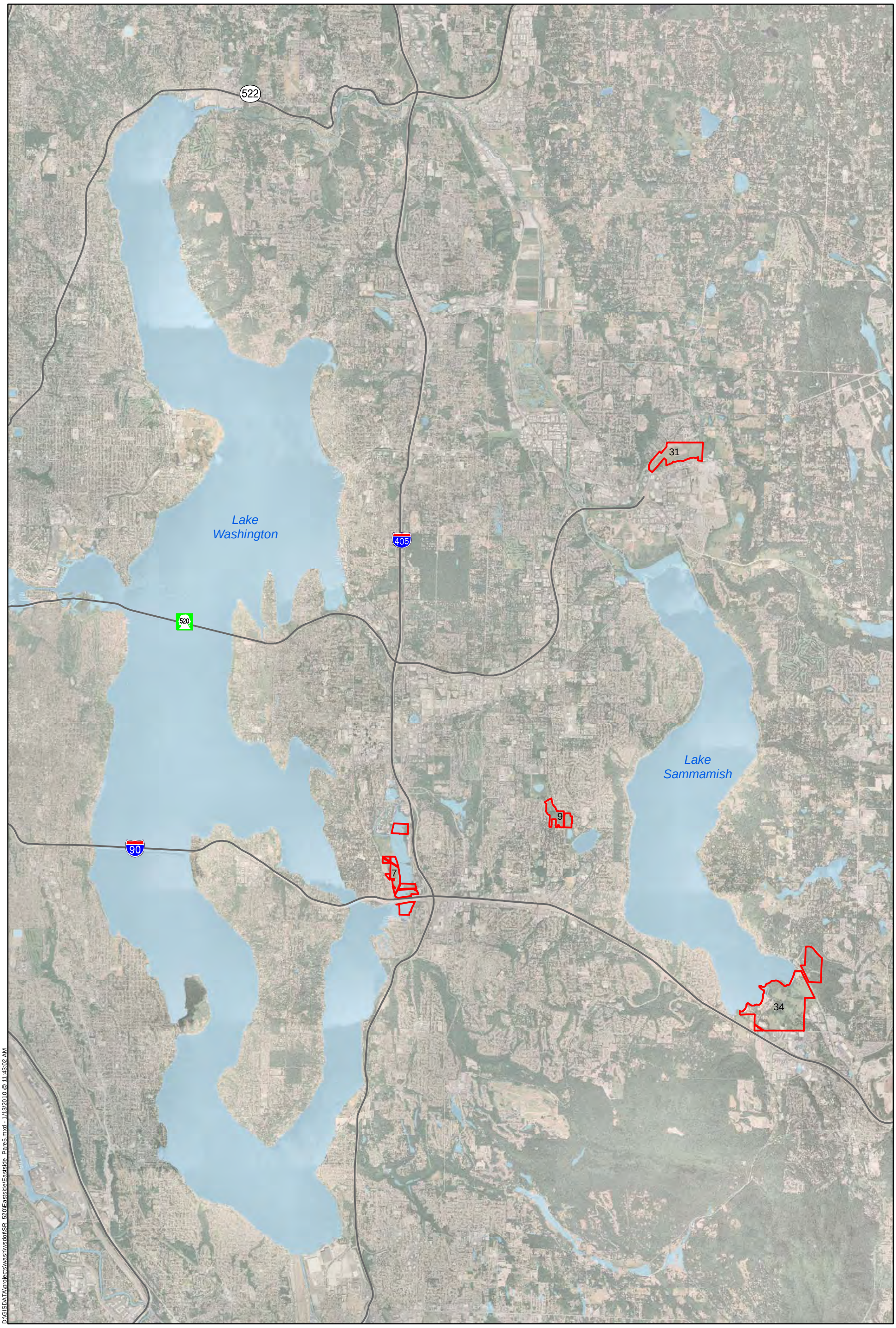

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Miles

Legend
Top 4

Figure 7
Potential/Candidate Mitigation Sites
Pare 5

Washington State
Department of Transportation

SR520 Bridge Replacement and HOV Program
Medina to SR 202: Eastside Transit and HOV Project

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1.4 Mitigation Site Selection

At the completion of the paring process, the Keller Mitigation Site was recommended as the wetland mitigation site for Medina to SR202: Eastside Transit and HOV Project. The primary factors in its recommendation include:

- Identification of suitable mitigation opportunities at the site are of a preferred category (rehabilitation vs. enhancement)
- Previous identification of the site as suitable for wetland mitigation
- The large size of the parcel provides suitable area for the mitigation needs at applicable ratios
- Potential for mitigation that will realize benefits to multiple habitat types (wetlands and streams).
- Location and landscape position of the site
- Costs
- Feasibility of construction at the site
- Presence of a suitable source of wetland hydrology
- Willingness of current owners to sell a portion of the site suitable for the mitigation needs of the project.
- Absence of hazardous materials on site
- Absence of culturally significant resources on site

The other five sites were not recommended for mitigation for various reasons including:

- More limited options for mitigation
- Less desirable mitigation opportunities
- Less desirable mitigation ratios
- Constraints with existing land use
- Constraints imposed by adjoining land uses
- Ability to purchase site outright to maintain WSDOT control of the site