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 0.23 acre of temporary fill in wetlands in the form of steel pilings for all areas of the project, and temporary fill for drilled shafts in Portage Bay. 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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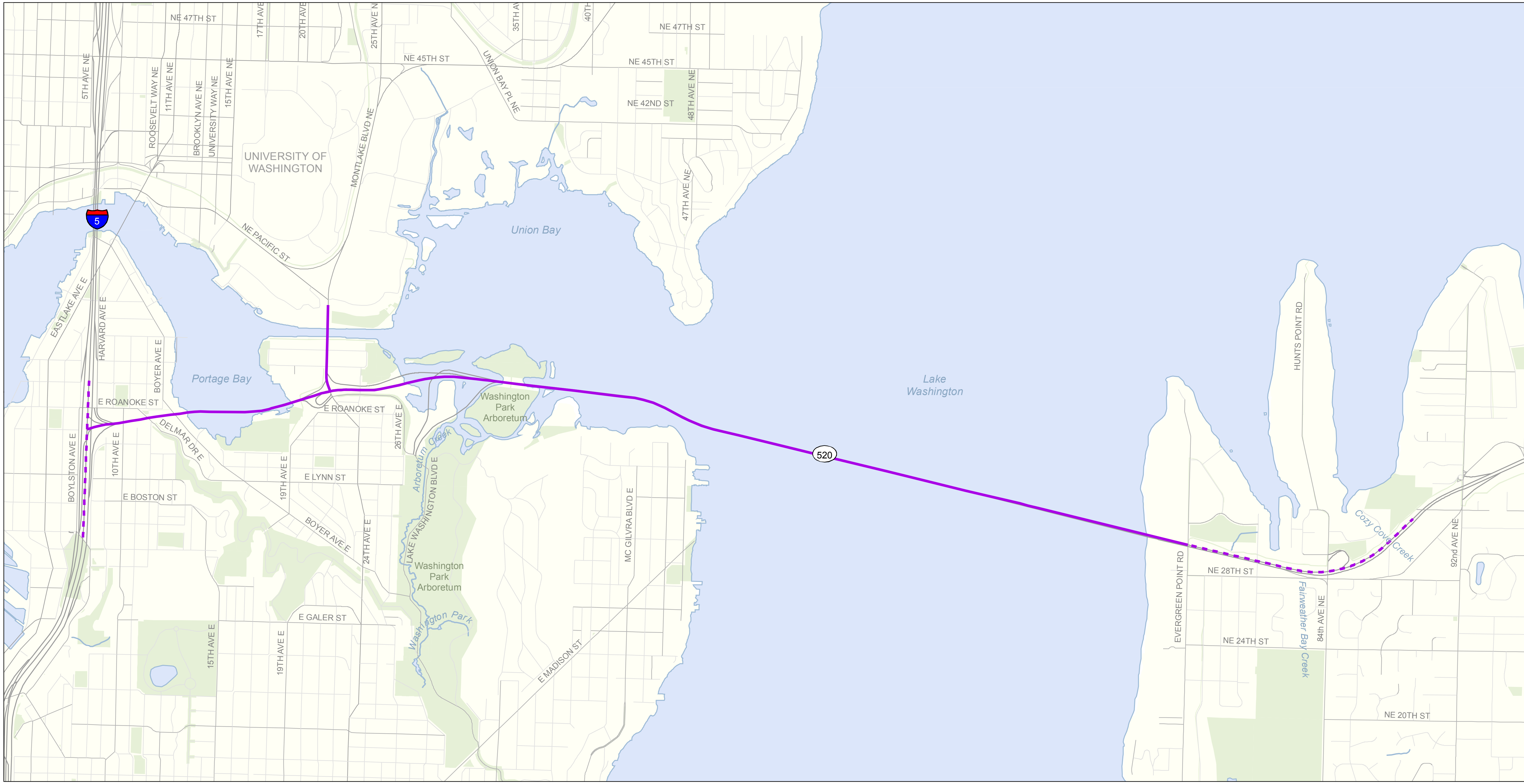

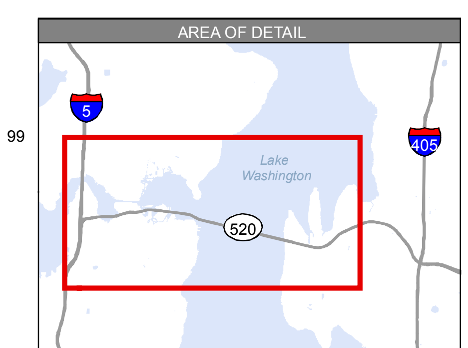

Project Extent

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.

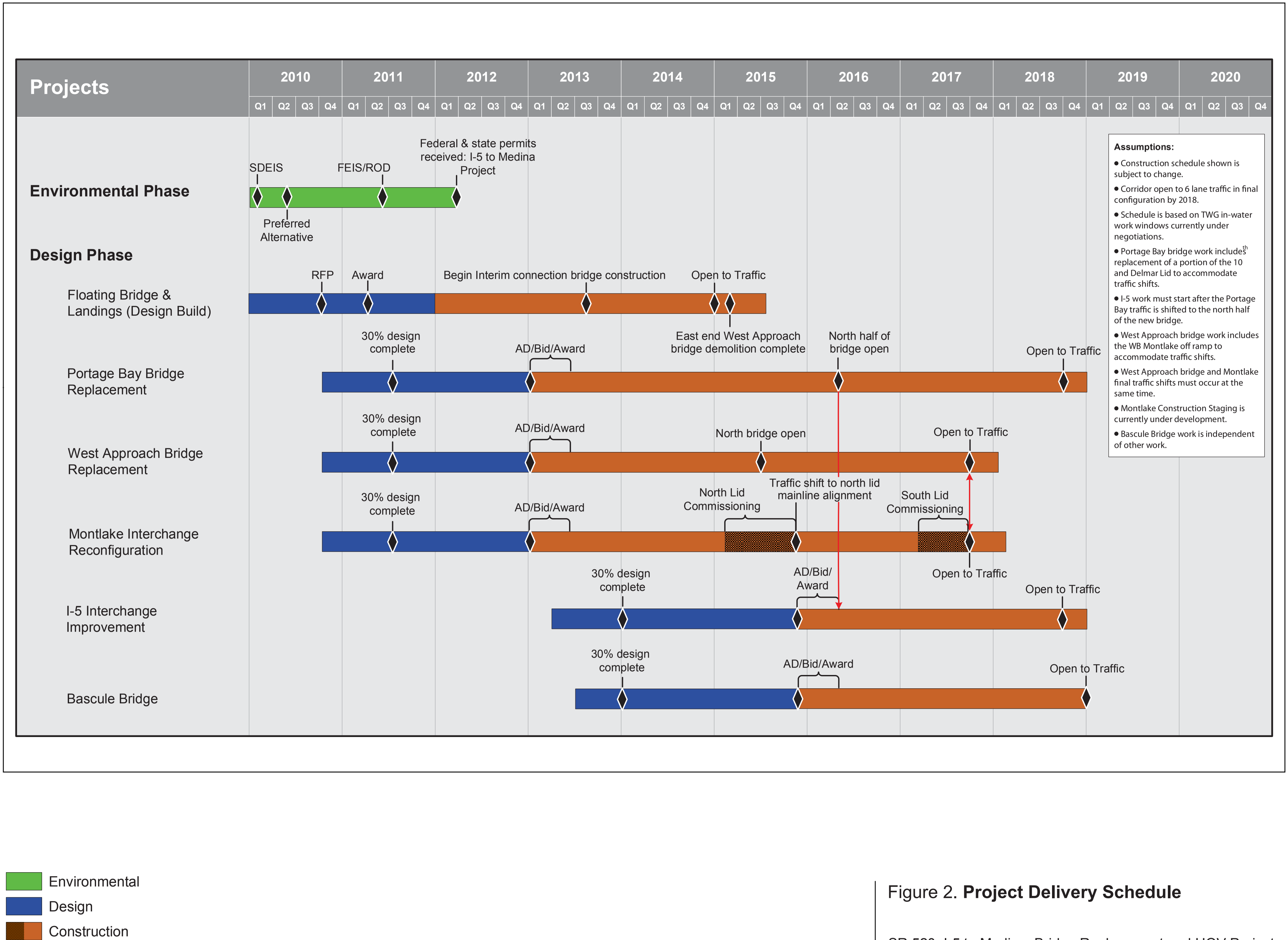

Figure 2. **Project Delivery Schedule**

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		
	Cowardin[b]	HGM[c]	Ecology[c]	Seattle[d]		Fill	Shading	Percent Affected	Fill[g]	Clearing	Shading[h]
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	0.08	1.25	1.23
Subtotal, Portage Bay Bridge Replacement						**0.13**	**0.54**		**0.08**	**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	0.04	0.32	1.01
LWN-2	L2AB, PEM, PSS, PFO	Lake Fringe	III	III	3.02	0.02	0.81	27.48	0.01	0.01	0.10
LWN-3	L2AB, PEM, PSS	Lake Fringe	III	III	7.10	0.01	1.05	14.93	0.03	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	0.03	0.06	1.20
LWS-3	L2AB, PEM PSS, PFO	Lake Fringe	II	II	15.22	0.005	0.53	3.52	0.02	0.16	0.73

Wetland[a]	Wetland Classification				Wetland Size (acres)	Wetland Impact Areas[e,f] (acres)					
						Permanent Impact			Temporary		
	Cowardin[b]	HGM[c]	Ecology[c]	Seattle[d]		Fill	Shading	Percent Affected	Fill[g]	Clearing	Shading[h]
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	0.03	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**		**0.15**	**1.55**	**3.93**
Total Wetland Impacts					137.19	**0.29**	**4.87**		**0.23**	**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 fill shown for the project includes short-term temporary fill impacts. These impacts result from the drilled concrete shafts supporting the temporary expansion of the Portage Bay Bridge, necessary to carry traffic during construction. The short-term temporary fill impacts will occur in twelve locations, approximately 100 square feet each, and total 0.03 acre, all within Wetland PBS-1. The impacts are expected to last less than one year, occur primarily in areas of aquatic vegetation. This aquatic vegetation is expected to naturally re-colonize within the following growing season. As a result, WSDOT is not proposing compensatory mitigation for these areas.

[h] The temporary expansion of the Portage Bay Bridge to carry traffic during construction will also result in 0.44 acre of short-term shading, primarily to aquatic vegetation not shown in Table 1. 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.

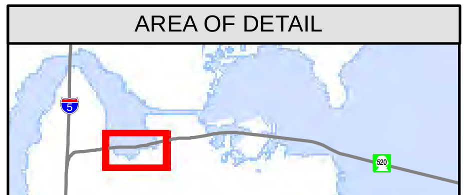
Note: Some of the wetlands shown in this table will not be affected by the project. The information on these wetlands has been included to provide consistency with other project documents, and to show wetlands that were avoided by the project.

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.

AREA OF DETAIL



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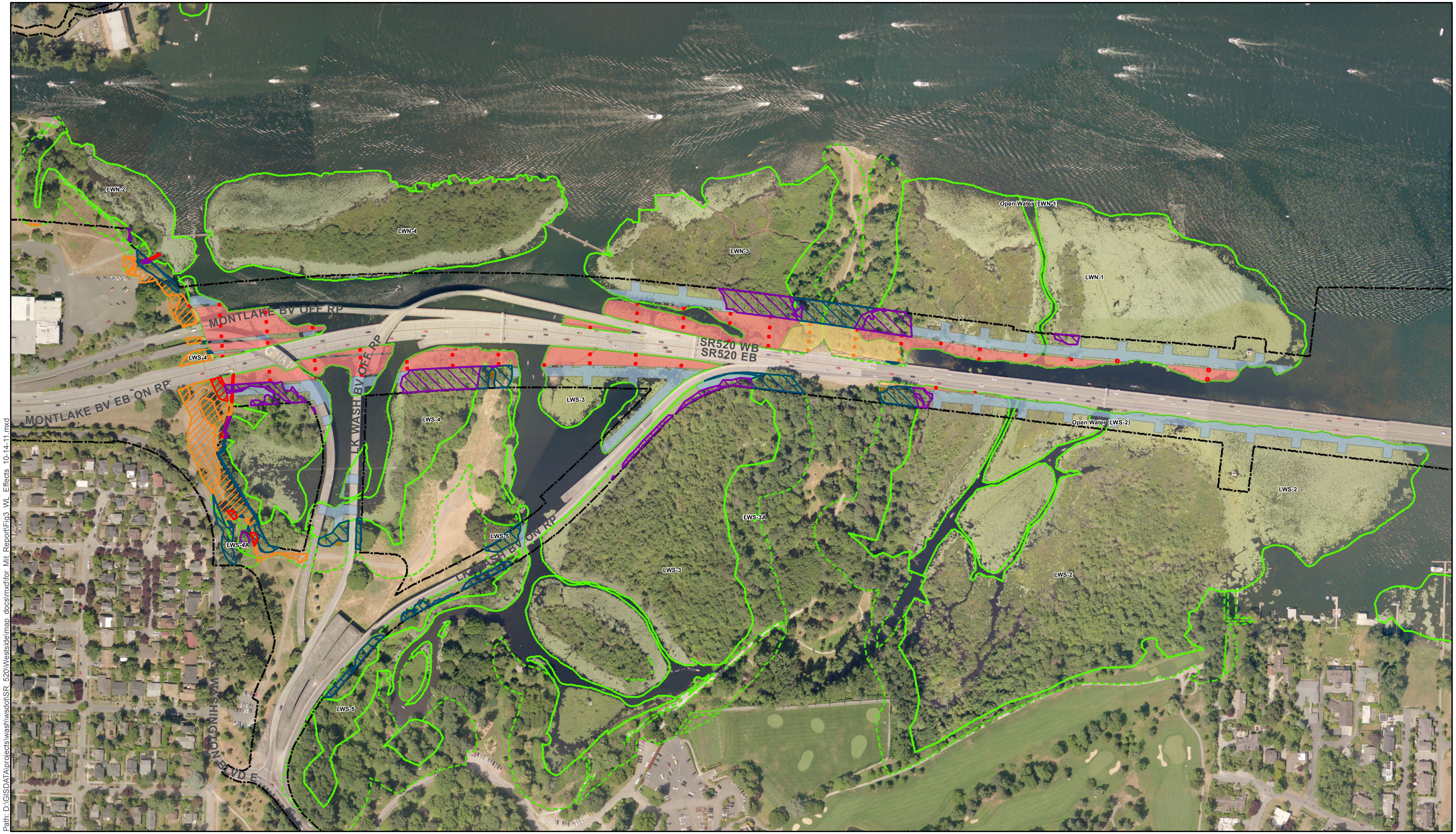
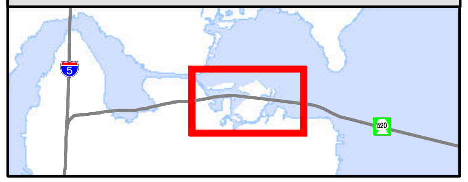


AREA OF DETAIL



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 0.23 acre (Table 1). Of this total, 0.20 acre 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). The remaining 0.03 acre of temporary fill is short-term, and is discussed in Section 3.5.2.

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 includes both temporary fill and temporary shading. The temporary fill result from the drilled concrete shafts to support the temporary bridge expansion. These impacts occur in twelve locations in Wetland PBS-1, and total 0.03 acre. Temporary shading results from the temporary bridge deck, and will affect a total of 0.44 acre of Wetland PBS-1 and PBS-1A.

The affected area for all of the short-term temporary impacts is primarily lacustrine aquatic bed wetland, 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.

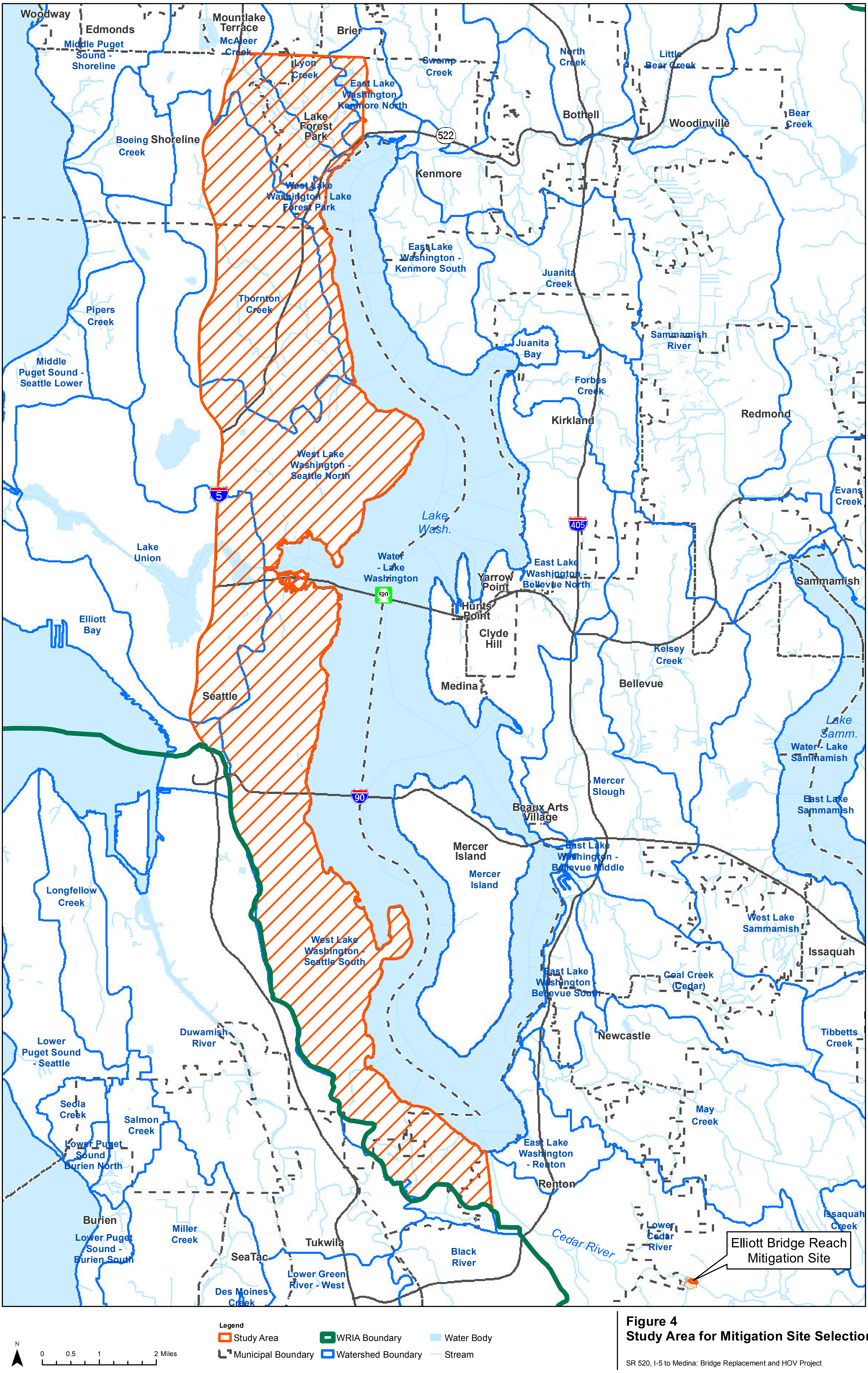

Figure 4
Study Area for Mitigation Site Selection

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), which would require 0.83 acre of wetland establishment, or 1.66 acres of wetland rehabilitation (Tables 6 and 8).
- 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 wetland establishment, or 12.57 acres of rehabilitation (Tables 6 and 8).
- Temporary impacts to wetlands (0.20 fill, 2.82 acres of clearing, and 5.25 acres of shading) in the project area require 8.03 acres of wetland establishment or16.06 acres rehabilitation (Tables 7 and 8), over 50 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

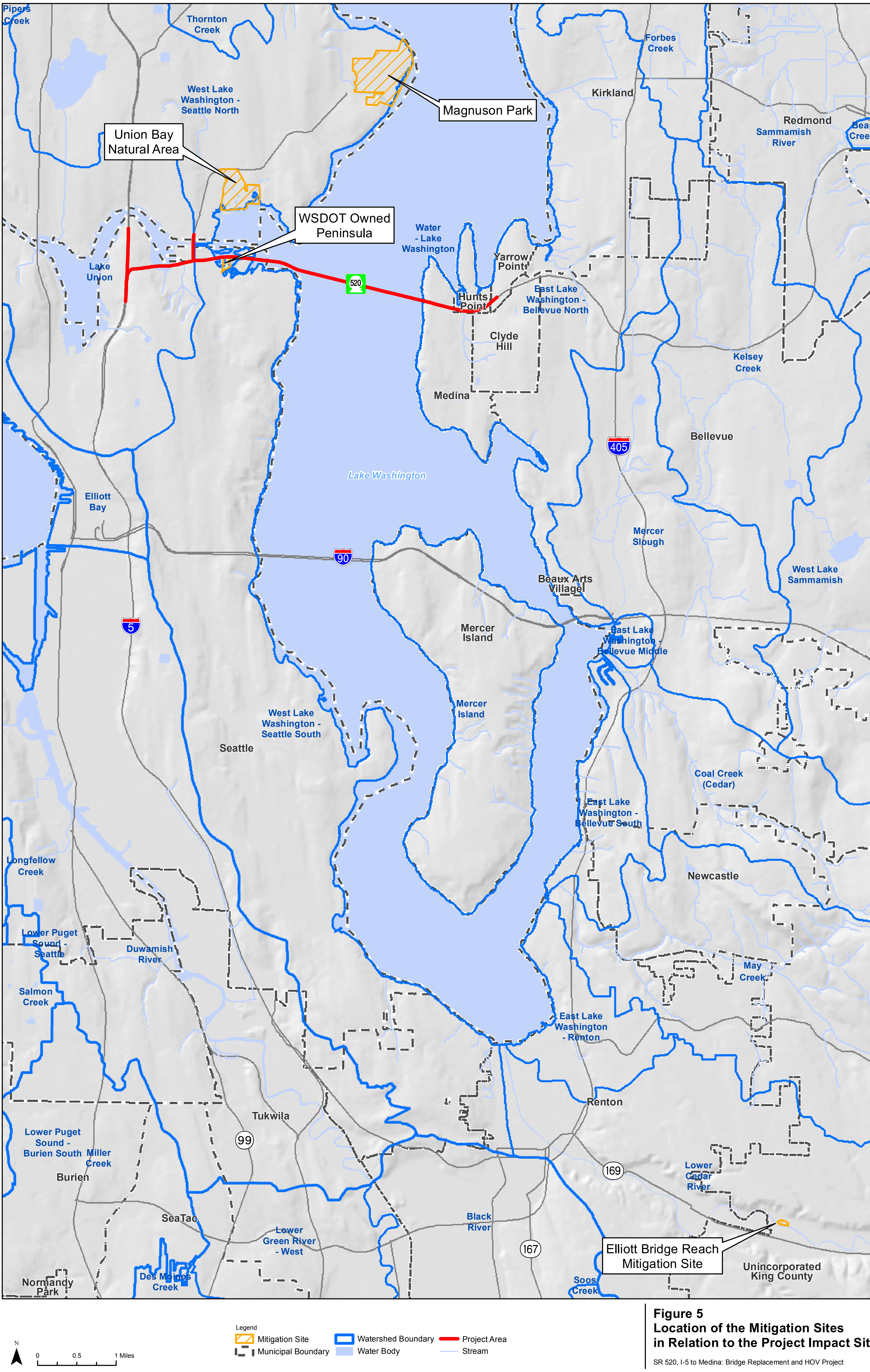

Figure 5
Location of the Mitigation Sites in Relation to the Project Impact Site

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

<table>
<tr><th>Location</th><th colspan="2">Peninsula on the south shoreline of Union Bay</th></tr>
<tr><td rowspan="10">
WSDOT-Owned Peninsula facing east

WSDOT-Owned Peninsula facing SW</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</td></tr>
<tr><td>Seattle Rating</td><td>II</td></tr>
<tr><td>Seattle Standard Buffer Width</td><td>110 feet</td></tr>
<tr><td>Wetland Size</td><td>6.95 acres (LWS-4)
2.29 acres (LWS-5)</td></tr>
<tr><td>Cowardin Classification</td><td>PFO, PEM, L2AB</td></tr>
<tr><td>HGM Classification</td><td>Lake Fringe</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>16 (LWS-4)/20 (LWS-5)
12 (LWS-4)/12 (LWS-5)
26 (LWS-4)/25 (LWS-5)
56 (LWS-4)/57 (LWS-5)</td></tr>
<tr><td>Dominant Vegetation</td><td colspan="2">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.</td></tr>
<tr><td>Soils</td><td colspan="2">Silt loam over loam with redoximorphic features or peat.</td></tr>
<tr><td>Hydrology</td><td colspan="2">Lake Washington</td></tr>
<tr><td>Rationale for Local Rating</td><td colspan="2">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.</td></tr>
</table>

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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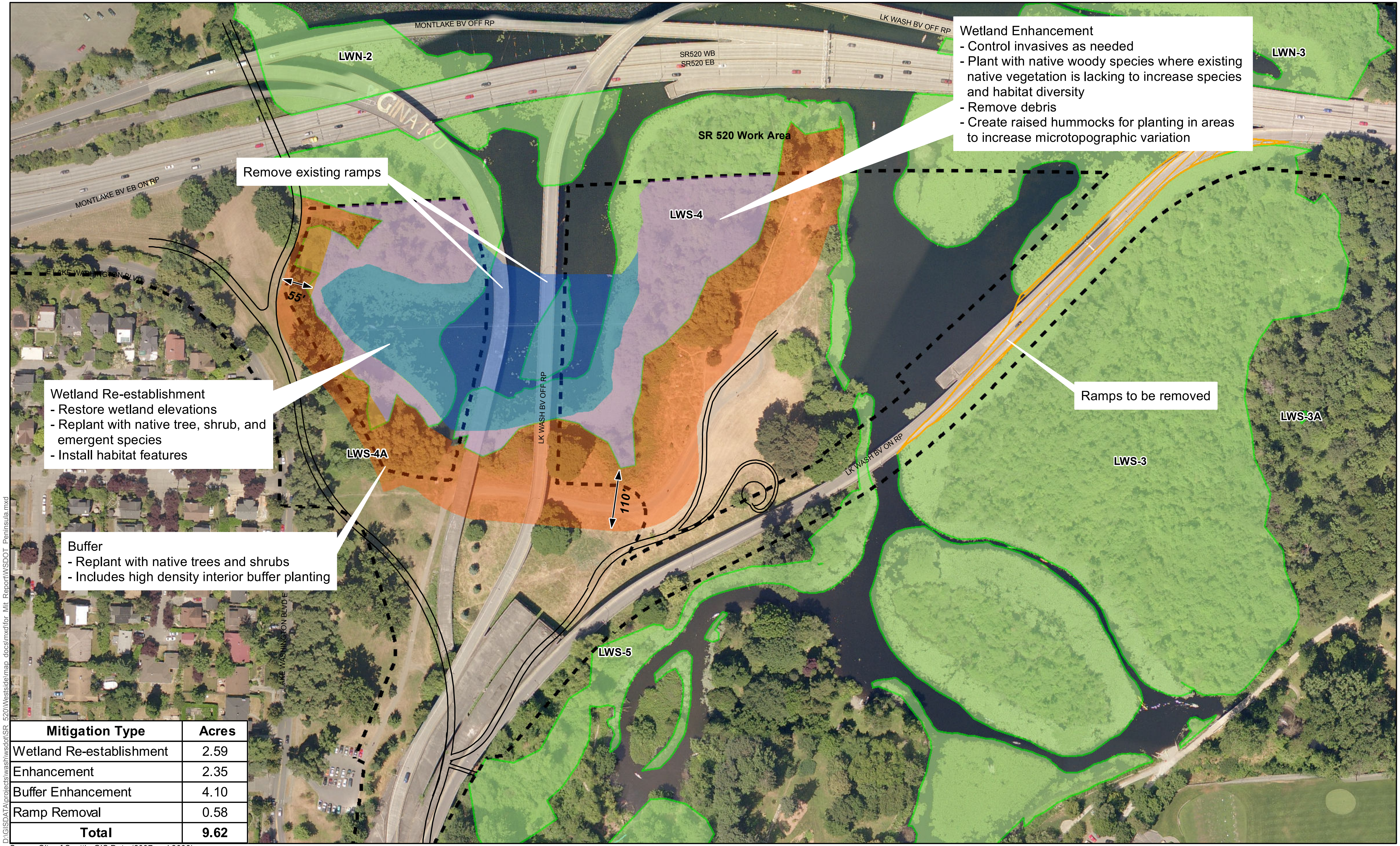

Mitigation Type	Acres
Wetland Re-establishment	2.59
Enhancement	2.35
Buffer Enhancement	4.10
Ramp Removal	0.58
Total	**9.62**

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

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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

Location	North shoreline of Union Bay	
 Typical enhancement area at UBNA Site	**Local Jurisdiction**	Seattle
	WRIA	WRIA 8
	Ecology Rating (Hruby 2004)	II, III & IV
	Seattle Rating	II, III & IV
	Seattle Standard Buffer Width	150 – 60 feet
	Wetland Size	19.71 acres
	Cowardin Classification	L2AB, PSS, PEM
	HGM Classification	Lake Fringe and Depressional
	Wetland Rating System Pts.	
	Water Quality Score **Hydrologic Score** **Habitat Score** **Total Score**	**See Final Wetland Assessment Report for Rating Scores**
Dominant Vegetation	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.	
Soils	Historic landfill and fill cap.	
Hydrology	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.	
Rationale for Local Rating	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.	

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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