Attachment 9

Conceptual Wetlands Mitigation Plan

Washington State Department of Transportation

SR 520 Bridge Replacement and HOV Program

I-5 to Medina: Bridge Replacement and HOV Project

Conceptual 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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SR 520 Bridge Replacement and HOV Program

I-5 to Medina: Bridge Replacement and HOV Project

Conceptual Wetland Mitigation Report

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

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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 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 has since identified the preferred alternative in a Draft EIS issued in August 2006 for the SR 520 Bridge Replacement and HOV Project. This mitigation plan assumes that WSDOT will select the preferred alternative; thus, it presents the design and impacts associated with the preferred alternative. A formal selection of the preferred alternative will be described in the Final EIS and Record of Decision (ROD) expected in 2011. Construction and operation of the project will impact wetland 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 conceptual 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. These wetlands generally have limited potential for water quality or hydrologic function due to the size of the watershed, and their position in the lower watershed. 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. 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. Note that 0.58 acre of permanent bridge shading will be removed from aquatic bed area in Category II wetlands as the existing on-ramps to SR 520 are removed.

Permanent impacts to buffers include 1.87 acres of permanent fill, and 0.75 acre of permanent shading in wetland buffers.

Temporary impacts of the project will result from the temporary structures necessary to construct the permanent replacement bridge and from clearing for these structures. These temporary impacts will be long-term due to the length of the construction process. The temporary impacts include approximately 0.2 acre of temporary fill in wetlands in the form of steel pilings. Although the final configuration of the temporary bridge pilings will be determined by the contractor, all of this temporary fill will be assumed to occur in Category II wetlands (the highest category wetland in the vicinity). Construction of the project will result in 2.82 acres of temporary clearing. Of these 2.82 acres, 1.14 acres will be in Category II wetlands, 1.66 acres will be in Category III wetlands, and 0.02 acre will be in Category IV wetlands. 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. 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 five locations. Four of the locations are on-site or in close proximity to the project, and one is located off-site. Temporary impacts will be restored on-site, where feasible.

The proposed on-site mitigation will take place at the four mitigation sites near the project corridor. The four sites 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), (3) the Arboretum Creek Mitigation Site (located in the Washington Park Arboretum), and (4) the Magnuson Park Mitigation Site. These four sites will provide the following:

- Establishment of 5.44 acres of palustrine forested and scrub-shrub wetland.
- Re-establishment of 1.68 acres of scrub-shrub wetland.
- Enhancement of 24.47 acres of existing lacustrine and palustrine wetland.
- Enhancement of 24.47 acres of existing disturbed wetland and shoreline buffer.

- Enhancement of 3.46 acres of riparian buffers (may include areas of wetland enhancement and creation).

Off-site mitigation will take place at the Elliott Bridge Reach Mitigation Site in unincorporated King County, Washington. The off-site compensatory mitigation will provide the following:

- Establishment of 2.47 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 riparian/floodplain buffer.

The final mitigation proposal will include wetland establishment, re-establishment, and enhancement, and wetland/buffer enhancement activities that are sufficient to meet federal, state, and local regulatory requirements.

The proposed mitigation sites will be monitored for 10 years. Revegetated temporary impact areas will be monitored for 5 years. Monitoring, contingency, and site management plans are provided in this mitigation report and will be used to adaptively manage the mitigation site.

Table of Contents

Executive Summary i

Chapter 1. Introduction 1

Chapter 2. Proposed Project 7
- *2.1 Location* 7
- *2.2 Purpose and Description* 7
- *2.3 Project Schedule* 10
- *2.4 Responsible Parties* 11

Chapter 3. Wetland Impact Assessment 13
- *3.1 Landscape Setting* 13
- *3.2 Existing Conditions of Wetlands and Buffers to be Impacted* 16
- *3.3 Impact Calculation* 17
- *3.4 Permanent Wetland Impacts* 18
- *3.5 Temporary Wetland Impacts* 29
- *3.6 Wetland Buffer Impacts* 30
- *3.7 Wetland Functions Impacted* 35

Chapter 4. Mitigation Strategy 37
- *4.1 Avoidance and Minimization of Wetland Impacts* 39
- *4.2 Compensatory Mitigation* 42

Chapter 5. Compensatory Mitigation Sites 57
- *5.1 WSDOT-Owned Peninsula Mitigation Site* 61
- *5.2 Union Bay Natural Area Mitigation Site* 77
- *5.3 Arboretum Creek Mitigation Site* 94
- *5.4 Magnuson Park Mitigation Site* 106
- *5.5 Elliott Bridge Reach Mitigation Site* 124

Chapter 6. Mitigation Goals, Objectives, and Performance Criteria 139
- *6.1 Wetland Mitigation Sites* 139
- *6.2 On-Site Temporary Impact Area Revegetation* 146

Chapter 7. Monitoring, Contingency Plan, and Site Management 149
- *7.1 Monitoring* 149
- *7.2 Contingency Plan* 150
- *7.3 Site Management* 152

Chapter 8. References 155

Figures

Figure 1. Project Vicinity Map 5
Figure 2. Effects on Wetlands and Buffers in the Project Corridor (1 of 2) 25
Figure 2. Effects on Wetlands and Buffers in the Project Corridor (2 of 2) 27
Figure 3. Study Area for Mitigation Site Selection 45
Figure 4. Location of the Mitigation Sites in Relation to the Project Impact Site 59
Figure 5. WSDOT-Owned Peninsula Mitigation Concept 67
Figure 6. UBNA Mitigation Concept 87
Figure 7. Arboretum Creek Mitigation Concept 97
Figure 8. Magnuson Park Mitigation Concept 109
Figure 9. Elliott Bridge Reach Mitigation Concept 129

Tables

Table 1. Wetland Size, Classification, and Area Impacted by the Proposed Project 21
Table 2. Permanent Wetland Impact Summary by Classification 23
Table 3. Wetland Buffer Size, Classification, and Area Impacted by the Proposed Project ... 33
Table 4. Functions and Values of the Existing Wetlands* 36
Table 5. Mitigation Needs for Permanent Impacts from SR 520, I-5 to Medina: Bridge Replacement and HOV Project 48
Table 6. Mitigation Needs for Long-Term Temporary Impacts from the SR 520, I-5 to Medina: Bridge Replacement and HOV Project 51
Table 7. Overall Mitigation Needs for the SR 520, I-5 to Medina: Bridge Replacement and HOV Project* 53
Table 8. Proposed Compensatory Mitigation 57
Table 9. WSDOT-Owned Peninsula Mitigation Site Wetland Summary 65
Table 10. Proposed Typical Planting List for Wetland Areas 71
Table 11. Proposed Typical Planting List for Upland Buffer Areas 73
Table 12. Existing and Proposed Wetland Functions at the WSDOT-Owned Peninsula Mitigation Site 75
Table 13. UBNA Mitigation Site Wetland Summary 84
Table 14. Existing and Proposed Wetland Functions at the UBNA Mitigation Site 92
Table 15. Arboretum Creek Mitigation Site Wetland Summary 102
Table 16. Existing and Proposed Wetland Functions at the Arboretum Creek Mitigation Site 105

Table 17. Magnuson Park Mitigation Site Wetland Summary 112
Table 18. Proposed Typical Planting List for Wetland Areas 117
Table 19. Proposed Typical Planting List for Upland Buffer Areas 119
Table 20. Existing and Proposed Wetland Functions at the Magnuson Park Mitigation Site 122
Table 21. Elliott Bridge Reach Mitigation Site Wetland Summary 127
Table 22. Existing and Proposed Wetland Functions at the Elliott Bridge Reach Mitigation Site 136
Table 23. Monitoring Report Recipients 150

Appendices

Appendix A—Wetland Impact Summaries

Appendix B—Mitigation Site Wetland Memoranda

Appendix C—Boring Logs

Appendix D—Hydrology Data

Appendix E—Mitigation Plan Design Sheets

Appendix F—Wetland Rating Forms for Anticipated Site Conditions

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Acronyms and Abbreviations

ABGC	Arboretum and Botanical Garden Committee
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
LIDAR	Light Detection and Ranging
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
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 will result 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 *SR-520, I-5 to Medina: Bridge Replacement and HOV Project Conceptual Aquatic Mitigation Plan* (WSDOT 2010a), has been prepared to discuss aquatic impacts resulting from this project and mitigation for those impacts. For the purposes of this Conceptual 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).
- 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), 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), 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 mitigation needs. 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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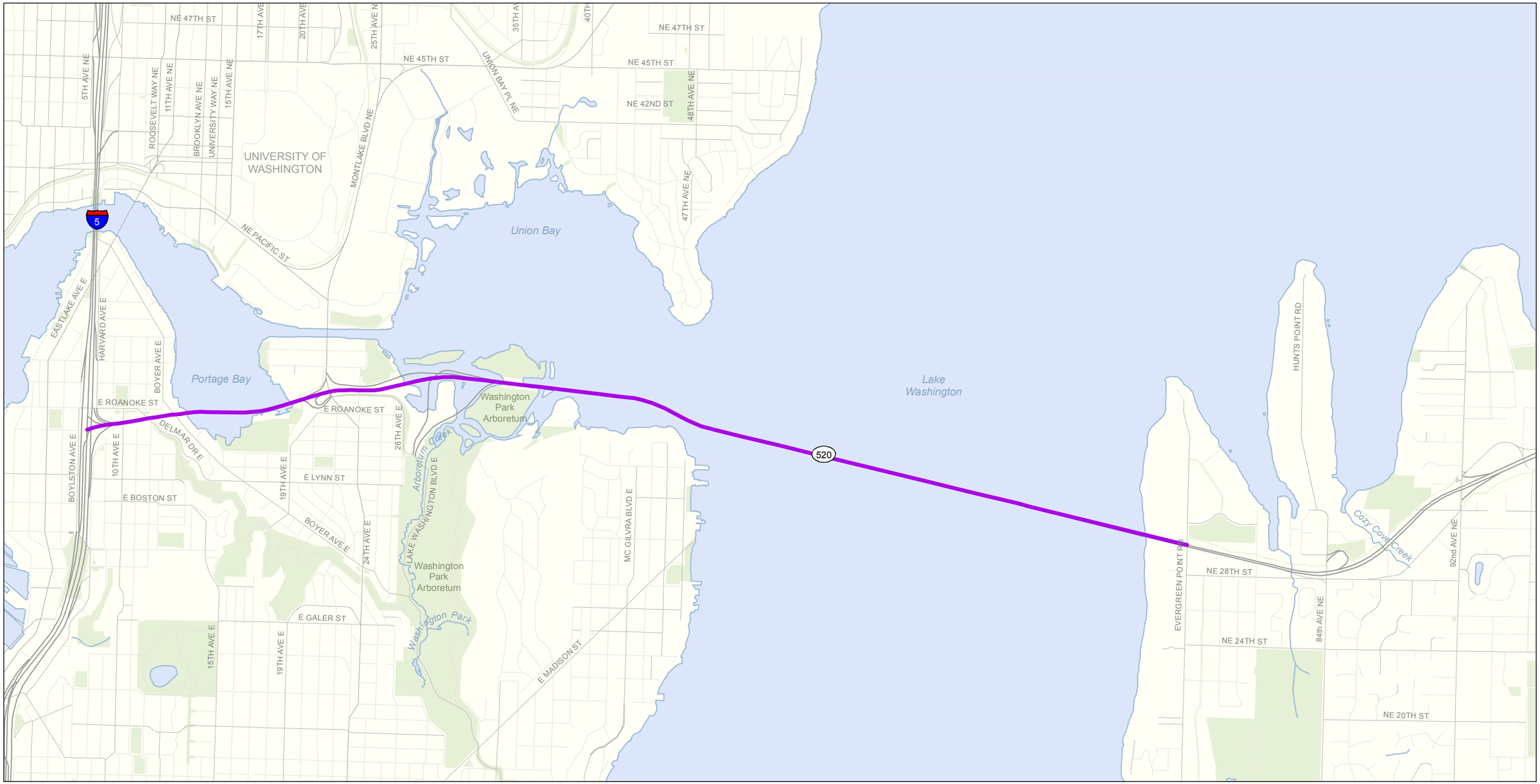

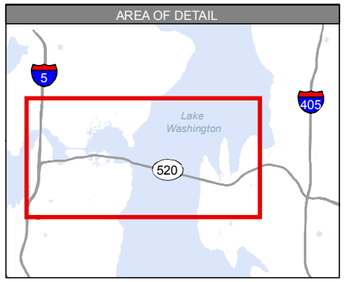

Project Extent

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 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. 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. 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.

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. 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 5 years.

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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 and

western red cedar are the dominant upland forest species in this zone, although Douglas-fir 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 (particularly depressional and riverine systems) have been lost though urban development in the City of Seattle.

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 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.

Lake level regulation by USACE has eliminated the seasonal inundation of the shoreline that historically shaped the structure of the riparian vegetation community, and reversed the normal hydrologic pattern for the remaining and new wetland areas 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.

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.

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 that 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) 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 will be 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 is 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. Also, fish may respond behaviorally to reduced light and/or the transition from natural lighting to shaded areas. Shaded areas will be calculated based on the plan view area of temporary and permanent structure surfaces. Filled and cleared areas will be omitted from 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.

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 sedimentation from upslope construction, changes in surface or subsurface water movement, shading from overhead structures, 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.

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 2 (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 (0.05 acre forested, 0.3 acre emergent, and 0.02 acre aquatic bed), 0.16 acre of Category III wetlands (0.13 acre forested, less than 0.01 acre scrub-shrub, and 0.03 acre aquatic bed), and 0.02 acre of Category IV emergent wetlands.

The SR 520, I-5 to Medina Project will permanently fill portions of seven 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 2.48 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 2.01 acres aquatic bed), and 0.01 acre of permanent shading in Category IV wetlands (aquatic bed). Note that 0.58 acre of permanent bridge shading will be removed from aquatic bed area in Category II wetlands as the existing on-ramps to SR 520 are removed.

Permanent impacts are listed by wetland in Table 1 and shown in Figure 2 (Effects on Wetlands and Buffers in the Project Corridor). Detailed descriptions of the impacts to individual wetlands are provided in Appendix A.

In addition to the permanent wetland fill and shading, loss of portions of the forested 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) may result in a loss of some functions in these 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.

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	Clearing	Shading
Portage Bay Drainage											
PBN-1	L2AB, PEM	Lake Fringe	IV	IV	0.92	-	0.01	1.09	-	-	0.09
PBS-1A	PEM, PSS	Lake Fringe	III	III	0.05	-	-	0	-	0.02	-
PBS-1	L2AB, PEM, PFO	Lake Fringe/Slope	III	III	12.74	0.13	0.53	5.18	-	1.25	1.23
Lake Washington (Union Bay) Drainage											
LWN-1	L2AB, PEM, PSS, PFO	Lake Fringe	II	II	14.52	0.01	0.75	5.23	-	0.32	1.01
LWN-2	L2AB, PEM, PSS, PFO	Lake Fringe	III	III	3.02	0.02	0.81	27.48	-	0.01	0.10
LWN-3	L2AB, PEM, PSS	Lake Fringe	III	III	7.10	0.01	1.05	14.93	-	0.38	0.31
LWN-4	L2AB, PSS, PFO	Lake Fringe	III	III	7.70	-	-	0	-	-	0.01
LWN-5	L2AB, PEM, PSS	Lake Fringe	III	III	37.24	-	-	0	-	-	-
LWS-1	L2AB	Lake Fringe	IV	IV	2.94	-	-	0	-	-	-
LWS-2	L2AB, PEM, PSS	Lake Fringe	II	II	26.38	0.001	0.04	0.16	-	0.06	1.20

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	Clearing	Shading
LWS-3	L2AB, PEM PSS, PFO	Lake Fringe	II	II	15.22	0.005	0.53	3.52	-	0.16	0.73
LWS-3A	PFO	Depressional	IV	IV	<0.1	-	-	0	-	-	-
LWS-4	L2AB, PEM PFO	Lake Fringe	II	II	6.95	0.09	1.15	17.84	-	0.60	0.53
LWS-4A	PEM, PFO	Slope	IV	IV	0.11	0.02	-	18.18	-	0.02	-
LWS-5	L2AB, PEM, PFO	Lake Fringe	II	II	2.29	-	-	0	-	-	0.03
Total					137.19	**0.29**	**4.87**	**3.76**	**0.2**	**2.82**	**5.25**

[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.

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

Table 2. Permanent Wetland Impact Summary by Classification

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

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

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

[c] Local ratings based on City of Seattle SMC 25.09.160.

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

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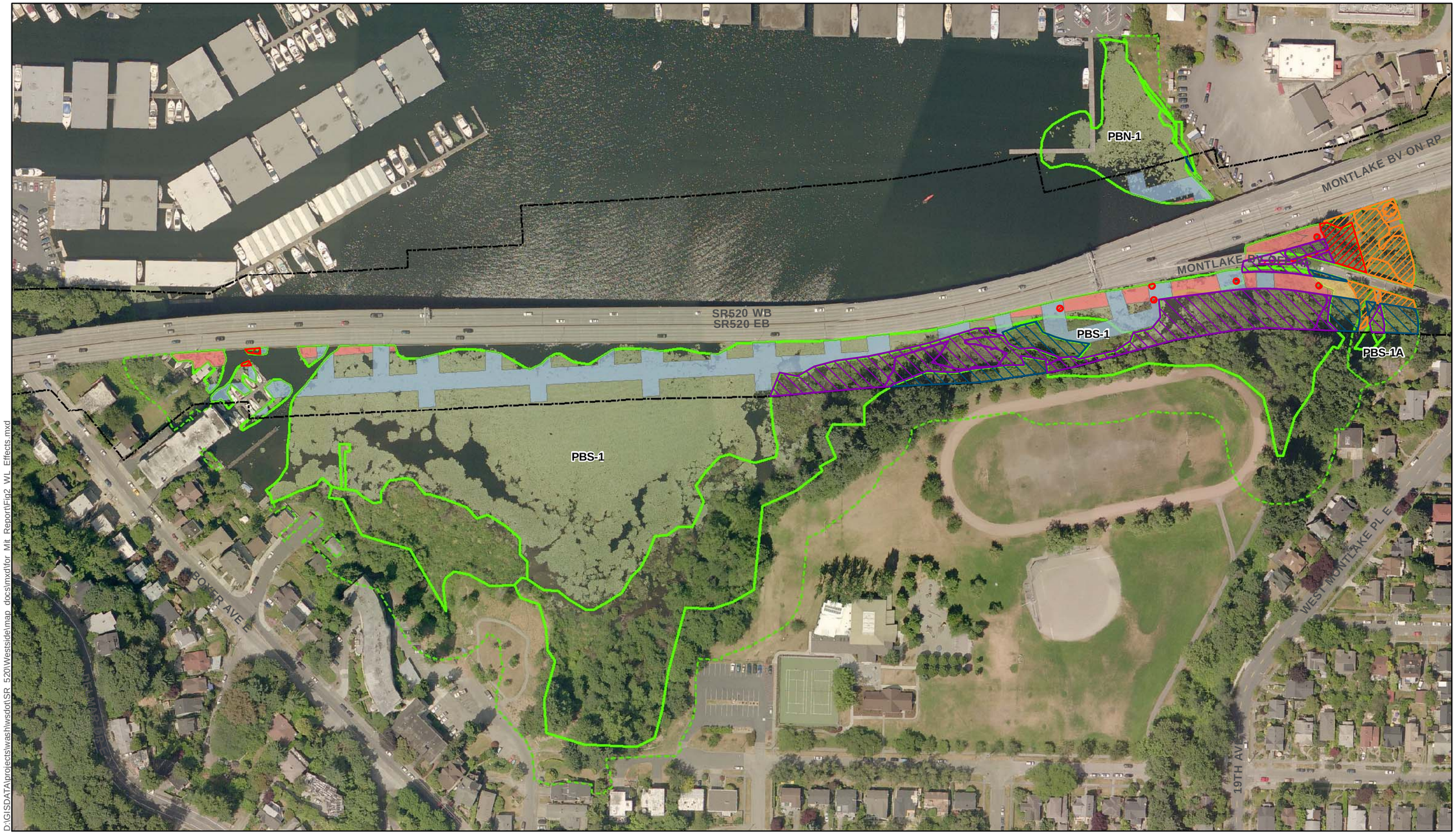

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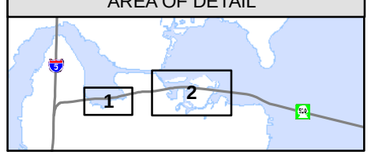

Permanent Shading (Wetland)
Permanent Shading (Buffer)
Temporary Shading (Wetland)
Temporary Shading (Buffer)
Permanent Fill (Wetland)
Permanent Fill (Buffer)
Temporary Clearing (Wetland)
Temporary Clearing (Buffer)
Wetland
Wetland Buffer

N

0 250 500 Feet

Figure 2, Plate 1
Effects on Wetlands and Buffers in the Project Corridor

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

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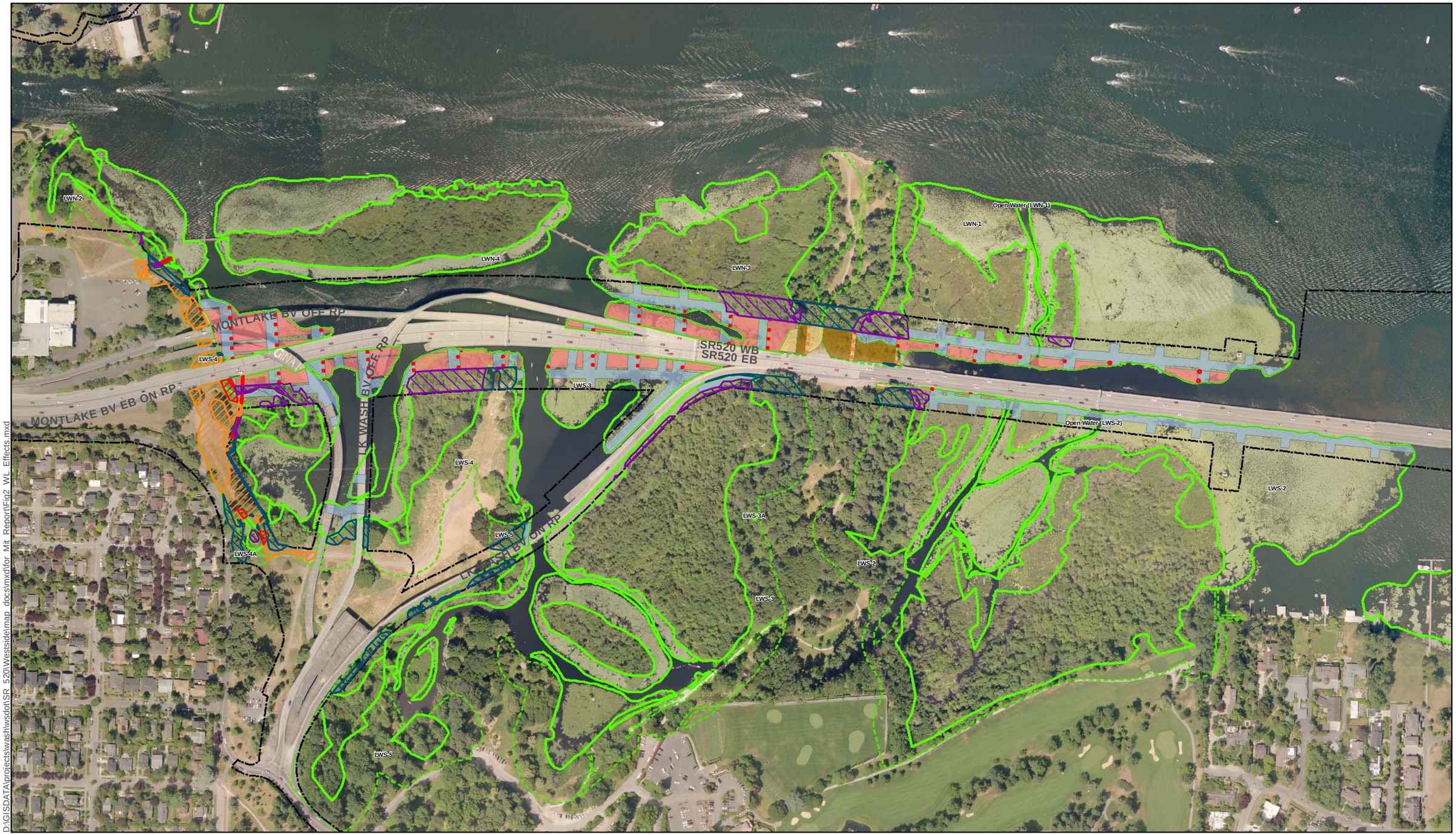

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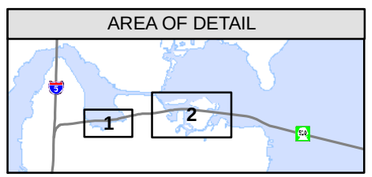

- Permanent Shading (Wetland)
- Permanent Shading (Buffer)
- Temporary Shading (Wetland)
- Temporary Shading (Buffer)
- Permanent Fill (Wetland)
- Permanent Fill (Buffer)
- Temporary Clearing (Wetland)
- Temporary Clearing (Buffer)
- Wetland
- Wetland Buffer

N

0 250 500 Feet

Figure 2, 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. Due to the nature of the impacts and the expectation that impacts will take longer than 1 year to restore, all the temporary impacts resulting from the project have been categorized as 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.

Temporary fill impacts will result from the installation of work bridge piling. The boundary of temporary fill impacts is calculated as the plan view extent of work bridge piling, overlaid atop all wetlands. This impact type is reported in square feet rounded up to the nearest 10 square feet. Spatial data for work bridge piling has been estimated.

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. This impact is reported in acres rounded up to the nearest 1/100th of an acre. In cleared areas of forested and scrub-shrub wetlands that will later be shaded by construction work bridges, the temporary impact will be calculated only as clearing.

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 will be 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 is 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. This impact is reported in acres rounded up to the nearest 1/100th of an acre.

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

Temporary clearing impacts will affect 2.82 acres of wetland (Table 1). This includes 1.14 acres in Category II wetlands (1.04 acres forested and 0.11 acre scrub-shrub), 1.66 acres of Category III wetland (1.25 acre forested and 0.40 acre scrub-shrub), and 0.02 acre Category IV wetland (all forested).

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 2. Detailed descriptions of the impacts to individual wetlands are provided in Appendix A.

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 provided by wetland buffers include sediment removal; phosphorous and nitrogen removal; toxic removal (bacteria, metals, pesticides); microclimate influence; habitat maintenance; screening adjacent disturbances (noise, light, etc.); and habitat connectivity. Factors that affect the performance of buffer functions include vegetation characteristics, slopes, soils, and buffer width and length (Sheldon et. al. 2005).

Wetland buffers in the SR 520, I-5 to Medina Project study area consist of a mixture for 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 2).

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 fill 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 from the total 1.87 acre 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 2 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 2 and listed in Table 3.

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

Wetland[a]	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 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. Function scores for the wetlands are shown in Appendix A, and additional details 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.

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	H	L	H	M	M	M	M	L	M	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.

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.

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 Conceptual 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 2009 Ecosystems Discipline Report (WSDOT 2009a). 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.
- Use barges and floats to store stockpile materials, construction equipment, water containment systems and water storage tanks, and to transport demolition debris.
- Construct cofferdams to isolate in-water work.
- Construct bubble curtains to reduce in-water noise.

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

1. Support constant slope on road surface. This minimizes wetland shading impacts and reduces stormwater pumping.

2. Minimize noise impacts due to pile driving.

   - Continue to develop mitigation measures in addition to bubble curtains for pile driving.

3. Restore mudline footing areas.

   - Install mudline footings below the mudline and restore lakebed above them.

4. Monitor water quality during construction.

   - Monitor turbidity, dissolved oxygen, and noise before and during construction.

5. Minimize impacts of structures on aquatic resources.

   - Remove structures at the earliest possible date, even if removal occurs outside of the in-water work window.

6. Adaptive management measures:

   - Monitor Lake Washington environment and fisheries populations during construction and adjust activities as necessary.

- 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. The implementation of the measures listed above will result in a substantial decrease in the areas of impact. 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 (0.2 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).

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 3 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.

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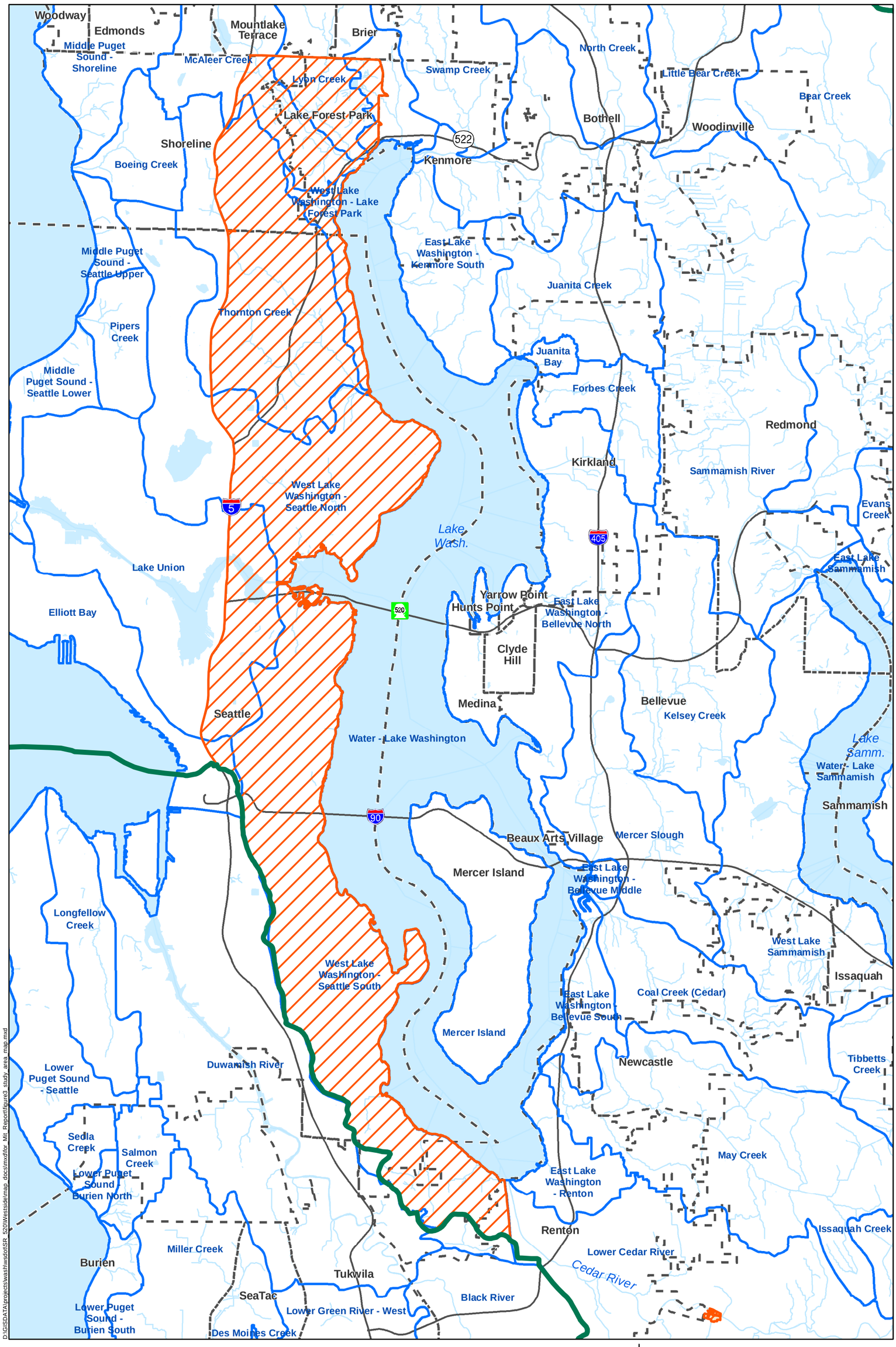

Figure 3
Study Area for Mitigation Site Selection

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

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4.2.2. Proposed Wetland Mitigation

Mitigation for 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 or eliminate 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.

Mitigation ratios for permanent impacts

The guidance in *Wetland Mitigation in Washington State Part 1: Agency Policies and Guidance* (Ecology 2006a) provides typical compensatory mitigation ratios for wetlands. Table 5 provides a summary of the mitigation needs for the SR 520, I-5 to Medina Project based on the standard mitigation ratios for rehabilitation.

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.

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

Wetland Impact Category	Impact Area[a]	Mitigation Ratio[b]	Mitigation Area[c]
Permanent Fill Category II & III	0.27	6:1	1.58
Permanent Fill Category II & III	0.02	3:1	0.07
Permanent Fill Subtotal	***0.29***	**-**	***1.65***
Permanent Shading Category II & III (PFO converted to PSS, PSS, PEM)	0.72	3:1	2.16
Permanent Shading Category II & III (PSS)	0.23	3:1	0.68
Permanent Shading Category II & III (L2AB)	3.92	1.5:1	5.87
Eastbound on-ramp removal area at WSDOT Peninsula	-0.58	1.5:1	-0.87
Permanent Shading Category IV (L2AB)	0.01	0.75:1	0.01
Permanent Shading Subtotal	***4.30***	**-**	***7.85***
Permanent Impact Total	**4.59**		**9.50**

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

[b] Ecology (2006a).

[c] Mitigation areas are based on standard ratios for rehabilitation (Ecology 2006a). Mitigation using creation ratios would require ½ of the area shown in this table, and mitigation using enhancement ratios would require twice the areas shown.

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 subsequent e-mail communications).

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 and represent, on average, about 8 percent of incoming light. 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. This also suggests that areas temporarily shaded by work bridges during construction will recover after structures are removed.
- 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 proposes the following modifiers to the permanent mitigation ratios for permanent shading impacts:

- 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. 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. Temporary impact areas where woody vegetation will be re-established will be monitored for a period of 5 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 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 increased from one-quarter to one-half of the mitigation ratio for permanent fill. This is consistent with the guidance on mitigation ratios for temporary impacts that are more permanent in nature (Ecology 2006a, Section 6.5.6).

Table 6 summarizes the compensatory mitigation needs for temporary long-term impacts resulting from the project.

Table 6. 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]	Mitigation Ratio[b]	Mitigation Area[b]
Temporary Fill Category II	0.20	3:1	0.60
Temporary Fill Subtotal	***0.20***	**-**	***0.60***
Temporary Clearing Category II & III (PFO)	2.29	3:1 (+1:1 revegetation)	6.87
Temporary Clearing Category II & III (PSS)	0.51	1.5:1 (+1:1 revegetation)	0.76
Temporary Clearing Category IV (PFO)	0.02	1.5:1 (+1:1 revegetation)	0.03
Temporary Clearing Subtotal	***2.82***	**-**	***7.66***
Temporary Shading Category II & III (PEM)	0.53	1.5:1 (+1:1 revegetation)	0.80
Temporary Shading Category II & III (L2AB)	4.62	1.5:1[c]	6.93
Temporary Shading Category IV (L2AB)	0.09	0.75:1[c]	0.07
Temporary Shading Subtotal	***5.25***	**-**	***7.80***
Temporary Impacts Total	**8.07**	**-**	**16.06**

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

[b] Mitigation areas are based on modified standard ratios for rehabilitation Ecology (2006a). Mitigation using creation ratios would be at approximately one-half of the area shown in this table, and mitigation using enhancement ratios would require twice the areas shown. 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 2006a), and consultation with and approval 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 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 low-growing in nature.
- 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 7 summarizes the overall mitigation needs for the SR 520, I-5 to Medina Project. It combines the information presented in Tables 5 and 6. Mitigation areas shown are based on the modified ratios for rehabilitation described above.

Table 7. 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]
Permanent Fill Subtotal	0.29	1.65
Permanent Shading Subtotal	4.30	7.85
Permanent Impact Total	***4.59***	***9.50***
Temporary Fill	0.20	0.60
Temporary Clearing	2.82	7.66
Temporary Shading	5.25	7.80
Temporary Impact Subtotal	***8.27***	***16.06***
Grand Total	**12.86**	**25.56**

*. 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] Mitigation areas are based on modified standard ratios for rehabilitation (Ecology 2006a). Mitigation using creation would be at approximately one-half of the area shown in this table, and mitigation using enhancement ratios would require twice the areas shown. 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.

Based on the current level of design, the total wetland mitigation need for the project (including both permanent and long-term temporary impacts) is 25.56 acres of rehabilitation.

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 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 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 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.

Four of the five 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 buffer (based on City of Seattle requirement for Category II wetland with moderate habitat value).
- Union Bay Natural Area (UBNA) – 110-foot standard buffer (see note above).
- Arboretum Creek – no wetland mitigation proposed, so buffers do not apply.

- Magnuson Park – 110-foot standard buffer (see note above).

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 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 five mitigation sites is 29.95 acres.

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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 five locations. Four of these locations are in the general vicinity of the project: the WSDOT-Owned Peninsula, UBNA, Arboretum Creek (in the Washington Park Arboretum), and Magnuson Park. The fifth site (the Elliott Bridge Reach site) is located outside the project vicinity along the Cedar River. The five sites are shown in Figure 4, and mitigation activities at each site are summarized in Table 8.

Table 8. Proposed Compensatory Mitigation

Mitigation Site	Wetland Establishment in acres (applied area)[a]	Wetland Re-establishment in acres (applied area)[a]	Wetland Enhancement in acres (applied area)[a]	Buffer Enhancement in acres (applied area)[a]
WSDOT-Owned Peninsula		1.68 (100% ratio)	2.33 (100% ratio)	0.83
UBNA	2.53 (2.28 at 50%)	-	9.19 new (8.27 at 90%) + 8.41 (4.21 at 50%) ongoing	10.96 new + 6.21 ongoing
Arboretum Creek				3.46 riparian habitat restoration
Magnuson Park	2.91 (at 100%)	-	4.54 (at 100%)	6.47
Elliott Bridge Reach	2.47 (at 100%)	-	-	2.02
Total	**7.91**	**1.68**	**24.47**	**29.95**

[a] Applied area is the area proposed for acreage of the mitigation action listed in the column heading. See the ecological benefits sections of the individual site descriptions for more detail.

The 9.59 acres of established (7.91 acres) and re-established (1.68 acres) wetland equates to 18.67 acres of the mitigation need described in Chapter 4, Table 7, using ratios for wetland creation/re-establishment (as modified above). The mitigation also provides 24.47 acres of enhancement, which would provide compensation for an additional 9.67 acres of wetland impact (using ratios for wetland enhancement ratio as modified above). Overall, these mitigation actions provide equivalent mitigation for 28.35 acres using the rehabilitation ratios as a baseline.

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

- The affected wetlands exist within a highly urbanized area and have a long history of disturbance. The surrounding land uses include high-density residential areas, the campus of a major university, roadways, and the existing SR 520 roadway. Invasive species are common. These factors contribute to the disturbed conditions in these wetlands.
- The project will result in a small amount of permanent wetland fill (0.29 acre). This results in 1.65 acres of mitigation need.
- The majority of permanent impacts (4.87 acres) will result from shading of wetland habitat and will not result in a loss of wetland area. This accounts for another 7.85 acres of the mitigation need (Table 5).
- Temporary impacts to wetlands (0.20 fill, 2.82 acres of clearing, and 5.25 acres of shading) in the project area result in 16.06 acres of the mitigation need, over 60 percent of the total mitigation need.
- Areas subject to temporary fill and clearing impacts will be restored after construction.
- The proposed wetland mitigation includes establishment and re-establishment of 9.59 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.

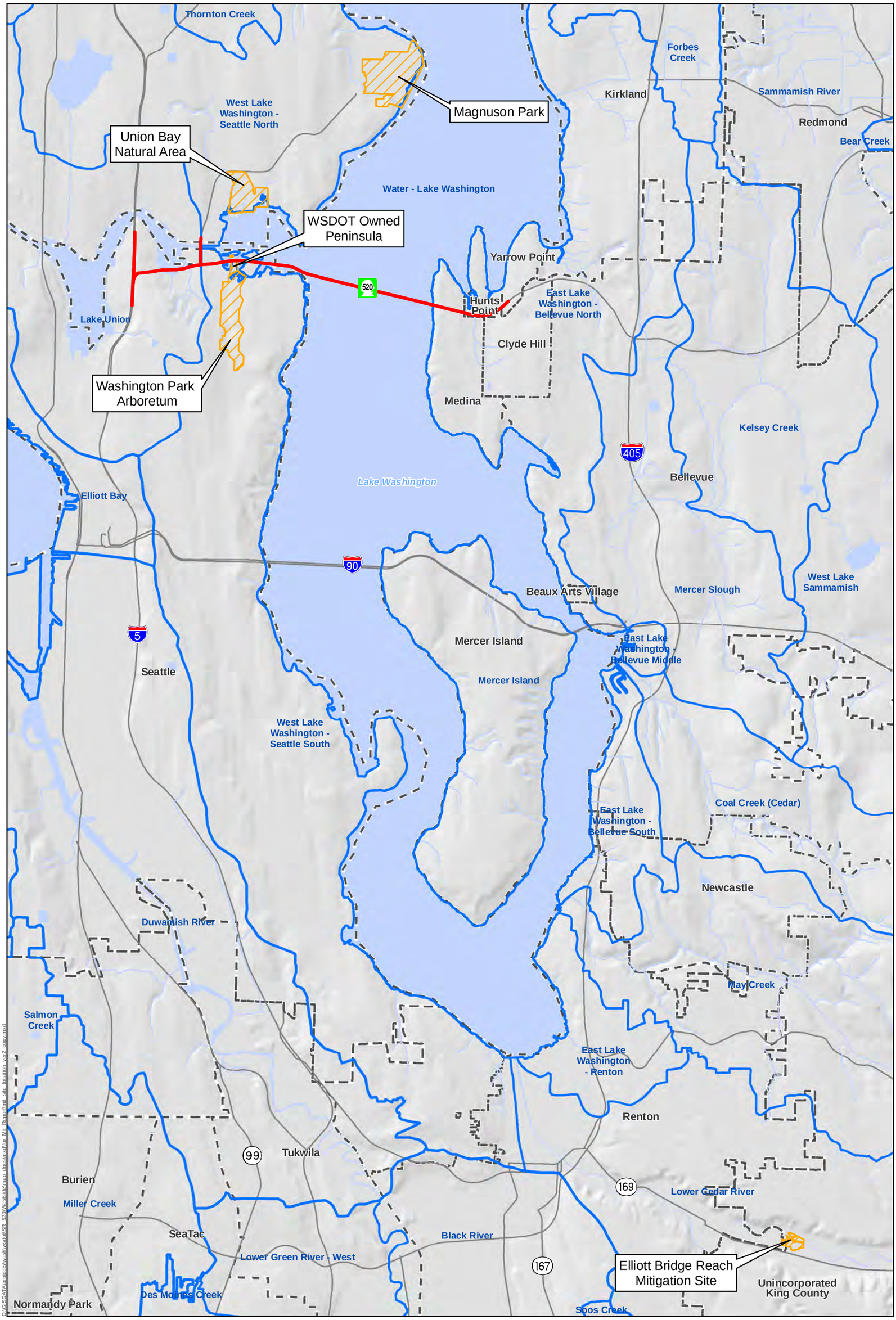

Figure 4
Location of the Mitigation Sites in Relation to the Project Impact Site

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.

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 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 8 and Figures 2 and 5). LWS-4 and LWS-5 are lacustrine fringe wetlands and include palustrine forested, emergent, and lacustrine aquatic bed vegetation types. Dominant species present in these wetlands include black cottonwood, red alder, Pacific willow (*Salix lucida*), Douglas spirea (*Spirea douglasii*), reed canarygrass, creeping buttercup, 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 following paragraphs summarize wildlife use at the proposed WSDOT-Owned Peninsula mitigation sites.

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, 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 up to 1.68 acres of historically dredged wetland, enhancement of up to 2.33 acres of existing forested wetland, and enhancement of up to 0.83 acre of upland buffer. Specific activities will include excavating to remove upland fill, 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 5 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 restraint 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 conceptual 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 within the buffer.
- Wildlife (e.g., beaver, geese) may pose special risks for plantings.

Table 9. WSDOT-Owned Peninsula Mitigation Site Wetland Summary

Location	Peninsula on the south shoreline of Union Bay

WSDOT-Owned Peninsula facing east

WSDOT-Owned Peninsula facing SW

Local Jurisdiction	Seattle
WRIA	WRIA 8
Ecology Rating (Hruby 2004)	II
Seattle Rating	II
Seattle Standard Buffer Width	110 feet
Wetland Size	6.95 acres (LWS-4) 2.29 acres (LWS-5)
Cowardin Classification	PFO, PEM, L2AB
HGM Classification	Lake Fringe
Wetland Rating System Pts.	
Water Quality Score	**16 (LWS-4)/20 (LWS-5)**
Hydrologic Score	**12 (LWS-4)/12 (LWS-5)**
Habitat Score	**26 (LWS-4)/25 (LWS-5)**
Total Score	**56 (LWS-4)/57 (LWS-5)**

Dominant Vegetation	Black cottonwood, red alder, Pacific willow, Douglas spirea, reed canarygrass, creeping buttercup, and common cattail. White waterlily and European water-milfoil are present in aquatic bed portions of these wetlands.
Soils	Silt loam over loam with redoximorphic features or peat.
Hydrology	Lake Washington
Rationale for Local Rating	The City of Seattle has adopted the Ecology rating system for western Washington. Wetlands on the WSDOT-Owned Peninsula site were rated Category II using the Ecology rating system because they provide moderate to high water quality functions (16 to 20 of a possible 24), high hydrologic (12 of 12), and high habitat (25 to 26) functions.
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

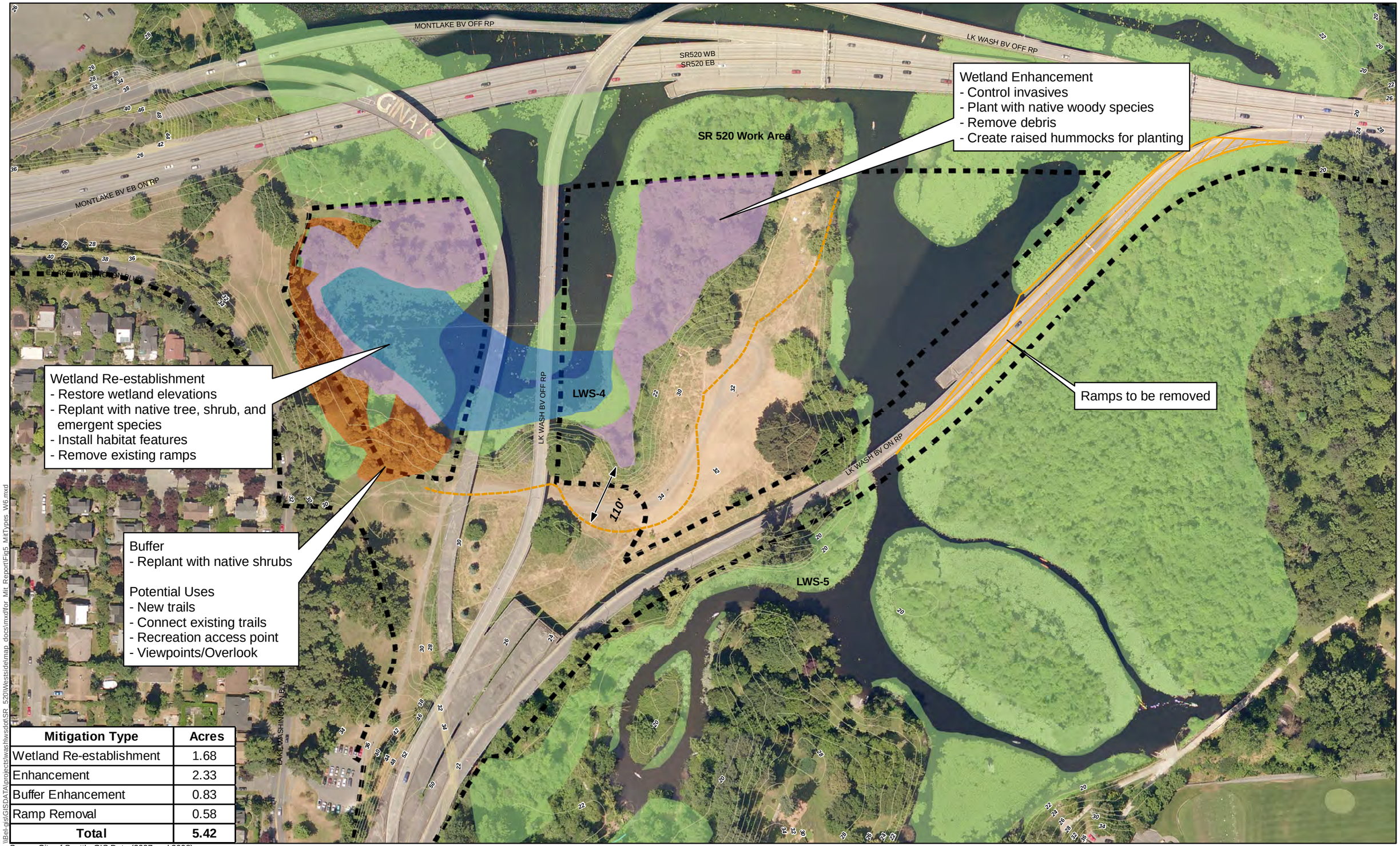
Wetland hydrology at the WSDOT-Owned Peninsula Mitigation Site is determined by the water elevations in Lake Washington, which are controlled via the Chittenden locks. As a result, the hydrology at this site is consistent and well known. WSDOT believes that the probability of successfully establishing wetland hydrology is quite high and the probability of success for this mitigation site is also high.

Stream Flow

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

Groundwater

Groundwater is not expected to be a significant component of the wetland re-establishment. Groundwater information for the enhancement areas is not yet available. If deemed necessary, WSDOT will install groundwater wells to evaluate hydrology on the site as the mitigation design is advanced. Data from that groundwater monitoring and other information related to hydrology will be incorporated into future mitigation planning documents and final site design (PS&E), if appropriate, as it becomes available.



Mitigation Type	Acres
Wetland Re-establishment	1.68
Enhancement	2.33
Buffer Enhancement	0.83
Ramp Removal	0.58
Total	**5.42**

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

N

0 50 100 150 200 250 300 Feet

Legend

Wetland Re-establishment
Wetland Enhancement
Buffer Enhancement
Limits of Construction
Wetland
110-foot Buffer
Stream
2-foot Contour

Figure 5
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. The presence of these species likely reflects the past disturbance and current uses of the WSDOT-Owned Peninsula. Invasive species control for the site will be discussed under Site Management (Section 7.3) in future reports.

5.1.11. Grading Design

As of the writing of this conceptual mitigation plan, site survey has not been completed and detailed topographic information is not available. Wetland elevations and grading descriptions for the WSDOT-Owned Peninsula Mitigation Site are based on inventory-level topographic information from the City of Seattle. As survey-level site topography and more complete hydrologic data become available, this information will be used to revise the grading plans and will be incorporated into future designs and reports for the site. 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 design.

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 would likely include constructing a berm across the mouth of the lagoon, dewatering, and filling the areas behind the berm with clean fill materials. Grades will be established at elevations that will allow the restoration of wetland vegetation.

Grading Design at All Areas

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, scrub-shrub, and emergent wetland. Forested wetland communities will be planted at the higher elevations in the wetland, and the shrub community will be divided into lower and higher elevation communities to reflect the seasonal fluctuations in lake level. The emergent community would be places at the lowest elavations.

Table 10 presents a list of typical plant species and community composition for planting zones at all mitigation site. Note that the composition of the planting zones shown in the conceptual plan may be revised in the draft and final versions of this report as more information is collected at the mitigation site.

Canopy species identified in the proposed planting palette include both fast-growing and slow-growing species, as well as both deciduous and coniferous species. Additional modifications to the selected species may be made as additional site design information (particularly hydrology and geotechnical data) becomes available.

Table 10. Proposed Typical Planting List for Wetland Areas

Common Name	Scientific Name	Indicator Status
Water's Edge Planting		
Live Stakes		
Scouler's willow	*Salix scouleriana*	FAC
Sitka willow	*Salix sitchensis*	FACW
Emergents		
Sawbeak sedge	*Carex stipata*	OBL
Slough sedge	*Carex obnupta*	OBL
Creeping spikerush	*Eleocharis palustris*	OBL
Tall mannagrass	*Glyceria elata*	FACW+
Skunk cabbage*	*Lysichiton americanum*	OBL
Small fruited bulrush	*Scirpus microcarpus*	OBL
Water parsley	*Oenanthe sarmentosa*	OBL
Hardstem bulrush	*Schoenoplectus acutus*	OBL
Giant burreed	*Sparganium eurycarpum*	OBL
Scrub-shrub Wetland Planting		
Higher Elevation Shrub		
Black hawthorn	*Crataegus douglasii*	FAC
Black twinberry	*Lonicera involucrata*	FAC+
Nootka rose	*Rosa nutkana*	FAC
Peafruit rose	*Rosa pisocarpa*	FAC
Salmonberry*	*Rubus spectabilis*	FAC+
Red-osier dogwood	*Cornus sericea*	FACW+
Pacific ninebark	*Physocarpus capitatus*	FACW-
Scouler's willow	*Salix scouleriana*	FAC
Sitka willow	*Salix sitchensis*	FACW
Forested Riparian and Lacustrine Wetland Planting		
Trees		
Red alder**	*Alnus rubra*	FAC
Oregon ash	*Fraxinus latifolia*	FACW
Sitka spruce*	*Picea sitchensis*	FAC
Black cottonwood	*Populus balsamifera ssp.*	FAC
Cascara*	*Rhamnus purshiana*	FAC-
Pacific willow	*Salix lucida var. lasiandra*	FACW+
Western red cedar*	*Thuja plicata*	FAC

Common Name	Scientific Name	Indicator Status
Shrubs		
Red-osier dogwood	*Cornus sericea*	FACW+
Black twinberry	*Lonicera involucrata*	FAC+
Nootka rose	*Rosa nutkana*	FAC
Salmonberry	*Rubus spectabilis*	FAC+
Emergents		
Skunk cabbage	*Lysichiton americanum*	OBL
Water parsley	*Oenanthe sarmentosa*	OBL

* 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 nests
- 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. A typical species list is shown in Table 11. 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). Planting densities will be higher than similar wetland areas to reduce intrusion and provide additional screening for the resources.

Table 11. Proposed Typical Planting List for Upland Buffer Areas

Common Name	Scientific Name	Indicator Status
Upland Forested		
Trees		
Big leaf maple	*Acer macrophyllum*	FACU
Red alder	*Alnus rubra*	FAC
Black cottonwood	*Populus balsamifera ssp. trichocarpa*	FAC
Quaking aspen	*Populus tremuloides*	FAC+
Bitter cherry	*Prunus emarginata*	FACU
Douglas-fir	*Pseudotsuga menziesii*	FACU
Garry oak	*Quercus garryana*	NL
Western red cedar*	*Thuja plicata*	FAC
Shrubs		
Vine maple*	*Acer circinatum*	FAC-
Serviceberry	*Amelanchier alnifolia*	FACU
Beaked hazelnut*	*Corylus cornuta*	FACU
Oceanspray	*Holodiscus discolor*	NL
Indian plum*	*Oemleria cerasiformis*	FACU
Baldhip rose	*Rosa gymnocarpa*	FACU
Clustered rose	*Rosa pisocarpa*	FAC
Nootka rose	*Rosa nutkana*	FAC
Thimbleberry	*Rubus parviflorus*	FAC-
Common snowberry	*Symphoricarpos albus*	FACU

* 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 deed restrictions, conservation easements, or Native Growth Protection Easements. Mitigation areas will also be fenced (if necessary and appropriate) and appropriate signage will be installed.

5.1.16. Implementation Schedule

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

- Shallow groundwater monitoring (if appropriate)
- Identification of historic elevations, fill elevations, and soil stratigraphy
- Soil studies
- Archaeological and geological studies to determine boundaries of landfill and assess the extent to which it will affect mitigation
- Wetland boundary verification (USACE, pending)
- Permit applications
- Permit approval

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 1.68 acres of wetland re-establishment, 2.33 acres of wetland enhancement, and 0.83 acre of buffer enhancement. 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 11.

Improved Functional Attributes

- Reduced prevalence of invasive species
- Increased plant diversity by planting with native species
- Increased vertical and horizontal habitat complexity
- Additional habitat features
- Woody vegetation that protects shorelines along Lake Washington from erosion

New Functional Attributes

- Restores historically lost wetland area
- Creates a complex mosaic of wetland habitat

Table 12. Existing and Proposed Wetland Functions at the WSDOT-Owned Peninsula Mitigation Site

Function/Value[a]	Existing Conditions	Re-established Wetland
Flood flow alteration	n/a	No Change
Sediment removal	n/a	No Change
Nutrient and toxicant removal	n/a	No Change
Erosion control and shoreline stabilization	L-M	+ Provides additional dense woody plantings to stabilize the shoreline
General habitat suitability	M-H	+ Restored lost habitat area; plan provides additional interspersed woody vegetation
Fish habitat	L	No Change
Native plant richness	L	+ Plantings include additional native wetland plants
Educational or scientific value	M	+ Restores native habitat; opportunities for trails, overlooks, and interpretive signage in buffer areas

[a] L = Low
M = Moderate
H = High.
For the proposed mitigation + indicates an improvement in functional attribute.

Buffer Functions

The current standard buffers for this wetland are 110 feet in width (SMC 25.09.160). Buffers for the site will be designed in accordance with USACE and Ecology joint guidance to provide adequate protection for the wetland functions at the mitigation sites. 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 likely represent 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 function than the sum of the individual habitat improvements.

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 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 1966, 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 restoration 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

As noted for the WSDOT-Owned Peninsula Mitigation Site, 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 restoration 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 restoration 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. These additions to wetland restoration knowledge and professional development are important benefits to society, and are directly reflected in the understanding of wetland functions and mitigation ratios.
- 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. Notable species present in quantities over 10 percent include quack grass (*Agropyron repens* 16.1 percent), Kentucky bluegrass (*Poa pratensis* 16.7 percent), and redtop (*Agrostis alba* 21.7 percent) (Huang and del Moral 1988). Forested areas to the east are dominated by black cottonwood (*Populus balsamifera*), Pacific willow (*Salix lucida* var. *lasiandra*), 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).

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.

Several small wetlands are present in the interior of the UBNA site, notably the central pond and Shoveller's Pond. These areas are dominated by a mixture of rushes with a narrow fringe of willows. Scrub-shrub and forested areas are located to the east of the site and are dominated by various willows with a canopy of cottonwood and willow. Aquatic bed wetlands on the shoreline of the site are dominated by white waterlily, European water-milfoil, and cattail. Wetlands associated with this site are described in the *I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft EIS Wetland Assessment Report Technical Memorandum* (WSDOT 2010b) as LWN-5, and were rated as Category II. A summary of the UBNA's wetland characteristics is provided in Table 12.

Wildlife Habitat and Use

The Supplemental Draft Environmental Impact Statement Ecosystems Discipline Report for the project (WSDOT 2009a) 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 species diversity within the larger habitat mosaic. WSDOT proposes to establish 2.53 acres of new palustrine wetland; to enhance up to 9.19 acres of existing palustrine wetland; and to complete restoration/enhancement activities begun by the various groups at the University of Washington on 8.41 acres of existing wetland. The proposed

mitigation will also enhance 10.96 acres of disturbed buffer and complete enhancement activities begun by UW and other groups on 6.21 acres of buffer. These buffer enhancement activities would target native upland grassland and upland forest as the final habitat to serve as buffers for the UBNA site.

WSDOT proposes wetland establishment at one location at the UBNA site. The location selected is in the E-5 Restoration Management Area (Figure 6). This location was selected for wetland establishment for the following reasons:

- Establishing wetland in this location is consistent with long term plans for the site.
- The selected location is believed to have been part of the earthen fill used to retain the landfill in place. As a result, it is expected that the substrate is clean fill and poses less risk of uncovering landfill waste. Most of the site's other locations are reported to have a much thinner cover of clean fill materials.
- Areas along the southern shoreline are currently subsiding. This subsidence is expected to continue in future years. Since these areas are likely to become wetland without intervention, wetland establishment here provides little additional benefit and poses substantially greater risk.
- The area is currently used as a parking lot and the developed surface can be readily regraded to achieve elevations that will ensure a consistent source of wetland hydrology.
- The University of Washington has successfully established wetlands immediately adjacent to this location.
- Trail systems are effective at managing users and keeping the majority of the users from disturbing restoration sites. Maintaining a trail system at the site that minimizes disturbance to the mitigation is a desirable goal.

The 2.53-acre wetland establishment is proposed at 90 percent of the standard ratio for wetland establishment in acknowledgement of the site conditions limited potential for buffering this urban mitigation. This results in 2.28 acres of wetland establishment credit.

WSDOT proposes 9.19 acres of wetland enhancement at one location in the northwest sub-area of the UBNA site (Figure 6). This wetland enhancement is located to the north and east of the E-5 Restoration. This location was selected for wetland enhancement for the following reasons:

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

In light of the limited potential for buffering this urban mitigation site, wetland enhancement activities in this location are proposed at 90 percent of the standard ratios for wetland enhancement. This results in 8.27 acres of enhancement credit.

WSDOT also proposes to complete 8.41 acres of wetland restoration/enhancement activities at several additional locations on the UBNA site (Figure 6). The activities at these locations represent the completion of ongoing restoration work undertaken by various groups at the site. These locations were selected for wetland enhancement for the following reasons:

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

In light of the limited potential for buffering this urban mitigation site and acknowledging the value of the restoration work that had already taken place, wetland enhancement activities at these locations are proposed at 50 percent of the standard ratios for wetland enhancement. This results in 4.21 acres of enhancement credit. Note that the East Basin area (northeast corner of the site, Figure 6) includes a full 110 foot buffer from the adjacent roadways.

WSDOT proposes 10.96 acres of new buffer enhancement and completion of 6.21 acres of buffer enhancement/restoration activities at locations throughout the UBNA site (Figure 6). Buffer enhancement in these locations was selected for the following reasons:

- The locations provide relatively large areas of potential buffer contiguous with existing or proposed wetlands.

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

The proposed buffer enhancement activities total 17.17 acres of improvements to buffers on-site.

Specific construction activities will include grading to establish a surface consistent with wetland hydrology, replanting native wetland and upland plant species, and controlling non-native species on the site. The proposed mitigation will be developed in consultation with the University of Washington faculty and staff, and will be consistent with the intent of maintaining the site as an outdoor laboratory for wetland science. Figure 6 illustrates the mitigation concept for the UBNA site.

Table 13. UBNA Mitigation Site Wetland Summary

Location	North shoreline of Union Bay	
Potential establishment area at UBNA Site	**Local Jurisdiction**	Seattle
	WRIA	WRIA 8
	Ecology Rating (Hruby 2004)	III
	Seattle Rating	III
	Seattle Standard Buffer Width	60 feet
	Wetland Size	37.24 acres
	Cowardin Classification	L2AB, PSS, PEM
	HGM Classification	Lake Fringe
Typical enhancement area at UBNA Site	**Wetland Rating System Pts.**	
	Water Quality Score	**18**
	Hydrologic Score	**4**
	Habitat Score	**26**
	Total Score	**48**
Dominant Vegetation	Black cottonwood, Pacific willow, reed canarygrass, 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.	
Rationale for Local Rating	Wetlands associated with UBNA (LWN-5) were rated Category III using the Ecology rating system. These wetlands provide moderate water quality functions (18), low hydrologic (4), and moderate habitat (26) functions.	
Functions of Entire Wetland	Vegetation in Wetland LWN-5 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. LWN-5 has multiple Cowardin classes and high interspersion of habitats, indicating moderate potential to provide habitat. Connections to other habitats provide moderate habitat opportunity.	
Buffer Condition	The buffer of LWN-5 is 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) is to the south.	

5.2.8. Site Constraints

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

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

5.2.9. Site Hydrology

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

Stream Flow

Flow data for the University Ditch has not been collected. If flow data is necessary for the mitigation design, it will be incorporated into future versions of the mitigation plan and the final engineering for the project as it becomes available.

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Mitigation Type	Acres
Establishment	2.53
Enhancement	9.19
Ongoing Wetland Restoration	8.47
Ongoing Buffer Enhancement	6.93
Buffer Enhancement	8.40
Total	**35.52**

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

N

0 100 200 300 400 500 Feet

Legend

- Wetland Establishment
- Wetland Enhancement
- Buffer Enhancement
- Existing Mitigation Areas
- Forest and Shrub Plantings
- Herbaceous and Emergent Plantings
- Existing Wetlands (No action proposed)
- Candidate Site
- Management Area
- Maintain Viewpoints
- Stream
- 2-foot Contour

Figure 6
Union Bay Natural Area Mitigation Concept

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

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Groundwater

Groundwater information for the UBNA Mitigation Sites is not yet available. Groundwater data and other information related to hydrology will be incorporated into future mitigation planning documents and final site design (PS&E) as it becomes available.

5.2.10. Invasive Species

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

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

5.2.11. Grading Design

As of the writing of this conceptual mitigation plan, site survey has not been completed and detailed topographic information is not available. Existing wetland elevations and grading descriptions are based on inventory-level topographic information from the City of Seattle. As survey-level site topography and more complete hydrologic data becomes available, this information will be used to revise the grading plans for future designs and reports for the site.

Exposure of the landfill at UBNA is a significant constraint on this site. As a result, WSDOT will focus the grading activities in the E-5 area where the existing parking lot will be removed. This area is expected to have the least potential for exposing landfill material, and the greatest potential for successful wetland establishment. Activities in this area will include scarification/tilling or removal of the parking area's gravel fill and subsoil if necessary. Excavation is expected to remove a minimal amount of earth in this area to meet the elevations required for consistent wetland hydrology. WSDOT may perform minor grading (including topsoil placement) in other portions of the site for wetland and buffer enhancement, if required.

5.2.12. Planting Design

Appropriate native planting designs for the UBNA Mitigation Site will be developed to meet the wetland establishment and wetland and upland habitat enhancement goals for the project. The designs will be developed in consultation with the University of Washington faculty and staff, and will be included in future versions of this report.

5.2.13. Habitat Features

Habitat features appropriate to the target plant communities, wildlife species, and site conditions will be selected in consultation with the University of Washington faculty and staff. These features will be incorporated into the mitigation design and described in future versions of the mitigation plan.

5.2.14. Buffers and Uplands

Upland buffer plantings for the UBNA will be developed in consultation with the University of Washington faculty and staff, and will be included in future versions of this report.

5.2.15. Site Protection

Mitigation at the UBNA will include long-term protective measures such as deed restrictions, conservation easements, or Native Growth Protection Easements. Ownership of the site will be retained by the University of Washington.

5.2.16. Implementation Schedule

A complete implementation schedule for this mitigation has not yet been developed. However, a number of additional studies are anticipated as part of the design process. Specific studies are listed in 5.1.16.

5.2.17. Ecological Benefits

Wetland Functions

WSDOT proposes the following mitigation activities for the UBNA site:

- Establishment of 2.53 acres of wetland (2.28 acres of wetland establishment credit at 90 percent).
- Enhancement of 9.19 acres of wetland (8.27 acres of enhancement credit at 90 percent).

- Enhancement to complete 8.41 acres of wetland restoration (4.21 acres of enhancement credit at 50 percent).
- Enhancement of 17.17 acres of wetland buffer.

The proposed mitigation at the UBNA Mitigation Site is expected to substantially improve habitat functions at the site. Functional attributes of the mitigation wetlands that will be improved and added, compared to the existing impacted wetlands, are listed below. A summary of the potential improvements is provided in Table 14.

Improved Functional Attributes

- Reduced prevalence of invasive species
- Increased plant diversity by replanting with native species
- Increased vertical and horizontal habitat complexity
- Additional habitat features
- Enhanced connection of existing mosaic of habitats to Lake Washington

New Functional Attributes

- Establish new wetland area
- Additional habitat area

Table 14. Existing and Proposed Wetland Functions at the UBNA Mitigation Site

Function/Value[a]	Existing Conditions	Established Wetland
Flood flow alteration	L	No Change
Sediment removal	L	+ Increase in vegetated wetland area
Nutrient and toxicant removal	L	+ Increase in vegetated wetland area
Connection of existing wetlands with Lake Washington	interrupted	+ Increase in lineal feet of shoreline directly connected to Lake Washington
Erosion control and shoreline stabilization	M (high in some area, low in others)	+ Increase in lineal feet of shoreline enhanced with native vegetation
General habitat suitability	M The site contains a mixture of higher and lower quality habitats	+ Plan establishes additional wetland area with multiple vegetation strata and increases interspersion of habitat types
Fish habitat	L Limited fish habitat is present on UBNA site	No Change
Native plant richness	L-M	No Change
Educational or scientific value	H	+ Plan establishes additional wetland area and improves existing habitats that can provide additional educational opportunities

[a] L = Low
M = Moderate
H = High.
For the proposed mitigation + indicates an improvement in functional attribute.

Buffer Functions

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

- Improved screening of wetland from adjoining uses
- Control of invasive species
- Improved habitat function through planting with appropriate native trees and shrubs
- Improved connectivity between nearby habitats
- Trails maintained to control access to mitigation areas by casual users

5.3 Arboretum Creek Mitigation Site

5.3.1. Site Location

The Arboretum Creek Mitigation Site is within the Washington Park Arboretum. The Washington Park Arboretum is located to the south of the WSDOT-Owned Peninsula; its northern boundary is along the southern shore of Union Bay on Lake Washington and its southern boundary is at Madison Avenue. The Arboretum is owned by the City of Seattle Parks Department and jointly managed by Seattle Parks and the University of Washington. It occupies one parcel (2125049044) that includes portions of the eastern 1/2 of Section 21, Township 25 North, Range 4 East and the northeast quarter of Section 28, Township 25 North, Range 4 East, in the City of Seattle.

5.3.2. Landscape Perspective

Landscape Position

The Arboretum Creek Mitigation Site is located in WRIA 8, the Lake Washington-Cedar/Sammamish Watershed. The Arboretum Creek Mitigation Site occupies a valley extending southward from the lake along Arboretum Creek, and is dominated by slope and riparian landscape elements.

5.3.3. Ecological Connectivity

The Arboretum Creek site provides a variety of wetland and upland habitat in a heavily developed portion of Seattle and includes riparian habitat along Arboretum Creek. Mitigation activities at the three sites will provide additional native riparian vegetation to reduce erosion, improve cover and foraging habitat for diverse species, and maintain and improve connection between these habitats and Lake Washington.

5.3.4. Historic and Current Land Use

The Arboretum Creek Mitigation Site is within the Washington Park Arboretum, which is located on the south side of Union Bay on Lake Washington. The park extends southward from the lake, and includes the Arboretum Creek valley and the ridges on either side, encompassing approximately 230 acres. Washington Park was one of the city's first parks, and was created by a series of purchases between 1900 and 1904 (Bola Architecture+Planning 2003). The park was included in plans for the City developed by the Olmsted Brothers beginning in 1903 (Bola

Architecture+Planning 2003). The Arboretum collection officially began in 1934 in an agreement between the University of Washington and the City of Seattle that continues to the present day. The Washington Park Arboretum is a forested urban park developed in the Olmsted style, and contains a scenic drive, walking trails, and a botanical collection that includes 4,400 species and cultivated varieties.

5.3.5. Rationale for Site Selection

The Arboretum Creek Mitigation Site was identified in a multi-stage, hierarchical selection process. Details of this site selection process are provided in Section 4.2.

5.3.6. Mitigation Site Existing Conditions

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

Uplands

Although the Washington Park Arboretum is essentially a managed environment, it includes both forested and meadow vegetation communities. Both communities are maintained and include a relatively high percentage of non-native plants that are part of the botanical collections. Mowed lawn areas run through much of the property, and are dominated by cultivated grass species and interspersed with paved or unpaved paths. The forested slopes on the east side of the Arboretum are less managed and generally consist of native forest and shrub communities.

Three potential mitigation areas were identified along Arboretum Creek: a pond and associated seep wetland, an upland field, and a portion of Arboretum Creek suitable for enhancement (see Figure 5). Each of the three areas is described below. The pond and seep (Area A in Figure 7) is located in the southern portion of the Washington Park Arboretum on the slope east of Azalea Way, the park's primary footpath. Upland vegetation in this location consists mostly of mowed domestic grasses with a few larger cherry trees (*Prunus* sp.), catalpa trees (*Catalpa* sp.), and ornamental specimens such as hornbeam (*Carpinus* sp.). Native forest, dominated by western red cedar (*Thuja plicata*), rhododendron (*Rhododendron* sp.), thimbleberry (*Rubus parviflorus*), sword fern (*Polystichum munitum*), creeping buttercup (*Ranunculus repens*), horsetails (*Equisetum telmateia*), and unidentified sedges (*Carex* sp.) extends upslope from this area toward the access road along the Arboretum's eastern boundary.

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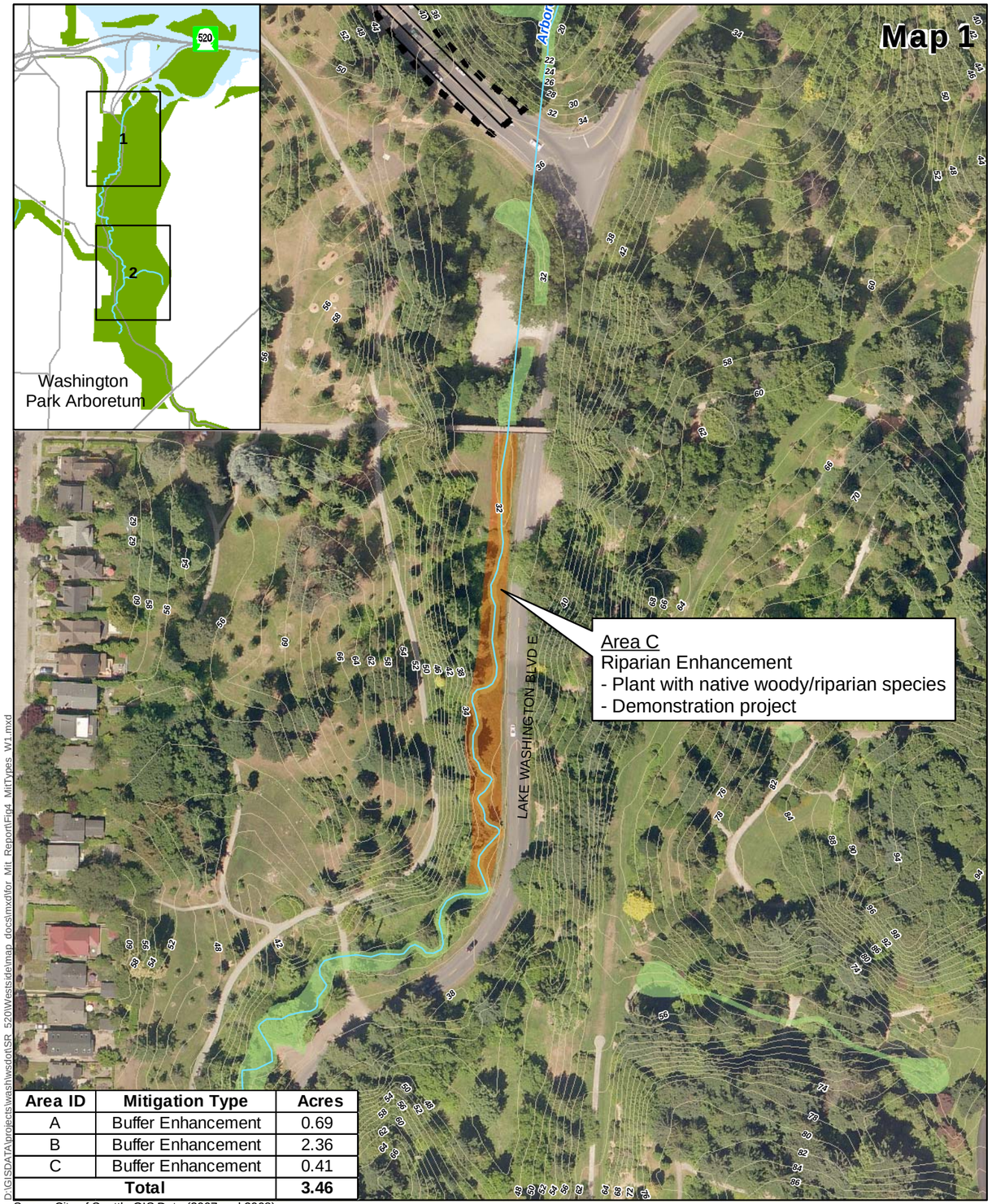

Area ID	Mitigation Type	Acres
A	Buffer Enhancement	0.69
B	Buffer Enhancement	2.36
C	Buffer Enhancement	0.41
Total		**3.46**

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

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N

0 50 100 200 Feet

Legend

Wetland Establishment
Buffer Enhancement
Limits of Construction
2-foot Contour
Wetland Enhancement
Wetland
Stream

Figure 7
Arboretum Creek Mitigation Concept

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

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The upland field (Area B in Figure 7) is located near the middle of the Arboretum, on a wide terrace between Arboretum Creek and Azalea Way. The field's vegetation is dominated by grasses (notably bentgrasses [*Agrostis* sp.], fescue species [*Festuca* sp.], common velvetgrass [*Holcus lanatus*], and reed canarygrass) with a few scattered trees (birch hybrids, native and cultivar willows [*Salix* sp.]) and shrubs (salmonberry [*Rubus spectabilis*]) nearest the stream. Some mowed footpaths cross through this area, but they are relatively narrow and far less travelled than Azalea Way.

The third potential location is in the north of the Washington Park Arboretum, where Arboretum Creek runs along Arboretum Way. Approximately 500 feet of Arboretum Creek has been channelized, straightened and placed adjacent to the roadway. A narrow mowed flat separates the stream from the forested slope to the west. Vegetation in the mowed areas consists of disturbance-tolerant grasses and forbs. The vegetation to the west is predominantly western red cedar with a few scattered big leaf maple (*Acer macrophyllum*), and an understory of dogwood (*Cornus sericea*), Indian plum (*Oemleria cerasiformis*), Himalayan blackberry, sword fern, and lady fern (*Athyrium filix-femina*).

Wetlands

The following section provides a description of wetland conditions at the Arboretum Creek 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 Arboretum Creek Mitigation Site is provided in Section 5.3.17.

Three potential mitigation areas were identified along Arboretum Creek; they are the same locations as noted above for upland: a pond and associated seep wetland, an upland field, and a portion of Arboretum Creek suitable for enhancement (Area A, B, and C, respectively, as shown in Figure 7). Each of the three areas is described below.

The pond and seep is located in the southern portion of the Arboretum on the slope east of Azalea Way, the primary footpath through the Arboretum (Area A, Figure 7). Water enters this wetland through seepage from the slope and from a subsurface drainage system that conveys water into the pond at the center of this area. Vegetation in the pond is primarily duckweed (*Potamogeton* sp.) and pond lily, with a mixture of grasses and creeping buttercup emergent plants along the edge. Some small areas of unidentified sedge (*Carex* sp.) are present upslope and to the south of the pond. The buffer is mostly mowed domestic grasses with a few larger

cherry trees *(Prunus* sp.). Native forest, dominated by western red cedar, rhododendron, thimbleberry, and sword fern, extends upslope from this area to the access road along the Arboretum's eastern boundary.

The field is located near the middle of the Arboretum, on a wide terrace between Arboretum Creek and Azalea Way (Area B, Figure 7). Although wetlands have not been delineated in this area, several seeps were noted upslope that may provide a potential water source for wetlands. Vegetation in the wetland portion of this area is dominated by grasses (primarily fescues, bentgrasses, and common velvetgrass) with a few scattered trees and shrubs. Some mowed footpaths cross through this area, but they are relatively narrow and far less travelled than Azalea Way.

The third potential location is in the north of the Arboretum, where Arboretum Creek runs along Arboretum Way (Area C, Figure 7). As noted above in the discussion of upland mitigation at this site, approximately 500 feet of Arboretum Creek has been channelized, straightened and placed adjacent to the roadway. A narrow mowed flat separates the stream from the forested slope to the west. Surrounding upland vegetation is described in the uplands section.

A summary of the Arboretum Creek wetlands is provided in Table 15.

Wildlife Habitat and Use

The Supplemental Draft Environmental Impact Statement Ecosystems Discipline Report for the project (WSDOT 2009a) indicates that habitats in the project area (including the Arboretum Creek Mitigation Site) can potentially support a diverse assemblage of wildlife species, particularly bird species and disturbance-tolerant mammals. A list of species potentially present (divided into upland and wetland species) is presented in the discussion of the WSDOT-Owned Peninsula Mitigation Site (Section 5.1.6). In addition, the Bioblitz (2010) indicates the presence of northwest salamanders and egg masses in the pond located in the Arboretum Creek Mitigation Site. Other amphibians are also present in the vicinity, including long-toed salamanders, red-eared sliders, bullfrogs, and Pacific tree frogs.

5.3.7. Mitigation Site Design

WSDOT proposes a total of 3.46 acres of riparian enhancement at the Arboretum Creek Mitigation Site. This enhancement will include mitigation actions in both wetland and upland habitats along Arboretum Creek and the associated hillside seeps. Specific construction activities may include minor grading/contouring, replanting native wetland and upland plant species, and

control of non-native species on the site. The proposed mitigation will be developed in consultation with the Arboretum and Botanical Garden Committee (ABGC) and will be consistent with the Arboretum's goals and master plan (Seattle Parks and Recreation 2001). Figure 7 illustrates the mitigation concept for the Arboretum Creek site.

5.3.8. Site Constraints

Mitigation activities at the Arboretum Creek site are constrained by several factors, including the following:

- The site is currently used as a public arboretum and park.
- Areas of potential mitigation are relatively small.
- Management and maintenance activities are ongoing.
- Future plans for the site could also constrain mitigation activities.

5.3.9. Site Hydrology

The Arboretum Creek Mitigation Site has a variety of natural water sources that will support riparian vegetation. These sources include Arboretum Creek and several hillside seeps that feed into the creek from the east. Water availability is supplemented by artificial irrigation in many areas.

5.3.10. Invasive Species

Reed canarygrass, Japanese knotweed, and Himalayan blackberry are present in portions of the Arboretum Creek Mitigation Site. The presence of these species likely reflects the current uses, maintenance, and management practices at the Arboretum Creek Site.

Control of invasive species will be an important element of mitigation activities at the Arboretum Creek Mitigation Site. A plan for the control of invasive species will be develop in consultation with the Arboretum and Botanical Garden Committee (ABGC). The plan will incorporate those practices necessary to achieve control of invasive species, while maintaining consistency with the Arboretum's ongoing uses, maintenance practices, and overall goals for the site. This invasive species control plan will incorporated into the discussion of Site Management (Section 7.3) in future reports.

Table 15. Arboretum Creek Mitigation Site Wetland Summary

Location	North shoreline of Union Bay	
Pond at Arboretum Creek Mitigation Site *Slope above Arboretum Creek*	**Local Jurisdiction**	Seattle
	WRIA	WRIA 8
	Ecology Rating (Hruby 2004)	III/IV
	Seattle Rating	III/IV
	Seattle Standard Buffer Width	60 to 85
	Wetland Size	~0.5 acres
	Cowardin Classification	PEM, PSS
	HGM Classification	Slope
	Wetland Rating System Pts.	
	Water Quality Score	**8 (Pond)/ 8 (Slope)**
	Hydrologic Score	**5 (Pond)/ 2 (Slope)**
	Habitat Score	**15 / 12**
	Total Score	**28 / 22**
Dominant Vegetation	Pondweed, pond lily, mixed grasses, and creeping buttercup are the dominant plants at the pond site. Some small areas of unidentified sedge (*Carex* sp.) are present upslope and to the south. The slope above Arboretum Creek is dominated by fescues, bentgrasses, and common velvetgrass, with scattered willows and birches (native and domestic). Vegetation along Arboretum Creek itself is predominantly disturbance-tolerant grasses and forbs.	
Soils	Not sampled.	
Hydrology	Wetland hydrology is provided by seepage from the hillside to the east.	
Rationale for Local Rating	Relatively low wetland function is due to low species and habitat diversity, limited habitat interspersion, ongoing maintenance activities, and frequent human disturbance.	
Functions of Entire Wetland	Identified wetlands at the Arboretum Creek Site provide low performance for water quality, hydrologic, and habitat functions. This level of function is consistent with the landscape position of the wetlands (which do not support water quality and hydrologic functions at a high level) and the disturbed nature of the habitat.	
Buffer Condition	Buffers to the east are naturally vegetated (mowed domestic grasses with a few larger cherry trees [Prunus sp.]), but interrupted by a series of unpaved foot trails. The buffers to the west generally consist of mowed grasses, maintained walkways, and Arboretum specimens.	

5.3.11. Grading Design

Site survey has not been completed and detailed topographic information is not currently available for the Arboretum Creek Mitigation Site. Elevations and excavation descriptions are based on inventory-level topographic information from the City of Seattle. However, WSDOT expects the grading activities associated with this riparian buffer mitigation to be minor. Grading plans will be incorporated into future designs and reports for the site if necessary.

5.3.12. Planting Design

Appropriate native planting designs for the Arboretum Creek Mitigation Site will be developed that meet the riparian habitat improvement goals for the site. The designs will be developed in consultation with the ABGC, and will be consistent with the Arboretum's ongoing uses of the site, maintenance practices, and overall goals. Design specifics will be included in future versions of this plan.

5.3.13. Habitat Features

Habitat features appropriate to the target riparian plant communities and site conditions will be selected in consultation with the ABGC. These features will be incorporated into the mitigation design and described in future versions of the mitigation plan.

5.3.14. Buffers and Uplands

See planting design above.

5.3.15. Site Protection

Mitigation at the Arboretum Creek will include long-term protective measures, such as deed restrictions, conservation easements, or Native Growth Protection Easements, as appropriate to the site. Ownership of the Arboretum Creek Mitigation Site will be retained by Seattle Parks/ University of Washington.

5.3.16. Implementation Schedule

A complete implementation schedule for this mitigation has not yet been developed. However, a number of additional studies are anticipated as part of the design process. Specific studies are listed in Section 5.1.16.

5.3.17. Ecological Benefits

Wetland Functions

The proposed mitigation at the Arboretum Creek is not intended to provide compensatory wetland mitigation. However, the proposed actions (enhancement of 3.46 acres of riparian buffer) are expected to result in improvement to wetland functions at the site. A summary of the expected improvements to wetland function is provided in Table 16.

Improved Functional Attributes

- Increased native plant presence in affected areas
- Reduced prevalence of invasive species
- Increased vertical and horizontal habitat complexity
- New corridors of riparian habitat created in two areas to shade Arboretum Creek
- Improved screening of existing wetland areas
- Additional habitat features

Table 16. Existing and Proposed Wetland Functions at the Arboretum Creek Mitigation Site

Function/Value[a]	Existing Conditions	Enhanced Riparian Buffers
Flood flow alteration	L Flows in Arboretum Creek are low due to entrainment of the upper watershed of the stream in Madison Valley	No Change
Sediment removal	L Limited sources of sediment upslope	No Change
Nutrient and toxicant removal	L	No Change
Connection of Arboretum Creek to associated floodplains	Varies	No Change
Erosion control and shoreline stabilization	Varies low in lower reach of Arboretum Creek, and higher upstream	+ Plan will add additional woody vegetation which will stabilize the banks of Arboretum Creek
General habitat suitability	Varies	+ Plan will add woody riparian habitat
Fish habitat	L	No Change
Native plant richness	Varies	+ Plan will increase presence of native species in mitigation areas
Educational or scientific value	High	+ Add signage describing restoration activities

[a] L = Low
M = Moderate
H = High.
For the proposed mitigation + indicates an improvement in functional attribute.

5.4 Magnuson Park Mitigation Site

5.4.1. Site Location

Magnuson Park is located on a peninsula on the western shore of Lake Washington in the city of Seattle. The site is north of the University of Washington and about 2.5 miles north of the SR 520 Bridge in the southeast quarter of Section 2, Township 25 North, Range 4 East. The site is owned and operated by the City of Seattle as a municipal park. Within Magnuson Park, the SR 520 mitigation site is located adjacent to and north east of a wetland mitigation project completed in 2009 as part of Phase 2 of the Magnuson Park Master Plan (Otak 2010). The eastern boundary of the site is Beach Drive, across from the Phase 3 Lagoon planned for construction in 2011 (Figure 8). This area is currently viewed by WSDOT as the best area for anticipated SR520 mitigation needs within the park.

In the same way as previous mitigation completed on site by City of Seattle, the proposed SR 520 mitigation would be aligned with the larger overall ecological restoration vision and concept for the park documented in the park master plan. There are other similar areas in the park that may provide for additional mitigation or the mitigation area may shift to these areas as the design matures. One specific nearby restoration element under evaluation involves expansion of the lagoon system to establish a direct surface water connection to Lake Washington. The master plan identifies this restoration element as important for ecological connectivity. Another nearby restoration element would involve expansion to the northwest or west, towards potential water sources including the North Meadow Pond to provide added area and functional benefits. Further work and coordination with the City of Seattle is necessary to clarify the full extent of the mitigation site and assure that it is consistent with the park master plan.

5.4.2. Landscape Perspective

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

5.4.3. Ecological Connectivity

The Magnuson Park Mitigation Site provides open space and wildlife habitat adjacent to and connecting with other wetland habitats in the park. Establishing a mitigation site here will provide a connection between the recently-created Phase 2 wetland mitigation site (14 acres of wetlands) and other existing wetland habitat located in the park to the south, west and north (Otak 2007 and Sheldon and Associates 2005). Lake Washington is located 300 to 500 feet southeast and east across Beach Drive from the proposed mitigation site. Mitigation activities at this site will improve the quality of existing wetland habitat, add additional habitat and increase habitat diversity. The project will improve the density and structure of vegetation allowing more secluded movement by wildlife between the many wetland habitats found in the park. The future Phase 3 (funded for construction in 2011), and Phase 4 (unfunded) lagoons will provide added connectivity to Lake Washington. Lake Washington provides a corridor for waterfowl, aquatic and amphibian species between the Magnuson Park site and the Washington Park Arboretum, the Union Bay Natural Area and other wetland habitats along the lake.

5.4.4. Current and Historic Land Use

The Magnuson Park peninsula is a relatively low, flat peninsula that extends east into Lake Washington. The mitigation site is located on the eastern edge of the peninsula, 300 feet west of Lake Washington and Magnuson Park public beaches. Wetlands and natural areas exist at the base of Kite Hill, existing wetland mitigation and natural areas are located west and southwest of the proposed mitigation site and two relic bunkers are located north of the site. The proposed mitigation site is currently used as part of the City Park, and includes wetland and upland grasses with overgrown areas. Paved trails surround the site and it is crossed by a few unofficial trails.

The Magnuson Park peninsula was originally below the surface of Lake Washington, but was exposed by the construction of the Ship Canal and subsequent lowering of Lake Washington. In the 1920s and 30s, the Navy established an airfield by filling low areas, including marshes and the small Mud Lake, and grading the site level. Commander A. W. Radford noted in a memo that grading of the airfield involved more than 1,500,000 cubic yards (Seattle Parks 2011). In the early 1940s, with the onset of World War II, the runways were paved and expanded and buildings were added. In 1970 the airstrip was deactivated, and in the late 1970s, the runways, tarmac, and taxiways were demolished (Seattle Parks 2011). In the early 1990s the naval station was decommissioned and in 1995 it was officially closed. Ninety acres were transferred to Seattle and the University of Washington. In 2004, the Seattle City Council approved a wetland and sports field master plan for the area that included a wetland mitigation site (Seattle Parks 2011). In 2009, the sports field and a wetland mitigation site were constructed as Phase 2 of the

Magnuson Park Master Plan. A lagoon located between the mitigation site and the lake is planned for construction in 2011 as Phase 3 of the master plan.

5.4.5. Rationale for Site Selection

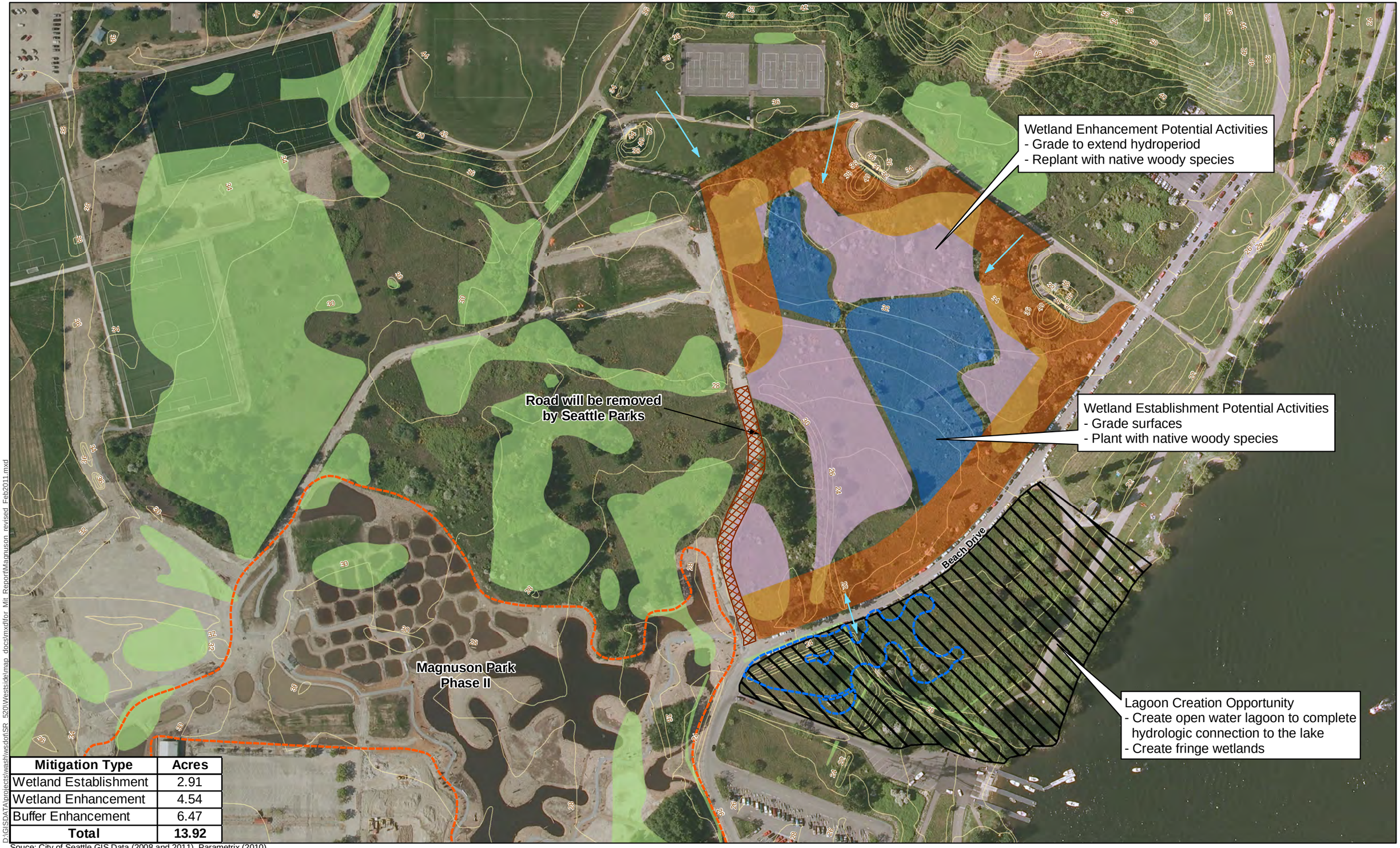
As described in Section 4.2, the Magnuson Park mitigation site was identified in a multi-stage, hierarchical selection process. This site was selected due to its relatively large size, availability, location in the affected watershed/basin, and potential for wetland mitigation activities.

5.4.6. Mitigation Site Existing Conditions

The Magnuson Park Mitigation Site is a mixture of existing low quality wetland mosaic intermixed with disturbed uplands. Past activities on the site include filling, soil compaction, runway construction and demolition that prevent significant infiltration. The site soils limit any significant infiltration and rapidly sheet flow precipitation to low areas (wetlands) or off-site. The fill soils were placed over historic wetland soils and are relatively deep. Excavation for the Phase 2 wetland mitigation sites found only pockets of peat soils (Guy Michaelson and Dyanne Sheldon 2011 pers. comm.) The fill soils form a hardpan of clay, silt, sand, and gravel making it difficult for animals to burrow, dig, and den in the site soils. The soils contain little organic matter to retain soil moisture in the summer. The top organic soil layer is shallow or absent and the soil invertebrate community is sparse. Thirty years after the runway was decommissioned grasses dominated much of the site most likely because of the poor soil quality. Non-native plant species (such as reed canarygrass, Himalayan blackberry, Scot's broom, English hawthorn [*Crataegus monogyna*], white poplar [*Populus alba*] and English ivy [*Hedera helix*]) are common and also indicates the disturbed nature of the site.

Uplands

The uplands in this area tend to be mostly fields with a mixture of bentgrasses, velvet grass and common weeds. There are patches of Scot's broom, Himalayan blackberry, and scattered black cottonwood, Lombardy poplars (*Populus nigra*), white poplar, and English hawthorns.



Mitigation Type	Acres
Wetland Establishment	2.91
Wetland Enhancement	4.54
Buffer Enhancement	6.47
Total	**13.92**

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

N

0 50 100 150 200 250 300 Feet

Legend

- Wetland Establishment
- Wetland Enhancement
- Buffer Enhancement
- Existing Wetland (Pre-Phase II Delineation)
- Lagoon Creation Opportunity
- Increased Flow
- Phase II Mitigation
- Phase III Mitigation
- 2-foot Contour

Figure 8
Magnuson Park Mitigation Concept

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

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Wetlands

Wetland K1

Three wetlands have been delineated on-site. These wetlands are identified as K1, K2, and K3 (Sheldon and Associates 2005). All three are depressional wetlands receiving most of their water from direct precipitation or the immediate watershed. Wetland K2 and K3 have no defined outlets, and Wetland K1 drains into a central ditch that flows south under Beach Drive, into the proposed Phase 3 lagoon, and on into Lake Washington. Wetland K1 (3.16 acres) has an emergent and forested area. The emergent area is dominated primarily by reed canarygrass, bentgrass, and soft rush. The forested area, along the ditch, is dominated by black cottonwood, willows and Douglas spirea. Wetland K2 (2.78 acres) is dominated by velvet grass and bentgrass with areas of black cottonwood, English hawthorns, white poplars, and Douglas spirea (*Spiraea douglasii*). This wetland has a large patch of slough sedge (*Carex obnupta*). Wetland K3 (0.73 acres) is dominated by bent grasses, velvet grass, and soft rush. Himalayan blackberry, Scot's broom, and English hawthorn are scattered throughout the wetland. Wetlands K1 and K2 are Category III wetlands, while Wetland K3 is a Category IV wetland (Table 17) (Hruby 2004).

Wetland K1 showing some of the non-native plants on-site

Table 17. Magnuson Park Mitigation Site Wetland Summary

Location	Peninsula on west side of lake Washington - north of SR 520

Wetland K1 facing west across center of site

Wetland K2, north end of site facing north

Local Jurisdiction	Seattle
WRIA	WRIA 8
Ecology Rating (Hruby 2004)	III and IV
Seattle Rating	III and IV
Seattle Standard Buffer Width	60 and 50 feet
Wetland Size	Three covering 6.7 acres
Cowardin Classification	PEM, PSS and PFO
HGM Classification	Depressional
Wetland Rating System Pts.	

SCORE	**K1**	**K2**	**K3**
Water Quality Score	**14**	**8**	**8**
Hydrologic Score	**10**	**10**	**10**
Habitat Score	**14**	**12**	**8**
Total Score	**38**	**30**	**27**

Dominant Vegetation	Emergent areas: bentgrass,velvet grass, reed canarygrass, and soft rush. Scrub-shrub areas: Douglas spirea. Forested areas: black cottonwood, red alder, white poplars, and willow. Uplands: Himalayan blackberry, Scot's broom, white poplar.
Soils	Mapped as Urban Land. Gray silt, clay, sand, and gravel soils forming hardpan near surface and limiting penetration by water, animals or invertebrates. Top organic layer shallow or absent. Organic matter limited soils that dry out quickly in summer.
Hydrology	Perched water table fed by seasonal rains producing seasonally saturated soils and small area (ditch) of seasonal inundation.

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

Wildlife Habitat and Use

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

5.4.7. Mitigation Site Design

The basic elements of the mitigation design include the following:

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

Wetland area will be established and enhanced through site grading. Wetland K1 will be expanded and other areas will be established by redirecting existing runoff that currently drains to Lake Washington into the wetlands. Water from two existing ditches north of the site will likely be re-directed into the mitigation site. Water that currently feeds Wetland K1 includes both treated seasonal stormwater and the 400 gal/minute discharge from the USGS fish research station. It is anticipated that most of the site will be graded to create wetlands composed of seasonally inundated emergent, scrub-shrub and forested wetlands. The site's rough grading will over-excavate to allow importation and spreading of 1.5 to 2 feet of suitable native soils to mimic a more natural soil layer and to reach the final grade.

The design will attempt to retain the large black cottonwoods and willow along the ditch as well as some black cottonwoods and a few Douglas-fir and other conifers at the north end of the site. Little else of the existing vegetation would be retained. The proposed mitigation site will be developed in consultation with the City of Seattle and will be consistent with the Magnuson Park Master Plan.

Figure 8 illustrates the mitigation concept for the Magnuson Park site.

This mitigation concept also includes work within wetlands that may be either enhancement or rehabilitation. Additional analysis of site conditions and available hydrology will be needed to assess which type of mitigation is most appropriate for the site. For the purpose of estimating mitigation credits, enhancement will be used for those areas.

5.4.8. Site Constraints

The following constraints apply to the Magnuson Park Mitigation Site:

- A sanitary sewer line crosses the center of the site east to west.
- Access to an existing electrical box must be maintained along the northwest side of the site.
- Fill materials on the site may contain hazardous materials. Excavation of Phase 2 wetland mitigation sites identified four small, minor contamination sites which the Navy subsequently removed (Otak 2010).
- Concerns of other stakeholders (e.g., recreational users of the park, nearby residents, birdwatchers) may affect the design and construction of the mitigation.
- Future plans for nearby portions of Magnuson Park could also constrain mitigation activities.
- Management and maintenance activities are ongoing.

5.4.9. Site Hydrology

The mitigation design expands the catchment area, and thus the amount of water reaching the site. The existing wetlands are perched above the groundwater and rely on surface waters for hydrology. The project does not expect to intersect the groundwater and will rely instead on the existing surface waters, additional runoff, and overflow from the existing mitigation site to provide water to the proposed mitigation site. Site grading will increase the variety of hydroperiods found within the existing wetlands. WSDOT will continue to study and evaluate wetland hydrology to support the mitigation design development.

Stream Flow

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

Groundwater

Groundwater information for the Magnuson Park Mitigation Site is not yet available.

WSDOT will install groundwater wells to evaluate hydrology on the site as the mitigation design is advanced. Data from that groundwater monitoring and other information related to hydrology

will be incorporated into future mitigation planning documents and final site design (PS&E) as it becomes available.

5.4.10. Invasive Species

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

5.4.11. Grading Design

As of the writing of this conceptual mitigation plan, site survey has not been completed and detailed topographic information is not available. Wetland elevations and excavation descriptions for the Magnuson Park Mitigation Site are based on inventory-level topographic information from the City of Seattle. As survey-level site topography and more complete hydrologic data becomes available, this information will be used to develop grading plans that will be incorporated into future designs and reports for the site.

5.4.12. Planting Design

The plant communities proposed for the wetland creation and enhancement or rehabilitation areas at the Magnuson Park Mitigation Site are anticipated to include emergent, scrub-shrub, and forested wetland areas. A list of typical plant species and community composition for planting zones is presented in Table 18. Note that the composition of the planting zones may be revised in the draft and final versions of this report as more information is collected at the mitigation sites.

Table 18. Proposed Typical Planting List for Wetland Areas

Common Name	Scientific Name	Indicator Status
Emergent Planting		
Common spikerush	*Eleocharis palustris*	OBL
Ovoid spikerush	*Eleocharis obtusa*	OBL
Hardstem bulrush	*Schoenoplectus acutus*	OBL
Sawbeak sedge	*Carex stipata*	OBL
Small fruited bulrush	*Scirpus microcarpus*	OBL
Wool-grass	*Scirpus cyperinus*	OBL
Slough sedge	*Carex obnupta*	OBL
Tapertip rush	*Juncus acuminatus*	OBL
Rice cutgrass	*Leersia oryzoides*	OBL
Scrub-shrub Wetland Planting		
Black hawthorn	*Crataegus douglasii*	FAC
Black twinberry	*Lonicera involucrata*	FAC+
Nootka rose	*Rosa nutkana*	FAC
Pacific ninebark	*Physocarpus capitatus*	FACW-
Peafruit rose	*Rosa pisocarpa*	FAC
Red-osier dogwood	*Cornus sericea*	FACW+
Salmonberry	*Rubus spectabilis*	FAC+
Scouler's willow	*Salix scouleriana*	FAC
Sitka willow	*Salix sitchensis*	FACW
Forested Wetland Planting		
Trees		
Black cottonwood	*Populus balsamifera ssp.*	FAC
Oregon ash	*Fraxinus latifolia*	FACW
Pacific willow	*Salix lucida var. lasiandra*	FACW+
Red alder	*Alnus rubra*	FAC
Sitka spruce	*Picea sitchensis*	FAC
Western red cedar	*Thuja plicata*	FAC
Shrubs		
Black twinberry	*Lonicera involucrata*	FAC+
Nootka rose	*Rosa nutkana*	FAC
Red-osier dogwood	*Cornus sericea*	FACW+
Salmonberry	*Rubus spectabilis*	FAC+

Canopy species identified in the proposed planting palette include both fast-growing and slow-growing species, as well as both deciduous and coniferous species. Additional modifications to the selected species may be made as additional site design information (particularly hydrology data) becomes available.

5.4.13. Habitat Features

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

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

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

5.4.14. Buffers and Uplands

Buffer plantings at the Magnuson Park will be largely composed of mixed upland forest species. A typical species list is shown in Table 19. The list includes canopy communities (consisting of both deciduous and coniferous tree species) and sub-canopy communities (consisting of deciduous species tolerant to a broad variety of light availability). Planting densities will be higher than similar wetland areas to reduce intrusion and provide additional screening for the resources.

Table 19. Proposed Typical Planting List for Upland Buffer Areas

Common Name	Scientific Name	Indicator Status
Upland Forested		
Trees		
Big leaf maple	*Acer macrophyllum*	FACU
Black cottonwood	*Populus balsamifera ssp. trichocarpa*	FAC
Bitter cherry	*Prunus emarginata*	FACU
Douglas-fir	*Pseudotsuga menziesii*	FACU
Red alder	*Alnus rubra*	FAC
Western red cedar	*Thuja plicata*	FAC
Cascara	*Rhamnus purshiana*	FAC-
Shrubs		
Baldhip rose	*Rosa gymnocarpa*	FACU
Beaked hazelnut	*Corylus cornuta*	FACU
Common snowberry	*Symphoricarpos albus*	FACU
Red elderberry	*Sambucus racemosa*	FACU
Redflower currant	*Ribes sanguineum*	FACU
Serviceberry	*Amelanchier alnifolia*	FACU
Thimbleberry	*Rubus parviflorus*	FAC-
Vine maple	*Acer circinatum*	FAC-

5.4.15. Site Protection

Trails and plantings at the site will be located in a manner that limits human intrusion into the mitigation site, while still allowing for viewing points. Magnuson Park is protected as a City Park. WSDOT will work with the city and regulatory agencies as needed to establish appropriate long-term protective measures that will protect the wetland functions established at the site. Ownership of the site will be retained by Seattle Parks and Recreation.

5.4.16. Implementation Schedule

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

- Wetland delineation

- Soil studies
- Shallow groundwater monitoring
- Permit applications
- Permit approval

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

5.4.17. Ecological Benefits

Wetland Functions

The proposed mitigation at the Magnuson Park Mitigation Site is expected to substantially improve wetland functions at this location. Functional attributes of the mitigation wetlands that will be increased, compared to the existing impacted wetlands, are listed below. A summary is provided in Table 20.

Improved Functional Attributes

- Increased flood storage volume and retention times.
- Increased water quality treatment because of increased retention times, soil organic content, and improved soil infiltration in the layers replaced or treated.
- Soils more conducive to native plant growth, invertebrate and small mammal use.
- Increased number of habitat types, interspersion, plant species richness, vertical structure to increase native wildlife use and diversity.
- Lengthened hydroperiods, resulting in increasing habitat types and providing wildlife water source throughout the year.
- Non-native plant species removed and replaced with native plant species favoring native wildlife.
- Improved habitat connectivity within the park.

New Functional Attributes

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

Table 20. Existing and Proposed Wetland Functions at the Magnuson Park Mitigation Site

Function/Value[a]	Existing Conditions	Created Wetland	Enhanced Wetland
Flood flow alteration	n/a	No Change	No Change
Sediment removal	L	+ Expand and increase density of the vegetated wetland area.	+ Increase watershed size and retention time.
Nutrient and toxicant removal	L	+ Expand vegetated wetland area.	+ Increased organic content and soil infiltration in upper layers.
Erosion control and shoreline stabilization	n/a	n/a	n/a
General habitat suitability	L	+ Plan adds wetland habitat areas with buffers. Also improved.	+ Plan provides greater habitat complexity and increases vertical structure, habitat interspersion and species richness. Also improved buffers and provides habitat features. Improves soils, invertebrate habitat, burrowing small mammal habitat and amphibian habitat.
Fish habitat	Not present	No Change Small area of permanent open water may provide some habitat for fish such as sticklebacks, but access would be difficult.	
Native plant richness	L	+ Plan removes non-native species that dominate the site and plans for a variety of native plant species not currently found on-site.	
Educational or scientific value	L	+ Trails, overlooks, and signage will utilized in the design to maximize educational opportunities.	

[a] L = Low
M = Moderate
H = High.
For the proposed mitigation + indicates an improvement in functional attribute.

Buffer Functions

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

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

5.5 Elliott Bridge Reach Mitigation Site

The Elliott Bridge Reach Mitigation Site will provide wetland and aquatic habitat mitigation for the SR 520, I-5 to Medina Project.

5.5.1. Site Location

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

5.5.2. Landscape Perspective

Landscape Position

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

5.5.3. Ecological Connectivity

The Elliott Bridge Reach Mitigation Site consists of currently and formerly developed residential parcels with publicly-owned open space both up and downstream. Mitigation at this location will establish riparian wetlands and rearing habitat for salmonids, provide additional floodplain capacity, enhance riparian vegetation and riparian buffer functions, and connect currently fragmented habitats to the east at Cavanaugh Pond Natural Area to habitats at Ron Regis Park and Maplewood Golf Course to the west of the site.

5.5.4. Historic and Current Land Use

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

into the mid 1930s (King County IMAP aerial). The golf course located downstream of Ron Regis Park was originally developed in 1927 as the Cedar River Golf Club. The name was changed to Maplewood Golf Club in the 1940s, and the City of Renton acquired the course in 1985. The agricultural parcels were subdivided into smaller residential lots and developed in the 1950s (King County IMAP Assessor's Data Report). The Elliott Bridge was removed in 2005, and replaced with a new structure upstream of the site, that carries 154th Place SE over the Cedar River. Parcels in the Elliott Bridge Reach site have remained in residential use until purchased by King County in the mid 2000s as part of the Levee Setback program. Structures have been removed from four of the purchased parcels.

5.5.5. Rationale for Site Selection

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

5.5.6. Mitigation Site Existing Conditions

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

Uplands

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

Vegetation at the Elliott Bridge Reach site is typical of developed residential areas. Trees have been retained on the site or planted to provide shade, and include native species (e.g., red alder [*Alnus rubra*], black cottonwood, Douglas-fir, Sitka spruce [*Picea sitchensis*], western red cedar, and western white pine [*Pinus monticola*]) and ornamental and fruiting species (e.g. *Prunus* and *Malus* sp.). Much of the site is open, and the dominant species present are landscape grasses (*Agrostis* sp., *Lolium* sp.) and disturbance-tolerant forbs (cat's ear [*Hypocharis radicata*], clover (*Trifolium* sp.), common mullein [*Verbascum thapsus*], creeping buttercup, plantains [*Plantago* sp.], and thistles [*Cirsium* sp.]). Invasive species (Himalayan blackberry, Japanese knotweed, and reed canarygrass) are common in the areas adjacent to the dike. A narrow, 10-foot-wide fringe of wetland vegetation is located on the north bank of the Cedar River extending up the dike slope but apparently within the OHWM. Vegetation in this area consists of an emergent stratum of unidentified sedges (*Carex* sp.) daggerleaf rush (*Juncus ensifolius*), spikerush

(*Eleocharis* sp.), soft rush (*Juncus effusus*), tapertip rush (*Juncus acuminatus*), and toad rush (*Juncus bufonius*).

Wetlands and streams

The following section provides a description of wetland conditions at the Elliott Bridge Reach Mitigation Site. Wetland functions at the mitigation site were evaluated using the *Washington State Wetland Rating System for Western Washington – Revised* (Hruby 2004). Additional discussion of wetland function at the Elliott Bridge Reach Mitigation Site is provided in Section 5.5.17.

No wetlands were identified on the site. One unnamed tributary was identified on the site (Figure 9). Unnamed Stream 1 is a small stream on the north that drains the slope to the north, flows along the old 149th Street road prism, and enters the Cedar River at the old 149th Street Bridge footing. This stream is approximately 3 to 8 feet wide at the top of bank, and has a silt and sand substrate. Flows were observed in October, indicating that this stream is likely perennial.

A summary of the Elliott Bridge Reach's existing vegetation is provided in Table 21.

Wildlife Habitat and Use

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

Detailed information on habitat type and potential usage will be provided in the *Draft Wetland Assessment Report for the I-5 to Medina: Bridge Replacement and HOV Project Wetland Mitigation Sites* (WSDOT 2011). Additional detail regarding fish use at the site is provided in the *Conceptual Aquatic Mitigation Plan for the I-5 to Medina: Bridge Replacement and HOV Project* (WSDOT 2010a).

Table 21. Elliott Bridge Reach Mitigation Site Wetland Summary

Location	Banks of the Cedar River near 154th Place SE in Renton	
Elliott Bridge Reach Mitigation Site, Parcel 2323059142 facing north. *Open area in Parcel 2323059141 facing north.*	**Local Jurisdiction**	Renton
	WRIA	WRIA 8
	Ecology Rating (Hruby 2004)	n/a
	Renton Rating	n/a
	Renton Buffer Width	n/a
	Wetland Size	n/a
	Cowardin Classification	Upland
	HGM Classification	n/a
	Wetland Rating System Pts.	
	Water Quality Score	n/a
	Hydrologic Score	n/a
	Habitat Score	n/a
	Total Score	n/a
Dominant Vegetation	Mixed grasses, landscape trees and shrubs. No wetlands were identified on the site.	
Soils	Newberg silt loam, Puyallup fine sandy loam.	
Hydrology	No wetlands were identified on the site.	
Rationale for Local Rating	No wetlands were identified on the site.	
Functions of Entire Wetland	No wetlands were identified on the site.	
Buffer Condition	Mixed grasses and landscape plants. Surrounding areas are residential yards.	

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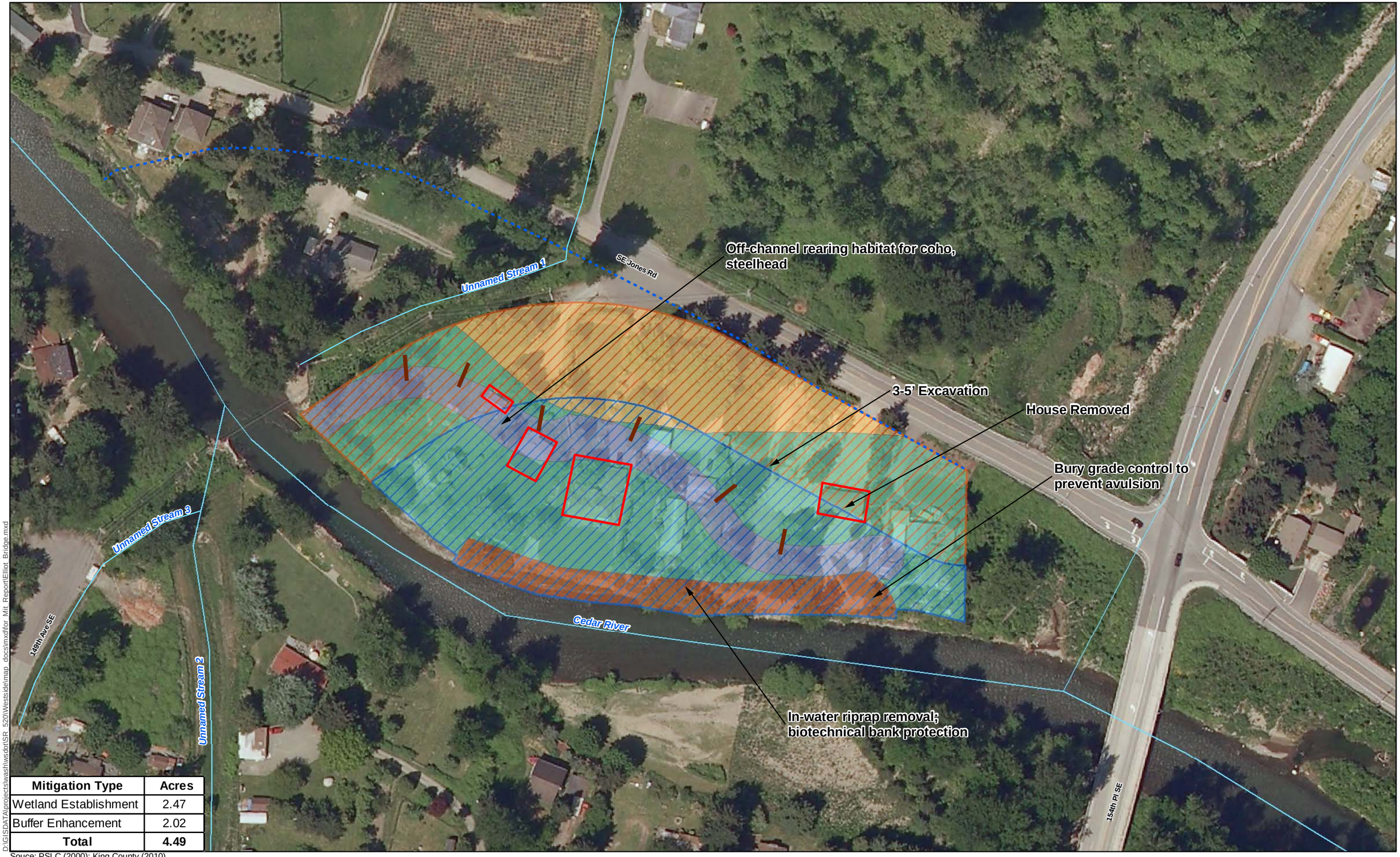

Mitigation Type	Acres
Wetland Establishment	2.47
Buffer Enhancement	2.02
Total	**4.49**

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

N

0 50 100 150 200 250 300 Feet

Legend

- Wetland Establishment
- Wetland Buffer Enhancement
- Proposed Stream Channel
- Floodplain Restoration
- Hard Structure Removal
- Riparian Enhancement and Floodplain Restoration
- Wood Groin
- Proposed Levee Setback
- Stream

Figure 9
Elliott Bridge Reach Mitigation Concept

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

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5.5.7. Mitigation Site Design

At this site, WSDOT proposes to establish 2.47 acres of forested, scrub-shrub, and emergent wetland and to enhance 2.02 acres of forested riparian buffer along the Cedar River. Specific construction activities may include setback of the existing levees, excavation to construct a blind channel on the north side of the Cedar River, excavation/grading/contouring to establish a surface consistent with wetland hydrology, replanting native wetland and upland plant species, and control of non-native species on the site. Wetland would be established within the proposed levee setback area, and the remaining areas of the site would be revegetated with appropriate forested upland vegetation. Figure 9 illustrates the mitigation concept for the site.

5.5.8. Site Constraints

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

- Adjoining land uses to the north and west require adequate buffering.
- Substantial excavation will be required to achieve appropriate wetland hydrology.
- Soil substrate may require amendment to create a suitable growing medium.
- In-water work windows may shorten work period at this location.

5.5.9. Site Hydrology

Wetland hydrology at the Elliott Bridge Reach site would be primarily determined by water levels in the Cedar River. Smaller tributaries associated with the Cedar River and groundwater seepage from the slope to the north may provide supplemental hydrology for the site, and could be used to extend the wetland hydroperiod.

Stream Flow

Stream flow data for the Cedar River has not been collected. This data will be incorporated into future versions of the mitigation plan and the final engineering for the project as it becomes available.

Groundwater

Groundwater information for the mitigation sites is not yet available. WSDOT will install groundwater wells to evaluate hydrology on the wetland mitigation sites as site procurement and mitigation design is advanced. Data from that groundwater monitoring and other information

related to hydrology will be incorporated into future mitigation planning documents and final site design (PS&E) as it becomes available.

5.5.10. Invasive Species

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

5.5.11. Grading Design

As of the writing of this conceptual mitigation plan, site survey has not been completed and detailed topographic information is not available. Wetland elevations and excavation descriptions are based on inventory-level topographic information from LIDAR data. As survey-level site topography and more complete hydrologic data becomes available, this information will be incorporated into future grading plans, designs, and reports for the site.

The proposed design for the Elliott Bridge Reach site will include: demolition and removal of existing structures, driveways and roads; removal of existing levees and associated culverts; construction of replacement setback levees; and excavation of new channels and floodplain wetlands. WSDOT will excavate the surface of the site within the setback levee to more closely approach the elevations of the Cedar River, providing a consistent source of wetland hydrology. The depth of excavation on the site is expected to vary from 3 feet deep in the terrace areas, to approximately 7 feet deep at the current levee locations and in created side channels. WSDOT does not propose excavation on the south side of the Cedar River.

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

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

5.5.12. Planting Design

Proposed plantings for the wetland establishment areas at the Elliott Bridge Reach Mitigation Site include streamside plantings, shrub-shrub plantings, and riparian forested plantings. A list of typical plants species and community composition for these zones are presented in Table 10, Section 5.1.12. Note that the composition of the planting zones shown in this plan may be revised in the future versions of this report as more information is collected at the mitigation site.

Canopy species identified in the proposed planting palette include both fast-growing and slow-growing species, as well as both deciduous and coniferous species. The scrub-shrub plantings will occupy the areas between the forested zones and the streamside zones at the Elliott Bridge Reach site. Shrubs have been selected from species common in the areas that are tolerant to full sun and to a broad range of hydrologic conditions. Species included in the streamside palette include fast-growing woody species in live stake form to protect the shoreline and native emergent species common in these areas. These live-staked woody species will also be suitable for the edge of the established wetlands. Additional modifications to the selected species may be made as additional site design information (particularly hydrology data) becomes available.

5.5.13. Habitat Features

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

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

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

5.5.14. Buffers and Uplands

Buffer plantings at the Elliott Bridge Reach will be largely composed of mixed upland forest species. A typical species list is shown in Table 10, Section 5.1.14. The list includes canopy communities (consisting of both deciduous and coniferous tree species) and sub-canopy communities (consisting of deciduous species tolerant to a broad variety of light availability).

Planting densities will be higher than similar wetland areas to reduce intrusion and provide additional screening for the resources.

5.5.15. Site Protection

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

5.5.16. Implementation Schedule

A complete implementation schedule for this mitigation has not yet been developed. Additional studies and benchmarks to be completed are expected to be similar to those listed in Section 5.1.16.

5.5.17. Ecological Benefits

Wetland Functions

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

- Establishment of 2.47 acres of wetland
- Enhancement of 2.02 acres of wetland buffer

The proposed mitigation at the Elliott Bridge Reach site is expected to substantially improve water quality, hydrologic, and habitat functions. Functional attributes of the mitigation wetlands that will be improved and added, compared to the existing impacted wetlands, are listed below. A summary is provided in Table 22.

Improved Functional Attributes:

- Reduced prevalence of invasive species
- Increased plant diversity by replanting with native species
- Increased vertical and horizontal habitat complexity
- Additional habitat features

New Functional Attributes:

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

Table 22. Existing and Proposed Wetland Functions at the Elliott Bridge Reach Mitigation Site

Function/Value[a]	Existing Conditions	Established Wetland
Flood flow alteration	L Cedar River constrained in levees	+ Plan creates additional floodplain areas
Sediment removal	L No wetland present; existing upland vegetation may remove pollutants	+ Plan includes woody vegetation to slow flows and trap sediments
Nutrient and toxicant removal	L No wetland present; existing upland vegetation may remove pollutants	Pollutant removal increased due to establishment of wetlands
Connection of Cedar River to associated wetlands	No wetland in this area	+ Established wetlands will have a direct hydrologic connection to the Cedar River
Erosion control and shoreline stabilization	Riprap	+ Controlled by natural vegetation
General habitat suitability	H	+ Additional side channel habitat provided
Fish habitat	H	+ Additional side channel habitat provided
Native plant richness	L	+ Additional native plant species provided
Educational or scientific value	L	+ Public ownership will enhance educational and research opportunities at the site

[a] L = Low
M = Moderate
H = High.
For the proposed mitigation + indicates an improvement in functional attribute.

Buffer Functions

Buffers for the site have been designed in accordance with USACE and Ecology joint guidance to provide adequate protection for the wetland functions at the mitigation sites. The proposed buffers for the Elliott Bridge Reach Mitigation Site will be a minimum of 110 feet wide, and are expected to provide the following:

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

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Chapter 6. Mitigation Goals, Objectives, and Performance Criteria

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

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

6.1 Wetland Mitigation Sites

6.1.1. Goals

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

- Establish 7.91 acres of palustrine forested, scrub-shrub and emergent wetland.
- Re-establish 1.68 acres of lake fringe scrub-shrub wetland.
- Enhance 24.47 acres of existing lake fringe and palustrine wetland.
- Enhance 29.95acres of mixed wetland and shoreline buffer.

6.1.2. Objectives

WSDOT-Owned Peninsula Mitigation Site

PENINSULA 1: Re-establish 1.68 acres of lake fringe wetland at the WSDOT-Owned Peninsula Mitigation Site.

Re-establish wetland by restoring natural elevations in this area.

Improve hydrologic and water quality functions by adding vegetative roughness within the re-established wetlands.

Improve complexity of wetland wildlife habitat by increasing the diversity of the native wetland plant community.

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

PENINSULA 2: Enhance 2.33 acres of lake fringe wetlands at the WSDOT-Owned Peninsula Mitigation Site.

Improve diversity of wetland wildlife habitat by altering the existing wetland to support a diverse community of native wetland plants.

Increase structural complexity of wetlands by adding additional vegetation types.

Improve wildlife habitat value by adding constructed habitat.

PENINSULA 3: Enhance 0.83 acre of wetland and shoreline buffers at the WSDOT-Owned Peninsula Mitigation Site.

Screen wetland from nearby human activities.

Improve adjacent upland habitat by increasing native plant diversity.

Improve wildlife habitat value by adding constructed habitat.

UBNA Mitigation Site

UBNA 1: Establish 2.53 acres of wetlands at the UBNA Mitigation Site.

Establish wetlands by removing or grading upland fill.

Improve hydrologic and water quality functions by adding vegetative roughness within the established wetlands.

Improve complexity of wetland wildlife habitat by increasing the diversity of the native wetland plant community.

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

UBNA 2: Enhance 9.19 acres of wetland and complete enhancement at 8.41 acres of wetland at the UBNA Mitigation Site.

Improve diversity of wetland wildlife habitat by altering the existing wetland to support a diverse community of native wetland plants.

Increase structural complexity of wetlands by adding additional vegetation types.

Improve wildlife habitat value by adding constructed habitat features.

UBNA 3: Enhance 17.17 acres of wetland buffers at the UBNA Mitigation Site.

Screen wetland from nearby human activities.

Improve adjacent upland habitat by increasing native plant diversity.

Arboretum Creek Mitigation Site

ARBORETUM 1: Enhance 3.46 acres of riparian buffers at the Arboretum Creek Mitigation Site.

Improve upland wildlife habitat adjacent to Arboretum Creek by enhancing disturbed riparian habitat into a native riparian forest community.

Screen Arboretum Creek from nearby human activities.

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

Magnuson Park Mitigation Site

MAGNUSON 1: Establish 2.91 acres of wetlands at the Magnuson Park Mitigation Site.

Establish wetlands by excavating fill material and shaping basins to retain surface flows.

Improve hydrologic and water quality functions by adding vegetative roughness within the re-established wetlands.

Improve complexity of wetland wildlife habitat by increasing the diversity of the native wetland plant community.

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

MAGNUSON 2: Enhance 4.54 acres of existing wetlands at the Magnuson Park Mitigation Site.

Improve diversity of wetland wildlife habitat by altering the existing wetland to support a diverse community of native wetland plants at the Magnuson Park Mitigation Site.

Increase structural complexity of wetlands by adding additional vegetation types.

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

MAGNUSON 3: Enhance 6.47 acres of wetland buffers at the Magnuson Park Mitigation Site.

Screen wetlands from nearby human activities.

Improve adjacent upland habitat by increasing native plant diversity.

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

Elliott Bridge Reach Mitigation Site

ELLIOTT 1: Establish 2.47 acres of wetlands at the Elliott Bridge Reach Mitigation Site.

Establish additional wetlands by removing upland soil.

Provide hydrologic functions by creating a side channel connected to the Cedar River. This will increase the area to receive flood waters, which will assist in decreasing peak flows and downstream flooding.

Improve hydrologic and water quality functions by replacing rock levees with vegetation and creating new, vegetated wetlands.

Provide wetland wildlife habitat by creating a diverse native wetland plant community.

Provide wildlife habitat features (e.g., snags, downed logs, and brush piles) to improve the quality of the constructed habitat.

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

Screen established wetlands from nearby human activities.

Improve upland wildlife habitat adjacent to a wetland by converting formerly developed residential yards into a forested riparian buffer community.

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

6.1.3. Performance Standards

The performance standards described below provide benchmarks for measuring the progress of the goals and objectives of the mitigation site. Mitigation activities are intended to meet these performance standards within 10 years. The performance standards are based on function

characteristics described in *Method for Assessing Wetland Functions* (Hruby et al. 1999a and 1999b) or other approved methods. These performance standards measure structural attributes that serve as indicators of wetland functions. Methods to monitor each performance standard are described in general terms.

Hydrologic Performance

The hydrologic performance standards document and verify that wetland area and ground elevations are established according to the criteria specified during the design. The hydrologic performance standards also ensure that the wetlands are saturated or inundated at sufficient frequency and duration to support the prevalence of wetland vegetation. These hydrologic performance standards directly relate to Objectives PENINSULA 1, UBNA 1, MAGNUSON 1, and ELLIOTT 1.

Performance Standard

Year 1

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

Years 1, 3, 5, and 7

Soils in the wetland will be inundated or saturated to the surface, or the water table will be within 12 inches of the surface for 28 or more consecutive days during the growing season in years when rainfall is within or above the normal range of the 30-year average.

Year 10

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

- The WSDOT-Owned Peninsula Mitigation Site will contain at least 1.68 acres of re-established wetlands.
- The Union Bay Natural Area Mitigation Site will contain at least 2.53 acres of newly established wetlands.
- The Magnuson Park Mitigation Site will contain at least 2.91 acres of palustrine wetlands.
- The Elliott Bridge Reach Mitigation Site will contain at least 2.47 acres of riverine/palustrine wetlands.

Wetland Vegetation

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

Performance Standard

Year 1

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

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

Year 3

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

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

Year 5

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

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

Year 7

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

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

Year 10

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

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

Wetland and Riparian Buffer Vegetation Performance

The buffer vegetation performance standards document the establishment of a plant community that (1) provides habitat for native wildlife, (2) screens wetland wildlife from human activity, and (3) provides vegetative roughness to slow floodwaters and allow the deposition of sediment and associated pollutants.

Native upland vegetation, both planted and volunteer, will be counted to achieve the density performance standard. Native species colonizing portions of the site will be included in the cover. The vegetation performance standards for vegetation in the buffer directly relate to Buffer Enhancement Objectives PENINSULA 3, UBNA 3, ARBORETUM 1, MAGNUSON 3, and ELLIOTT 2.

Performance Standards

Year 1 and Year 3

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

Herbaceous upland buffer: Cover of native herbaceous vegetation will provide at least 50 percent cover.

Year 5

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

Herbaceous upland buffer: Cover of native herbaceous vegetation will provide at least 90 percent cover.

Year 7

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

Herbaceous upland buffer: Cover of native herbaceous vegetation will provide at least 90 percent cover.

Year 10

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

Herbaceous upland buffer: Cover of native herbaceous vegetation will provide at least 90 percent cover.

Habitat Structure Performance Standard

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

Performance Standards

Year 1

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

6.2 On-Site Temporary Impact Area Revegetation

6.2.1. Goals

The temporary impacts from the SR 520, I-5 to Medina Project include 3.55 acres of temporary impact to forested scrub-shrub and emergent wetlands, and 4.71 acres of aquatic bed wetlands (Table 6). The aquatic bed areas are expected to revegetate naturally and no plantings are

proposed. The forested, scrub-shrub and emergent areas will be revegetated with appropriate native species as part of the project. WSDOT's goal for these areas is as follows:

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

6.2.2. Objectives

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

Replant disturbed forested and shrub areas with appropriate woody species.

Replant disturbed emergent areas with appropriate native emergent species.

6.2.3. Performance Standards

The performance standards described below provide benchmarks for measuring the progress of the goals and objectives of the mitigation site. Temporary impact revegetation areas are intended to meet these performance standards within 5 years for woody vegetation and within 1 year for emergent vegetation. The performance standards are based on function characteristics described in *Method for Assessing Wetland Functions* (Hruby et al. 1999a and 1999b) or other approved methods. These performance standards measure structural attributes that serve as indicators of wetland functions. Methods to monitor each performance standard are described in general terms.

Wetland Vegetation

The performance standards for wetland vegetation document the establishment of wetland plant communities. This standard will use native wetland (facultative and wetter) species, both planted and volunteer, to meet plant density requirements. Native species colonizing portions of the site will be included in the cover. The performance standards below relate to On-site Objective 1.

Performance Standard

Year 1

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

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

Year 3

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

Year 5

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

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Chapter 7. Monitoring, Contingency Plan, and Site Management

7.1 Monitoring

7.1.1. Wetland Mitigation Sites

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

Quantitative monitoring will be completed and documented 1, 3, 5, 7, and 10 years after initial acceptance of the mitigation construction. The site should be evaluated during the summer following plant installation to assess survival rates and document the presence of non-native invasive species. The WSDOT HQ Wetland Assessment and Monitoring Program (or its designated representatives) will also complete informal (qualitative) assessments of the mitigation site in Years 2, 4, 6, 8, and 9 for adaptive management purposes only. Quantitative monitoring will be designed to determine if the performance standards have been met.

7.1.2. On-Site Impact Areas

For on-site temporary impact areas that are being revegetated, WSDOT staff (or their designated representatives) will monitor the mitigation site for 5 years after installation in areas of woody vegetation and 1 year in areas of emergent vegetation. If all the performance standards are achieved in fewer than 5 years, WSDOT may terminate monitoring with approval of the review agencies.

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

7.1.3. All Areas

WSDOT has established a comprehensive set of monitoring methods used to monitor mitigation sites. The actual methods used to monitor each site are documented in annual monitoring reports prepared by WSDOT's Wetland Assessment and Monitoring Program based in the Environmental Services Office in Olympia, Washington, or its designated representatives. Monitoring reports will be submitted for review to the recipients listed in Table 23 by the month of April, following the formal monitoring activities conducted the previous year.

Table 23. Monitoring Report Recipients

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

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

7.2 Contingency Plan

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

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

Hydrology

Hydrologic problems that occur on a mitigation site are typically the result of either insufficient water or excessive water. Insufficient water can occur seasonally during drought conditions or can be a long-term problem. Long-term problems can result from altered surface water flows at

mitigation sites that rely on surface water flows as the primary source of hydrology. For groundwater-driven mitigation sites, typical long-term hydrologic problems that result in either excessive or insufficient hydrology can occur when (1) a design is based on insufficient groundwater data, (2) incorrect final grade elevations are established, or (3) an unperceived soil condition alters groundwater flows.

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

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

Vegetation

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

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

vegetation to mature under these conditions. Occasionally it may be necessary to dissuade or exclude destructive wildlife species.

- Native species such as beaver may initially create a perception of damaging effects on the expected outcome of a mitigation site; however, the site modifications that result from their activities can create functions and habitats suited to several other species. The following additional measures are proposed as potential contingencies for beaver-induced failure to meet vegetation performance standards:
  - Replace plants.
  - Plant less preferable species.
  - Adjust plant species and/or communities.
  - Install temporary fenced enclosures around some of the forested and/or shrub communities.
  - Vandalism – To prevent vegetation disturbance from vandalism, fences and sensitive area signage will be installed.

Wildlife Structures

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

7.3 Site Management

WSDOT (or its designated representatives) will manage the site annually for the first 10 years. Site management activities shall include noxious weed control and may include mulching, fertilizing, supplemental watering, maintaining access, repairing damage from vandals, correcting erosion or sedimentation problems, or litter pickup. During the first year, supplemental watering of buffers and seasonally saturated wetland areas will occur during July, August, and September to ensure, at a minimum, the equivalent of normal rainfall levels and no periods of drought (no rainfall or watering) longer than 3 weeks.

Reed canarygrass dominates the watershed and suppression/control of this invasive plant will require careful site preparation and active site management. While complete elimination of reed

canarygrass from the mitigation site may not be possible, it should be managed sufficiently to ensure survival of the native planted species until they can effectively compete.

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

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

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Appendix A – Wetland Impact Summaries

Table A1. Wetland PBN-1 Summary

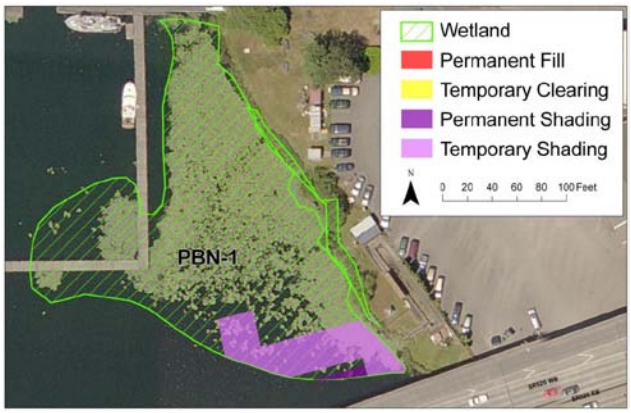
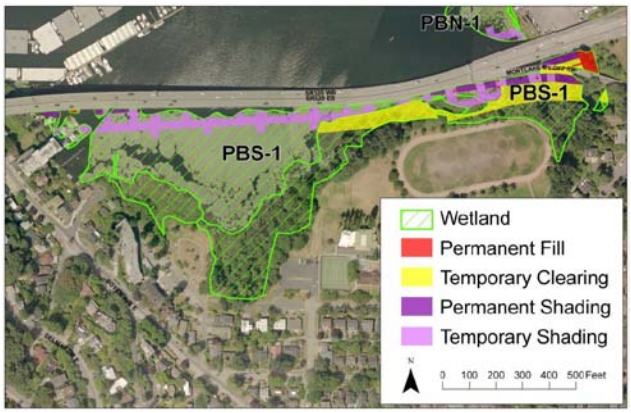
WETLAND PBN-1 – INFORMATION SUMMARY				
Location:	Wetland PBN-1 is located north of SR 520 on the east side of Portage Bay.			
		**Local Jurisdiction**	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	IV	
		Seattle Rating	IV	
		Seattle Standard Buffer Width	50 feet	
		Wetland Size	0.92 acre	
		Cowardin Classification	L2AB, PEM	
		HGM Classification	Lake Fringe	
		Wetland Rating System		
		Water Quality Score Hydrology Score Habitat Score **Total Score**	2 0 9 **11**	
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- 0.01	Temporary Fill Temporary Clearing Temporary Shading	- - 0.09
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- <0.01 -
Dominant Vegetation Impact	Cattail (*Typha latifolia*).			
Soil Impact	No sample plots were dug due to lack of permission for soil disturbance. No soil impacts.			
Hydrology Impact	Hydrology is driven by Lake Washington. No impact to wetland hydrology. Shading in wetland and buffer will not affect wetland hydrology.			
Wetland Functions Impact Summary				
Water Quality	Wetland PBN-1 has a low potential to improve water quality because it has a narrow vegetation width and consists primarily of aquatic vegetation. It has the opportunity to improve water quality because it can dissipate potential contamination from adjacent boat use. Shading impacts in this wetland will not affect water quality function.			
Hydrologic	PBN-1 has minimal potential to reduce shoreline erosion because it has a narrow vegetation width and consists primarily of aquatic vegetation. It does, however, have the opportunity to reduce erosion caused by boat use. Shading impacts in this wetland will not affect hydrology function.			
Habitat	Wetland PBN-1 has a low potential to provide habitat because of low vegetation structure and special habitat features. It has a low opportunity to provide habitat because it has limited habitat connectivity and buffer. Shading impacts in this wetland may result in a loss of some wetland habitat function by limiting access.			
Buffer Condition	The buffer of PBN-1 includes open water (Lake Washington) and maintained lawn. Lake Washington provides habitat for amphibious and aquatic wildlife. No impacts to the buffer of Wetland PBN-1			

Table A2. Wetland PBS-1 Summary

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



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

Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0.13 0.53	Temporary Fill Temporary Clearing Temporary Shading	- 1.25 1.23
Buffer Impact	Permanent Fill Permanent Shading	0.31 0.04	Temporary Fill Temporary Clearing Temporary Shading	- 0.65 -
Dominant Vegetation Impact	Reed canarygrass (*Phalaris arundinacea*), English ivy (*Hedera helix*), black cottonwood (*Populus balsamifera*), and Pacific willow (*Salix lucida*). Filling will result in a small loss of wetland vegetation. Clearing will result in temporary (but long term) loss of some tall woody vegetation. Shading may result in changes to species composition and plant density.			
Soil Impact	Mucky peat (2.5Y 2.5/1). A small area of wetland soil will be lost.			
Hydrology Impact	Lake Washington. Wetland impacts are not expected to affect wetland hydrology.			

Wetland Functions Impact Summary	
Water Quality	Wetland PBS-1 has a moderate potential to improve water quality due to the width of vegetation along the shoreline. It has the opportunity to improve water quality because it can minimize potential contamination or pollutant runoff from boat use and the proximity to a park. The project is not expected to affect water quality function of wetland PBS-1.
Hydrologic	Wetland PBS-1 has a low potential to reduce shoreline erosion because much of the vegetation is aquatic bed. Because of the presence of human structures, there is opportunity to reduce erosion. The project is not expected to affect water quality functions of wetlands.
Habitat	PBS-1 provides high habitat functions due to the presence of special habitat features and multiple Cowardin classes and hydroperiods. It has a moderate opportunity to provide habitat. This is due primarily to its location on the shore of Lake Washington. Permanent fill and shading and temporary filling and shading will result in a loss of wetland area and changes to plant composition and or densities. These are expected to affect wildlife habitat quality.

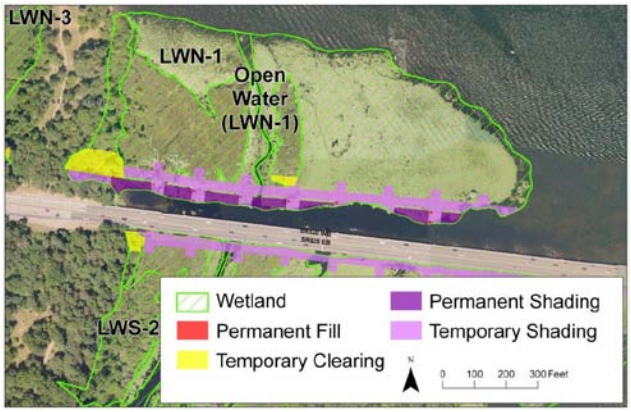
WETLAND PBS-1 – INFORMATION SUMMARY	
Buffer Condition	The buffer of PBS-1 is disturbed to the north by SR 520 and to the south by an urban park and track. The buffer to the south consists primarily of maintained grasses. Permanent shading and temporary clearing will result in some loss of habitat function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

Table A3. Wetland PBS-1A Summary

WETLAND PBS-1A – INFORMATION SUMMARY				
Location:	Wetland PBS-1A is located south of SR 520 and northeast of Montlake Playground Park.			
		Local Jurisdiction	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	III	
		Seattle Rating	III	
		Seattle Standard Buffer Width	60 feet	
		Wetland Size	0.05 acre	
		Cowardin Classification	PSS, PEM	
		HGM Classification	Depressional/Slope	
		Wetland Rating System		
		Water Quality Score Hydrology Score Habitat Score **Total Score**	16 7 13 **36**	
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0 0	Temporary Fill Temporary Clearing Temporary Shading	- 0.02 -
Buffer Impact	Permanent Fill Permanent Shading	0.04 -	Temporary Fill Temporary Clearing Temporary Shading	- 0.08 -
Dominant Vegetation Impact	Creeping buttercup (*Ranunculus repens*), Himalayan blackberry (*Rubus armeniacus*), bentgrass (*Agrostis* sp.), and Japanese knotweed (*Polygonum cuspidatum*). Some vegetation will be temporarily cleared in PBS-1A.			
Soil Impact	Mucky loam (10YR 2/2) over sandy clay loam (10YR 4/1). Wetland soils will not be impacted by the project.			
Hydrology Impact	High groundwater table. The project will not affect the hydrology of Wetland PBS-1A.			
Wetland Functions Impact Summary				
Water Quality	Wetland PBS-1A has a moderate potential to improve water quality due to the dense vegetation and lack of seasonal ponding. It has the opportunity to improve water quality because of residential land use upgradient of the wetland. The project will not affect the water quality function of PBS-1A.			
Hydrologic	Wetland PBS1-A has a moderate potential to reduce flooding and erosion because it does not have an outlet. It does not have the opportunity to reduce flooding and erosion due to its location in the watershed.			
Habitat	Wetland PBS-1A has a low potential and opportunity to provide habitat. This is due to its limited structure and its degraded buffer. The project will not affect the hydrologic function of PBS-1A.			
Buffer Condition	The buffer of PBS-1A is disturbed by a paved footpath to the west and SR 520 to the northeast. The buffer to the north, east, and south is an urban forest dominated by young red alder (*Alnus rubra*) and Himalayan blackberry in the understory. It provides some habitat and water quality functions. Permanent buffer shading and temporary buffer clearing are expected to affect the quality of habitat in the buffer of PBS-1A.			

Table A4. Wetland LWN-1 Summary

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



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

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

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

Table A5. Wetland LWN-2 Summary

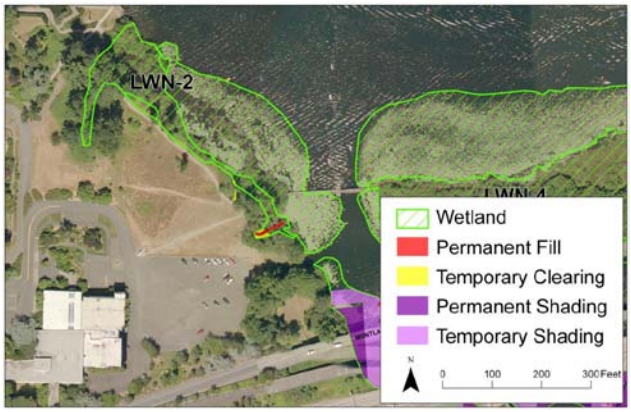
WETLAND LWN-2 – INFORMATION SUMMARY				
Location:	Wetland LWN-2 is located north of SR 520, in the vicinity of McCurdy Park, and the northwest corner of the Washington Park Arboretum.			
		**Local Jurisdiction**	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	III	
		Seattle Rating	III	
		Seattle Standard Buffer Width	60 feet	
		Wetland Size	3.02 acres	
		Cowardin Classification	L2AB, PFO, PSS, PEM	
		HGM Classification	Lake Fringe	
		Wetland Rating System		
		Water Quality Score Hydrology Score Habitat Score **Total Score**	18 8 18 **44**	
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0.02 0.81	Temporary Fill Temporary Clearing Temporary Shading	- 0.01 0.10
Buffer Impact	Permanent Fill Permanent Shading	0.29 0.02	Temporary Fill Temporary Clearing Temporary Shading	- 0.09 -
Dominant Vegetation Impact	Red-osier dogwood, reed canarygrass, and Pacific willow. Loss of a small area of vegetation permanently. Permanent shading may result in changes in composition or density. Temporary clearing and shading will result in temporary but long-tern vegetation changes.			
Soil Impact	Silt (10YR 3/1) over silt clay loam (10Y 5/1) with redoximorphic features over peat (10YR 2/1). A small area of wetland soil will be lost.			
Hydrology Impact	Lake Washington. No changes to wetland hydrology.			
Wetland Functions Impact Summary				
Water Quality	LWN-2 provides a moderate potential to improve water quality due to the width of vegetation along the lakeshore. Opportunity is provided by the urban setting and boat traffic. Water quality function of LWN-2 will not be affected.			
Hydrologic	The woody vegetation of the wetland provides a low potential to improve hydrologic conditions. Human structures along the upland edge of the wetland are protected by the wetland; therefore, the opportunity to reduce erosion is present. Hydrologic function of LWN-2 will not be affected.			
Habitat	Moderate potential and opportunity for wildlife habitat are provided by the wetland due to multiple Cowardin classes. Permanent shading and temporary clearing and shading will reduce performance of some indicators of habitat function.			
Buffer Condition	The buffer of LWN-2 is composed primarily of maintained lawn to the southwest, Lake Washington to the northeast, and forest to the northwest. The forested component of the buffer is dominated by black cottonwood, with English ivy in the understory. The buffer provides low levels of water quality functions. Lake Washington provides habitat for amphibious and aquatic wildlife. Permanent shading will affect a small area of LWN-2's buffer. Temporary clearing will affect a larger area of the buffer. These effects are expected to reduce habitat function in the buffer somewhat.			

Table A6. Wetland LWN-3 Summary

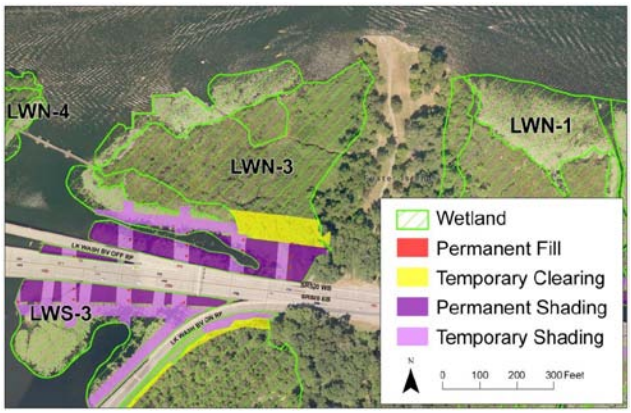
WETLAND LWN-3 – INFORMATION SUMMARY				
Location:	Wetland LWN-3 is located north of SR 520 and on the west side of Foster Island.			
		**Local Jurisdiction**	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	III	
		Seattle Rating	III	
		Seattle Standard Buffer Width	85 feet	
		Wetland Size	7.1 acres	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

Table A7. Wetland LWN-4 Summary

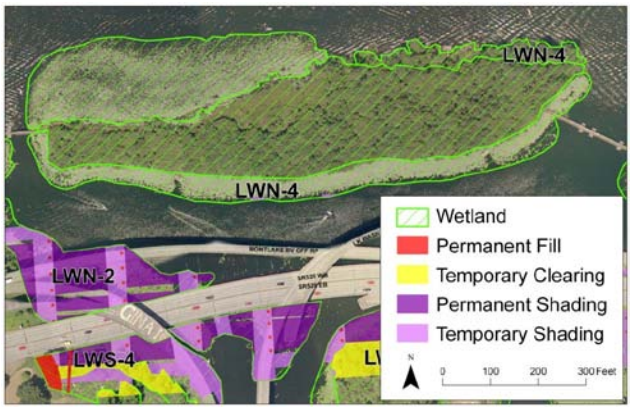
WETLAND LWN-4 – INFORMATION SUMMARY				
Location:	Wetland LWN-4 comprises Marsh Island and the surrounding aquatic bed vegetation, located north of SR 520.			
		**Local Jurisdiction**	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	III	
		Seattle Rating	III	
		Seattle Standard Buffer Width	85 feet	
		Wetland Size	7.7 acres	
		Cowardin Classification	L2AB, PFO, PSS	
		HGM Classification	Lake Fringe	
		Wetland Rating System		
		Water Quality Score Hydrology Score Habitat Score **Total Score**	18 12 19 **49**	
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - 0.01
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Dominant Vegetation Impact	Willows (*Salix* sp.) and American white waterlily. A small area of vegetation in LWN-4 will be temporarily shaded.			
Soil Impact	No sample plots were dug due to lack of permission for soil disturbance. No wetland soil area will be lost.			
Hydrology Impact	Lake Washington. Wetland hydrology will not be affected by the project.			
Wetland Functions Impact Summary				
Water Quality	LWN-4 has a moderate potential to provide water quality functions primarily because of the dense vegetation along the lakeshore. It has the opportunity to improve water quality because it can dissipate potential contamination or pollutant runoff from boat traffic and nearby maintained lawn grasses. The small area of temporary shading is not expected to affect water quality function.			
Hydrologic	Moderate hydrologic functions are provided by the wetland due to dense woody vegetation that helps reduce shoreline erosion. Wetland LWN-4 also has the opportunity to reduce erosion. The small area of temporary shading is not expected to affect hydrologic function.			
Habitat	LWN-4 has a moderate potential and opportunity to provide habitat because it has multiple Cowardin vegetation classes and hydroperiods, moderate dispersion of habitats, and is connected to other wetlands by a relatively undisturbed corridor. The small area of temporary shading is expected to have minimal effect on habitat function in LWN-4.			
Buffer Condition	LWN-4 is surrounded by Lake Washington, which provides habitat for aquatic and amphibious wildlife. Buffer functions are not expected to be affected.			

Table A8. Wetland LWN-5 Summary

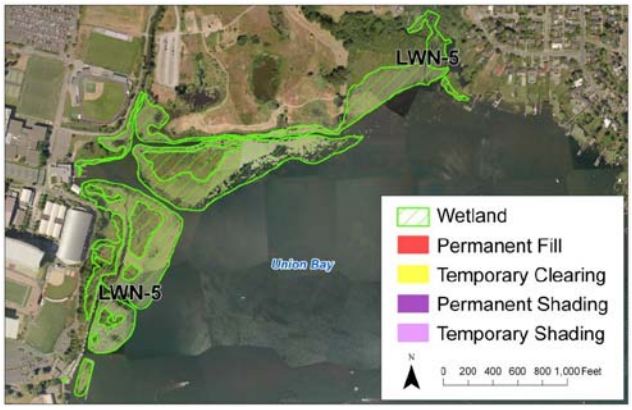
WETLAND LWN-5 – INFORMATION SUMMARY				
Location:	Wetland LWN-5 is located north of the Montlake Cut along the shoreline of the University of Washington.			
		**Local Jurisdiction**	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	III	
		Seattle Rating	III	
		Seattle Standard Buffer Width	60 feet	
		Wetland Size	37.24 acres	
		Cowardin Classification	L2AB, PSS, PEM	
		HGM Classification	Lake Fringe	
		Wetland Rating System		
		Water Quality Score Hydrology Score Habitat Score **Total Score**	18 4 26 **48**	
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Dominant Vegetation Impact	Red-osier dogwood, Pacific willow, cattail, and black cottonwood. The project will not affect vegetation in LWN-5.			
Soil Impact	No sample plots were dug due to lack of permission for soil disturbance. Soils in LWN-5 will not be affected by the project.			
Hydrology Impact	Lake Washington. Wetland hydrology will not be affected by the project.			
Wetland Functions Impact Summary				
Water Quality	LWN-5 has moderate potential to improve water quality primarily because there is a wide band of vegetation along the lakeshore. It has the opportunity to improve water quality by dissipating any pollutant runoff or contamination from boat use in the lake and urban areas nearby. No impacts to this function.			
Hydrologic	LWN-5 has low potential to reduce shoreline erosion because nonaquatic bed vegetation along the shoreline is not very wide. It does not have the opportunity to reduce erosion. No impacts to this function.			
Habitat	LWN-5 has moderate potential to provide habitat because it has multiple Cowardin classes and high interspersion of habitats. It has moderate opportunity to provide habitat because it is connected to other habitats.			
Buffer Condition	The buffer of LWN-5 is dominated by nonnative grasses and trails. Some portions of the buffer, to the west of LWN-5, are dominated by black cottonwood and red-osier dogwood. Open water (Lake Washington) is to the south. The buffer of LWN-5 provides wildlife habitat and some water quality functions. No impacts to wetland buffers.			

Table A 9. Wetland LWS-1 Summary

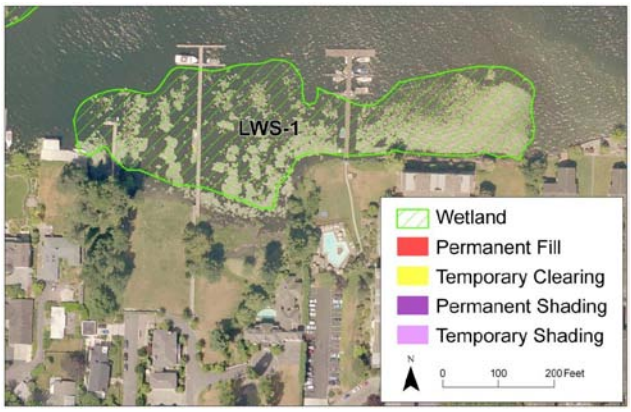
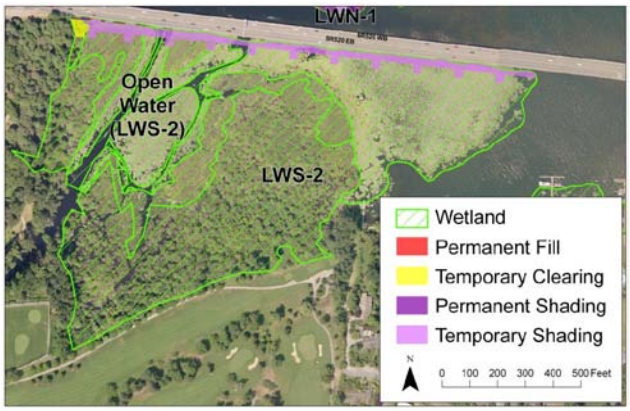
WETLAND LWS-1 – INFORMATION SUMMARY				
Location:	Wetland LWS-1 is located south of SR 520 and to the east-northeast of the Broadmoor Golf Club.			
		**Local Jurisdiction**	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	IV	
		Seattle Rating	IV	
		Seattle Standard Buffer Width	50 feet	
		Wetland Size	2.94 acres	
		Cowardin Classification	L2AB	
		HGM Classification	Lake Fringe	
		Wetland Rating System		
		Water Quality Score Hydrology Score Habitat Score **Total Score**	6 4 14 **24**	
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - -
Dominant Vegetation Impact	American white waterlily. No impacts to wetland vegetation.			
Soil Impact	No sample plots were dug because the wetland is aquatic bed only. No impacts to wetland soils.			
Hydrology Impact	Lake Washington. No impacts to wetland hydrology.			
Wetland Functions Impact Summary				
Water Quality	LWS-1 has the potential to provide low water quality functions because of vegetation along the lakeshore and the herbaceous plants that cover more than a third of the vegetated area. It has the opportunity to improve water quality because there are urban areas and maintained parks nearby. No impacts to water quality.			
Hydrologic	The potential to reduce shoreline erosion is low because the nonaquatic bed vegetation along the shoreline is not very wide. It has the opportunity to reduce erosion because there are structures along the upland edge of the wetland that could be damaged by erosion. No impacts to hydrologic function.			
Habitat	LWS-1 has the potential to provide habitat because it has multiple Cowardin classes, moderate habitat interspersion, and special habitat features. It has the opportunity to provide habitat because it is connected to other habitats. No impacts to wetland habitat.			
Buffer Condition	The buffer of Wetland LWS-1 encompasses Lake Washington to the north and maintained lawns to the south. Residential structures are located in the buffer to the south, which provides minimal water quality functions. Lake Washington provides habitat for amphibious and aquatic wildlife. No impact to wetland buffers.			

Table A10. Wetland LWS-2 Summary

WETLAND LWS-2 – INFORMATION SUMMARY				
Location:	Wetland LWS-2 is located south of SR 520, north of the Broadmoor Golf Club, and on the east side of Foster Island.			
	**Local Jurisdiction**	Seattle		
	WRIA	8		
	Ecology Rating (Hruby 2004)	II		
	Seattle Rating	II		
	Seattle Standard Buffer Width	110 feet		
	Wetland Size	26.38 acres		
	Cowardin Classification	L2AB, PSS, PEM		
	HGM Classification	Lake Fringe		
	Wetland Rating System			
	Water Quality Score Hydrology Score Habitat Score **Total Score**	20 12 24 **56**		
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0.001 0.04	Temporary Fill Temporary Clearing Temporary Shading	- 0.06 1.20
Buffer Impact	Permanent Fill Permanent Shading	<0.01 0.03	Temporary Fill Temporary Clearing Temporary Shading	0.14 0.01 -
Dominant Vegetation Impact	American white waterlily, Himalayan blackberry, salmonberry (*Rubus spectabilis*), red-osier dogwood, and red alder. Permanent fill and shading will affect a small area of vegetation. Temporary clearing and shading will remove a small area of vegetation and shade a larger are of the wetland. This may affect plant composition and density.			
Soil Impact	Peat (10YR 2/1) over muck (10YR 2/2) over loam (10YR 2/2) over sand (10YR 4/1). A small area of wetland soil will be lost.			
Hydrology Impact	Lake Washington. Wetland hydrology will not be affected.			
Wetland Functions Impact Summary				
Water Quality	LWS-2 provides moderate water quality functions primarily due to the dense vegetation along the lakeshore. It has the opportunity to improve water quality because the wetland vegetation can sequester pollutants from boats and maintained lawn. Water quality function will not be affected by the project.			
Hydrologic	LWS-2 provides moderate hydrologic functions due to fringe vegetation along the lakeshore. It also has the opportunity to reduce erosion. Hydrologic function will not be affected by the project.			
Habitat	LWS-2 has a moderate potential and opportunity to provide habitat because it has multiple Cowardin classes and hydroperiods (water level fluctuations over time), moderate dispersion of habitats, and is connected to other wetlands by a relatively undisturbed corridor. Effects to vegetation may result in a decrease in some parameters of wetland habitat function.			

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

Table A11. Wetland LWS-3 Summary

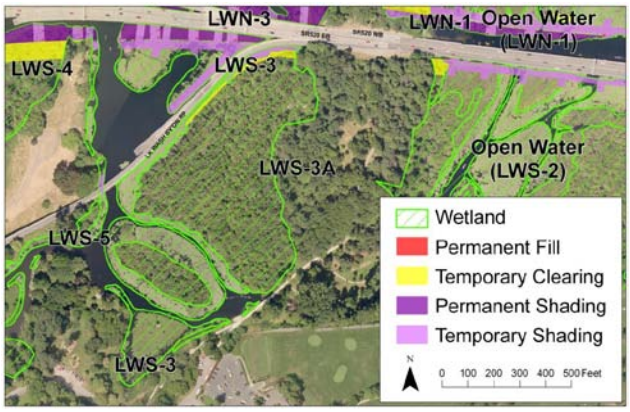
WETLAND LWS-3 – INFORMATION SUMMARY				
Location:	Wetland LWS-3 is located south of SR 520 on the west side of Foster Island.			
		**Local Jurisdiction**	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	II	
		Seattle Rating	II	
		Seattle Standard Buffer Width	110 feet	
		Wetland Size	15.22 acres	
		Cowardin Classification	L2AB, PFO, PSS, PEM	
		HGM Classification	Lake Fringe	
		Wetland Rating System		
		Water Quality Score Hydrology Score Habitat Score **Total Score**	18 12 24 **54**	
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0.005 0.53	Temporary Fill Temporary Clearing Temporary Shading	- 0.16 0.73
Buffer Impact	Permanent Fill Permanent Shading	<0.01 <0.01-	Temporary Fill Temporary Clearing Temporary Shading	- 0.18 -
Dominant Vegetation Impact	Birch (*Betula sp.),* salmonberry, slough sedge (*Carex obnupta*), red-osier dogwood, and Oregon ash. Permanent shading and temporary clearing and shading may result in changes in vegetation composition and density. Filling will result in a loss of a small area of wetland vegetation.			
Soil Impact	Mucky peat (10YR 3/2) over peat (10YR 2/2). A small area of wetland soil will be lost.			
Hydrology Impact	Lake Washington. Wetland hydrology will not be affected.			
Wetland Functions Impact Summary				
Water Quality	LWS-3 has a moderate potential to improve water quality because the vegetation along the lakeshore is wide. It has the opportunity to improve water quality because it can sequester contamination from boat usage. Water quality function will not be affected by the project.			
Hydrologic	LWS-3 has a moderate potential to reduce shoreline erosion because the fringe vegetation along the shore is a wide band of shrubs and trees. It has the opportunity to reduce erosion. Hydrologic function will not be affected by the project.			
Habitat	LWS-3 has a high potential to provide habitat because it has multiple Cowardin classes and hydroperiods, moderate habitat interspersion, and special habitat features. It has a moderate opportunity to provide habitat because it is connected to other habitats. Habitat function will likely be reduced by the changes in vegetation described above.			
Buffer Condition	The buffer of LWS-3 comprises SR 520 to the north, forest to the east, and a road to the south. The forested component of the buffer is dominated by Oregon ash, California blackberry (*Rubus ursinus*), English ivy, and Indian plum (*Oemleria cerasiformis*). This buffer provides some wildlife habitat and water quality functions and is relatively undisturbed to the east. Temporary clearing will result in a temporary loss of some aspects of habitat function.			

Table A12. Wetland LWS-3A Summary

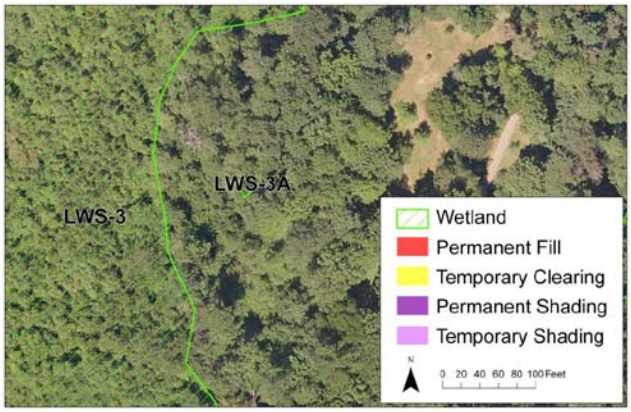
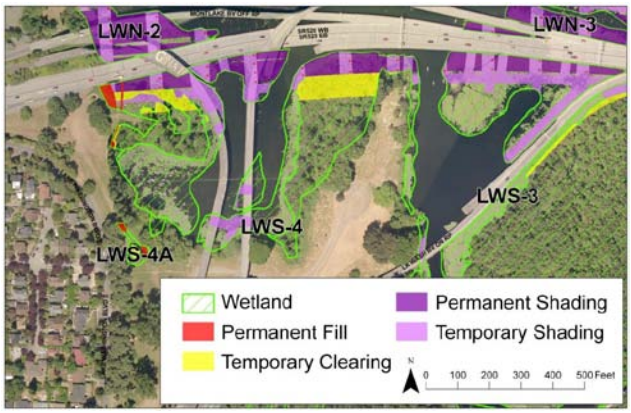
WETLAND LWS-3A – INFORMATION SUMMARY				
Location:	Wetland LWS-3A is located south of SR 520 in the southwest portion of Foster Island			
		**Local Jurisdiction**	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	IV	
		Seattle Rating	IV	
		Seattle Standard Buffer Width	N/A	
		Wetland Size	< 0.01 acre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

Table A13. Wetland LWS-4 Summary

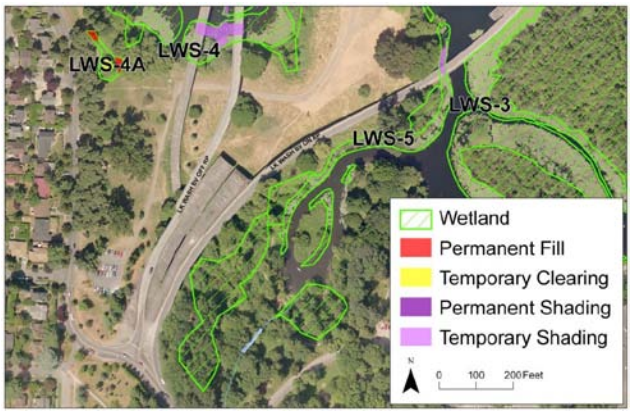
WETLAND LWS-4 – INFORMATION SUMMARY				
Location:	Wetland LWS-4 is located south of SR 520 in the vicinity of the Lake Washington Boulevard on-ramps and off-ramps.			
	**Local Jurisdiction**	Seattle		
	WRIA	8		
	Ecology Rating (Hruby 2004)	II		
	Seattle Rating	II		
	Seattle Standard Buffer Width	110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

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

Table A14. Wetland LWS-4A Summary

WETLAND LWS-4A – INFORMATION SUMMARY				
Location:	Wetland LWS-4A is located south of SR 520, just east of East Lake Washington Boulevard.			
		Local Jurisdiction	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	IV	
		Seattle Rating	IV	
		Seattle Standard Buffer Width	50 feet	
		Wetland Size	0.11 acre	
		Cowardin Classification	PFO, PEM	
		HGM Classification	Slope	
		Wetland Rating System		
		Water Quality Score Hydrology Score Habitat Score **Total Score**	4 2 13 **19**	
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	0.02 -	Temporary Fill Temporary Clearing Temporary Shading	- 0.02 -
Buffer Impact	Permanent Fill Permanent Shading	0.01 -	Temporary Fill Temporary Clearing Temporary Shading	- 0.10 -
Dominant Vegetation Impact	Willow, bluegrass (*Poa* sp.), and creeping buttercup. Temporary clearing of small area of wetland vegetation.			
Soil Impact	Mucky loam (10YR 2/2) over silt clay loam (5Y 4/1) with redoximorphic features. No loss of wetland soils.			
Hydrology Impact	Surface runoff and precipitation. No impact to wetland hydrology.			
Wetland Functions Impact Summary				
Water Quality	LWS-4A has a low potential to improve water quality because much of the vegetation in the wetlands is mowed. It has the opportunity to improve water quality because it is near urban areas and a maintained park and can dissipate potential pollutant runoff from these areas. No impacts to water quality function.			
Hydrologic	LWS-4A has a low potential to reduce erosion because only a small area in the center of the wetland consists of woody vegetation. It does not have the opportunity to reduce erosion. No impact to hydrologic function.			
Habitat	LWS-4A has a low potential to provide habitat because it is small and has limited habitat interspersion. It has a moderate opportunity to provide habitat because it is connected to other habitats. Temporary clearing of vegetation may result in a temporary reduction of some habitat function.			
Buffer Condition	The buffer of LWS-4A consists of maintained lawn and it is disturbed. It provides minimal water quality functions. It may also provide minimal habitat functions for urban-adapted species. Temporary clearing is expected to result in a temporary loss of some habitat functions.			

Table A15. Wetland LWS-5 Summary

WETLAND LWS-5 – INFORMATION SUMMARY				
Location:	Wetland LWS-5 is located in the Washington Park Arboretum, south of SR 520, and north of East Foster Island Road.			
		**Local Jurisdiction**	Seattle	
		WRIA	8	
		Ecology Rating (Hruby 2004)	II	
		Seattle Rating	II	
		Seattle Standard Buffer Width	110 feet	
		Wetland Size	2.29 acres	
		Cowardin Classification	L2AB, PFO, PEM	
		HGM Classification	Lake Fringe	
		Wetland Rating System		
		Water Quality Score Hydrology Score Habitat Score **Total Score**	20 12 26 **58**	
Wetland and Buffer Impact Summary				
Wetland Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- - 0.03
Buffer Impact	Permanent Fill Permanent Shading	- -	Temporary Fill Temporary Clearing Temporary Shading	- 0.32 -
Dominant Vegetation Impact	Pacific willow, creeping buttercup, and black cottonwood. Temporary shading may change plant composition and density in a small area.			
Soil Impact	Silt loam (10YR 3/1) over silt loam (7.5YR 3/1). No loss of wetland soil.			
Hydrology Impact	Lake Washington. No loss impact to wetland hydrology.			
Wetland Functions Impact Summary				
Water Quality	LWS-5 has a moderate potential to improve water quality because vegetation along the lakeshore is wide and two-thirds of the wetland is vegetated. It has the opportunity to improve water quality because it can dissipate potential contamination or pollutant runoff from boat use and maintained parks nearby. Water quality function are not expected to be affected by the project.			
Hydrologic	LWS-5 has a moderate potential to reduce shoreline erosion because vegetation along the lakeshore is wide. It has the opportunity to reduce erosion because there are trails and stormwater pipes that could be affected. Hydrologic function is not expected to be affected by the project.			
Habitat	LWS-5 has a moderate potential to provide habitat because it has multiple Cowardin classes and hydroperiods. It also has a moderate opportunity to provide habitat because it is on the shore of Lake Washington. Temporary shading may result in changes to habitat use during construction of the project.			
Buffer Condition	The buffer of LWS-5 is primarily forested with an open understory. The dominant vegetation is red alder, Himalayan blackberry, and creeping buttercup. The buffer provides some wildlife habitat and water quality functions. A small area of buffer will be temporarily cleared. This may result in temporary changes to wetland function.			

Appendix B – Mitigation Site Wetland Memoranda

To be provided in Final Report

Appendix C – Boring Logs

To be provided in Final Report

Appendix D – Hydrology Data

To be provided in Final Report

Appendix E – Mitigation Plan Design Sheets

To be provided in Final Report

Appendix F – Wetland Rating Forms for Anticipated Site Conditions

To be provided in Final Report