Washington State Department of Transportation

SR 520 Bridge Replacement and HOV Program

I-5 to Medina: Bridge Replacement and HOV Project

Final Wetland Mitigation Report

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Prepared for

Washington State Department of Transportation

and

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Washington State Department of Transportation

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December 2011

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Errata

This Final Wetland Mitigation Report was updated in February 2012 to reflect comments provided by USACE, Washington State Department of Ecology, and WDFW. Please refer to Appendix G for the complete list of pages that have changed.

Executive Summary

The Washington State Department of Transportation (WSDOT) is proposing to construct the I-5 to Medina: Bridge Replacement and HOV Project (SR 520, I-5 to Medina Project) to reduce transit and high-occupancy vehicle (HOV) travel times and to replace the aging spans of the Portage Bay and Evergreen Point bridges, which are highly vulnerable to windstorms and earthquakes. The project will also widen the State Route (SR) 520 corridor to six lanes from I-5 in Seattle to Evergreen Point Road in Medina, and will restripe and reconfigure the lanes in the corridor from Evergreen Point Road to 92nd Avenue NE in Yarrow Point. The project will complete the regional HOV lane system across SR 520, as called for in regional and local transportation plans.

The SR 520, I-5 to Medina: Bridge Replacement and HOV Project (SR 520, I-5 to Medina Project) extends approximately 5.2 miles, from the interchange at I-5 in Seattle eastward to Evergreen Point Road in Medina, on the east side of Lake Washington. The project passes through Section 24, in Township 25 North, Range 5 East, and Sections 20, 21, and 22 in Township 25 North, Range 4 East. The wetland impact study area extends approximately 1/2 mile beyond the limits of construction.

The proposed SR 520 bridge will be six lanes (two 11-foot-wide outer general-purpose lanes in each direction, one 12-foot-wide inside HOV lane in each direction, and a 14-foot-wide bicycle/pedestrian path), with 4-foot-wide inside shoulders and 10-foot-wide outside shoulders across the floating bridge. The combined roadway cross-section will be wider (115 feet) than the existing bridge (60 feet), although in places the eastbound and westbound lanes will consist of separate structures with a gap between them. The additional roadway width is needed for the new HOV lanes and to accommodate wider, safer travel lanes and shoulders.

The environmental review process was originally initiated by WSDOT and Sound Transit in 2000, when a Notice of Intent was issued to prepare an environmental impact statement (EIS) to evaluate improvements in the SR 520 corridor. WSDOT issued a Draft EIS in 2006, a Supplemental Draft EIS, in 2010, and has since identified the preferred alternative in a Final EIS issued in June 2011 for the SR 520 Bridge Replacement and HOV Project. This mitigation plan is based on the preferred alternative identified in the Final EIS; thus, it presents the design and impacts associated with the preferred alternative. A formal decision on the selected alternative was described in the Record of Decision (ROD), issued in August 2011. During construction, the project will affect Portage Bay of Lake Union, the Lake Washington Ship Canal and Lake Washington, aquatic resources that are regulated by federal, state, or local agencies.

This report identifies the project's potential impacts on wetlands and their buffers, and it presents a proposal to minimize or avoid impacts and to provide compensatory mitigation for unavoidable impacts. The final mitigation plan presented in this document is based on the most current information on project impacts and characteristics of the mitigation site. WSDOT will continue to develop and modify the concept in response to additional technical studies and analyses as they are completed.

Existing Wetland in the Project Area

Fifteen wetlands were identified in the SR 520, I-5 to Medina Project vicinity, covering approximately 133 acres. These wetlands were rated according to the Washington State Department of Ecology (Ecology) rating system (Hruby 2004). Five of the identified wetlands were rated Category II (approximately 61.4 acres), six wetlands were rated Category III (approximately 67.8 acres), and the remaining four wetlands were rated Category IV (approximately 4.1 acres). All of the identified wetlands are within the City of Seattle.

Wetlands in the study area range from less than one-tenth of one acre to over 35 acres in size. Fourteen of the fifteen wetlands are lacustrine fringe systems associated with Lake Washington, and one wetland is of the slope/depressional class. Eleven of the 15 wetlands have the potential to provide moderate water quality improvements. These water quality improvements occur low in the watershed of a water level controlled lake, which limits opportunity for some water quality and hydrologic functions (such as flood reduction). These wetlands are nevertheless important to supporting the aquatic ecosystem associated with Lake Washington. Wetlands in the study area generally provide moderate levels of habitat function. When classified by vegetation type, one wetland consists solely of floating aquatic bed vegetation, and one wetland is entirely forest. The remaining 13 wetlands include multiple vegetation types (aquatic bed, emergent, scrub-shrub, and/or forested).

Wetland Impacts

Wetland impacts described in this report are based on a design freeze date of July 1, 2010, and no changes to wetland impacts have occurred since this time. These impacts were discussed with regulators and stakeholders and approved at the Natural Resources Technical Working Group meeting on September 30, 2010. The SR 520, I-5 to Medina Project will result in permanent and long-term temporary impacts to wetlands and buffers. The project will permanently fill 0.29 acre of wetlands in the Westside project area. This 0.29 acre includes 0.11 acre of fill in Category II wetlands, 0.16 acre of fill in Category III wetlands, and 0.02 acre fill in Category IV wetlands. Shading from the project will result in 4.87 acres of permanent impacts to wetlands in the project area. Of these 4.87 acres of permanent shading, 2.48 acres will be in Category II wetlands, 2.39 acres will be in Category III wetlands, and 0.01 acre will be in Category IV wetlands. The permanent shading includes areas where there is a conversion of vegetation from forested wetland to lower scrub-shrub vegetation, a total of 0.72 acre. Permanent impacts to buffers include 1.87 acres of permanent fill, and 0.75 acre of permanent shading in wetland buffers.

Temporary impacts of the project will result from the temporary structures necessary to construct the permanent replacement bridge and from clearing for these structures. These temporary impacts will be long-term due to the length of the construction process. The temporary impacts include approximately 0.2 acre of temporary fill in wetlands in the form of steel pilings. Although the final configuration of the temporary bridge pilings will be determined by the contractor, all of this temporary fill will be assumed to occur in Category II wetlands (the highest category wetland in the vicinity). Construction of the project will result in 2.82 acres of temporary clearing. Of these 2.82 acres, 1.14 acres will be in Category II wetlands, 1.66 acres will be in Category III wetlands, and 0.02 acre will be in Category IV wetlands. Temporarily cleared wetland areas will include forested (2.29 acres Category II and III, 0.02 acre Category IV) and scrub-shrub (0.51 acres, 0.11 acre Category II, 0.40 acre Category III) habitats. The temporary structures necessary to construct the replacement bridge will also result in 5.25 acres of shading. These 5.25 acres include 3.50 acres in Category II wetlands, 1.65 acres in Category III wetlands, and 0.10 acre in Category IV wetlands. Portions of the temporary shading impacts are beneath existing bridge structure, and so are already shaded. These areas are not counted as shading impact. Other portions of the temporary shading impacts will be beneath the replacement bridge structure (these areas will be calculated as permanent shading). Temporary impacts to buffers include less than 0.01 acre of temporary fill, 2.33 acres of temporary clearing, and 0.04 acre of temporary shading in wetland buffers.

Wetland Mitigation

The SR 520, I-5 to Medina Project proposes compensatory mitigation for all the project wetland impacts in four locations. Three of the locations are at the project location or in the vicinity of the project, and one is located off-site. Temporary impacts will be restored on-site.

The three sites that are near the project corridor are (1) the WSDOT-Owned Peninsula (located at the south end of Union Bay alongside SR 520), (2) the Union Bay Natural Area (located on the University of Washington campus at the north side of Union Bay), and (3) the Magnuson Park Mitigation Site. These three sites provide important functions that are similar to those at the impacts sites and are important to the functioning of Lake Washington and its watershed. Mitigation activities at the sites will include the following:

- Establishment of 6.96 acres of palustrine forested and scrub-shrub wetland.
- Re-establishment of 2.59 acres of scrub-shrub wetland.
- Rehabilitation of 2.44 acres of palustrine emergent wetland.
- Enhancement of 14.39 acres of existing lacustrine and palustrine wetland.
- Enhancement of 28.22 acres of existing disturbed wetland and shoreline buffer.

Off-site mitigation will take place at the Elliott Bridge Reach Mitigation Site in unincorporated King County, Washington. Mitigation at the Elliott Bridge Reach provides wetland and riparian functions that are important at the watershed scale, and includes the following components:

- Establishment of 2.25 acres of floodplain wetland where existing levees will be removed, areas behind the levees excavated to appropriate grades, and the natural hydrologic processes restored along the Cedar River.
- Enhancement of 2.02 acres of off channel habitat, riparian floodplain and buffer.

The proposed mitigation sites will be monitored for 10 years. Revegetated temporary impact areas will be monitored for 10 years. Monitoring, contingency, and site management plans are provided in this mitigation report and will be used to adaptively manage the mitigation site. Long-term management plans will be developed for each of the sites. These long-term management plans will be developed in consultation with the site stakeholders and agencies, and will take into account the unique needs of each site.

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Figures

Tables

Appendices

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Acronyms and Abbreviations

ABGC	Arboretum and Botanical Garden Committee
BAS	Best Available Science
BMP	best management practice
CESCL	Certified Erosion and Sediment Control Lead
CFR	Code of Federal Regulations
CWA	Clean Water Act
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
ESO	Environmental Services Office
ESSB	Engrossed Substitute Senate Bill
FHWA	Federal Highway Administration
FR	Federal Register
GIS	Geographic Information System
HGM	hydrogeomorphic
HOV	high-occupancy vehicle
I-5	Interstate 5
I-90	Interstate 90
JARPA	Joint Aquatic Resources Permit Application
KCDNRP	King County Department of Natural Resources and Parks
L2AB	Lacustrine littoral aquatic bed
LWD	large woody debris
MAP	Multi-Agency Permitting
NAVD	North American Vertical Datum
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NRTWG	Natural Resources Technical Working Group
NWI	National Wetlands Inventory
OHW	ordinary high water
OHWM	ordinary high water mark
PEM	palustrine emergent

PFO	palustrine forested
PSS	palustrine scrub-shrub
ROD	Record of Decision
SDEIS	Supplementary Draft Environmental Impact Statement
SEPA	State Environmental Policy Act
SMC	Seattle Municipal Code
SPCC	Spill Prevention, Control, and Countermeasures (Plan)
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control (Plan)
UBNA	Union Bay Natural Area
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
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 SR 520, I-5 to Medina: Bridge Replacement and HOV Project (SR 520, I-5 to Medina Project) to reduce transit and high-occupancy vehicle (HOV) travel times and to replace the aging spans of the Portage Bay and Evergreen Point bridges, which are highly vulnerable to windstorms and earthquakes. Specifically, the project proposes to enhance travel time reliability, mobility, access, and safety for transit and HOVs in the rapidly growing areas along State Route (SR) 520 between I-5 in Seattle and 92nd Avenue NE in Yarrow Point (Figure 1).

This report identifies the project's permanent and temporary impacts to terrestrial and aquatic bed wetlands and their buffers, and describes the mitigation strategy for the project. Permanent impacts discussed in this report results from wetland fill required for the widened roadway, support structures, accessory facilities, and permanent shading resulting from these new structures. Temporary impacts result from clearing and shading 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 compensatory mitigation elements.

A separate report, the *Final Aquatic Mitigation Plan SR 520, I-5 to Medina: Bridge Replacement and HOV Project* (WSDOT 2011a), has been prepared to discuss aquatic impacts resulting from this project and mitigation for those impacts. For the purposes of this Final Wetland Mitigation Report, aquatic habitats are those areas without aquatic bed vegetation and/or habitats with water depths greater than 6.6 feet.

This report will be part of the Joint Aquatic Resources Permit Application (JARPA) and 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 Seattle permits, including the Seattle Shoreline Substantial Development Permit, and other local permits as applicable.

This mitigation report addresses project impacts and their mitigation. The following documents and guidelines were used in preparation of this report:

- Bridge Replacement and HOV Project Supplemental Draft Environmental Impact Statement Wetland Assessment Technical Memorandum (WSDOT 2010b).
- I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft Environmental Impact Statement Ecosystems Discipline Report (WSDOT 2009a).
- I-5 to Medina: Bridge Replacement and HOV Project Final Environmental Impact Statement and Final Section 4(f) and 6(f) Evaluation Ecosystems Discipline Report Addendum and Errata (WSDOT 2010d).
- I-5 to Medina: Bridge Replacement and HOV Project Final Environmental Impact Statement and Final Section 4(f) and 6(f) Evaluation Ecosystems Discipline Report (WSDOT 2011b).
- WSDOT Wetland Guidelines (WSDOT 2010c).
- 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 SR 520, I-5 to Medina 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 Core Team includes (or has included) the following individuals: Bill Leonard (WSDOT, initiation through December 2007), Paul Fendt (Parametrix, Inc., initiation through March 2008), Ken Sargent (Headwaters Environmental Consulting), Michelle Meade (WSDOT), Phil Bloch (WSDOT, initiation through September 2011), Shane Cherry (Confluence Environmental Company), Jeff Meyer (Parametrix, Inc.), Gretchen Lux (WSDOT, December 2007 to present), Beth Peterson (HDR, December 2007 to present), and Bill Bumback (ICF International).

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 December 2007), Paul Fendt (Parametrix, Inc., initiation through March 2008), Ken Sargent (Headwaters Environmental Consulting, Inc.), Michelle Meade (WSDOT), Phil Bloch (WSDOT, initiation through September 2011), Shane Cherry (Confluence Environmental Company), Jeff Meyer (Parametrix, Inc.), Gretchen Lux (WSDOT, December 2007 to present), Beth Peterson (HDR, December 2007 to present), Pat Togher (HDR), and Bill Bumback (ICF International).

WSDOT also engaged regulatory agencies in collaborative technical working groups to assist in the development of appropriate mitigation for project effects. The initial mitigation plan (October 2009) was submitted to the Natural Resources Technical Working Group (NRTWG) for review and comment, and project mitigation was discussed in detail during the NRTWG meetings held from June to October 2010. The NRTWG is composed of federal, state, and local regulatory agencies, the University of Washington, and the Muckleshoot Indian Tribe. The goal of the NRTWG meetings was to identify and discuss project impacts and confirm the sites that would be the best candidates for mitigating the types and amount of project impacts.

On September 30, 2010, the NRTWG reviewed and confirmed three wetland impact mechanisms: filling, clearing, and shading of wetlands. These impact mechanisms result from construction (temporary) and operations of the project (permanent). One important change to this impact mechanism to wetlands occurred since the September 30, 2010 NRTWG meeting. In areas where permanent bridge structures will be built over construction bridges, the impacts will be counted only as permanent to prevent double counting of the affected areas. This change has been discussed and approved by Ecology (J. Meyer Pers. Comm. 2010). Other differences in area calculation from the NRTWG meeting result from clarifying overlapping geographic information system (GIS) polygons used for the calculations, and do not reflect any change in design or impact categories.

The mitigation sites underwent detailed analysis prior to inclusion into the wetland mitigation plan. The wetland mitigation plans incorporate field investigations, scientific research, and the collective knowledge from the NRTWG and the project mitigation team.

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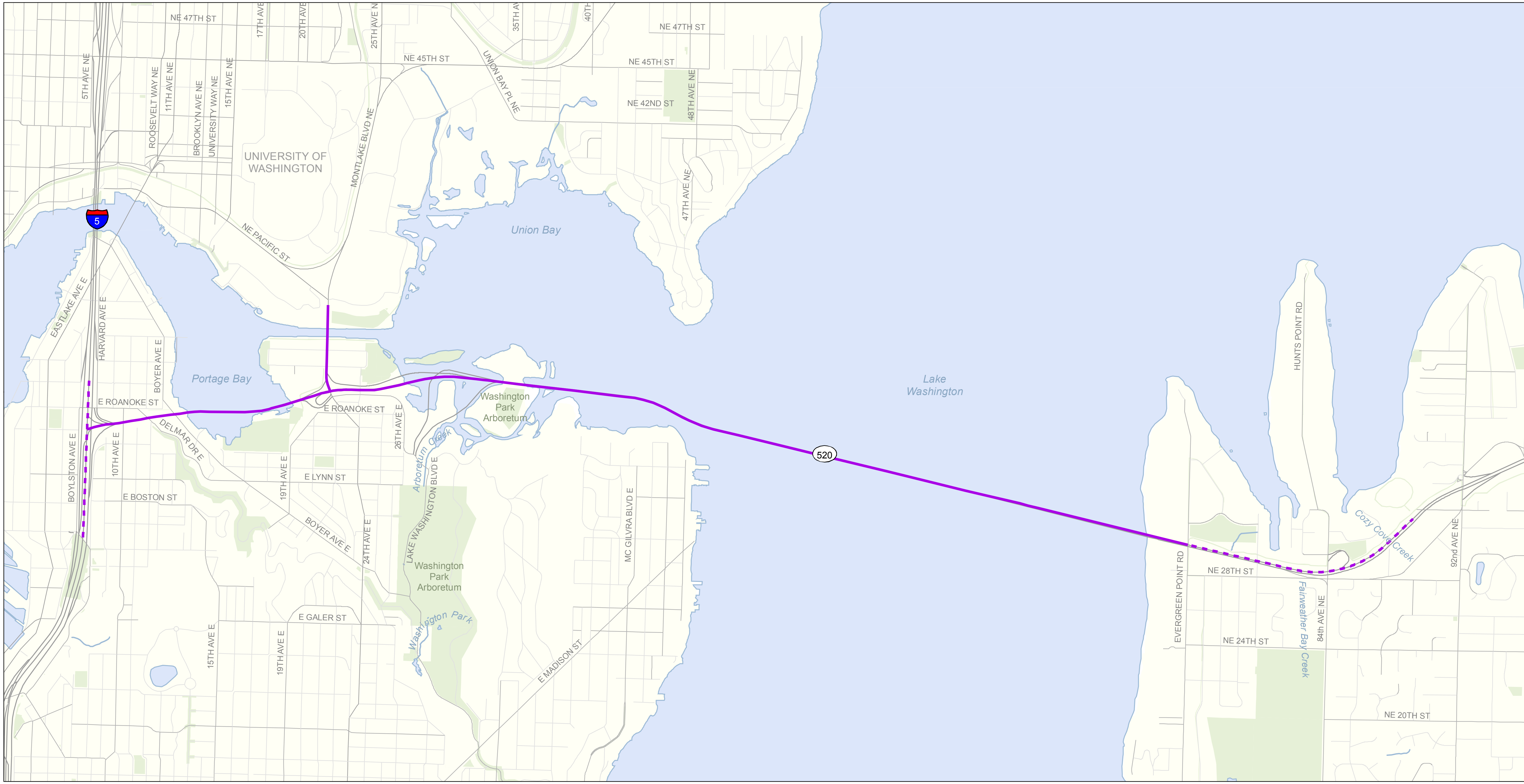

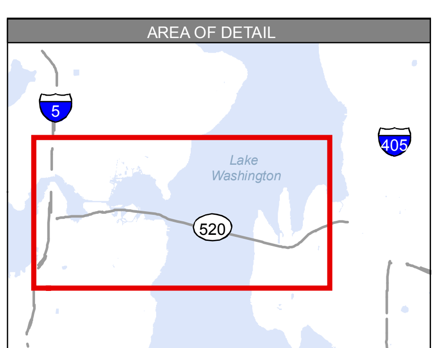

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Project Extent

Limited Improvement

Stream

Park

N

0 500 1,000 2,000 Feet

Source: 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 1. **Project Vicinity Map**

I-5 to Medina: Bridge Replacement and HOV Project

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Chapter 2. Proposed Project

This chapter describes the key elements of the proposed project.

2.1 Location

The SR 520, I-5 to Medina Project is located in King County and extends approximately 5.2 miles. It begins at the SR 520 interchange at I-5 in Seattle, and ends at Evergreen Point Road in Medina, east of Lake Washington (Figure 1). The project passes through Section 24, in Township 25 North, Range 5 East, and Sections 20, 21, and 22 in Township 25 North, Range 4 East.

The SR 520 corridor lies within the Lake Washington/Cedar River watershed, one of the two major watersheds within the Cedar-Sammamish Water Resource Inventory Area (WRIA) 8; WRIA 8 covers about 607 square miles. Lake Washington is the primary water body relevant to the project area. Streams in the project area drain to Lake Washington or Portage Bay on Lake Union.

The study area assessed for wetland impact covers approximately one-half mile on either side of the project footprint. This study area extends from I-5 to the east side of Lake Washington.

2.2 Purpose and Description

WSDOT is proposing to construct the SR 520, I-5 to Medina 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 SR 520, I-5 to Medina Project will widen the SR 520 corridor to six lanes from I-5 in Seattle to Evergreen Point Road in Medina and will restripe and reconfigure the traffic lanes between Evergreen Point Road and 92nd Avenue NE in Yarrow Point. It will replace the vulnerable Evergreen Point Bridge, Portage Bay Bridge, and the east and west approaches with new structures. The project will complete the regional HOV lane system across SR 520, as called for in regional and local transportation plans.

The proposed SR 520 bridge will be six lanes (two 11-foot-wide outer general-purpose lanes in each direction, one 12-foot-wide inside HOV lane in each direction, and a 14-foot-wide bicycle/pedestrian path), with 4-foot-wide inside shoulders and 10-foot-wide outside shoulders across the floating bridge. The combined roadway cross-section will be wider (115 feet wide) compared to the existing width of 60 feet, although in places the eastbound and westbound lanes will consist of separate structures with a gap between them. The additional roadway width is needed for the new HOV lanes and to accommodate wider, safer travel lanes and shoulders. Specific improvements in the proposed SR 520, I-5 to Medina Project are described below. Note that it is possible that WSDOT will elect to have the project completed as a design-build project. If this option is selected, the exact configuration of some improvements may change, and changes would need to be discussed with and approved by regulatory agencies as needed.

SR 520 Improvements from I-5 to Medina

- The SR 520 and I-5 interchange ramps will be reconstructed in generally the same configuration as the existing interchange. The only exceptions will be that a new reversible HOV ramp will connect to the existing I-5 reversible express lanes south of SR 520, and the alignment of the ramp from northbound I-5 to eastbound SR 520 will shift to the south.
- The East Roanoke Street Bridge over I-5 will provide an enhanced pedestrian crossing. The 10th Avenue East and Delmar Drive East overcrossing would be rebuilt as part of the proposed lid structure, generally within the same alignment and with a similar vertical profile as today.
- Construction activities and durations in the I-5 area will occur over a 2- to 3-year period.
- The Portage Bay Bridge will be replaced with a new bridge that will include two general-purpose lanes, an HOV lane in each direction (six lanes total), and a westbound shoulder. Connections between the new bridge and the exit lanes and ramps to Roanoke Street and northbound I-5 will be configured much as they are currently. The new bridge will be about 14 feet higher than the existing bridge’s lowest point near the middle of Portage Bay, and will remain at a greater height above the water than the existing bridge throughout the eastern portion. Two facilities–one basic treatment bioswale and one constructed wetland for enhanced treatment—will be constructed to treat stormwater from this area.
- Construction of the Portage Bay Bridge and related elements will take place over a 5- to 6-year construction period, excluding mobilization and project closeout.
- The Montlake interchange will be widened to the north to accommodate a shift in the mainline alignment, HOV lanes and ramps, and the widened mainline ramps. The Montlake Boulevard and 24th Avenue East overcrossing structures will be demolished

and replaced with a lid structure, and a new two-leaf bascule bridge (drawbridge) will be constructed over the Montlake Cut.

- A longer and wider bridge will be required to accommodate the additional lanes on SR 520 below Montlake Boulevard and to provide wider through lanes, shoulders, a center median, and additional turning lanes on Montlake Boulevard over SR 520. This bridge will be integrated as part of the new Montlake lid over SR 520.
- The SR 520 west approach structure will be replaced with wider fixed span structures and the alignment will shift to the north as it approaches the new floating span. The replacement approaches will maintain a constant profile rising from the shoreline at Montlake out to the west transition span. Bridge structures will be compatible with potential future light rail through the corridor. Improvements in this area also include the removal of the existing Lake Washington Boulevard eastbound on-ramp and westbound off-ramp and the R.H. Thomson Expressway ramps.
- The Evergreen Point floating bridge will be replaced with a new structure composed of support columns and a roadway decking, constructed on a foundation of hollow concrete pontoons connected in series across the deeper portion of the lake. The new floating span will be located between 190 feet and 160 feet north of the existing bridge. Construction activities associated with pontoon installation will occur over an estimated 3-year period.
- The east approach span will be replaced with a higher and wider structure than today and the alignment will be shifted north. The combined width of the north and south structures will range from 134 to 152 feet, from west to east. The structure will be approximately 660 feet long and range from 66 to 78 feet above the water surface. Construction of the new east approach span will be concurrent with the floating bridge construction, and will take place over a 3-year period.
- A new bridge maintenance facility will be constructed at the same time as the east approach structure. The maintenance facility will include permanent and temporary access roads, retaining walls, a 12,000-square-foot building, a dock, and a parking facility.
- Once the east approach and floating portions of the Evergreen Point Bridge have been replaced, grading and paving operations will occur east to Evergreen Point Road, and the Evergreen Point Road transit stop will be relocated to the inside median (constructed as part of the SR 520, Medina to SR 202: Eastside Transit and HOV Project) at Evergreen Point Road. This project activity will occur over a 3.5-year period.

- The stormwater outfall and shoreline restoration initially identified for the Eastside will now be constructed as part of the Westside project. Impacts and offsetting mitigation are accounted for in this plan.
- The project includes a 14-foot-wide bicycle/pedestrian path along the north side of SR 520 through the Montlake area and across the Evergreen Point Bridge to the Eastside. This path will connect to the Bill Dawson Trail, the Montlake lid, East Montlake Park, and the Washington Park Arboretum.
- The project will include quieter concrete, along with other innovative noise reduction techniques such as noise-absorptive crash barriers. WSDOT and the Federal Highway Administration (FHWA) will continue to work with the affected property owners to make a final determination of reasonable and feasible mitigation measures for project-related noise effects.
- The project includes the installation of biofiltration swales and construction of enhanced treatment facilities to collect and treat stormwater runoff.

2.3 Project Schedule

Construction of the SR 520, I-5 to Medina Project is planned to begin in 2012, after project permits are received. In order to maintain traffic flow in the corridor, the project will be built in stages. Major construction in the corridor is expected to be completed in 2018. The most vulnerable structures (Evergreen Point Bridge and Portage Bay Bridge) will be built in the first stages of construction, followed by the less vulnerable components (Montlake and I-5 interchanges).

Construction will occur adjacent to the existing roadway and primarily within existing or acquired WSDOT right-of-way, although some temporary construction easements will be required. Construction activities will take place on land, on work bridges constructed adjacent to the roadway, and from barges floating on the lake and outfitted with cranes. Construction will be sequenced to maintain traffic flow along the corridor. Detailed construction elements are summarized in Section 2.2, and shown below in Figure 2. A detailed construction schedule will be included in the JARPA submittal package.

Construction and restoration activities in the project area will likely be ongoing for up to 8 years, and may be phased to construct portions of the project as discrete units. This estimated time frame is based on the assumption that the project receives full funding and that construction will occur concurrently in multiple locations in the project area.

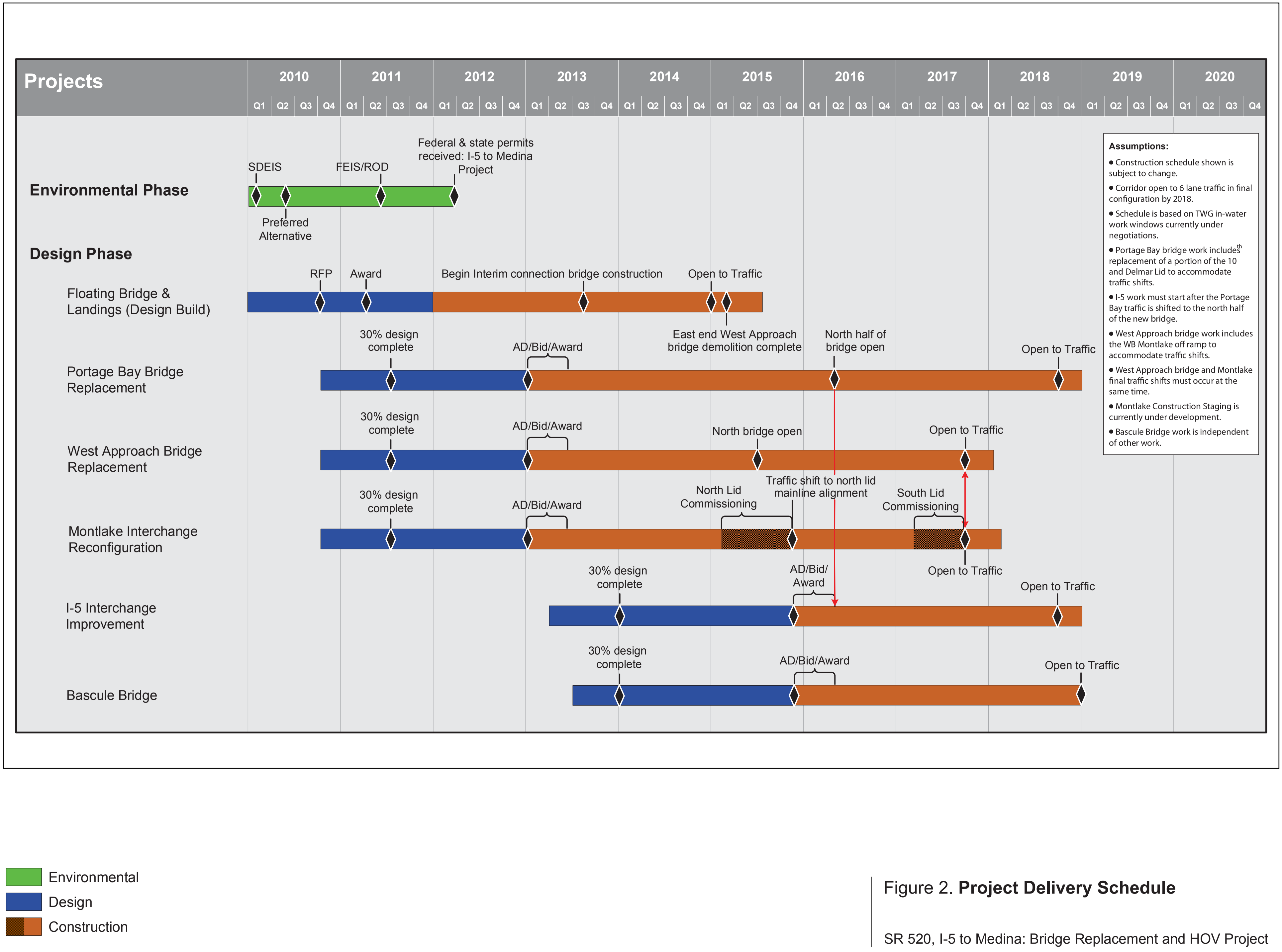

Figure 2. **Project Delivery Schedule**

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

2.4 Responsible Parties

WSDOT will administer the contract for roadway improvements. Contracts for the mitigation components of the project may be administered by WSDOT or other entities. The monitoring and site management of the mitigation sites will be the responsibility of WSDOT for 10 years, or until the Year 10 performance standards have been met. WSDOT will be responsible for ensuring that the mitigation sites are protected in perpetuity. Restored temporary impact areas will be monitored for a period of up to 10 years, depending on vegetation type.

A long-term management plan for each site will be developed that will describe the long-term monitoring activities. Approaches to monitoring and methodology are expected to vary due to site differences, but in general the long-term monitoring will assess the general condition of any fencing, document any trash accumulation and take representative photos from points that show the relative condition of the site. Long term monitoring will also note any condition that impairs or threatens the ongoing ecological functioning of the site.

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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.

Impacts described in this report are based on the design as of July 1, 2010. While most major design decisions have been made, minor changes in the design could occur as the design advances. The project also has the potential to be completed as a design-build project, which could also result in design changes. These changes could modify the impact areas shown.

3.1 Landscape Setting

3.1.1. Watershed Context

The project site is in the Puget Sound trough, which is a 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 SR 520, I-5 to Medina Project is located within WRIA 8, the Cedar River/Sammamish drainage (Kerwin 2001). Lake Washington and its westside tributary streams are the dominant water features in the project area. 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 (*Tsuga* *heterophylla*) and western red cedar (*Thuja plicata*) are the dominant upland forest species in this zone, although Douglas-fir (*Pseudotsuga menziesii*) is also very common.

The hills and valleys on the west side of Lake Washington provided 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. Groundwater seeps on the slopes of the stream valley also provided a stable source of hydrology that supported wetland development, as did the numerous low-lying depressions in the uplands between stream drainages. The majority of these wetlands have been lost though urban development in the City of Seattle, and as a result of water level changes associated with the Ship Canal construction and management of the locks.

Streams and shallow shoreline environments of the Ship Canal, Portage Bay, the Montlake Cut, and Union Bay on Lake Washington provide habitat for spawning, rearing, and migration of fish species native to the area; the associated wetlands also provide habitat functions that support fisheries. The aquatic habitats in the project area 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 within the City of Seattle, in the intensively developed areas between the I-5 corridor and Lake Washington. The long history of growth in the area has resulted in a matrix of land uses including single and multi-family residential, commercial, institutional (Seattle Preparatory School, University of Washington Campus and facilities, and the Museum of History and Industry), and open space (Rogers Playground, East Montlake Park, Montlake Playfields, McCurdy Park, Broadmoor Golf Course, and Washington Park Arboretum).

Following the initial development of these areas in the mid 1800s, 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 associated with Portage Bay and Union Bay on Lake Washington. Buffers are either narrow and disturbed by human activities, or entirely absent. Migratory corridors are largely fragmented by roads and developed parcels.

3.1.3. Lake Washington Hydrology

The Lake Washington watershed has been dramatically altered from its pre-settlement conditions primarily due to urban development and removal of the surrounding forest, as well as the lowering of the lake elevation and rerouting of the outlet from the Black River/Duwamish estuary through the Ship Canal in 1917. Historically, Lake Washington's surface elevation was nearly 9 feet higher than it is today, and the seasonal fluctuations further increased that elevation by up to an additional 7 feet annually (Williams 2000). In 1903, the average lake elevation was recorded at approximately 32 feet (9.8 m) (USACE datum) (NMFS 2008), or approximately 27 feet in the project datum (North American Vertical Datum [NAVD] 88).

The major sources of water to Lake Washington are the Cedar River basin (approximately 50 percent) and the Lake Sammamish basin (approximately 25 percent). The remaining 25 percent is provided by the smaller tributaries and sub-basins in the Lake Washington system (Thornton, McAleer, Forbes, Juanita, Kelsey, Coal, and May creeks, and Mercer Slough).

USACE is mandated by Congress (Public Law 74-409, August 30, 1935) to maintain the level of Lake Washington between 16.72 and 18.72 feet (NAVD) as measured at the locks. The USACE manages the water level in Lake Washington over four distinct management periods. The four management periods are:

- Spring refill – lake level increases to 18.72 feet between February 15 and May 1 (NAVD 88).
- Summer conservation – lake level maintained at about 18.72 feet for as long as possible, with involuntary drawdown typically beginning in late June or early July.
- Fall drawdown – lake level decreases to about 16.72 feet from the onset of the fall rains until December 1.
- Winter holding – lake level maintained at 16.72 feet between December 1 and February 15.

Note that the actual water levels at any given time vary somewhat from the management elevations.

Lake level regulation by USACE has eliminated the seasonal inundation of the shoreline that historically shaped the structure of the riparian vegetation community. The normal hydrologic pattern for the remaining and new wetland areas has also been reversed from high water in winter to high water in summer.

3.2 Existing Conditions of Wetlands and Buffers to be Impacted

Summaries of observed conditions for each wetland and buffer that will be affected are provided in the Wetland Impacts Summary Sheets (see Appendix A). Refer also to the *Bridge Replacement and HOV Project Supplemental Draft EIS Wetland Assessment Technical Memorandum* (WSDOT 2010b) for additional detail about each wetland, including rating forms and field data forms.

Wetlands were classified using the following:

- United States Fish and Wildlife Service (USFWS) system (Cowardin et al. 1979).
- *Washington State Wetlands Rating System for Western Washington* (Hruby 2004).
- City of Seattle Code, Title 25.09.160, retrieved October 4, 2010, reviewed for changes September 23, 2011.

The condition and function of wetlands and buffers were qualitatively assessed using the guidance provided in *Washington State Wetlands Rating System for Western Washington* (Hruby 2004).

Wetlands in the project area exist within a highly urbanized context. Adjoining land uses include high-density residential areas, the University of Washington, urban park land, a golf course, city streets, and the existing SR 520 roadway corridor. Light, noise, and runoff contaminated with pollutants from these uses degrade the quality of wetlands in the project area. The buffers of these wetlands are generally encroached on by the adjoining land uses, reducing the protection provided by these buffers.

Foot trails and a boardwalk traverse several wetlands in the project area, providing recreational users (and pets) access to the project area’s wetlands. This recreational use of the wetland and associated buffers is desirable from a social and educational standpoint, but does introduce additional disturbance from a wildlife habitat standpoint.

The history of disturbance in the project area extends back at least to the construction of the Ship Canal in the early 1900s (discussed in section 3.1.3), and likely earlier. The managed water levels in Lake Washington described in Section 3.1.3 have effectively reversed the natural hydrologic cycle for wetland along the fringe of Lake Washington, altering those habitat functions that are dependent on the natural water cycle. This results in a lacustrine community limited to those species that can adapt to high water levels during most of the growing season, with a water level that recedes in the late summer. Woody wetland species in particular will grow more slowly due to the limited physiological activity under these conditions.

Additional modifications to the wetlands in the Union Bay area were undertaken by various entities and include dredging of the exposed wetlands to create lagoons, landfill activities, development of the University of Washington campus, landscaping for the Arboretum, and construction of the existing SR 520 roadway and RH Thompson Expressway ramps in the 1960s.

The urban context, intensity of nearby land uses, and history of disturbance and modifications provide an environment that is favorable for invasive species. These invasive species tend to produce dense monotypic plant communities and provide lower habitat quality than a diverse assemblage of native species. Notable in the invasive species present in the wetland along Lake Washington are Himalayan blackberry (*Rubus armeniacus*), purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Polygonum cuspidatum*), reed canarygrass (*Phalaris arundinacea*), white waterlily (*Nymphaea odorata*), and European water-milfoil (*Myriophyllum spicatum*).

3.3 Impact Calculation

Impacts described in this report are based on the design as of July 1, 2010. Most major design decisions have been made, but minor changes in the design could occur as the design advances or if the project proceeds as design-build project. These changes could modify the impact areas shown.

WSDOT assessed wetland and buffer impacts using the guidance provided in WSDOT's Wetland and Buffer Impact Assessment Guidance (updated April 16, 2008). Impacts were calculated based on surveyed wetland boundaries (as approved by USACE during the Jurisdictional Determination, June 15, 2011) and SR 520 roadway design drawings using

ARC/GIS software. The impacts result from three mechanisms: filling, clearing, and shading of wetlands and buffers. The interpretation of these impact mechanisms was discussed and approved in the NRTWG meeting on September 30, 2010.

Filling will occur where natural substrate is displaced by the installation of structural foundations. This displacement will result in a direct loss of existing lakebed, wetlands, and buffer habitats and their associated ecological functions. Structures may include temporary and permanent foundation elements such as pilings, mudline footings, drilled shafts, and pontoon anchors. Filling was calculated based on the plan view of substrate impacted by structure. For the purposes of these calculations, if a structure type changes at or near the mudline the larger structure type is used to calculate the area impacted (e.g., for columns sitting on top of mudline footings, only the mudline footings are calculated).

Clearing of woody vegetation will be required prior to work bridge construction to remove obstructions prior to construction of the work bridges and for construction access. During this clearing, woody stems will be cut to just above the soil surface, but roots will not be damaged. The work bridges will be close to the water so subsequent growth of the woody stems may need to be trimmed back again after initial removal. This action will remove or alter potential wildlife habitat during the construction period. Clearing was calculated based on the work area footprint and the footprint of woody vegetation.

Shading occurs where bridge decking of permanent and temporary structures creates a shaded area. Resources could be affected by this shading, potentially resulting in an indirect loss of ecological function. Wetland vegetation and wildlife could be affected due to a reduced light regime, and forested vegetation may be converted to other vegetation types. Also, fish may respond behaviorally to reduced light and/or the transition from natural lighting to shaded areas. Shaded areas were calculated based on the plan view area of temporary and permanent structure surfaces. Filled and cleared areas were not considered to have shading impacts and are not included in the calculation.

One important change to this wetland impact mechanism occurred since the September 30, 2010 NRTWG. In areas where permanent bridge structures will be built over construction bridges, the impacts will be counted only as permanent to prevent double counting of mitigation needs. Other differences in area calculation from the NRTWG meeting result from clarifying overlapping GIS polygons used for the calculations, and do not reflect any change in design or impact categories.

3.4 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. 2006a). Permanent impacts associated with the SR 520, I-5 to Medina Project will result from widening the roadway surface from four lanes to six lanes, improving existing on- and off-ramps, constructing a replacement floating span, and adding or expanding stormwater facilities at several locations to treat runoff from existing and new road surfaces. Permanent fill impacts have been calculated based on the plan view extent of columns and/or shafts, overlaid atop all wetlands and buffers. This impact is reported in acres rounded up to the nearest 1/100th of an acre. Permanent shade impacts have been calculated based on the plan view extent of bridge limits, less the area of columns and/or shafts, less the area of the existing bridge limits, overlaid atop all wetlands and buffers. This impact is reported in acres rounded up to the nearest 1/100th of an acre.

Project activities will permanently fill 0.29 acre of wetlands and permanently shade 4.87 acres of wetlands in the SR 520, I-5 to Medina Project corridor. Impacts by wetland are listed in Table 1 and shown in Figure 3 (Effects on Wetlands and Buffers in the Project Corridor). Permanent wetland impacts summarized by wetland classification are presented in Table 2. Detailed descriptions of the impacts to individual wetlands are provided in Appendix A.

Permanently filled areas total 0.29 acres, and will include 0.11 acre of Category II wetland (approximately 0.05 acre forested, 0.03 acre emergent, and 0.02 acre aquatic bed), 0.16 acre of Category III wetlands (approximately 0.13 acre forested, less than 0.01 acre scrub-shrub, and 0.03 acre aquatic bed), and approximately 0.02 acre of Category IV emergent wetlands.

The SR 520, I-5 to Medina Project will permanently fill portions of eight wetlands (PBS-1; LWN-1 and LWN-2; LWN-3; LWS-2, LWS-3, LWS-4, and LWS-4A). The filling of these wetlands will be a result of the construction of drilled shafts and mudline footings for the new fixed span portions of the proposed bridge structures. All seven of the affected wetlands are classified as lacustrine in the hydrogeomorphic (HGM) system (i.e., dominated by the hydrology of the lake; Hruby 2004). Sizes of the permanently affected wetlands range from 3.0 acres to over 26 acres.

In addition to the permanent fill impacts, construction of the bridge and associated facilities will result in 4.87 acres of permanent shading impacts to wetlands in the project area (Table 1). The 4.87 acres include 2.43 acres of permanent shading in Category II wetlands (0.51 acre forested, less than 0.01 acre scrub-shrub, and 1.91 acres aquatic bed), 2.39 acres of permanent shading in

Category III wetlands (0.21 acre forested, 0.22 acre scrub-shrub, and 1.96 acres aquatic bed), and 0.01 acre of permanent shading in Category IV wetlands (aquatic bed). The permanent shading includes areas where there is a conversion of vegetation from forested wetland to other vegetation types (typically woody shrubs which are lower than the bridge height). This conversion of vegetation type occurs in 0.72 acre of the overall shading area. Note that 0.58 acre of existing permanent bridge shading will be removed from aquatic bed area in Category II wetlands as the existing on-ramps to SR 520 are removed. This 0.58 acre will be subtracted from the impact area when calculating the compensatory mitigation area in Section 4.2.

Permanent fill and shading impacts are listed by wetland in Table 1 and shown in Figure 3 (Effects on Wetlands and Buffers in the Project Corridor). Detailed descriptions of the impacts to individual wetlands are provided in Appendix A.

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 impacts to wetlands may result include 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 the project area, indirect effects result from the loss of forested wetland buffers. Loss of forested buffer may result in a loss of some functions in wetlands. Habitat is the function most likely to be affected by this loss for forested buffer, since buffer habitat function and diversity will be somewhat reduced, and there may be an increase in the extent to which disturbances such as light and noise penetrate into the affected wetlands. Hydrologic function in the affected wetlands is largely driven by the water levels in Lake Washington, which are maintained by USACE. Furthermore, WSDOT will provide stormwater treatment for additional impervious surfaces resulting from the SR 520, I-5 to Medina Project to maintain and improve water quality. Runoff from the existing impervious surfaces is untreated. Additional discussion of wetland buffer impacts is provided in Section 3.5.

Loss of forested buffer will occur in portions of the buffers of Wetlands PBS-1, PBS-1A, LWN-1, LWN-2, LWN-3, LWS-2, LWS-3, LWS-4, and LWS-4A (0.97 acre total). Most of the lost forested buffers that have the potential to indirectly affect wetlands (0.50 acre total) adjoin areas of permanent or temporary wetland impacts. This includes portions of the forested buffer for wetlands PBS-1, PBS-1A, LWN-1, LWN-2, LWN-3, LWS-2, LWS-3, LWS-4, and LWS-4A. As a result, the potential indirect effects to these wetlands are already being mitigated for under the overall mitigation proposal. The remaining loss of forested buffer (0.47 acre) occurs in the buffers of Wetland LWN-2 and LWN-4. These forested buffer impacts are discussed in greater detail below.

In LWN-2, 0.05 acre of forested buffer will be lost that is not adjoining the affected portion of the wetland. This 0.05 acre is not located immediately along the edge of LWN-2, and so the indirect effects due to loss of contiguous habitat or beneficial shading to wetlands would be minimal, and would be mitigated under City of Seattle regulations as buffer impacts.

In wetland LWS-4, 0.23 acre of the forested buffer loss is in areas where the buffer is not immediately adjoining the wetland edge. This includes several small pockets of woody vegetation that are separated from the rest of the wetland buffer by mowed lawn and informal foot trails (See Figure 3, plate 2). The indirect effects of loss of contiguous habitat and loss of shading for wetland vegetation would be minimal in these areas.

An additional 0.19 acre of the lost forested buffer for Wetland LWS-4 would be within the proposed buffers for the project's wetland mitigation, and so would be encompassed in the overall mitigation proposed for the project. The remaining 0.05 acre of buffer loss is composed of small area of mowed grass or foot trails incorporated within the forested buffer area. Since these areas are not actually forested, they do not provide the same suite as functions as the forested buffer community, and their loss does not incur indirect effects to Wetland LWS-4. The loss of these areas, along with the other non-woody buffers lost, are encompassed within the buffer component of the overall mitigation proposed for the project.

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

Wetland[a]	Wetland Classification				Wetland Size (acres)	Wetland Impact Areas[e,f] (acres)					
						Permanent Impact			Temporary[g]		
	Cowardin[b]	HGM[c]	Ecology[c]	Seattle[d]		Fill	Shading	Percent Affected	Fill	Clearing	Shading
Portage Bay Bridge Replacement											
PBN-1	L2AB, PEM	Lake Fringe	IV	IV	0.92	-	0.01	1.09	-	-	0.09
PBS-1A	PEM, PSS	Lake Fringe	III	III	0.05	-	-	0	-	0.02	-
PBS-1	L2AB, PEM, PFO	Lake Fringe/Slope	III	III	12.74	0.13	0.53	5.18	-	1.25	1.23
Subtotal, Portage Bay Bridge Replacement						**0.13**	**0.54**		**-**	**1.27**	**1.32**
West Approach, Floating Bridge and Landings											
LWN-1	L2AB, PEM, PSS, PFO	Lake Fringe	II	II	14.52	0.01	0.75	5.23	-	0.32	1.01
LWN-2	L2AB, PEM, PSS, PFO	Lake Fringe	III	III	3.02	0.02	0.81	27.48	-	0.01	0.10
LWN-3	L2AB, PEM, PSS	Lake Fringe	III	III	7.10	0.01	1.05	14.93	-	0.38	0.31
LWN-4	L2AB, PSS, PFO	Lake Fringe	III	III	7.70	-	-	0	-	-	0.01
LWN-5	L2AB, PEM, PSS	Lake Fringe	III	III	37.24	-	-	0	-	-	-
LWS-1	L2AB	Lake Fringe	IV	IV	2.94	-	-	0	-	-	-
LWS-2	L2AB, PEM, PSS	Lake Fringe	II	II	26.38	0.001	0.04	0.16	-	0.06	1.20
LWS-3	L2AB, PEM PSS, PFO	Lake Fringe	II	II	15.22	0.005	0.53	3.52	-	0.16	0.73

Wetland[a]	Wetland Classification				Wetland Size (acres)	Wetland Impact Areas[e,f] (acres)					
						Permanent Impact			Temporary[g]		
	Cowardin[b]	HGM[c]	Ecology[c]	Seattle[d]		Fill	Shading	Percent Affected	Fill	Clearing	Shading
LWS-3A	PFO	Depressional	IV	IV	<0.1	-	-	0	-	-	-
LWS-4	L2AB, PEM PFO	Lake Fringe	II	II	6.95	0.09	1.15	17.84	-	0.60	0.53
LWS-4A	PEM, PFO	Slope	IV	IV	0.11	0.02	-	18.18	-	0.02	-
LWS-5	L2AB, PEM, PFO	Lake Fringe	II	II	2.29	-	-	0	-	-	0.03
Subtotal, West Approach, Floating Bridge and Landings						**0.16**	**4.33**		**0.2**	**1.55**	**3.93**
Total Wetland Impacts					137.19	**0.29**	**4.87**		**0.2**	**2.82**	**5.25**

[*] Wetland impact data has been subtotaled by project phase.

[a] Wetland names refer to the drainage (for example, LW=Lake Washington), 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. L2AB = Lacustrine aquatic bed; PEM -= Palustrine emergent; PSS= Palustrine scrub-shrub; PFO = Palustrine forested.

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

[d] Local ratings based on City of Seattle 25.09.160.

[e] Wetland impacts based on design as of July 1, 2010.

[f] One important change to this impact mechanism to wetlands occurred since the September 30, 2010 NRTWG meeting. In areas where permanent bridge structures will be built over construction bridges, the impacts will be counted only as permanent to prevent double counting of mitigation needs. Other differences in area calculation from the NRTWG meeting result from clarifying overlapping GIS polygons used for the calculations, and do not reflect any change in design or impact categories.

[g] Temporary impacts shown in this table are long-term temporary impacts. Short-term temporary impacts were generally included in this total, except for the temporary expansion of the Portage Bay Bridge to carry traffic during construction. These impacts (0.44 acre) consist entirely of short-term shading to primarily aquatic vegetation. Shade studies indicate that potential effects on the vegetation are likely to be minimal (due to the bridge heights and southern exposure), and any affected vegetation is expected to naturally re-colonize within the following growing season. As a result, WSDOT is not proposing compensatory mitigation for these areas.

Note: Some of the wetlands shown in this table will not be affected by the project. 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.

Table 2. Permanent Wetland Impact Summary by Classification

Wetland Classification	Class [a,b,c]	Permanently Filled Wetland Area [d] (acres)	Percent of Affected Wetland Area	Permanently Shaded Wetland Area [d] (acres)	Percent of Affected Wetland Area
USFWS (Cowardin et al. 1979)	L2AB	0.05	0.04%	3.93	2.86%
	PEM	0.05	0.04%	-	-
	PSS	<0.01	0%	0.23	0.17%
	PFO	0.18	0.13%	0.72	0.52%
	Total	**0.29**	**0.21%**	**4.87**	**3.55%**
Washington Department of Ecology (Hruby 2004)	I	-	-	-	-
	II	0.11	0.08%	2.48	1.81%
	III	0.16	0.12%	2.39	1.74%
	IV	0.02	0.01%	0.01	0.01%
	Total	**0.29**	**0.21%**	**4.87**	**3.55%**
City of Seattle Rating (25.09.160)	I	-	-	-	-
	II	0.11	0.08%	2.48	1.81%
	III	0.16	0.12%	2.39	1.74%
	IV	0.02	0.01%	0.01	0.01%
	Total	**0.29**	**0.21%**	**4.87**	**3.55%**
Hydrogeomorphic Class	Depressional	-	-	-	-
	Slope/Lake fringe	0.13	0.09%	0.53	0.39%
	Lake fringe	0.14	0.10%	4.34	3.16%
	Slope	0.02	0.01%	-	-
	Total	**0.29**	**0.21%**	**4.87**	**3.55%**

[a] Vegetation classes based on Cowardin, et al. (1979).
[b] Ecology rating and HGM classification according to Hruby (2004).
[c] Local ratings based on City of Seattle SMC 25.09.160.
[d] Wetland impacts based on design as of July 1, 2010.

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- Permanent Shading (Wetland)
- Permanent Shading (Buffer)
- Temporary Shading (Wetland)
- Temporary Shading (Buffer)
- Permanent Wetland Fill
- Permanent Buffer Impact
- Temporary Clearing (Wetland)
- Temporary Clearing (Buffer)
- Temporary Wetland Shade (Existing Bridge Deck Widening)
- Wetland Buffer

N

0 250 500 Feet

Figure 3, Plate 1
Effects on Wetlands and Buffers in the Project Corridor

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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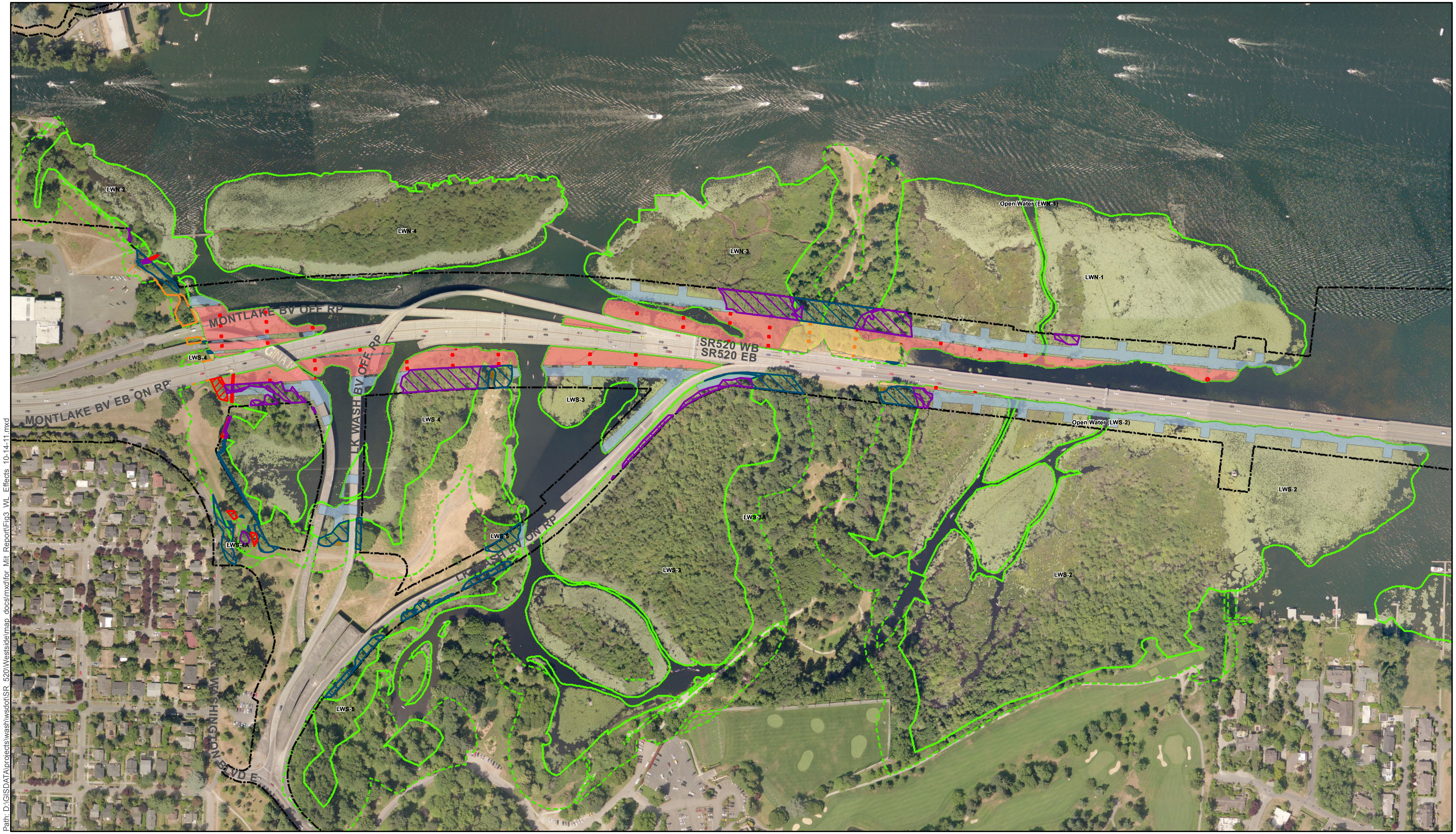

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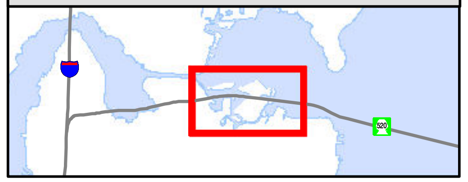

Permanent Shading (Wetland)
Permanent Shading (Buffer)
Temporary Shading (Wetland)
Temporary Shading (Buffer)
Permanent Wetland Fill
Permanent Buffer Impact
Temporary Clearing (Wetland)
Temporary Clearing (Buffer)
Wetland Buffer

N

0 250 500 Feet

Figure 3, Plate 2
Effects on Wetlands and Buffers in the Project Corridor

SR 520; I-5 to Medina: Bridge Replacement and HOV Project

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3.5 Temporary Wetland Impacts

Temporary impacts are direct impacts to wetlands that do not result in permanent filling of the wetlands or in permanent loss of wetland function. Typically, temporary impacts are restored following construction or over some period of time afterward. 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, in which case it would take several years to regain similar habitat. Short-term temporary impacts are where functions can be restored relatively soon, generally within 1 year (Ecology et al. 2006a). An example of this would be clearing of emergent vegetation.

3.5.1. Long Term Temporary Impacts

Temporary impacts for the SR 520, I-5 to Medina Project will result from construction of the temporary work bridges, access, and staging areas. These temporary impacts will occur in 12 wetlands (PBN-1; PBS-1 and PBS-1A; LWN-1, LWN-2, LWN-3, and LWN-4; LWS-2, LWS-3, LWS-4, LWS-4A and LWS-5), and will include temporary filling, clearing, and shading. All temporary impacts are reported to the nearest 1/100th acre.

Temporary fill impacts will result from the installation of work bridge piling. The boundary of temporary fill impacts was calculated as the plan view extent of work bridge piling, overlaid atop all wetlands. Spatial data for work bridge piling has been estimated.

Temporary filling will total 0.20 acre (Table 1), and will result from temporary pilings to support the temporary work bridges. The exact location of pilings will be determined by the contractor, but WSDOT has assumed a worst case scenario and calculated all temporary filling impacts as if they will occur in Category II wetlands (the highest wetland category in the vicinity).

Temporary clearing impacts result from the clearing of vegetation to allow the construction of work bridges, or generally to provide access for construction equipment. The boundary of clearing impacts includes the limits of construction overlaid on top of forested and scrub-shrub wetlands. In cleared areas of forested and scrub-shrub wetlands that will later be shaded by construction work bridges, the temporary impact was calculated only as clearing.

Temporary clearing impacts will affect 2.82 acres of wetland (Table 1). This includes 1.14 acres in Category II wetlands (1.03 acres forested and 0.11 acre scrub-shrub), 1.66 acres of Category III wetland (Approximately 1.25 acres forested and 0.40 acre scrub-shrub), and 0.02 acre Category IV wetland (all forested).

Temporary shading impacts result from the work bridges. Shade impacts in forested and scrub-shrub wetlands will occur entirely within the boundaries of temporary clearing impacts. Shading of emergent wetlands was calculated as the plan view extent of work bridges overlaid atop the emergent wetlands, omitting areas of temporary fill, existing bridge shade, and proposed bridge shade. For aquatic bed areas, the boundary of temporary shade impacts was defined by the plan view extent of work bridges overlaid atop aquatic bed wetlands, omitting areas of temporary fill, existing bridge shade and proposed bridge shade.

Temporary shading impacts will occur in the areas beneath the temporary work bridges. Temporary shading will affect 5.25 acres of wetlands in the project area (Table 1). The 5.25 acres includes 3.50 acre of Category II wetland (0.41 acre emergent and 3.09 acres of aquatic bed), 1.65 acres of Category III wetlands (0.12 acre emergent and 1.53 acres of aquatic bed), and 0.10 acre of Category IV wetland (0.10 acre of aquatic bed and less than 0.01 acre of emergent).

Temporary impacts are listed by wetland in Table 1 and shown in Figure 3. Detailed descriptions of the impacts to individual wetlands are provided in Appendix A.

3.5.2. Short-term Temporary Impacts

Short-term temporary impacts from the project will result from the temporary expansion of the existing Portage Bay Bridge to carry traffic during construction. This short-term temporary impact consists entirely of shading and will affect Wetland PBS-1 and PBS-1A, a total of 0.44 acre. The affected area is primarily lacustrine aquatic bed wetlands, with a small area of emergent vegetation. Shade studies performed for the project indicate that potential effects on the vegetation are likely to be minimal (due to the bridge heights and southern exposure), and any affected vegetation is expected to naturally re-colonize within the following growing season. As a result, WSDOT is not proposing compensatory mitigation for these areas. This approach is consistent with the discussion of mitigation for short-term impacts provided in the mitigation guidance (Ecology 2006a, Section 3.6).

3.6 Wetland Buffer Impacts

The primary purpose of regulatory buffers is to protect and maintain the wide variety of functions and values provided by wetlands (or other aquatic areas). Functions protected (and to a lesser degree performed) 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).

Wetland buffers in the SR 520, I-5 to Medina Project study area consist of a mixture of forested areas, developed park areas, and maintained rights-of-way dominated by mowed grasses. Forested buffer areas are present in the buffers of PBN-1, PBS-1, PBS-1A, LWN-1, LWN-2, LWN-3, LWS-2, LWS-3, LWS-4, LWS-4A, and LWS-5 (Figure 3).

3.6.1. 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, the SR 520, I-5 to Medina Project will permanently alter portions of the buffers of nine wetlands (PBS-1, PBS-1A, LWN-1, LWN-2, LWN-3, LWS-2, LWS-3, LWS-4, and LWS-4A), resulting in a total of 1.87 acres of impact (Table 3). This total includes 1.21 acres of Category II wetland buffer, 0.64 acre of Category III wetland buffer, and 0.01 acre of Category IV wetland buffer.

Permanent shading will occur in seven wetland buffers (PBS-1, LWN-1, LWN-2, LWN-3, LWS-2, LWS-3, and S-4). The total affected area is 0.75 acre, and includes 0.48 acre of Category II wetland buffer and 0.29 acre of Category III wetland buffer. Permanently affected buffers are shown in Figure 3 and listed in Table 3.

3.6.2. Temporary

Temporary buffer impacts occur where construction work will extend beyond the permanent footprint of the project. For the SR 520, I-5 to Medina Project, this includes temporary work bridges, access, and staging areas. Expected impacts include temporary soil disturbance, clearing, and shading. All temporary impacts are reported in acres rounded up to the nearest 1/100th of an acre.

Temporary soil disturbance impacts will result from the installation of work bridge piling. The boundary of temporary soil disturbance impacts is calculated as the plan view extent of work bridge piling, overlaid atop wetland buffers.

Temporary clearing impacts will result where vegetation is cleared to allow the construction of work bridges, or generally to provide access for construction equipment. The boundary of clearing impacts for temporary buffer impacts is similar to that described for temporary wetland impacts, and includes the limits of construction overlaid on top of forest- and shrub-dominated buffers. In cleared forest and shrub dominated buffer areas, buffers that will later be shaded by construction work bridges will be calculated only as clearing.

Temporary shading impacts in buffers result from the work bridges. As with temporary shading impacts to wetlands, shade impacts to forest- and shrub-dominated buffers will occur within the boundaries of, and are captured in, temporary clearing impacts. Shading of herbaceous buffers will be calculated as shading, and defined by the plan view extent of work bridges overlaid atop herbaceous buffers. Calculations will omit areas of temporary fill, existing bridge shade, and proposed bridge shade.

Temporary buffer impacts will affect 11 wetland buffers (PBN-1, PBS-1, PBS-1A, LWN-1, LWN-2, LWN-3, LWS-2, LWS-3, LWS-4, LWS-4A, and LWS-5). The temporary impacts will include less than 0.01 acre of temporary soil disturbance. Temporary buffer clearing will account for 2.33 acres of the temporary impact. This will include clearing in 1.25 acres in Category II, 0.98 acre in Category III, and 0.11 acre in Category IV buffers. Temporary shading represents 0.04 acre of temporary impact to Category II buffers. All of the temporary shading will occur in Category II buffer. These temporary buffer impacts are shown in Figure 3 and listed in Table 3.

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

Wetland	Wetland Classification			Buffer Impact Area (acres) [c,d]			
	Ecology[a]	Local Jurisdiction[b] (City)	Buffer Width[b] (feet)	Permanent Fill	Permanent Shading	Temporary Clearing	Temporary Shading
Portage Bay							
PBN-1	IV	IV	50	-	-	<0.01	-
PBS-1	III	III	85	0.31	0.04	0.65	-
PBS-1A	III	III	60	0.04	-	0.08	-
Union Bay							
LWN-1	II	II	110	<0.01	0.43	0.21	<0.01
LWN-2	III	III	60	0.29	0.02	0.09	-
LWN-3	III	III	85	<0.01	0.23	0.16	-
LWS-2	II	II	110	<0.01	0.03	0.14	0.01
LWS-3	II	II	110	<0.01	<0.01	0.18	-
LWS-4	II	II	110	1.21	0.02	0.40	0.03
LWS-4A	IV	IV	50	0.01	-	0.10	-
LWS-5	II	II	110	-	-	0.32	-
Total				**1.87**	**0.75**	**2.33**	**0.04**

[a] Hruby (2004).

[b] Local ratings and buffers based on City of Seattle, Critical Area 25.09.160. Shoreline buffers in the City of Seattle are 100 feet, and may extend beyond wetland boundaries in some areas.

[c] Buffer impacts based on design as of July 1, 2010.

[d] The calculated impacts to buffers shown in this table include the extents of both wetland buffers and shoreline buffers, whichever is greater.

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3.7 Wetland Functions Impacted

The functions and values of delineated wetlands within the project area were evaluated using the *Washington State Wetlands Rating System for Western Washington* (Hruby 2004) and the Ecology publication *Focus On: Using the Wetland Rating System in Compensatory Mitigation* (Hruby 2008). The results of this evaluation are presented below. The 2004 rating system characterizes wetland functions based on specific attributes such as rarity, sensitivity to disturbance, and functions. The rating system uses a field worksheet to assess wetland functions based on certain environmental characteristics. Wetland functions are divided into three subsets: water quality functions, hydrologic functions, and habitat functions.

In the 2004 rating system, wetlands are assessed based on their capacity to perform functions and on their opportunity to provide these functions. 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 publication *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 educational or scientific value, were unique in some way, or provide particular heritage value. Total function scores for the wetlands are shown in the Wetland Rating System entries, Tables A1-A15, Appendix A. These entries are based on Hruby (2004). A description of the potential and opportunity for wetland functions (Hruby 2008) is presented in the Wetland Functions Impact Summary entries in Tables A1-A15, Appendix A. Additional details for each wetland can be found in the *Bridge Replacement and HOV Project Supplemental Draft EIS Wetland Assessment Technical Memorandum* (WSDOT 2010b).

Wetlands in the project areas generally scored low to moderate for water quality, hydrologic, and habitat functions (Table 4), although three wetlands scored high for potential to provide habitat and moderate for opportunity to provide habitat (see below). The lacustrine wetlands in the project area have the potential to improve water quality because of their proximity to SR 520 and urban development, and the presence of vegetation that can trap pollutants and reduce shoreline erosion. However, these wetlands have a limited ability to reduce flooding and stream degradation due to their small size relative to the watershed. Wetlands in the study area have variable ratings for habitat potential and opportunity. This is due to the limited number of habitat features and low structural diversity in some systems. Five wetlands (PBS-1, LWN-1, LWS-3, LWS-4, and LWS-5) provide high potential for habitat function due to their larger size, location near other wetlands, and multiple vegetation classes. Additional detail on the impacts to individual wetlands is provided in Appendix A, Wetland Impact Summaries.

Table 4. Functions and Values of the Existing Wetlands*

Function / Value [a]	Wetland														
	PBN-1	PBS-1	PBS-1A	LWN-1	LWN-2	LWN-3	LWN-4	LWN-5	LWS-1	LWS-2	LWS-3	LWS-3A	LWS-4	LWS-4A	LWS-5
Water Quality Functions															
Potential	L	M	M	M	M	M	M	M	L	M	M	L	M	L	M
Opportunity	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X
Hydrologic Functions															
Potential	L	M	M	L	L	L	M	L	L	M	M	L	M	L	M
Opportunity**	X	X	-	X	X	X	X	-	X	X	X	-	X	-	X
Habitat Functions															
Potential	L	M	L	H	M	M	M	M	L	H	H	L	H	L	H
Opportunity	L	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Special Characteristics															
Educational or Scientific Value	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-
Uniqueness and Heritage	-	-	-	X	-	X	-	-	-	X	X	-	-	-	-

* After Hruby (2004, 2008)

[a] "L" = the function is of lower quality.

"M" = the function is of moderate quality.

"H" = the function is of higher quality.

"X" = the function is present.

"-" = the function is not present.

** The actual opportunity of lake fringe wetlands to provide hydrologic function is relatively minor due to the position of these wetlands in the watershed and the manipulated nature of the hydrology in Lake Washington.

Another useful method for evaluating wetland function is to assess them based on the synthesis of wetland functions presented in *Freshwater Wetland in Washington State, Volume 1: A Synthesis of the Science Final* (Sheldon et al. 2005), commonly referred to as the Best Available Science (BAS). As in the previously mentioned functional assessment methods (Hruby 2004, 2008), the BAS defines wetland functions for three categories: water quality, hydrologic functions, and habitat functions. Performance of these functions is described by hydrogeomorphic (HGM) class and characteristics of the wetlands. The following sections provide an analysis of wetland functions in the project area based on the information the synthesis (BAS) presents about wetland functions.

Wetlands affected by the SR 520, I-5 to Medina Project fall primarily into the lacustrine fringe HGM class. While the impact classes include permanent fill and shading, and temporary filling, clearing, and shading, the bulk of the impacts (10.12 acres) are shading impacts where no permanent wetland area will be lost, and 5.25 acres of this shading is temporary, albeit long-term in nature. Note that 0.58 acres of existing permanent shading will be removed as the eastbound on-ramps at the WSDOT Peninsula are removed). Section 4 provides a complete breakdown of wetland impacts by impact type and the required mitigation. With these factors in mind, the effects of the project on wetlands can be further analyzed by functional type.

Sheldon et al. (2005) describes the primary functions for water quality improvement in wetlands as sediment removal, phosphorous removal, nitrogen removal, metal and toxic organic removal, and pathogen removal (Sheldon et al. 2005). All these functions may be performed to varying degree by depressional, slope and lacustrine wetlands.

3.7.1. Water Quality Functions

Wetlands along the shores of lakes (lacustrine fringe) trap and retain suspended sediment by anchoring the shoreline, reducing re-suspension of bottom mud by wind mixing, and slowing water velocities (Sheldon et al. 2005). Aquatic bed vegetation typically provides less resistance to water flow than emergent or woody plants, but may reduce water movement enough to induce settling (Sheldon et al. 2005). Closed depressional wetlands generally trap all the sediments they receive (Sheldon et al. 2005). While slope class wetlands do not retain water, vegetation in these wetlands may also trap sediments (Sheldon et al. 2005).

Filling resulting from the project will result in a loss of 0.29 acre of vegetation (0.18 forested, <0.01 scrub-shrub, 0.05 emergent, 0.05 aquatic bed) in lacustrine and slope/depressional wetlands that can trap and retain sediments, anchor shorelines, and reduce water velocities.

Aquatic bed wetlands represent 0.05 acre (~ 17 percent) of the permanent filling. Permanent shading may result in a decrease in vegetation density over 4.87 acres (0.72 forested, 0.23 scrub-shrub, 3.93 aquatic bed) that could result in a reduction of this function; however, the actual extent to which this function is reduced is difficult to estimate. Temporary filling will result in a temporary but long-term loss of 0.20 acre of wetland area that performs this function. Temporary clearing (which will remove surface growth but not emergent vegetation or woody roots that bind the soil) and temporary shading (2.82 acres and 5.25 acres, respectively) may result in a reduction of this function in some areas of the project.

Wetlands that are effective at trapping sediments are also effective at removing phosphorus regardless of the wetland location, and clay and organic soils can bind and retain dissolved phosphorous (Sheldon et al. 2005). Because the performance of this function is related to the trapping of sediments, the affected area for this wetland function will be similar to that described for sediment removal. The presence of clay and organic soils would only be affected in permanent fill areas.

The removal of nitrogen in wetlands is promoted by seasonal inundation or saturation of soils (Sheldon et al. 2005). Lacustrine wetlands along Lake Washington are subject to fluctuating water levels due to the managed water level in Lake Washington. The depressional/slope wetland in the project area is seasonally saturated/inundated, and would also provide this function. There will be a permanent loss of inundation or saturation of soils in 0.29 acre of permanently filled wetland, and a temporary loss of these areas in 0.20 acre of wetland (Table 7). The project will not affect inundation or saturation of soils outside of the fill areas.

Wetlands that effectively trap sediments are also effective at removing toxic materials that are bound to sediment particles or that form insoluble particles and settle (Sheldon et al. 2005). Because the performance of this function is related to the trapping of sediments, the affected area for this wetland function will be similar to that described for sediment removal.

Pathogen removal in wetlands is generally a function of residence time rather that HGM classification (Sheldon et al. 2005). Because the SR 520, I-5 to Medina Project is not expected to change the residence time of water in the affected lacustrine wetlands, this function will not be affected in these wetlands. Wetland PBS-1A (a closed depressional/slope wetland) and would likely provide this function at a higher level. However, the effects to this wetland are temporary clearing, and would not affect residence time. As a result, the performance of this function would not be affected in PBS-1A.

3.7.2. Hydrologic Functions

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

Wetlands reduce peak flows in streams and rivers by slowing and storing water in overbank areas and by holding back runoff that would otherwise flow directly downstream and cause more severe flooding (Sheldon et al. 2005). Performance of this function is directly related to the total area of wetlands in the watershed, or to the area of wetlands in the headwaters of the system (Sheldon et al. 2005). In WRIA 8, increased peak flows are noted as a component of altered hydrologic processes resulting from urbanization, and as a limiting factor for salmonid habitat in tributary streams to Lake Washington, including the Cedar River (Kerwin 2001). Peak flows have not been studied with relation to slope or lacustrine wetlands in western Washington. In theory, the permanent (0.29 acre) and temporary (0.20 acre) of wetland fill on Lake Washington has the potential to reduce this function by reducing the storage capacity of the affected wetlands. However, the performance of this function within the project is severely limited by the fact that the water levels in Lake Washington (and these wetlands) are controlled artificially by the Chittenden Locks. Wetland PBS-1 had the capacity to retain water before it enters Lake Washington, and may provide this function. However, the temporary clearing proposed in this wetland would not substantially affect the performance of this function. As a result, the effect of the SR 520, I-5 to Medina Project on peak flow reduction is minimal.

Studies cited in Sheldon et al. (2005) indicate that wetlands along the shores of lakes in western Washington (lacustrine fringe) may reduce erosion along the shore because the vegetation anchors the shoreline and dissipates erosive forces. Wetlands with extensive, persistent (especially woody) vegetation provide protection from waves and currents associated with large storms and snowmelt that would otherwise penetrate deep into the shoreline (Sheldon et al. 2005). Although the wetlands along Union Bay are more sheltered from storms due to their location, the presence of heavy seasonal boat traffic does raise the risks of shoreline erosion that is reduced by the presence of wetlands (this function is provided primarily by wetlands LWN-1, LWN-2, LWN-3, and LWN-4). Permanent loss of wetland area (0.29 acre) and temporary loss of wetland area (0.20 acre) would result in a loss of some vegetation that provides this function. Permanent shading (4.87 acres) and temporary clearing (2.82 acres) and shading (5.25 acres) may also reduce the density of vegetation (particularly woody vegetation) that provides this function.

Depressional wetlands with no outlet store all surface waters flowing into them. They have the greatest potential, therefore, to decrease erosion because no water leaves the wetland that could cause erosion (Sheldon et al. 2005). Wetland PBS-1A has the potential to provide this function over 0.05 acre. Impacts to this wetland consist of temporary clearing of 0.02 acre of vegetation. The temporary loss of this vegetation would not reduce the ability of the wetland to retain water, and so would not result in a loss of erosion reduction.

Groundwater recharge occurs only in a subset of depressional wetlands and some riverine wetlands that impound and hold surface water (Sheldon et al. 2005). Lacustrine wetlands in the SR 520, I-5 to Medina Project area are not known to provide this function. Wetland PBS-1A is a closed depressional wetland on the slope above Lake Washington. Temporary clearing impacts to Wetland PBS-1A (0.02 acre) would not affect the wetland's ability to retain and recharge groundwater.

3.7.3. Habitat Functions

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). All these functions may be provided by depressional, slope, and lacustrine wetlands. The sole depressional/slope wetland in the project area (PBS-1A) is located in close proximity to lacustrine wetland PBS-1, and can be expected to provide similar habitat functions, albeit at a lower level due to its small size. As a result, the potential impacts to this wetland are included in the generalized discussion of habitat impacts below.

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 affected wetlands in the SR 520, I-5 to Medina Project area have varying water depths from aquatic bed areas to saturated soils; a mixture of habitat types including aquatic bed, emergent, scrub-shrub, and forest vegetation; and a variety of plant species (including a number of invasive species). Additional detail on wildlife use in this area is provided in Section 5.1.6 and in the *Supplemental Draft Environmental Impact Statement Ecosystems Discipline Report* (WSDOT 2009a). Filling activities associated with the project will result in a loss of some habitat areas permanently and temporarily. Clearing and shading will result in a change in habitat and species interspersion in the affected area, although this habitat will not be lost.

Connectivity to natural resources plays a complex role in maintaining biodiversity; connectivity may include population and genetic exchange as well as the movement of predators and invasive species (Sheldon et al. 2005). The affected wetlands in the SR 520, I-5 to Medina Project area are connected by Lake Washington. The connection is interrupted by the existing SR 520 bridge. Although this may be a deterrent to travel and migration for some species, the areas along either side of the bridge still provide usable habitats occupied by a variety of wildlife species. Additional detail on wildlife use in this area is provided in Section 5.1.6 and in the *Supplemental Draft Environmental Impact Statement Ecosystems Discipline Report* (WSDOT 2009a). Filling will result in a loss of 0.29 acre of habitat in the affected wetlands, but the fill results from individual columns (typically 70 square feet or less in size). This is consistent with the existing bridge structure, and will not present an increased barrier to the movement of wildlife.

Wetlands are known for their high primary productivity (production of plant material) and the subsequent movement of this "food" to adjacent aquatic ecosystems (Sheldon et al. 2005). As a result, they can provide abundant food sources. Wetlands in the SR 520, I-5 to Medina Project area produce leaves and stems, seeds, fruit, detritus, insects, and invertebrates that serve as food for a variety of wildlife. Permanent and temporary fill would result in a loss of this primary and secondary productivity for these areas. Shading and clearing activities may result in changes in or loss of some primary and/or secondary production in these wetlands.

The presence of water and thick vegetation in wetlands results in a microclimate that is generally more moist and that has milder temperature extremes than the surrounding areas, and provides desirable habitat for many species (Sheldon et al. 2005). Wetlands in the SR 520, I-5 to Medina Project vicinity provide varying water depths and dense vegetation that supports this function. Filling activities would result in a permanent loss of the moist, moderate habitat of 0.29 acre. Permanent shading would result in an improvement in the sheltering of the areas beneath the bridge, and would result in a gain of moderate, moist climate for these areas of 4.87 acres. The result is a gain in moist, moderate microclimate over approximately 4.0 acres. The additional habitat, however, is not entirely natural and may not be used in the same way, or by all species that would typically utilize this type of moderate moist habitat.

Temporary filling will result in a loss of 0.20 acre of moist, moderate microclimate, and temporary clearing would result in a loss of surface vegetation, exposing 2.82 acres of wetland and potentially creating a less moderate, drier microclimate in these areas. Temporary shading will shade 5.25 acres of wetland, enhancing the moderate moist microclimate in the affected area. The result is a temporary net gain of 2.43 acres of moist, moderate microclimate in the affected wetlands.

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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 FR 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 CWA, which regulates placement of fill in Waters of the United States. 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 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 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 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 CWA 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, I-5 to Medina Project, along with the SR 520 Bridge Replacement and HOV Program, 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.

WSDOT recently adopted a wetland policy (P2038.00, July 2011) that directs WSDOT employees to protect and preserve wetlands, to ensure no net loss of wetlands is caused by departmental actions, and to increase the quantity and quality of wetland in the long term. P 2038.00 also supports mitigation in accordance with Executive Order 90-04.Wetland mitigation guidance was jointly prepared by USACE, USEPA Region 10, and 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.

Constraints exist when using the Washington State Wetlands Rating System to estimate changes in wetland function for wetland mitigation; these constraints are outlined in the Ecology Shorelands and Environmental Assistance Focus Sheet, *Focus on: Using the Wetland Rating System in Compensatory Mitigation* (Hruby 2008).

The mitigation proposed for the SR 520, I-5 to Medina 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.

In 2010, the Washington State Legislature passed and Governor Gregoire signed Engrossed Substitute Senate Bill (ESSB) 6392. ESSB 6392 directs WSDOT to consult with the governing board of the Washington Park Arboretum, the Seattle City Council and Mayor, and the University of Washington to identify all mitigation required by state and federal law resulting from the SR 520 Bridge Replacement and HOV Program’s impact on the Arboretum, and to develop a project mitigation plan to address these impacts. The law further specifies that wetland mitigation required by state and federal law as a result of the program’s impacts on the

Arboretum must, to the greatest extent practicable, include on-site wetland mitigation at the Arboretum.

WSDOT has worked with the technical staff from the Arboretum, University of Washington, and City of Seattle to identify and evaluate potential wetland mitigation opportunities located within the Arboretum. Practicable mitigation opportunities that enhance the Arboretum are included in this Final Wetland Mitigation Report documenting the mitigation proposed for the SR 520, I-5 to Medina Project. The proposed mitigation was developed through a process that is consistent with ESSB 6392.

WSDOT engaged regulatory agencies, the University of Washington, and the Muckleshoot Tribe in the collaborative NRTWG process to assist in the development of appropriate mitigation for project impacts on wetlands and aquatic resources.

4.1 Avoidance and Minimization of Wetland Impacts

WSDOT has designed the project to minimize the permanent and temporary impacts of the proposed alternative while still meeting the project’s engineering standards and design criteria. Specific design features to avoid and minimize impacts on wetlands are listed in the 2010 Ecosystems Discipline Report Addendum and Errata (WSDOT 2010d). Additional measures have been incorporated into the project design to minimize impacts on wetlands and aquatic resources.

Measures to minimize impacts to wetlands, waters, and wildlife

1. Construct the new roadway to the extent feasible within the footprint of the existing roadway.
    - Overlap temporary work areas with permanent footprint.
    - Span wetlands rather than filling them with a road prism.
    - Raise the profile of elevated bridge sections to allow more ambient light.
    - Use a work bridge across Foster Island to replace temporary work roads and reduce temporary clearing.
    - Reduce shoulder widths where feasible.

2. Minimize the number and total area of in-water structures.

- Increase span length from existing condition; use precast girders to eliminate the need for falsework.
- Increase column spacing from the existing condition.
- Use mudline footings for structure foundations (reduces in-water structure and shading compared to waterline footings).
- Avoid span lengths that require footers.

3. Minimize stormwater discharge impacts by locating outfalls at or near existing outfalls.

   - Revegetate between outfalls and water.

4. Minimize lighting impacts to water bodies.

   - Use cut-off light fixtures with shielding when fixtures are adjacent to water.
   - Place permanent lights on center median whenever possible to limit light spillage.
   - Direct pedestrian lighting in walls toward the ground.
   - Limit construction lighting to areas of active work and direct the lights at work surfaces.

5. Incorporate the following over-water construction best management practices (BMPs):

   - Prepare a Stormwater Pollution Prevention Plan (SWPPP), Temporary Erosion and Sediment Control (TESC) Plan, and a Spill Prevention Control and Countermeasures (SPCC) Plan.
   - Provide training to employees and subcontractors in proper maintenance, spill cleanup procedures, material delivery, storage practices, and fueling procedures.
   - Ensure that a Certified Erosion and Sediment Control Lead (CESCL) is consulted and on-site during construction activities.
   - Implement an oil containment boom to contain potential spills.
   - Use a floating sediment curtain to settle suspended solids (silt) in water.
   - Use tie-downs to secure all materials and aid in preventing discharges to receiving waters via wind.
   - Use absorbent materials under all vehicles and equipment placed on over-water structures when the vehicle or equipment is expected to be idle for more than 1 hour.

- Inspect vehicle and construction equipment prior to entering work zones.
- Use off-site fueling stations and repair shops to the extent practicable.
- Implement appropriate cover and catchment measures to cover/contain work areas, debris, and staging areas.
- Use treatment systems to treat construction water before discharging.
- Use eco-friendly lubricants and fuel sources (e.g., vegetable-based) where practicable.
- Construct cofferdams to isolate in-water work.

Additional measures WSDOT is considering to further limit impacts to wetlands, waters, and wildlife

1. Minimize noise impacts due to pile driving.
   - Continue to develop mitigation measures in addition to bubble curtain deployment as needed for pile driving.
2. Restore mudline footing areas.
   - Install mudline footings below the mudline and restore lakebed above them.
3. Monitor water quality during construction.
   - Monitor turbidity and noise before and during construction.
4. Minimize impacts of structures on aquatic resources.
   - Remove structures at the earliest possible date.
5. Adaptive management measures:
   - Review environmental performance (e.g., turbidity, underwater noise, water quality) during initial construction activities and apply lessons learned to subsequent similar activities.

The replacement bridge and approaches will be constructed with an emphasis on reducing impacts to wetlands and other resources and their buffers. Although the proposed project will widen the Portage Bay and Floating Bridges from four lanes (60 feet wide) to six lanes (110 feet wide), and the affected area includes a substantial area of wetlands, implementation of the measures listed above has reduced the permanent fill impacts of the project to a small fraction of the total impact.. Specifically, the 0.29 acre of permanent fill represents only 5.6 percent of the total impact area (5.16 acres), and the vast majority of the permanent impacts (94.4 percent) from the project will result from unavoidable shading impacts. The total temporary fill (0.20 acre) area represents only 2.4 percent of the total temporary impact (8.27 acres). Remaining temporary impacts are from temporary clearing (34.1 percent) and temporary shading (63.5 percent). Table 5 quantifies the avoidance and minimization of impacts resulting from the project.

Table 5. Impact Avoidance and Minimization from the SR 520, I-5 to Medina Bridge Replacement and HOV Project

Alternative	Permanent Wetland Impact (in acres)		Permanent Wetland Buffer Impact (in acres)	
	Filling and Clearing	Shading	Filling and Clearing	Shading
Proposed Project	0.29*	4.3	1.87	0.75
Preferred Alternative	0.2	6.8	3.0	1.1
Option A	0.6	6.4	2.8	0.2
Option K	1.1	8.1	3.2	0.6
Option L	0.5	6.4	2.8	0.2
Reduction in impact**	0.21 to 0.81	2.1 to 3.8	0.93 to 1.33	+0.55 to +0.15 increase

* This change may result from refinement in calculation of small impacts associated with a more detailed and complete design stage.

** Note that the variation in the reduction is based on which alternative is evaluated.

The proposed project represents the Preferred Alternative, but the analysis has been refined. The refined analysis has generally resulted in a decrease in wetland impacts. For the project as currently proposed, permanent fill has increased slightly (0.09 acre, this may be due to a more refined calculation of impacts from the advances in the design), but permanent shading has been reduced by 2.5 acres, an overall reduction of 2.41 acres in permanent impact to wetlands. Likewise, permanent filling and clearing in wetland buffers has been reduced from the Preferred Alternative total of 3.0 acres to 1.87 acres in the project as currently proposed, and permanent shading has been reduced from 1.1 acres to 0.75 acre. Permanent impact to wetland buffers has been reduced by a total of 1.48 acres.

Comparing the proposed project to Options A, K, and L, the proposed project has from 0.21 to 0.81 acre less filling and clearing than the three options. The proposed project has between 2.1 and 3.8 acres less permanent wetland shading than the options. The proposed project has 0.93 to 1.33 acres less permanent buffer fill and clearing than the three options, but 0.15 to 0.55 acres more permanent buffer shading than the three options.

4.2 Compensatory Mitigation

4.2.1. Landscape Approach to Mitigation

The Mitigation Core Team (described in Chapter 1) identified candidate sites for wetland mitigation using a hierarchical selection process based on the watersheds in the project areas. The process is intended to list sites that have potential to provide not only mitigation appropriate to the level of project impacts, but also 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 process for selecting mitigation sites (a more detailed description is provided in the SR 520, *I-5 to Medina: Bridge Replacement and HOV Project Initial Wetland Mitigation Report* (WSDOT 2009c).

- The Westside study area limits are I-5 and the western edge of WRIA 8 on the west, and the western shoreline of Lake Washington on the east. The drainages that discharge to Lake Washington were evaluated from the King County boundary on the north to the southern end of Lake Washington on the south. At the request of Ecology, this study area was extended to include portions of the Lower Cedar River watershed in order to add additional, larger mitigation sites. Figure 4 shows this study area with drainage basins and incorporated cities.
- A review of documents, aerial photography, and public GIS layers for WRIA 8 was conducted for the Westside study area. Sites were also added based on input from regulatory agencies and team members.
- To select suitable potential wetland mitigation sites, the Mitigation Team identified eight broad parameters that would define suitable mitigation sites for the master list of potential sites. These eight parameters were divided into two categories: opportunity parameters and risk parameters. ‘The “opportunity set” includes mitigation type, location, special characteristics, and cost. Size was initially included in this set; however, since so few sites are available due to the urban nature of study area, the minimum size criterion

was dropped. 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 primarily on risk factors to quickly eliminate high-risk sites. The second screening focused on opportunities.
- Paring was performed in five steps. Pares 1 through 3 were aimed at removing high-risk sites and sorting the primary list to identify the most appropriate sites for further analysis. Pare 4 was based on likely availability of the candidate site for mitigation actions. 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 mitigation 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 outside groups through consultation with regulatory agency technical staff, NRTWG, local jurisdictions, and stakeholders.

In 2008, the U.S. Army Corps of Engineers (USACE) released the *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule* (Vol. 73, No. 70, Part 2, page 19630 of the Federal Register). This final rule identified (among other things) criteria for a watershed approach to compensatory mitigation site selection that considers the importance of landscape position and resource type in providing sustainable aquatic resource functions in the watershed. Ecology, USACE, and USEPA jointly developed guidance for selecting wetland mitigation sites in western Washington that comply with the final rule (*Selecting Wetland Mitigation Sites Using a Watershed Approach* [Hruby et al. 2009]). The guidance presents one method of site selection that meets the requirements of the final rule, but its use is not required by the authoring agencies (Hruby et al. 2009).

WSDOT’s site selection process for the SR 520, I-5 to Medina Project has been in development since 2002, and the first *Initial Wetland Mitigation Plan* was published in 2006. Similar to the criteria outlined in the final rule, the initial plan evaluated mitigation in the context of the watershed, and identified opportunities both in the immediate vicinity of the project and off-site that have the potential to improve ecological connections and maximize overall benefit within the watershed. A second initial site selection process was initiated in early 2008, specifically for the SR 520, I-5 to Medina Project. Subsequently, the WSDOT mitigation team revised the site selection approach for the SR 520, I-5 to Medina Project to be consistent with concepts articulated in the final rule. This revised site selection process is described in the *I-5 to Medina: Bridge Replacement and HOV Project Initial Wetland Mitigation Report* (WSDOT 2009), which was presented to the Cooperating Agencies for comment in October of that year.

The approach presented in the 2009 second Initial Mitigation Plan, the Draft Wetland Mitigation Plan (August 2011), and in this Final Wetland Mitigation Plan provides a parallel approach to watershed-based wetland mitigation site selection. Under the Watershed Approach Guidance, site selection in watersheds without a Watershed Plan (such as WRIA 8) follow a process where:

1. The WRIA is evaluated for altered functions,
2. The impact site is evaluated to determine local regulatory requirements within the urban growth area,
3. Critical functions are met within the urban growth area,
4. Additional mitigation is sought in less developed adjacent hydrologic units with an emphasis on projects identified in local and regional studies, and
5. The off-site locations are evaluated for sustainability (Hruby et al. 2009).

Under the approach developed by the WSDOT Mitigation Team, the wetland impacts for the project were evaluated to determine mitigation acreage needs. Wetland impacts associated with the SR 520, I-5 to Medina Project occur within the highly developed environs of the City of Seattle, and represent a type of wetland (lacustrine fringe) that has been greatly reduced by urbanization and the lowered water levels resulting from the excavation of the Ship Canal (as in 2 above). As a result, the affected wetland functions and services represent resources that are difficult to replace either on-site or near the impact site. In addition, ESSB 6392 (see introduction to Chapter 4) requires that impacts to wetlands in the Arboretum (where most of the project impacts are located) must include on-site mitigation in the Arboretum to the greatest extent possible. These regulatory imperatives constrain the mitigation to on-site mitigation opportunities where feasible (2 and 3 above). During the site selection process, mitigation sites were developed based on resource documents that assess the deficiencies in the watershed, similar to the description of step 1 above. Documents evaluated included the *Salmon and*

Steelhead Habitat Limiting Factors Report for the Cedar Sammamish Basin, the *Final Lake Washington and Cedar /Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan*, the Puget Sound Nearshore Project Priorities (WDFW 2007), and Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Near Term Action Agenda for Salmon Habitat Conservation (King County 2007), and local critical areas ordinances. Additional sites were added based on input from regulators and stakeholders, extending the search for sites upstream through the lower reach of the Cedar River basin in order to provide additional off-site mitigation opportunities and include sites that address watershed process deficiencies (See 4 and 5 above).

These steps of evaluating impacts, determining regulatory requirements for the mitigation, meeting process-based mitigation needs at the local level, and incorporating sites that address process-based mitigation sites in nearby basins parallel the steps outlined in Ecology's watershed approach for watersheds lacking a completed watershed plan.

This Final Wetland Mitigation Plan also conforms to the principles of ecologically sound mitigation design by designing mitigation that is hydrologically and morphologically appropriate to the landscape setting and hydrogeomorphic classification of the mitigation, designing sites based on the naturally available water supply, maintaining existing hydric soils as appropriate and practicable, and providing control measures, performance standards, and contingency plans for invasive plant species. These ecological principles parallel the sustainable mitigation criteria outlined in Ecology's guidance on site selection.

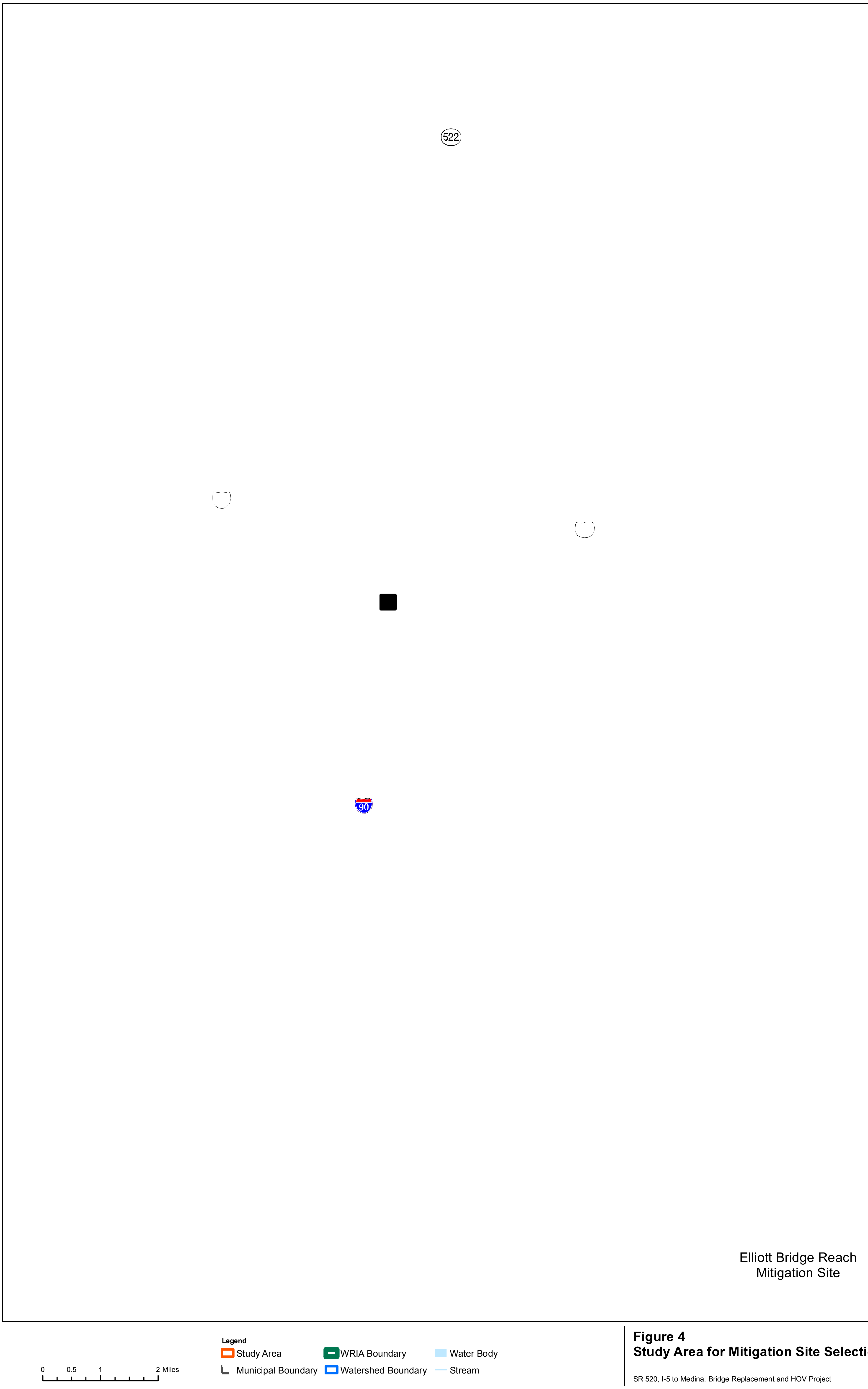

Figure 4
Study Area for Mitigation Site Selection

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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4.2.2. Proposed Wetland Mitigation

Summary of Permanent Impacts

The proposed project will permanently impact a total of 5.16 acres of lacustrine and palustrine wetland area (0.29 acre of permanent fill and 4.87 acres of permanent shading). Most of the affected wetlands in the project area are Category II and III, with smaller impacts to Category IV wetlands (there are no Category I wetlands in the project area). These impacts will reduce water quality, hydrologic, and habitat functions in the affected wetlands and watersheds. Removal of existing on-ramps will remove 0.58 acre of permanent bridge shading in Category II wetlands. These areas are expected to naturally revegetate to aquatic bed habitat. For mitigation accounting purposes, this area is being subtracted from the impact in Table 6, in turn reducing the overall mitigation need for the project.

Mitigation ratios for permanent impacts

The guidance in *Wetland Mitigation in Washington State Part 1: Agency Policies and Guidance* (Ecology et al. 2006a) provides guidance on compensatory mitigation ratios for wetlands. Table 6 provides a summary of the mitigation needs for the SR 520, I-5 to Medina Project based on the mitigation ratios developed in consultation with and with the concurrence of the NRTWG and Ecology at the NRTWG meeting held September 30, 2010. Multiple mitigation types may be used at the proposed mitigation sites.

Several of the Category III wetlands in the project area (PBS-1, LWN-3, LWN-4 and LWN-5) provide moderate levels of habitat function and as a result, have overall scores that approach the threshold for Category II wetlands. Due to the interconnected nature of the wetlands systems in the Union Bay and Portage Bay areas, and the relatively high quality of these Category III wetlands, WSDOT will provide compensatory mitigation for all of the Category III wetlands at the same ratio as the Category II wetlands.

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Table 6. Mitigation Needs for Permanent Impacts from SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Wetland Impact Category	Impact Area[a]	Establish-ment Ratio[b]	Establish-ment Area	Rehabilitation Ratio[b]	Rehabilitation Area	Enhancement Ratio[b]	Enhancement Area
Permanent Fill Category II & III	0.27	3:1	0.80	6:1	1.60	12:1	3.19
Permanent Fill Category IV	0.02	1.5:1	0.03	3:1	0.06	6:1	0.12
Permanent Fill Subtotal	***0.29***	***-***	***0.83***	***-***	***1.66***	***-***	***3.31***
Permanent Shading Category II & III (PFO converted to PSS, PSS, PEM)	0.72	1.5:1	1.08	3:1	2.16	6:1	4.32
Permanent Shading Category II & III (PSS)	0.23	1.5:1	0.35	3:1	0.69	6:1	1.38
Permanent Shading Category II & III (L2AB) , bridge height less than 24'	3.13	1.50:1	4.70	3:1	9.39	6:1	18.78
Permanent Shading Category II & III (L2AB), bridge height greater than 24'+	0.79	0.75:1	0.59	1.5:1	1.19	3:1	2.37
Eastbound on-ramp removal area at WSDOT-Owned Peninsula	-0.58	0.75:1	-0.44	1.5:1	-0.87	3:1	-1.74
Permanent Shading Category IV (L2AB)	0.01	0.75:1	0.01	1.5:1	0.02	3:1	0.03
Permanent Shading Subtotal	***4.30[c]***	***-***	***6.29***	***-***	***12.57***	***-***	***25.14***
Permanent Impact Total	**4.59[c]**		**7.11**		**14.23**		**28.45**

[a] Wetland impact areas are based on the design as of July 1, 2010.

[b] Modified mitigation ratios were developed in consultation with and with the concurrence of the NRTWG and Ecology at the NRTWG meeting held September 30, 2010.

[c] Note that 0.58 acre has been subtracted from the permanent impact. This 0.58 acre represents the wetland recovered during the removal of the eastbound ramps.

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Modifiers for non-fill permanent impacts

WSDOT has developed modifiers for the standard mitigation ratios that apply specifically to the permanent shading impacts of the SR 520, I-5 to Medina Project. These modifiers were developed based on a thorough evaluation of the impacts to wetland functions resulting from the SR 520, I-5 to Medina Project, a review of the guidance, and consultation with and approval by the regulatory agencies and local stakeholders (NRTWG meeting, September 30, 2010 and personal communications (Meyer, J. 2010).

In 2009, WSDOT performed additional studies to assess the effects of shading on wetlands in the project area. These studies were presented in the *I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft EIS Final Wetland Vegetation Response to Shade Special Study* (WSDOT 2009b). This report concluded the following:

- Bridge heights of about 24 feet or higher have relatively minor impacts on vegetation in terms of total cover, with the exception of areas directly under the midpoints of bridge decks.
- The greatest impacts on vegetation were in areas where solid, wide bridge decks were relatively low to the ground or water surface—at a height of 8 feet or less.
- Light conditions under or near the edges of bridges (north and south sides) represent partial shade. Although light levels are low here, some light is still available for photosynthesis in the partial shade at the south and north edges of the bridge shadow. These light levels are very similar to the light levels found under tree or shrub canopies, and although vegetation cover is lower than in full sunlight, some low shrubs and herbaceous vegetation grow in these areas.
- Gaps between bridge decks, especially where the decks are not low to the ground, result in light penetrating to the areas beneath the decks, and gaps between bridge decks have relatively high vegetation cover.

In light of these conclusions, WSDOT has proposed the following modifiers to the standard permanent mitigation ratios for permanent shading impacts with the concurrence of NRTWG and Ecology at the NRTWG meeting held September 30, 2010:

- Permanent shading of wetlands (forested, scrub-shrub, emergent, and aquatic bed) where bridge heights are less than 24 feet high – one-half of the mitigation ratio for permanent fill.

- Permanent shading impacts to aquatic bed wetlands where bridge heights are over 24 feet (no forested, scrub-shrub, or emergent wetlands are permanently shaded by bridges higher than 24 feet) – one-quarter of the mitigation ratio for permanent fill impacts.

These ratio modifiers take into account that while wetland habitat functions will be permanently reduced by shading and the type and density of vegetation present will likely change, the affected areas will not be filled, and water quality and hydrology functions will not be affected.

Mitigation for Temporary Impacts

Construction-related activities for the SR 520, I-5 to Medina Project will temporarily impact 8.27 acres of wetland. These 8.27 acres of temporary impact include 0.20 acre of temporary fill, 2.82 acres of temporary clearing, and 5.25 acres of temporary shading. All of these temporary impacts will be considered long-term temporary impacts due to the nature of the affected areas and the 6-year construction time frame.

Construction activities will include clearing of woody vegetation (forest and shrub vegetation classes) to allow access and construction for work bridges. It is assumed that clearing is not necessary in areas of emergent or aquatic bed vegetation. 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. In order to avoid creating additional impact in areas that are naturally revegetating, planting areas and plant densities may be adjusted to account for natural regrowth. Woody vegetation will be planted in areas where woody vegetation was previously cleared, and appropriate emergent vegetation will be planted in the existing emergent wetland areas. Weed control measures will be applied on all temporary impact areas. Temporary impact areas where woody vegetation will be re-established will be monitored for a period of 10 years to determine whether 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 et al. 2006a). The temporary fill impacts resulting from construction of the SR 520, I-5 to Medina Project will be in place for a substantial period of time— up to 6 years. As a result, WSDOT proposes some modifiers to account for the unusual nature of the temporary impacts. As noted for the permanent impacts, WSDOT will base these ratio modifications on a Category II baseline for both the Category II and Category III wetland impacts. The ratio for temporary fill would be one-half of the mitigation ratio for permanent fill. This ratio was developed in consultation with and with the concurrence of the NRTWG and Ecology at the NRTWG meeting held September 30, 2010, and is consistent with the guidance on mitigation ratios for temporary impacts that are more permanent in nature (Ecology et al. 2006a, Section 6.5.6).

Table 7 summarizes the compensatory mitigation needs for temporary long-term impacts resulting from the project.

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Table 7. Mitigation Needs for Long-Term Temporary Impacts from the SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Wetland Impact Category	Impact Area[a]	Establishment Ratio[b]	Establishment Area	Rehabilitation Ratio[b]	Mitigation Area[b]	Enhancement Ratio[b]	Enhancement Area
Temporary Fill Category II	0.20	1.5:1	0.3	3:1	0.60	6:1	1.2
Temporary Fill Subtotal	***0.20***	***-***	***0.30***	***-***	***0.60***	***-***	***1.20***
Temporary Clearing Category II & III (PFO)	2.29	1.5:1 (+1:1 revegetation)	3.44	3:1 (+1:1 revegetation)	6.87	6:1 (+1:1 revegetation)	13.74
Temporary Clearing Category II & III (PSS)	0.51	0.75:1 (+1:1 revegetation)	0.38	1.5:1 (+1:1 revegetation)	0.77	3:1 (+1:1 revegetation)	1.53
Temporary Clearing Category IV (PFO)	0.02	0.75:1 (+1:1 revegetation)	0.02	1.5:1 (+1:1 revegetation)	0.03	3:1 (+1:1 revegetation)	0.06
Temporary Clearing Subtotal	**2.82**	**-**	**3.83**	**-**	**7.67**	**-**	**15.33**
Temporary Shading Category II & III (PEM)	0.53	0.75:1 (+1:1 revegetation)	0.40	1.5:1 (+1:1 revegetation)	0.80	3:1 (+1:1 revegetation)	1.59
Temporary Shading Category II & III (L2AB)	4.62	0.75:1[c]	3.47	1.5:1[c]	6.93	3:1[c]	13.86
Temporary Shading Category IV (L2AB)	0.09	0.375:1[c]	0.03	0.75:1[c]	0.07	1.5:1[c]	0.14
Temporary Shading Subtotal	**5.25**	**-**	**3.90**	**-**	**7.79**	**-**	**15.59**
Temporary Impacts Total	**8.27**		**8.03**	**-**	**16.06**		**32.12**

[a] Wetland impact areas are based on the design as of July 1, 2010.

[b] Modified mitigation ratios were developed in consultation with and with the approval of the NRTWG and Ecology at the NRTWG meeting held September 30, 2010.

[c] Assumes natural recolonization of these areas.

Modifiers for non-fill long-term temporary impacts

The majority of the temporary impacts from the SR 520, I-5 to Medina Project will result from non-fill related impacts; rather, these impacts will be construction-related clearing and shading resulting from the temporary work structures. While these impacts will not result in a permanent loss of wetland area, the type and density of wetland vegetation will be changed in the affected areas for a period of up to 6 years. After a thorough review of these temporary impacts, a review of the joint guidance (Ecology et al. 2006a), and consultation with and concurrence of the regulatory agencies at the NRTWG meeting of September 30, 2010, WSDOT proposes the following compensatory mitigation ratio modifiers specifically for this project:

- Temporary clearing of forested areas – one-half of the standard ratio for permanent impacts, plus revegetation of the affected areas (this is consistent with the joint guidance, Ecology et al. 2006a, Section 6.5.6).
- Temporary clearing of scrub-shrub vegetation – one-quarter of the standard ratio for permanent impacts, plus revegetation of the affected areas. This ratio takes into account that the affected vegetation is generally re-established more rapidly than forest vegetation.
- Temporary shading of emergent marsh – one-quarter of the standard ratio for permanent impacts, plus revegetation of the affected areas. This is an increase from the standards in the guidance, to account for the longer duration of the impacts.
- Temporary shading of aquatic bed – one-quarter of the standard ratio for permanent impacts, plus natural recolonization of the affected areas. Impacts to aquatic bed wetland are not discussed in the joint guidance.

Total Wetland Mitigation Needs

Table 8 summarizes the overall mitigation needs for the SR 520, I-5 to Medina Project. It combines the information presented in Tables 6 and 7. Mitigation areas shown are based on the modified ratios for rehabilitation described above.

Table 8. Overall Mitigation Needs for the SR 520, I-5 to Medina: Bridge Replacement and HOV Project*

Wetland Impact Category	Impact Area[a]	Mitigation Area[b]		
		Establishment (Acres)	Rehabilitation (Acres)	Enhancement (Acres)
Permanent Fill Subtotal	0.29	0.83	1.66	3.31
Permanent Shading Subtotal	4.30	6.29	12.57	25.14
Permanent Impact Total	***4.59***	***7.11***	***14.23***	***28.45***
Temporary Fill	0.20	0.30	0.60	1.20
Temporary Clearing	2.82	3.83	7.67	15.33
Temporary Shading	5.25	3.90	7.79	15.59
Temporary Impact Subtotal	***8.27***	***8.03***	***16.06***	***32.12***
Grand Total	**12.86**	**15.14**	**30.28**	**60.57**

* Note that some "errors" for rounding are present in the individual entries. Subtotals are correct.

[a] Wetland impact areas are based on the design as of July 1, 2010.

[b] Modified mitigation ratios were developed in consultation with and with the concurrence of the NRTWG and Ecology at the NRTWG meeting held September 30, 2010.

Based on the current level of design, the total wetland mitigation need for the project (including both permanent and long-term temporary impacts) ranges from 15.14 acres of establishment, to 60.57 acres if only enhancement is to be used.

Buffer Mitigation

While federal and state regulatory agencies do not require direct mitigation for impacts to buffers, the proposed wetland mitigation plan is generally required to provide buffers that appropriately protect the functions at the mitigation sites. Local governments (including the City of Seattle) also have requirements for mitigation of buffer impacts.

Wetland buffers are vegetated areas that can reduce the impact from adjacent land uses (Ecology et al. 2006a). On compensatory mitigation sites, the buffers may also provide habitat for wetland-dependent species. The joint guidance recognizes that in urban areas, smaller wetlands can provide adequate protection for functions such as water quantity and quality functions, while larger buffers are generally required to protect moderate- to high-value wildlife habitat functions (Ecology et al. 2006a).

Determining appropriate buffer widths for compensatory mitigation sites depends on several characteristics, goals, and objectives of the site; functions the site is expected to provide; current and expected land use; and the presence of connections to other habitats (Ecology et al. 2006a).

The wetlands in the project area exist within a highly-developed urban matrix, and their performance of wetland functions reflects the limitations that result from past disturbance, adjacent high intensity land uses, and disturbed/degraded habitats and buffers. Habitat functions in these wetlands are significantly different from those of wetlands in an undisturbed area.

In urban areas, more intense development pressures and higher property values make it difficult to provide buffers that meet the Ecology standard requirements. The joint guidance recognizes this difficulty and indicates that smaller buffers may be utilized where habitat functions are not of moderate or high value, or where connections to other habitats may be sufficient to maintain habitat functions at the mitigation site. Larger buffers on one side of a site or buffer averaging may also be used to protect these functions, if necessary and applicable at the site.

The guidance also acknowledges that enhancing buffers on a mitigation site may provide mitigation credit in some situations, such as where both the impacted wetlands and the mitigation site have minimal or degraded buffers.

The four mitigation sites are located in the urbanized limits of the City of Seattle, and reflect a similar history of urbanization and disturbance. These mitigation sites are limited in their capacity to provide maximum buffers due to their urban locations. The following proposed mitigation site buffers are consistent with buffers required for similar wetlands per the City of Seattle's Critical Areas ordinance:

- WSDOT-Owned Peninsula – 110-foot standard Ecology buffer (based on Ecology requirement for Category II wetland with moderate habitat value). A reduced buffer (55 feet wide) is necessary on the west due to site constraints. This buffer width will be averaged as much as feasible within the site constraints to provide the maximum buffer area without reducing potential wetland mitigation activities.

- Union Bay Natural Area (UBNA) –standard Ecology buffers, width varies (Category II wetland adjoining high intensity uses 150, Category II adjoining moderate intensity uses trails, etc. 110 feet, Category III adjoining high intensity uses 80 feet, Category III adjoining moderate intensity uses –60 feet, Category IV wetlands adjoining moderate intensity uses –40 feet).
- Magnuson Park – 110-foot standard buffer (based on Ecology requirement for Category II wetland with moderate habitat value).

The last site is located within King County in a location that also has a significant history of disturbance but has less intense urban development.

- Elliott Bridge Reach – 110 feet, as recommended for moderate intensity land use near Category II wetlands of moderate habitat value (Ecology et al. 2006a).

The buffers noted above represent adequate protection for the functions provided at the wetlands at these mitigation sites. These buffers were developed taking into consideration site opportunities and constraints inherent in the landscapes and the proposed mitigation sites.

The total buffer area to be provided at the four mitigation sites is 30.24 acres. Since the total buffer impact is less than 5 acres, the buffers provided at the wetland mitigation sites represent approximately 6 times the total buffer impact.

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Chapter 5. Compensatory Mitigation Sites

This chapter describes the key elements of the compensatory wetland mitigation concept for the SR 520, I-5 to Medina Project.

Introduction to the Proposed Mitigation

To meet the requirements of federal, state, and local regulations and policies, WSDOT proposes compensatory mitigation at four locations. Three of these locations are in the general vicinity of the project: the WSDOT-Owned Peninsula, UBNA, and Magnuson Park. The fourth site (the Elliott Bridge Reach site) is located along the Cedar River, outside of the mitigation site selection study area. The four sites are shown in Figure 5, and mitigation activities at each site are summarized in Table 9. Table 9 and the subsequent discussion are based on the mitigation ratios discussed in the NRTWG meeting (September 30, 2010).

Table 9. Proposed Compensatory Mitigation

Mitigation Site	Wetland Establishment in acres	Wetland Re-establishment in acres	Wetland Rehabilitation in acres	Wetland Enhancement in acres	Buffer Enhancement in acres
WSDOT-Owned Peninsula		2.59	-	2.35	4.10
UBNA	2.29	-	-	9.39[a]	14.02[b]
Magnuson Park	4.67	-	2.44	2.65	10.10
Elliott Bridge Reach	2.25	-	-	-	2.02
Total	**9.21**	**2.59**	**2.44**	**14.39**	**30.24**
	Wetland Establishment	**Wetland Re-establishment**	**Wetland Rehabilitation**	**Wetland Enhancement**	**Total**
Total Wetland Mitigation Provided	**9.21**	**2.59**	**2.44**	**14.39**	**28.63**
Establishment equivalent	**9.21**	**2.59**	**1.22[c]**	**3.60[d]**	**16.62**
Total Mitigation Required					**15.14**
Excess Mitigation in acres					**1.48**

a Of this 9.39 acres, 1.90 acres of the wetland enhancement occurs in areas where the UW had ongoing enhancement activities.

b Of this 14.02 acres, 2.35 acres of buffer enhancement occurs in areas where the UW had ongoing enhancement activities.

c ½ of establishment/re-establishment value.

d ¼ of establishment/re-establishment value.

The proposed mitigation provides 11.80 acres of established (9.21 acres) and re-established (2.59 acres) wetland to meet the mitigation need described in Chapter 4, Table 8. The mitigation also provides 2.44 acres of rehabilitation and 14.39 acres of enhancement. The total exceeds the mitigation need by 5.91 acres of enhancement, or the equivalent of 1.48 acres of establishment credit.

The following factors are important points that should be considered when reviewing the adequacy of this proposed mitigation:

- The affected wetlands exist within a highly urbanized area and have a long history of disturbance. The surrounding land uses include high-density residential areas, the campus of a major university, roadways, and the existing SR 520 roadway. Invasive species are common. These factors contribute to the disturbed conditions in these wetlands.
- The project will result in a small amount of permanent wetland fill (0.29 acre). This results in 1.65 acres of mitigation need.
- The majority of permanent impacts (4.87 acres) will result from shading of wetland habitat and will not result in a loss of wetland area. This accounts for another 6.29 acres of the mitigation need (Table 6).
- Temporary impacts to wetlands (0.20 fill, 2.82 acres of clearing, and 5.25 acres of shading) in the project area result in 16.06 acres of the mitigation need, over 60 percent of the total mitigation need.
- Areas subject to temporary fill and clearing impacts will be restored after construction.
- The proposed wetland mitigation includes establishment and re-establishment of 11.80 acres of new wetland habitat.

WSDOT believes that the mitigation proposed adequately compensates for unavoidable impacts to wetland resources.

Any compensatory mitigation in excess of actual project needs may be reserved as a contingency measure, and may be considered by the team and agencies as mitigation for impacts that develop as the project design continues to 100 percent, or in the event that the full mitigation potential of the sites selected is not realized due to project site limitations.

The SR 520 Final EIS (WSDOT 2011b) describes the overall construction sequence for the project (see also Figure 2). The anticipated schedule for project elements and mitigation site construction is provided in Table 10. Mitigation sites will be funded and constructed at the same time as the construction element creating the impacts. Furthermore, if impacts identified in this plan are not realized due to future design refinements, then the total area of wetland mitigation constructed may be reduced.

Table 10. Project Element and Wetland Mitigation Site Construction Schedule

Project Element	WSDOT-Owned Peninsula		UBNA		Magnuson Park		Elliott Bridge Reach	
	Implementing Agency	Schedule	Implementing Agency	Schedule	Implementing Agency	Schedule	Implementing Agency	Schedule
Design	WSDOT	3rd quarter 2013 – 3rd quarter 2014	WSDOT	1st quarter 2014 – 1st quarter 2015	Seattle Parks	Mid 2012- 3rd quarter 2013	WSDOT	Mid 2012- late 2013
Construction	WSDOT	3rd quarter 2014 – 1st quarter 2016	WSDOT	2nd quarter 2015- 4th quarter 2015	Seattle Parks	Early 2014 – late 2015	WSDOT	Early 2014 – late 2015
Monitoring and Maintenance	WSDOT	2016-2026	WSDOT	2015-2025	WSDOT	2015-2025	WSDOT	2015-2025

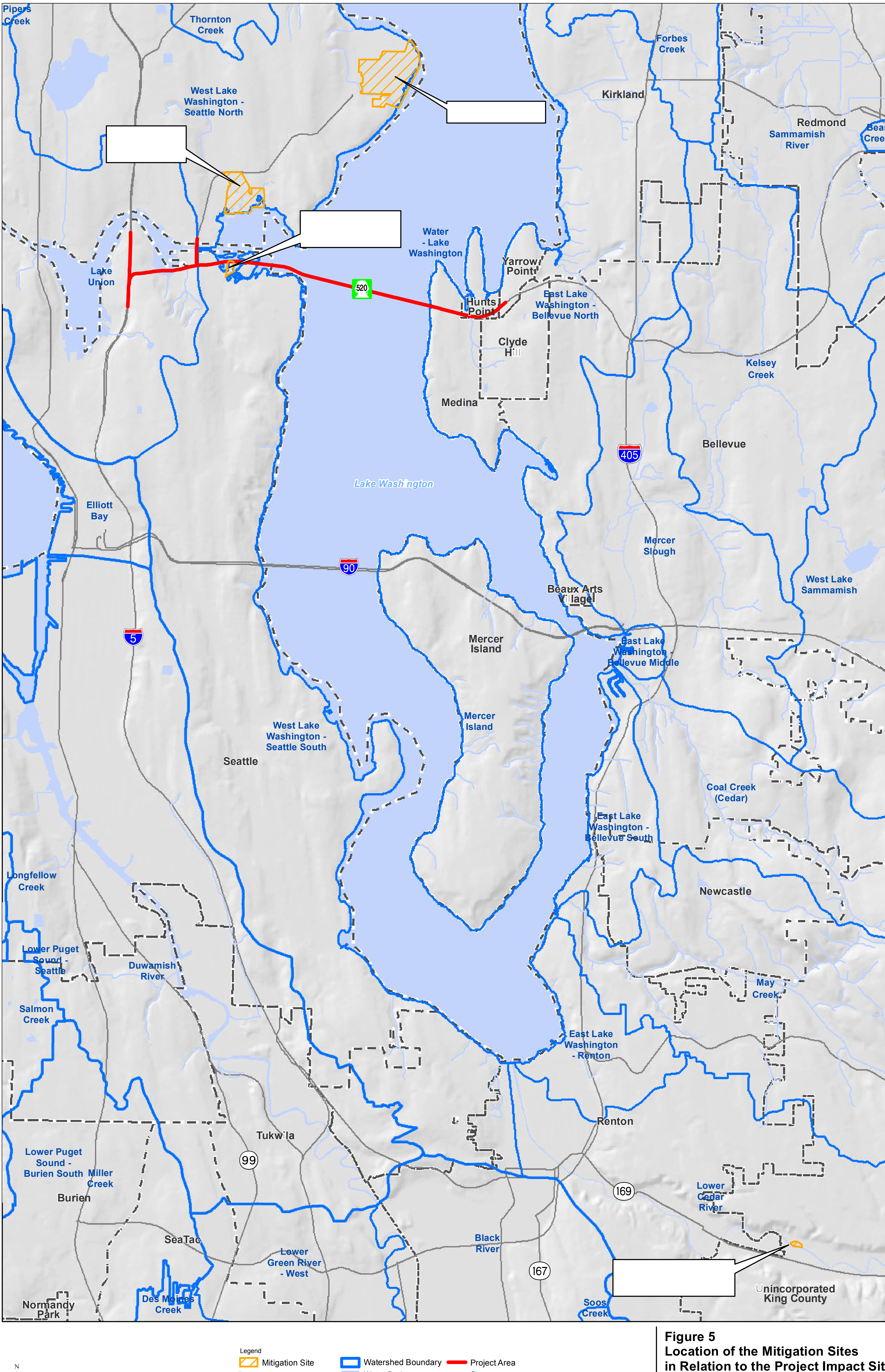

Figure 5
Location of the Mitigation Sites in Relation to the Project Impact Site

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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5.1 WSDOT-Owned Peninsula Mitigation Site

5.1.1. Site Location

The WSDOT-Owned Peninsula is located on the southern shore of Lake Washington's Union Bay, just south of the existing SR 520 bridge and adjoining the Washington Park Arboretum in the City of Seattle. The peninsula is part of property owned by WSDOT and is in the northeast quarter of Section 21, Township 25 North, Range 4 East.

5.1.2. Landscape Perspective

The WSDOT-Owned Peninsula is within the Lake Washington Subarea of WRIA 8, the Lake Washington-Cedar/Sammamish Watershed, and is located along the lake fringe of Lake Washington. This site consists of lands that were under the surface of Lake Washington prior to construction of the Hiram M. Chittenden Locks and the Ship Canal in 1916, which lowered the level of Lake Washington some 9 feet to the present day shoreline. USACE currently maintains water level in Lake Washington at between 16.72 and 18.72 feet (NAVD 88) above sea level.

5.1.3. Ecological Connectivity

The WSDOT-Owned Peninsula provides open space and wildlife habitat on the shores of Lake Washington, and provides a connection between the lake and more developed habitats in the Washington Park Arboretum and at the Broadmoor Golf Course. Mitigation activities at this site will provide shoreline and riparian vegetation to reduce erosion and provide refugia, cover, and foraging habitat for diverse species, and will maintain and improve connections between these habitats and Lake Washington.

5.1.4. Historic and Current Land Use

The WSDOT-Owned Peninsula is a relatively high, flat peninsula that extends northward into Union Bay. This area was originally below the surface of Lake Washington, but was exposed by the construction of the Ship Canal and subsequent lowering of Lake Washington. The WSDOT-Owned Peninsula was used as a dump during the 1930s, and is referred to as the Miller Street Dump in documents from the period. In 1936, the City required the Health Department to stop using the site as a dump and permitted the use of the site for the Washington Park Arboretum. During the 1940s, the area was used for a portion of the Arboretum’s *Rosaceae* collection (Bola Architects+Planners 2003). This area was obtained by WSDOT and used for construction of SR 520 in the 1960s. Currently, the majority of the peninsula is approximately 12 feet above Lake

Washington, and the adjoining lagoon to the west reaches depths of 12 feet (later summer water elevations are 18.72 feet above sea level). The existing ramps for SR 520 and partially-constructed ramps for the R.H. Thompson expressway (construction of this roadway was not completed) occupy portions of the site.

Areas adjacent to the mitigation site will provide construction staging throughout project construction. The existing ramps that currently bisect the lagoon will be removed during project construction.

5.1.5. Rationale for Site Selection

As described in Section 4.2.2, the WSDOT-Owned Peninsula mitigation site was identified in a multi-stage, hierarchical selection process. This site was selected due to its historic wetland characteristics, relatively large size, availability, location in the affected watershed/basin, similarity to affected environments, and potential for wetland mitigation activities.

5.1.6. Mitigation Site Existing Conditions

The following sections provide a summary of the existing conditions at the proposed WSDOT-Owned Peninsula mitigation site.

Uplands

Vegetation on the WSDOT-Owned Peninsula is primarily upland, dominated by mowed meadow (consisting of *Poa* species and other landscape grasses) with a few scattered large tree-of-heaven (*Alianthus altissima*) and a few smaller coast pines (*Pinus contorta*).

Wetlands

The following section provides a description of wetland conditions at the WSDOT-Owned Peninsula mitigation site. Wetland delineations for this area were completed in January 2008 as part of the wetland assessment for the SR 520, I-5 to Medina Project. Detailed information regarding wetland vegetation, site hydrology, soils, functions, and buffer conditions can be found in the *Bridge Replacement and HOV Project Supplemental Draft EIS Wetland Assessment Report Technical Memorandum (Final)* (WSDOT 2010b).

Wetland functions at the mitigation site were evaluated using the *Washington State Wetland Rating System for Western Washington – Revised* (Hruby 2004). A summary of this information is provided in Table 4, and additional details are provided in the *I-5 to Medina: Bridge*

Replacement and HOV Project Supplemental Draft EIS Wetland Assessment Report Technical Memorandum (Final) (WSDOT 2010b). Additional discussion of wetland function is provided in Section 5.1.17.

Two wetlands are located on the margins of the WSDOT-Owned Peninsula site (LWS-4 and LWS-5, see Table 11 and Figures 3 and 6). LWS-4 and LWS-5 are lake fringe wetlands and include palustrine forested, emergent, and lacustrine aquatic bed vegetation types. Dominant species present in these wetlands include black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra*), Pacific willow (*Salix lucida var. lasiandra*), Douglas spirea (*Spirea douglasii*), reed canarygrass, creeping buttercup (*Ranunculus repens*), and cattail (*Typha latifolia*). White waterlily dominates the aquatic bed portions of these wetlands. European water-milfoil (a sub-emergent aquatic plant) occurs in both the aquatic bed portions of LWS-4 and LWS-5 and within the adjacent open water areas. Wetlands LWS-4 and LWS-5 were rated Category II. Complete details on these wetlands can be found in the *I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft EIS Wetland Assessment Report Technical Memorandum* (WSDOT 2010b).

Wildlife Habitat and Use

The *Supplemental Draft Environmental Impact Statement Ecosystems Discipline Report* for the project (WSDOT 2009a) indicates that upland habitats in the project area may support a number of wildlife species, particularly bird species. Typical bird species that may use these upland habitats in the vicinity of Union Bay include warblers and other songbirds, downy woodpeckers, hairy woodpeckers, red-tailed hawks, Cooper’s hawks, and band-tailed pigeons (WSDOT 2009a). Disturbance-tolerant mammals may also be present such as moles, voles, mice, rats, eastern gray squirrel, striped skunk, opossums, raccoons, and coyote (Bioblitz 2010).

Wildlife associated with the wetlands and riparian areas at Union Bay includes red-winged blackbirds, marsh wrens, great blue herons, belted kingfishers, beavers, mink, foraging bats (e.g., little brown bats and big brown bats), Pacific treefrogs, and garter snakes. Large cottonwood trees, which are abundant in the Washington Park Arboretum, provide potential nesting, roosting (resting), and perching sites for great blue herons, bald eagles, and other bird species. Wood ducks are also present at the Washington Park Arboretum (WSDOT 2009a). Disturbance-tolerant mammals as noted in the uplands discussion may also use these habitats, although their presence has not been confirmed.

While open water habitats in Union Bay are not a large component of the WSDOT-Owned Peninsula, the site adjoins open water habitats. The open water provides habitat for a variety of waterfowl, the most common of which are American coots, buffleheads, mallards, scaups, goldeneyes, widgeons, Canada geese, double-crested cormorants, pied-billed grebes, and western grebes. Other species using these areas include bald eagles, great blue herons, belted kingfishers, river otters, beavers, muskrat, nutria, Pacific treefrogs, and bullfrogs. Bat species also forage over open water (WSDOT 2009a and Bioblitz 2010).

5.1.7. Mitigation Site Design

WSDOT proposes the re-establishment of 2.59 acres of historically dredged wetland adjacent to wetland LWS-4. In addition, 2.35 acres of the existing forested wetland (LWS-4) will be enhanced, and 4.10 acres of upland buffer will be enhanced. Final mitigation areas will depend on the geotechnical and economic constraints, and may be smaller or larger than currently shown. Specific activities will include restoring dredged areas in the lagoon west of the WSDOT-Owned Peninsula, grading to establish a surface consistent with wetland hydrology, replanting native wetland and upland plant species, and controlling non-native species on the site. Figure 6 illustrates the mitigation concept for the WSDOT-Owned Peninsula site.

5.1.8. Site Constraints

The following constraints apply to the WSDOT-Owned Peninsula:

- The upland peninsula's historic use as the Miller Street Dump presents a significant constraint on potential use.
- Geotechnical information may affect the design of the dredge restoration area.
- Additional studies will be required to assess site conditions, and further site design will consider information from these investigations and evaluations. Site conditions unknown at this time could result in changes to the final mitigation plan.
- Additional requirements may be imposed by site conditions, such as requirements to specially treat and dispose of excavated materials.
- Invasive species are present nearby and will need to be controlled in the site.
- Park uses are adjacent to the site and near (but outside of) the buffer.
- In addition to existing park uses, additional park improvements associated with the north entry to the Washington Park Arboretum are planned for the upland areas adjacent to and south of the mitigation area.
- Wildlife (e.g., beaver, nutria, geese) may pose special risks for plantings.

- Lake Washington Boulevard constrains the western perimeter of the mitigation area, and SR520 constrains the northern perimeter.
- The upland area adjacent to the mitigation area will be used for construction staging for SR520, and construction access may use the existing ramps and a route along the western perimeter of the mitigation area. While this may affect the timing of some mitigation activities, this constraint will be eliminated when the staging is complete.

Table 11. WSDOT-Owned Peninsula Mitigation Site Wetland Summary

Location	**Peninsula on the south shoreline of Union Bay**	
 WSDOT-Owned Peninsula facing east  WSDOT-Owned Peninsula facing SW	**Local Jurisdiction**	Seattle
	WRIA	WRIA 8
	Ecology Rating (Hruby 2004)	II
	Seattle Rating	II
	Seattle Standard Buffer Width	110 feet
	Wetland Size	6.95 acres (LWS-4) 2.29 acres (LWS-5)
	Cowardin Classification	PFO, PEM, L2AB
	HGM Classification	Lake Fringe
	Wetland Rating System Pts.	
	Water Quality Score	**16 (LWS-4)/20 (LWS-5)**
	Hydrologic Score	**12 (LWS-4)/12 (LWS-5)**
	Habitat Score	**26 (LWS-4)/25 (LWS-5)**
	Total Score	**56 (LWS-4)/57 (LWS-5)**
Dominant Vegetation	Black cottonwood, red alder, Pacific willow, Douglas spirea, reed canarygrass, creeping buttercup, and common cattail. White waterlily and European water-milfoil are present in aquatic bed portions of these wetlands.	
Soils	Silt loam over loam with redoximorphic features or peat.	
Hydrology	Lake Washington	
Rationale for Local Rating	The City of Seattle has adopted the Ecology rating system for western Washington. Wetlands on the WSDOT-Owned Peninsula site were rated Category II using the Ecology rating system for water quality functions (16 to 20 of a possible 24), hydrologic (12 of 12), and habitat (25 to 26) functions, totalling greater than 50 points.	

Location	Peninsula on the south shoreline of Union Bay
Functions of Entire Wetland	Wetlands LWS-4 and LWS-5 have moderate potential to improve water quality because they have a wide band of vegetation along the lakeshore. Nearby urban areas and maintained parks provide a potential source of contamination or pollutant runoff. Woody vegetation in these wetlands has moderate potential to reduce shoreline erosion, the presence of multiple interspersed vegetation classes provides high potential for habitat, and the connections to other wetland and upland habitats in the area create moderate opportunity for this function.
Buffer Condition	The buffer areas of the site include maintained lawn, SR 520, and open water (Lake Washington). The terrestrial buffer provides minimal functions, and is disturbed by human activities.

5.1.9. Site Hydrology

Wetland hydrology at the WSDOT-Owned Peninsula Mitigation Site is determined by the water elevations in Lake Washington, which are controlled via the Chittenden Locks. As a result, the hydrology at this site is consistent and well known. Wetland hydrology driven by controlled lake levels is a predictable condition that supports the conclusion that this will develop and sustain wetland function.

Stream Flow

There are no streams that affect the WSDOT-Owned Peninsula in the existing or proposed configurations.

Groundwater

Because the proposed wetland hydrology will be based on water elevation in Lake Washington, groundwater is not expected to be a significant component of the wetland re-establishment. Information related to hydrology will be incorporated into final site design (PS&E), if appropriate, as it becomes available.

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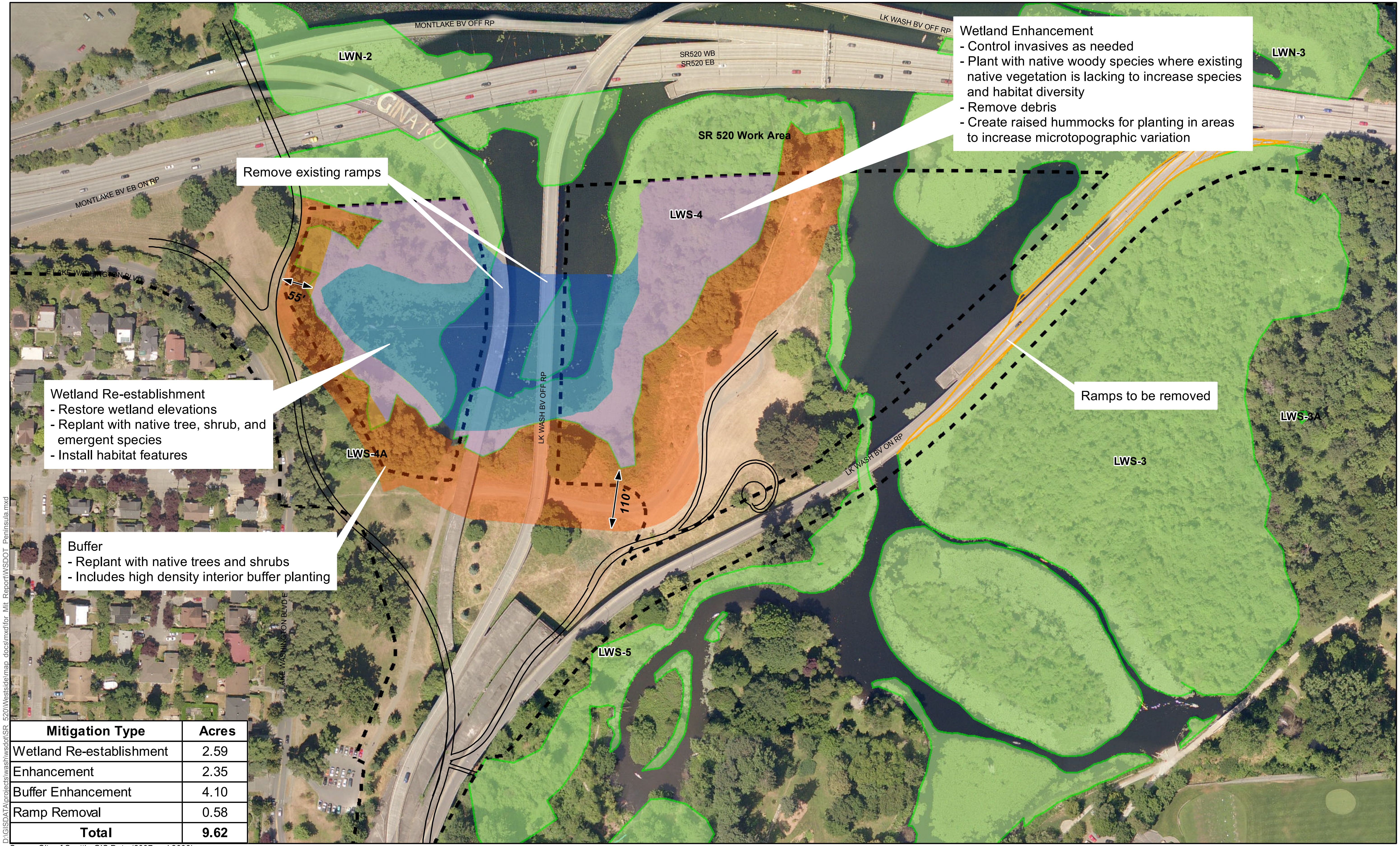

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Mitigation Type	Acres
Wetland Re-establishment	2.59
Enhancement	2.35
Buffer Enhancement	4.10
Ramp Removal	0.58
Total	**9.62**

Souce: City of Seattle GIS Data (2007 and 2008)

N

0 50 100 150 200 250 300 Feet

Legend

- Wetland Re-establishment
- Wetland Enhancement
- Buffer Enhancement
- Limits of Construction
- Wetland
- Trail

Figure 6
WSDOT-Owned Peninsula Mitigation Concept

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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5.1.10. Invasive Species

Reed canarygrass, Japanese knotweed, and Himalayan blackberry are the dominant invasive species present at the WSDOT-Owned Peninsula Mitigation Site. English ivy (*Hedera helix*) is also present, but not dominant. The presence of these species likely reflects the past disturbance and current uses of the WSDOT-Owned Peninsula. Invasive species control for the site is discussed under Site Management (Section 7.3).

5.1.11. Grading Design

Wetland elevations and grading descriptions for the WSDOT-Owned Peninsula Mitigation Site are based on site survey topographic information developed for the project corridor. Exposure of the underlying Miller Street Dump is a concern for this site. Boundaries of the former dump will need to be established before final PS&E.

Grading Design at Dredged Areas in the WSDOT Lagoon

Aerial photographs from 1936 show the WSDOT-Owned Peninsula, Foster Island, and the adjoining lagoons as a single wetland, extending south to the shoreline at the Washington Park Arboretum. The Miller Street Dump is the only intrusion into the central portion of this large wetland complex at that time. The lagoons east of the WSDOT-Owned Peninsula were constructed prior to 1942, and the western lagoon was excavated to facilitate construction of the Evergreen Point floating bridge and the ramps for the proposed R.H. Thompson Expressway.

1936 Aerial ortho photograph. Approximate current shoreline shown in blue.

After completion of the SR 520 construction project, WSDOT will demolish and remove the existing on- and off-ramps at the WSDOT-Owned Peninsula site. The proposed mitigation would restore a portion of the dredged area to wetland. Construction activities will include constructing a submerged berm across the mouth of the lagoon, isolating the work area, and filling the areas behind the berm with clean fill materials in several phases to allow for settling. Grades will be established at elevations that will allow the restoration of wetland vegetation. Note that the final area of grading will depend on the geotechnical and economic considerations. As a result, the final wetland establishment area may be larger or smaller than currently shown.

Grading Design at All Areas

Final grading plans are included in Appendix E. The mitigation design will also incorporate minor grading activities such as lowering high spots and creating small raised areas to increase micro-topographic variations. Final grades will be established consistent with wetland hydrology requirements for the restored wetland areas, and may be adjusted for desired habitats based on more detailed hydrologic data.

5.1.12. Planting Design

The proposed plant community for the wetland re-establishment and enhancement areas at the WSDOT-Owned Peninsula Mitigation Site is a lake fringe forested wetland. Canopy trees will be planted at the higher elevations and at the margins of the wetland, and the shrub community will be planted throughout the re-establishment and enhancement areas. Emergent vegetation would be placed at the lowest elevations.

Canopy species identified in the proposed planting palette include both fast-growing and slow-growing species, as well as both deciduous and coniferous species. Western red cedar and Sitka spruce will provide an evergreen tree component not presently in the existing forested wetlands in its vicinity. The shrub sub-canopy plantings will provide more dense cover and improved foraging opportunities for wildlife under the forested canopy, and as a densely vegetated habitat in the wettest portions of the newly established wetland areas. Woody plantings will be grouped by species, and the groupings will be intermixed at the edges to provide a diffuse edge. Species requiring shade will be planted under existing canopy cover. Forested planting areas are shown in Appendix E.

Emergent wetland plantings will provide an understory in sparsely vegetated portions of the forested enhancement area and in a narrow band along the new shoreline. These shoreline planting areas will also include willow stakes to prevent excessive predation by Canada geese and nutria. Emergent plants will be grouped by species, and intermixed at the edges of the groups to provide a diffuse edge.

Table 12 presents a list of typical plant species and community composition for planting zones at the WSDOT-Owned Peninsula site. Species for 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. Additional modifications to the species selected may be made during the final design (PS&E) phase.

Table 12. Proposed Typical Planting List for Wetland Areas at the WSDOT-Owned Peninsula

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Water's Edge Planting				
Live Stakes				
Scouler's willow	*Salix scouleriana*	FAC	36" Live Stake	1'
Sitka willow	*Salix sitchensis*	FACW	36" Live Stake	1'
Emergents				
Sawbeak sedge	*Carex stipata*	OBL	Plug	2'
Slough sedge	*Carex obnupta*	OBL	Plug	2'
Creeping spikerush	*Eleocharis palustris*	OBL	Plug	2'
Tall mannagrass	*Glyceria elata*	FACW+	Plug	2'
Small fruited bulrush	*Scirpus microcarpus*	OBL	Plug	2'
Water parsley	*Oenanthe sarmentosa*	OBL	Plug	2'
Hardstem bulrush	*Schoenoplectus acutus*	OBL	Plug	2'
Giant burreed	*Sparganium eurycarpum*	OBL	Plug	2'
Forested Wetland Re-establishment Planting				
Trees				
Oregon ash	*Fraxinus latifolia*	FACW	1" Caliper Bare Root	10'-12'
Sitka spruce*	*Picea sitchensis*	FAC	1" Caliper Bare Root	10'-12'
Black cottonwood	*Populus balsamifera ssp. trichocarpa*	FAC	1" Caliper Bare Root	10-12'
Pacific willow	*Salix lucida var. lasiandra*	FACW+	1" Caliper Bare Root	10'-12'
Western red cedar*	*Thuja plicata*	FAC	4' Height Bare root	10'-12'
Shrub				
Red-osier dogwood	*Cornus sericea*	FACW+	36" Live Stake	4'
Black hawthorn	*Crataegus douglasii*	FAC	15" Height	4'

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Black twinberry	*Lonicera involucrata*	FAC+	15” Height	4’
Nootka rose	*Rosa nutkana*	FAC	15” Height	4’
Peafruit rose	*Rosa pisocarpa*	FAC	15” Height	4’
Salmonberry*	*Rubus spectabilis*	FAC+	15” Height	4’
Pacific ninebark	*Physocarpus capitatus*	FACW-	15” Height	4’
Scouler’s willow	*Salix scouleriana*	FAC	36” Live Stake	4’
Sitka willow	*Salix sitchensis*	FACW	36” Live Stake	4’
Forested Wetland Enhancement Planting				
Trees				
Red alder**	*Alnus rubra*	FAC	1” Caliper Bare Root	20’
Oregon ash	*Fraxinus latifolia*	FACW	1” Caliper Bare Root	20’
Sitka spruce*	*Picea sitchensis*	FAC	4-6’ Height Bare root	20’
Black cottonwood	*Populus balsamifera ssp. trichocarpa*	FAC	1” Caliper Bare Root	20’
Cascara*	*Rhamnus purshiana*	FAC-	1” Caliper Bare Root	20’
Pacific willow	*Salix lucida var. lasiandra*	FACW+	1” Caliper Bare Root	20’
Western red cedar*	*Thuja plicata*	FAC	4’, Bare root	20’
Shrubs				
Red-osier dogwood	*Cornus sericea*	FACW+	15” Height	8’
Black twinberry	*Lonicera involucrata*	FAC+	15” Height	8’
Nootka rose	*Rosa nutkana*	FAC	15” Height	8’
Salmonberry	*Rubus spectabilis*	FAC+	15” Height	8’
Emergents				
Skunk cabbage	*Lysichiton americanum*	OBL	Plug	2’
Water parsley	*Oenanthe sarmentosa*	OBL	Plug	2’

* Species to be planted in shaded areas or as secondary planting into established canopy.

** Plantings should include soil medium inoculated with beneficial rhizobium.

5.1.13. Habitat Features

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

- Downed logs
- Standing snags
- Bat boxes
- Wood duck nest boxes
- Brush piles

Quantities and placement of habitat features will be determined as the former landfill boundary is established and design is developed.

5.1.14. Buffers and Uplands

Buffer plantings at the WSDOT-Owned Peninsula will be largely composed of mixed upland forest species. Forested buffer plantings will be located along the upslope side of the wetland boundary across the site (see Appendix E).

A typical species list is shown in Table 13. The list includes canopy communities (consisting of both deciduous and coniferous tree species) and sub-canopy communities (consisting of deciduous species tolerant of a broad variety of light availability). The buffer plantings will incorporate an interior buffer planting, 10 feet wide. The interior buffer planting will consist of native rose species, which will provide dense cover and screening and will deter casual access into the wetland.

Plants will be installed in groups by species, and the edges of groups will be intermixed to provide a diffuse edge. Planting densities will be similar to those for wetland areas to reduce intrusion and provide additional screening for the resources.

Table 13. Proposed Typical Planting List for Upland Buffer Areas at the WSDOT-Owned Peninsula

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Upland Forested				
Trees				
Big leaf maple	*Acer macrophyllum*	FACU	1” Caliper Bare Root	10’-12’
Red alder	*Alnus rubra*	FAC	1” Caliper Bare Root	10’-12’
Black cottonwood	*Populus balsamifera ssp. trichocarpa*	FAC	1” Caliper Bare Root	10’-12’
Quaking aspen	*Populus tremuloides*	FAC+	1” Caliper Bare Root	10’-12’
Bitter cherry	*Prunus emarginata*	FACU	1” Caliper Bare Root	10’-12’
Douglas-fir	*Pseudotsuga menziesii*	FACU	4’, Bare root	10’-12’
Garry oak	*Quercus garryana*	NL	1” Caliper Bare Root	10’-12’
Western red cedar*	*Thuja plicata*	FAC	4’, Bare root	10’-12’
Shrubs				
Vine maple*	*Acer circinatum*	FAC-	4’ Height Bare Root	4’
Serviceberry	*Amelanchier alnifolia*	FACU	15” Height	4’
Beaked hazelnut*	*Corylus cornuta*	FACU	15” Height	4’
Oceanspray	*Holodiscus discolor*	NL	15” Height	4’
Indian plum*	*Oemleria cerasiformis*	FACU	15” Height	4’
Baldhip rose	*Rosa gymnocarpa*	FACU	15” Height	4’
Clustered rose	*Rosa pisocarpa*	FAC	15” Height	4’
Nootka rose	*Rosa nutkana*	FAC	15” Height	4’
Thimbleberry	*Rubus parviflorus*	FAC-	15” Height	4’
Common snowberry	*Symphoricarpos albus*	FACU	15” Height	4’
Interior Buffer Planting				
Shrubs				
Baldhip rose	*Rosa gymnocarpa*	FACU	15” Height	2.5’
Clustered rose	*Rosa pisocarpa*	FAC	15” Height	2.5’
Nootka rose	*Rosa nutkana*	FAC	15” Height	2.5’

* Species to be planted in shaded areas or as secondary planting into established canopy.

5.1.15. Site Protection

The WSDOT-Owned Peninsula Mitigation Site will have long-term protective measures put in place such as recording on WSDOT Right-of-Way plans, deed restrictions, conservation easements, or Native Growth Protection Easements. WSDOT will also install appropriate signage in the mitigation areas.

WSDOT will develop a long-term management plan for the WSDOT-Owned Peninsula Mitigation Site that will address such elements as: documentation of any trash accumulation; identification of any condition that impairs or threatens the ongoing ecological functioning of the site; and representative photos from points that show the relative condition of the site.

5.1.16. Implementation Schedule

A complete implementation schedule for this mitigation has not yet been developed. However, the following studies and benchmarks are anticipated as part of the design process:

- Identification of historic elevations, fill elevations, and soil stratigraphy
- Soil studies
- Archaeological and geological/geotechnical studies to determine boundaries of landfill and assess the extent to which it will affect mitigation
- Wetland boundary verification (USACE, June 15, 2011)
- Characterization of reference wetland
- Permit applications
- Permit approval
- Final design of the mitigation at the WSDOT-Owned Peninsula will be executed by WSDOT. Design of this project is expected to begin in the 3rd quarter of 2013.
- Construction of the mitigation at the WSDOT-Owned Peninsula will be executed by WSDOT or their contractor. Construction is expected to begin in the 3rd quarter of 2014. Construction of the mitigation area must occur after the existing ramps have been removed as part of the west approach construction. Changes to the construction schedule for the west approach will directly affect the timing of the mitigation construction.
- Mitigation monitoring and maintenance at the WSDOT-Owned Peninsula site will be completed by WSDOT or its designated agent.

- Long-term management of the WSDOT-Owned Peninsula site will be provided by WSDOT, University of Washington, and Seattle Parks Department.

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

5.1.17. Ecological Benefits

Wetland Functions

The proposed mitigation at the WSDOT-Owned Peninsula Mitigation Site consists of 2.59 acres of wetland re-establishment, 2.35 acres of wetland enhancement, and 4.10 acres of buffer enhancement. 0.58 acre of existing onramps will also be removed. The proposed mitigation is expected to substantially improve habitat functions at this location. Functional attributes of the mitigation wetlands that will be increased, compared to the existing affected wetlands, are listed below. A summary is provided in Table 14.

Improved Functional Attributes

- Reduced prevalence of invasive species
- Increased plant diversity will be achieved by addition of species that are not present in the existing wetland. Native tree species that will be added include western red cedar, Oregon ash, and Sitka Spruce. Native shrub species to be added include black hawthorn, black twinberry, Nootka and peafruit rose, salmonberry, red-osier dogwood, and Pacific ninebark.
- Increased vertical and horizontal habitat complexity will be achieved by establishing new area of forested wetland and connecting currently fragmented habitat
- Additional habitat features
- Woody vegetation that protects shorelines along Lake Washington from erosion
- Indirect benefits to Wetlands LWS-3, 3A and LWS-5. Removal of the existing on- and off-ramps will restore the connection between Wetlands LWS-3a and LWS-3 to create a single larger wetland and will remove barrier in Wetland LWS-4 and LWS-5 to decrease fragmentation and improve access throughout these areas for wildlife.
- The re-establishment area will increase the size of LWS-4 wetland patch and decrease the relative ratio of edge to patch size. This addition provides a larger wetland forested/shrub patch, a habitat that is limited in this basin.

New Functional Attributes

- Restores historically lost wetland area
- Creates a complex mosaic of wetland habitat
- Restores historic corridor of forested and scrub-shrub habitats.

Table 14. Existing and Proposed Wetland Functions at the WSDOT-Owned Peninsula Mitigation Site

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Water Quality			
Sediment removal	Absence of persistent vegetation in this area limits performance sediment trapping and pollutant removal/retention.	Plant 2.59 acres of dense woody vegetation that can slow flows and trap suspended sediments and remove pollutants. Add plants to 2.35 acres of existing wetlands.	2.59 acres of established scrub-shrub and forested wetland provide new water quality function. 2.35 acres of enhanced wetland are expected to perform this function at an increased level.
Phosphorous removal			
Nitrogen removal			
Metal and toxic organic removal			
Pathogen removal	Likely not provided.		No change.
Hydrologic			
Peak flow reduction	Not provided.		No change.
Erosion reduction	Open water area does not provide this function. Existing woody vegetation on banks does provide this function.	Increase in dense woody vegetation of 2.59 acres. Adding additional woody species and individuals in 2.35 acres.	2.59 acres of new scrub-shrub and forested wetland reduce erosion. Adding additional woody species to 2.35 acres of wetland enhances/supports this function.
Groundwater recharge	Not provided.		No change.
Habitat			
Structural complexity	Open water and forested wetland provide limited structure.	Establishing 2.59 acres of wetland with new shallowly inundated hydroperiod, interspersed vegetation classes, and plant species. Enhanced wetland will have increased species diversity.	Increase in structural complexity in establishing 2.59 acres of new scrub-shrub and forested habitat with differing water levels. Increased hydrologic structure by creating 2.59 acres of shallowly inundated wetland. Enhanced wetland will provide 2.35 acres of improved species diversity.

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Abundant food sources	Existing wetland provides a variety of food sources.	Established wetland will include 2.59 acres of woody and emergent plant species that provide a variety of food sources. Enhanced wetland will have increased species diversity. Plants selected include those with high food value.	Increase in primary and secondary productivity. 2.59 acres of established wetland. Increase in type and species of forage in 2.35 acres of enhanced wetland.
Connectivity to other natural resources	Open water and a narrow fringe of wetland connect habitats at the WSDOT-Owned Peninsula.	Established woody vegetation to improve connectedness.	Establishment on 2.59 acres of new wetland provides a broader connection between existing habitats, increases diversity of habitats present, and restores historic forested and scrub/shrub habitat. Removal of existing ramp structures improves connectivity between Wetlands LWS3 and LWS-3A (~15.2 acres) and effectively moves the roadway farther from portions of these wetlands. The ramp removal also decreases fragmentation of habitat in Wetland LWS-4 and LWS-5 (~9.25 acres total).
Moist and moderate microclimate	Existing wetland to be enhanced have moist, moderate microclimate.	Established wetland will have dense woody vegetation to provide shelter and shade.	Increase of moist and moderate microclimate by 2.59 acres in wetland establishment area. No change in enhancement area, 2.35 acres.

Functional Lift

The WSDOT-Owned Peninsula Mitigation Site provides a unique opportunity for wetland mitigation due to its location; history as a wetland, landfill, and then Arboretum; past dredging for the construction of the original 520 Bridge; and its location in the developed urban landscape.

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*. A number of methods can be used to assess functional lift but most are suitable only for smaller sites, (Ecology et al. 2006a) and so are not appropriate for larger sites such as the WSDOT-Owned Peninsula Mitigation Site. . 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 smaller part of a larger wetland (Hruby 2008), such as would occur at the WSDOT-Owned Peninsula Mitigation Site.

WSDOT discussed these limitations with agencies and provides the following summary, which was developed as a description of functional lift based on the three functions used in both the *Washington State Wetland Rating System for Western Washington Revised* (Hruby 2004) and *Wetlands 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 wetland mitigation sites using the suite of physical characteristics identified by Sheldon et al. (2005).

Water Quality Functions

Wetlands at the WSDOT-Owned Peninsula have dense, woody vegetation that can reduce water flows and trap and retain sediment. Establishment of 2.59 acres of new, shallowly inundated wetland with dense, woody vegetation would result in greater potential to reduce water velocities and trap sediments. This increased capacity to trap sediments would also enhance the potential for the removal of phosphorous, nitrogen, metals, and toxic organic compounds that are often tied to sediments. Pathogen removal is a function of long-term water retention, and is unlikely to be affected by the mitigation.

Hydrologic Functions

The addition of 2.59 acres of shallow water habitat and dense woody vegetation and the enhancement of existing wetland with additional woody plants will improve the potential for performance of erosion reduction functions at the WDSOT-Owned Peninsula Mitigation Site by slowing incoming waves and holding soils in place. These wetlands would not provide groundwater recharge or peak flow reduction functions.

Habitat Functions

While the wetlands on either side of the WSDOT-Owned Peninsula provide aquatic bed, emergent, scrub-shrub, and forested habitats, the area associated with the mitigation provides only open water and forested wetland habitat. Adding 2.59 acres for shallowly inundated forested habitat in this area will increase the vertical and horizontal complexity in this habitat.

The WSDOT-Owned Peninsula is located within a larger complex of wetlands, uplands, and open space. As a result, the site provides a connection between the lake and more developed habitats in the Washington Park Arboretum and at the Broadmoor Golf Course. Currently this connection consists of a narrow fringe of forested wetland on the south end of the mitigation site, which is broken in some areas by the existing ramp structures. The proposed mitigation activities would create additional forest habitat that would extend the amount of cover available for terrestrial species, improving the site's potential as a connection between habitats. Removing the existing ramp structures allows for larger areas of contiguous wetland habitat, decreasing the fragmentation of the existing habitats. This decrease in fragmentation improves the connectivity of these wetlands for birds in particular, resulting in larger areas of contiguous wetland and increased distance from light and noise disturbance on SR 520. Although this removal does not fit well within the usual mitigation ratio discussion, it does provide a valuable improvement to function for the affected wetlands. Therefore, to account for these benefits, we have removed this area from the overall shading impacts.

The wetlands associated with Union Bay provide a mixture of wetland vegetation types that provide a variety of primary and secondary food sources beneficial to the adjacent aquatic habitats. On the WSDOT-Owned Peninsula, this function is performed at the margins of the site where the forested wetlands meet the water. Establishment of additional shallowly inundated, interspersed scrub-shrub and forested habitat would expand this function over an additional 2.59 acres that are currently open water. Species selected for the mitigation planting include emergent and woody species that provide a variety of food sources (leaves, seeds, and fruit).

The forested wetlands currently present on the WSDOT-Owned Peninsula Mitigation Site provide cover that supports a moist, moderate microclimate. Enhancement of the existing wetland would continue to support this function. The establishment of 2.59 acres of forest and scrub-shrub vegetation would extend this function to an additional 2.35 acres.

Buffer Functions

Existing buffers include maintained turfs, and are affected by recreational users and include both formal and informal recreational trails. These uses will continue adjacent to the mitigation site; however, buffer function will improve through plant establishment and through the use of trails and signage to manage recreational access.

The current standard buffers for this wetland are 110 feet in width (SMC 25.09.160). The buffers proposed for the UBNA site will largely be the standard 110 feet required by Ecology (Ecology et al. 2006a), except on the west side if the lagoon, where size and configuration of the buffer is constrained by the proposed recreational trail and existing land uses. Buffers in this area will be a minimum of 55 feet in width, and the necessary buffers will extend into existing wetland in some areas. Buffer averaging has been incorporated in some areas (notable to the south of the lagoon and at the north end of the peninsula, but these area do not achieve a 1:1 replacement of the total required buffer. WSDOT expects that the entire buffer will be densely vegetated on establishment, and the planting list incorporates a high percentage of thorny native plants that will help deter access. The proposed buffers also incorporate a more densely planted interior strip, approximately 10 feet wide. This interior planting strip runs the full length of the wetland boundary.

Overall, WSDOT believes that the proposed buffers provide adequate protection for the wetland functions at the mitigation sites, and are appropriate to the context of the site both ecologically and with respect to the surrounding park uses.

The following benefits are expected to occur:

- Functional buffers to screen re-established wetland and enhanced wetlands from nearby recreational activities.
- Control of invasive species.
- Improved upland and edge habitat function through planting with appropriate native trees and shrubs.

5.2 Union Bay Natural Area Mitigation Site

5.2.1. Site Location

The UBNA site is located on the north side of Union Bay on Lake Washington, south of the intersection of NE 45th Street and Union Bay Place NE in the City of Seattle, Washington. The UBNA site is owned by the University of Washington, and includes a portion of parcel 1625049001 in the northeast quarter of Section 16, Township 25 North, Range 4 East.

5.2.2. Landscape Perspective

Landscape Position

The UBNA Mitigation Site is located along the lake fringe of Lake Washington in the Lake Washington Subarea of WRIA 8, the Lake Washington-Cedar/Sammamish Watershed. As noted for the WSDOT-Owned Peninsula Mitigation Site, this area represents lands that were under the surface of the Lake Washington prior to the construction of the Hiram M. Chittenden Locks and the Ship Canal.

5.2.3. Ecological Connectivity

The UBNA Mitigation Site provides open space and wildlife habitat on the shores of Lake Washington. The existing wetland habitats form patches of different wetland habitat types, which form a matrix with upland habitats. This matrix provides a complex edge and vertical and horizontal complexity that are beneficial to habitat functions. The UBNA site also provides wetland and upland habitat in a heavily developed portion of the City of Seattle.

Mitigation activities at this site will provide shoreline and riparian vegetation to reduce erosion, provide refugia, cover and foraging habitat for diverse species, and maintain and improve connections between the existing wetland and on-site upland habitats and aquatic habitats in Lake Washington. The proposed mitigation will continue to enhance the patchiness of the matrix of habitats by providing additional interspersed habitats of different wetland types. The resulting matrix of habitats is expected to provide greater overall site function than the sum of the individual habitat improvements.

Nearby Restoration and Mitigation Activities

Three existing restoration or mitigation sites are located in the vicinity of WSDOT's proposed mitigation at UBNA. These three sites are the Conibear Restoration Site, the Dempsey Indoor Practice Facility Restoration, and the King County Mitigation Site. The three sites are described below.

The Conibear Restoration Site located immediately to the west of the UBNA site, on the west shoreline of Union Bay. This site bordered on the north by an access road and the University's baseball diamond, and on the east and south by the Conibear Shellhouse and docks, and is separated from WSDOT's proposed mitigation at UBNA by University Slough and a portion of Union Bay. The Conibear Restoration Site is approximately 1.3 acres in size. The Conibear Restoration was constructed as a part of the Conibear Shellhouse and the Dempsey Indoor Practice Facility projects (Ewing, 2010).

The Dempsey Indoor Practice Facility Restoration Site is located to the south of the UBNA mitigation Site, on the western shoreline of Union Bay, south of the Conibear Shellhouse and immediately east of the Dempsey Indoor Practice Facility and Women's softball field. The Dempsey Restoration Site is approximately 3.76 acres in size, 2.58 of which has been used for wetland restoration (Ewing, 2010). This site was also constructed as a part of the Conibear Shellhouse and the Dempsey Indoor Practice Facility projects (Ewing, 2010).

King County Mitigation Site is located north of the proposed WSDOT Mitigation on University Slough. The King County Mitigation Site extends from West Clark Road northward to NE 45th Street. The University of Washington Golf Driving Range is located immediately to the west of this site, and open lawn athletic fields (IMA Sports Field #1) are located immediately to the east. The site is approximately 2.2 acres in size. King County is restoring 1.0 acre of the site, along the east bank of University Slough north of Clark Road, as mitigation for a 2008 sewage spill (Ewing, 2010). The mitigation activities consist largely of the placement of large woody debris along the channel. Information about the spill can be found on the King County website (http://www.kingcounty.gov/environment/wtd/Construction/Seattle/RavennaCkPipeExtension/Library.aspx#1). Details of the current phase of the University Slough Wastewater Overflow Mitigation Project-Phase C can found in http://your.kingcounty.gov/dnrp/library/wastewater/wtd/construction/RavennaCrkTransferPipe/110314_Ravenna-UniversitySlough_Ph3_DNS_Checklist_FINAL.pdf

5.2.4. Historic and Current Land Use

The UBNA site is located on a flat terrace at the mouth of the historic delta of Yesler Creek, Ravenna Creek, and Kincaid Ravine. Originally below the surface of Lake Washington, this area was exposed in 1916, when the water level in Lake Washington was lowered. The area was subsequently colonized by wetland vegetation (Ewing 2010). In 1895, the University of Washington moved its campus from downtown Seattle to the campus on Union Bay in Lake Washington.

A portion of the site was used for waste disposal beginning in 1925. In 1933, the site was opened to public dumping, and in 1956 the City of Seattle began to use the site for domestic garbage disposal. From approximately 1959 to 1969, the site was extended outward with a series of dikes, constructed from timber and rubbish mats. The extension was intended to provide a stable base for roadways, and to contain the displacement of peat soils on the site (Dunn 1966, Montlake Landfill Work Group 1999). The first dike layer was a minimum of 15 feet thick, 150 to 200 feet wide, and sufficient to support a 35-ton tractor. At locations where the depth of the peat was greater, the mats were 30 to 40 feet deep. These mats were capped with earth to sink them below the water surface. A canal (now referred to as University Slough) was later excavated through this fill to convey stormwater from Ravenna and the University Village to the north across the site to Lake Washington (Dunn 1966). Landfill activities were closed in 1969, and filling, grading, and seeding activities continued through 1971 (Ewing 2010).

The former Montlake Landfill currently supports sports fields and parking lots for the University of Washington and the Union Bay Natural Area. There are several areas where enhancement activities have been undertaken by students, non-profit groups, and community groups. These activities began at the site in 1990, and continue to the present. Note that these activities are ongoing, and should not be considered complete or advance mitigation.

5.2.5. Rationale for Site Selection

The UBNA was identified using a multi-stage, hierarchical selection process described in Section 4.2.2. Ownership by a public entity provides benefits at the UBNA mitigation site that are not generally present for mitigation sites. Specific benefits include the following:

- The University of Washington can help mitigation projects succeed by offering extensive historical knowledge and access to ongoing research at the site. This historical knowledge is a feature that is not generally available for mitigation sites.

- The University of Washington has actively managed enhancement activities at the UBNA site since 1990, and will remain actively involved in the continued use and management of the site. Ongoing studies and master planning efforts for the site are indicative of the University's dedication to good stewardship of the UBNA site.
- Approximately 15 acres of wetland and buffer enhancement work is ongoing at the site. This work has been undertaken by students, non-profit and community groups and includes successful wetland establishment in the E-5 area.
- WSDOT intends to partner with the University of Washington on the development and management of this proposed mitigation. The University of Washington conducts education and research projects on-site for design and ecological restoration classes that contribute to the body of wetland restoration knowledge and support the development of professionals in the field of wetland science.
- As owner and steward of this site the University of Washington's participation in maintenance and monitoring could bring continuity and additional perspective to monitoring this uniquely sited mitigation.
- The University of Washington can potentially provide a variety of services that would benefit the mitigation. Examples of these potential services include: plant propagation and establishment, aesthetics, grading techniques, tree protection techniques, and developing design solutions to hypothetical problems, such as adaptive management.

5.2.6. Mitigation Site Existing Conditions

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

Uplands

The Union Bay Natural Area is composed of a mixture of open grasslands and communities dominated by shrubs and forest. The grasslands are generally located in the interior portion of the site and consist of a mixture of non-native grass species, predominantly sweet vernal grass (*Anthoxanthum odoratum*), tall fescue (*Schedonorus phoenix*) and chicory (*Cichorium intybus*), Huang and del Moral (1988) also noted quack grass (*Agropyron repens*), Kentucky bluegrass (*Poa pratensis*), and redtop (*Agrostis alba*) (on the site. Forested areas to the east are dominated by black cottonwood, Pacific willow, Scouler willow (*S. scouleriana*), and Hooker willow (*S. hookeriana*). The non-native species Himalayan blackberry, Japanese knotweed, and reed canarygrass are present in some areas. Other invasive species present include Scot's broom (*Cytisus scoparius*), Canada thistle (*Cirsium arvense*), tansy ragwort (*Senecio jacobaea*), yellow loosestrife (*Lysimachia punctata*), and giant knotweed (*P. sachalinense*) (Ewing 2010). Invasive species (in particular purple loosestrife) remain on the site despite management efforts to reduce and eliminate them on-site. The University of Washington has a current grant to manage purple loosestrife on-site, and is using methods such as biological control.

Wetlands

The following section provides a description of wetland conditions at the UBNA Mitigation Site. Wetland functions at the mitigation site were evaluated using the *Washington State Wetland Rating System for Western Washington – Revised* (Hruby 2004). Additional discussion of wetland function at the UBNA Mitigation Site is provided in Section 5.2.17.

Wetlands located on the UBNA site were delineated in 2011. Details on these wetlands can be found in the *Draft Wetland and Stream Assessment Report for Union Bay Natural Area, Magnuson Park, and Elliott Bridge Reach Mitigation Sites* (WSDOT 2011c).

One shoreline wetland and five interior wetlands were delineated at the UBNA site. Interior wetlands include a mixture of forest, scrub-shrub, and emergent habitats. Forested areas are dominated by black cottonwood and red alder, with wetlands areas also having willows (*Salix* spp.), typically pacific willow, but also Scouler's (*Salix scouleriana*) and sitka willow (*Salix sitchensis*). Shrub areas are generally dominated by these species as well. Vegetation present in the emergent area includes bentgrass, reed canarygrass, velvetgrass (*Holcus lanatus*), soft rush (*Juncus effuses*) and water foxtail (*Alopecurus geniculatus*) in wetlands. The marsh areas are dominated by creeping spike rush (*Eleocharis palustris*), cattails, and yellow flag (*Iris pseudacorus*). Aquatic bed wetlands on the shoreline of the site are dominated by white waterlily, European water-milfoil, and cattail.

One wetland was rated Category II, four were rated as Category III, and one wetland was rated as Category IV. A summary of the UBNA's wetland characteristics is provided in Table 15.

Table 15. UBNA Mitigation Site Wetland Summary

<table>
<tr><th>Location</th><th colspan="2">North shoreline of Union Bay</th></tr>
<tr><td rowspan="10">
Typical enhancement area at UBNA Site</td><td>Local Jurisdiction</td><td>Seattle</td></tr>
<tr><td>WRIA</td><td>WRIA 8</td></tr>
<tr><td>Ecology Rating (Hruby 2004)</td><td>II, III & IV</td></tr>
<tr><td>Seattle Rating</td><td>II, III & IV</td></tr>
<tr><td>Seattle Standard Buffer Width</td><td>150 – 60 feet</td></tr>
<tr><td>Wetland Size</td><td>19.71 acres</td></tr>
<tr><td>Cowardin Classification</td><td>L2AB, PSS, PEM</td></tr>
<tr><td>HGM Classification</td><td>Lake Fringe and Depressional</td></tr>
<tr><td colspan="2">Wetland Rating System Pts.</td></tr>
<tr><td>Water Quality Score
Hydrologic Score
Habitat Score
Total Score</td><td>See Final Wetland Assessment Report for Rating Scores</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Black cottonwood, red alder, willows, reed canarygrass, bent grasses, common velvetgrass, soft rush, water foxtail, creeping buttercup, and cattail. White waterlily and European water-milfoil are present in aquatic bed portions of these wetlands.</td></tr>
<tr><td>Soils</td><td colspan="2">Historic landfill and fill cap.</td></tr>
<tr><td>Hydrology</td><td colspan="2">Lake Washington is the primary source of wetland hydrology for the shoreline wetlands. Note that this hydrology is reversed from normal lake water levels due to the management of the locks. Interior wetlands are depressional wetland with precipitation as the primary water source.</td></tr>
<tr><td>Rationale for Local Rating</td><td colspan="2">Most of the wetlands on the UBNA site were rated as Category III, with one rated Category II and one wetland rated Category IV. These wetlands generally had low to moderate scores for water quality, hydrologic, and habitat functions. Additional detail is provided in the Final Wetland Assessment Report.</td></tr>
</table>

Location	North shoreline of Union Bay
Functions of Entire Wetland	Vegetation in the wetland at UBNA has moderate potential to improve water quality and provides an opportunity for dissipation of pollution from urban areas or boat use. The narrow band of aquatic vegetation has low potential to reduce shoreline erosion. Several of the wetlands have multiple Cowardin classes and moderate to high interspersion of habitats, indicating moderate potential to provide habitat. Connections to other habitats provide moderate habitat opportunity.
Buffer Condition	Wetland buffers at UBNA are generally narrow and dominated by non-native grasses and trails. A narrow woody buffer is present at the northeast end of the UBNA site. Open water (Lake Washington) provides a substantial buffer to the south.

Wildlife Habitat and Use

The Supplemental Draft Environmental Impact Statement Ecosystems Discipline Report (WSDOT 2009a) for the project indicates that lakeshore and upland habitats in the project area (including the UBNA Mitigation Site) may support a number of wildlife species, particularly bird species and disturbance tolerant mammals. A list of species potentially present at the UBNA site is provided in the discussion of the WSDOT-Owned Peninsula Mitigation Site (Section 5.1.6).

5.2.7. Mitigation Site Design

The UBNA site provides a matrix of wetland and uplands in a unique location. Wetland mitigation activities proposed at the UBNA site will incorporate the mitigation areas into the diverse and complex mosaic of wetlands and terrestrial habitats on-site, by increasing horizontal and vertical habitat diversity and species diversity within the larger habitat mosaic. WSDOT proposes to establish 2.29 acres of new palustrine wetland; to enhance up to 7.49 acres of existing palustrine wetland; and to complete the enhancement activities begun by the various groups at the University of Washington on 1.90 acres of existing wetland. The proposed mitigation will also enhance 11.67 acres of disturbed buffer and complete enhancement activities begun by UW and other groups on 2.35 acres of buffer. These buffer enhancement activities would target low growing native upland shrub and upland forest as the final habitat to serve as buffers for the UBNA site. The mitigation design is shown in Figure 7.

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Mitigation Type	Acres
Wetland Establishment	2.29
Wetland Enhancement	7.49
Ongoing Wetland Enhancement	1.90
Ongoing Buffer Enhancement	2.35
Buffer Enhancement	11.67
Total	**25.69**

Souce: City of Seattle GIS Data (2008), University of Washington (2010), BingMap (2010), PSLC (2000)

Figure 7
Union Bay Natural Area Mitigation Concept
SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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WSDOT proposes 2.29 acres of wetland establishment at one location at the UBNA site. The location selected is in the E-5 Restoration Management Area (Figure 7). This location was selected for wetland establishment for the following reasons:

- Establishing wetland in this location is consistent with long term plans for the site.
- The selected location is believed to have been part of the earthen fill used to retain the landfill in place. As a result, it is expected that the substrate is clean fill and poses less risk of uncovering landfill waste. Most of the site's other locations are reported to have a much thinner cover of clean fill materials.
- The area is currently used as a parking lot and the developed surface can be readily regraded to achieve elevations that will ensure a consistent source of wetland hydrology.
- Although the Douglas Road access road to the parking area is expected to remain, removing the parking lot area will greatly reduce traffic on the access road, substantially reducing the pollutant load on this paved surface.
- The University of Washington has successfully established wetlands immediately adjacent to this location.
- Trail systems are effective at managing users and keeping the majority of the users from disturbing restoration sites. Maintaining a trail system at the site that minimizes disturbance to the mitigation is a desirable goal.

WSDOT proposes 7.49 acres of new wetland enhancement in several locations at the UBNA site (Figure 7). These locations were selected for wetland enhancement for the following reasons:

- It represents a relatively large area of disturbed wetland that would benefit from enhancement activities.
- Wetland enhancement in this location is consistent with the overall goals for the site.
- The areas are relatively removed from trails on the site.

WSDOT also proposes to complete wetland enhancement activities on 1.90 acres at the UBNA site (locations are shown on Figure 7). The activities at these locations represent the completion of ongoing enhancement work undertaken by various groups at the site. These locations were selected for wetland enhancement for the following reasons:

- The selected locations represent a relatively large area of wetland that would benefit from enhancement activities.

- Wetland enhancement activities in these locations would complete enhancement work begun by others (some of which is experimental).
- The areas selected have not been previously encumbered as compensatory mitigation, and represent enhancement undertaken purely for restorations sake.
- Activities in these areas will enhance the quality of the habitat on-site.
- Wetland enhancement at these locations is consistent with the overall goals for the site.

The existing activities at the UBNA site are generally small is size and experimental in nature. Maintenance has also been limited by staff availability (Ewing 2010 calculates the approximate maintenance need for the entire UBNA site at 3.2 full time equivalents [FTE], with approximately 0.29 FTE available in 2010). Buffer areas are also inconsistent in size and the degree of protection they provide to the wetlands. These results are consistent with the educational nature of the site, the experimental nature of the treatments, and the limits of available funding for these activities.

Mitigation proposed by WSDOT for these areas will be fully funded, consistent in treatment, will incorporate traditional protective buffer areas, and will be maintained consistently over time. As a result, we feel the proposed improvement will result in a substantial improvement in wetland function at the UBNA site.

WSDOT proposes 11.67 acres of new buffer enhancement and completion of 2.35 acres of buffer enhancement activities at locations throughout the UBNA site (Figure 7). Buffer enhancement in these locations was selected for the following reasons:

- The locations provide relatively large areas of potential buffer contiguous with existing or proposed wetlands.
- These areas will provide improved upland habitat that will contribute to the value of the adjoining wetlands.
- Enhancement activities in these locations will improve the overall value of the site.
- Buffer enhancement is consistent with the overall goals for the site.
- Buffer enhancement in ongoing enhancement areas will complete the restoration efforts for these areas. Note that these areas have not been previously used as compensatory mitigation. They represent enhancement undertaken purely for restoration's sake.

The proposed buffer enhancement activities total 14.02 acres of improvements to buffers on-site.

Specific construction activities will include grading to establish a surface consistent with wetland hydrology, replanting native wetland and upland plant species, and controlling non-native species on the site. The proposed mitigation will be developed in consultation with the University of Washington faculty and staff, and will be consistent with the intent of maintaining the site as an outdoor laboratory for wetland science.

5.2.8. Site Constraints

The UBNA site has several constraints that will affect mitigation design and construction, and will require careful and continued attention. These constraints have also been identified as potential risks for the mitigation. As a result, the project will actively evaluate these constraints and incorporate additional information to assess potential risks as the mitigation plans are further developed. Currently identified constraints include the following:

- The site was previously used as a landfill. Thus, excavated materials may require special treatment and disposal.
- Landfill materials, peat and clay beneath the UBNA result in a dynamic site. Design and construction need to account for potential changes to hydrology resulting from subsidence.
- Methane present on the site will require special construction practices.
- A 3-foot cap of clean fill must be maintained over landfill areas.
- Use of the site for mitigation must remain consistent with the University of Washington's plans for and ongoing uses of the site.
- Concerns of other stakeholders (e.g., nearby residents, birdwatchers) may affect the design and construction of the mitigation.
- Beaver and nutria in Union Bay may hinder plant survival.

5.2.9. Site Hydrology

Wetland hydrology for the wetlands along the outer portion of the UBNA site is determined by the water elevations in Lake Washington, which are controlled via the Chittenden locks. Interior wetlands are seasonally ponded and have a perched water table derived from direct precipitation and localized runoff.

The established wetland at the UBNA site will be depressional and will rely on precipitation in the wetland and surface runoff from adjacent uplands to provide wetland hydrology. Over time, wetlands or adjacent upland areas at UBNA may subside, extending the connection to Lake Washington further into the interior of the UBNA site.

Groundwater

Site hydrology will be based on rainfall and runoff from a small watershed. No groundwater study will be completed because of the risks associated with this type of monitoring on a landfill. Other information related to hydrology will be incorporated into final site design (PS&E) as it becomes available.

5.2.10. Invasive Species

Reed canarygrass, Japanese knotweed, and Himalayan blackberry are the dominant invasive species present that are present at the UBNA Mitigation Site. Purple loosestrife is also present along the shoreline. The presence of these species likely reflects the past history of disturbance on the site.

Control of invasive species will be an important element of mitigation activities at the UBNA. A plan for the control of invasive species will be developed in consultation with the University of Washington faculty and staff. The plan will incorporate those practices necessary to achieve control of invasive species in the proposed mitigation areas, while maintaining consistency with the University's ongoing uses of the UBNA site, current management and maintenance practices, and the University's mission of educational use. The invasive species control strategy for the UBNA site will be incorporated into the discussion of Site Management (Section 7.3).

5.2.11. Grading Design

A complete topographic survey for the site has been completed and is provided in Appendix E. Existing wetland elevations and grading descriptions are based this topographic survey.

Potential wetland establishment area

Exposure of the landfill at UBNA is a significant constraint on this site. As a result, WSDOT has focused the grading activities in the E-5 area where the existing parking lot will be removed. This area is expected to have the least potential for exposing landfill material, and the greatest potential for successful wetland establishment. Activities in this area will include scarification/tilling or removal of the parking area's gravel fill and subsoil if necessary. Excavation is expected to remove a minimal amount of earth in this area, creating a shallow depression that will retain water from precipitation and runoff from the adjacent uplands to achieve wetland hydrology. Final grading plans are included in Appendix E. WSDOT may also perform minor grading (including topsoil placement) in other portions of the site for wetland and buffer enhancement, if required.

5.2.12. Planting Design

Appropriate native planting designs for the UBNA Mitigation Site have been developed to meet the wetland establishment and wetland and upland habitat enhancement goals for the project. These designs will be refined in consultation with the University of Washington faculty and staff. WSDOT will coordinate with agencies on the refined designs..

The planting plans include forested and emergent wetland planting zones. The plantings are located in the wetland establishment area, and Wetlands UBNA 4, 5 and 6 on the west and in the Yesler Swamp area of Wetland UBNA 1 on the east.

The forested plantings will consist of a canopy of tree species with sub-canopy shrub plantings. Canopy species selected include both fast-growing and more slow-growing species, as well as both deciduous and coniferous species. The shrub understory will provide more dense cover and improved foraging opportunities for wildlife. Woody plantings will be grouped by species, and the groupings will be intermixed at the edges to provide a diffuse edge. Species requiring shade will be planted under existing canopy cover. Forest and shrub planting areas are shown in Appendix E.

Emergent wetland plantings are proposed for the enhancement areas in Wetlands UBNA 2 and 3, and the shoreline portions of Wetland UBNA 1. Plantings will consist of infilling the existing wetland vegetation with native emergent species. Live willow stake plantings will be used in selected locations on the edges of seasonally inundated portions of the wetland, and will be supplemented with shade-tolerant native emergent species. Plants will be grouped by species, and intermixed at the edges of the groups to provide a diffuse edge. The emergent planting areas are shown in Appendix E.

A proposed planting list for planting areas is shown below in Table 16. Species for all planting have been selected in consultation with University of Washington staff, 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.

Additional modifications to the species selected may be made as additional site design information becomes available.

1 **Table 16. Proposed Typical Planting List for Wetland Areas at UBNA**

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Emergent and Water's Edge Wetland Enhancement Plantings				
Live Stakes				
Scouler's willow	*Salix scouleriana*	FAC	36" Live Stake	1'
Sitka willow	*Salix sitchensis*	FACW	36" Live Stake	1'
Emergents				
Sawbeak sedge	*Carex stipata*	OBL	Seed or Plug	2'
Slough sedge	*Carex obnupta*	OBL	Seed or Plug	2'
Creeping spikerush	*Eleocharis palustris*	OBL	Seed or Plug	2'
Tall mannagrass	*Glyceria elata*	FACW+	Seed or Plug	2'
Baltic rush*	*Juncus balticus*	FACW+	Seed or Plug	2'
Daggerleaf rush*	*Juncus ensifolius*	FACW	Seed or Plug	2'
Skunk cabbage**	*Lysichiton americanum*	OBL	Seed or Plug	2'
Small fruited bulrush	*Scirpus microcarpus*	OBL	Seed or Plug	2'
Water parsley	*Oenanthe sarmentosa*	OBL	Seed or Plug	2'
Hardstem bulrush	*Schoenoplectus acutus*	OBL	Seed or Plug	2'
Giant burreed	*Sparganium eurycarpum*	OBL	Seed or Plug	2'
Forested Wetland Establishment and Enhancement Planting				
Trees				
Red alder***	*Alnus rubra*	FAC	4', Bare Root	10'-12'
Oregon ash	*Fraxinus latifolia*	FACW	4', Bare Root	10'-12'
Sitka spruce**	*Picea sitchensis*	FAC	4', Bare Root	10'-12'
Black cottonwood	*Populus balsamifera ssp.*	FAC	4', Bare Root	10'-12'
Cascara**	*Rhamnus purshiana*	FAC-	4', Bare Root	10'-12'
Pacific willow	*Salix lucida var. lasiandra*	FACW+	4', Bare Root	10'-12'
Western red cedar**	*Thuja plicata*	FAC	4', Bare Root	10'-12'
Shrubs				
Black hawthorn	*Crataegus douglasii*	FAC	#1 Container	4'
Black twinberry	*Lonicera involucrata*	FAC+	#1 Container	4'
Nootka rose	*Rosa nutkana*	FAC	#1 Container	4'
Peafruit rose	*Rosa pisocarpa*	FAC	#1 Container	4'
Salmonberry**	*Rubus spectabilis*	FAC+	#1 Container	4'
Red-osier dogwood	*Cornus sericea*	FACW+	#1 Container	4'
Pacific ninebark	*Physocarpus capitatus*	FACW-	#1 Container	4'

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Scouler's willow	*Salix scouleriana*	FAC	#1 Container	4'
Sitka willow	*Salix sitchensis*	FACW	#1 Container	4'
Emergents				
Skunk cabbage	*Lysichiton americanum*	OBL	Seed or Plug	2
Water parsley	*Oenanthe sarmentosa*	OBL	Seed or Plug	2

* Species to be planted is drier wetland areas.

** Species to be planted in shaded areas or as secondary planting into established canopy.

*** Plantings should include soil medium inoculated with beneficial rhizobium.

5.2.13. Habitat Features

Habitat features appropriate to the target plant communities, wildlife species, and site conditions will be selected in consultation with the University of Washington faculty and staff. WSDOT will coordinate with agencies on the refined designs.

5.2.14. Buffers and Uplands

Upland buffer plantings for the UBNA will be developed in consultation with the University of Washington faculty and staff. WSDOT will coordinate with agencies on the refined designs.

Buffer enhancement plantings will consist of two vegetation types: a taller, forested buffer planting consisting of canopy trees with a shrub sub-canopy, and a lower-growing shrub planting for the buffers of emergent wetlands. Planting plans for the buffer areas are shown in Appendix E.

The woody buffer planting will be planted in the buffers of forested and scrub-shrub wetlands (i.e., in the new wetland establishment area, along UBNA 1 near University Slough, and in the buffers of Wetlands 4, 5, and 6). The canopy includes both deciduous and coniferous tree species, with greater emphasis on deciduous species that have been shown to be well adapted to the site. The sub-canopy and lower growing shrub group consists of deciduous shrub species intended to provide forage and cover. Planting densities in the woody upland planting are consistent with those proposed for the wetland plantings. A densely planted interior buffer, approximately 10 feet wide is also included in the buffer plantings.

The low-growing shrub buffer plantings will be planted along the buffers of emergent wetland enhancement areas in Wetlands UBNA 2 and 3. Plant species selected for this planting are a subset of those proposed for the forested buffer planting, selected for size. These plantings will provide greater cover and foraging opportunities than the current conditions, while not greatly restricting views. The planting densities proposed for this buffer type are less than that of the forested buffer, to allow for a more “patchy” approach to the planting (i.e., distinct groups of plants in an upland matrix).

The buffer enhancement areas are shown in Figure 7, and a proposed planting list is shown in Table 17. Plant species for the wetland buffers at UBNA have been selected in consultation with University of Washington staff, and include those species tolerant to the light and hydrologic conditions present at UBNA. In areas where the regulatory buffer includes jurisdictional wetland, the wetland plant list may be used instead.

Table 17. Proposed Typical Planting List for Upland Buffer Areas for UBNA

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Upland Forested				
Trees				
Big leaf maple	*Acer macrophyllum*	FACU	5, Bare Root	10’-12’
Red alder	*Alnus rubra*	FAC	5, Bare Root	10’-12’
Black cottonwood	*Populus balsamifera ssp. trichocarpa*	FAC	5, Bare Root	10’-12’
Quaking aspen	*Populus tremuloides*	FAC+	5, Bare Root	10’-12’
Bitter cherry	*Prunus emarginata*	FACU	5, Bare Root	10’-12’
Douglas-fir	*Pseudotsuga menziesii*	FACU	5, Bare Root	10’-12’
Garry oak	*Quercus garryana*	NL	5, Bare Root	10’-12’
Western red cedar*	*Thuja plicata*	FAC	5, Bare Root	10’-12’
Shrubs				
Vine maple*	*Acer circinatum*	FAC-	#1 Container	4’
Serviceberry	*Amelanchier alnifolia*	FACU	#1 Container	4’
Beaked hazelnut*	*Corylus cornuta*	FACU	#1 Container	4’
Oceanspray	*Holodiscus discolor*	NL	#1 Container	4’
Indian plum*	*Oemleria cerasiformis*	FACU	#1 Container	4’
Baldhip rose	*Rosa gymnocarpa*	FACU	#1 Container	4’
Clustered rose	*Rosa pisocarpa*	FAC	#1 Container	4’
Nootka rose	*Rosa nutkana*	FAC	#1 Container	4’
Thimbleberry	*Rubus parviflorus*	FAC-	#1 Container	4’
Common snowberry	*Symphoricarpos albus*	FACU	#1 Container	4’

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Upland Shrub				
Baldhip rose	*Rosa gymnocarpa*	FACU	#1 Container	4’**
Clustered rose	*Rosa pisocarpa*	FAC	#1 Container	4’**
Nootka rose	*Rosa nutkana*	FAC	#1 Container	4’**
Thimbleberry	*Rubus parviflorus*	FAC-	#1 Container	4’**
Common snowberry	*Symphoricarpos albus*	FACU	#1 Container	4’**

* Species to be planted in shaded areas or as secondary planting into established canopy.
** Planting densities will be increased to 2.5’ on center for the interior 10 feet of wetland buffers.

5.2.15. Site Protection

UBNA will be protected through a long term protection mechanism that will be approved by agencies. Ownership of the site will be retained by the University of Washington.

A long-term management plan will be developed for the wetland mitigation at the UBNA site. This plan will address such elements as: documentation of any trash accumulation, identification of any condition that impairs or threatens the ongoing ecological functioning of the site, representative photos from points that show the relative condition of the site.

5.2.16. Implementation Schedule

A complete implementation schedule for the UBNA Mitigation Site has not yet been developed. However, a number of additional studies and benchmarks are anticipated as part of the design process.

- Wetland Delineation (2011 – Complete)
- Topographic Site Survey (2011 – Complete)
- Characterization of reference wetland
- Final design of the mitigation at the UBNA Mitigation Site is expected to begin in mid-2014 and proceed through the first quarter of 2015. Site design would be completed by WSDOT.

- Construction of the mitigation at the UBNA Mitigation Site is expected to begin in mid-2014 and to be completed at the end of 2015. Site construction would be completed by WSDOT or its contractor.
- Mitigation monitoring and maintenance at the UBNA site will be completed by WSDOT or its designated agent.
- Long-term management of the UBNA site will be provided by the University of Washington.

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

5.2.17. Ecological Benefits

Wetland Functions

WSDOT proposes the following mitigation activities for the UBNA site:

- Establishment of 2.29 acres of wetland.
- Enhancement of 7.49 acres of wetland.
- Enhancement activities to complete 1.90 acres of ongoing wetland enhancement.
- Enhancement of 14.02 acres of wetland buffer.

The proposed mitigation at the UBNA Mitigation Site is expected to substantially improve habitat functions at the site. Functional attributes of the mitigation wetlands that will be improved and added, compared to the existing impacted wetlands, are listed below. A summary of the potential improvements is provided in Table 18.

Improved Functional Attributes

- Reduced prevalence of invasive species
- Increased plant diversity by replanting with seven native tree species and nine native shrub species
- Increased habitat complexity by adding new areas of forested wetland
- Additional habitat features
- Enhanced connection of existing mosaic of habitats to Lake Washington

New Functional Attributes

- Establish new wetland area
- Additional habitat area

Table 18. Existing and Proposed Wetland Functions at the UBNA Mitigation Site

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Water Quality			
Sediment removal Phosphorous removal Nitrogen removal Metal and toxic organic removal	Establishment area is currently a gravel paved parking area. Does not provide sediment or pollutant removal, contributes sediment/pollutants to associated wetland and Lake Washington. Existing wetlands provide emergent and woody vegetation that can remove sediments and pollutants. This function is generally performed by Wetland UBNA 1 and 6, which are associated with the higher intensity adjacent land uses.	Establish new wetland with dense emergent and woody vegetation. Enhance existing wetland with dense vegetation	Wetland establishment will remove 2.29 acres of sediment/pollutant generating surface and create 2.29 acres of new wetland with potential for sediment and pollutant removal. 0.7 acre of pollution-generating roadway surface will also have reduced traffic use after the parking area is removed, resulting in a decrease in the amount of pollutants being generated. Improve potential for sediment removal in 2.47 acres of existing wetland (UBNA 6);
Pathogen removal	Not provided.		No change.
Hydrologic			
Peak flow reduction	Not provided.		No change.
Erosion reduction	Existing gravel paved area does not provide erosion reduction. Vegetated shoreline of Wetland UBNA provides this function on portions of the site. The open water area does not provide this function. Existing woody vegetation in wetlands UBNA 2, 3, 4, 5, and 6 does not provide this function.	Increase in dense woody vegetation of 2.29 acres. Adding additional woody species and individuals in 1.49 acres of lacustrine wetland.	Established wetland is not directly connected to a shoreline and does not provide this function. Adding additional woody species to 1.49 acres of wetland UBNA 1; enhances/supports erosion reduction functions.
Groundwater recharge	Not provided		No change

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Habitat			
Structural complexity	Open water and forested wetland provide limited structure.	Plant 2.29 acres woody wetland habitat. Enhance 9.39 acres of wetland to increase species diversity. Add woody buffers on east and west of site. Enhance 14.02 acres of buffers on site interior.	Increase in structural complexity in 2.29 acres of established forest and scrub-shrub wetland. Established wetland will expand depressional wetland habitat and connect lacustrine wetland UBNA 1 and depressional wetland UBNA 4. Enhancement activities will increase structural complexity and/or species diversity in 9.39 acres of existing wetlands. Create woody buffers along proposed wetland areas and along University Slough.
Abundant food sources	Existing wetlands provide a variety of food sources.	Established wetland will include 2.29 acres of acres of woody and emergent plant species that provide a variety of food sources. Plant 9.39 acres of wetland to increased species diversity. Plants selected include those with high food value.	Increase in primary and secondary productivity. 2.29 acres of established wetland. Increase in type and species of forage in 9.39 acres of enhanced wetland.

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Connectivity to other natural resources	Wetlands at UBNA provide habitats connected to University and Lake Washington; The corridor along University Slough is narrow and dominated by paved areas, mowed grass, and Himalayan blackberry.	Establish 2.29 acres woody vegetation to improve connectedness. Enhance 9.39 acres of existing wetland and 14.02 acres of buffer with appropriate vegetation	Establishment on 2.29 acres of new wetland connects existing wetlands on the west side of UBNA to University Slough. Creates additional wetland to expand the complex along University Slough and Lake Washington. Wetland enhancement provides additional cover and forage in existing wetlands; enhances connection across 9.39 acres of the site. Buffer enhancements extend a corridor of natural vegetation along east side of University Slough; vegetation also screens slough from access road/trail. Enhanced buffers in site interior (40-60 feet) buffer wetlands from existing trails.
Moist and moderate microclimate	Wetland establishment area is open and paved – does not provide moist moderate habitat microclimate. Existing wetlands to be enhanced have moist, moderate microclimate.	Plant 2.29 acres of dense woody vegetation to provide shelter and shade.	Increase of moist and moderate microclimate by 2.29 acres in wetland establishment area. No change in enhancement area.

Functional Lift

The UBNA Mitigation Site provides a unique opportunity for wetland mitigation due to its location and history as wetland, landfill, and public space owned by the University of Washington. The mitigation opportunities present at the UBNA also occupy only a portion of the wetlands involved. As a result, WSDOT has provided a description of functional lift based on Sheldon et al. (2005), as described for the WSDOT-Owned Peninsula Mitigation Site.

Water Quality Functions

The UBNA Mitigation Site includes wetlands, uplands, trails, a parking lot, and an access road/driveway. The parking lot and access road are in daily use, as are the offices and greenhouses to the north and the walking trails. Existing wetlands on the eastern portion of the site may trap pollutants present in the runoff from the adjacent residential land uses. This portion of the wetland and UBNA 1 may also trap and retain suspended sediments and pollutants carried by waters in Lake Washington. Wetland UBNA 6 to the north also provides sediment and pollutant trapping functions because this area receives untreated runoff from the adjacent transfer facility.

The established wetland will remove 2.29 acres of pollutant-generating parking area, and reduce the pollutant load on the 0.7 acre of access road/driveway. The sediment load entering the newly established wetland will likely be low because the surrounding areas are generally foot or bicycle traffic only. Enhancement plantings in the easternmost portion of Wetland UBNA 1 and the northern portion of UBNA 6 have the potential to increase sediment retention and removal of pollutants bound to these sediments. However, the greatest lift to the site is the removal of existing pollution-generating surfaces.

Pathogen removal is a function of long-term water retention, and will not be affected by the mitigation.

Hydrologic Functions

The enhancement of existing wetland and buffers with woody and native herbaceous plants will improve the performance of erosion reduction functions in the shoreline areas of the UBNA by slowing incoming waves and holding soils in place over approximately 1.49 acres of lacustrine fringe wetland. The established and enhanced wetlands at the UBNA site are not classified as wetland types that provide peak flow reduction or groundwater recharge functions.

Habitat Functions

While the wetlands at the UBNA site provide aquatic bed, emergent, scrub-shrub, and forested habitats, the proposed wetland establishment area is currently a gravel paved parking area. Wetland establishment activities in this area will create 2.29 acres of additional forested wetland and remove a source of noise, light, and disturbance from the site. Enhancement activities will add more native species, increasing species diversity at the site. Establishing new wetland area and enhancing existing wetlands by planting native species and removing invasive species will increase the structural complexity of the site, increasing the habitat niches present.

Establishment and enhancement activities at the UBNA site will improve the habitat associated with University Slough, extending the corridor connection farther north into the site. Adding additional forest cover extends cover and foraging opportunities over a greater portion of the site, improving the site's potential as a connection between habitats.

The wetlands at UBNA provide a mixture of wetland vegetation types and plant species that provide a variety of primary and secondary food sources. The addition of 4.76 acres of woody plant cover (2.29 in the new wetland and 2.47 acres of enhancement in UBNA 6) and enhancement of 3.42 acres of woody vegetation in Wetlands UBNA 1 and 4 will increase the diversity of foraging types along University Slough and in the nearby wetlands, and the 6.74 acres of wetland enhancement activities in emergent areas will increase the quality of existing foraging habitat by decreasing invasive species and improving the native plant community.

The wetland communities at UBNA support a moist, moderate microclimate. Enhancement of 9.39 acres of existing wetland would continue to support this function, and the establishment of new forested wetland would extend this function to an additional 2.29 acres.

Buffer Functions

Buffers for the UBNA Mitigation Site will incorporate the following benefits:

- Improved screening of wetland from adjoining uses
- Control of invasive species
- Improved habitat function through planting with appropriate native trees and shrubs

5.3 Magnuson Park Mitigation Site

5.3.1. Site Location

Magnuson Park is located on a peninsula on the western shore of Lake Washington in the city of Seattle. The site is north of the University of Washington and about 2.5 miles north of the SR 520 Bridge in the southeast quarter of Section 2, Township 25 North, Range 4 East. The site is owned and operated by the City of Seattle as a municipal park. Within Magnuson Park, the SR 520 wetland mitigation site is located adjacent to and north east of a wetland mitigation project completed in 2009 as part of Phase II of the Magnuson Park Master Plan (Otak 2010). The eastern boundary of the site is Beach Drive, across from the Phase III Shore Pond planned for construction in 2011 (Figure 8). WSDOT is also planning to provide aquatic mitigation in the form of shoreline restoration (WSDOT 2011a), just southeast of the site between the shore trail and Lake Washington. The SR 520 wetland mitigation area is currently viewed by WSDOT as the best area for anticipated SR520 wetland mitigation needs within the park.

In the same way as previous mitigation completed on site by City of Seattle, the proposed SR 520 mitigation would be aligned with the larger overall ecological restoration vision and concept for the park documented in the park master plan (Otak 2010). There are other similar areas in the park that may provide for additional mitigation or the mitigation area may shift to these areas as the design matures.

5.3.2. Landscape Perspective

The Magnuson Park site is within the Lake Washington Subarea of WRIA 8, the Lake Washington-Cedar/Sammamish Watershed, and is located along the shoreline of Lake Washington. This site consists of lands that were under the surface of Lake Washington prior to the construction of the Hiram M. Chittenden Locks and the Ship Canal in 1916, which lowered the level of Lake Washington some 9 feet to the present day shoreline. The USACE currently maintains water level in Lake Washington at between 16.72 to 18.72 feet above sea level (NAVD 88), and Magnuson Park elevations currently range from 6 to 16 feet above the lake’s water level.

5.3.3. Ecological Connectivity

The Magnuson Park Mitigation Site provides open space and wildlife habitat adjacent to and connecting with other wetland habitats in the park. Establishing a mitigation site here will provide a connection between the recently-created Phase II wetland mitigation site (14 acres of wetlands located immediately west of WSDOT's proposed mitigation) and other existing wetland habitat located in the park to the south, west and north (Otak 2007 and Sheldon and Associates 2005). Lake Washington is located 300 to 500 feet southeast and east across Beach Drive from the proposed mitigation site. Mitigation activities at this site will improve the quality of existing wetland habitat, add additional habitat and increase habitat diversity. The project will improve the density and structure of vegetation allowing more secluded movement by wildlife between the many wetland habitats found in the park. The future Phase III (funded for construction in 2011), and Phase IV (unfunded) shore pond will provide added connectivity to Lake Washington. Lake Washington provides a corridor for waterfowl, aquatic and amphibian species between the Magnuson Park site and the Washington Park Arboretum, the Union Bay Natural Area and other wetland habitats along the lake.

A nearby restoration element under evaluation by the City of Seattle involves expansion of the shore pond system to establish an ecological connection and wildlife corridor between 24 acres of wetlands (14 acres in Phase II and 10 acres in WSDOT's mitigation site) and Lake Washington (Figure 8, Ecological Connection Area). Note that while this shore pond expansion could provide a direct connection to Lake Washington, it is not a part of WSDOT's proposed mitigation.

One proposal for this shore pond expansion would add a small discharge channel flowing downslope to Lake Washington, bordered by upland forest. This ecological connection would provide a wildlife corridor, but not a fish passageway, linking the WSDOT SR 520 mitigation site, Phase II Mitigation site and the Phase III shore pond site to Lake Washington. This connection would improve the ecological connectivity of the project and provide an important link for wildlife species that use the wetlands farther inland and move to and from the lake. The key design element is to make the shore pond–channel interface fish impassable, so the shore pond does not become a nursery for warm water fish that feed on juvenile salmon in Lake Washington. If the shore pond is constructed, additional data on potential impacts of the project will be provided to the agencies for review.

Considering that the WSDOT wetland and aquatic mitigation sites are located on both side of the ecological connection area and the site could complete the linkage between 24 acres of wetlands and Lake Washington, it seems appropriate to include a discussion of the Ecological Connection Area element in this report. However, the master plan still requires Beach Drive and the shore trail to remain, both of which must cross the Ecological Connection Area. Mitigation sites must be buffered from the road and trail (Ecology 2006b), which prevents WSDOT from obtaining sufficient mitigation credits for completing this potential project element. WSDOT does not want to fund work in this area without obtaining reasonable mitigation credit, but may include this element as part of a negotiated settlement with the City of Seattle for use of the Park as a mitigation site.

The park's master plan identifies this restoration element as important for ecological connectivity. Further work and coordination with the City of Seattle and its citizens is necessary to clarify the full extent of the mitigation site and details of the mitigation, and to ensure that it is consistent with the park master plan.

5.3.4. Current and Historic Land Use

The Magnuson Park peninsula is a relatively low, flat peninsula that extends east into Lake Washington. The mitigation site is located on the eastern edge of the peninsula, 300 feet west of Lake Washington and Magnuson Park public beaches. Wetlands and natural areas exist at the base of Kite Hill, existing wetland mitigation and natural areas are located west and southwest of the proposed mitigation site and two relic bunkers are located north of the site. The proposed mitigation site is currently used as part of the City Park, and includes wetland and upland grasses with overgrown areas. Paved trails surround the site, one crossing through the northern area, and one on the west side of the site. Several unpaved, informal trails also cross the site.

The Magnuson Park peninsula was originally below the surface of Lake Washington, but was exposed by the construction of the Ship Canal and subsequent lowering of Lake Washington. In the 1920s and 30s, the Navy established an airfield by filling low areas, including marshes and the small Mud Lake, and grading the site level. Commander A. W. Radford noted in a memo that grading of the airfield involved more than 1,500,000 cubic yards (Seattle Parks 2011). In the early 1940s, with the onset of World War II, the runways were paved and expanded and buildings were added. In 1970 the airstrip was deactivated, and in the late 1970s, the runways, tarmac, and taxiways were demolished (Seattle Parks 2011). In the early 1990s the naval station was decommissioned and in 1995 it was officially closed. In 2004, the Seattle City Council approved a wetland and sports field master plan for the area that included a wetland mitigation site (Seattle Parks 2011). In 2009, the sports field and a wetland mitigation site were constructed as Phase II of the Magnuson Park Master Plan. A shore pond located between the mitigation site and the lake is planned for construction in 2011 as Phase III of the master plan.

5.3.5. Rationale for Site Selection

As described in Section 4.2, the Magnuson Park mitigation site was identified in a multi-stage, hierarchical selection process. This site was selected due to its relatively large size, availability, location in the affected watershed/basin, and potential for wetland mitigation activities.

5.3.6. Mitigation Site Existing Conditions

The Magnuson Park Mitigation Site is a mixture of existing low quality wetland mosaic intermixed with disturbed uplands. Past activities on the site include filling, soil compaction, runway construction and demolition that prevent significant infiltration.

Soils at the Magnuson Park Mitigation Site are largely fill materials placed over historic wetland soils and are relatively deep. The soils contain little organic matter to retain soil moisture in the summer. Excavation for the Phase II wetland mitigation sites found only pockets of peat soils (Guy Michaelson and Dyanne Sheldon 2011 pers. comm.) this soil has tended to form a hardpan of clay, silt, sand, and gravel, which limits any significant infiltration and precipitation rapidly sheet flows downslope to low areas (wetlands) or off-site. . The dense soils limit denning potential, since it is difficult for animals to burrow or dig in them. The soil invertebrate community is also sparse. Thirty years after the runway was decommissioned grasses dominated much of the site most likely because of the poor soil quality. Non-native plant species (such as reed canarygrass, Himalayan blackberry, Scot's broom, English hawthorn [*Crataegus monogyna*], white poplar [*Populus alba*] and English ivy [*Hedera helix*]) are common and also indicates the disturbed nature of the site.

Uplands

The existing uplands consist primarily of open fields, dominated by a mixture of bentgrasses, velvet grass and common weeds. There are patches of Scot's broom, Himalayan blackberry, and scattered black cottonwood, Lombardy poplars (*Populus nigra*), white poplar, and English hawthorns.

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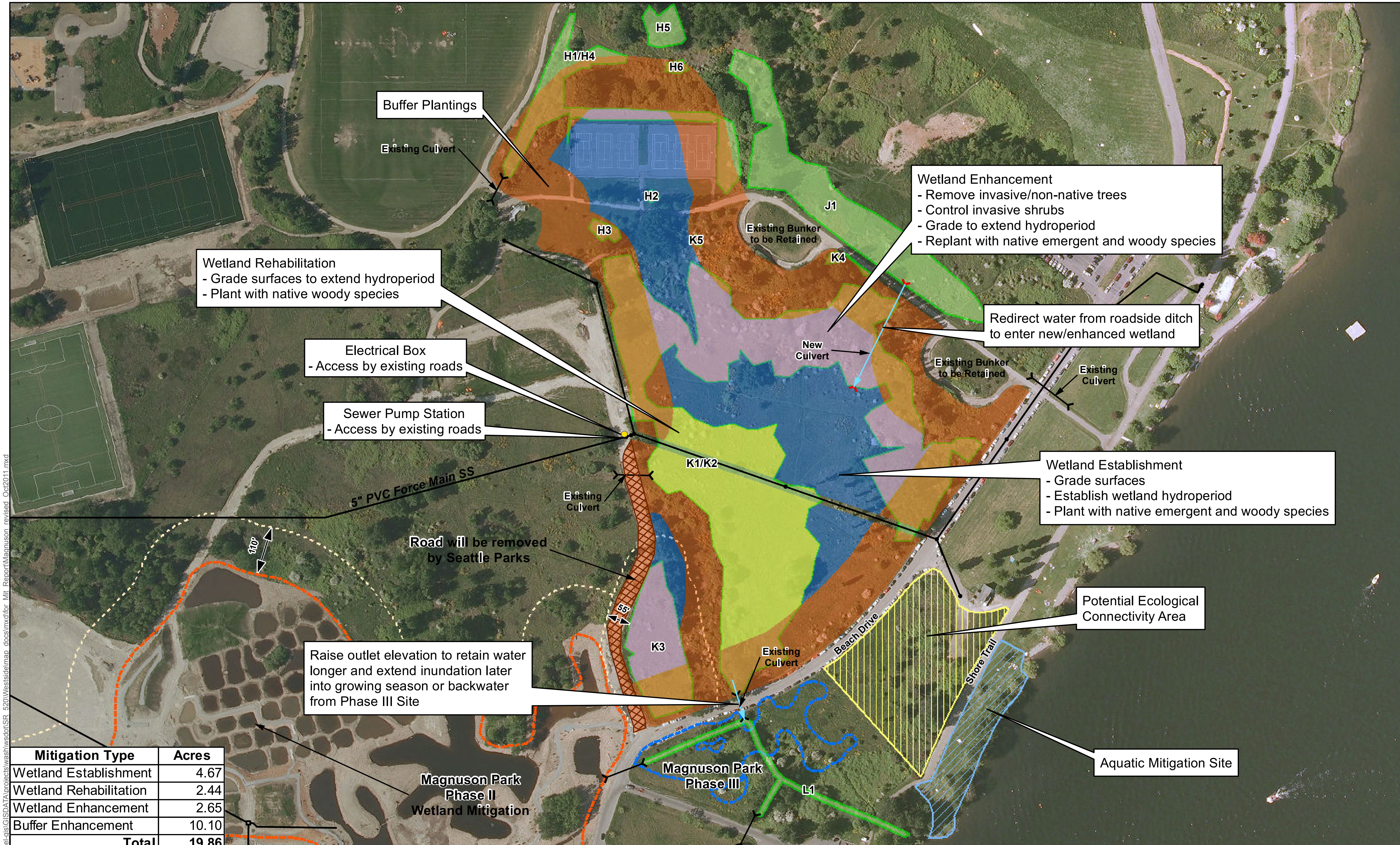

Mitigation Type	Acres
Wetland Establishment	4.67
Wetland Rehabilitation	2.44
Wetland Enhancement	2.65
Buffer Enhancement	10.10
Total	19.86

Souce: City of Seattle (2008 and 2011), Parametrix (2010)

Legend

Wetland Establishment
Wetland Enhancement
Wetland Rehabilitation
Wetland Buffer Enhancement
Aquatic Mitigation Site
Potential Ecological Connectivity Area
Wetland (Delineated May/June 2011)
City of Seatle Phase II Mitigation
City of Seatle Phase III Mitigation
Increased Flow

N

0 50 100 150 200 250 300 Feet

Figure 8
Magnuson Park Mitigation Concept

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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Wetlands

Wetland K1

Eleven wetlands were located on the Magnuson Park Mitigation Site, covering 9.4 acres. Wetland K1/K2 is the largest of these 11 wetlands, and encompasses 6.56 acres.

Two of the wetlands have forested, scrub-shrub, and emergent Cowardin classes, one wetland has scrub-shrub and emergent classes, three wetlands include only a forested class, and five wetlands include only an emergent Cowardin class. The dominant tree species present at the site include black cottonwood, white poplar, Lombardy poplar, and quaking aspen (*Populus tremuloides*). The dominant shrubs include willow (Scouler's, Pacific, and Sitka), English Hawthorn, and Himalayan blackberry. Also present are scattered domesticated apple (*Malus* spp.), Scot's broom, Douglas spiraea, and Hookers willow. Emergent species present include velvetgrass, bentgrasses, reed canarygrass, tall fescue, soft rush, hare sedge (*Carex leporina*), slough sedge (*Carex obnupta*), and lupine (*Lupinus* spp.).

Wetlands present at Magnuson Park are predominantly Category III wetlands, although four small wetlands were rated as Category IV wetlands (approximately 5 percent of the wetland area). All these wetlands are considered to belong to the depressional hydrogeomorphic class. Table 19 provides a summary of the wetlands, and additional details on these wetlands can be found in the *Draft Wetland and Stream Assessment Report for Union Bay Natural Area, Magnuson Park, and Elliott Bridge Reach Mitigation Sites* (WSDOT 2011c).

Table 19. Magnuson Park Mitigation Site Wetland Summary

<table>
<tr><th>Location</th><th colspan="2">Peninsula on west side of lake Washington
- north of SR 520</th></tr>
<tr><td rowspan="10">

Wetland K1 facing west across center of site

Wetland K2, north end of site facing north</td><td>Local Jurisdiction</td><td>Seattle</td></tr>
<tr><td>WRIA</td><td>WRIA 8</td></tr>
<tr><td>Ecology Rating (Hruby 2004)</td><td>III and IV</td></tr>
<tr><td>Seattle Rating</td><td>III and IV</td></tr>
<tr><td>Seattle Standard Buffer Width</td><td>60 and 50 feet</td></tr>
<tr><td>Wetland Size</td><td>Eleven wetland covering ~9.4 acres</td></tr>
<tr><td>Cowardin Classification</td><td>PEM, PSS and PFO</td></tr>
<tr><td>HGM Classification</td><td>All wetlands are Depressional</td></tr>
<tr><td colspan="2">Wetland Rating System Pts.</td></tr>
<tr><td>SCORE
Water Quality Score
Hydrologic Score
Habitat Score
Total Score</td><td>See Wetland Assessment Report for Details</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Emergent areas: bentgrass, velvetgrass, reed canarygrass, and soft rush. Scrub-shrub areas: Douglas spirea. Forested areas: black cottonwood, red alder, quaking aspen, white poplars, and willow. Uplands: Himalayan blackberry, Scot’s broom, white poplar.</td></tr>
<tr><td>Soils</td><td colspan="2">Mapped as Urban Land.
Gray silt, clay, sand, and gravel soils forming hardpan near surface and limiting penetration by water, animals or invertebrates. Top organic layer shallow or absent. Organic matter limited soils that dry out quickly in summer.</td></tr>
</table>

Location	Peninsula on west side of lake Washington - north of SR 520
Hydrology	Perched water table fed by seasonal rains producing seasonally saturated soils and small area (ditch) of seasonal inundation.
Rationale for Local Rating	Same as Ecology Rating
Functions of Wetland	The shallowness of the wetlands and their lack of soil organic matter limit their potential to store or desynchronize flood flows. The soils’ hardpan character, lack of organic content, and poor infiltration limiting the de-nitrification processes and phosphate and heavy metal adsorption and reduce the wetland’s capacity for water quality improvement. The short hydrologic retention time limits the wetlands’ ability for water quality improvement. The site soil compaction limits the amount of soil invertebrates and the small mammals and birds that would feed on them. The site soils limit use by mammals that would burrow or forage in the duff and upper soil layers including moles, ground squirrels, shrews and some mice species. The wetlands do not retain water long enough (except maybe in a short section of the ditch in Wetland K1) to provide amphibian habitat. The open grass areas provide little cover for native wildlife. The trees provide some native wildlife habitat for passerine birds and raptors, but dominance by non-native vegetation limits the use of the site by native wildlife species.
Buffer Condition	The buffer areas are mostly grass with some areas of shrubs and trees. The shrub- and tree-dominated areas provide some screening of the wetlands. The trees provide some native wildlife habitat for passerine birds and raptors, but dominance by non-native vegetation limits the use of the site by native wildlife species.

Wildlife Habitat and Use

The dominance of non-native plant species (such as reed canarygrass, Himalayan blackberry, Scot’s broom, English hawthorn, and white poplar) currently in the mitigation site provides limited habitat value for native wildlife species. The site is most likely used by passerine birds common in urban areas such as crows, robins, and house sparrows. Raptors and crows may use the larger trees for perching. Raccoons and opossum may forage in the ditch and among the blackberry, and a coyote is known to use the site. The site soils limit the amount of soil invertebrates and the small mammals and birds that would feed on them. The site soils limit use by mammals that would burrow or forage in the duff or upper soil layers including moles, ground squirrels, shrews, and some mice species. The wetlands do not retain water long enough (except maybe in a short section of the ditch in Wetland K1) to provide amphibian habitat.

5.3.7. Mitigation Site Design

The basic elements of the mitigation design include the following:

- Grading the site and harvesting additional water from nearby areas to establish new seasonally and permanently inundated wetland areas and extend the hydroperiods of existing wetlands.
- Replacing the topsoil on-site (if necessary) with material conducive to native plant growth and wetland functions such as water storage and water quality improvements.
- Removing non-native species and replanting with native species, retaining clumps of native trees.
- Locating the wetlands farther from Beach Drive and major trails to provide a wider and more densely-planted buffer with more vertical structure to increase wildlife use in the wetland and buffer.

Wetland area will be established, rehabilitated, and enhanced through site grading. The wetland area (including portions of K1/K2, K3, K4, K5, H1/H4, H2, and H3) will be expanded and other areas will be established by redirecting existing runoff that currently drains to Lake Washington into the wetlands. The site will be graded to create a series of interconnected depressional and slope wetlands composed of shallow, seasonally inundated emergent, scrub-shrub and forested wetlands. Existing slopes will be modified to retain water longer in the southern portion of K1/K2 to extend the seasonal hydrology in this area. Created, rehabilitated, and enhanced wetland areas are expected to consist of a matrix of wetland and may have upland inclusions. The site’s rough grading will over-excavate to allow importation and spreading of suitable native soils to mimic a more natural soil layer and to reach the final grade. Because much of the site's hydrology will rely on surface water retention and shallow subsurface flow for wetland hydrology, the over-excavation will be kept to a minimum.

The mitigation will establish 4.67 acres of new wetland in three locations in the Magnuson Park Site (Figure 8). The establishment in the three areas differs in construction method and wetland type. In the northernmost portion of the site, construction will include removing the tennis courts and excavating a depression to retain water. The establishment in the interior of the site will be graded to remove the upper soils, lowering the surface, and a series of shallow depressions (approximately 6 inches deep) will be excavated into the slope. On the western side of the site, soils will be removed to extend the existing depression farther northward, extending the wetland in this area.

Wetland rehabilitation will occur in the western half of Wetland K-1. Grades in this area will be substantially altered to (1) extend the lowest area of the wetland farther to the north, (2) lower the slopes, and (3) establish a series of shallow depressions (approximately 6 inches deep) in the slope to retain water and provide micro-topographic variation on the site.

Enhancement will occur in the eastern portion of the site (Wetland K2). Grading activities in this area are similar to those proposed for the wetland establishment and wetland rehabilitation areas (reducing elevations, adding shallow depressions), but existing elevations have generally been retained in these areas. A culvert will be constructed to convey water from the ditch on the south end of Wetland J1 into a depression graded into the slope in the northern end of Wetland K1/K2 to supplement water in the enhancement area. The culvert will be approximately 260 feet long, and will cross beneath a portion of Wetland K1/K2. Mechanisms such as trench dams will be used to avoid excessive drainage of Wetlands J1 and K1/K2, and the pipe will be constructed to avoid the loss of mature willows in the northeast portion of Wetland K1/K2. Overall, the mitigation in the enhancement area places a greater emphasis on preserving the existing grades and retaining mature native woody vegetation. The enhancement activities also include removal and control of invasive/non-native plant species. Notably invasive or non-native species that occur in these wetlands are white poplar, Lombardy poplar, and domestic apple in the canopy, English hawthorn and Himalayan blackberry in the shrub/subcanopy layer, and reed canarygrass in the emergent/herbaceous stratum. Enhancement activities for the existing wetland will include removal of these undesirable species and replanting with native species. The design will attempt to retain the large black cottonwoods and willows along the central ditch as well as willows, black cottonwoods and a few Douglas-fir and other conifers at the north end of the site. Little else of the existing vegetation would be retained. Figure 8 illustrates the mitigation concept for the Magnuson Park site.

The proposed mitigation site will be developed in consultation with the City of Seattle and will be consistent with the Magnuson Park Master Plan.

5.3.8. Site Constraints

The following constraints apply to the Magnuson Park Mitigation Site:

- A sanitary sewer line crosses the center of the site east to west. The exact depth is not currently known.
- Access to an existing electrical box must be maintained along the northwest side of the site.

- Fill materials on the site may contain hazardous materials. Excavation of Phase II wetland mitigation sites identified four small, minor contamination sites which the Navy subsequently removed (Otak 2010).
- Concerns of other stakeholders (e.g., recreational users of the park, nearby residents, birdwatchers) may affect the design and construction of the mitigation.
- Future plans for nearby portions of Magnuson Park could also constrain mitigation activities.
- An east–west main paved trail must be maintained south of Kite Hill after the existing trail is removed/relocated.
- Management and maintenance activities are ongoing.
- The final plan for the proposed mitigation will be subject to a public review process. Changes resulting from this process may affect the final proposed mitigation.

5.3.9. Site Hydrology

The mitigation design expands the catchment area, and thus the amount of water reaching the site. The existing wetlands are perched above the groundwater and rely on precipitation and surface waters for hydrology.

The project does not expect to intersect the groundwater and will rely instead on the existing precipitation and surface water runoff, raising the invert elevation of the culvert under Beach Drive, and redirecting additional runoff from a ditch that drains Wetland J1 (located to the north) to provide water for the proposed mitigation site. Water also enters Wetland K1/K2 from the west (north of the existing utility line location) through the existing culvert.

The redirected runoff will be conveyed south of the existing bunkers in a culvert to enter Wetland K2 at the north end. WSDOT intends to install this culvert in a manner that will retain most existing vegetation in the northern end of Wetland K2, and clay block check dams or similar structures will be installed to prevent subsurface drainage along the exterior of the pipe.

Site grading will increase the variety of hydroperiods found within the existing wetlands by creating depressions in the slope and deeper areas near the channel and backing up water north of Beach Drive. Hydrology from the culvert on the west side of the site will be maintained. WSDOT will continue to study and evaluate wetland hydrology to support the mitigation design development.

Stream Flow

There are no streams on-site; a drainage ditch in the center of the site directs water to a culvert under Beach Drive.

Groundwater

The design for the Magnuson Park Mitigation Site relies on surface water to provide wetland hydrology, and WSDOT does not intend to install deep groundwater monitoring wells. WSDOT is evaluating the installation of shallow groundwater wells to provide additional information on hydrology at the site. Any additional hydrology data gathered at the site (from shallow wells or other sources) will be incorporated into final site design (PS&E) as it becomes available.

5.3.10. Invasive Species

Reed canarygrass, Scot's broom, English hawthorn, white poplar, Lombardy poplar, and Himalayan blackberry are the dominant invasive species present at the Magnuson Park Mitigation Site. Invasive species control for the Magnuson Park site will be discussed under Site Management (Section 7.3).

5.3.11. Grading Design

A complete topographic survey of the site has been completed. Wetland elevations and excavation descriptions for the Magnuson Park Mitigation Site are based on this topographic survey, supplemented by information from the City of Seattle.

The current proposal for grading includes five elements. Three of these grading areas will result in the establishment of new wetland areas, one will result to substantial changes to wetland hydrology (rehabilitation), and one will be with a wetland enhancement area. Details of the grading activities are provided below.

- WSDOT will remove the existing tennis courts, relocate the existing trail to the north, and create a depression that will retain water. New wetland will be established in this depression.

- WSDOT will grade the interior areas of the site to establish new wetland areas. The proposed grading will consist of lowering areas on the slope by approximately 1 foot to more closely approach the impermeable layer underlying the surface soils. Depressions running perpendicular to the slope will be graded into the slope to slow overland flows and retain water.

- In the southern end of the site, WSDOT will excavate portions of Wetland K1 to widen the lowest areas of the site. This larger depression, combined with the raised culvert elevation at Beach Drive, will create areas of longer-term inundation at the site.

- WSDOT will also grade to extend the lower elevation areas of Wetland K3 farther north and east. This grading will establish new depressional wetland area alongside the existing wetland.

- WSDOT will provide minimal grading in enhancement areas. This grading will consist of the removal of minor high spots and creation of microtopographic variation.

Final grading plans are included in Appendix E. As more complete hydrologic data become available, this information will be used to further advance the grading plans for PS&E for the site.

5.3.12. Planting Design

The plant communities proposed for the wetland establishment, rehabilitation, and enhancement areas at the Magnuson Park Mitigation Site are anticipated to include emergent, scrub-shrub, and forested wetland areas.

Emergent plantings will be located in the interior areas of the depressions created in the wetland establishment and wetland rehabilitation areas shown in Appendix E. The plantings will consist of seed or plugs of emergent species adapted to saturation and shallow inundation, and the species selected are also consistent with the planting list used for adjoining mitigation in Magnuson Park. Emergent plants will be grouped by species, and intermixed at the edges of the groups to provide a diffuse edge. Table 20 shows the plant list for this habitat type.

Scrub-shrub plantings will be located along the margins of the depressions, and are intended to provide a gradual transition into the taller, woody habitat in the forest planting. The plants selected for this planting palette (Table 20) include species that will provide dense cover and good sources of food for wildlife, while being adapted to relatively broad hydrologic conditions. These plants will be installed in groups by species, and interspersed on the edges of the groups.

The forested plantings will include canopy and sub-canopy species. The canopy species include both fast-growing and slow-growing species, as well as both deciduous and coniferous species. The shrub understory planting is similar to the scrub-shrub habitat planting. Woody plantings will be grouped by species, and the groupings will be intermixed at the edges to provide a diffuse edge. Forested planting areas are shown in Appendix E, and the proposed plant list is shown on Table 20.

Additional modifications to the selected species may be made as additional site design information (particularly hydrology data) becomes available.

Table 20. Proposed Typical Planting List for Wetland Areas at Magnuson Park

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Emergent Planting				
Common spikerush	*Eleocharis palustris*	OBL	Seed or Plug	1’
Giant burreed	*Sparganium eurycarpum*	OBL	Seed or Plug	1’
Hardstem bulrush	*Schoenoplectus acutus*	OBL	Seed or Plug	1’
Hare sedge	*Carex leporina*	FACW	Seed or Plug	1’
Ovoid spikerush	*Eleocharis obtusa*	OBL	Seed or Plug	1’
Reed mannagrass	*Glyceria grandis*	OBL	Seed or Plug	1’
Sawbeak sedge	*Carex stipata*	OBL	Seed or Plug	1’
Small fruited bulrush	*Scirpus microcarpus*	OBL	Seed or Plug	1’
Slough sedge	*Carex obnupta*	OBL	Seed or Plug	1’
Tapertip rush	*Juncus acuminatus*	OBL	Seed or Plug	1’
Wool-grass	*Scirpus cyperinus*	OBL	Seed or Plug	1’
Scrub-shrub Wetland Planting				
Black hawthorn	*Crataegus douglasii*	FAC	#1 Container	4’
Black twinberry	*Lonicera involucrata*	FAC+	#1 Container	4’
Nootka rose	*Rosa nutkana*	FAC	#1 Container	4’
Pacific ninebark	*Physocarpus capitatus*	FACW-	#1 Container	4’
Peafruit rose	*Rosa pisocarpa*	FAC	#1 Container	4’
Red-osier dogwood	*Cornus sericea*	FACW+	#1 Container	4’
Salmonberry	*Rubus spectabilis*	FAC+	#1 Container	4’
Sitka willow	*Salix sitchensis*	FACW	#1 Container	4’

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Forested Wetland Planting				
Trees				
Black cottonwood	*Populus balsamifera ssp.*	FAC	4’, Bare Root	10’-12’
Oregon ash	*Fraxinus latifolia*	FACW	4’, Bare Root	10’-12’
Pacific crabapple	*Malus fusca*	FACW	4’, Bare Root	10’-12’
Pacific willow	*Salix lucida var. lasiandra*	FACW+	4’, Bare Root	10’-12’
Red alder	*Alnus rubra*	FAC	4’, Bare Root	10’-12’
Sitka spruce	*Picea sitchensis*	FAC	4’, Bare Root	10’-12’
Western red cedar	*Thuja plicata*	FAC	4’, Bare Root	10’-12’
Shrubs				
Black twinberry	*Lonicera involucrata*	FAC+	#1 Container	4’
Nootka rose	*Rosa nutkana*	FAC	#1 Container	4’
Pacific ninebark	*Physocarpus capitatus*	FACW-	#1 Container	4’
Peafruit rose	*Rosa pisocarpa*	FAC	#1 Container	4’
Red-osier dogwood	*Cornus sericea*	FACW+	#1 Container	4’
Salmonberry	*Rubus spectabilis*	FAC+	#1 Container	4’

5.3.13. Habitat Features

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

- Downed logs
- Standing snags
- Bat boxes
- Brush piles

Quantities and placement of habitat features will be determined as the grading plan is established and the design is further developed.

5.3.14. Buffers and Uplands

Buffer plantings at the Magnuson Park will be largely composed of mixed upland forest species. Final planting plans are included in Appendix E, and a typical species list is shown in Table 21. The list includes canopy communities (consisting of both deciduous and coniferous tree species) and sub-canopy communities (consisting of deciduous species tolerant to a broad variety of light availability). The species selected for the upland and buffer plantings are generally adapted to drier conditions. These plantings will be used in those areas where appropriate hydrology is present. In areas where the regulatory buffer includes jurisdictional wetland, the wetland plant list shown in Table 20 may be used instead. Planting densities for the upland and buffer areas will be similar to those shown for the adjoining wetland areas.

Table 21. Proposed Typical Planting List for Upland Buffer Areas at Magnuson Park

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Upland Forested				
Trees				
Big leaf maple	*Acer macrophyllum*	FACU	4', Bare Root	10'-12'
Black cottonwood	*Populus balsamifera ssp. trichocarpa*	FAC	4', Bare Root	10'-12'
Bitter cherry	*Prunus emarginata*	FACU	4', Bare Root	10'-12'
Cascara	*Rhamnus purshiana*	FAC-	4', Bare Root	10'-12'
Douglas-fir	*Pseudotsuga menziesii*	FACU	4', Bare Root	10'-12'
Garry oak	*Quercus garryana*	NL	4', Bare Root	10'-12'
Grand fir	*Abies grandis*	FACU-	4', Bare Root	10'-12'
Pacific yew	*Taxus brevifolia*	NL	4', Bare Root	10'-12'
Red alder	*Alnus rubra*	FAC	4', Bare Root	10'-12'
Western Hemlock	*Tsuga heterophylla*	FACU-	4', Bare Root	10'-12'
Western red cedar	*Thuja plicata*	FAC	4', Bare Root	10'-12'
Shrubs				
Baldhip rose	*Rosa gymnocarpa*	FACU	#1 Container	4'
Beaked hazelnut	*Corylus cornuta*	FACU	#1 Container	4'
Common snowberry	*Symphoricarpos albus*	FACU	#1 Container	4'
Oceanspray	*Holodiscus discolor*	NL	#1 Container	4'
Red elderberry	*Sambucus racemosa*	FACU	#1 Container	4'
Redflower currant	*Ribes sanguineum*	FACU	#1 Container	4'
Serviceberry	*Amelanchier alnifolia*	FACU	#1 Container	4'
Tall Oregon grape	*Mahonia repens*	NL	#1 Container	4'
Thimbleberry	*Rubus parviflorus*	FAC-	#1 Container	4'
Vine maple	*Acer circinatum*	FAC-	#1 Container	4'

5.3.15. Site Protection

Trails and plantings at the site will be located in a manner that limits human intrusion into the mitigation site, while still allowing for viewing points. Magnuson Park is protected as a City Park. WSDOT will work with the city and regulatory agencies as needed to establish appropriate long-term protective measures that will protect the wetland functions established at the site, and to develop a long-term management plan for the site. The plan will address such elements as: documentation of any trash accumulation; identification of any condition that impairs or threatens the ongoing ecological functioning of the site; and representative photos from points that show the relative condition of the site. Ownership of the site will be retained by Seattle Parks and Recreation.

5.3.16. Implementation Schedule

A complete implementation schedule for this mitigation has not yet been developed. However, the following studies and benchmarks are anticipated as part of the design process:

- Wetland delineation (2011 – Completed)
- Topographic Site Survey (2011 – Completed)
- Characterization of reference wetland
- Soil studies
- Shallow groundwater monitoring (early 2012)
- Permit applications
- Permit approval
- Preliminary design of the mitigation at the Magnuson Park Mitigation Site will be provided by WSDOT.
- Final design of the mitigation at the Magnuson Park Mitigation Site will be provided by Seattle Parks, and is expected to begin in mid-2012 and proceed through the third quarter of 2013.
- Construction of the mitigation at the Magnuson Park Mitigation Site will be provided by Seattle Parks, and is expected to begin in early 2014 and to be completed at the end of 2015.
- Mitigation monitoring and initial maintenance at the Magnuson Park site will be completed by WSDOT or its designated agent.

Long-term management of the Magnuson Park Site will be provided by the Seattle Parks Department. A more comprehensive implementation schedule will be developed as the project design advances.

5.3.17. Ecological Benefits

Wetland Functions

The proposed mitigation at the Magnuson Park Mitigation Site is expected to substantially improve wetland functions at this location. Functional attributes of the mitigation wetlands that will be increased, compared to the existing impacted wetlands, are listed below. A summary is provided in Table 22.

Improved Functional Attributes

- Increased flood storage volume and retention times.
- Increased water quality treatment because of increased retention times, soil organic content, and improved soil infiltration in the layers replaced or treated.
- Soils more conducive to native plant growth, invertebrate and small mammal use.
- Increased number of habitat types, interspersion, plant species richness and complexity (by adding seven native tree species and eight native shrub species through interspersed areas of forested, scrub-shrub, and emergent vegetation shown in planting plans.
- Lengthened hydroperiods, resulting in increasing habitat types and providing wildlife water source throughout the year.
- Non-native plant species removed and replaced with native plant species favoring native wildlife.
- Improved habitat connectivity within the park.

New Functional Attributes

- Additional wetland area adding functions
- Areas of permanent and seasonal inundation
- New habitat features

Table 22. Existing and Proposed Wetland Functions at the Magnuson Park Mitigation Site

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Water Quality			
Sediment removal	Access road and parking areas to east provide a source of sediments and pollutants.	Establish new wetland with depressions, multiple vegetation types. Create depressions in enhancement and rehabilitation areas. Add trees, shrubs, and emergent plants to existing wetlands.	Increased sediment and pollutant removal in 4.67 acres of new slope/depressional wetland. Activities in enhancement/rehabilitation area will improve sediment and pollutant retention in 5.09 acres of wetland.
Phosphorous removal			
Nitrogen removal			
Metal and toxic organic removal			
Pathogen removal	Existing depressional wetland may retain water long enough to decrease pathogens.	Establish new depressional wetland habitat. Create new depression in existing wetlands.	Increase area of potential pathogen removal by 4.67 acres. Increase residence time in existing wetland, 5.09 acres.
Hydrologic			
Peak flow reduction	Not performed. Landscape position limits opportunity for this function.	Create additional depressional habitat that can retain water.	Increased potential for peak flow reduction for 9.76 acres (established and existing wetland); however, the landscape position does not provide opportunity for this function.
Erosion reduction	Not performed. Landscape position limits opportunity for this function.		No change.
Groundwater recharge	Not performed. Impermeable strata limit potential for this function.		No change.

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Habitat			
Structural complexity	The mitigation site includes a mixture of disturbed wetland and uplands. Wetland areas include multiple habitat types (emergent, scrub-shrub and forested), but in discrete blocks. Wetland and upland include substantial quantities of non-native/invasive species. A paved trail crosses part of the mitigation site.	Connect existing habitats with new wetland area. Increase interspersion by creating forested and scrub-shrub habitats with pockets of emergent vegetation. Retain desirable vegetation where possible. Increase native species by removing invasive species and replanting with native species. Add created habitat features.	Increased structural complexity over 4.67 acres of established wetland. Enhance wetland by connecting existing habitats and adding additional species and habitats with complex edges, 5.09 acres. Controlling invasive and planting native species increases complexity of habitat. Habitat features add more habitat niches.
Abundant food sources	Existing wetlands include forested, scrub-shrub, and emergent habitats that provide a variety of food sources. Invasive species are common throughout the site.	Establish forest and scrub-shrub wetland habitat. Use native species that provide a variety of food sources. Control invasive species.	Established forested and scrub-shrub wetland areas create additional foraging habitat – 4.67 acres. Improve quality of forage in 5.09 acres of existing wetlands by removing invasive species and planting more native species.
Connectivity to other natural resources	Existing habitat is fragmented by access roads and trails.	Establish new wetland area to connect existing wetlands. Move existing paved trail to north. Enhance existing wetland to improve forage and cover in corridor.	Established wetland, 4.67 acres of new wetland habitat. Creates connection from area north of tennis courts to Magnuson Park Phase II mitigation, increases size of contiguous habitat by 5.09 acres. Moving paved trails reduces human and domestic animal disturbance in the habitat.
Moist and moderate microclimate	Existing wetlands provide moist, moderate microclimate.	Establish new wetland area.	Provides 4.67 acres of new moist, moderate microclimate.

Functional Lift

The Magnuson Park Mitigation Site provides a unique opportunity for wetland mitigation due to its location and history as wetland, military base, and publicly owned park space. Since, the mitigation opportunities present at Magnuson Park occupy only a portion of the wetlands involved, WSDOT has provided a description of functional lift based on Sheldon et al. (2005).

Water Quality Functions

The Magnuson Park Mitigation Site includes several wetlands, uplands, trails, a parking lot, and an access road/driveway. Seattle Parks and Recreation has successfully completed wetland mitigation on portions of the park to the east of the WSDOT mitigation site. Magnuson Park is a heavily used site due to its location in the City of Seattle and the size and quality of the facility. As a result, the paved trails and tennis courts to the north of the site are extensively used, as is the access road and parking to the east. Runoff from portions of these paved areas enters the many of the wetlands (K1/K2, K3, K4, H1/H4 and J1) on the mitigation site. These wetlands have the capacity to trap sediments and retain them, along with pollutants bound to these sediments. The mitigation will remove the tennis court area and approximately 500 feet of pollutant-generating paved trail, and create 4.67 acres of depressional and slope wetland that can retain these pollutants. Enhancement/rehabilitation activities are expected to increase residence time, improving the pollution retention capacity of these wetlands. Pathogen removal is also a function of long-term water retention, and should be improved over the same areas.

Hydrologic Functions

Due to the landscape position of the wetland at the Magnuson Park Mitigation Site, these wetlands do not have the capacity to reduce peak flows or reduce erosion. The impermeable layer beneath most of the wetlands on the site precludes performance of groundwater recharge functions. Although the creation of depressions and planting of dense vegetation increase the potential of wetlands on the site to provide hydrologic functions, the landscape position and underlying soils limit the opportunity to perform these functions. As a result, the proposed mitigation activities at the Magnuson Park Mitigation Site are not expected to result in a change to hydrologic functions.

Habitat Functions

Wetlands at the Magnuson Park Mitigation Site provide forested, shrub, and emergent habitat with the potential to provide structural complexity. However, the complexity of the site is limited by the limited interspersion of habitat types, and the presence of invasive species. The proposed mitigation will excavate depressions in both the establishment and enhancement/rehabilitation areas to increase the diversity of inundation regimes at the site. Grading and planting activities will also add more forested and scrub-shrub habitat and increase interspersion of habitat types at the site. Invasive species will also be controlled at the site, improving the quality of the habitat. These proposed changes will result in greater structural complexity in 5.09 acres of existing wetland, and in 4.67 acres of new wetland with structural complexity.

The wetlands at Magnuson Park provide a mixture of wetland vegetation types and plant species that provide a variety of primary and secondary food sources. The addition of 4.67 acres of woody plant cover will increase the diversity of foraging types at the site, and the wetland enhancement/rehabilitation activities will increase the quality of foraging habitat by decreasing invasive species and improving the native plant diversity in 5.09 acres of existing wetlands.

The Magnuson Park Mitigation Site includes a variety of habitats that form a relatively large refuge in the developed urban area of Seattle. The wetland and uplands are also connected to Lake Washington, although the connection is disturbed. Moving the existing paved trail will increase the size of contiguous habitat on the site, connecting the area north of the tennis courts to Magnuson Park Phase II mitigation, an increase of 4.67 acres. The enhanced wetland buffers will also reduce human and domestic animal disturbance in this contiguous habitat.

The wetland communities at Magnuson Park support a moist, moderate microclimate. Enhancement of 5.09 acres of existing wetland would continue to support this function, and the establishment of new forested and scrub-shrub wetlands would extend this function to an additional 4.67 acres.

Buffer Functions

Buffers for the site have been designed in accordance with City of Seattle requirements to provide adequate protection for the wetland functions at the mitigation sites. The following benefits are expected to occur:

- 110-foot standard buffer along roads and paved trails.
- Increased buffer planting density and vertical structure to improve screening of created wetland from ongoing park activities.
- Control of invasive species.
- Improved upland and edge habitat function through planting with appropriate native trees and shrubs.

5.4 Elliott Bridge Reach Mitigation Site

The Elliott Bridge Reach Mitigation Site will provide floodplain wetland and aquatic habitat mitigation for the SR 520, I-5 to Medina Project. Details of the aquatic habitat mitigation can be found in the *Final Aquatic Mitigation Plan SR 520, I-5 to Medina: Bridge Replacement and HOV Project* (WSDOT 2011a).

5.4.1. Site Location

The Elliott Bridge Reach Mitigation Site is located along the Cedar River, between SR 169 (on the south) and SE Jones Place (on the north), and west of 154th Place SE. The site is currently owned by King County, and is composed of 20 parcels in the northwest 1/4 and southwest 1/4 of Township 23 North, Range 5 East, within the City of Renton, Washington.

5.4.2. Landscape Perspective

Landscape Position

The Elliott Bridge Reach Mitigation Site is located in the riparian zone and historic floodplain of the Cedar River at River Mile 5. The Cedar River drainage is within WRIA 8, the Lake Washington-Cedar/Sammamish Watershed.

5.4.3. Ecological Connectivity

The Elliott Bridge Reach Mitigation Site consists of currently and formerly developed residential parcels with publicly-owned open space both up and downstream. Mitigation at this location will establish riparian wetlands and rearing habitat for salmonids, provide additional floodplain capacity, enhance riparian vegetation and riparian buffer functions, and connect currently fragmented habitats to the east at Cavanaugh Pond Natural Area to habitats at Ron Regis Park and Maplewood Golf Course to the west of the site. Overall, the mitigation at Elliott Bridge Reach fits into a larger series of projects in the floodplains of the Cedar River planned by King County. As a result, the mitigation at the Elliott Bridge Reach site, while relatively small, will provide functions that are part of a larger riparian improvement program.

Nearby Restoration and Mitigation Activities

One existing mitigation site is located nearby. This mitigation site is located immediately to the east of the Elliott Bridge Reach Site, and was constructed by King County as apart of the mitigation for the bridge at 154th Place SE (which replaces the historic bridge at 149th Avenue SE). The King County mitigation includes wetland creation and stream mouth enhancement to the east of the Elliott Bridge Reach Site, and upland restoration on the abandoned 149th Avenue SE embankment to the west of the Elliott Bridge Reach site. These areas are excluded from WSDOT's mitigation at the Elliott Bridge Reach Site, but their presence will contribute to overall wetland and floodplain function in this area. Additional mitigation projects are located on the Cedar River, but outside the immediate project vicinity.

5.4.4. Historic and Current Land Use

The Elliott Bridge Reach Mitigation Site consists of a series of residential parcels along the north side of the Cedar River on the eastern side of Renton. The area was homesteaded in the 1870s (Slauson 1971). By the early 1900s the areas had transitioned to dairy farming. Transportation improvements (Maple Valley Highway and local railroad access) supported future development in the area (Slauson 1971), and the Elliott Bridge (which carried 149th Street over the Cedar River) was constructed in the early part of the 1910s. Training levees were installed to control flooding and channel migration of the Cedar River.

The site remained in agricultural use at least into the mid 1930s (King County IMAP aerial: http://www.kingcounty.gov/operations/gis/Maps/iMAP.aspx).

The golf course located downstream of Ron Regis Park was originally developed in 1927 as the Cedar River Golf Club. The name was changed to Maplewood Golf Club in the 1940s, and the City of Renton acquired the course in 1985. The agricultural parcels were subdivided into smaller residential lots and developed in the 1950s (King County IMAP Assessor's Data Report, http://www.kingcounty.gov/operations/gis/Maps/iMAP.aspx).

The Elliott Bridge was removed in 2005, and replaced with a new structure upstream of the site, that carries 154th Place SE over the Cedar River. Parcels in the Elliott Bridge Reach site have remained in residential use until purchased by King County in the mid 2000s as part of the Levee Setback program. Structures have been removed from four of the purchased parcels.

5.4.5. Rationale for Site Selection

The Elliott Bridge Reach site was added to the mitigation plan based on the mitigation needs of the project and input from stakeholders and regulatory agencies.

5.4.6. Mitigation Site Existing Conditions

The following sections provide a summary of the existing conditions at the proposed wetland mitigation sites.

Uplands

The Elliott Bridge Reach site is located on the broad floodplain of the Cedar River. At the site, two training dikes retain the Cedar River in its current location. The majority of the site is 5 to 7 feet above the Cedar River.

Vegetation at the Elliott Bridge Reach site is typical of developed residential areas. Trees have been retained on the site or planted to provide shade, and include native species (e.g., red alder, black cottonwood, Douglas-fir, Sitka spruce [*Picea sitchensis*], western red cedar, and western white pine [*Pinus monticola*]) and ornamental and fruiting species (e.g. *Prunus* and *Malus* sp.). Much of the site is open, and the dominant species present are landscape grasses (*Agrostis* sp., *Lolium* sp.) and disturbance-tolerant forbs (cat's ear [*Hypocharis radicata*], clover (*Trifolium* sp.), common mullein [*Verbascum thapsus*], creeping buttercup, plantains [*Plantago* sp.], and thistles [*Cirsium* sp.]). Invasive species (Himalayan blackberry, Japanese knotweed, and reed canarygrass) are common in the areas adjacent to the dike.

Wetlands and Streams

The following section provides a description of wetland conditions at the Elliott Bridge Reach Mitigation Site. Wetland functions at the mitigation site were evaluated using Hruby (2004) and Sheldon et al. (2005). Detailed information on the wetland delineation is provided in the *Draft Wetland and Stream Assessment Report for Union Bay Natural Area, Magnuson Park, and Elliott Bridge Reach Mitigation Sites* (WSDOT 2011c). Additional discussion of wetland function at the Elliott Bridge Reach Mitigation Site is provided in Section 5.5.17.

One small area of wetland vegetation was identified near the Elliott Bridge Reach site (Figure 9). The area is a small (~ 0.03 acre) , and is located on the slope of the north side training levee of the Cedar River, and within the river's ordinary high water mark. The wetland is within the active channel of the river, and is considered part of the Cedar River.

Vegetation in this area is dominated by small-flowered bullrush (*Scirpus microcarpus)*, with smaller amounts of creeping bentgrass (*Agrostis stolonifera*), Canada thistle, and soft rush. Other species present include white clover (*Trifolium repens*), lance leaf plantain (*Plantago lanceolata*), and curly dock (*Rumex crispus*). Daggerleaf rush (*Juncus ensifolius*), spikerush (*Eleocharis* sp.), tapertip rush (*Juncus acuminatus*), toad rush (*Juncus bufonius*), and Japanese knotweed are also present in limited quantities in some areas along the waterline. The surrounding vegetation is dominated by domestic grasses and disturbance-tolerant forbs (creeping bentgrass, Kentucky bluegrass [*Poa pratensis*], tansy [*Tanacetum vulgare*], and lance leaf plantain [*Plantago lanceolata*]). Additional date for this area can be found in the *Draft Wetland and Stream Assessment Report for Union Bay Natural Area, Magnuson Park, and Elliott Bridge Reach Mitigation Sites* (WSDOT 2011c).

Unnamed Stream 1 is a small stream on the north side of the Cedar River that drains the steep slope that extends northward to SE 145th Place in the Renton Highlands. Within the project vicinity, Unnamed Stream 1 flows along a driveway and agricultural field to the north of Jones Road and crosses under Jones Road in a 12-inch corrugated metal pipe culvert near the old 149th Street intersection. From this point, Unnamed Stream 1 flows southward along the old 149th Street road prism, entering the Cedar River at the old 149th Street Bridge footing.

North of Jones Road, Unnamed Stream 1 is confined to a narrow, linear ditch with mowed lawn and cultivated land to the west, and mowed lawn and a residential driveway to the east. Width of the ditch has not been surveyed, but appears to be approximately 6 feet, based on observations from the Jones Road right-of-way. South of Jones Road, Unnamed Stream 1 flows along the north/west side of the abandoned 149th Street road embankment, is approximately 3 to 8 feet wide at the top of bank, and has a silt and sand substrate. Vegetation in this area consists of naturally revegetated shrubs on the restored road embankment, and mowed residential yards with a mixture of mature evergreen and coniferous shade trees on the west. Flows were observed in October, indicating that this stream is likely perennial.

A summary of the Elliott Bridge Reach's existing vegetation is provided in Table 23.

Wildlife Habitat and Use

Wildlife species observed at the Elliott Bridge Reach site include great blue heron and mallard. Beaver presence was indicated by foraging signs and a possible den site on the north bank of the stream. Where homes have been removed and along the river, the habitat is also a suitable travel corridor for white-tail deer and black bear. Other species likely to be present include waterfowl and songbirds similar to those described at the Union Bay sites (See Section 5.1.6 and 5.2.6), and disturbance-tolerant mammals similar to those noted for the other mitigation sites.

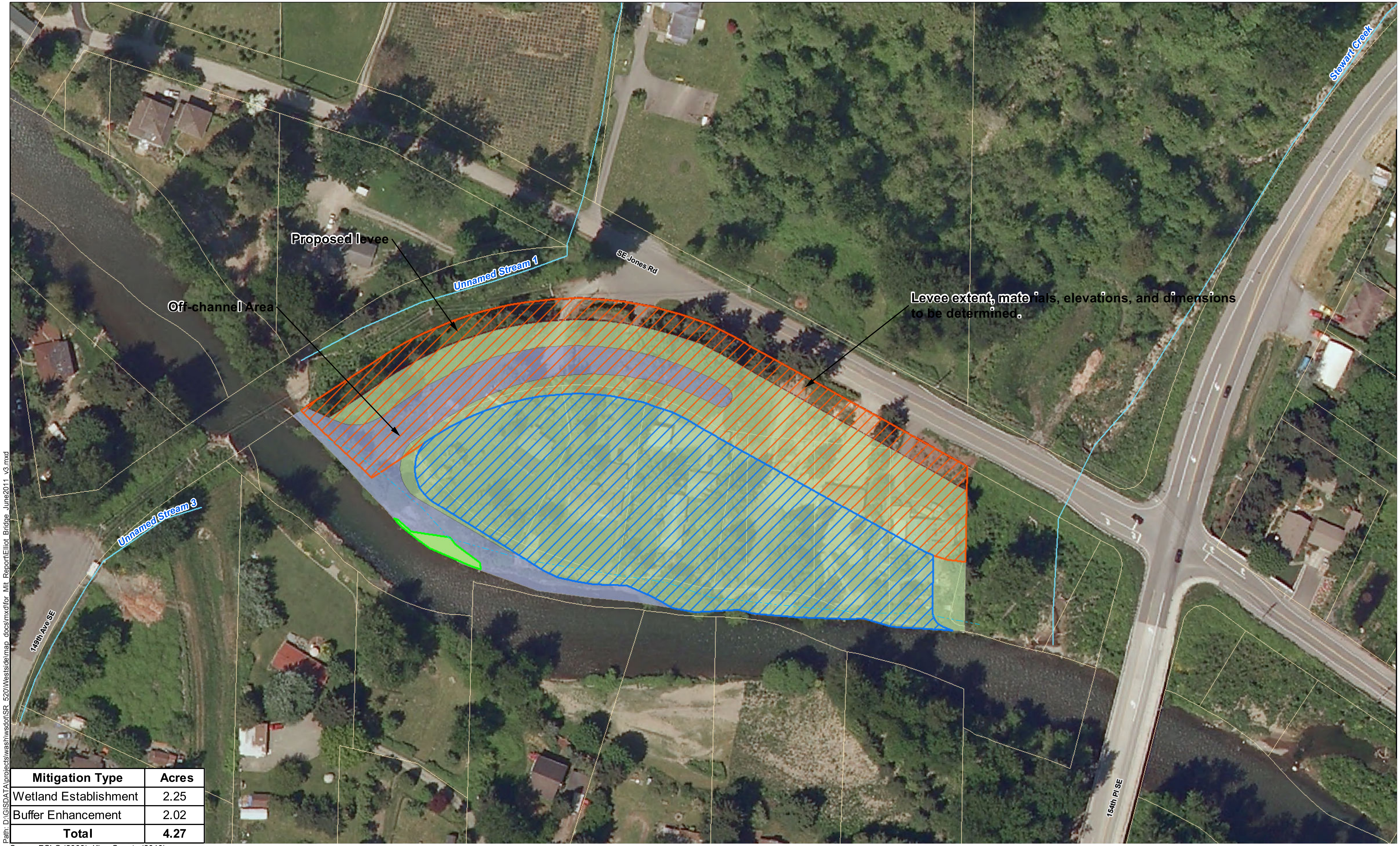
Detailed information on habitat type and potential usage will be provided in the *Draft Wetland and Stream Assessment Report for Union Bay Natural Area, Magnuson Park, and Elliott Bridge Reach Mitigation Sites* (WSDOT 2011c). Additional detail regarding fish use at the site is provided in the *Final Aquatic Mitigation Plan for the I-5 to Medina: Bridge Replacement and HOV Project* (WSDOT 2010a).

Table 23. Elliott Bridge Reach Mitigation Site Summary

<table>
<tr><th>Location</th><th colspan="2">Banks of the Cedar River near 154th Place SE in Renton</th></tr>
<tr><td rowspan="10">
Elliott Bridge Reach Mitigation Site, Parcel 2323059142 facing north.

Open area in Parcel 2323059141 facing north.</td><td>Local Jurisdiction</td><td>King County</td></tr>
<tr><td>WRIA</td><td>WRIA 8</td></tr>
<tr><td>Ecology Rating (Hruby 2004)</td><td>n/a</td></tr>
<tr><td>King County Rating</td><td>n/a</td></tr>
<tr><td>King County Buffer Width</td><td>n/a</td></tr>
<tr><td>Wetland Size</td><td>0.03 (within OHWM)</td></tr>
<tr><td>Cowardin Classification</td><td>within OHWM</td></tr>
<tr><td>HGM Classification</td><td>Riverine</td></tr>
<tr><td colspan="2">Wetland Rating System Pts.</td></tr>
<tr><td>Water Quality Score
Hydrologic Score
Habitat Score
Total Score</td><td>n/a
n/a
n/a
n/a</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">Vegetation in the wetland area inside the OHWM is dominated by small-flowered bullrush (Scirpus microcarpus), with smaller amounts of creeping bentgrass (Agrostis stolonifera) Canada thistle, soft rush. Other species present include white clover (, lance leaf plantain, and curly dock. Japanese knotweed is also present in some areas.</td></tr>
<tr><td>Soils</td><td colspan="2">Newberg silt loam, Puyallup fine sandy loam. Observed soils consist of low chroma color sandy loam, consistent with the mapped soils for the area. The observed soils satisfy the depleted matrix (F3) and redox dark surface (F6) indicators, and so meet the hydric soils criterion.</td></tr>
<tr><td>Hydrology</td><td colspan="2">Flows from the Cedar River likely serve as the source of hydrology for Wetland A. Saturation was present at 12 inches below the surface, which meets the wetland hydrology criterion.</td></tr>
</table>

Location	Banks of the Cedar River near 154th Place SE in Renton
Rationale for Local Rating	Wetland areas identified on the site are below the OHWM and were not rated.
Functions of Entire Wetland	Wetland areas identified on the site are below the OHWM
Buffer Condition	Mixed grasses and landscape plants. Surrounding areas are residential yards that have been vacated and have had the structures removed.



Mitigation Type	Acres
Wetland Establishment	2.25
Buffer Enhancement	2.02
Total	**4.27**

Souce: PSLC (2000); King County (2010)

N

0 50 100 200 300 Feet

Legend
- Levee Setback
- Riparian and Floodplain Restoration
- Proposed Stream Channel
- Wetland Establishment
- Wetland Buffer Enhancement
- Wetland (Delineated in May/June 2011)
- Parcel
- Ordinary High Water Mark
- Stream

Figure 9
Elliott Bridge Reach Mitigation Concept

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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5.4.7. Mitigation Site Design

At this site, WSDOT proposes to establish 2.25 acres of forested and scrub-shrub wetland and to enhance 2.02 acres of forested riparian buffer in floodplain of the Cedar River. The Elliott Bridge Reach Mitigation Site is also part of the aquatic mitigation plan (WSDOT 2011a), and will be designed to meet both aquatic and wetland mitigation needs.

Specific construction activities may include setback of the existing levees, excavation to construct a blind channel on the north side of the Cedar River, excavation/grading/contouring to establish a surface consistent with wetland hydrology, replanting native wetland and upland plant species, and control of non-native species on the site. Wetland would be established within the proposed levee setback area (created active floodplain zone), and the remaining areas of the site would be revegetated with appropriate forested upland vegetation. Due to dynamic nature of the Cedar River floodplain, it is expected that the Elliott Bridge Reach Mitigation Site may experience significant change in substrate or vegetation during the monitoring period. Change of this type is consistent with the nature of existing wetland in this system, and is consistent with the overall intent of the design. Figure 9 illustrates the mitigation concept for the site.

5.4.8. Site Constraints

Constraints that may limit design or construction of the site are listed below:

- The site is located on the bank of the Cedar River, and will be subject to river stage hydrology and floodplain dynamics. The restoration must fit in this context.
- The mitigation plan must be forward-compatible and fit in the context of the larger floodplain restoration effort planned by King County.
- Adjoining land uses to the north and west require adequate buffering.
- Substantial excavation will be required to achieve appropriate wetland hydrology.
- Soil substrate may require amendment to create a suitable growing medium.
- In-water work windows may shorten work period at this location.

5.4.9. Site Hydrology

Wetland hydrology at the Elliott Bridge Reach site would be primarily determined by water levels in the Cedar River. Groundwater seepage from the slope to the north currently supports wetland and small streams in the vicinity of the site; this groundwater seepage may provide supplemental hydrology for the site, and could serve to extend the wetland hydroperiod.

Stream Flow

Stream flow data for the Cedar River has not been collected. A more detailed hydraulic analysis of the Cedar River will be performed during the PS&E phase. WSDOT is preparing a plan for the collection of additional stream date at the site, and will continue to coordinate with the regulatory agencies as the plan evolves.

Groundwater

Groundwater information for the mitigation sites is not yet available. WSDOT is preparing a groundwater well installation plan for the Elliott Bridge Reach Mitigation Site. Data from that groundwater monitoring and other information related to hydrology will be incorporated into final site design (PS&E) as it becomes available.

5.4.10. Invasive Species

Reed canarygrass, Japanese knotweed, and Himalayan blackberry are the dominant invasive species present at the Elliott Bridge Reach Mitigation Site. The presence of these species likely reflects the past agricultural and residential use of the site. Invasive species control strategies for the Elliott Bridge Reach Mitigation Site will be discussed under Site Management (Section 7.3).

5.4.11. Grading Design

Topographic site survey has been completed and detailed topographic information is provided in Appendix E. Wetland elevations and excavation descriptions presented in this report are based on this site survey. As more complete hydrologic data becomes available, this information will be incorporated into PS&E for the site.

The proposed design for the Elliott Bridge Reach site will include: demolition and removal of the remaining structures, driveways and roads; removal of existing levees; construction of replacement setback levees; and excavation of new channels and floodplain wetlands. Final grading plans are included in Appendix E. WSDOT will excavate the surface of the site within the setback levee to more closely approach the elevations of the Cedar River, providing a consistent source of wetland hydrology. The wetland elevations were established based on the topographic site survey and the ordinary high water mark for the site (recorded with handheld GPS), and wetland elevations are presumed to extend approximately 1-foot above the OHWM elevation. Elevations were also cross checked with the project plans for the adjoining King County mitigation. Additional survey work was done in the Cedar River, and this information was used to revise the side channel elevations. The depth of excavation on the site is expected to vary from 4 feet deep on the existing levee, to up to 8 feet deep in the interior of the site and in created side channel. WSDOT does not propose excavation on the south side of the Cedar River.

The internal portions of the site will be excavated first. The off-channel connection to the Cedar River will be created after vegetation has been established on the site, and within the established work windows for salmon. Work areas will be isolated and erosion control measures will be installed prior to the "final phase" of removing the levee and making the off-channel connection.

The mitigation design for the Elliott Bridge Reach Mitigation Site may incorporate additional minor grading activities such as lowering high spots and creating micro-topographic variations. Final grades will be established consistent with wetland hydrology requirements for the established wetlands and the proposed channel, and may be adjusted for desired habitats based on more detailed hydrologic data.

5.4.12. Planting Design

Proposed plantings for the wetland establishment areas at the Elliott Bridge Reach Mitigation Site include streamside plantings, shrub-shrub plantings, and riparian forested plantings (see Appendix E for plans). A list of typical plants species and community composition for these zones are presented in Table 24. Note that the composition of the planting zones shown in this plan may be revised in the PS&E for the site.

Canopy species identified in the proposed planting palette include both fast-growing and slow-growing species, as well as both deciduous and coniferous species. These species will be located in the higher elevation areas in the interior of the wetland establishment area and along the upper slopes on the northern edge of the site. The scrub-shrub plantings will occupy the areas between the forested zones and the streamside zones. 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 included in the streamside palette include fast-growing woody species in live stake form to protect the shoreline and native emergent species common in these areas. These live-staked woody species will also be suitable for the waterward edges of the established wetland. Additional modifications to the selected species may be made as additional site design information (particularly hydrology data) becomes available.

Table 24. Proposed Typical Planting List for Wetland Areas at the Elliott Bridge Mitigation Site

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Water's Edge Planting				
Live Stakes				
Scouler's willow	*Salix scouleriana*	FAC	Live Stake	1'
Sitka willow	*Salix sitchensis*	FACW	Live Stake	1'
Scrub-shrub Wetland Planting				
Black twinberry	*Lonicera involucrata*	FAC+	#1 Container	4'
Peafruit rose	*Rosa pisocarpa*	FAC	#1 Container	4'
Salmonberry*	*Rubus spectabilis*	FAC+	#1 Container	4'
Red-osier dogwood	*Cornus sericea*	FACW+	#1 Container	4'
Pacific ninebark	*Physocarpus capitatus*	FACW-	#1 Container	4'
Scouler's willow	*Salix scouleriana*	FAC	#1 Container	4'
Sitka willow	*Salix sitchensis*	FACW	#1 Container	4'
Emergents				
Sawbeak sedge	*Carex stipata*	OBL	Plug	2'
Slough sedge	*Carex obnupta*	OBL	Plug	2'
Creeping spikerush	*Eleocharis palustris*	OBL	Plug	2'
Fowl mannagrass	*Glyceria elata*	FACW+	Plug	2'
Tapertip rush	*Juncus acuminatus*	OBL	Plug	2'
Baltic rush	*Juncus balticus*	FACW+	Plug	2'
Daggerleaf rush	*Juncus ensifolius*	FACW	Plug	2'
Skunk cabbage	*Lysichiton americanum*	OBL	Plug	2'
Wooly sedge	*Scirpus cyperinus*	OBL	Plug	1'
Small fruited bulrush	*Scirpus microcarpus*	OBL	Plug	2'
Hardstem bulrush	*Schoenoplectus acutus*	OBL	Plug	2'
Forested Riparian Wetland Planting				
Trees				
Red alder	*Alnus rubra*	FAC	4', Bare Root	10'-12'
Oregon ash	*Fraxinus latifolia*	FACW	4', Bare Root	10'-12'
Sitka spruce*	*Picea sitchensis*	FAC	4', Bare Root	10'-12'
Black cottonwood	*Populus balsamifera ssp.*	FAC	4', Bare Root	10'-12'
Pacific willow	*Salix lucida var. lasiandra*	FACW+	4', Bare Root	10'-12'
Western red cedar	*Thuja plicata*	FAC	4', Bare Root	10'-12'

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Shrubs				
Red-osier dogwood	*Cornus sericea*	FACW+	#1 Container	4’
Black twinberry	*Lonicera involucrata*	FAC+	#1 Container	4’
Nootka rose	*Rosa nutkana*	FAC	#1 Container	4’
Salmonberry	*Rubus spectabilis*	FAC+	#1 Container	4’
Emergents				
Skunk cabbage	*Lysichiton americanum*	OBL	Plug	2’
Water parsley	*Oenanthe sarmentosa*	OBL	Plug	2’

* Species to be planted in shaded areas or as secondary planting into established canopy.

5.4.13. Habitat Features

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

- Downed logs
- Standing snags
- Bat boxes
- Brush piles

Quantities and placement of habitat features will be determined as the design is developed.

5.4.14. Buffers and Uplands

Buffer plantings at the Elliott Bridge Reach will be largely composed of mixed upland forest species (see Appendix E for plans). A typical species list is shown in Table 25. The list includes canopy communities (consisting of both deciduous and coniferous tree species) and sub-canopy communities (consisting of deciduous species tolerant to a broad variety of light availability). Planting densities will be higher than similar wetland areas to reduce intrusion and provide additional screening for the resources. Note that in areas where wetland hydrology will extend into the regulatory buffer, the wetland planting palette may be substituted.

Table 25. Proposed Typical Planting List for Upland Buffer Areas at the Elliott Bridge Reach Mitigation Site

Common Name	Scientific Name	Indicator Status	Size and Condition	Plant Spacing (in feet on center)
Upland Forested				
Trees				
Big leaf maple	*Acer macrophyllum*	FACU	4’, Bare Root	10’-12’
Red alder	*Alnus rubra*	FAC	4’, Bare Root	10’-12’
Black cottonwood	*Populus balsamifera ssp. trichocarpa*	FAC	4’, Bare Root	10’-12’
Bitter cherry	*Prunus emarginata*	FACU	4’, Bare Root	10’-12’
Douglas-fir	*Pseudotsuga menziesii*	FACU	4’, Bare Root	10’-12’
Cascara*	*Rhamnus purshiana*	FAC-	4’, Bare Root	10’-12’
Western red cedar*	*Thuja plicata*	FAC	4’, Bare Root	10’-12’
Shrubs				
Black hawthorn	*Crataegus douglasii*	FAC	#1 Container	4’
Vine maple*	*Acer circinatum*	FAC-	#1 Container	4’
Serviceberry	*Amelanchier alnifolia*	FACU	#1 Container	4’
Salal	*Gaultheria shallon*	FACU	#1 Container	4’
Beaked hazelnut*	*Corylus cornuta*	FACU	#1 Container	4’
Oceanspray	*Holodiscus discolor*	NL	#1 Container	4’
Oregon Grape	*Mahonia nervosa*	FACU	#1 Container	4’
Indian plum*	*Oemleria cerasiformis*	FACU	#1 Container	4’
Baldhip rose	*Rosa gymnocarpa*	FACU	#1 Container	4’
Nootka rose	*Rosa nutkana*	FAC	#1 Container	4’
Thimbleberry	*Rubus parviflorus*	FAC-	#1 Container	4’
Red Elderberry	*Sambucus racemosa*	FACU	#1 Container	4’
Common snowberry	*Symphoricarpos albus*	FACU	#1 Container	4’

* Species to be planted in shaded areas or as secondary planting into established canopy.

5.4.15. Site Protection

WSDOT, in conjunction with King County, will provide long-term protective measures for the Elliott Bridge Reach Mitigation Site, such as deed restrictions, conservation easements, or Native Growth Protection Easements. Mitigation areas will also be fenced (if necessary and appropriate) and appropriate signage will be installed.

A long-term management plan will be developed for the Elliott Bridge Reach Mitigation Site. The plan will address such elements as: general condition of any fencing and signage; documentation of any trash accumulation; identification of any condition that impairs or threatens the ongoing ecological functioning of the site; and representative photos from points that show the relative condition of the site. Ownership of the site will be retained by King County.

5.4.16. Implementation Schedule

A complete implementation schedule for the Elliott Bridge Reach Mitigation Site has not yet been developed. Additional studies and benchmarks to be completed are expected to be similar to those listed in Section 5.1.16.

- Wetland Delineation (2011 - Complete).
- Topographic Site Survey (2011 – Completed).
- Characterization of reference wetland.
- Final design of the mitigation at the Elliott Bridge Reach Mitigation Site will be provided by WSDOT, and is expected to begin in mid-2012 proceed through the last quarter of 2013.
- Construction of the mitigation at the Elliott Bridge Reach Mitigation Site will be provided by WSDOT, and is expected to begin in early 20142012 and to be completed at the end of 2015.
- Mitigation monitoring and initial maintenance at the Elliott Bridge Reach site will be complete by WSDOT or their designated agent.

Long-term management of the Elliott Bridge Reach site will be provided by the King County Department of Development and Environmental Services.

5.4.17. Ecological Benefits

Wetland Functions

WSDOT proposes the following mitigation activities for the Elliott Bridge Reach Mitigation Site:

- Establishment of 2.25 acres of wetland

- Enhancement of 2.02 acres of wetland buffer

The proposed mitigation at the Elliott Bridge Reach 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. A summary is provided in Table 26.

Improved Functional Attributes:

- Reduced prevalence of invasive species
- Increased plant diversity by replanting with six native tree species and seven native shrub species
- Increased vertical and horizontal habitat complexity by creating new, interspersed forested and scrub-shrub wetland areas as shown in planting plans
- Additional habitat features

New Functional Attributes:

- Additional functional floodplain and floodplain wetland
- Natural side channel configuration
- Side channel habitat for salmonids and other fish species
- Corridors of riparian habitat to shade new side channel
- A new source for natural LWD recruitment
- Shading provided that assists in maintaining low water temperatures desirable for fish habitat

Table 26. Existing and Proposed Wetland Functions at the Elliott Bridge Reach Mitigation Site

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
Water Quality			
Sediment removal	Small area of wetland vegetation located on the levee slope provides minimal removal of sediment and pollutants.	Remove levee and fill to restore floodplain capacity. Create backwater channel. Plant dense woody vegetation to slow flows and capture sediments.	Established wetland will restore 2.25 acres of floodplain capacity. Dense woody vegetation will reduce water velocities. Woody stems and root mass will retain sediments and associated pollutants.
Phosphorous removal			
Nitrogen removal			
Metal and toxic organic removal			
Pathogen removal	Existing wetland does not provide this function.		No change.
Hydrologic			
Peak flow reduction	Small wetland provides less than 0.1 acre of peak flow reduction.	Lower levee, remove 3-6 feet of fill to restore floodplains. Densely plant with woody plant species.	Lowered floodplain wetland will provide peak flow reduction by providing storage for 2.25 acres of floodplain 3-6 feet deep. Dense woody vegetation will slow water and assist in peak flow attenuation over 2.25 acres.
Erosion reduction	Existing levee has limited vegetation to reduce erosion.	Plant dense woody vegetation with emergent understory.	Dense vegetation will reduce erosion over 2.25 acres of established wetland.
Groundwater recharge	Not known to be provided by this wetland.		No change.
Habitat			
Structural complexity	The site currently is composed of abandoned residential yards with a small emergent wetland on the levee.	Regrade to create multiple hydrologic layers including permanently inundated side channel, seasonally/occasionally inundated and saturated floodplain wetland, and riparian/wetland buffer. Plant three vegetation communities: scrub-shrub and forested wetlands and forested upland	Established wetland will create multiple hydrologic periods and multiple interspersed vegetation strata, creating structurally complex habitat over 2.25 acres. Forested buffer will provide improved upland habitat and additional interspersion.

Characteristic	Existing Conditions	Proposed Conditions	Change in Function
		buffer. Intersperse communities to create complex edges.	
Abundant food sources	Landscape trees, domestic grasses, and disturbance-tolerant herbaceous species provide limited and low quality food sources.	Plant multiple vegetation types. Include plant species that provide a variety of food sources.	Established wetland will create more abundant food sources over 2.25 acres. Food sources will consist of native species.
Connectivity to other natural resources	Disturbed residential lots provide minimal connection and are subject to disturbance.	Create a wide connection between downstream and upstream habitats. Add dense woody species to provide cover and forage. Buffer the wetland and the Cedar River from adjacent residential and agricultural uses.	Established wetland will provide a wide connection extending over 2.25 acres. Dense woody vegetation will provide cover for wildlife and foraging opportunities over 2.25 acres. 110-foot-wide buffer zone will screen the wetland and the Cedar River from adjacent land uses, 2.02 acres. These 2.2 acres will include a constructed side channel as well as a forested riparian zone.
Moist and moderate microclimate	Existing conditions provide moist, moderate microclimate over a small portion of the site, less than 0.1 acre.	Establish wetland to provide moist habitat. Establish dense vegetative cover to provide cover and moderate temperatures.	Establish moist moderate microclimate over 2.25 acres of new area.

Functional Lift

The Elliott Bridge Reach Mitigation Site provides an opportunity for wetland mitigation that addresses deficiencies identified in the watershed plans for WRIA 8, such as loss of floodplain area and volume; loss of riparian vegetation; and loss of water quality improvement functions such as sediment reduction and shading to reduce water temperature. The methods used to describe functional lift are the same as those described for the WSDOT-Owned Peninsula Mitigation Site.

It is important to understand that the mitigation proposed at the Elliott Bridge Reach Mitigation Site is one component of series of floodplain and habitat restoration efforts being undertaken by King County along the lower Cedar River. As such, the Elliott Bridge Reach site functions as part of the larger whole, connecting habitats up and downstream of the site and providing localized functions that are part of a larger overall improvement in riparian function.

Water Quality Functions

No terrestrial wetlands were identified at the Elliott Bridge Reach Mitigation Site. A small area of wetland vegetation was identified on the levee slope and within the ordinary high water mark that likely performs wetland functions in the manner of riverine class wetland. Riverine wetlands can trap sediments and retain and stabilize them between flood events (Sheldon et al. 2005). Performance of sediment and pollutant trapping and retention by the wetland vegetation within the OHW at Elliott Bridge Reach are severely limited due to its small size. The proposed wetland establishment will create 2.25 acres of palustrine wetland with dense woody and emergent vegetation. This large new area of dense wetland vegetation will have the capacity to trap and retain sediments and pollutants between bank-cutting flood events. Pathogen removal is largely a function of long-term water retention. This function may be enhanced by the established wetlands, but is not expected to be a significant component of the function performed at the site.

Hydrologic Functions

In riverine wetlands of western Washington, the major characteristic judged to reduce peak flows is the storage provided by overbank areas. The presence of a wide surface with an elevation at or near that of the riverbank is the most important factor in reducing peak flows (Sheldon et al. 2005). The existing Elliott Bridge Reach Mitigation Site is within the training levee constructed to retain and redirect the flows of the Cedar River, and does not provide capacity for peak flow reduction. Establishment of wetland and floodplain restoration at the Elliott Bridge Reach will provide a significant improvement in overbank storage capacity (3–6 feet of capacity over the 2.25 acres of wetland) and additional capacity will be provided within the buffer.

In riverine wetlands of 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). The Elliott Bridge Reach performs minimal reduction of erosion due to the presence of the training levee and limited presence of woody vegetation on the levee. The established wetland and restored floodplains will provide dense woody and herbaceous vegetation that can slow flows and reduce erosion over 2.25 acres of wetland and 2.02 acres of riparian buffer and channel, a substantial increase in this function.

Groundwater recharge occurs only in a subset of depressional wetlands and some riverine wetlands that impound and hold surface water (Sheldon et al. 2005). These functions are not currently performed at the Elliott Bridge Reach Mitigation Site. Wetlands established at the Elliott Bridge Reach Mitigation Site will be situated within the historic floodplain of the Cedar River. Considering the alluvial deposits in the vicinity of the river and the design of the wetlands, which will not include depressions that could trap fish, the establishment of new wetlands at this site is not likely to affect groundwater recharge.

Habitat Functions

Vegetation at the Elliott Bridge Reach Mitigation Site is dominated by residential landscaping and does not provide substantial structural complexity. The proposed mitigation will include planting to create interspersed forested and scrub-shrub habitats and grading to create a side channel for the Cedar River and topographic variation in the wetlands. These design elements will increase the vertical and horizontal structure of the habitats diversity of inundation regimes at the site. These proposed changes will result in greater structural complexity over 2.25 acres of new wetland, and additional structural complexity in the side channel and riparian/wetland buffer.

The residential landscaping currently present at the Elliott Bridge Reach Mitigation Site does not provide significant primary or secondary food sources for wildlife. The addition of 2.25 acres of intersperses woody plant cover will provide new foraging opportunities on the site, and the proposed side channel for the Cedar River will provide an outlet that allows export of these food sources downstream.

The Elliott Bridge Reach currently consists of a mixture of razed home sites and open lawn, and landscape trees and shrubs. Although the residences have been removed from the sites, the lack of cover and absence of foraging opportunities make this connection less desirable for wildlife. The proposed mitigation at the Elliott Bridge Reach Mitigation Site includes dense scrub-shrub and forest vegetation that will provide 2.25 acres of cover suitable for use as a wildlife corridor. The proposed buffer will reduce disturbance in the wetland area and will also provide cover and utility as a wildlife corridor. The proposed side channel may prove an obstacle to some small wildlife species; however, its location is typical of the habitats naturally present in this landscape.

The residential landscaping that dominates the current plant community at the Elliott Bridge Reach Mitigation Site does not support a moist, moderate microclimate. The forest and scrub-shrub wetland would provide an additional 2.25 acres of moist, moderate habitat at the Elliott Bridge Reach Mitigation Site.

Habitat elements specifically related to aquatic species are discussed in detail in the *SR-520, I-5 to Medina: Bridge Replacement and HOV Project Final Aquatic Mitigation Plan* (WSDOT 2011a).

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 mitigation sites. The proposed buffers for the Elliott Bridge Reach Mitigation Site will be a minimum of 110 feet wide, and are expected to provide the following:

- Improved screening of wetlands from off-site activities.
- Control of invasive species.
- Improved habitat function over existing disturbed conditions by planting with appropriate native trees and shrubs to provide additional forage and cover.
- Improved connectivity between habitats upstream and downstream of the site along the Cedar River.

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Chapter 6. Mitigation Goals, Objectives, and Performance Standards

WSDOT uses goals and objectives to guide mitigation design and construction. Goals describe the overall intent of a mitigation project, and objectives describe individual components of the mitigation plan designed to achieve the goals. Performance standards are quantitative targets that indicate whether or not the mitigation site is on-track toward achieving an objective, a goal, or a regulatory permit requirement.

6.1 Wetland Mitigation Sites

6.1.1. Goals

Mitigation at the four mitigation sites will provide the following compensatory mitigation elements:

- Establish 9.21 acres of palustrine forested, scrub-shrub and emergent wetland.
- Re-establish 2.59 acres of palustrine scrub-shrub wetland.
- Rehabilitate 2.44 acres of palustrine emergent wetland.
- Enhance 14.39 acres of existing lacustrine and palustrine wetland.
- Enhance 30.24 acres of mixed wetland and shoreline buffer.
- Enhance 0.58 acre of wetlands by removing existing ramp structures.

6.1.2. Objectives

WSDOT-Owned Peninsula Mitigation Site

PENINSULA 1: Re-establish 2.59 acres of palustrine wetland at the WSDOT-Owned Peninsula Mitigation Site.

- Re-establish wetland by restoring natural elevations in this area.
- Improve hydrologic and water quality functions by adding vegetative roughness within the re-established wetlands.
- Improve complexity of wetland wildlife habitat by increasing the number of native plant species present.

- Improve wildlife habitat value by adding constructed habitat features such as snags, downed logs, and brush piles.

PENINSULA 2: Enhance 2.35 acres of palustrine wetlands at the WSDOT-Owned Peninsula Mitigation Site.

- Add diversity to existing wetland wildlife habitat by establishing native plant species not present in the existing native wetland plant communities
- Increase structural complexity of wetlands by adding additional shrub sub-canopy species to existing forested wetland.
- Improve wildlife habitat value by adding constructed habitat.

PENINSULA 3: Enhance 4.10 acres of wetland and shoreline buffers at the WSDOT-Owned Peninsula Mitigation Site.

- Screen wetland from nearby human activities.
- Improve adjacent upland habitat by increasing native plant diversity and establishing additional woody vegetation.
- Improve wildlife habitat value by adding constructed habitat.
- Reduce fragmentation of existing wetlands and improve connectivity between them by removing existing ramps.

UBNA Mitigation Site

UBNA 1: Establish 2.29 acres of wetlands at the UBNA Mitigation Site.

- Establish wetlands by removing or grading upland fill.
- Improve hydrologic and water quality functions by establishing persistent emergent and woody vegetation to provide surface roughness within the established wetlands.
- Improve complexity of wetland wildlife habitat by adding 2.29 acres of native wetland forest and increasing the number of native plant species present.
- Improve wildlife habitat value by adding constructed habitat features such as snags, downed logs, and brush piles.

UBNA 2: Enhance 7.49 acres of wetland and complete enhancement at 1.90 acres of wetland at the UBNA Mitigation Site.

- Add diversity to existing wetland wildlife habitat by establishing native plant species not present in the existing native wetland plant communities
- Increase structural complexity of wetlands by adding additional forested habitat and increasing number of native species in emergent wetlands.
- Improve wildlife habitat value by adding constructed habitat features.

UBNA 3: Enhance 14.02 acres of wetland buffers at the UBNA Mitigation Site.

- Screen wetland from nearby human activities.
- Improve adjacent upland habitat by adding native emergent and woody plant species.

Magnuson Park Mitigation Site

MAGNUSON 1: Establish 4.67 acres of wetlands at the Magnuson Park Mitigation Site.

- Establish wetlands by excavating fill material and shaping basins to retain surface flows.
- Established wetland may include some areas of upland that do not meet all three wetland criteria. We expect these areas will be primarily wetland, but may have some mosaic characteristics.
- Improve hydrologic and water quality functions by adding vegetative roughness within the re-established wetlands.
- Add interspersed native forest, scrub-shrub, and emergent wetland to create new wildlife habitat areas.
- Increase plant diversity by increasing the number of native species in the established wetland.
- Improve wildlife habitat value by adding constructed habitat features such as snags, downed logs, and brush piles.

MAGNUSON 2: Rehabilitate 2.44 acres of wetlands at the Magnuson Park Mitigation Site.

- Modify hydrology by excavating fill material and shaping slopes and basins to retain surface flows.

- Improve hydrologic and water quality functions by adding vegetative roughness within the re-established wetlands.
- Improve complexity of wetland wildlife habitat by adding forest and scrub-shrub areas to existing emergent wetland community.
- Increase plant diversity by increasing the number of native species in the re-habilitated wetland.
- Improve wildlife habitat value by adding constructed habitat features such as snags, downed logs, and brush piles.
- Rehabilitated wetland may include some areas of upland that do not meet all three wetland criteria. We expect these areas will be primarily wetland, but may have some mosaic characteristics.

MAGNUSON 3: Enhance 2.65 acres of existing wetlands at the Magnuson Park Mitigation Site.

- Add diversity to existing wetland wildlife habitat by adding forested and scrub-shrub areas, removing invasive species, and establishing native plant species not present in the existing native wetland plant communities.
- Increase structural complexity of wetlands by adding interspersed, scrub/shrub and forested areas.
- Improve wildlife habitat value by adding constructed habitat features such as snags, downed logs, and brush piles.
- Enhanced wetland may include some areas of upland that do not meet all three wetland criteria. This is consistent with the existing wetlands on the site. We expect these areas will be primarily wetland, but may have some mosaic characteristics.

MAGNUSON 4: Enhance 10.10 acres of wetland buffers at the Magnuson Park Mitigation Site.

- Screen wetlands from nearby human activities.
- Add native emergent and woody wetland plant species.
- Improve wildlife habitat value by adding constructed habitat features such as snags, downed logs, and brush piles.

Elliott Bridge Reach Mitigation Site

ELLIOTT 1: Establish 2.25 acres of dynamic floodplains and wetlands at the Elliott Bridge Reach Mitigation Site.

- Establish additional wetlands by removing upland soil.
- Provide hydrologic functions by creating a side channel connected to the Cedar River. This will increase the area to receive flood waters, which will assist in decreasing peak flows and downstream flooding.
- Improve hydrologic and water quality functions by replacing rock levees with vegetation and creating new, vegetated wetlands.
- Provide wetland wildlife habitat by establishing new forested and scrub-shrub wetland areas with a diverse native wetland plant community.
- Provide wildlife habitat features (e.g., snags, downed logs, and brush piles) to improve the quality of the constructed habitat.
- Due to the frequent flooding on the Cedar River and the dynamic nature of its floodplain, the wetland area may experience some active deposition. As a result, the established wetland may include some areas of upland that do not meet all three wetland criteria. This is consistent with the nature of dynamic floodplain/riparian floodplain wetlands.

ELLIOTT 2: Enhance 2.02 acres of riparian buffers at the Elliott Bridge Reach Mitigation Site.

- Screen established wetlands from nearby human activities.
- Improve upland wildlife habitat adjacent to a wetland by converting formerly developed residential yards into a forested riparian buffer community.
- Improve wildlife habitat value by adding constructed habitat features such as snags, downed logs, and brush piles.

6.1.3. Performance Standards

The performance standards described below provide benchmarks for measuring the 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) and *Wetlands in Washington State, Volume I: A Synthesis of the Science*, (Ecology

Publication # 05-06-006). These performance standards measure structural attributes that serve as indicators of wetland functions. Methods to monitor each performance standard are described in general terms.

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 ensure that the wetlands are saturated or inundated at sufficient frequency and duration to support the prevalence of wetland vegetation. These hydrologic performance standards directly relate to Objectives PENINSULA 1, UBNA 1, MAGNUSON 1, MAGNUSON 2, and ELLIOTT 1.

Performance Standard

Year 1

As-built condition documented in as-built report submitted to agencies is consistent with the proposed grading plans or revisions approved by regulatory agencies.

Years 1, 3, 5, and 7

In normal years, within the intended wetland area, the area will be inundated or soils will be saturated to within 12 inches of the soil surface for at least 30 consecutive days during the growing season in years when rainfall meets normal precipitation conditions[1,2].

Year 10

Wetlands at the mitigation sites will be delineated using the delineation methods that are approved at the time of the monitoring.

- The WSDOT-Owned Peninsula Mitigation Site will contain at least 2.59 acres of re-established wetlands.
- The Union Bay Natural Area Mitigation Site will contain at least 2.29 acres of newly established wetlands.

[1] Years with normal conditions as related to precipitation are referenced in *The Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Corps 2010).
[2] Methods for determining the normal range of precipitation are described in *Technical Standard for Water-Table Monitoring of Potential Wetland Sites*, ERDC TN-WRAP-05-02 (http://el.erdc.usace.army.mil/wrap/pdf/tnwrap05-2.pdf).

- The Magnuson Park Mitigation Site will contain at least 4.67 acres of established palustrine wetlands.
- The Magnuson Park Mitigation Site will contain at least 2.44 acres of rehabilitated palustrine wetlands.
- The established and rehabilitated wetland at Magnuson Park may include areas of upland within the wetland boundary. This wetland/upland mosaic is consistent with the seasonally saturated depressional wetlands currently present on the site.
- The Elliott Bridge Reach Mitigation Site will contain at least 2.25 acres of dynamic floodplains and wetlands.

Wetland Vegetation

The performance standards for wetland vegetation document the establishment of wetland plant communities. Native wetland vegetation (facultative and wetter species), both planted and volunteer, will be counted to achieve the density performance standard. Native species colonizing portions of the site will be included in the cover. The performance standards listed below relate to wetland establishment and re-establishment Objectives PENINSULA 1, UBNA 1, MAGNUSON 1, and ELLIOTT 1, wetland rehabilitation Objective MAGNUSON 2, and wetland enhancement Objectives PENINSULA 2, UBNA 2 and MAGNUSON 3. Note that emergent habitat performance standards apply only to UBNA and Magnuson Park.

Performance Standard

Year 1

Forested and scrub-shrub habitats: Native wetland woody species will achieve an average density of at least four plants per 100 square feet in the wetland.

Emergent habitats: Cover of native, wetland emergent vegetation will provide at least 30 percent cover in the wetland.

Year 3

Forested and scrub-shrub habitats: Native wetland woody species will achieve an average density of at least four plants per 100 square feet in the wetland.

Forested and scrub-shrub habitats: Native wetland woody species will be evaluated for percent cover. Cover will be reported.

Emergent habitats: Cover of native, wetland emergent vegetation will provide at least 50 percent cover in the wetland.

Year 5

Forested and scrub-shrub habitats: Cover of native, wetland woody species will provide at least 35 percent cover in the wetland.

Emergent habitats: Cover of native, wetland emergent vegetation will provide at least 75 percent cover in the wetland.

Year 7

Forested and scrub-shrub habitats: Cover of native, wetland woody species will provide at least 50 percent cover in the wetland.

Emergent habitats: Cover of native, wetland emergent vegetation will provide at least 90 percent cover in the wetland.

Year 10

Forested and Scrub-shrub habitats: Cover of native, wetland woody species will provide at least 70 percent cover in the wetland.

Emergent habitats: Cover of native, wetland emergent vegetation will provide at least 90 percent cover in the wetland.

Species Diversity Performance

The performance standards for species diversity document the increase in native plant species in the established, re-established, rehabilitated, and enhanced wetland communities. Native wetland vegetation (facultative and wetter species), both planted and volunteer, will be counted to achieve the species diversity performance standard. The performance standards listed below relate to wetland establishment and re-establishment Objectives PENINSULA 1, UBNA 1, MAGNUSON 1, and ELLIOTT 1, wetland rehabilitation Objective MAGNUSON 2, and wetland enhancement Objectives PENINSULA 2, UBNA 2, and MAGNUSON 3.

Performance Standard

Year 0

All wetland habitats: Count the number of native plant species within the wetland habitats prior to construction.

Year 1

All wetland habitats: The number of native plant species within the wetland habitats will be greater than in Year 0.

Year 3

All wetland habitats: The number of native plant species within the wetland habitats will be greater than in Year 0.

Year 10

All wetland habitats: The number of native plant species within the wetland habitats will be greater than in Year 0.

Structural Complexity Performance

The performance standards for structural complexity document the increase in Cowardin vegetation classes in the established, re-established, rehabilitated, and enhanced wetland communities. The performance standards listed below relate to wetland establishment and re-establishment Objectives PENINSULA 1, UBNA 1, MAGNUSON 1, and ELLIOTT 1, wetland rehabilitation Objective MAGNUSON 2, and wetland enhancement Objectives PENINSULA 2, UBNA 2, and MAGNUSON 3.

Performance Standard

Year 0

All wetland habitats: Identify and map all Cowardin vegetation class polygons greater than 2,500 square feet in size.

Year 1

All wetland habitats: Installed vegetation is consistent with the proposed vegetation type as identified in the wetland mitigation planting plans.

Years 3, 7, and 10

All wetland habitats: Identify and map all Cowardin vegetation class polygons greater than 2,500 square feet in size to document habitat diversity.

Wetland and Riparian Buffer Vegetation Performance

The buffer vegetation performance standards document 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.

Native upland vegetation, both planted and volunteer, will be counted to achieve the density performance standard. Native species colonizing portions of the site will be included in the cover. The vegetation performance standards for vegetation in the buffer directly relate to Buffer Enhancement Objectives PENINSULA 3, UBNA 3, MAGNUSON 4, and ELLIOTT 2.

Performance Standards

Year 1 and Year 3

Woody upland buffer: Native woody species will achieve an average density of at least four plants per 100 square feet.

Year 3

Woody upland buffer: Native woody species will be evaluated for percent cover. Cover will be reported.

Year 5

Woody upland buffer: Cover of native woody species will provide at least 30 percent in the upland buffer.

Year 7

Woody upland buffer: Cover of native woody species will provide at least 40 percent cover in the upland buffer.

Year 10

Woody upland buffer: Cover of native woody species will provide at least 50 percent cover in the upland buffer.

Habitat Connectivity Performance Standard

Existing ramps at the WSDOT-Owned Peninsula will b e removed to improve habitat connectivity. The habitat connectivity performance standard refers to Wetland Enhancement Objective Peninsula 3.

Performance Standards

Year 1

Verify removal of existing ramps via as-built drawing.

Habitat Structure Performance Standard

Wildlife structures such as snags, downed logs, and brush piles will be designed to provide immediate habitat for wildlife. The habitat structure performance standards directly relate to all objectives.

Performance Standards

Year 1

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

Noxious Weeds and Invasive Species Performance Standards

The noxious weeds and invasive species performance standards document the control of noxious weeds and invasive species that can compete with native plants and degrade habitat quality at wetland mitigation sites. The noxious weeds and invasive species performance standards directly relate to Wetland and Buffer Enhancement Objectives PENINSULA 1, 2, and 3; UBNA 1, 2, and 3; MAGNUSON 1, 2, 3, and 4; and ELLIOTT 1 and 2.

Performance Standards

All Years

Noxious Weeds Performance Standards

Washington State-listed or King County-listed Class A weeds designated for control by the County weed board must be eradicated. All occurrences shall be immediately reported to the site manager and an eradication program will be initiated within 30 days of the report.

Designated Class B or C by King County will be controlled to prevent all seed production and to prevent dispersal of propagative parts that are capable of starting new plants.

Invasive Species Performance Standards

The combined cover of non-native blackberries (*Rubus armeniacus* and *R. laciniatus*), Scotch broom (*Cytisus scoparius*), thistles (*Cirsium arvense, C. vulgare, Carduus nutans,* and *Onopordum acanthium*), purple loosestrife (*Lythrum salicaria*), yellow-flag iris (*Iris pseudacorus*), and non-native knotweeds (*Polygonum cuspidatum, P. polystachyum)* will not exceed 10 percent cover, collectively, in the restored, created, rehabilitated or enhanced wetland and buffer areas.

Reed canarygrass (*Phalaris arundinacea*) will be managed and controlled to reduce the competition with and to enhance the survival of tree and shrub plantings in all wetland mitigation areas. Reed canarygrass will not exceed 25% cover in any of the wetland mitigation areas. This standard will be assessed qualitatively each year to document compliance with this standard.

6.2 On-Site Temporary Impact Area Revegetation

6.2.1. Goals

The temporary impacts from the SR 520, I-5 to Medina Project include 3.55 acres of temporary impact to forested scrub-shrub and emergent wetlands, and 4.71 acres of aquatic bed wetlands (Table 7). The aquatic bed areas are expected to revegetate naturally and no plantings are proposed. The forested, scrub-shrub and emergent areas will be revegetated with appropriate native species as part of the project. WSDOT’s goal for these areas is as follows:

- Revegetation of temporarily-cleared forest and shrub wetland areas and temporarily-shaded emergent wetland areas with appropriate native species.

6.2.2. Objectives

On-site 1: Revegetate temporarily-disturbed areas with appropriate native species.

Replant disturbed forested and shrub areas with appropriate woody species.

Replant disturbed emergent areas with appropriate native emergent species.

6.2.3. Performance Standards

The performance standards described below provide benchmarks for measuring the progress of the goals and objectives of the mitigation site. Temporary impact revegetation areas are intended to meet these performance standards within 10 years for woody vegetation and within 1 year for emergent vegetation. The performance standards are based on function characteristics described in *Method for Assessing Wetland Functions* (Hruby et al. 1999a and 1999b) and *Wetlands in Washington State, Volume I: A Synthesis of the Science,* (Ecology Publication # 05-06-006). . These performance standards measure structural attributes that serve as indicators of wetland functions. Methods to monitor each performance standard are described in general terms.

Wetland Vegetation

The performance standards for wetland vegetation document the establishment of wetland plant communities. This standard evaluate native woody wetland(facultative and wetter) species, including regrowth from temporarily disturbed shrubs, and both planted and volunteer material, to meet plant density and cover requirements specified for years 1, 3, 5, and 10. The performance standards below relate to On-site Objective 1.

Performance Standard

Year 1

Forested and scrub-shrub habitats: Native, wetland woody species will achieve an average density of at least four plants per 100 square feet in the revegetated wetland.

Emergent habitats: Cover of native, wetland emergent vegetation will provide at least 30 percent cover.

Year 3

Forested and scrub-shrub habitats: Native, wetland woody species will achieve an average density of at least four plants per 100 square feet in the revegetated wetland.

Forested and scrub-shrub habitats: Native wetland woody species will be evaluated for percent cover. Cover will be reported.

Emergent habitats: Cover of native, wetland emergent vegetation will provide at least 60 percent cover.

Year 5

Forested and scrub-shrub habitats: Cover of native wetland woody species will provide at least 35 percent cover in the revegetated wetland.

Year 10

Forested and scrub-shrub habitats: Cover of native wetland woody species will provide at least 50-percent cover in the revegetated wetland.

Chapter 7. Monitoring, Contingency Plan, and Site Management

7.1 Monitoring

7.1.1. Wetland Mitigation Sites

WSDOT staff (or their designated representatives) will monitor the mitigation site for 10 years after installation. If all the performance standards are achieved in fewer 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 Program will also complete informal (qualitative) assessments of the mitigation site in Years 2, 4, 6, 8, and 9 for adaptive management purposes only. Quantitative monitoring will be designed to determine if the performance standards have been met.

7.1.2. On-Site Impact Areas

For on-site temporary impact areas that are being revegetated, WSDOT staff (or their designated representatives) will monitor the mitigation site for 10 years after installation in areas of woody vegetation and 1 year in areas of emergent vegetation. If all the performance standards are achieved in fewer than 10 years, WSDOT may terminate monitoring with approval of the review agencies.

Quantitative monitoring will be completed and documented 1, 3, 5 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 Program will also complete informal (qualitative) assessments of the mitigation site in Years 2 and 4 for adaptive management purposes only.

7.1.3. All Areas

WSDOT has established a comprehensive set of monitoring methods used to monitor mitigation sites. The actual methods used to monitor each site will be documented in annual monitoring reports prepared by WSDOT's Wetland Program based in the Environmental Services Office in Olympia, Washington. Monitoring reports will be submitted for review to the recipients listed in Table 27 by the month of April, following the formal monitoring activities conducted the previous year.

Table 27. Monitoring Report Recipients

Permitting Agency or Organization
U.S. Army Corps of Engineers
Washington State Department of Ecology
WDFW

Reports will be submitted to regulatory agencies for permit compliance purposes. Reports will also be posted to a WSDOT website and will be available to the public.

7.2 Adaptive Management and Contingency Measures

WSDOT uses an adaptive management process to improve mitigation success and correct site deficiencies that are observed during monitoring. Adaptive management is a process through which monitoring results may initiate changes to mitigation and maintenance activities, or monitoring protocols. Mid-course corrections may be necessary if monitoring data show the site is developing in ways that were not anticipated during design and permitting of the project. Information from ongoing monitoring further directs subsequent site management activities.

WSDOT anticipates that the mitigation goals will be accomplished with the construction and installation of the mitigation design shown on the grading and planting plans. However, contingency actions may be needed to correct unforeseen problems. Contingency measures describe what actions can be taken to correct site deficiencies. Contingency revisions typically require coordination with the permitting agencies.

The following describes potential situations that can occur and the potential contingencies that may 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.

Hydrology

Hydrologic problems that occur 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 result from altered surface water flows at mitigation sites that rely 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 when (1) a design is based on insufficient groundwater data, (2) incorrect final grade elevations are established, or (3) an unperceived soil condition alters groundwater flows.

Hydrologic contingency measures will be implemented based on observed conditions or monitoring data. Steps to address insufficient or excessive hydrology are as follows:

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

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 lack of watering in the first few growing seasons), animal browsing, 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 for the browsing will be identified and appropriate control measures will be attempted. These measures could include plant protection, fence installation, or the use of repellents. However, some pestilent and invasive wildlife species are difficult to control. Implementing precautionary measures

with design and placement will minimize unwanted species but is unlikely to eliminate them. Wildlife damage and manipulation of 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.

- Measures to minimize damage from nutria will be included in the mitigation design. Shoreline slopes will be constructed at slopes of less than 3:1 rather than steep slopes to reduce burrowing by nutria (http://wdfw.wa.gov/living/nutria.html). Shorelines will be planted with a mix of shrubs and small trees, and herbaceous vegetation will be planted in small, selected patches along the shoreline.
- If damage to mitigation plantings resulting from nutria is measurable and exceeds performance standards, WSDOT will implement one or more control methods as contingency measures. Appropriate control measures for nutria as listed by WDFW may include wire and electric fencing, embankment barriers, harassment, and lethal control. Contingency measures would be implemented in coordination with WDFW. A nutria control program has been implemented on the northern shores of Union Bay with considerable success. WSDOT would also review and use, as appropriate.
- Fencing of new plantings will be considered as an additional measure to minimize herbivory by nutria and Canada geese during the vegetation establishment period.
- 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.
- Vandalism – To prevent vegetation disturbance from vandalism, fences and sensitive area signage will be installed.

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 are vandalized, are missing, or are functionally damaged, they will be repaired or replaced as necessary.

7.3 Site Management

WSDOT (or its 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 ensure, at a minimum, the equivalent of normal rainfall levels and no periods of drought (no rainfall or watering) longer than 3 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 its designated representatives) will promptly remove the stems above ground and chemically treat it to facilitate elimination of roots and rhizomes below ground.

WSDOT will develop appropriate invasive species control strategies for the individual mitigation sites as the mitigation site designs are developed.

7.3.1. Long Term Management

Long term management plans will be developed for each mitigation site. The objective of the long term management plan is to ensure that the mitigation sites are maintained and monitored to ensure the ecological functioning of the established mitigation site is protected after the ten year period of active site management and monitoring has concluded. The long term management plans will require monitoring and reporting for a period of at least ten years. Reports will include the results of qualitative monitoring assessments and summaries of management activities implemented.

Each plan will identify specific tasks or performance standards that will be monitored during the long term monitoring period to assess different elements of the site that relate to overall site condition and ongoing ecological function at the site.

The long term management plan and associated long term monitoring plan for each site will describe site specific objectives and related tasks and performance standards used to provide information about the following elements:

- Qualitative assessment of overall site condition
- Photo documentation of representative site conditions
- Qualitative assessment of King County-listed noxious weeds
- Qualitative assessment of other specified non-native invasive weeds.
- The condition of fences
- The condition of signage
- Sources of trash or vandalism
- Maintenance implemented to correct issues identified by monitoring activities.

Drafts of the long term management plans will be submitted to USACE and Ecology for approval prior to the conclusion of the ten year monitoring period for each mitigation site.

Chapter 8. References

Alt, D. B., and D. Hyndman. 1984. Roadside Geology of Washington. Mountain Press Publishing Company, Missoula, Montana.

Bioblitz 2010. http://depts.washington.edu/natmap/bioblitz/wpa/

BOLA Architecture + Planning. 2003. Washington Park Arboretum Historic Review. September 2003. Prepared as part of the Washington Park Arboretum Master Plan. Final Environmental Impact Statement. Seattle Parks and Recreation. Seattle, WA.

Celedonia, M. 2002. Benchmarks for Stand Development of Forested and Scrub-shrub Plant Communities at Wetland Mitigation Sites in the Lowlands of Western Washington. Washington State Department of Transportation, Olympia, WA.

Cowardin, L. M., V. Carter, F. C. Golet and E. T. Laroe. 1979. Classification of Wetlands and Deep Water Habitats of the United States. U.S. Fish and Wildlife Service. FWS/OBS 79/31.

Dunn, Walter L. 1966. Reclamation of Union Bay Swamp in Seattle. The Trend in Engineering. April 1966.

Elzinga, C. L., D. W. Salzer, and J. W. Willoughby. 1998. Measuring and Monitoring Plant Populations. Bureau of Land Management Technical Reference 1730-1, BLM/RS/ST-98/005+1730.

Ewing, Kern. 2010. Union Bay Natural Are Shoreline Management Guidelines, 2010. University of Washington, School of Forest Resources. Seattle, Washington.

Federal Register. 1978. “Executive Order No. 11990 Protection of Wetlands”. Federal Register. 42 (May 24, l977). 26961.

Federal Register. 2008. “Compensatory Mitigation for Losses of Aquatic Resources; Final Rule”. Federal Register. Vol. 73, No. 70 (April 10, 2008). 19594-19705.

Franklin, J. F., and C. T. Dyrness. 1988. Natural Vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR.

Granger, T., T. Hruby, A. McMillan, D. Peters, J. Rubey, D. Sheldon, S. Stanley, and E. Stockdale. 2005. Wetlands in Washington State - Volume 2: Guidance for Protecting and Managing Wetlands. Washington State Department of Ecology. Publication #05-06-008. Olympia, WA. April 2005. State University Press, Corvallis, OR.

Guy Michaelson and Dyanne Sheldon. 2011. Personal communication with Pat Togher and Ken Sargent. Meeting at Berger Partnership February 8, 2011.

Hruby, T., K. Harper, and S. Stanley (2009). Selecting Wetland Mitigation Sites Using a Watershed Approach. Washington State Department of Ecology Publication #09-06-032.

Hruby, T. 2008. Focus on: Using the Wetland Rating System in Compensatory Mitigation. Shorelands and Environmental Assistance Focus Sheet, March 2008 Publication Number: 08-06-009. Washington State Department of Ecology. http://www.ecy.wa.gov/pubs/0806009.pdf

Hruby, T. 2004. Washington State Wetland Rating System for Western Washington – Revised. Washington State Department of Ecology Publication # 04-06-15. http://www.ecy.wa.gov/pubs/0406025.pdf.

Hruby, T., T. Granger, K. Brunner, S. Cooke, K. Dublancia, R. Gersib, L. Reinelt, K. Richter, D. Sheldon, E. Teachout, A. Wald, and F. Weinmann. July 1999a. Methods for Assessing Wetland Functions Volume 1: Riverine and Depressional Wetlands in the Lowlands of Western Washington. Washington State Department of Ecology Publication #99-115.

Hruby, T., T. Granger, K., and E. Teachout. July 1999b. Methods for Assessing Wetland Functions Volume 1: Riverine and Depressional Wetlands in the Lowlands of Western Washington. Part 2: Procedures for Collecting Data. Washington State Department of Ecology Publication #99-116.

Huang, Chih-Lin and del Moral, Roger. 1988. Plant-environment relationships on the Montlake wildlife area, Seattle, Washington, USA. Plant Ecology Volume 75, Numbers 1-2, 103-113, DOI: 10.1007/BF00044632

King County. 2005. The Final Lake Washington and Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan Vol. II. July, 2005. http://www.govlink.org/watersheds/8/planning/chinook-conservation-plan.aspx

King County. 2007. Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Near Term Action Agenda for Salmon Habitat Conservation . http://www.govlink.org/watersheds/8/reports/near-term-action-agenda.aspx

Kerwin, J. 2001. Salmon and Steelhead Habitat Limiting Factors Report for the CEDAR – SAMMAMISH BASIN (Water Resource Inventory Area 8). Washington Conservation Commission. Olympia, WA. http://www.scc.wa.gov/index.php/174-Salmon-Habitat-Limiting-Factors-Reports/View-category/Page-6.html.

Meyer, Jeff, PWS. 2010. Personal Communication with Caroline Cororan, Washington State Department of Ecology. October 7, 2010.

Montlake Landfill Work Group 1999. Montlake Landfill Information Summary.

NMFS (National Marine Fisheries Service). 2008. Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Operation and Maintenance of the Lake Washington Ship Canal located in the City of Seattle, King County, Washington. 6th Field HUC 171100120301 – Lower Sammamish River, 171100120302 - Cedar River, and 171100190401 - Shell Creek.

Otak. 2007. Final Wetland Compensation Plan for Magnuson Park Phase 2 Development. Prepared for Seattle Parks and Recreation. December 2007. Dyanne Sheldon and Doug Gresham, authors. http://www.cityofseattle.net/parks/proparks/projects/Magnuson2007FinalCompensation.pdf

Otak. 2010. 2009 Year 0/ As-Built Monitoring Report for Magnuson Park Phase 2 Development. January 29, 2010.

Reinhardt, C. and S. M. Galatowitsch. 2004. Best Management Practices for the Invasive Phalaris arundinacea L. (reed canary grass) in Wetland Restorations. Minnesota Department of Transportation, St. Paul, MN. [Final Report, May 2004] http://www.fws.gov/shorebirdplan/downloads/ReedCanaryGrassReport2004.pdf

WDFW. 2007. Puget Sound Nearshore Project Priorities: Assessing Consistency between Local and Regional Strategies of the Puget Sound Salmon Recovery Plan. Eds. Rosenkotter, B., Peters, K., Osterman, D., Myers, D., Nelson, A., Vigue, L., Mitchell, T., Tyler, M., and Cascadia Consulting Group, Inc.

Saldi-Caromile, K., K. Bates, P. Skidmore, J. Barenti, D. Pineo. 2004. Stream Habitat Restoration Guidelines: Final Draft. Co-published by the Washington Departments of Fish and Wildlife and Ecology and the U.S. Fish and Wildlife Service. Olympia, Washington. http://wdfw.wa.gov/hab/ahg/shrg/

Seattle Parks and Recreation. 2001. Washington Park Arboretum Master Plan Final Environmental Impact Statement. Seattle, WA.

Seattle Parks. 2011. Warren G Magnuson Park History Website. http://www.seattle.gov/parks/Magnuson/timeline/WW2.htm. Accessed February 2011.

Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, T. Granger, S. Stanley, and E. Stockdale. 2005. Wetlands in Washington State - Volume 1: A Synthesis of the Science. Washington State Department of Ecology. Publication #05-06-006. Olympia, WA. [March 2005] http://www.ecy.wa.gov/pubs/0506006.pdf.

Sheldon and Associates. 2005 Magnuson Park Wetland Delineation Report. August 2005. http://www.cityofseattle.net/parks/proparks/projects/MagnusonWetlandReport8-16-05.pdf

Slauson, Morda C. 1971. One Hundred Years Along the Cedar River. Reprint edition (1995). Maple Valley Historical Society. Maple Valley, WA.

Snyder, D. E., P.S. Gale, and R.F. Russell. 1973. Soil Survey of King County Area, Washington. Soil Conservation Service, in cooperation with Washington Agricultural Experimental Station. U.S. Government Printing Office, Washington D.C.

United States Department of Transportation (USDOT). 1978. DOT Order 5660.1a PRESERVATION OF THE NATION'S WETLANDS. http://nepa.fhwa.dot.gov/ReNEPA/ReNepa.nsf/docs/6749292D98E3C0CD85256FE400731ADF?opendocument&Group=Natural%20Environment&tab=REFERENCE

Washington State Department of Ecology (Ecology), U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. 2006a. Wetland Mitigation in Washington State – Part 1: Agency Policies and Guidance (Version 1). Washington State Department of Ecology Publication #06-06-011a. Olympia, WA. [March 2006] http://www.ecy.wa.gov/pubs/0606011a.pdf.

Washington State Department of Ecology (Ecology), U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. 2006b. Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1). Washington State Department of Ecology Publication #06-06-011b. Olympia, WA. [March 2006] http://www.ecy.wa.gov/pubs/0606011b.pdf.

Washington State Department of Transportation (WSDOT). 2007. Wetland Guidelines. Washington State Department of Transportation, Environmental Affairs Office. Olympia, WA. http://www.wsdot.wa.gov/Environment/Biology/Wetlands/guidelines.htm.

Washington State Department of Transportation (WSDOT). 2008. Wetland and Buffer Impact Assessment Guidance (updated April 16, 2008). WSDOT Environmental Services. Olympia, WA. www.wsdot.wa.gov/NR/rdonlyres/D0FE60A8-A193-4615-A68427E66CFBFB61/0/WetMitBuffImpAssess.pdf.

Washington State Department of Transportation (WSDOT). 2009a. I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft EIS Ecosystems Discipline Report. Prepared for the WSDOT Environmental Services Office. Seattle, WA.

Washington State Department of Transportation (WSDOT). 2009b. I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft EIS Final Wetland Vegetation Response to Shade Special Study. Prepared for the WSDOT Environmental Services Office. Seattle, WA.

Washington State Department of Transportation (WSDOT). 2009c. I SR 520, I-5 to Medina: Bridge Replacement and HOV Project Initial Wetland Mitigation Report. Prepared for the WSDOT Environmental Services Office. Seattle, WA.

Washington State Department of Transportation (WSDOT). 2010a. I-5 to Medina: Bridge Replacement and HOV Project Draft Aquatic Mitigation Plan. Prepared for the WSDOT Environmental Services Office. Seattle, WA.

Washington State Department of Transportation (WSDOT). 2010b. Bridge Replacement and HOV Project Supplemental Draft EIS Wetland Assessment Technical Memorandum Prepared for the WSDOT Environmental Services Office. Seattle, WA.

Washington State Department of Transportation (WSDOT). 2010c. Wetland Guidelines. Washington State Department of Transportation, Environmental Affairs Office. Olympia, WA. http://www.wsdot.wa.gov/Environment/Biology/Wetlands/guidelines.htm.

Washington State Department of Transportation (WSDOT). 2010d. I-5 to Medina: Bridge Replacement and HOV Project Final Environmental Impact Statement and Final Section 4(f) and 6(f) Evaluation Ecosystems Discipline Report Addendum and Errata. Prepared for the WSDOT Environmental Services Office. Seattle, WA.

Washington State Department of Transportation (WSDOT). 2011a. Final Aquatic Mitigation Plan SR 520, I-5 to Medina: Bridge Replacement and HOV Project. Prepared for the WSDOT Environmental Services Office. Seattle, WA.

Washington State Department of Transportation (WSDOT). 2011c. Draft Wetland and Stream Assessment Report for Union Bay Natural Area, Magnuson Park, and Elliott Bridge Reach Mitigation Sites. Prepared for the WSDOT Environmental Services Office. Seattle, WA.

Washington State Department of Transportation (WSDOT). 2011c. I-5 to Medina: Bridge Replacement and HOV Project Final Environmental Impact Statement. July 2011. Prepared for the WSDOT Environmental Services Office. Seattle, WA.

Washington State Department of Transportation (WSDOT). 2011d. SR 520, I-5 to Medina: Bridge Replacement and HOV Project, Final Aquatic Assessment Report, Aquatic Mitigation Sites. Prepared for the WSDOT Environmental Services Office. Seattle, WA.Williams, D. B. 2000. Building the Ship Canal: A saga of dreamers, schemers and one tough government engineer. Pacific Northwest Magazine, Seattle Times, Seattle, Washington.

Wisconsin Reed Canary Grass Management Working Group. 2009. Reed Canary Grass (*Phalaris arundinacea)* Management Guide: Recommendations for Landowners and Restoration Professionals PUB-FR-428 2009.

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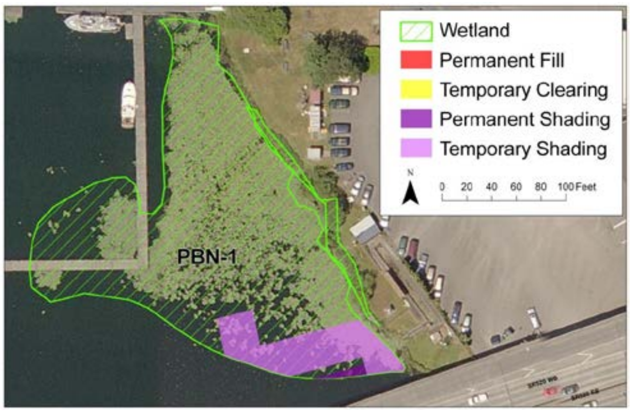
Appendix A – Wetland Impact Summaries

Table A1. Wetland PBN-1 Summary

WETLAND PBN-1 – INFORMATION SUMMARY	
Location:	Wetland PBN-1 is located north of SR 520 on the east side of Portage Bay.



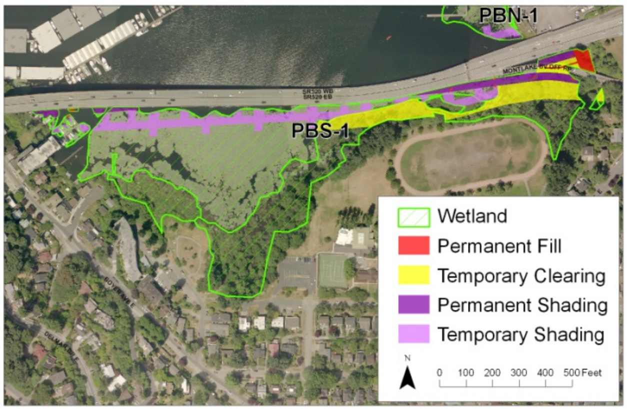
Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	IV
Seattle Rating	IV
Seattle Standard Buffer Width	50 feet
Wetland Size	0.92 acre
Cowardin Classification	L2AB, PEM
HGM Classification	Lake Fringe
Wetland Rating System	
Water Quality Score	2
Hydrology Score	0
Habitat Score	9
Total Score	**11**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- 0.01	Temporary Fill Temporary Clearing Temporary Shading	- - 0.09
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- <0.01 -
Dominant Vegetation Impact	Cattail (*Typha latifolia*).			
Soil Impact	No sample plots were dug due to lack of permission for soil disturbance. No soil impacts.			
Hydrology Impact	Hydrology is driven by Lake Washington. No impact to wetland hydrology. Shading in wetland and buffer will not affect wetland hydrology.			

Wetland Functions Impact Summary	
Water Quality	Wetland PBN-1 has a low potential to improve water quality because it has a narrow vegetation width and consists primarily of aquatic vegetation. It has the opportunity to improve water quality because it can dissipate potential contamination from adjacent boat use. Shading impacts in this wetland will not affect water quality function.
Hydrologic	PBN-1 has minimal potential to reduce shoreline erosion because it has a narrow vegetation width and consists primarily of aquatic vegetation. It does, however, have the opportunity to reduce erosion caused by boat use. Shading impacts in this wetland will not affect hydrology function.
Habitat	Wetland PBN-1 has a low potential to provide habitat because of low vegetation structure and special habitat features. It has a low opportunity to provide habitat because it has limited habitat connectivity and buffer. Shading impacts in this wetland may result in a loss of some wetland habitat function by limiting access.
Buffer Condition	The buffer of PBN-1 includes open water (Lake Washington) and maintained lawn. Lake Washington provides habitat for amphibious and aquatic wildlife. No impacts to the buffer of Wetland PBN-1

Table A2. Wetland PBS-1 Summary

WETLAND PBS-1 – INFORMATION SUMMARY	
Location:	Wetland PBS-1 is located south of SR 520 along the south shore of Portage Bay.



Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	III
Seattle Rating	III
Seattle Standard Buffer Width	85 feet
Wetland Size	12.74 acres
Cowardin Classification	L2AB, PFO, PEM
HGM Classification	Lake Fringe/Slope
Wetland Rating System	
Water Quality Score	18
Hydrology Score	8
Habitat Score	22
Total Score	**48**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading* Includes a small area of permanent clearing in the same area	0.13 0.53	Temporary Fill Temporary Clearing Temporary Shading	- 1.25 1.23
Buffer Impact	Permanent Fill Permanent Shading	0.31 0.04	Temporary Fill Temporary Clearing Temporary Shading	- 0.65 -
Dominant Vegetation Impact	Reed canarygrass (*Phalaris arundinacea*), English ivy (*Hedera helix*), black cottonwood (*Populus balsamifera*), and Pacific willow (*Salix lucida*). Filling will result in a small loss of wetland vegetation. Clearing will result in temporary (but long term) loss of some tall woody vegetation. Shading may result in changes to species composition and plant density.			
Soil Impact	Mucky peat (2.5Y 2.5/1). A small area of wetland soil will be lost.			
Hydrology Impact	Lake Washington. Wetland impacts are not expected to affect wetland hydrology.			
Wetland Functions Impact Summary				
Water Quality	Wetland PBS-1 has a moderate potential to improve water quality due to the width of vegetation along the shoreline. It has the opportunity to improve water quality because it can minimize potential contamination or pollutant runoff from boat use and the proximity to a park. The project is not expected to affect water quality function of wetland PBS-1.			
Hydrologic	Wetland PBS-1 has a low potential to reduce shoreline erosion because much of the vegetation is aquatic bed. Because of the presence of human structures, there is opportunity to reduce erosion. The project is not expected to affect water quality functions of wetlands.			
Habitat	PBS-1 provides high habitat functions due to the presence of special habitat features and multiple Cowardin classes and hydroperiods. It has a moderate opportunity to provide habitat. This is due primarily to its location on the shore of Lake Washington. Permanent fill and shading and temporary filling and shading will result in a loss of wetland area and changes to plant composition and or densities. These are expected			

WETLAND PBS-1 – INFORMATION SUMMARY	
	to affect wildlife habitat quality.
Buffer Condition	The buffer of PBS-1 is disturbed to the north by SR 520 and to the south by an urban park and track. The buffer to the south consists primarily of maintained grasses. Permanent shading and temporary clearing will result in some loss of habitat function in the buffer of Wetland PBS-1.

Table A3. Wetland PBS-1A Summary

WETLAND PBS-1A – INFORMATION SUMMARY	
Location:	Wetland PBS-1A is located south of SR 520 and northeast of Montlake Playground Park.

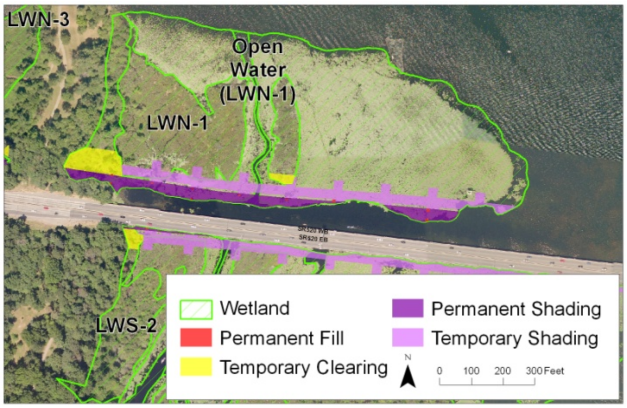
Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	III
Seattle Rating	III
Seattle Standard Buffer Width	60 feet
Wetland Size	0.05 acre
Cowardin Classification	PSS, PEM
HGM Classification	Depressional/Slope
Wetland Rating System	
Water Quality Score Hydrology Score Habitat Score **Total Score**	16 7 13 **36**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0 0	Temporary Fill Temporary Clearing Temporary Shading	- 0.02 -
Buffer Impact	Permanent Fill Permanent Shading	0.04 -	Temporary Fill Temporary Clearing Temporary Shading	- 0.08 -

Dominant Vegetation Impact	Creeping buttercup (*Ranunculus repens*), Himalayan blackberry (*Rubus armeniacus*), bentgrass (*Agrostis* sp.), and Japanese knotweed (*Polygonum cuspidatum*). Some vegetation will be temporarily cleared in PBS-1A.
Soil Impact	Mucky loam (10YR 2/2) over sandy clay loam (10YR 4/1). Wetland soils will not be impacted by the project.
Hydrology Impact	High groundwater table. The project will not affect the hydrology of Wetland PBS-1A.
Wetland Functions Impact Summary	
Water Quality	Wetland PBS-1A has a moderate potential to improve water quality due to the dense vegetation and lack of seasonal ponding. It has the opportunity to improve water quality because of residential land use upgradient of the wetland. The project will not affect the water quality function of PBS-1A.
Hydrologic	Wetland PBS1-A has a moderate potential to reduce flooding and erosion because it does not have an outlet. It does not have the opportunity to reduce flooding and erosion due to its location in the watershed.
Habitat	Wetland PBS-1A has a low potential and opportunity to provide habitat. This is due to its limited structure and its degraded buffer. The project will not affect the hydrologic function of PBS-1A.
Buffer Condition	The buffer of PBS-1A is disturbed by a paved footpath to the west and SR 520 to the northeast. The buffer to the north, east, and south is an urban forest dominated by young red alder (*Alnus rubra*) and Himalayan blackberry in the understory. It provides some habitat and water quality functions. Permanent buffer shading and temporary buffer clearing are expected to affect the quality of habitat in the buffer of PBS-1A.

Table A4. Wetland LWN-1 Summary

WETLAND LWN-1 – INFORMATION SUMMARY	
Location:	Wetland LWN-1 is located north of SR 520 and on the east side of Foster Island.



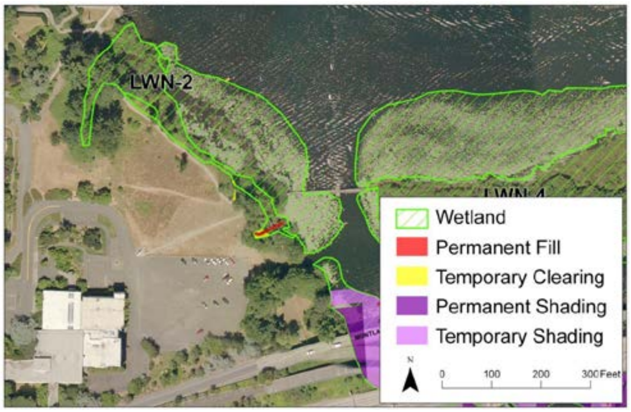
Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	II
Seattle Rating	II
Seattle Standard Buffer Width	110 feet
Wetland Size	14.52 acres
Cowardin Classification	L2AB, PFO, PSS, PEM
HGM Classification	Lake Fringe
Wetland Rating System	
Water Quality Score Hydrology Score Habitat Score **Total Score**	18 8 25 **51**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading* Includes a small area of permanent clearing in the same area	0.01 0.75	Temporary Fill Temporary Clearing Temporary Shading	- 0.32 1.01
Buffer Impact	Permanent Fill Permanent Shading	<0.01 0.43	Temporary Fill Temporary Clearing Temporary Shading	- 0.21 <0.01
Dominant Vegetation Impact	Rose spiraea (*Spiraea douglasii*), red-osier dogwood (*Cornus sericea*), American white waterlily (*Nymphaea odorata*), and red alder. Permanent fill in LWN-1 will result in a loss of some vegetation. Permanent shading and temporary clearing and shading may result in changes to species composition and plant density in the affected area.			
Soil Impact	Loam with organics (10YR 2/1) over loam (10YR 4/2) over silt loam (10YR 5/2). Impacts will result in a small area of wetland soils lost.			
Hydrology Impact	Lake Washington. The project is not expected to result in changes to wetland hydrology.			
Wetland Functions Impact Summary				
Water Quality	Dense herbaceous and shrub vegetation provide moderate water quality functions. The urban setting and use of boats provides opportunity for this wetland to provide water quality functions. The project is not expected to result in changes to water quality function in Wetland LWN-1.			
Hydrologic	The shrub vegetation provides a low hydrologic potential and the presence of infrastructure (Evergreen Point Bridge columns) provides the opportunity to improve hydrologic conditions. The project is not expected to result in changes to hydrologic function in Wetland LWN-1.			
Habitat	Wetland LWN-1 has a moderate level of opportunity and high potential to provide habitat functions. This is due to the presence of multiple Cowardin classes and habitat structures. Permanent fill and shading and temporary clearing and shading are expected to result in a reduction in wetland habitat function.			

WETLAND LWN-1 – INFORMATION SUMMARY	
Buffer Condition	The buffer of Wetland LWN-1 includes open water (Lake Washington) to the north and east, SR 520 to the south, and upland forest to the west. The dominant vegetation in the buffer to the west is red alder, black cottonwood, Himalayan blackberry, Oregon ash (*Fraxinus latifolia*), and English laurel. This forested buffer provides some wildlife habitat as well as water quality functions. Lake Washington provides habitat for amphibious and aquatic wildlife. Permanent filling and shading and temporary clearing are expected to result in a reduction in some buffer functions, particularly habitat functions.

Table A5. Wetland LWN-2 Summary

WETLAND LWN-2 – INFORMATION SUMMARY	
Location:	Wetland LWN-2 is located north of SR 520, in the vicinity of McCurdy Park, and the northwest corner of the Washington Park Arboretum.



Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	III
Seattle Rating	III
Seattle Standard Buffer Width	60 feet
Wetland Size	3.02 acres
Cowardin Classification	L2AB, PFO, PSS, PEM
HGM Classification	Lake Fringe
Wetland Rating System	
Water Quality Score Hydrology Score Habitat Score **Total Score**	18 8 18 **44**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0.02 0.81	Temporary Fill Temporary Clearing Temporary Shading	- 0.01 0.10
Buffer Impact	Permanent Fill Permanent Shading	0.29 0.02	Temporary Fill Temporary Clearing Temporary Shading	- 0.09 -
Dominant Vegetation Impact	Red-osier dogwood, reed canarygrass, and Pacific willow. Loss of a small area of vegetation permanently. Permanent shading may result in changes in composition or density. Temporary clearing and shading will result in temporary but long-tern vegetation changes.			
Soil Impact	Silt (10YR 3/1) over silt clay loam (10Y 5/1) with redoximorphic features over peat (10YR 2/1). A small area of wetland soil will be lost.			
Hydrology Impact	Lake Washington. No changes to wetland hydrology.			

Wetland Functions Impact Summary	
Water Quality	LWN-2 provides a moderate potential to improve water quality due to the width of vegetation along the lakeshore. Opportunity is provided by the urban setting and boat traffic. Water quality function of LWN-2 will not be affected.
Hydrologic	The woody vegetation of the wetland provides a low potential to improve hydrologic conditions. Human structures along the upland edge of the wetland are protected by the wetland; therefore, the opportunity to reduce erosion is present. Hydrologic function of LWN-2 will not be affected.
Habitat	Moderate potential and opportunity for wildlife habitat are provided by the wetland due to multiple Cowardin classes. Permanent shading and temporary clearing and shading will reduce performance of some indicators of habitat function.
Buffer Condition	The buffer of LWN-2 is composed primarily of maintained lawn to the southwest, Lake Washington to the northeast, and forest to the northwest. The forested component of the buffer is dominated by black cottonwood, with English ivy in the understory. The buffer provides low levels of water quality functions. Lake Washington provides habitat for amphibious and aquatic wildlife. Permanent shading will affect a small area of LWN-2's buffer. Temporary clearing will affect a larger area of the buffer. These effects are expected to reduce habitat function in the buffer somewhat.

Table A6. Wetland LWN-3 Summary

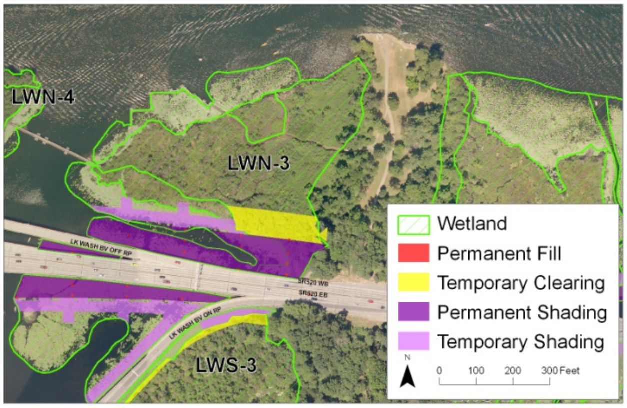
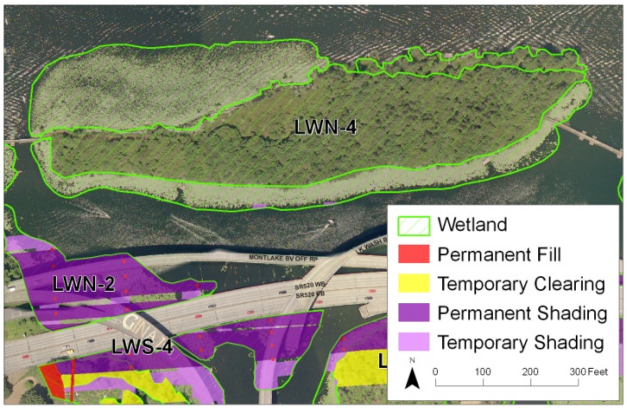
<table>
<tr><th colspan="5">WETLAND LWN-3 – INFORMATION SUMMARY</th></tr>
<tr><td>Location:</td><td colspan="4">Wetland LWN-3 is located north of SR 520 and on the west side of Foster Island.</td></tr>
<tr><td colspan="3" rowspan="10">
</td><td>Local Jurisdiction</td><td>Seattle</td></tr>
<tr><td>WRIA</td><td>8</td></tr>
<tr><td>Ecology Rating (Hruby 2004)</td><td>III</td></tr>
<tr><td>Seattle Rating</td><td>III</td></tr>
<tr><td>Seattle Standard Buffer Width</td><td>85 feet</td></tr>
<tr><td>Wetland Size</td><td>7.1 acres</td></tr>
<tr><td>Cowardin Classification</td><td>L2AB, PSS, PEM</td></tr>
<tr><td>HGM Classification</td><td>Lake Fringe</td></tr>
<tr><td colspan="2">Wetland Rating System</td></tr>
<tr><td>Water Quality Score
Hydrology Score
Habitat Score
Total Score</td><td>18
8
23
49</td></tr>
<tr><th colspan="5">Wetland and Buffer Impact Summary</th></tr>
<tr><td>Wetland Impact</td><td>Permanent Fill
Permanent Shading</td><td>0.01
1.05</td><td>Temporary Fill
Temporary Clearing
Temporary Shading</td><td>-
0.38
0.31</td></tr>
<tr><td>Buffer Impact</td><td>Permanent Fill
Permanent Shading</td><td><0.01
0.23</td><td>Temporary Fill
Temporary Clearing
Temporary Shading</td><td>-
0.16
-</td></tr>
<tr><td>Dominant Vegetation Impact</td><td colspan="4">American white waterlily, cattail, red-osier dogwood, red alder, and Oregon ash. A small area of wetland vegetation will be permanently lost. Shading will likely result in changes to plant composition and density. Temporary clearing and shading will have effects similar to the permanent effects, but vegetation is expected to recover after the construction is complete.</td></tr>
<tr><td>Soil Impact</td><td colspan="4">Silt (10YR 2/1) over mucky peat (10YR 4/2). A small area of wetland soils will be lost.</td></tr>
<tr><td>Hydrology Impact</td><td colspan="4">Lake Washington. Wetland hydrology will not be affected by the project.</td></tr>
<tr><th colspan="5">Wetland Functions Impact Summary</th></tr>
<tr><td>Water Quality</td><td colspan="4">LWN-3 provides moderate potential to improve water quality due to the width of vegetation along the lakeshore and presence of herbaceous vegetation. There is also the opportunity to improve water quality by dissipating potential pollutants from boat traffic. Water quality function in LWN-3 will not be affected by the project.</td></tr>
<tr><td>Hydrologic</td><td colspan="4">There is a low potential to improve hydrologic conditions because the wetland is partially vegetated with woody vegetation near the lakeshore. The wetland also has the opportunity to improve water quality. Hydrologic function in LWN-3 will not be affected by the project.</td></tr>
<tr><td>Habitat</td><td colspan="4">Moderate habitat functions are provided by LWN-3. Multiple Cowardin classes, high levels of habitat interspersion, and habitat structures are present in the wetland. Changes in wetland vegetation are likely to result in a reduction in some aspects of wetland habitat function.</td></tr>
<tr><td>Buffer Condition</td><td colspan="4">The buffer of LWN-3 comprises forest and maintained lawn to the east and Lake Washington to the north, west, and south. The buffer to the east is dominated by maintained grasses and nonnative ornamental trees. Lake Washington provides habitat for amphibious and aquatic wildlife. Permanent filling, shading and temporary clearing will result in changes to vegetation in the LWN-3 buffer which will reduce some habitat functions of the buffer.</td></tr>
</table>

Table A7. Wetland LWN-4 Summary

WETLAND LWN-4 – INFORMATION SUMMARY	
Location:	Wetland LWN-4 comprises Marsh Island and the surrounding aquatic bed vegetation, located north of SR 520.



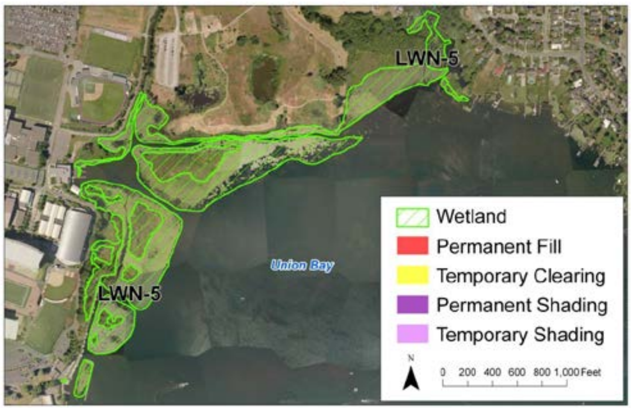
Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	III
Seattle Rating	III
Seattle Standard Buffer Width	60 feet
Wetland Size	7.7 acres
Cowardin Classification	L2AB, PFO, PSS
HGM Classification	Lake Fringe
Wetland Rating System	
Water Quality Score Hydrology Score Habitat Score **Total Score**	18 12 19 **49**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - 0.01
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Dominant Vegetation Impact	Willows (*Salix* sp.) and American white waterlily. A small area of vegetation in LWN-4 will be temporarily shaded.			
Soil Impact	No sample plots were dug due to lack of permission for soil disturbance. No wetland soil area will be lost.			
Hydrology Impact	Lake Washington. Wetland hydrology will not be affected by the project.			

Wetland Functions Impact Summary	
Water Quality	LWN-4 has a moderate potential to provide water quality functions primarily because of the dense vegetation along the lakeshore. It has the opportunity to improve water quality because it can dissipate potential contamination or pollutant runoff from boat traffic and nearby maintained lawn grasses. The small area of temporary shading is not expected to affect water quality function.
Hydrologic	Moderate hydrologic functions are provided by the wetland due to dense woody vegetation that helps reduce shoreline erosion. Wetland LWN-4 also has the opportunity to reduce erosion. The small area of temporary shading is not expected to affect hydrologic function.
Habitat	LWN-4 has a moderate potential and opportunity to provide habitat because it has multiple Cowardin vegetation classes and hydroperiods, moderate dispersion of habitats, and is connected to other wetlands by a relatively undisturbed corridor. The small area of temporary shading is expected to have minimal effect on habitat function in LWN-4.
Buffer Condition	LWN-4 is surrounded by Lake Washington, which provides habitat for aquatic and amphibious wildlife. Buffer functions are not expected to be affected.

Table A8. Wetland LWN-5 Summary

WETLAND LWN-5 – INFORMATION SUMMARY	
Location:	Wetland LWN-5 is located north of the Montlake Cut along the shoreline of the University of Washington.



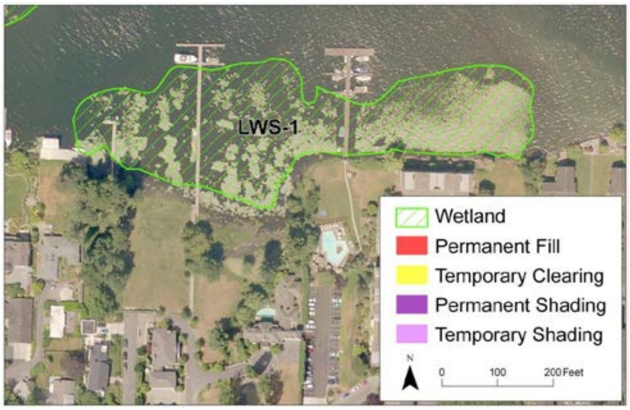
Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	III
Seattle Rating	III
Seattle Standard Buffer Width	85 feet
Wetland Size	37.24 acres
Cowardin Classification	L2AB, PSS, PEM
HGM Classification	Lake Fringe
Wetland Rating System	
Water Quality Score	18
Hydrology Score	4
Habitat Score	26
Total Score	**48**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Dominant Vegetation Impact	Red-osier dogwood, Pacific willow, cattail, and black cottonwood. The project will not affect vegetation in LWN-5.			
Soil Impact	No sample plots were dug due to lack of permission for soil disturbance. Soils in LWN-5 will not be affected by the project.			
Hydrology Impact	Lake Washington. Wetland hydrology will not be affected by the project.			

Wetland Functions Impact Summary	
Water Quality	LWN-5 has moderate potential to improve water quality primarily because there is a wide band of vegetation along the lakeshore. It has the opportunity to improve water quality by dissipating any pollutant runoff or contamination from boat use in the lake and urban areas nearby. No impacts to this function.
Hydrologic	LWN-5 has low potential to reduce shoreline erosion because nonaquatic bed vegetation along the shoreline is not very wide. It does not have the opportunity to reduce erosion. No impacts to this function.
Habitat	LWN-5 has moderate potential to provide habitat because it has multiple Cowardin classes and high interspersion of habitats. It has moderate opportunity to provide habitat because it is connected to other habitats.
Buffer Condition	The buffer of LWN-5 is dominated by nonnative grasses and trails. Some portions of the buffer, to the west of LWN-5, are dominated by black cottonwood and red-osier dogwood. Open water (Lake Washington) is to the south. The buffer of LWN-5 provides wildlife habitat and some water quality functions. No impacts to wetland buffers.

Table A 9. Wetland LWS-1 Summary

WETLAND LWS-1 – INFORMATION SUMMARY	
Location:	Wetland LWS-1 is located south of SR 520 and to the east-northeast of the Broadmoor Golf Club.



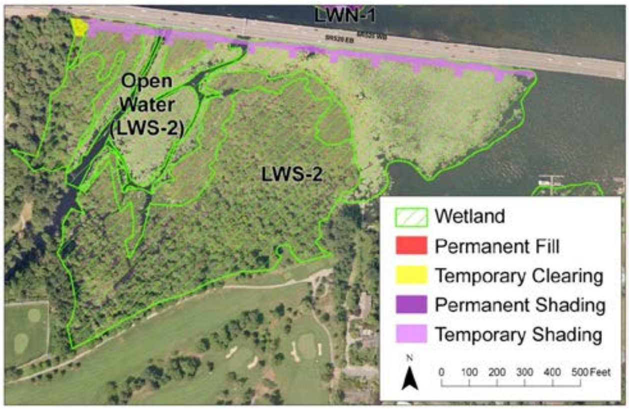
Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	IV
Seattle Rating	IV
Seattle Standard Buffer Width	50 feet
Wetland Size	2.94 acres
Cowardin Classification	L2AB
HGM Classification	Lake Fringe
Wetland Rating System	
Water Quality Score Hydrology Score Habitat Score **Total Score**	6 4 14 **24**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Dominant Vegetation Impact	American white waterlily. No impacts to wetland vegetation.			
Soil Impact	No sample plots were dug because the wetland is aquatic bed only. No impacts to wetland soils.			
Hydrology Impact	Lake Washington. No impacts to wetland hydrology.			

Wetland Functions Impact Summary	
Water Quality	LWS-1 has the potential to provide low water quality functions because of vegetation along the lakeshore and the herbaceous plants that cover more than a third of the vegetated area. It has the opportunity to improve water quality because there are urban areas and maintained parks nearby. No impacts to water quality.
Hydrologic	The potential to reduce shoreline erosion is low because the nonaquatic bed vegetation along the shoreline is not very wide. It has the opportunity to reduce erosion because there are structures along the upland edge of the wetland that could be damaged by erosion. No impacts to hydrologic function.
Habitat	LWS-1 has the potential to provide habitat because it has multiple Cowardin classes, moderate habitat interspersion, and special habitat features. It has the opportunity to provide habitat because it is connected to other habitats. No impacts to wetland habitat.
Buffer Condition	The buffer of Wetland LWS-1 encompasses Lake Washington to the north and maintained lawns to the south. Residential structures are located in the buffer to the south, which provides minimal water quality functions. Lake Washington provides habitat for amphibious and aquatic wildlife. No impact to wetland buffers.

Table A10. Wetland LWS-2 Summary

WETLAND LWS-2 – INFORMATION SUMMARY	
Location:	Wetland LWS-2 is located south of SR 520, north of the Broadmoor Golf Club, and on the east side of Foster Island.



Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	II
Seattle Rating	II
Seattle Standard Buffer Width	110 feet
Wetland Size	26.38 acres
Cowardin Classification	L2AB, PSS, PEM
HGM Classification	Lake Fringe
Wetland Rating System	
Water Quality Score Hydrology Score Habitat Score **Total Score**	20 12 24 **56**

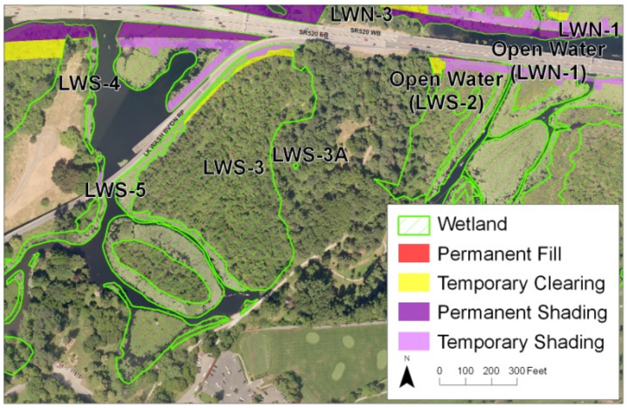
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0.001 0.04	Temporary Fill Temporary Clearing Temporary Shading	- 0.06 1.20
Buffer Impact	Permanent Fill Permanent Shading	<0.01 0.03	Temporary Fill Temporary Clearing Temporary Shading	0.14 0.01 -
Dominant Vegetation Impact	American white waterlily, Himalayan blackberry, salmonberry (*Rubus spectabilis*), red-osier dogwood, and red alder. Permanent fill and shading will affect a small area of vegetation. Temporary clearing and shading will remove a small area of vegetation and shade a larger are of the wetland. This may affect plant composition and density.			
Soil Impact	Peat (10YR 2/1) over muck (10YR 2/2) over loam (10YR 2/2) over sand (10YR 4/1). A small area of wetland soil will be lost.			
Hydrology Impact	Lake Washington. Wetland hydrology will not be affected.			

Wetland Functions Impact Summary	
Water Quality	LWS-2 provides moderate water quality functions primarily due to the dense vegetation along the lakeshore. It has the opportunity to improve water quality because the wetland vegetation can sequester pollutants from boats and maintained lawn. Water quality function will not be affected by the project.
Hydrologic	LWS-2 provides moderate hydrologic functions due to fringe vegetation along the lakeshore. It also has the opportunity to reduce erosion. Hydrologic function will not be affected by the project.
Habitat	LWS-2 has a high potential and moderate opportunity to provide habitat because it has multiple Cowardin classes and hydroperiods (water level fluctuations over time), moderate dispersion of habitats, and is connected to other wetlands by a relatively undisturbed corridor. Effects to vegetation may result in a decrease in some parameters of wetland habitat function.

WETLAND LWS-2 – INFORMATION SUMMARY	
Buffer Condition	A golf course is located to the south of LWS-2 and SR 520 is located to the north. To the east of LWS-2 the buffer is open water and to the west the buffer is forested. The forested component is dominated by black cottonwood, Oregon ash, and Indian plum. The buffer of LWS-2 provides some water quality and wildlife habitat functions. Permanent filling and shading and temporary clearing in the buffer of LWS-2 may result in reduction in habitat function.

Table A11. Wetland LWS-3 Summary

WETLAND LWS-3 – INFORMATION SUMMARY	
Location:	Wetland LWS-3 is located south of SR 520 on the west side of Foster Island.



Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	II
Seattle Rating	II
Seattle Standard Buffer Width	110 feet
Wetland Size	15.22 acres
Cowardin Classification	L2AB, PFO, PSS, PEM
HGM Classification	Lake Fringe
Wetland Rating System	
Water Quality Score Hydrology Score Habitat Score **Total Score**	18 12 24 **54**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0.005 0.53	Temporary Fill Temporary Clearing Temporary Shading	- 0.16 0.73
Buffer Impact	Permanent Fill Permanent Shading	<0.01 <0.01-	Temporary Fill Temporary Clearing Temporary Shading	- 0.18 -

Dominant Vegetation Impact	Birch (*Betula sp.),* salmonberry, slough sedge (*Carex obnupta*), red-osier dogwood, and Oregon ash. Permanent shading and temporary clearing and shading may result in changes in vegetation composition and density. Filling will result in a loss of a small area of wetland vegetation.
Soil Impact	Mucky peat (10YR 3/2) over peat (10YR 2/2). A small area of wetland soil will be lost.
Hydrology Impact	Lake Washington. Wetland hydrology will not be affected.
Wetland Functions Impact Summary	
Water Quality	LWS-3 has a moderate potential to improve water quality because the vegetation along the lakeshore is wide. It has the opportunity to improve water quality because it can sequester contamination from boat usage. Water quality function will not be affected by the project.
Hydrologic	LWS-3 has a moderate potential to reduce shoreline erosion because the fringe vegetation along the shore is a wide band of shrubs and trees. It has the opportunity to reduce erosion. Hydrologic function will not be affected by the project.
Habitat	LWS-3 has a high potential to provide habitat because it has multiple Cowardin classes and hydroperiods, moderate habitat interspersion, and special habitat features. It has a moderate opportunity to provide habitat because it is connected to other habitats. Habitat function will likely be reduced by the changes in vegetation described above.
Buffer Condition	The buffer of LWS-3 comprises SR 520 to the north, forest to the east, and a road to the south. The forested component of the buffer is dominated by Oregon ash, California blackberry (*Rubus ursinus*), English ivy, and Indian plum (*Oemleria cerasiformis*). This buffer provides some wildlife habitat and water quality functions and is relatively undisturbed to the east. Temporary clearing will result in a temporary loss of some aspects of habitat function.

Table A12. Wetland LWS-3A Summary

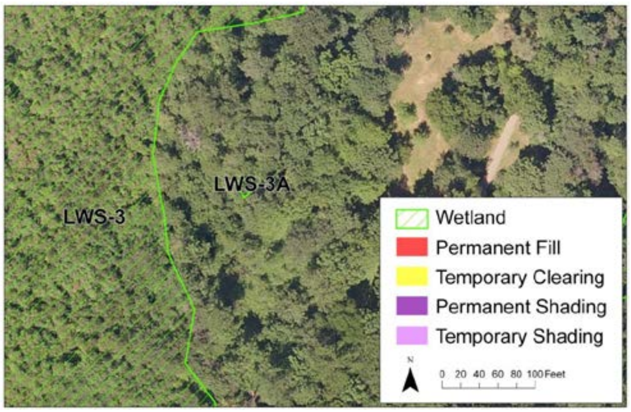
<table>
<tr><th colspan="6">WETLAND LWS-3A – INFORMATION SUMMARY</th></tr>
<tr><td>Location:</td><td colspan="5">Wetland LWS-3A is located south of SR 520 in the southwest portion of Foster Island</td></tr>
<tr><td colspan="2" rowspan="10">
</td><td colspan="2">Local Jurisdiction</td><td colspan="2">Seattle</td></tr>
<tr><td colspan="2">WRIA</td><td colspan="2">8</td></tr>
<tr><td colspan="2">Ecology Rating (Hruby 2004)</td><td colspan="2">IV</td></tr>
<tr><td colspan="2">Seattle Rating</td><td colspan="2">IV</td></tr>
<tr><td colspan="2">Seattle Standard Buffer Width</td><td colspan="2">N/A</td></tr>
<tr><td colspan="2">Wetland Size</td><td colspan="2">< 0.01 acre</td></tr>
<tr><td colspan="2">Cowardin Classification</td><td colspan="2">PFO</td></tr>
<tr><td colspan="2">HGM Classification</td><td colspan="2">Depressional</td></tr>
<tr><td colspan="4">Wetland Rating System</td></tr>
<tr><td colspan="2">Water Quality Score
Hydrology Score
Habitat Score
Total Score</td><td colspan="2">8
7
13
28</td></tr>
<tr><th colspan="6">Wetland and Buffer Impact Summary</th></tr>
<tr><td>Wetland Impact</td><td>Permanent Fill
Permanent Shading</td><td>-
-</td><td>Temporary Fill
Temporary Clearing
Temporary Shading</td><td colspan="2">-
-
-</td></tr>
<tr><td>Buffer Impact</td><td>Permanent Fill
Permanent Shading</td><td>-
-</td><td>Temporary Fill
Temporary Clearing
Temporary Shading</td><td colspan="2">-
-
-</td></tr>
<tr><td>Dominant Vegetation Impact</td><td colspan="5">Slough sedge, red-osier dogwood, and Oregon ash. No impacts to wetland vegetation.</td></tr>
<tr><td>Soil Impact</td><td colspan="5">Silty clay loam (2.5YR 4/2) over clay (10YR 4/1). No impacts to wetland soils.</td></tr>
<tr><td>Hydrology Impact</td><td colspan="5">Seasonal high groundwater table. No impact to wetland hydrology,</td></tr>
<tr><th colspan="6">Wetland Functions Impact Summary</th></tr>
<tr><td>Water Quality</td><td colspan="5">LWS-3A has a low opportunity to improve water quality because it has persistent ungrazed vegetation for most of its area. It does not have the opportunity to improve water quality. No impacts to this function.</td></tr>
<tr><td>Hydrologic</td><td colspan="5">LWS-3A has a low potential to reduce flooding and erosion because it has no outlet and the area of the basin is 10 to 100 times the area of the wetland. No impact to this function.</td></tr>
<tr><td>Habitat</td><td colspan="5">LWS-3A has a low potential to provide habitat because it only has one Cowardin class and one hydroperiod. It has a moderate opportunity to provide habitat because it is connected to other habitats. No impact to habitat function.</td></tr>
<tr><td>Buffer Condition</td><td colspan="5">The buffer of Wetland LWS-3A is forested and dominated by Himalayan blackberry, black cottonwood, and Oregon ash. It provides water quality and habitat functions and is relatively undisturbed. No impacts to the buffer of LWS-3A.</td></tr>
</table>

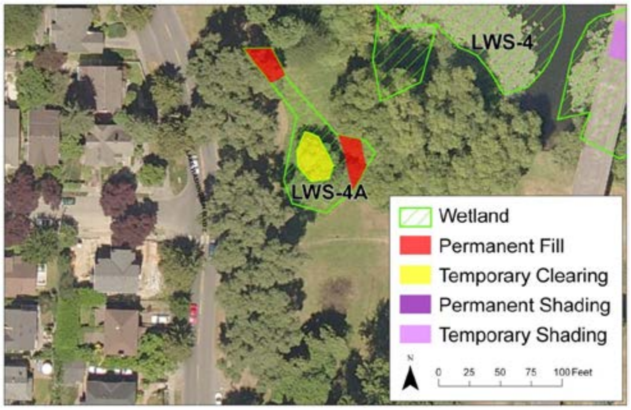
Table A13. Wetland LWS-4 Summary

<table>
<tr><th colspan="6">WETLAND LWS-4 – INFORMATION SUMMARY</th></tr>
<tr><td>Location:</td><td colspan="5">Wetland LWS-4 is located south of SR 520 in the vicinity of the Lake Washington Boulevard on-ramps and off-ramps.</td></tr>
<tr><td colspan="3" rowspan="10">
</td><td colspan="2">Local Jurisdiction</td><td>Seattle</td></tr>
<tr><td colspan="2">WRIA</td><td>8</td></tr>
<tr><td colspan="2">Ecology Rating (Hruby 2004)</td><td>II</td></tr>
<tr><td colspan="2">Seattle Rating</td><td>II</td></tr>
<tr><td colspan="2">Seattle Standard Buffer Width</td><td>110 feet</td></tr>
<tr><td colspan="2">Wetland Size</td><td>6.95 acres</td></tr>
<tr><td colspan="2">Cowardin Classification</td><td>L2AB, PFO, PEM</td></tr>
<tr><td colspan="2">HGM Classification</td><td>Lake Fringe</td></tr>
<tr><td colspan="3">Wetland Rating System</td></tr>
<tr><td colspan="2">Water Quality Score
Hydrology Score
Habitat Score
Total Score</td><td>18
12
25
55</td></tr>
<tr><th colspan="6">Wetland and Buffer Impact Summary</th></tr>
<tr><td>Wetland Impact</td><td>Permanent Fill
Permanent Shading*
Includes a small area of permanent clearing in the same area</td><td>0.09
1.15</td><td colspan="2">Temporary Fill
Temporary Clearing
Temporary Shading</td><td>-
0.60
0.53</td></tr>
<tr><td>Buffer Impact</td><td>Permanent Fill
Permanent Shading</td><td>1.21
0.02</td><td colspan="2">Temporary Fill
Temporary Clearing
Temporary Shading</td><td>-
0.40
0.03</td></tr>
<tr><td>Dominant Vegetation Impact</td><td colspan="5">Pacific willow, creeping buttercup, sweet gum (Liquidambar sp.), reed canarygrass, and birch. Permanent fill and shading will result in loss of a small area of vegetation and may change plant composition and density. Temporary clearing and shading will have similar effects to permanent shading, but are expected to be restored after construction.</td></tr>
<tr><td>Soil Impact</td><td colspan="5">Silt loam (10YR 2/1) over loam (10YR 3/2) with redoximorphic features. Small permanent loss of wetland soil.</td></tr>
<tr><td>Hydrology Impact</td><td colspan="5">Lake Washington. No impacts to wetland hydrology.</td></tr>
<tr><th colspan="6">Wetland Functions Impact Summary</th></tr>
<tr><td>Water Quality</td><td colspan="5">LWS-4 has a moderate potential to improve water quality because it has a wide band of vegetation along the lakeshore and the nonaquatic bed vegetation covers most of the wetland area. It has the opportunity to improve water quality because it is near urban areas and maintained parks and can dissipate potential contamination or pollutant runoff from these areas. No impact to water quality function.</td></tr>
<tr><td>Hydrologic</td><td colspan="5">LWS-4 has a moderate potential to reduce shoreline erosion because three-quarters of the fringe vegetation along the shore is shrubs or trees at least 6 feet wide. It has the opportunity to reduce shoreline erosion. No impact to hydrologic function.</td></tr>
<tr><td>Habitat</td><td colspan="5">LWS-4 has a high potential to provide habitat because it has four Cowardin classes and high habitat interspersion. It has a moderate opportunity to provide habitat because it is connected to other habitats. The changes in vegetation described above may result in loss of some aspects of habitat function.</td></tr>
</table>

WETLAND LWS-4 – INFORMATION SUMMARY	
Buffer Condition	The buffer of Wetland LWS-4 includes maintained lawn, SR 520, and open water (Lake Washington). The terrestrial buffer provides minimal functions, and is disturbed by human activities. Lake Washington provides habitat for amphibious and aquatic wildlife. Permanent shading and temporary clearing are likely to result in a reduction in some aspects of buffer habitat function during the construction period.

Table A14. Wetland LWS-4A Summary

WETLAND LWS-4A – INFORMATION SUMMARY	
Location:	Wetland LWS-4A is located south of SR 520, just east of East Lake Washington Boulevard.



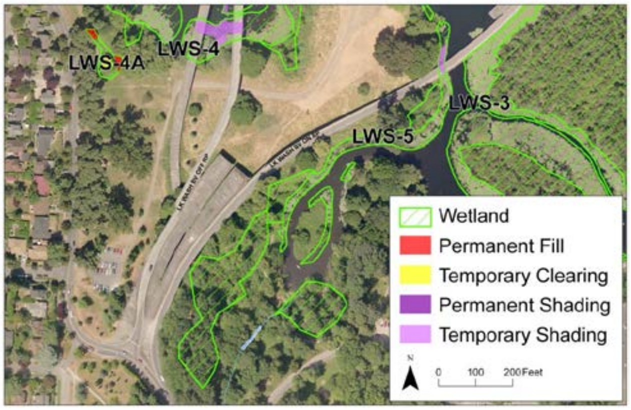
Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	IV
Seattle Rating	IV
Seattle Standard Buffer Width	50 feet
Wetland Size	0.11 acre
Cowardin Classification	PFO, PEM
HGM Classification	Slope
Wetland Rating System	
Water Quality Score Hydrology Score Habitat Score **Total Score**	4 2 13 **19**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0.02 -	Temporary Fill Temporary Clearing Temporary Shading	- 0.02 -
Buffer Impact	Permanent Fill Permanent Shading	0.01 -	Temporary Fill Temporary Clearing Temporary Shading	- 0.10 -
Dominant Vegetation Impact	Willow, bluegrass (*Poa* sp.), and creeping buttercup. Temporary clearing of small area of wetland vegetation.			
Soil Impact	Mucky loam (10YR 2/2) over silt clay loam (5Y 4/1) with redoximorphic features. No loss of wetland soils.			
Hydrology Impact	Surface runoff and precipitation. No impact to wetland hydrology.			

Wetland Functions Impact Summary	
Water Quality	LWS-4A has a low potential to improve water quality because much of the vegetation in the wetlands is mowed. It has the opportunity to improve water quality because it is near urban areas and a maintained park and can dissipate potential pollutant runoff from these areas. No impacts to water quality function.
Hydrologic	LWS-4A has a low potential to reduce erosion because only a small area in the center of the wetland consists of woody vegetation. It does not have the opportunity to reduce erosion. No impact to hydrologic function.
Habitat	LWS-4A has a low potential to provide habitat because it is small and has limited habitat interspersion. It has a moderate opportunity to provide habitat because it is connected to other habitats. Temporary clearing of vegetation may result in a temporary reduction of some habitat function.
Buffer Condition	The buffer of LWS-4A consists of maintained lawn and it is disturbed. It provides minimal water quality functions. It may also provide minimal habitat functions for urban-adapted species. Temporary clearing is expected to result in a temporary loss of some habitat functions.

Table A15. Wetland LWS-5 Summary

WETLAND LWS-5 – INFORMATION SUMMARY	
Location:	Wetland LWS-5 is located in the Washington Park Arboretum, south of SR 520, and north of East Foster Island Road.



Local Jurisdiction	Seattle
WRIA	8
Ecology Rating (Hruby 2004)	II
Seattle Rating	II
Seattle Standard Buffer Width	110 feet
Wetland Size	2.29 acres
Cowardin Classification	L2AB, PFO, PEM
HGM Classification	Lake Fringe
Wetland Rating System	
Water Quality Score Hydrology Score Habitat Score **Total Score**	20 12 26 **58**

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - 0.03
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- 0.32 -
Dominant Vegetation Impact	Pacific willow, creeping buttercup, and black cottonwood. Temporary shading may change plant composition and density in a small area.			
Soil Impact	Silt loam (10YR 3/1) over silt loam (7.5YR 3/1). No loss of wetland soil.			
Hydrology Impact	Lake Washington. No loss impact to wetland hydrology.			

Wetland Functions Impact Summary	
Water Quality	LWS-5 has a moderate potential to improve water quality because vegetation along the lakeshore is wide and two-thirds of the wetland is vegetated. It has the opportunity to improve water quality because it can dissipate potential contamination or pollutant runoff from boat use and maintained parks nearby. Water quality function are not expected to be affected by the project.
Hydrologic	LWS-5 has a moderate potential to reduce shoreline erosion because vegetation along the lakeshore is wide. It has the opportunity to reduce erosion because there are trails and stormwater pipes that could be affected. Hydrologic function is not expected to be affected by the project.
Habitat	LWS-5 has a moderate potential to provide habitat because it has multiple Cowardin classes and hydroperiods. It also has a moderate opportunity to provide habitat because it is on the shore of Lake Washington. Temporary shading may result in changes to habitat use during construction of the project.
Buffer Condition	The buffer of LWS-5 is primarily forested with an open understory. The dominant vegetation is red alder, Himalayan blackberry, and creeping buttercup. The buffer provides some wildlife habitat and water quality functions. A small area of buffer will be temporarily cleared. This may result in temporary changes to wetland function.

Appendix B – Mitigation Site Wetland Memoranda

The Wetland Site Assessment Report is provided as separate document

Appendix C – Boring Logs

To be developed as part of the PS&E.

Appendix D – Hydrology Data

To be developed as part of the PS&E.

Appendix E – Mitigation Plan Design Sheets

N

0 50 100
SCALE IN FEET

Legend:
Proposed Contour
Existing Contour
Wetland Mitigation Areas
Section Cut Line

Figure E-1
WSDOT-Owned Peninsula Mitigation Site
Grading Plan

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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Legend:
Proposed Contour
Existing Contour
Wetland Mitigation Areas
Section Cut Line

Figure E-2
Union Bay Natural Area Mitigation Site
Grading Plan

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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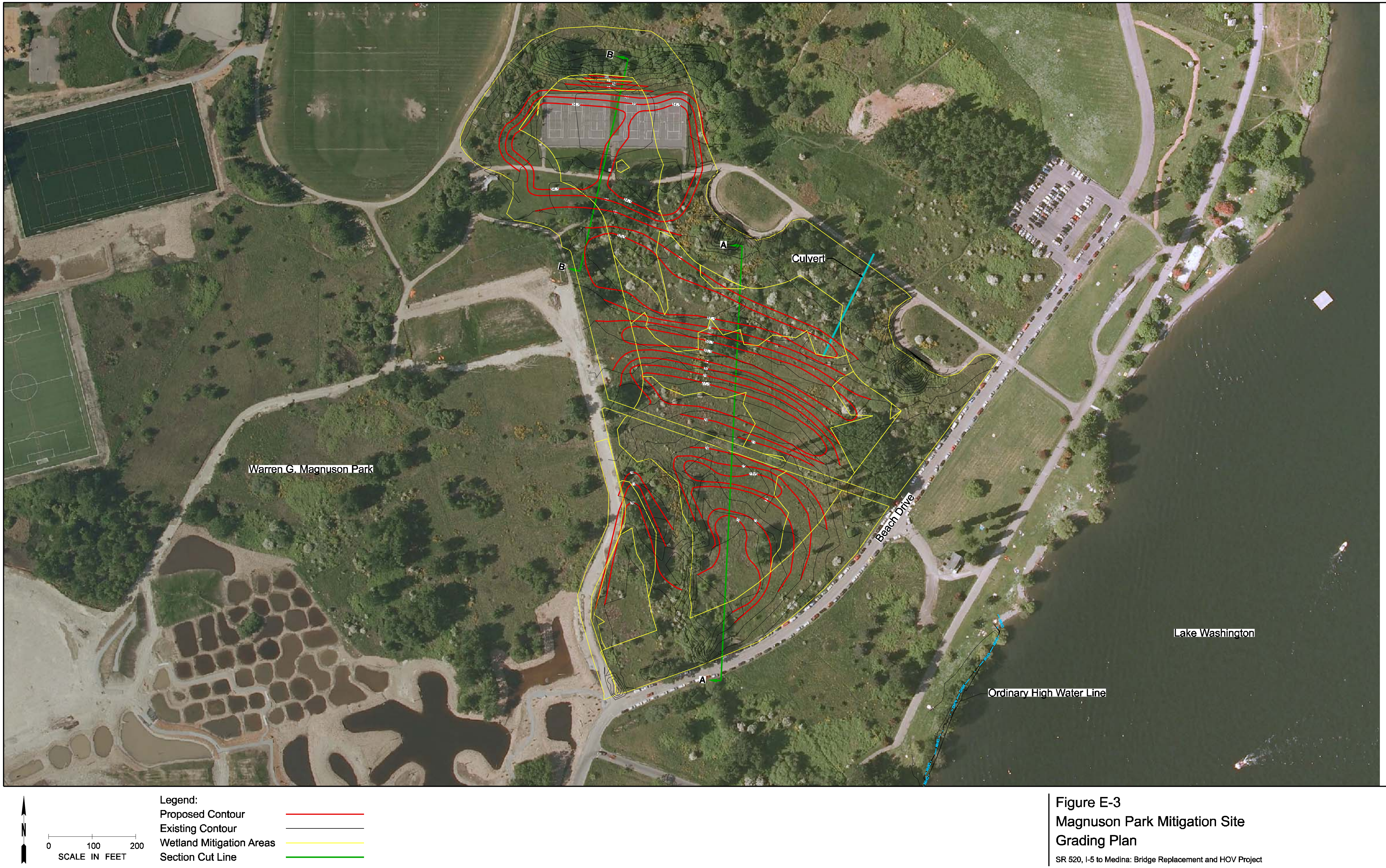

Figure E-3
Magnuson Park Mitigation Site
Grading Plan

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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Cedar River / Elliott Bridge Site

N

0 50 100
SCALE IN FEET

Legend:
Proposed Contour
Existing Contour
Wetland Mitigation Areas
Section Cut Line
Ordinary High Water Line

Figure E-4
Elliott Bridge Reach Mitigation Site
Draft Grading Plan

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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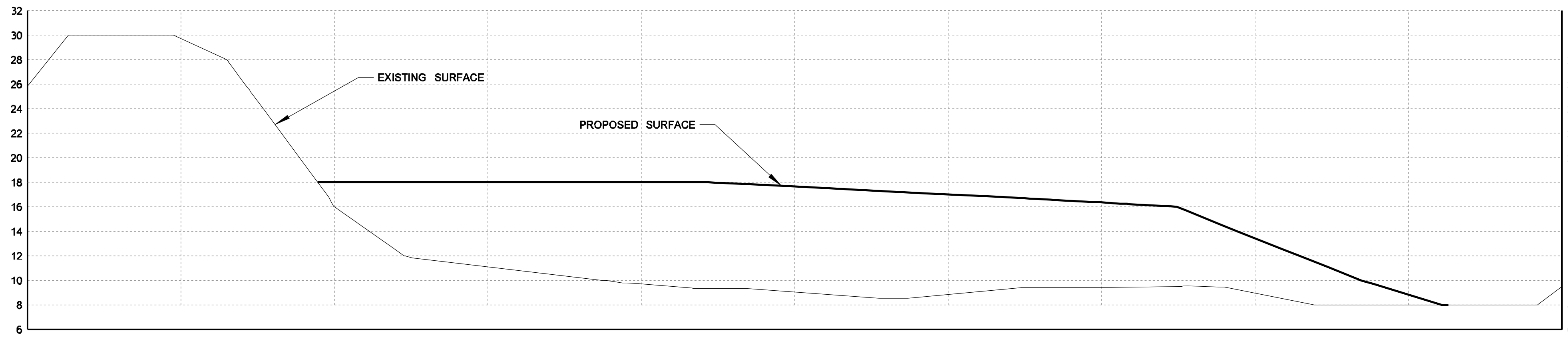
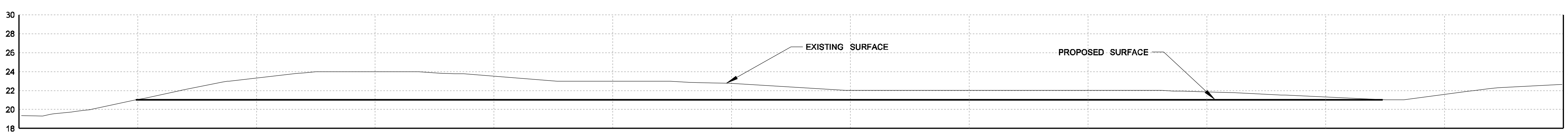
WSDOT Peninsula Mitigation Site



Section A-A

Union Bay Natural Area Mitigation Site



Section A-A

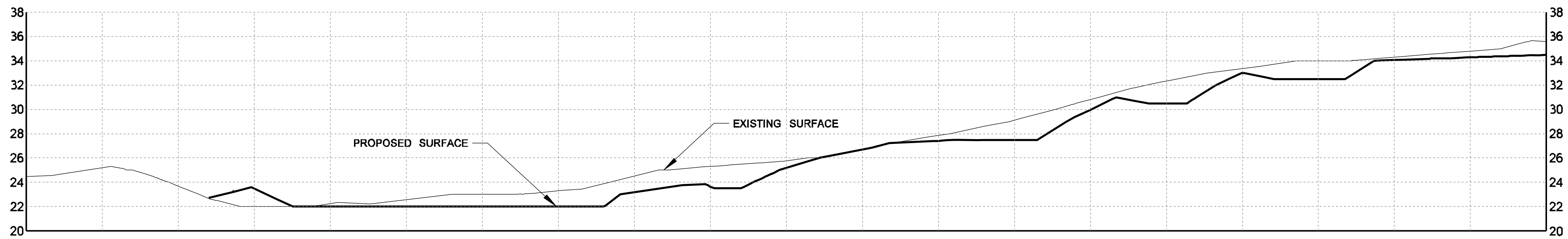
SCALE IN FEET
SCALE IS 4V:1H

Legend:
Proposed Grade
Existing Grade

Figure E-5
Cross Sections

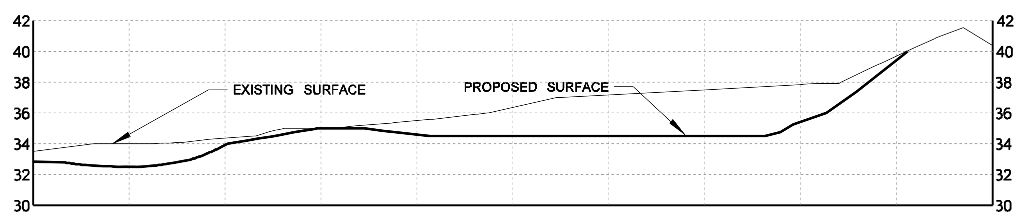
SR 520, I-5 to Medina: Bridge Replacement and HOV Project

Magnuson Park Mitigation Site



Section A-A

Magnuson Park Mitigation Site



Section B-B

0 50 100
SCALE IN FEET
SCALE IS 8V:1H

Legend:
Proposed Grade
Existing Grade

Figure E-6
Cross Sections

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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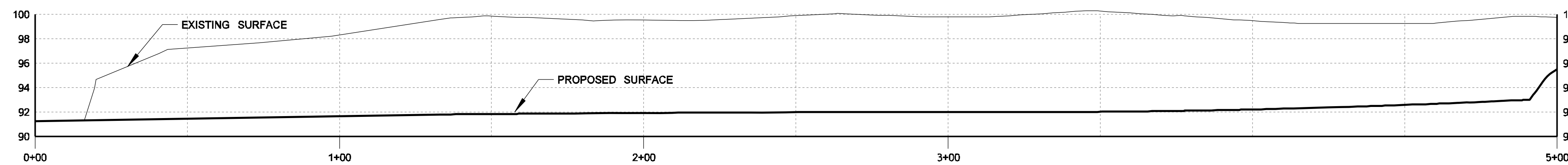
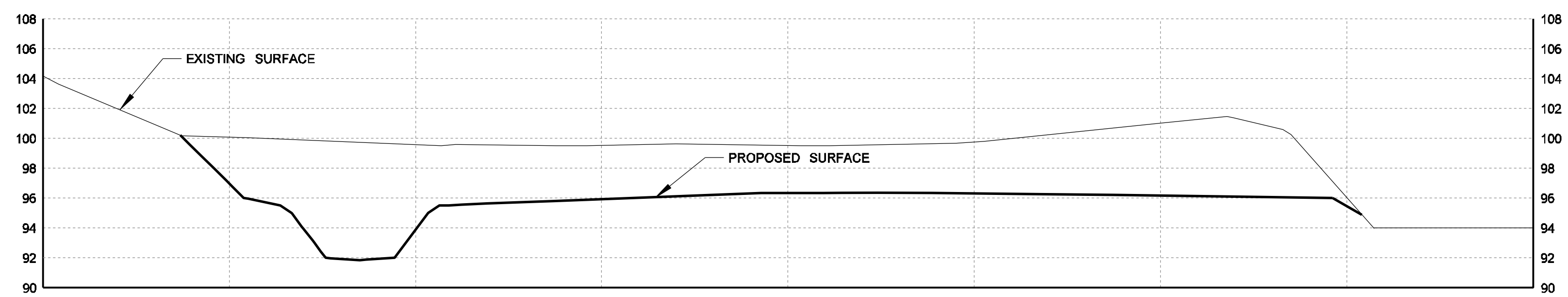
Elliott Bridge Reach Mitigation Site



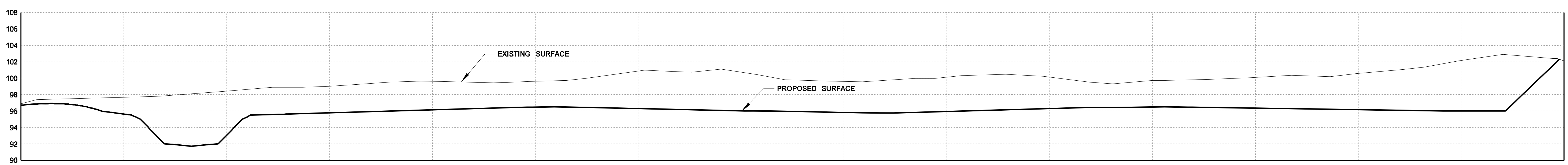
Profile

Elliott Bridge Reach Mitigation Site



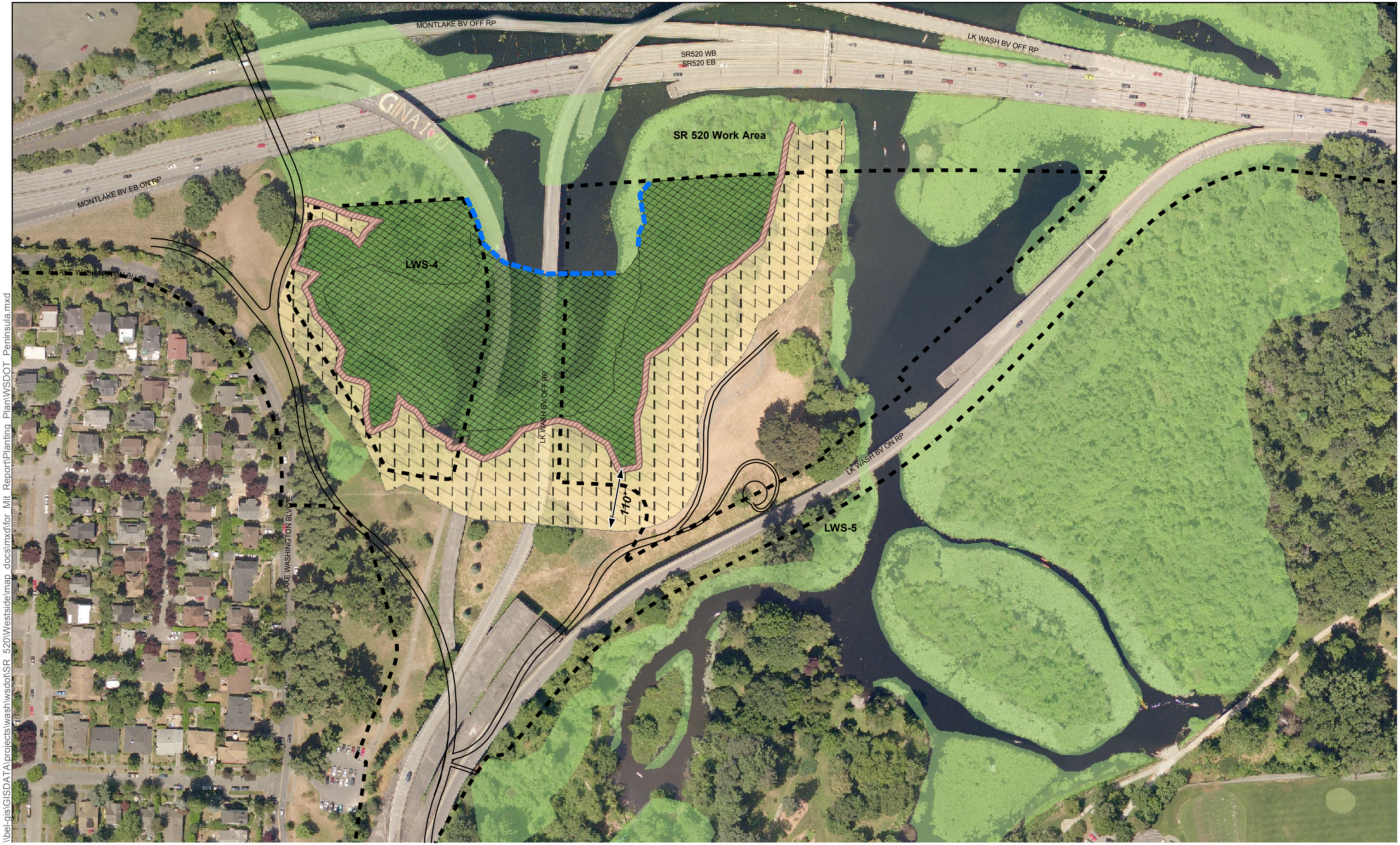
Section A-A

Elliott Bridge Reach Mitigation Site



Section B-B

Figure E-7
Cross Sections



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Legend

- Forested Wetland Planting (Re-establishment and Enhancement)
- Upland Forested Buffer Planting
- 10-foot Inner Buffer
- Limits of Construction
- Wetland
- Water's Edge Planting

Figure E-8
WSDOT-Owned Peninsula Planting Plan

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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Legend

- Forested Wetland Planting (Establishment and Enhancement)
- Emergent and Water's Edge Wetland Enhancement Planting
- Upland Forested Buffer Planting
- Upland Shrub Buffer Planting
- 10-foot Inner Buffer
- Water's Edge Planting
- Stream

Figure E-9
Union Bay Natural Area Planting Plan

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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Legend

- Emergent Wetland Planting
- Scrub-shrub Wetland Planting
- Forested Wetland Planting
- Emergent Wetland in Buffer Planting
- Forested Wetland in Buffer Planting
- Upland Forested Buffer Planting
- Wetland

N

0 50 100 150 200 250 300 Feet

Figure E-10
Magnuson Park Planting Plan

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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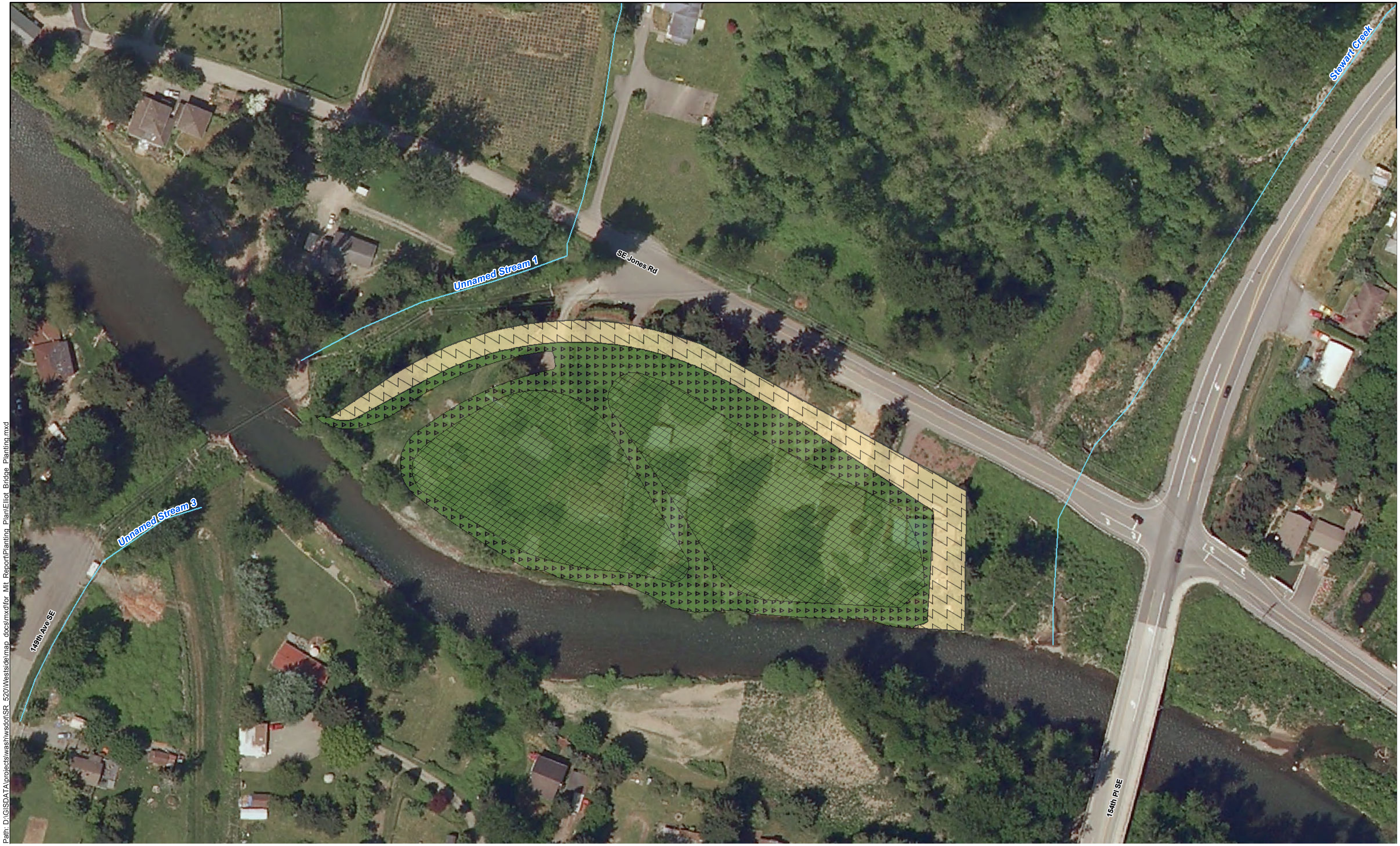

Path: D:\GISDATA\projects\wash\wsdot\SR 520\Westside\map_docs\mxd\for Mit Report\Planting Plan\Elliot Bridge Planting.mxd

N

0 50 100 200 300 Feet

Legend

Forested Riparian Wetland Planting

Scrub-shrub Wetland Planting

Upland Forested Buffer Planting

Stream

Figure E-11
Elliott Bridge Reach Planting Plan

SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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Appendix F – Initial Mitigation Site Selection Process and Results

1.1 Introduction

This appendix is intended to provide the reader with a comprehensive overview of the site selection process for candidate wetland mitigation sites in the SR 520, I-5 to Medina: Bridge Replacement and HOV Project. The following sections summarize the site selection process detailed in the *I-5 to Medina Bridge Replacement and HOV Project Initial Wetland Mitigation Report* (WSDOT 2009). This information was also shared with regulatory agencies and the Tribes as part of early agency coordination during the Natural Resources Technical Working Group (NRTWG) meetings.

The appendix is divided into two sections: Methods and Results. The methods section describes the site selection parameters, the process for selecting a preliminary list of sites, and process for 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 eight broad parameters that would define the best sites for the master list of potential mitigation sites. These eight parameters are divided into two sets: (1) opportunity parameters, and (2) risk parameters.

The “opportunity set” consists of four parameters: mitigation type, location, special characteristics, and cost. Size was initially included in this set. However, since so few sites are available due to the urban nature of study area, the minimum size criterion was dropped from the opportunity set. The Mitigation Team used mitigation type, as determined by the joint federal and Washington State guidance (Ecology et al. 2006), 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), watershed, and local jurisdiction, and the 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 was to be used during the final portion of the site analysis and would 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 I-5 to Medina: Bridge Replacement 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 I-5 to Medina: Bridge Replacement and HOV Project are: I-5 and the western edge of WRIA 8 on the west and the western shoreline of Lake Washington on the east. The drainages that discharge to Lake Washington were evaluated north to the WRIA boundary and south to I-90. The study area was later refined to the King County boundary on the north and the southern end of Lake Washington on the south. Figure F1 shows this study area with drainage basins and incorporated cities.

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 (City of Seattle, 2007, received in March 2009)
- County Assessor tax parcel information (data acquired from WSDOT, 2006)
- National Wetlands Inventory (NWI) (U.S. Fish and Wildlife Service)

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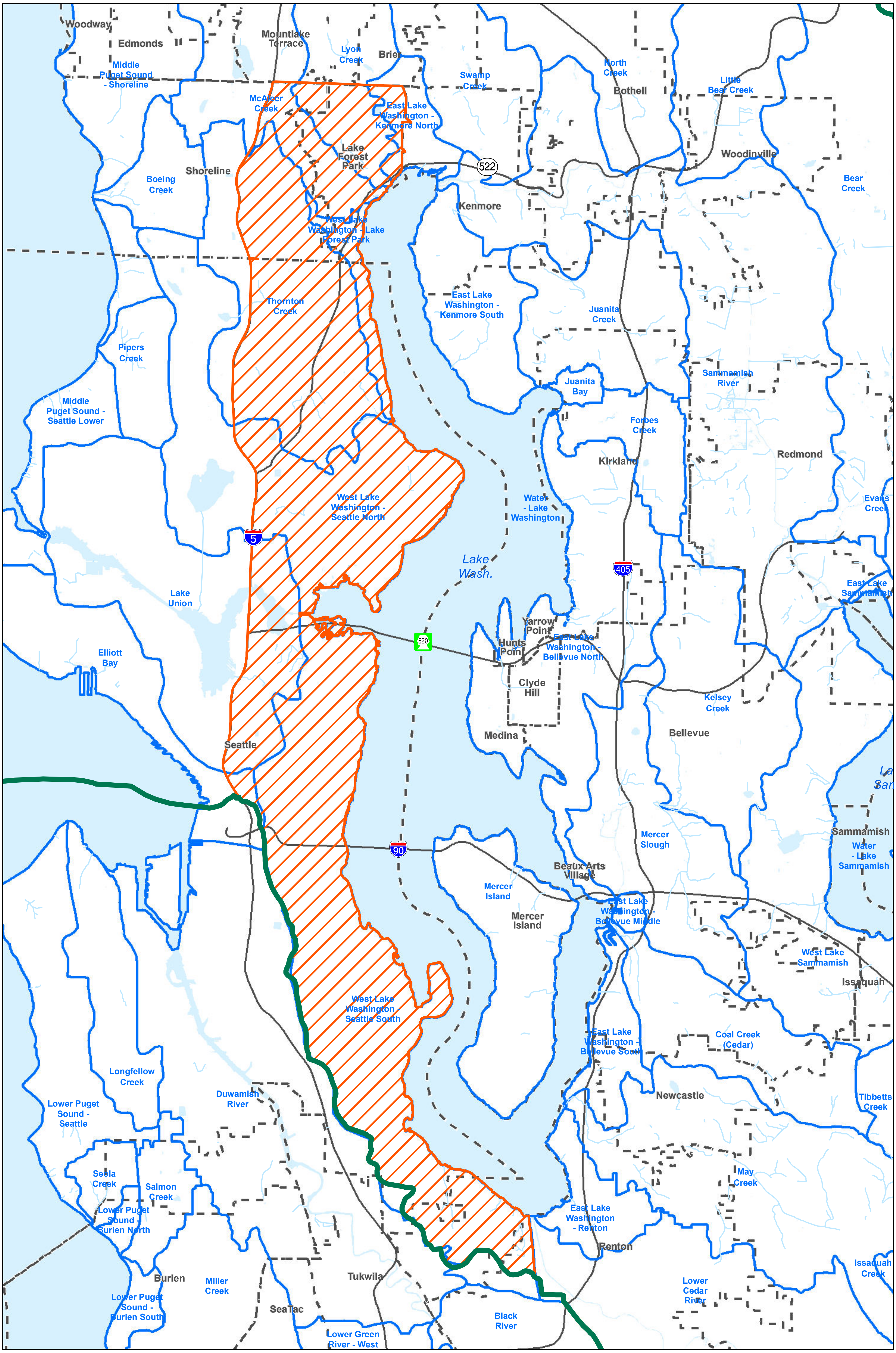

N
0 1 2
Miles

Legend
- Study Area
- Municipal Boundary
- WRIA Boundary
- Watershed Boundary
- Water Body
- Stream

Washington State Department of Transportation

Figure F1: Study Area Map

Potential/Candidate Mitigation Sites
I-5 to Medina: Bridge Replacement and HOV Project

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Input from Agencies, City of Seattle, and University of Washington

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 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 Seattle Parks Department staff and the University of Washington staff through their involvement with the I-5 to Medina: Bridge Replacement and HOV Project. Additional sites were added by biologists on the Mitigation Team with extensive experience in the project area through the I-5 to Medina: Bridge Replacement 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 I-5 to Medina: Bridge Replacement 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.

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 were not completed for the *Initial Wetland mitigation Plan,* but are intended to focus 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 F1.

Table 4. Mitigation Site Selection Summary.

Opportunity/Benefits	Pare 1	Pare 2 Office	Pare 3 Drive by	Pare 4 Site Availability	Pare 5 Field analysis	Verify Selection Final analysis
Potential mitigation type		Retain sites with mitigation types in the following order of preference: 1. Re-establishment and rehabilitation; 2. Creation; 3. Enhancement. Connectivity to other habitat is also desirable.	Verify and resort A-list. Preliminary Pare to 5 best sites. Others to B list		Conduct detailed reconnaissance level analysis for best sites and estimate mitigation credit. Recommend top sites to Mitigation Planning WG for selection and purchase process	Collaborative selection of top sites.
Special characteristics		Desired habitats: Seattle: lacustrine fringe	Verify		Verify	
Location		Must fit with local jurisdictions; Others to B	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	Preliminary contact with owners of best sites. 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 Materials	Review Ecology's Toxics Cleanup Program and UST databases D list cleanup sites and LUST sites		Verify		Visual and informal site check for Hazardous Materials	
Cultural Resources	Check Department of Archaeology and Historic Preservation data. No cultural sites known. Locations with a cultural site present are moved to D list..		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 F2.

Table F2. Pare 1 Criteria and Data Sources

Parameter	Criteria	Information Sources
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

Pare 2 further reduced the sites through opportunity-based parameters. These parameters were potential mitigation type, special characteristics, and location (see Table F3). To analyze these parameters, the Mitigation Team developed composite maps for each of the candidate sites using 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 estimated potential mitigation types (e.g., creation, re-establishment, rehabilitation, enhancement, preservation) for each of the candidate sites based on these composite maps. The Mitigation Team digitized the mitigation types and calculated the corresponding areas in Arc/Info. The team then used these calculations to estimate the potential mitigation available in the current joint guidance found in *Wetland Mitigation in Washington State – Part 1: Agency Policies and Guidance (Version 1)* (Ecology 2006). The candidate sites were then sorted using the estimated mitigation per site. Candidate sites that met the Pare 2 criteria were used as the basis for the Pare 3 field analysis.

Table F3. Pare 2 Criteria and Data Sources

Parameter	Criteria	Information Sources
Potential mitigation type	Retain sites with mitigation types in the following order of preference: 1. Re-establishment and rehabilitation; 2. Creation; 3. Enhancement. Connectivity to other habitat is also desirable.	Aerial photographs (WSDOT GIS data 2006); digitized information that the Mitigation Team analyzed in Arc/Info
Special characteristics	Desired habitats in Seattle include lacustrine fringe	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 criteria; others to B list.	Aerial photographs (WSDOT GIS data 2006)

Pare 3

After Pare 2, the Mitigation Team evaluated the remaining sites in the field. The intent of the field evaluation was to refine the proposed mitigation types, to note the presence of special characteristics, to verify the location (in this case adjacent land use and regulatory assumptions) and availability, and to identify the presence of reliable sources of hydrology and the absence of obvious hazardous materials or cultural resource issues. All the candidate sites are publicly accessible, so each site was evaluated directly.

Potential mitigation type and sources of hydrology were assessed based on the presence of visibly identifiable characteristics such as existing wetland vegetation (e.g., willow species, soft rush, sedges, etc.) and the presence of reliable water sources (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. The presence of special characteristics, current land use on the sites and in the adjoining areas, and the presence of hazardous materials were determined based on visible indicators observed from public rights of way or from aerial photographs. Table F4 lists the criteria and data sources for Pare 3.

Table F4. Pare 3 Criteria and Data Sources

Parameter	Criteria	Information Sources
Potential mitigation type	Consistent with proposed mapping from Pare 2.	Pare 2 GIS analysis; field data sheets
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; field data sheets
Hazardous materials	Confirm absence of materials sources on-site.	Field review
Cultural resources	Confirm absence of cultural resources on-site.	Field review

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.

Pare 4

Pare 4 was not completed for the *Initial Wetland Mitigation Plan* (WSDOT 2009). Pare 4 was intended to assess the potential for risk due to the loss of the site. The results of this pare would be based on preliminary contact with the owner (or owners) of the top 5 candidate sites. Evaluation criteria include the ability to obtain right of entry and the willingness of the owners to sell the candidate site. If the Mitigation Team is unable to obtain right of entry or the owner is unwilling to sell, the candidate site will be moved to the B list. If less than five sites remain at the end of Pare 4, the Mitigation Team will move up the top sites from the A list for right of entry contact.

Pare 5

Pare 5 was not completed for the *Initial Wetland Mitigation Plan* (WSDOT 2009). This pare consisted of a detailed on-site analysis of the top sites, up to a maximum of 15. Evaluation would include assessment of both opportunities and risks (see Table F5 for criteria and data sources). The Mitigation Team would present 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 Steinmetz (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 F5. 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 would also include an assessment of site habitat functions, ability to produce specific aquatic and hydrologic regimes, and potential construction techniques needed to achieve mitigation, along with relative costs and feasibility.

1.3 Results

The initial list of sites was quite limited due to the heavily developed nature of the study area. Most of the available sites are publicly owned, either by the City of Seattle Parks or by the University of Washington. The initial site list included 11 sites in the vicinity of Seattle; 7 of the sites are lacustrine, 3 are primarily riverine, and 1 is primarily palustrine depressional. This initial candidate list and supporting information has been retained, and additional sites can be added to the list for consideration at any time.

1.3.1. Pare 1

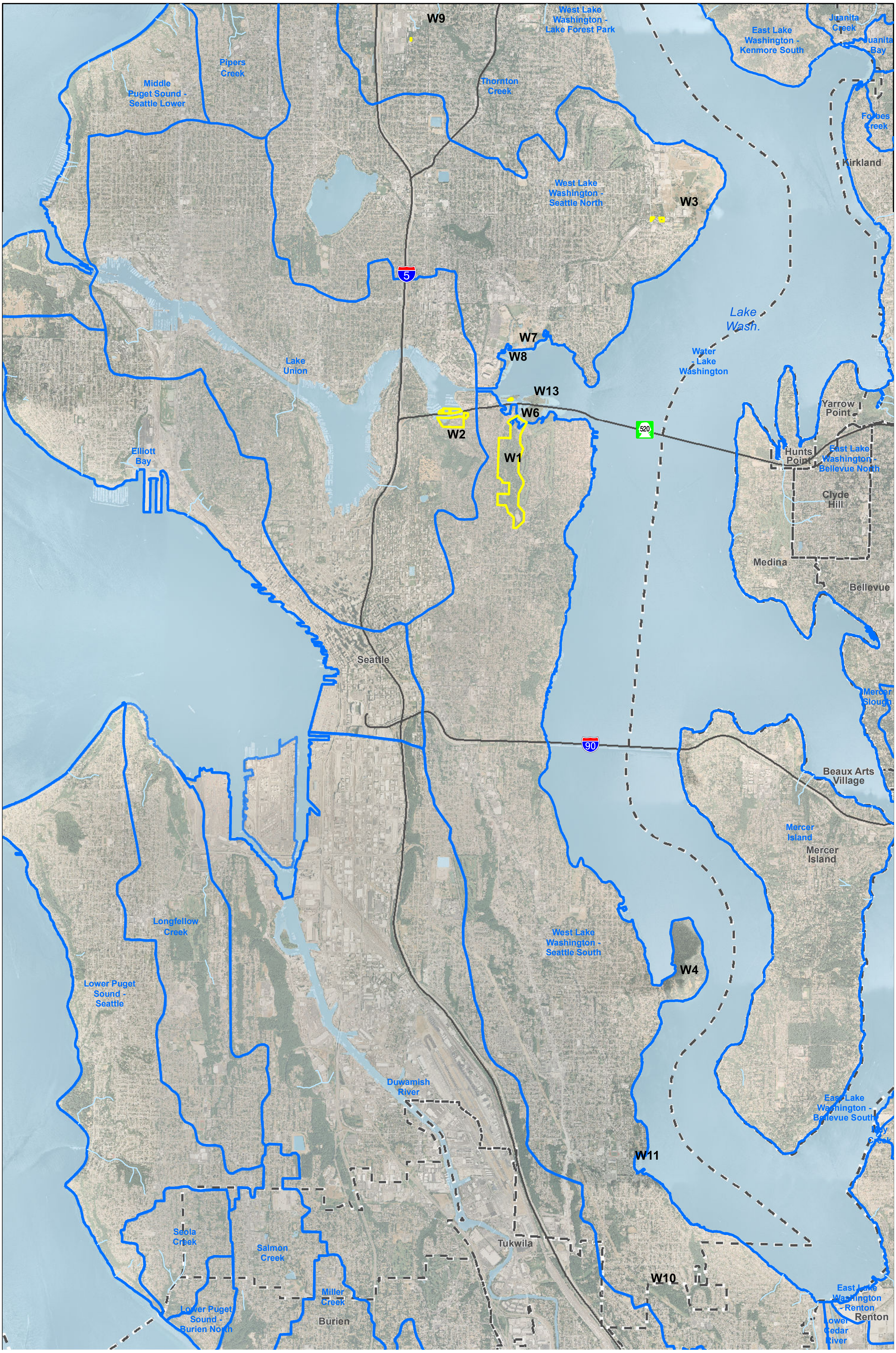
During Pare 1, the Mitigation Team evaluated the 11 candidate sites from the initial list. Two candidate sites (W2 – Montlake Playfield and W7 University of Washington Union Bay Natural Area) failed the hazardous materials portion of Pare 1 because they are listed in the hazardous materials site database. However, the Mitigation Team felt that the risks at these sites could be managed during the design process. The W7 site was specifically identified for potential mitigation by the University of Washington and has successfully been used by the University as a demonstration wetland restoration project. This indicates that despite the limitations, the site has the potential to successfully provide mitigation. As a result, both sites will continue through the paring process.

Three sites (Sites W1 - Washington Park Arboretum, W6 – WSDOT Owned Peninsula, and W13- Foster Island) have cultural sites present. The consensus of the team was that these risks can also be managed during the design process. As a result, no sites were eliminated due to the presence of cultural resources.

All 11 sites remained for further consideration at the end of Pare 1. The 11 sites are shown in Figure F2, and descriptions are provided in the Pare 1 List.

1.3.2. Pare 2

The Mitigation Team evaluated the 11 candidate sites using the Pare 2 criteria, and retained all of the sites. Since no sites were removed during Pare 1, the reader is again referred to Figure 2, which shows all 11 sites. Site details are listed in the Pare 2 list.



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Legend
- Candidate Site
- Municipal Boundary
- Watershed Boundary
- Water Body
- Stream

Washington State Department of Transportation

Figure F2: Results of Pare 1 and 2

Potential/Candidate Mitigation Sites
I-5 to Medina: Bridge Replacement and HOV Project

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1.3.3. Pare 3

The Mitigation Team visited the 11 candidate sites on June 24, July 1, and July 7, 2009. All of the candidate sites were publicly accessible, so members of the Mitigation Team were able to directly access the areas and evaluate the potential on each site. Formal wetland delineations were not performed for these sites and no formal soil, vegetation, or hydrology sample plots were taken. Ecology wetland rating forms and Wetland Mitigation Site Evaluation Matrix forms were completed for each site. Following the in-office analysis of the information from the field evaluation, one site (W3) was moved to the B List because the current mitigation activities on-site have utilized much of the mitigation potential at the site. Mitigation opportunities at several other sites were either expanded or reduced based on the conditions observed in the field.

The 10 sites retained after Pare 3 are shown in Figure F3. These sites include:

- Site W1: Washington Park Arboretum
- Site W2: Montlake Playfield
- Site W4: Seward Park
- Site W6: WSDOT-Owned Peninsula
- Site W7and W8: University of Washington Union Bay Natural Area and Shoreline Wetland
- Site W9: Headwaters of Thornton Creek South Fork
- Site W10: Headwaters of Taylor Creek
- Site W11: Mapes Creek Shoreline Restoration
- Site W13: Foster Island Shoreline Restoration

A discussion of each of these sites was provided to regulatory agencies in the *Medina to SR 202: Eastside Transit and HOV Project Initial Wetland Mitigation Report* (WSDOT 2009).

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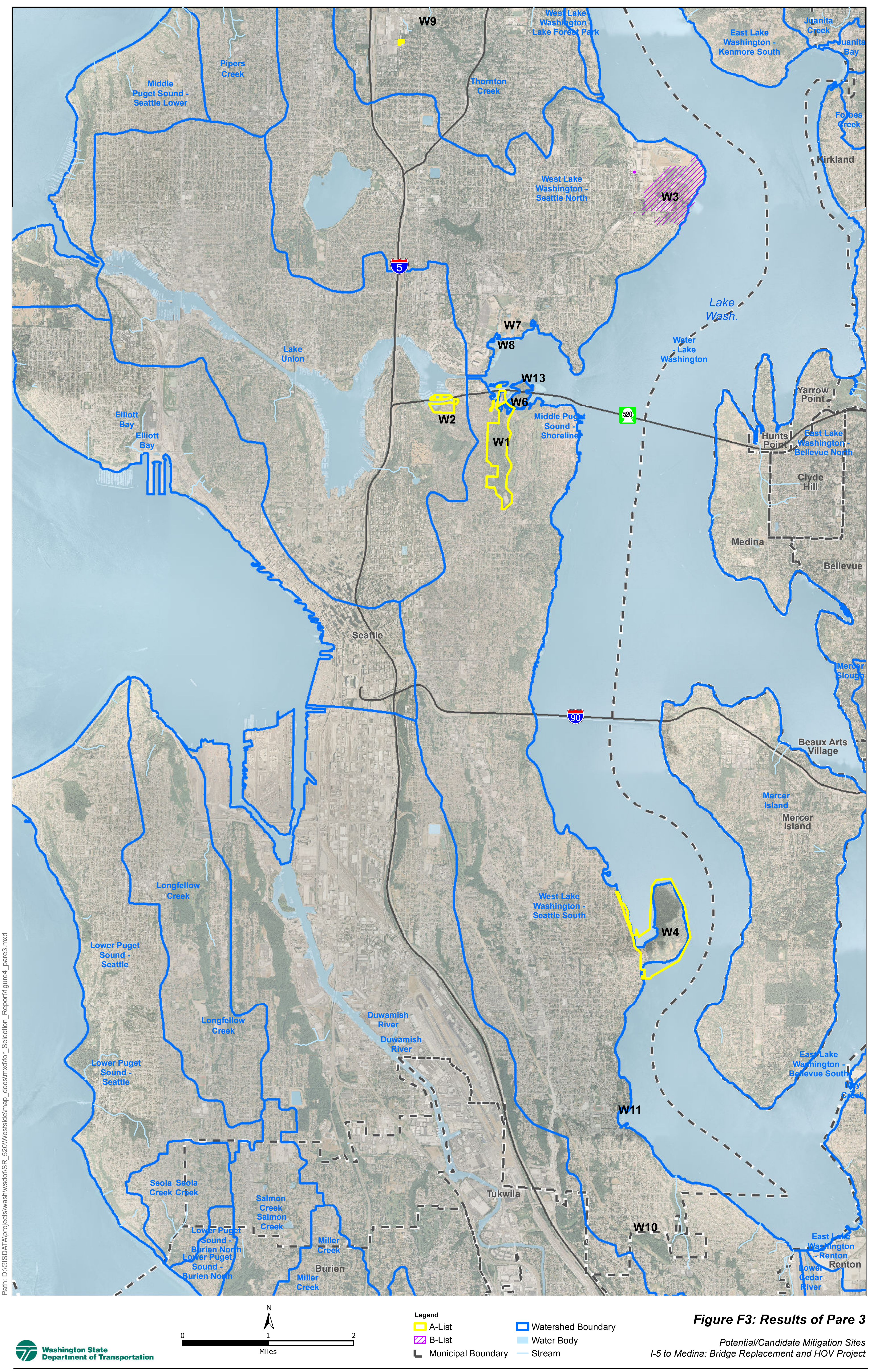

Figure F3: Results of Pare 3

Potential/Candidate Mitigation Sites
I-5 to Medina: Bridge Replacement and HOV Project

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1.3.4. Pare 4

Although Pare 4 was not completed for the *Initial Wetland Mitigation Plan* (WSDOT, 2009), no sites were eliminated due to acquisition limitations, since all of the sites listed would be constructed jointly with the owners, all of which area public agencies or utilities.

1.3.5. Pare 5

Pare 5 was not completed for the *Initial Wetland Mitigation Plan* (WSDOT, 2009). No sites were eliminated from consideration based on costs of the site or the potential for mitigation.

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1.4 Mitigation Site Selection

In the time between the submittal of the *Initial Wetland Mitigation Plan* (October 2009) and the development of the *Draft Wetland Mitigation Plan* (WSDOT February 2011), the wetland impacts from the I-5 to Medina: Bridge Replacement and HOV Project were refined, the concepts for the 10 sites from the sorting and paring process were advanced and revised, and input from the NRTWG members and comments from agency staff and stakeholders was incorporated into the mitigation concept. Based on the advances in project design, a refined understanding of the project's wetland impacts and mitigation needs, and limitations at the proposed mitigation sites, the compensatory mitigation proposed for the project was revised. From the list of 10 sites remaining after the pare 5, three sites were retained. These sites are:

- Site W1: Washington Park Arboretum (retained to meet ESBB 6392, but there is no suitable wetland mitigation credit available at the site)
- Site W6: WSDOT-Owned Peninsula
- Site W7 and W8: University of Washington Union Bay Natural Area and Shoreline Wetland (W7 was combined the northern portion of W8 and retained as one site)

The following six sites were dropped due to limited potential for suitable mitigation activities

- Site W2: Montlake Playfield
- Site W4: Seward Park (retained for aquatic plan)
- Site W9: Headwaters of Thornton Creek South Fork
- Site W10: Headwaters of Taylor Creek
- Site W11: Mapes Creek Shoreline Restoration
- Site W13: Foster Island Shoreline Restoration

Two new sites were added based on comments from agencies and other NRTWG members. The two new sites are:

- Magnusson Park (added to meet local mitigation requirements and provide additional compensatory wetland mitigation)

- Elliott Bridge Reach (a joint aquatic and wetland mitigation site, added to address watershed needs and provide additional compensatory wetland mitigation)

The addition of these 2 sites brings the total number of compensatory wetland mitigation sites to five.

The primary factors in recommending the five proposed mitigation sites include:

- Identification of suitable mitigation opportunities at the sites that meet watershed goals
- Previous identification of the sites as suitable for wetland mitigation
- The larger size of the parcels provides suitable area for the mitigation needs at applicable ratios
- Potential for mitigation that will realize benefits to multiple habitat types (e.g. wetlands and streams).
- Location and landscape position of the site
- Feasibility of construction at the site
- Presence of a suitable source of wetland hydrology
- Willingness of current owners to allow WSDOT to the 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 six 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

Appendix G –Errata Page List

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Washington State Department of Transportation

SR 520 Bridge Replacement and HOV Program

I-5 to Medina: Bridge Replacement and HOV Project

Document Name: SR 520 Bridge Replacement and HOV Project JARPA Comments

Document Lead:

Comment Source: Final Wetland Plan (FWMP)

Comment No.	Comment Reference	Document and Page Reference	Line No. (if applicable)	Comment	Remarks	Included in Errata	Errata Replacement Sheet(s)
1	Ecology	Page iv	lines 19-21	"final mitigation proposed…" Please remove this sentence.	Removed	✓	FWMR - i, ii (back)
2	Ecology	Page 21/Page 22	ines 29-32 / lines 1-5	The numbers in the parentheses add up to 2.43 for Cat II perm shade impacts (versus the total shown of 2.48) and 2.44 for Cat III perm shade (versus the total shown of 2.39). Please revise.	2.43 is correct for Category II vs 2.48, this # will be corrected. For Category III, the total is correct. Aquatic areas in parenthesis should read 1.96. This # will be corrected.	✓	FWMR - 21-22
3	Ecology	Page 39	lines 30-31	The numbers in the parentheses add up to 0.24, where the total shown is 0.29.	0.29 acres is the correct total, 0.05 acre Lacustrine aquatic bed will be added to complete the breakdown.	✓	FWMR - 39, 40
4	Ecology	Page 41/Page 43	Line 30/Line 24	Permanent shading should be 4.87, not 4.84.	These #'s will be corrected.	✓	FWMR - 41 - 44
5	Ecology	Page 72 also p iv.	Table 9	Wetland establishment of UBNA and Magnuson Park add up to 6.96 acres versus the 7.03 acres shown on Page iv, line 7. Also, the total adds up to 9.21 acres in Table 9 versus 9.28 acres on Page iv.	Table 9 is correct. Page iv (7.03 acres) will be corrected to 6.96 acres.	✓	FWMR - iii (front), iv
6	Ecology	Page 87	L. 9 & 10	"As additional hydrologic data become available, this information will be used to revised the grading plan and will be incorporated into PS&E for the site." Hydrology for this site is already known. Please remove this sentence.	Sentence will be removed.	✓	FWMR - 87, 88 (back)
7	Ecology	Page 89	Line 2	"Emergent planting areas are shown in Appendix E." No specific emergent planting areas shown in the planting plan in Appendix E.	Sentence will be removed - emergent species are to be planted on the water line along with live stakes. E-9 has also been revised to show waterline plantings.	✓	FWMR - 89, 90 (back), E-9
8	Ecology	Page 89	Lines 7&8	"Additional modifications to the species selected may be made as additional site design information (particularly hydrology data) becomes available. Please remove "hydrology data."	Sentence will be revised for clarity. Additional analysis of hydrology will be conducted during advanced design phases and will inform final species selection.	✓	FWMR - 89, 90 (back), E-9
9	Ecology	Page 114	Lines 24-26	"As more complete hydrologic data becomes available, this information will be used for PS&E". No hydrologic information data is being collected at this time, so please remove.	Sentence will be removed.	✓	FWMR - 113 (front), 114
11	Ecology	Appendix E	Figure E-5	Only one of the two section cut lines shown from Figure E-2.	The East/west cut doesn't show the extent of earth moving well, so it was replaced with the north to south section. The E/W section cut will be removed from E-2.	✓	FWMR - E-2+back
12	Ecology	Page 72	Table 9/Figure 8	Magnuson Park is shown as having 4.67 acres of wetland establishment, and 2.44 acres of wetland rehabilitation. Figure 8 shows 4.74 acres of wetland establishment and 2.61 acres of wetland rehabilitation. Please revise Figure 8.	The figures you quote from the text are correct. A revised figure has been provided.	✓	FWMR - 133, 134 (back)
13	Ecology	Pgs 149 & 150	Table 22	Various places in the table have 5.26 acres of wetland instead of 5.09 acres.	Areas for these functional descriptions will be corrected to 5.09.	✓	FWMR - 149, 150
14	Ecology	Page 152	Several	Three "5.26" on this page should be changed to "5.09."	Areas for these functional descriptions will be corrected to 5.09.	✓	FWMR - 151 (front), 152
15	Ecology			Please provide the final grading plan that includes hydrologic and stream flow data once it is available for the Elliot Bridge Reach Mitigation Site.	The grading design will be provided during advanced phases of PS&E.		
16	Ecology	Pages 183-184		Please specify which sites will have distinct emergent habitats. Currently only the UBNA and Magnuson Park sites have defined emergent wetland planting areas on the planting plans. Please clearly state in the Wetland Vegetation section on page 183 that the emergent habitats performance standards are only for the UBNA and Magnuson Park. If this standard is also meant for the WSDOT and Elliot sites, they need defined emergent areas on their planting plans.	Will revise text to note that emergent (P183 L 17) performance criteria pertain only to UBNA and Magnuson.	✓	FWMR 183, 184 (back)
17	Ecology	Pages 184-185		The species diversity performance standards don't make sense to me. How will native plant species increase after Year 0 (as-built)? Please explain. This performance standard was not in the August 2011 version of the report.	The purpose of Year 0 is to establish the existing species compositioin prior to the construction. The definition of Year 0 will be added to the description of the performance standards.	✓	FWMR - 185, 186 (back)

Washington State Department of Transportation

SR 520 Bridge Replacement and HOV Program

I-5 to Medina: Bridge Replacement and HOV Project

Document Name:	SR 520 Bridge Replacement and HOV Project JARPA Comments
Document Lead:	
Comment Source:	Final Wetland Plan (FWMP)

Comment No.	Comment Reference	Document and Page Reference	Line No. (if applicable)	Comment	Response	Included in Erratta	Erratta Replacement Sheet(s)
1	Corps	FWMR - i	4th par.	This paragraph needs to be updated to reflect the selection of the preferred alternative and the issuance of the Record of Decision.	The FWMP will be revised to read: This mitigation plan is based on the preferred alternative identified in the Final EIS; thus, it presents the design and impacts associated with the preferred alternative. A formal decision on the selected alternative was described in the Record of Decision (ROD), issued in August 2011.	✓	FWMR i, ii (back)
2	Corps	FWMR - 11	Fig. 2	Thank you for adding the project delivery schedule by design phase. This partially fulfills comment #4 in the previous comment letter dated September 13, 2011. Please add what the wetland and aquatic impacts will be per design phase.	The impacts by project delivery schedule detailed in Figure 2 will be incorporated into Table 1 of the Final Wetland Mitigation Report with clarifying language added to correlate the impacts to the project delivery phase. An analogous table will replace the existing Table 6-16 in the Final Aquatic Mitigation Plan.	✓	FWMP 23-26, edits on 24-25
3	Corps	FWMR - 25	Table 1	The permanent wetland fill impact shown for Wetland LWS-4A is 0.02 acre, while Sheet 3 of the permit drawings has 0.03 acre. Please revise the document with the incorrect number.	Sheet 3 has been revised to reflect the correct impact number of 0.02 acre. Short term temporary imapcts were also clarified.	✓	FWMR 31-34
6	Corps	FWMR - 133	Fig. 8	The buffer along the west edge of Wetland K1/K2 and Wetland K3 may be reduced by to 55 feet using buffer width averaging. If a 55-foot buffer is not feasible, a paper buffer will need to be provided. Please revise Figure 8 and the text as needed.	Road removal will be extended to the north to provide the 55-foot buffer around the NW edge of Wetland K1/K2. Concept figure will be updated to refelct this change. The buffer for Wetland K3 extends into the adjacent Seattle Parks mitigation site. The Parks mitigation site will provide adequate buffer functions for Wetland K3.	✓	FWMR - 69 (total buffer area), 70, 71, 72 (Table 9), 133, 134 (back)
7	Corps	FWMR - 133	Fig. 8	Comment #39 in the previous comment letter dated September 13, 2011, requested the culvert that will convey flows from Wetland J1 to the wetland establishment area contiguous with Wetland K1/K2 be shown on Figure 8. The culvert was added to Figure E-3. Unfortunately Figure E-3 does not show the wetland establishment area. Please add the culvert to Figure 8.	The culvert locations (shown as blue flow arrows) will be confirmed and further clarity will be provided in the associated call-outs.	✓	FWMR - 133 134 (back)
8	Corps	FWMR - 139	2nd par.	The text mentions Wetland J1. Figure 8 does not show a Wetland J1. Please revise Figure 8 or the text to reflect the correct wetland name.	Figure 8 will be revised to show wetland J1.	✓	FWMR - 133 134 (back)
10	Corps	FWMR - 140	line 21	Please add the existing culvert to Figure 8.	The culvert locations (shown as blue flow arrows) will be confirmed and further clarity will be provided in the associated call-outs.	✓	FWMR - 133 134 (back)
11	Corps	FWMR - 140	line 22	Please identify where the existing bunkers are located on Figure 8.	Figure 8 will be revised to show the existing bunker locations.	✓	FWMR - 133 134 (back)
13	Corps	FWMR - 183 FWMR - 184	Wetland Vegetation Performance Standards	The emergent vegetation standards are a lower percent cover than what was proposed in the draft wetland mitigation report. Please change the emergent vegetation performance standard back to what was presented in the draft wetland mitigation report.	This performance standard has been revised based on discussions from USACE.	✓	FWMR - 183 FWMR - 184

14	Corps	FWMR - 185	line 3	Does the Year 0 performance standard count the baseline conditions or the as-built conditions? If it reflects the as-built conditions, is achieving this performance standard based on natural recruitment? Please revise the Year 0 performance standard or the preceding paragraph on page 184 to clarify how this performance standard will be monitored.	The purpose of Year 0 is to establish the existing species composition prior to the construction. The definition of Year 0 will be added to the description of the performance standards. The subsequent performance standards would include both planted materials and natural recruitment.	✓	FWMR - 185, 186 (back)
15	Corps	FWMR - Figures	Figures E-8 & E-9	A 10-foot inner buffer is shown on each of these planting plans. Tables 12 and 16 in the text do not have an inner buffer plant assemblage. These planting plans also do not show the emergent and water's edge wetland enhancement plantings proposed in Tables 12 and 16. Please review the tables and/or figures so that they match.	The denser interior plantings are shown on the buffer planting lists Tables 13 and 17. Figure E-8 had been revised to clarify the location of the water's edge planting area. Emergent plantings are shown in Figure E-9 as a single, diagonal hatch. E-9 has also been revised to show the water's edge planting on Lake Washington.	✓	Figures E-8 & E-9