

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
Federal Highway Administration

February 2011



Washington State
Department of Transportation

SR 520 Bridge Replacement and HOV Program

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Conceptual Wetland Mitigation Report

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February 2011

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Executive Summary

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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.

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

7 **Existing Wetland in the Project Area**

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

14 Wetlands in the study area range from less than one-tenth of one acre to over 35 acres in size.
15 Fourteen of the fifteen wetlands are lacustrine fringe systems associated with Lake Washington,
16 and one wetland is of the slope/depressional class. These wetlands generally have limited
17 potential for water quality or hydrologic function due to the size of the watershed, and their
18 position in the lower watershed. Wetlands in the study area generally provide moderate levels of
19 habitat function. When classified by vegetation type, one wetland consists solely of floating
20 aquatic bed vegetation, and one wetland is entirely forest. The remaining 13 wetlands include
21 multiple vegetation types (aquatic bed, emergent, scrub-shrub, and/or forested).

22 **Wetland Impacts**

23 Wetland impacts described in this report are based on a design freeze date of July 1, 2010. These
24 impacts were discussed with regulators and stakeholders and approved at the Natural Resources
25 Technical Working Group meeting on September 30, 2010. The SR 520, I-5 to Medina Project
26 will result in permanent and long-term temporary impacts to wetlands and buffers. The project
27 will permanently fill 0.29 acre of wetlands in the Westside project area. This 0.29 acre includes
28 0.11 acre of fill in Category II wetlands, 0.16 acre of fill in Category III wetlands, and 0.02 acre
29 fill in Category IV wetlands. Shading from the project will result in 4.87 acres of permanent
30 impacts to wetlands in the project area. Of these 4.87 acres of permanent shading, 2.48 acres will
31 be in Category II wetlands, 2.39 acres will be in Category III wetlands, and 0.01 acre will be in
32 Category IV wetlands. Note that 0.58 acre of permanent bridge shading will be removed from
33 aquatic bed area in Category II wetlands as the existing on-ramps to SR 520 are removed.

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

3 Temporary impacts of the project will result from the temporary structures necessary to construct
4 the permanent replacement bridge and from clearing for these structures. These temporary
5 impacts will be long-term due to the length of the construction process. The temporary impacts
6 include approximately 0.2 acre of temporary fill in wetlands in the form of steel pilings.
7 Although the final configuration of the temporary bridge pilings will be determined by the
8 contractor, all of this temporary fill will be assumed to occur in Category II wetlands (the highest
9 category wetland in the vicinity). Construction of the project will result in 2.82 acres of
10 temporary clearing. Of these 2.82 acres, 1.14 acres will be in Category II wetlands, 1.66 acres
11 will be in Category III wetlands, and 0.02 acre will be in Category IV wetlands. The temporary
12 structures necessary to construct the replacement bridge will also result in 5.25 acres of shading.
13 These 5.25 acres include 3.50 acres in Category II wetlands, 1.65 acres in Category III wetlands,
14 and 0.10 acre in Category IV wetlands. Portions of the temporary shading impacts are beneath
15 existing bridge structure, and so are already shaded. Other portions of the temporary shading
16 impacts will be beneath the replacement bridge structure (these areas will be calculated as
17 permanent shading). Temporary impacts to buffers include less than 0.01 acre of temporary fill,
18 2.33 acres of temporary clearing, and 0.04 acre of temporary shading in wetland buffers.

19 **Wetland Mitigation**

20 The SR 520, I-5 to Medina Project proposes compensatory mitigation for all the project wetland
21 impacts in five locations. Four of the locations are on-site or in close proximity to the project,
22 and one is located off-site. Temporary impacts will be restored on-site, where feasible.

23 The proposed on-site mitigation will take place at the four mitigation sites near the project
24 corridor. The four sites are (1) the WSDOT-Owned Peninsula (located at the south end of Union
25 Bay alongside SR 520), (2) the Union Bay Natural Area (located on the University of
26 Washington campus at the north side of Union Bay), (3) the Arboretum Creek Mitigation Site
27 (located in the Washington Park Arboretum), and (4) the Magnuson Park Mitigation Site. These
28 four sites will provide the following:

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

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

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

- 5 • Establishment of 2.47 acres of floodplain wetland where existing levees will be removed,
6 areas behind the levees excavated to appropriate grades, and the natural hydrologic
7 processes restored along the Cedar River.

- 8 • Enhancement of 2.02 acres of riparian/floodplain buffer.

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

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

15

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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.

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

- 3 • Bridge Replacement and HOV Project Supplemental Draft Environmental Impact
4 Statement Wetland Assessment Technical Memorandum (WSDOT 2010b).
- 5 • I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft Environmental
6 Impact Statement Ecosystems Discipline Report (WSDOT 2009a).
- 7 • I-5 to Medina: Bridge Replacement and HOV Project Final Environmental Impact
8 Statement and Final Section 4(f) and 6(f) Evaluation Ecosystems Discipline Report
9 Addendum and Errata (WSDOT 2010d).
- 10 • WSDOT Wetland Guidelines (WSDOT 2010c).
- 11 • Wetlands in Washington State, Volume 1 (Sheldon et al. 2005).
- 12 • Wetlands in Washington State, Volume 2 (Granger et al. 2005).
- 13 • Wetland Mitigation in Washington State, Part 1 (Ecology et al. 2006a).
- 14 • Wetland Mitigation in Washington State, Part 2 (Ecology et al. 2006b).

15 WSDOT is coordinating technical and planning efforts for the SR 520, I-5 to Medina Project
16 through two teams: the Mitigation Core Team and the Mitigation Technical Group.

17 The Mitigation Core Team is led by Shane Cherry, and serves as a steering group for mitigation
18 planning activities. The Mitigation Core Team is multi-disciplinary, composed of engineers,
19 planners, and biologists from WSDOT HQ Environmental Services, WSDOT's Environmental
20 Services Office (ESO), and private consulting companies. The Mitigation Core Team includes
21 (or has included) the following individuals: Bill Leonard (WSDOT, initiation through December
22 2007), Paul Fendt (Parametrix, Inc., initiation through March 2008), Ken Sargent (Headwaters
23 Environmental Consulting), Michelle Meade (WSDOT), Phil Bloch (WSDOT), Shane Cherry
24 (Confluence Environmental Company), Jeff Meyer (Parametrix, Inc.), Gretchen Lux (WSDOT,
25 December 2007 to present), Beth Peterson (HDR, December 2007 to present), and Bill Bumback
26 (ICF International).

27 The Wetland Mitigation Technical Group is led by Ken Sargent, and provides technical detail
28 and policy guidance to team members conducting analysis and preparing wetland mitigation
29 planning products. This group consists of Bill Leonard (WSDOT, initiation through December
30 2007), Paul Fendt (Parametrix, Inc., initiation through March 2008), Ken Sargent (Headwaters
31 Environmental Consulting, Inc.), Michelle Meade (WSDOT), Phil Bloch (WSDOT), Shane

1 Cherry (Confluence Environmental Company), Jeff Meyer (Parametrix, Inc.), Gretchen Lux
2 (WSDOT, December 2007 to present), Beth Peterson (HDR, December 2007 to present), Pat
3 Togher (HDR), and Bill Bumback (ICF International).

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

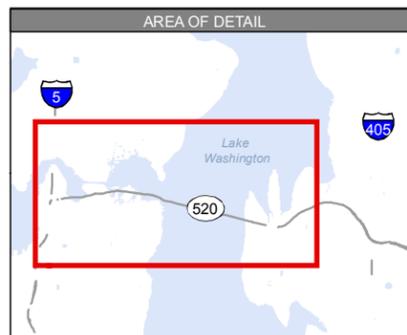
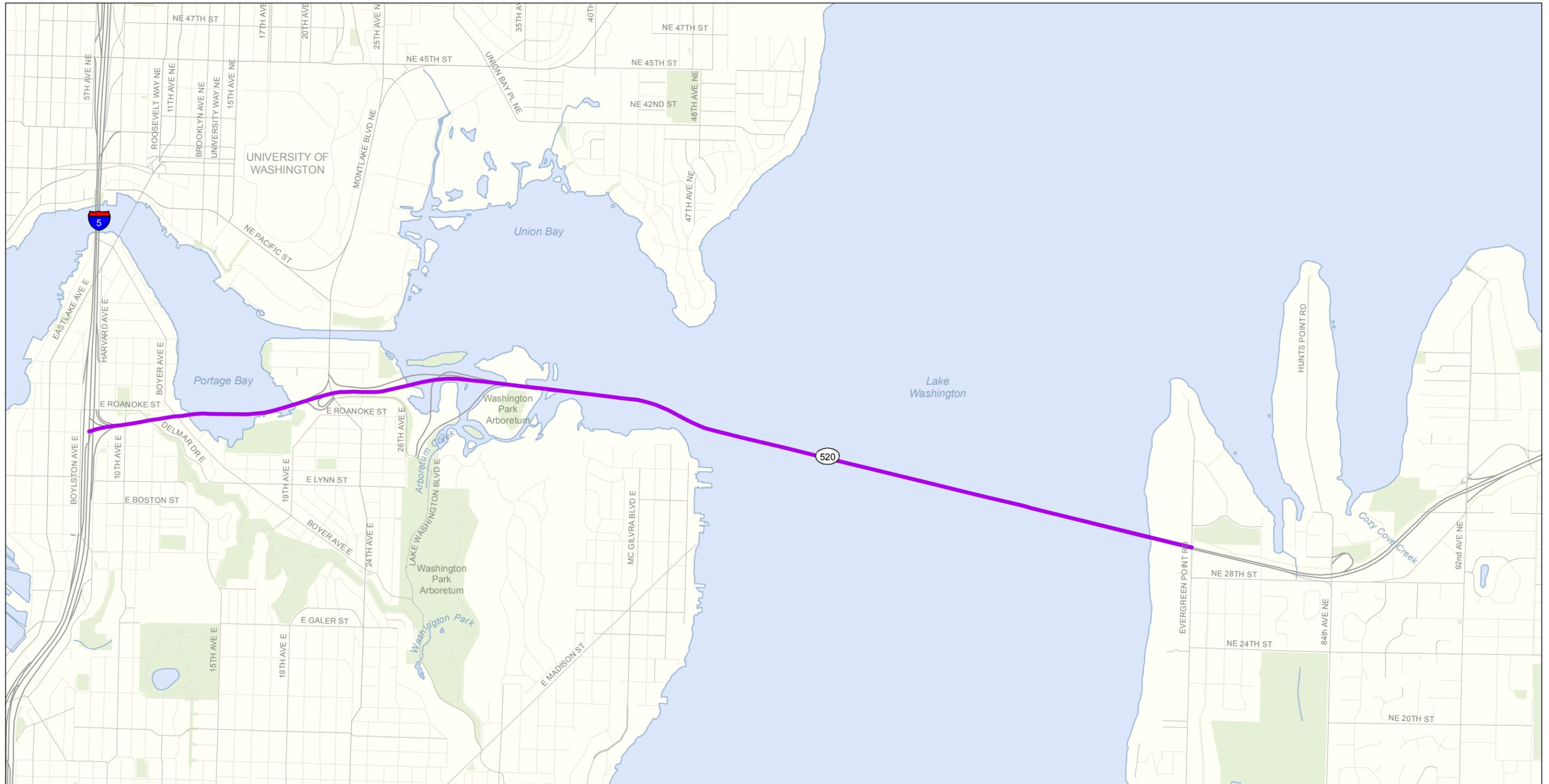
12 On September 30, 2010, the NRTWG reviewed and confirmed three wetland impact
13 mechanisms: filling, clearing, and shading of wetlands. These impact mechanisms result from
14 construction (temporary) and operations of the project (permanent). One important change to this
15 impact mechanism to wetlands occurred since the September 30, 2010 NRTWG meeting. In
16 areas where permanent bridge structures will be built over construction bridges, the impacts will
17 be counted only as permanent to prevent double counting of mitigation needs. Other differences
18 in area calculation from the NRTWG meeting result from clarifying overlapping geographic
19 information system (GIS) polygons used for the calculations, and do not reflect any change in
20 design or impact categories.

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

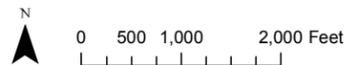
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- Project Extent
- Stream
- Park



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

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

10 ***SR 520 Improvements from I-5 to Medina***

- 11 • The SR 520 and I-5 interchange ramps will be reconstructed in generally the same
12 configuration as the existing interchange. The only exceptions will be that a new
13 reversible HOV ramp will connect to the existing I-5 reversible express lanes south of SR
14 520, and the alignment of the ramp from northbound I-5 to eastbound SR 520 will shift to
15 the south.
- 16 • The East Roanoke Street Bridge over I-5 will provide an enhanced pedestrian crossing.
17 The 10th Avenue East and Delmar Drive East overcrossing would be rebuilt as part of the
18 proposed lid structure, generally within the same alignment and with a similar vertical
19 profile as today.
- 20 • Construction activities and durations in the I-5 area will occur over a 2- to 3-year period.
- 21 • The Portage Bay Bridge will be replaced with a new bridge that will include two general-
22 purpose lanes, an HOV lane in each direction (six lanes total), and a westbound shoulder.
23 Connections between the new bridge and the exit lanes and ramps to Roanoke Street and
24 northbound I-5 will be configured much as they are currently. The new bridge will be
25 about 14 feet higher than the existing bridge's lowest point near the middle of Portage
26 Bay, and will remain at a greater height above the water than the existing bridge
27 throughout the eastern portion. Two facilities—one basic treatment bioswale and one
28 constructed wetland for enhanced treatment—will be constructed to treat stormwater
29 from this area.
- 30 • Construction of the Portage Bay Bridge and related elements will take place over a 5- to
31 6-year construction period, excluding mobilization and project closeout.
- 32 • The Montlake interchange will be widened to the north to accommodate a shift in the
33 mainline alignment, HOV lanes and ramps, and the widened mainline ramps. The
34 Montlake Boulevard and 24th Avenue East overcrossing structures will be demolished

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

- 3 • A longer and wider bridge will be required to accommodate the additional lanes on
4 SR 520 below Montlake Boulevard and to provide wider through lanes, shoulders, a
5 center median, and additional turning lanes on Montlake Boulevard over SR 520. This
6 bridge will be integrated as part of the new Montlake lid over SR 520.
- 7 • The SR 520 west approach structure will be replaced with wider fixed span structures and
8 the alignment will shift to the north as it approaches the new floating span. The
9 replacement approaches will maintain a constant profile rising from the shoreline at
10 Montlake out to the west transition span. Bridge structures will be compatible with
11 potential future light rail through the corridor. Improvements in this area also include the
12 removal of the existing Lake Washington Boulevard eastbound on-ramp and westbound
13 off-ramp and the R.H. Thomson Expressway ramps.
- 14 • The Evergreen Point floating bridge will be replaced with a new structure composed of
15 support columns and a roadway decking, constructed on a foundation of hollow concrete
16 pontoons connected in series across the deeper portion of the lake. The new floating span
17 will be located between 190 feet and 160 feet north of the existing bridge. Construction
18 activities associated with pontoon installation will occur over an estimated 3-year period.
- 19 • The east approach span will be replaced with a higher and wider structure than today and
20 the alignment will be shifted north. The combined width of the north and south structures
21 will range from 134 to 152 feet, from west to east. The structure will be approximately
22 660 feet long and range from 66 to 78 feet above the water surface. Construction of the
23 new east approach span will be concurrent with the floating bridge construction, and will
24 take place over a 3-year period.
- 25 • A new bridge maintenance facility will be constructed at the same time as the east
26 approach structure. The maintenance facility will include permanent and temporary
27 access roads, retaining walls, a 12,000-square-foot building, a dock, and a parking
28 facility.
- 29 • Once the east approach and floating portions of the Evergreen Point Bridge have been
30 replaced, grading and paving operations will occur east to Evergreen Point Road, and the
31 Evergreen Point Road transit stop will be relocated to the inside median (constructed as
32 part of the SR 520, Medina to SR 202: Eastside Transit and HOV Project) at Evergreen
33 Point Road. This project activity will occur over a 3.5-year period.

- 1 • The project includes a 14-foot-wide bicycle/pedestrian path along the north side of SR
2 520 through the Montlake area and across the Evergreen Point Bridge to the Eastside.
3 This path will connect to the Bill Dawson Trail, the Montlake lid, East Montlake Park,
4 and the Washington Park Arboretum.
- 5 • The project will include quieter concrete, along with other innovative noise reduction
6 techniques such as noise-absorptive crash barriers. WSDOT and the Federal Highway
7 Administration (FHWA) will continue to work with the affected property owners to make
8 a final determination of reasonable and feasible mitigation measures for project-related
9 noise effects.
- 10 • The project includes the installation of biofiltration swales and construction of enhanced
11 treatment facilities to collect and treat stormwater runoff.

12 **2.3 Project Schedule**

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

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

26 Construction and restoration activities in the project area will likely be ongoing for up to 8 years.
27 This estimated time frame is based on the assumption that the project receives full funding and
28 that construction will occur concurrently in multiple locations in the project area.

1 **2.4 Responsible Parties**

2 WSDOT will administer the contract for roadway improvements. Contracts for the mitigation
3 components of the project may be administered by WSDOT or other entities. The monitoring
4 and site management of the mitigation sites will be the responsibility of WSDOT for 10 years.
5 WSDOT will be responsible for ensuring that the mitigation sites are protected in perpetuity.
6 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

1 western red cedar are the dominant upland forest species in this zone, although Douglas-fir is
2 also very common.

3 The hills and valleys on the west side of Lake Washington provided numerous locations that
4 support the development of wetlands. Larger wetland complexes developed in the more sheltered
5 bays of Lake Washington, and along the many tributary streams in the area. Groundwater seeps
6 on the slopes of the stream valley also provided a stable source of hydrology that supported
7 wetland development, as did the numerous low-lying depressions in the uplands between stream
8 drainages. The majority of these wetlands (particularly depressional and riverine systems) have
9 been lost through urban development in the City of Seattle.

10 Streams and shallow shoreline environments of the Ship Canal, Portage Bay, the Montlake Cut,
11 and Union Bay on Lake Washington provide habitat for spawning, rearing, and migration of fish
12 species native to the area; the associated wetlands also provide habitat functions that support
13 fisheries. The aquatic habitats in the project area also provide habitat for invertebrates,
14 amphibians, birds, and mammals, and serve as migratory corridors for these species. The seep
15 and depressional wetlands provide habitat connections in the surrounding uplands that enhance
16 the movement of wildlife between drainages.

17 **3.1.2. Land Use History**

18 The project is located within the City of Seattle, in the intensively developed areas between the
19 I-5 corridor and Lake Washington. The long history of growth in the area has resulted in a matrix
20 of land uses including single and multi-family residential, commercial, institutional (Seattle
21 Preparatory School, University of Washington Campus and facilities, and the Museum of History
22 and Industry), and open space (Rogers Playground, East Montlake Park, Montlake Playfields,
23 McCurdy Park, Broadmoor Golf Course, and Washington Park Arboretum).

24 Following the initial development of these areas in the mid 1800s, ongoing urban and suburban
25 development has continued to cause physical change to the watershed through changes in land
26 cover and through increased water withdrawals (Kerwin 2001). In addition, the introduction of
27 non-native fauna and flora has significantly changed the biology of the Lake Washington
28 ecosystem (Kerwin 2001).

29 The majority of the lands within the project vicinity have been developed. This development has
30 resulted in loss and alteration of wetlands, which is common in urbanized environments. The
31 majority of the remaining wetlands are within parks or other areas that are marginally

1 developable, such as slopes that are difficult to develop, stream sides, relatively small
2 depressions, or areas immediately adjacent to Lake Washington. These remaining wetlands are
3 typically associated with Portage Bay and Union Bay on Lake Washington. Buffers are either
4 narrow and disturbed by human activities, or entirely absent. Migratory corridors are largely
5 fragmented by roads and developed parcels.

6 **3.1.3. Lake Washington Hydrology**

7 The Lake Washington watershed has been dramatically altered from its pre-settlement conditions
8 primarily due to urban development and removal of the surrounding forest, as well as the
9 lowering of the lake elevation and rerouting of the outlet from the Black River/Duwamish
10 estuary through the Ship Canal in 1917. Historically, Lake Washington's surface elevation was
11 nearly 9 feet higher than it is today, and the seasonal fluctuations further increased that elevation
12 by an additional 7 feet annually (Williams 2000). In 1903, the average lake elevation was
13 recorded at approximately 32 feet (9.8 m) (USACE datum) (NMFS 2008), or approximately
14 27 feet in the project datum (North American Vertical Datum [NAVD] 88).

15 The major sources of water to Lake Washington are the Cedar River basin (approximately
16 50 percent) and the Lake Sammamish basin (approximately 25 percent). The remaining
17 25 percent is provided by the smaller tributaries and sub-basins in the Lake Washington system
18 (Thornton, McAleer, Forbes, Juanita, Kelsey, Coal, and May creeks, and Mercer Slough).

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

- 23 • Spring refill – lake level increases to 18.72 feet between February 15 and May 1 (NAVD
24 88).
- 25 • Summer conservation – lake level maintained at about 18.72 feet for as long as possible,
26 with involuntary drawdown typically beginning in late June or early July.
- 27 • Fall drawdown – lake level decreases to about 16.72 feet from the onset of the fall rains
28 until December 1.
- 29 • Winter holding – lake level maintained at 16.72 feet between December 1 and February
30 15.

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

5 **3.2 Existing Conditions of Wetlands and Buffers to be Impacted**

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

11 Wetlands were classified using the following:

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

15 The condition and function of wetlands and buffers were qualitatively assessed using the
16 guidance provided in *Washington State Wetlands Rating System for Western Washington* (Hruby
17 2004).

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

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

1 The history of disturbance in the project area extends back at least to the construction of the Ship
2 Canal in the early 1900s (discussed in section 3.1.3), and likely earlier. The managed water
3 levels in Lake Washington described in Section 3.1.3 have effectively reversed the natural
4 hydrologic cycle for wetland along the fringe of Lake Washington, altering those habitat
5 functions that are dependent on the natural water cycle.

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

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

18 **3.3 Impact Calculation**

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

23 WSDOT assessed wetland and buffer impacts using the guidance provided in WSDOT's
24 Wetland and Buffer Impact Assessment Guidance (updated April 16, 2008). Impacts were
25 calculated based on surveyed wetland boundaries (as approved by USACE during the
26 Jurisdictional Determination) and SR 520 roadway design drawings using ARC/GIS software.
27 The impacts result from three mechanisms: filling, clearing, and shading of wetlands and buffers.
28 The interpretation of these impact mechanisms was discussed and approved in the NRTWG
29 meeting on September 30, 2010.

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

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

16 Shading occurs where bridge decking of permanent and temporary structures creates a shaded
17 area. Resources could be affected by this shading, potentially resulting in an indirect loss of
18 ecological function. Wetland vegetation and wildlife could be affected due to a reduced light
19 regime. Also, fish may respond behaviorally to reduced light and/or the transition from natural
20 lighting to shaded areas. Shaded areas will be calculated based on the plan view area of
21 temporary and permanent structure surfaces. Filled and cleared areas will be omitted from the
22 calculation.

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

28 **3.4 Permanent Wetland Impacts**

29 Permanent impacts result in the permanent loss of wetland, Waters of the United States, and/or
30 Waters of the State (Ecology et al. 2006a). Permanent impacts associated with the SR 520, I-5 to
31 Medina Project will result from widening the roadway surface from four lanes to six lanes,
32 improving existing on- and off-ramps, constructing a replacement floating span, and adding or

1 expanding stormwater facilities at several locations to treat runoff from existing and new road
2 surfaces. Permanent fill impacts have been calculated based on the plan view extent of columns
3 and/or shafts, overlaid atop all wetlands and buffers. This impact is reported in acres rounded up
4 to the nearest 1/100th of an acre.

5 The category of permanent impacts to wetlands also includes indirect impacts. Indirect impacts
6 result from activities inside or outside the wetland that do not result in a direct loss of wetland
7 area, but that do affect wetland function. Examples of situations where indirect impacts to
8 wetlands may result include sedimentation from upslope construction, changes in surface or
9 subsurface water movement, shading from overhead structures, changes in animal movement
10 patterns, loss of forested buffer, or loss of so much of an affected wetland area that the remaining
11 portion no longer provides the same level of wetland function.

12 Permanent shade impacts have been calculated based on the plan view extent of bridge limits,
13 less the area of columns and/or shafts, less the area of the existing bridge limits, overlaid atop all
14 wetlands and buffers. This impact is reported in acres rounded up to the nearest 1/100th of an
15 acre.

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

21 Permanently filled areas total 0.29 acres, and will include 0.11 acre of Category II wetland
22 (0.05 acre forested, 0.3 acre emergent, and 0.02 acre aquatic bed), 0.16 acre of Category III
23 wetlands (0.13 acre forested, less than 0.01 acre scrub-shrub, and 0.03 acre aquatic bed), and
24 0.02 acre of Category IV emergent wetlands.

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

1 In addition to the permanent fill impacts, construction of the bridge and associated facilities will
2 result in 4.87 acres of permanent shading impacts to wetlands in the project area (Table 1). The
3 4.87 acres include 2.48 acres of permanent shading in Category II wetlands (0.51 acre forested,
4 less than 0.01 acre scrub-shrub, and 1.91 acres aquatic bed), 2.39 acres of permanent shading in
5 Category III wetlands (0.21 acre forested, 0.22 acre scrub-shrub, and 2.01 acres aquatic bed), and
6 0.01 acre of permanent shading in Category IV wetlands (aquatic bed). Note that 0.58 acre of
7 permanent bridge shading will be removed from aquatic bed area in Category II wetlands as the
8 existing on-ramps to SR 520 are removed.

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

12 In addition to the permanent wetland fill and shading, loss of portions of the forested buffers of
13 Wetlands PBS-1, PBS-1A, LWN-1, LWN-2, LWN-3, LWS-2, LWS-3, LWS-4, and LWS-4A
14 (0.97 acre total) may result in a loss of some functions in these wetlands. Habitat is the function
15 most likely to be affected by this loss for forested buffer, since buffer habitat function and
16 diversity will be somewhat reduced, and there may be an increase in the extent to which
17 disturbances such as light and noise penetrate into the affected wetlands. Hydrologic function in
18 the affected wetlands is largely driven by the water levels in Lake Washington, which are
19 maintained by USACE. Furthermore, WSDOT will provide stormwater treatment for additional
20 impervious surfaces resulting from the SR 520, I-5 to Medina Project to maintain and improve
21 water quality. Runoff from the existing impervious surfaces is untreated. Additional discussion
22 of wetland buffer impacts is provided in Section 3.5.

23

1 **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)					
	Cowardin ^b	HGM ^c	Ecology ^c	Seattle ^d		Permanent Impact			Temporary		
						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)					
	Cowardin ^b	HGM ^c	Ecology ^c	Seattle ^d		Permanent Impact			Temporary		
						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

1 ^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.

2 ^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;

3 PFO = Palustrine forested.

4 ^c Ecology rating according to Hruby (2004).

5 ^d Local ratings based on City of Seattle 25.09.160.

6 ^e Wetland impacts based on design as of July 1, 2010.

7 ^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

8 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

9 result from clarifying overlapping GIS polygons used for the calculations, and do not reflect any change in design or impact categories.

10 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

11 documents, and to show wetlands that were avoided by the project.

1 **Table 2. Permanent Wetland Impact Summary by Classification**

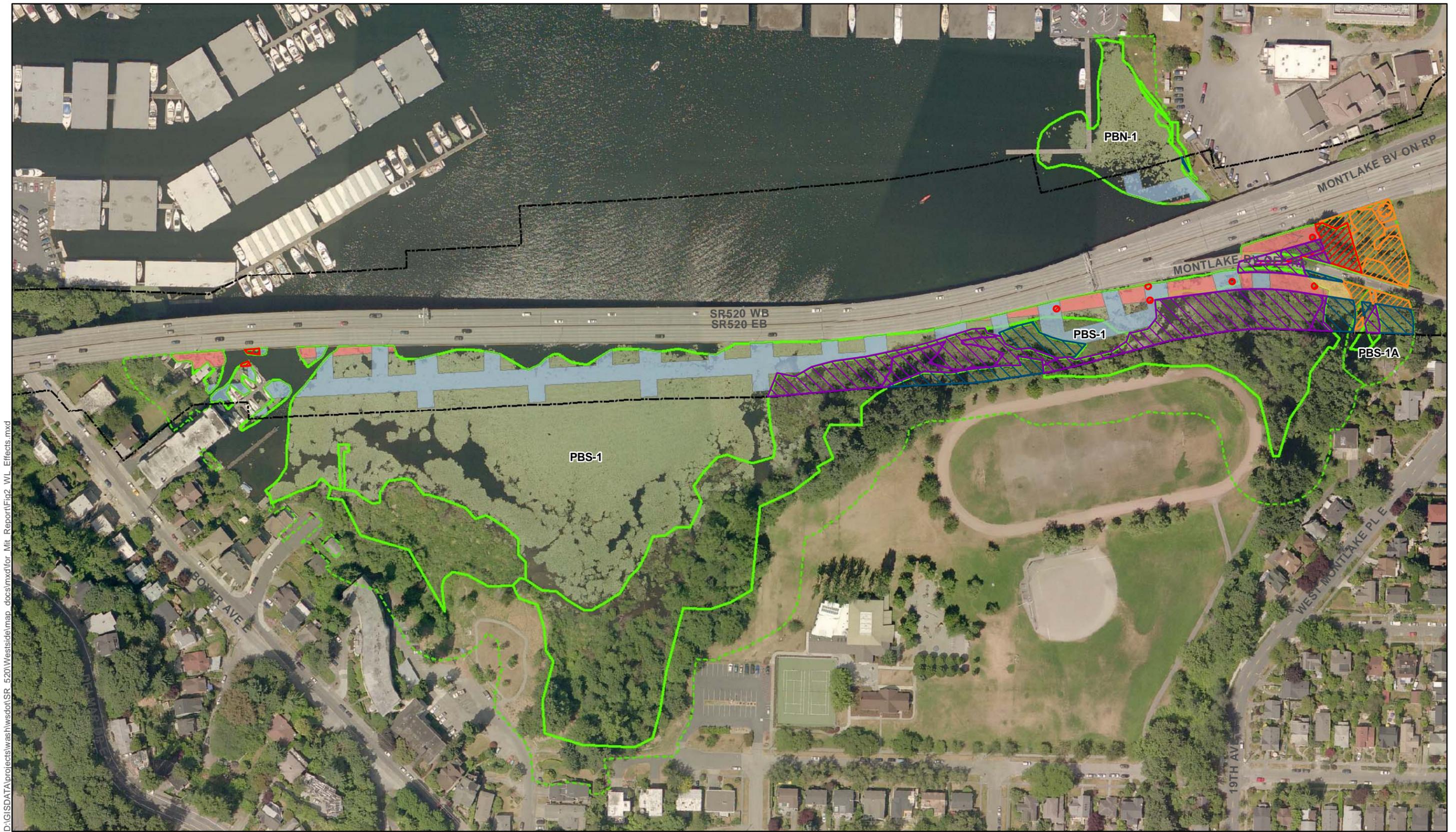
Wetland Classification	Class ^{a,b,c}	Permanently Filled Wetland Area ^d (acres)	Percent of Affected Wetland Area	Permanently Shaded Wetland Area ^d (acres)	Percent of Affected Wetland Area
USFWS (Cowardin et al. 1979)	L2AB	0.05	0.04%	3.93	2.86%
	PEM	0.05	0.04%	-	-
	PSS	<0.01	0%	0.23	0.17%
	PFO	0.18	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%

2 ^a Vegetation classes based on Cowardin, et al. (1979).
3 ^b Ecology rating and HGM classification according to Hruby (2004).
4 ^c Local ratings based on City of Seattle SMC 25.09.160.
5 ^d Wetland impacts based on design as of July 1, 2010.
6

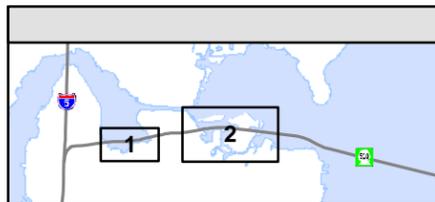
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- | | | | | | |
|---|-----------------------------|---|------------------------------|---|----------------|
|  | Permanent Shading (Wetland) |  | Permanent Fill (Wetland) |  | Wetland |
|  | Permanent Shading (Buffer) |  | Permanent Fill (Buffer) |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

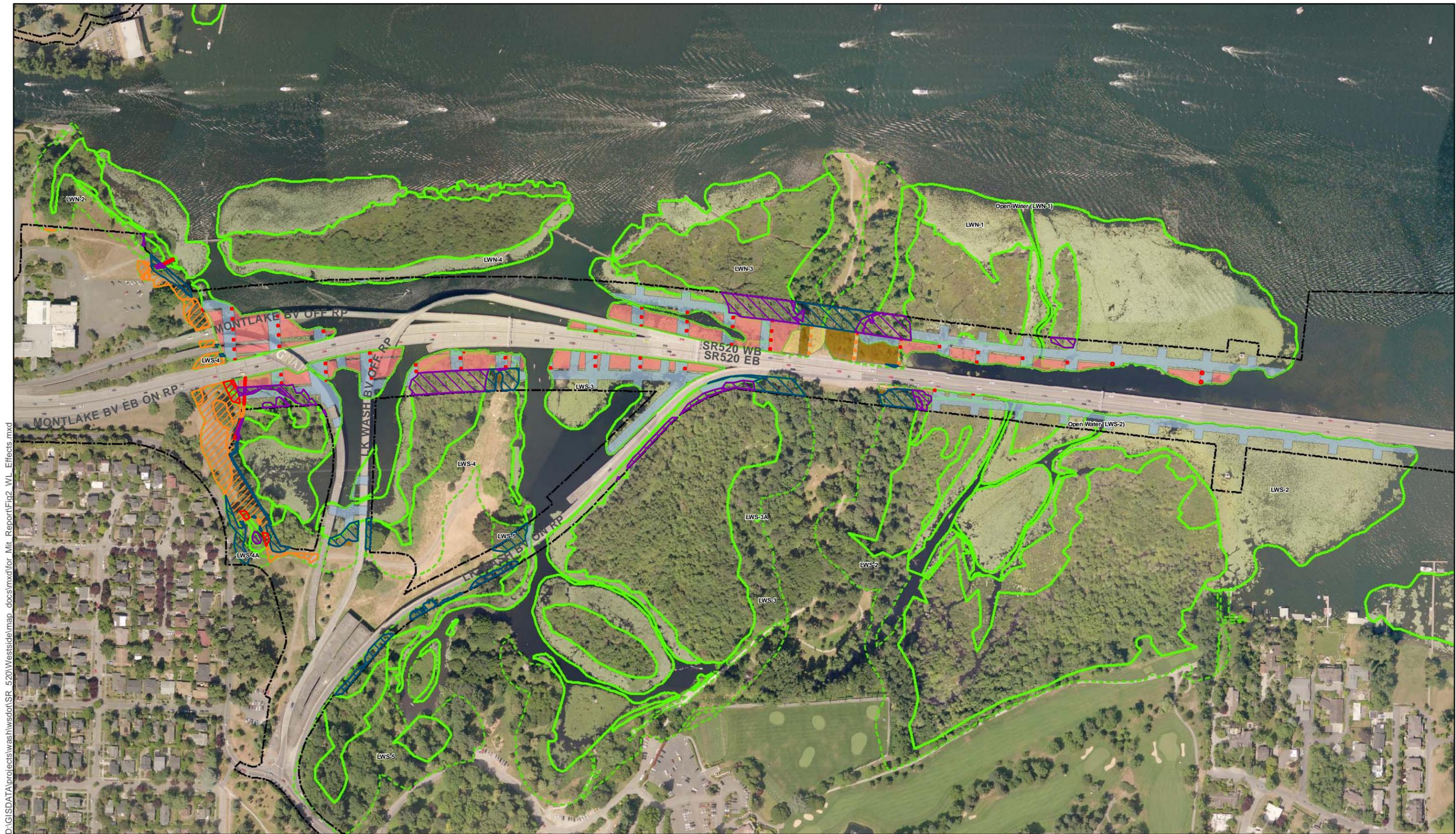


Figure 2, Plate 1
Effects on Wetlands and Buffers
in the Project Corridor

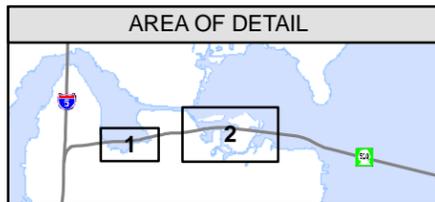
SR 520; I-5 to Medina: Bridge Replacement and HOV Project

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

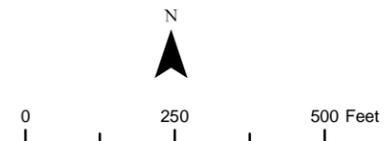


Figure 2, Plate 2
Effects on Wetlands and Buffers
in the Project Corridor

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

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1 **3.5 Temporary Wetland Impacts**

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

6 Long-term temporary impacts are those temporary impacts where the effects of the impact can be
7 restored over time, but not within a year or so (Ecology et al. 2006a). An example of long-term
8 temporary impact would be clearing of trees in a wetland, in which case it would take several
9 years to regain similar habitat. Short-term temporary impacts are where functions can be restored
10 relatively soon, generally within 1 year (Ecology et al. 2006a). An example of this would be
11 clearing of emergent vegetation. Due to the nature of the impacts and the expectation that
12 impacts will take longer than 1 year to restore, all the temporary impacts resulting from the
13 project have been categorized as long-term temporary impacts.

14 Temporary impacts for the SR 520, I-5 to Medina Project will result from construction of the
15 temporary work bridges, access, and staging areas. These temporary impacts will occur in 12
16 wetlands (PBN-1; PBS-1 and PBS-1A; LWN-1, LWN-2, LWN-3, and LWN-4; LWS-2, LWS-3,
17 LWS-4, LWS-4A and LWS-5), and will include temporary filling, clearing, and shading.

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

22 Temporary clearing impacts result from the clearing of vegetation to allow the construction of
23 work bridges, or generally to provide access for construction equipment. The boundary of
24 clearing impacts includes the limits of construction overlaid on top of forested and scrub-shrub
25 wetlands. This impact is reported in acres rounded up to the nearest 1/100th of an acre. In cleared
26 areas of forested and scrub-shrub wetlands that will later be shaded by construction work
27 bridges, the temporary impact will be calculated only as clearing.

28 Temporary shading impacts result from the work bridges. Shade impacts in forested and scrub-
29 shrub wetlands will occur entirely within the boundaries of temporary clearing impacts. Shading
30 of emergent wetlands will be calculated as the plan view extent of work bridges overlaid atop the

1 emergent wetlands, omitting areas of temporary fill, existing bridge shade, and proposed bridge
2 shade. For aquatic bed areas, the boundary of temporary shade impacts is defined by the plan
3 view extent of work bridges overlaid atop aquatic bed wetlands, omitting areas of temporary fill,
4 existing bridge shade and proposed bridge shade. This impact is reported in acres rounded up to
5 the nearest 1/100th of an acre.

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

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

14 Temporary shading impacts will occur in the areas beneath the temporary work bridges.
15 Temporary shading will affect 5.25 acres of wetlands in the project area (Table 1). The 5.25
16 acres includes 3.50 acre of Category II wetland (0.41 acre emergent and 3.09 acres of aquatic
17 bed), 1.65 acres of Category III wetlands (0.12 acre emergent and 1.53 acres of aquatic bed), and
18 0.10 acre of Category IV wetland (0.10 acre of aquatic bed and less than 0.01 acre of emergent).

19 Temporary impacts are listed by wetland in Table 1 and shown in Figure 2. Detailed descriptions
20 of the impacts to individual wetlands are provided in Appendix A.

21 **3.6 Wetland Buffer Impacts**

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

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

5 **3.6.1. Permanent**

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

10 As of the writing of this report, the SR 520, I-5 to Medina Project will permanently fill portions
11 of the buffers of nine wetlands (PBS-1, PBS-1A, LWN-1, LWN-2, LWN-3, LWS-2, LWS-3,
12 LWS-4, and LWS-4A), resulting from the total 1.87 acre of impact (Table 3). This total includes
13 1.21 acres of Category II wetland buffer, 0.64 acre of Category III wetland buffer, and 0.01 acre
14 of Category IV wetland buffer.

15 Permanent shading will occur in seven wetland buffers (PBS-1, LWN-1, LWN-2, LWN-3, LWS-
16 2, LWS-3, and S-4). The total affected area is 0.75 acre, and includes 0.48 acre of Category II
17 wetland buffer and 0.29 acre of Category III wetland buffer. Permanently affected buffers are
18 shown in Figure 2 and listed in Table 3.

19 **3.6.2. Temporary**

20 Temporary buffer impacts occur where construction work will extend beyond the permanent
21 footprint of the project. For the SR 520, I-5 to Medina Project, this includes temporary work
22 bridges, access, and staging areas. Expected impacts include temporary soil disturbance,
23 clearing, and shading. All temporary impacts are reported in acres rounded up to the nearest
24 1/100th of an acre.

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

28 Temporary clearing impacts will result where vegetation is cleared to allow the construction of
29 work bridges, or generally to provide access for construction equipment. The boundary of
30 clearing impacts for temporary buffer impacts is similar to that described for temporary wetland

1 impacts, and includes the limits of construction overlaid on top of forest- and shrub-dominated
2 buffers. In cleared forest and shrub dominated buffer areas, buffers that will later be shaded by
3 construction work bridges will be calculated only as clearing.

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

10 Temporary buffer impacts will affect 11 wetland buffers (PBN-1, PBS-1, PBS-1A, LWN-1,
11 LWN-2, LWN-3, LWS-2, LWS-3, LWS-4, LWS-4A, and LWS-5). The temporary impacts will
12 include less than 0.01 acre of temporary soil disturbance. Temporary buffer clearing will account
13 for 2.33 acres of the temporary impact. This will include clearing in 1.25 acres in Category II,
14 0.98 acre in Category III, and 0.11 acre in Category IV buffers. Temporary shading represents
15 0.04 acre of temporary impact to Category II buffers. All of the temporary shading will occur in
16 Category II buffer. These temporary buffer impacts are shown in Figure 2 and listed in Table 3.

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

Wetland ^a	Wetland Classification		Buffer Width ^b (feet)	Buffer Impact Area (acres) ^{c,d}			
	Ecology ^a	Local Jurisdiction ^b (City)		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

2 ^a Hruby (2004).

3 ^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
4 beyond wetland boundaries in some areas.

5 ^c Buffer impacts based on design as of July 1, 2010.

6 ^d The calculated impacts to buffers shown in this table include the extents of both wetland buffers and shoreline buffers, whichever is greater.
7

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1 **3.7 Wetland Functions Impacted**

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

10 In the 2004 rating system, wetlands are assessed based on their capacity to perform functions and
11 on their opportunity to provide these functions. For example, a particular wetland may have the
12 physical attributes to provide a particular function (e.g., dense emergent vegetation to filter
13 sediments), but may not have the opportunity to provide it (no sediment-laden waters are
14 entering the wetland). Both the water quality and hydrologic function subsets assess the capacity
15 and the opportunity to provide these functions.

16 The potential and opportunity to provide three functions (water quality, hydrology, and habitat)
17 were assessed for each wetland using the Ecology worksheet (Hruby 2004). The scores from the
18 Ecology rating system were converted to a qualitative rating of “High,” “Moderate,” or “Low” as
19 outlined in the publication *Focus Sheet - Using the Wetland Rating System in Compensatory*
20 *Mitigation* (Hruby 2008). For water quality and hydrologic opportunity, as well as special
21 characteristics, the function is either present (“X”) or not present (“-”). Wetlands were
22 considered to have special characteristics if they had educational or scientific value, were unique
23 in some way, or provide particular heritage value. Function scores for the wetlands are shown in
24 Appendix A, and additional details can be found in the *Bridge Replacement and HOV Project*
25 *Supplemental Draft EIS Wetland Assessment Technical Memorandum* (WSDOT 2010b).

26 Wetlands in the project areas generally scored low to moderate for water quality, hydrologic, and
27 habitat functions (Table 4), although three wetlands scored high for potential to provide habitat
28 and moderate for opportunity to provide habitat (see below). The lacustrine wetlands in the
29 project area have the potential to improve water quality because of their proximity to SR 520 and
30 urban development, and the presence of vegetation that can trap pollutants and reduce shoreline
31 erosion. However, these wetlands have a limited ability to reduce flooding and stream
32 degradation due to their small size relative to the watershed. Wetlands in the study area have

1 variable ratings for habitat potential and opportunity. This is due to the limited number of
 2 habitat features and low structural diversity in some systems. Five wetlands (PBS-1, LWN-1,
 3 LWS-3, LWS-4, and LWS-5) provide high potential for habitat function due to their larger size,
 4 location near other wetlands, and multiple vegetation classes.

5 **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	-	-	-	-

6 * After Hruby (2004, 2008)

7 ^a "L" = the function is of lower quality.

8 "M" = the function is of moderate quality.

9 "H" = the function is of higher quality.

10 "X" = the function is present.

11 "-" = the function is not present.

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

14

1 **Chapter 4. Mitigation Strategy**

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

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

8 Wetlands, streams, and other sensitive resources in the project vicinity are protected by Section
9 404 of the CWA, which regulates placement of fill in Waters of the United States. USACE is the
10 responsible agency for implementing permits under Section 404 of the CWA.

11 Wetland mitigation is regulated under Compensatory Mitigation for Losses of Aquatic
12 Resources; Final Rule (33 Code of Federal Regulations [CFR] Parts 325 and 332, April 10,
13 2008), hereafter referred to as the Federal Rule on Compensatory Mitigation. The Federal Rule
14 on Compensatory Mitigation was developed by USACE and the U.S. Environmental Protection
15 Agency (USEPA), and improves and consolidates existing regulations and guidance, to establish
16 equivalent standards for all types of mitigation under the CWA Section 404 regulatory program.

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

22 The U.S. Department of Transportation (USDOT) seeks to “assure the protection, preservation,
23 and enhancement of the nation’s wetlands to the fullest extent practicable” during the planning,
24 construction, and operation of transportation facilities and projects (USDOT Order 5660.1A;
25 Executive Order 11990, 1978). USDOT projects that receive federal funding are subject to this
26 order, including the SR 520 Bridge Replacement and HOV Program. Project-level design,
27 environmental review, and permitting for the project include avoidance, minimization,
28 restoration, and compensation of wetland loss in accordance with the CWA Section 404(b)(1)
29 guidelines shown in 40 CFR Part 230.

1 Washington State Executive Order 89-10 mandates that actions and activities of state agencies
2 achieve a goal of “no net loss” of wetlands. In recognition of the Wetland Executive Order,
3 WSDOT has adopted a “no net loss” agency policy. The SR 520, I-5 to Medina Project, along
4 with the SR 520 Bridge Replacement and HOV Program, will be consistent with that policy.

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

8 Wetland mitigation guidance was jointly prepared by USACE, USEPA Region 10, and Ecology
9 as found in *Wetland Mitigation in Washington State, Part 1: Agency Policies and Guidance*
10 (Ecology et al. 2006a) and *Wetland Mitigation in Washington State, Part 2: Developing*
11 *Mitigation Plans* (Ecology et al. 2006b). These documents provide information on impact
12 assessment, wetland mitigation ratios, buffer mitigation ratios, and wetland buffer requirements.

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

17 The mitigation proposed for the SR 520, I-5 to Medina Project has been designed to meet the
18 requirements of the Federal Rule on Compensatory Mitigation and to be consistent with federal
19 and state “no net loss” policies. The project has also been designed to meet the mitigation
20 sequencing, compensation, reporting, and monitoring requirements typically used in WSDOT
21 projects.

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

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

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

10 **4.1 Avoidance and Minimization of Wetland Impacts**

11 WSDOT has designed the project to minimize the permanent and temporary impacts of the
12 proposed alternative while still meeting the project's engineering standards and design criteria.
13 Specific design features to avoid and minimize impacts on wetlands are listed in the 2009
14 Ecosystems Discipline Report (WSDOT 2009a). Additional measures have been incorporated
15 into the project design to minimize impacts on wetlands and aquatic resources.

16 **Measures to minimize impacts to wetlands, waters, and wildlife**

- 17 1. Construct the new roadway to the extent feasible within the footprint of the existing roadway.
 - 18 • Overlap temporary work areas with permanent footprint.
 - 19 • Span wetlands rather than filling them with a road prism.
 - 20 • Raise the profile of elevated bridge sections to allow more ambient light.
 - 21 • Use a work bridge across Foster Island to replace temporary work roads and reduce
22 temporary clearing.
 - 23 • Reduce shoulder widths where feasible.
- 24 2. Minimize the number and total area of in-water structures.
 - 25 • Increase span length from existing condition; use precast girders to eliminate the need for
26 falsework.
 - 27 • Increase column spacing from the existing condition.

- 1 • Use mudline footings for structure foundations (reduces in-water structure and shading
- 2 compared to waterline footings).
- 3 • Avoid span lengths that require footers.
- 4 3. Minimize stormwater discharge impacts by locating outfalls at or near existing outfalls.
- 5 • Revegetate between outfalls and water.
- 6 4. Minimize lighting impacts to water bodies.
- 7 • Use cut-off light fixtures with shielding when fixtures are adjacent to water.
- 8 • Place permanent lights on center median whenever possible to limit light spillage.
- 9 • Direct pedestrian lighting in walls toward the ground.
- 10 • Limit construction lighting to areas of active work and direct the lights at work surfaces.
- 11 5. Incorporate the following over-water construction best management practices (BMPs):
- 12 • Prepare a Stormwater Pollution Prevention Plan (SWPPP), Temporary Erosion and
- 13 Sediment Control (TESC) Plan, and a Spill Prevention Control and Countermeasures
- 14 (SPCC) Plan.
- 15 • Provide training to employees and subcontractors in proper maintenance, spill cleanup
- 16 procedures, material delivery, storage practices, and fueling procedures.
- 17 • Ensure that a Certified Erosion and Sediment Control Lead (CESCL) is consulted and on-
- 18 site during construction activities.
- 19 • Implement an oil containment boom to contain potential spills.
- 20 • Use a floating sediment curtain to settle suspended solids (silt) in water.
- 21 • Use tie-downs to secure all materials and aid in preventing discharges to receiving waters
- 22 via wind.
- 23 • Use absorbent materials under all vehicles and equipment placed on over-water structures
- 24 when the vehicle or equipment is expected to be idle for more than 1 hour.
- 25 • Inspect vehicle and construction equipment prior to entering work zones.
- 26 • Use off-site fueling stations and repair shops to the extent practicable.

- 1 • Implement appropriate cover and catchment measures to cover/contain work areas,
2 debris, and staging areas.
- 3 • Use treatment systems to treat construction water before discharging.
- 4 • Use eco-friendly lubricants and fuel sources (e.g., vegetable-based) where practicable.
- 5 • Use barges and floats to store stockpile materials, construction equipment, water
6 containment systems and water storage tanks, and to transport demolition debris.
- 7 • Construct cofferdams to isolate in-water work.
- 8 • Construct bubble curtains to reduce in-water noise.

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

- 11 1. Support constant slope on road surface. This minimizes wetland shading impacts and reduces
12 stormwater pumping.
- 13 2. Minimize noise impacts due to pile driving.
 - 14 • Continue to develop mitigation measures in addition to bubble curtains for pile driving.
- 15 3. Restore mudline footing areas.
 - 16 • Install mudline footings below the mudline and restore lakebed above them.
- 17 4. Monitor water quality during construction.
 - 18 • Monitor turbidity, dissolved oxygen, and noise before and during construction.
- 19 5. Minimize impacts of structures on aquatic resources.
 - 20 • Remove structures at the earliest possible date, even if removal occurs outside of the
21 in-water work window.
- 22 6. Adaptive management measures:
 - 23 • Monitor Lake Washington environment and fisheries populations during construction and
24 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.

- 1 • A review of documents, aerial photography, and public GIS layers for WRIA 8 was
2 conducted for the Westside study area. Sites were also added based on input from
3 regulatory agencies and team members.
- 4 • To select suitable potential wetland mitigation sites, the Mitigation Team identified eight
5 broad parameters that would define suitable mitigation sites for the master list of
6 potential sites. These eight parameters were divided into two categories: opportunity
7 parameters and risk parameters. ‘The “opportunity set” includes mitigation type, location,
8 special characteristics, and cost. Size was initially included in this set; however, since so
9 few sites are available due to the urban nature of study area, the minimum size criterion
10 was dropped. The “risk set” includes availability, hydrology, hazardous waste, and
11 cultural resources.
- 12 • The parameters were applied in a series of steps referred to as screening and paring.
- 13 • Site screening was performed in two steps. The initial screening focused primarily on risk
14 factors to quickly eliminate high-risk sites. The second screening focused on
15 opportunities.
- 16 • Paring was performed in five steps. Pares 1 through 3 were aimed at removing high-risk
17 sites and sorting the primary list to identify the most appropriate sites for further analysis.
18 Pare 4 was based on likely availability of the candidate site for mitigation actions. Pare 5
19 consisted of a detailed on-site analysis of the top five sites based on both opportunities
20 and risks. The results of Pare 5 were presented to the Mitigation Technical Working
21 Group for consultation and selection of the top sites for the mitigation process.
- 22 • Generally, the sorting identified the sites with the greatest mitigation potential. The
23 remaining sites were moved to a backup list. In this process, candidate sites that are
24 sorted to the backup list can be moved back to the primary list (or vice versa) as the
25 project design and permit process evolve and as the criteria for mitigation change.
- 26 • Final site selection was based on the amount of mitigation available at the sites,
27 suitability of the mitigation, and incorporated input from outside groups through
28 consultation with regulatory agency technical staff, NRTWG, local jurisdictions, and
29 stakeholders.

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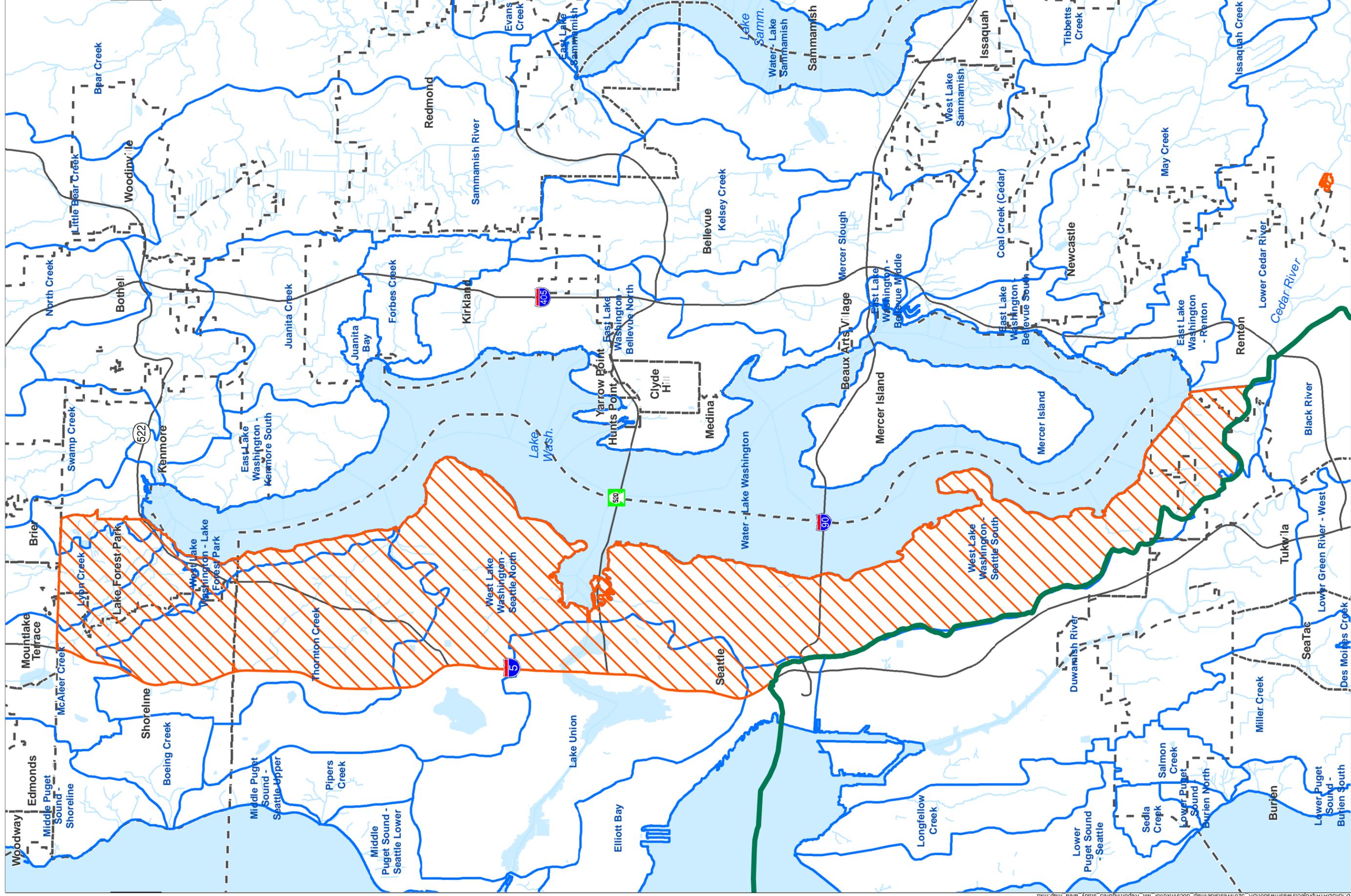
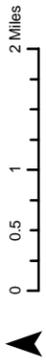


Figure 3
Study Area for Mitigation Site Selection



- Legend**
- Study Area
 - Municipal Boundary
 - WRIA Boundary
 - Watershed Boundary
 - Water Body
 - Stream

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1 **4.2.2. Proposed Wetland Mitigation**

2 **Mitigation for Permanent Impacts**

3 The proposed project will permanently impact a total of 5.16 acres of lacustrine and palustrine
4 wetland area (0.29 acre of permanent fill and 4.87 acres of permanent shading). Most of the
5 affected wetlands in the project area are Category II and III, with smaller impacts to Category IV
6 wetlands (there are no Category I wetlands in the project area). These impacts will reduce or
7 eliminate water quality, hydrologic, and habitat functions in the affected wetlands and
8 watersheds. Removal of existing on-ramps will remove 0.58 acre of permanent bridge shading in
9 Category II wetlands. These areas are expected to naturally revegetate to aquatic bed habitat.

10 *Mitigation ratios for permanent impacts*

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

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

21

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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

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^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.

8 ***Modifiers for non-fill permanent impacts***

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

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

- 5 • Bridge heights of about 24 feet or higher have relatively minor impacts on vegetation in
6 terms of total cover, with the exception of areas directly under the midpoints of bridge
7 decks.
- 8 • The greatest impacts on vegetation were in areas where solid, wide bridge decks were
9 relatively low to the ground or water surface—at a height of 8 feet or less.
- 10 • Light conditions under or near the edges of bridges (north and south sides) represent
11 partial shade and represent, on average, about 8 percent of incoming light. Although light
12 levels are low here, some light is still available for photosynthesis in the partial shade at
13 the south and north edges of the bridge shadow. These light levels are very similar to the
14 light levels found under tree or shrub canopies, and although vegetation cover is lower
15 than in full sunlight, some low shrubs and herbaceous vegetation grow in these areas.
16 This also suggests that areas temporarily shaded by work bridges during construction will
17 recover after structures are removed.
- 18 • Gaps between bridge decks, especially where the decks are not low to the ground, result
19 in light penetrating to the areas beneath the decks, and gaps between bridge decks have
20 relatively high vegetation cover.

21 In light of these conclusions, WSDOT proposes the following modifiers to the permanent
22 mitigation ratios for permanent shading impacts:

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

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

1 **Mitigation for Temporary Impacts**

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

7 Construction activities will include clearing of woody vegetation (forest and shrub vegetation
8 classes) to allow access and construction for work bridges. It is assumed that clearing is not
9 necessary in areas of emergent or aquatic bed vegetation. Temporary impact areas will not be
10 graded, and soil disturbance in the access areas will be minimized. Following construction, the
11 temporarily impacted areas will be revegetated with appropriate native species. Woody
12 vegetation will be planted in areas where woody vegetation was previously cleared, and
13 appropriate emergent vegetation will be planted in the existing emergent wetland areas.
14 Temporary impact areas where woody vegetation will be re-established will be monitored for a
15 period of 5 years to determine whether the desired vegetation type has been re-established.

16 ***Long-term temporary impacts***

17 Long-term temporary impacts to wetlands require compensation, but at lower ratios than for
18 permanent impacts (Ecology 2006a). The temporary fill impacts resulting from construction of
19 the SR 520, I-5 to Medina Project will be in place for a substantial period of time— up to 6
20 years. As a result, WSDOT proposes some modifiers to account for the unusual nature of the
21 temporary impacts. As noted for the permanent impacts, WSDOT will base these ratio
22 modifications on a Category II baseline for both the Category II and Category III wetland
23 impacts. The ratio for temporary fill would be increased from one-quarter to one-half of the
24 mitigation ratio for permanent fill. This is consistent with the guidance on mitigation ratios for
25 temporary impacts that are more permanent in nature (Ecology 2006a, Section 6.5.6).

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

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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

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^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.

10 **Modifiers for non-fill long-term temporary impacts**

11 The majority of the temporary impacts from the SR 520, I-5 to Medina Project will result from
 12 non-fill related impacts; rather, these impacts will be construction-related clearing and shading
 13 resulting from the temporary work structures. While these impacts will not result in a permanent
 14 loss of wetland area, the type and density of wetland vegetation will be changed in the affected
 15 areas for a period of up to 6 years. After a thorough review of these temporary impacts, a review
 16 of the joint guidance (Ecology 2006a), and consultation with and approval of the regulatory

1 agencies at the NRTWG meeting of September 30, 2010, WSDOT proposes the following
2 compensatory mitigation ratio modifiers specifically for this project:

- 3 • Temporary clearing of forested areas – one-half of the standard ratio for permanent
4 impacts, plus revegetation of the affected areas (this is consistent with the joint guidance,
5 Ecology 2006a, Section 6.5.6).
- 6 • Temporary clearing of scrub-shrub vegetation – one-quarter of the standard ratio for
7 permanent impacts, plus revegetation of the affected areas. This ratio takes into account
8 that the affected vegetation is generally low-growing in nature.
- 9 • Temporary shading of emergent marsh – one-quarter of the standard ratio for permanent
10 impacts, plus revegetation of the affected areas. This is an increase from the standards in
11 the guidance, to account for the longer duration of the impacts.
- 12 • Temporary shading of aquatic bed – one-quarter of the standard ratio for permanent
13 impacts, plus natural recolonization of the affected areas. Impacts to aquatic bed wetland
14 are not discussed in the joint guidance.

15

1 **Total Wetland Mitigation Needs**

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

5 **Table 7. Overall Mitigation Needs for the SR 520, I-5 to Medina: Bridge Replacement**
 6 **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
<i>Permanent Impact Total</i>	4.59	9.50
Temporary Fill	0.20	0.60
Temporary Clearing	2.82	7.66
Temporary Shading	5.25	7.80
<i>Temporary Impact Subtotal</i>	8.27	16.06
Grand Total	12.86	25.56

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

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

9 ^b Mitigation areas are based on modified standard ratios for rehabilitation (Ecology 2006a). Mitigation using creation
 10 would be at approximately one-half of the area shown in this table, and mitigation using enhancement ratios would
 11 require twice the areas shown. Modified mitigation ratios were developed in consultation with and with the approval
 12 of the NRTWG and Ecology at the NRTWG meeting held September 30, 2010.

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

16 **Buffer Mitigation**

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

1 Wetland buffers are vegetated areas that can reduce the impact from adjacent land uses (Ecology
2 2006a). On compensatory mitigation sites, the buffers may also provide habitat for wetland-
3 dependent species. The joint guidance recognizes that in urban areas, smaller wetlands can
4 provide adequate protection for functions such as water quantity and quality functions, while
5 larger buffers are generally required to protect moderate- to high-value wildlife habitat functions
6 (Ecology 2006a).

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

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

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

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

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

- 28 • WSDOT-Owned Peninsula – 110-foot standard buffer (based on City of Seattle
29 requirement for Category II wetland with moderate habitat value).
- 30 • Union Bay Natural Area (UBNA) – 110-foot standard buffer (see note above).
- 31 • Arboretum Creek – no wetland mitigation proposed, so buffers do not apply.

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

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

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

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

9 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.

1 The 9.59 acres of established (7.91 acres) and re-established (1.68 acres) wetland equates to
2 18.67 acres of the mitigation need described in Chapter 4, Table 7, using ratios for wetland
3 creation/re-establishment (as modified above). The mitigation also provides 24.47 acres of
4 enhancement, which would provide compensation for an additional 9.67 acres of wetland impact
5 (using ratios for wetland enhancement ratio as modified above). Overall, these mitigation actions
6 provide equivalent mitigation for 28.35 acres using the rehabilitation ratios as a baseline.

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

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

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

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

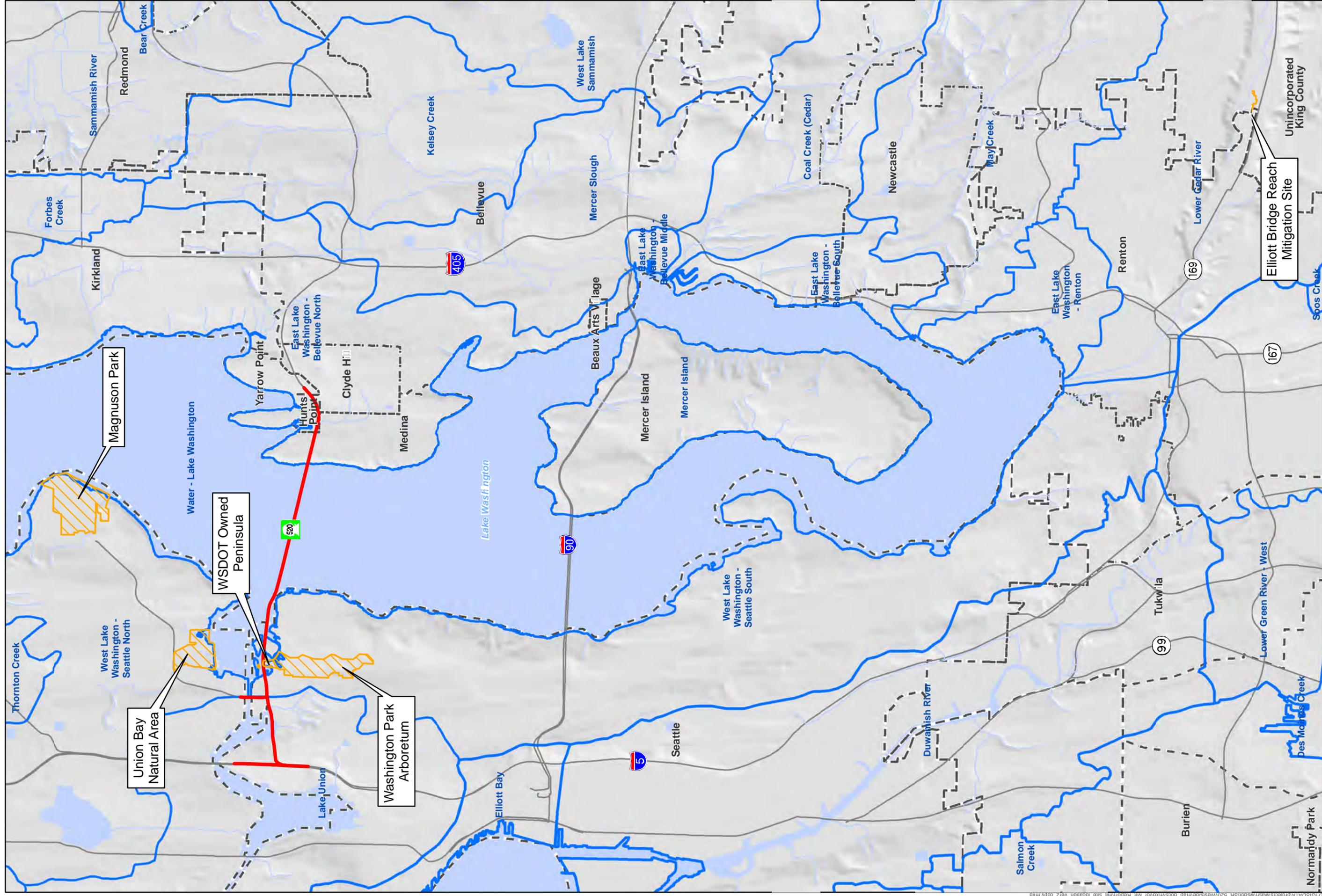
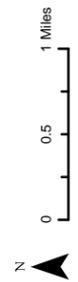


Figure 4
Location of the Mitigation Sites
in Relation to the Project Impact Site
 SR 520, I-5 to Medina: Bridge Replacement and HOV Project



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1 **5.1 WSDOT-Owned Peninsula Mitigation Site**

2 **5.1.1. Site Location**

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

7 **5.1.2. Landscape Perspective**

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

14 **5.1.3. Ecological Connectivity**

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

21 **5.1.4. Historic and Current Land Use**

22 The WSDOT-Owned Peninsula is a relatively high, flat peninsula that extends northward into
23 Union Bay. This area was originally below the surface of Lake Washington, but was exposed by
24 the construction of the Ship Canal and subsequent lowering of Lake Washington. The WSDOT-
25 Owned Peninsula was used as a dump during the 1930s, and is referred to as the Miller Street
26 Dump in documents from the period. In 1936, the City required the Health Department to stop
27 using the site as a dump and permitted the use of the site for the Washington Park Arboretum.
28 During the 1940s, the area was used for a portion of the Arboretum's *Rosaceae* collection (Bola
29 Architects+Planners 2003). This area was obtained by WSDOT and used for construction of SR
30 520 in the 1960s. Currently, the majority of the peninsula is approximately 12 feet above Lake

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

5 **5.1.5. Rationale for Site Selection**

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

10 **5.1.6. Mitigation Site Existing Conditions**

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

13 **Uplands**

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

17 **Wetlands**

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

24 Wetland functions at the mitigation site were evaluated using the *Washington State Wetland*
25 *Rating System for Western Washington – Revised* (Hruby 2004). A summary of this information
26 is provided in Table 4, and additional details are provided in the *I-5 to Medina: Bridge*
27 *Replacement and HOV Project Supplemental Draft EIS Wetland Assessment Report Technical*
28 *Memorandum (Final)* (WSDOT 2010b). Additional discussion of wetland function is provided in
29 Section 5.1.17.

1 Two wetlands are located on the margins of the WSDOT-Owned Peninsula site (LWS-4 and
2 LWS-5, see Table 8 and Figures 2 and 5). LWS-4 and LWS-5 are lacustrine fringe wetlands and
3 include palustrine forested, emergent, and lacustrine aquatic bed vegetation types. Dominant
4 species present in these wetlands include black cottonwood, red alder, Pacific willow (*Salix*
5 *lucida*), Douglas spirea (*Spirea douglasii*), reed canarygrass, creeping buttercup, and cattail
6 (*Typha latifolia*). White waterlily dominates the aquatic bed portions of these wetlands.
7 European water-milfoil (a sub-emergent aquatic plant) occurs in both the aquatic bed portions of
8 LWS-4 and LWS-5 and within the adjacent open water areas. Wetlands LWS-4 and LWS-5 were
9 rated Category II. Complete details on these wetlands can be found in the *I-5 to Medina: Bridge*
10 *Replacement and HOV Project Supplemental Draft EIS Wetland Assessment Report Technical*
11 *Memorandum* (WSDOT 2010b).

12 **Wildlife Habitat and Use**

13 The following paragraphs summarize wildlife use at the proposed WSDOT-Owned Peninsula
14 mitigation sites.

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

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

30 While open water habitats in Union Bay are not a large component of the WSDOT-Owned
31 Peninsula, the site adjoins open water habitats. The open water provides habitat for a variety of
32 waterfowl, the most common of which are American coots, buffleheads, mallards, scaups,
33 goldeneyes, widgeons, Canada geese, double-crested cormorants, pied-billed grebes, and western

1 grebes. Other species using these areas include bald eagles, great blue herons, belted kingfishers,
2 river otters, beavers, muskrat, nutria, Pacific treefrogs, and bullfrogs. Bat species also forage
3 over open water (WSDOT 2009a and Bioblitz 2010).

4 **5.1.7. Mitigation Site Design**

5 WSDOT proposes the re-establishment of up to 1.68 acres of historically dredged wetland,
6 enhancement of up to 2.33 acres of existing forested wetland, and enhancement of up to
7 0.83 acre of upland buffer. Specific activities will include excavating to remove upland fill,
8 restoring dredged areas in the lagoon west of the WSDOT-Owned Peninsula, grading to establish
9 a surface consistent with wetland hydrology, replanting native wetland and upland plant species,
10 and controlling non-native species on the site. Figure 5 illustrates the mitigation concept for the
11 WSDOT-Owned Peninsula site.

12 **5.1.8. Site Constraints**

13 The following constraints apply to the WSDOT-Owned Peninsula:

- 14 • The upland peninsula's historic use as the Miller Street Dump presents a significant
15 restraint on potential use.
- 16 • Geotechnical information may affect the design of the dredge restoration area.
- 17 • Additional studies will be required to assess site conditions, and further site design will
18 consider information from these investigations and evaluations. Site conditions unknown
19 at this time could result in changes to the final conceptual mitigation plan.
- 20 • Additional requirements may be imposed by site conditions, such as requirements to
21 specially treat and dispose of excavated materials.
- 22 • Invasive species are present nearby and will need to be controlled in the site.
- 23 • Park uses are adjacent to the site and within the buffer.
- 24 • Wildlife (e.g., beaver, geese) may pose special risks for plantings.

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1 **Table 9. WSDOT-Owned Peninsula Mitigation Site Wetland Summary**

Location	Peninsula on the south shoreline of Union Bay	
 <p data-bbox="233 684 688 714"><i>WSDOT-Owned Peninsula facing east</i></p>	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
 <p data-bbox="233 1096 688 1125"><i>WSDOT-Owned Peninsula facing SW</i></p>	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.	

1 **5.1.9. Site Hydrology**

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

7 **Stream Flow**

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

10 **Groundwater**

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



Wetland Re-establishment

- Restore wetland elevations
- Replant with native tree, shrub, and emergent species
- Install habitat features
- Remove existing ramps

Wetland Enhancement

- Control invasives
- Plant with native woody species
- Remove debris
- Create raised hummocks for planting

Ramps to be removed

Buffer

- Replant with native shrubs

Potential Uses

- New trails
- Connect existing trails
- Recreation access point
- Viewpoints/Overlook

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

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

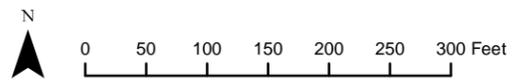
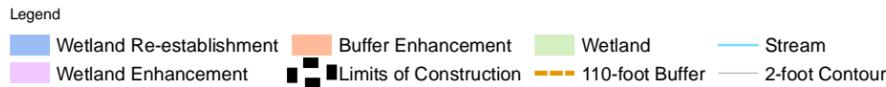


Figure 5
WSDOT-Owned Peninsula Mitigation Concept

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

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3

1 **5.1.10. Invasive Species**

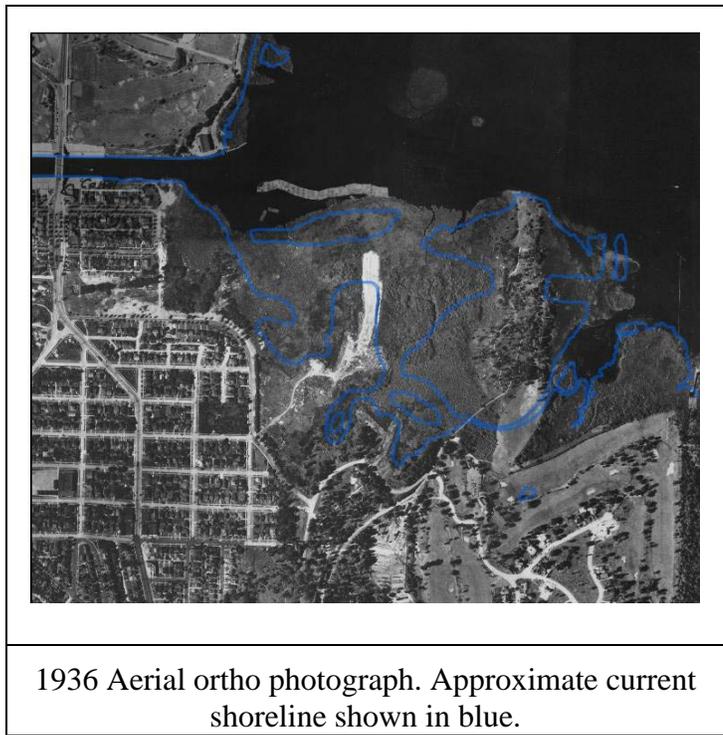
2 Reed canarygrass, Japanese knotweed, and Himalayan blackberry are the dominant invasive
3 species present at the WSDOT-Owned Peninsula Mitigation Site. The presence of these species
4 likely reflects the past disturbance and current uses of the WSDOT-Owned Peninsula. Invasive
5 species control for the site will be discussed under Site Management (Section 7.3) in future
6 reports.

7 **5.1.11. Grading Design**

8 As of the writing of this conceptual mitigation plan, site survey has not been completed and
9 detailed topographic information is not available. Wetland elevations and grading descriptions
10 for the WSDOT-Owned Peninsula Mitigation Site are based on inventory-level topographic
11 information from the City of Seattle. As survey-level site topography and more complete
12 hydrologic data become available, this information will be used to revise the grading plans and
13 will be incorporated into future designs and reports for the site. Exposure of the underlying
14 Miller Street Dump is a concern for this site. Boundaries of the former dump will need to be
15 established before final design.

16 **Grading Design at Dredged Areas in the WSDOT Lagoon**

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



1 After completion of the SR 520 construction project, WSDOT will demolish and remove the
2 existing on- and off-ramps at the WSDOT Owned Peninsula site. The proposed mitigation
3 would restore a portion of the dredged area to wetland. Construction activities would likely
4 include constructing a berm across the mouth of the lagoon, dewatering, and filling the areas
5 behind the berm with clean fill materials. Grades will be established at elevations that will allow
6 the restoration of wetland vegetation.

7 **Grading Design at All Areas**

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

12 **5.1.12. Planting Design**

13 The proposed plant community for the wetland re-establishment and enhancement areas at the
14 WSDOT-Owned Peninsula Mitigation Site is a lake fringe forested, scrub-shrub, and emergent
15 wetland. Forested wetland communities will be planted at the higher elevations in the wetland,
16 and the shrub community will be divided into lower and higher elevation communities to reflect
17 the seasonal fluctuations in lake level. The emergent community would be placed at the lowest
18 elevations.

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

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

27

1 **Table 10. Proposed Typical Planting List for Wetland Areas**

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

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

1 **Table 11. Proposed Typical Planting List for Upland Buffer Areas**

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

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

3

4 **5.1.15. Site Protection**

5 The WSDOT-Owned Peninsula Mitigation Site will have long-term protective measures put in
 6 place such as deed restrictions, conservation easements, or Native Growth Protection Easements.
 7 Mitigation areas will also be fenced (if necessary and appropriate) and appropriate signage will
 8 be installed.

1 **5.1.16. Implementation Schedule**

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

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

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

14 **5.1.17. Ecological Benefits**

15 **Wetland Functions**

16 The proposed mitigation at the WSDOT-Owned Peninsula Mitigation Site consists of 1.68 acres
17 of wetland re-establishment, 2.33 acres of wetland enhancement, and 0.83 acre of buffer
18 enhancement. The proposed mitigation is expected to substantially improve habitat functions at
19 this location. Functional attributes of the mitigation wetlands that will be increased, compared to
20 the existing affected wetlands, are listed below. A summary is provided in Table 11.

21 ***Improved Functional Attributes***

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

1 ***New Functional Attributes***

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

4

5 **Table 12. Existing and Proposed Wetland Functions at the WSDOT-Owned**
 6 **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

7 ^a L = Low
 8 M = Moderate
 9 H = High.
 10 For the proposed mitigation + indicates an improvement in functional attribute.

11
 12

1 **Buffer Functions**

2 The current standard buffers for this wetland are 110 feet in width (SMC 25.09.160). Buffers for
3 the site will be designed in accordance with USACE and Ecology joint guidance to provide
4 adequate protection for the wetland functions at the mitigation sites. The following benefits are
5 expected to occur:

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

11

1 **5.2 Union Bay Natural Area Mitigation Site**

2 **5.2.1. Site Location**

3 The UBNA site is located on the north side of Union Bay on Lake Washington, south of the
4 intersection of NE 45th Street and Union Bay Place NE in the City of Seattle, Washington. The
5 UBNA site is owned by the University of Washington, and includes a portion of parcel
6 1625049001 in the northeast quarter of Section 16, Township 25 North, Range 4 East.

7 **5.2.2. Landscape Perspective**

8 **Landscape Position**

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

14 **5.2.3. Ecological Connectivity**

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

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

1 **5.2.4. Historic and Current Land Use**

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

8 A portion of the site was used for waste disposal beginning in 1925. In 1933, the site was opened
9 to public dumping, and in 1956 the City of Seattle began to use the site for domestic garbage
10 disposal. From approximately 1959 to 1969, the site was extended outward with a series of dikes,
11 constructed from timber and rubbish mats. The extension was intended to provide a stable base
12 for roadways, and to contain the displacement of peat soils on the site (Dunn 1966, Montlake
13 Landfill Work Group 1999). The first dike layer was a minimum of 15 feet thick, 150 to 200 feet
14 wide, and sufficient to support a 35-ton tractor. At locations where the depth of the peat was
15 greater, the mats were 30 to 40 feet deep. These mats were capped with earth to sink them below
16 the water surface. A canal was later excavated through this fill to convey stormwater from
17 Ravenna and the University Village to the north across the site to Lake Washington (Dunn
18 1966). Landfill activities were closed in 1966, and filling, grading, and seeding activities
19 continued through 1971 (Ewing 2010). The former Montlake Landfill currently supports sports
20 fields and parking lots for the University of Washington and the Union Bay Natural Area. There
21 are several areas where restoration activities have been undertaken by students, non-profit
22 groups, and community groups. These activities began at the site in 1990, and continue to the
23 present. Note that these activities are ongoing, and should not be considered complete or
24 advance mitigation.

25 **5.2.5. Rationale for Site Selection**

26 As noted for the WSDOT-Owned Peninsula Mitigation Site, the UBNA was identified using a
27 multi-stage, hierarchical selection process described in Section 4.2.2. Ownership by a public
28 entity provides benefits at the UBNA mitigation site that are not generally present for mitigation
29 sites. Specific benefits include the following:

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

- 1 • The University of Washington has actively managed restoration activities at the UBNA
2 site since 1990, and will remain actively involved in the continued use and management
3 of the site. Ongoing studies and master planning efforts for the site are indicative of the
4 University’s dedication to good stewardship of the UBNA site.
- 5 • Approximately 15 acres of wetland and buffer restoration work is ongoing at the site.
6 This work has been undertaken by students, non-profit and community groups and
7 includes successful wetland establishment in the E-5 area.
- 8 • WSDOT intends to partner with the University of Washington on the development and
9 management of this proposed mitigation. The University of Washington conducts
10 education and research projects on-site for design and ecological restoration classes that
11 contribute to the body of wetland restoration knowledge and support the development of
12 professionals in the field of wetland science. These additions to wetland restoration
13 knowledge and professional development are important benefits to society, and are
14 directly reflected in the understanding of wetland functions and mitigation ratios.
- 15 • As owner and steward of this site the University of Washington’s participation in
16 maintenance and monitoring could bring continuity and additional perspective to
17 monitoring this uniquely sited mitigation.
- 18 • The University of Washington can potentially provide a variety of services that would
19 benefit the mitigation. Examples of these potential services include: plant propagation
20 and establishment, aesthetics, grading techniques, tree protection techniques, and
21 developing design solutions to hypothetical problems, such as adaptive management.

22 **5.2.6. Mitigation Site Existing Conditions**

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

25 **Uplands**

26 The Union Bay Natural Area is composed of a mixture of open grasslands and communities
27 dominated by shrubs and forest. The grasslands are generally located in the interior portion of the
28 site and consist of a mixture of non-native grass species. Notable species present in quantities
29 over 10 percent include quack grass (*Agropyron repens* 16.1 percent), Kentucky bluegrass (*Poa*
30 *pratensis* 16.7 percent), and redtop (*Agrostis alba* 21.7 percent) (Huang and del Moral 1988).
31 Forested areas to the east are dominated by black cottonwood (*Populus balsamifera*), Pacific
32 willow (*Salix lucida* var. *lasiandra*), Scouler willow (*S. scouleriana*), and Hooker willow (*S.*
33 *hookeriana*). The non-native species Himalayan blackberry, Japanese knotweed, and reed

1 canarygrass are present in some areas. Other invasive species present include Scot's broom
2 (*Cytisus scoparius*), Canada thistle (*Cirsium arvense*), tansy ragwort (*Senecio jacobaea*), yellow
3 loosestrife (*Lysimachia punctata*), and giant knotweed (*P. sachalinense*) (Ewing 2010).

4 **Wetlands**

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

9 Several small wetlands are present in the interior of the UBNA site, notably the central pond and
10 Shoveller's Pond. These areas are dominated by a mixture of rushes with a narrow fringe of
11 willows. Scrub-shrub and forested areas are located to the east of the site and are dominated by
12 various willows with a canopy of cottonwood and willow. Aquatic bed wetlands on the shoreline
13 of the site are dominated by white waterlily, European water-milfoil, and cattail. Wetlands
14 associated with this site are described in the *I-5 to Medina: Bridge Replacement and HOV*
15 *Project Supplemental Draft EIS Wetland Assessment Report Technical Memorandum* (WSDOT
16 2010b) as LWN-5, and were rated as Category II. A summary of the UBNA's wetland
17 characteristics is provided in Table 12.

18 **Wildlife Habitat and Use**

19 The Supplemental Draft Environmental Impact Statement Ecosystems Discipline Report for the
20 project (WSDOT 2009a) indicates that lakeshore and upland habitats in the project area
21 (including the UBNA Mitigation Site) may support a number of wildlife species, particularly
22 bird species and disturbance tolerant mammals. A list of species potentially present at the UBNA
23 site is provided in the discussion of the WSDOT-Owned Peninsula Mitigation Site (Section
24 5.1.6).

25 **5.2.7. Mitigation Site Design**

26 The UBNA site provides a matrix of wetland and uplands in a unique location. Wetland
27 mitigation activities proposed at the UBNA site will incorporate the mitigation areas into the
28 diverse and complex mosaic of wetlands and terrestrial habitats on-site, by increasing horizontal
29 and vertical habitat diversity species diversity within the larger habitat mosaic. WSDOT
30 proposes to establish 2.53 acres of new palustrine wetland; to enhance up to 9.19 acres of
31 existing palustrine wetland; and to complete restoration/enhancement activities begun by the
32 various groups at the University of Washington on 8.41 acres of existing wetland. The proposed

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

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

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

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

27 WSDOT proposes 9.19 acres of wetland enhancement at one location in the northwest sub-area
28 of the UBNA site (Figure 6). This wetland enhancement is located to the north and east of the E-
29 5 Restoration. This location was selected for wetland enhancement for the following reasons:

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

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

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

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

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

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

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

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

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

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

15

1 **Table 13. UBNA Mitigation Site Wetland Summary**

Location	North shoreline of Union Bay		
 <p>Potential establishment area at UBNA Site</p>	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	
	Wetland Rating System Pts.		
	 <p>Typical enhancement area at UBNA Site</p>	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.		

1 **5.2.8. Site Constraints**

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

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

21 **5.2.9. Site Hydrology**

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

26 **Stream Flow**

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

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



Figure 6
Union Bay Natural Area Mitigation Concept
 SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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1 **Groundwater**

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

5 **5.2.10. Invasive Species**

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

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

17 **5.2.11. Grading Design**

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

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

1 **5.2.12. Planting Design**

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

6 **5.2.13. Habitat Features**

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

11 **5.2.14. Buffers and Uplands**

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

14 **5.2.15. Site Protection**

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

18 **5.2.16. Implementation Schedule**

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

22 **5.2.17. Ecological Benefits**

23 **Wetland Functions**

24 WSDOT proposes the following mitigation activities for the UBNA site:

- 25 • Establishment of 2.53 acres of wetland (2.28 acres of wetland establishment credit at
26 90 percent).
- 27 • Enhancement of 9.19 acres of wetland (8.27 acres of enhancement credit at 90 percent).

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

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

8 ***Improved Functional Attributes***

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

14

15 ***New Functional Attributes***

- 16 • Establish new wetland area
- 17 • Additional habitat area

18

1 **Table 14. Existing and Proposed Wetland Functions at the UBNA**
 2 **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 interspersions 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

3 ^a L = Low
 4 M = Moderate
 5 H = High.
 6 For the proposed mitigation + indicates an improvement in functional attribute.

7
 8

1 **Buffer Functions**

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

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

8

1 **5.3 Arboretum Creek Mitigation Site**

2 **5.3.1. Site Location**

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

11 **5.3.2. Landscape Perspective**

12 **Landscape Position**

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

17 **5.3.3. Ecological Connectivity**

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

23 **5.3.4. Historic and Current Land Use**

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

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

6 **5.3.5. Rationale for Site Selection**

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

9 **5.3.6. Mitigation Site Existing Conditions**

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

12 **Uplands**

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

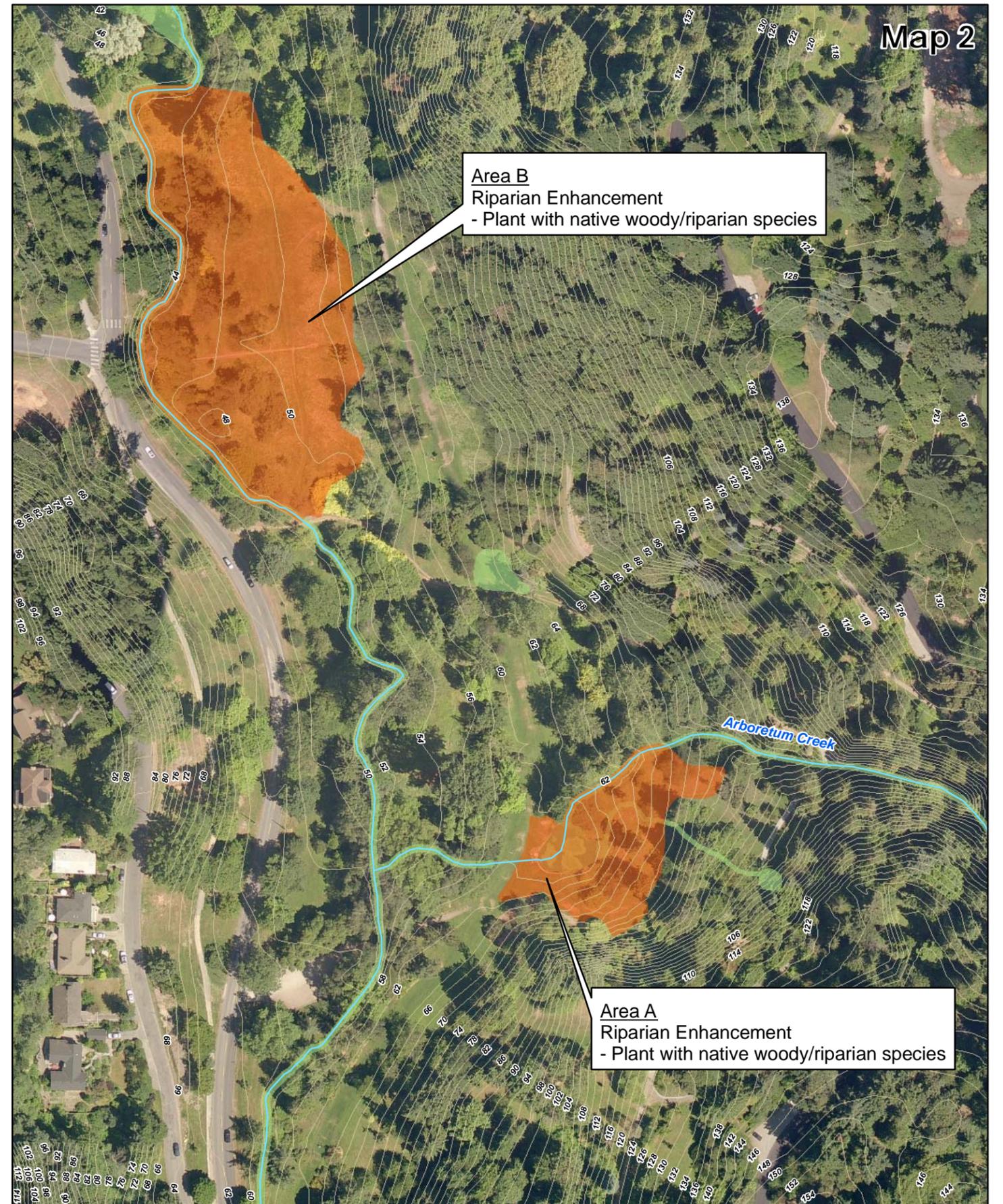
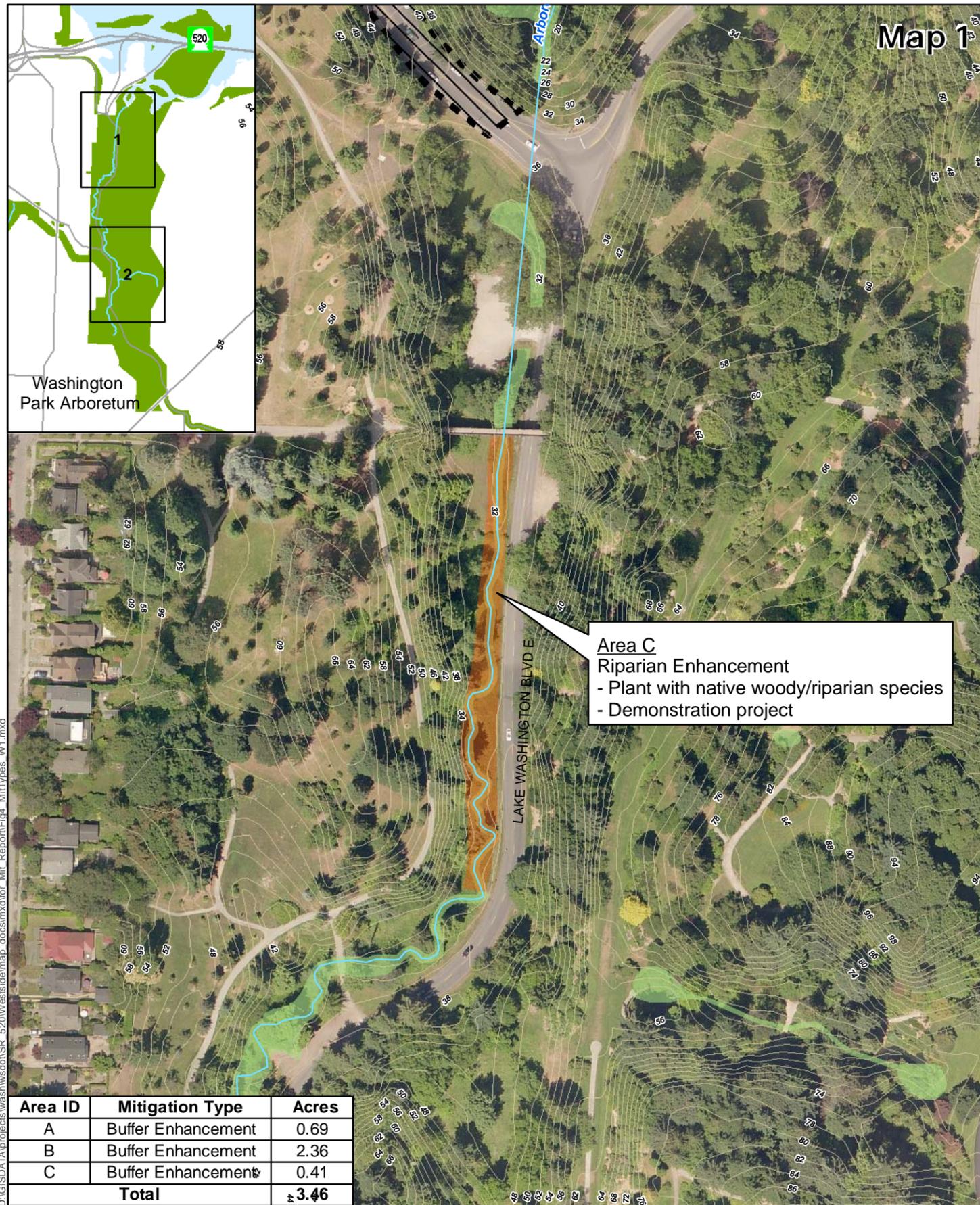
19 Three potential mitigation areas were identified along Arboretum Creek: a pond and associated
20 seep wetland, an upland field, and a portion of Arboretum Creek suitable for enhancement (see
21 Figure 5). Each of the three areas is described below. The pond and seep (Area A in Figure 7) is
22 located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

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D:\GISDATA\projects\wash\sr-520\Westside\map_docs\mxd\for_Mit_Report\Fig4_MitTypes_V1.mxd

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

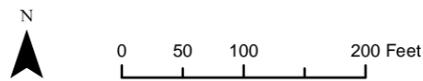


Figure 7
Arboletum Creek Mitigation Concept
SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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

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

16 **Wetlands**

17 The following section provides a description of wetland conditions at the Arboretum Creek
18 Mitigation Site. Wetland functions at the mitigation site were evaluated using the *Washington*
19 *State Wetland Rating System for Western Washington – Revised* (Hruby 2004). Additional
20 discussion of wetland function at the Arboretum Creek Mitigation Site is provided in Section
21 5.3.17.

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

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

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

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

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

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

17 **Wildlife Habitat and Use**

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

27 **5.3.7. Mitigation Site Design**

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

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

5 **5.3.8. Site Constraints**

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

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

12 **5.3.9. Site Hydrology**

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

17 **5.3.10. Invasive Species**

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

21 Control of invasive species will be an important element of mitigation activities at the Arboretum
22 Creek Mitigation Site. A plan for the control of invasive species will be develop in consultation
23 with the Arboretum and Botanical Garden Committee (ABGC). The plan will incorporate those
24 practices necessary to achieve control of invasive species, while maintaining consistency with
25 the Arboretum's ongoing uses, maintenance practices, and overall goals for the site. This
26 invasive species control plan will incorporated into the discussion of Site Management (Section
27 7.3) in future reports.

28

29

1 **Table 15. Arboretum Creek Mitigation Site Wetland Summary**

Location	North shoreline of Union Bay	
 <p data-bbox="224 680 704 709"><i>Pond at Arboretum Creek Mitigation Site</i></p>	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
	 <p data-bbox="282 1089 646 1119"><i>Slope above Arboretum Creek</i></p>	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 (<i>Carex</i> 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 [<i>Prunus</i> 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.	

1 **5.3.11. Grading Design**

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

7 **5.3.12. Planting Design**

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

13 **5.3.13. Habitat Features**

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

17 **5.3.14. Buffers and Uplands**

18 See planting design above.

19 **5.3.15. Site Protection**

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

24 **5.3.16. Implementation Schedule**

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

1 **5.3.17. Ecological Benefits**

2 **Wetland Functions**

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

7 *Improved Functional Attributes*

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

14

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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

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4
5
6
7

^a L = Low

M = Moderate

H = High.

For the proposed mitigation + indicates an improvement in functional attribute.

1 **5.4 Magnuson Park Mitigation Site**

2 **5.4.1. Site Location**

3 Magnuson Park is located on a peninsula on the western shore of Lake Washington in the city of
4 Seattle. The site is north of the University of Washington and about 2.5 miles north of the SR
5 520 Bridge in the southeast quarter of Section 2, Township 25 North, Range 4 East. The site is
6 owned and operated by the City of Seattle as a municipal park. Within Magnuson Park, the SR
7 520 mitigation site is located adjacent to and north east of a wetland mitigation project
8 completed in 2009 as part of Phase 2 of the Magnuson Park Master Plan (Otak 2010). The
9 eastern boundary of the site is Beach Drive, across from the Phase 3 Lagoon planned for
10 construction in 2011 (Figure 8). This area is currently viewed by WSDOT as the best area for
11 anticipated SR520 mitigation needs within the park.

12 In the same way as previous mitigation completed on site by City of Seattle, the proposed SR
13 520 mitigation would be aligned with the larger overall ecological restoration vision and concept
14 for the park documented in the park master plan. There are other similar areas in the park that
15 may provide for additional mitigation or the mitigation area may shift to these areas as the design
16 matures. One specific nearby restoration element under evaluation involves expansion of the
17 lagoon system to establish a direct surface water connection to Lake Washington. The master
18 plan identifies this restoration element as important for ecological connectivity. Another nearby
19 restoration element would involve expansion to the northwest or west, towards potential water
20 sources including the North Meadow Pond to provide added area and functional benefits.
21 Further work and coordination with the City of Seattle is necessary to clarify the full extent of
22 the mitigation site and assure that it is consistent with the park master plan.

23 **5.4.2. Landscape Perspective**

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

1 **5.4.3. Ecological Connectivity**

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

15 **5.4.4. Current and Historic Land Use**

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

23 The Magnuson Park peninsula was originally below the surface of Lake Washington, but was
24 exposed by the construction of the Ship Canal and subsequent lowering of Lake Washington. In
25 the 1920s and 30s, the Navy established an airfield by filling low areas, including marshes and
26 the small Mud Lake, and grading the site level. Commander A. W. Radford noted in a memo that
27 grading of the airfield involved more than 1,500,000 cubic yards (Seattle Parks 2011). In the
28 early 1940s, with the onset of World War II, the runways were paved and expanded and
29 buildings were added. In 1970 the airstrip was deactivated, and in the late 1970s, the runways,
30 tarmac, and taxiways were demolished (Seattle Parks 2011). In the early 1990s the naval station
31 was decommissioned and in 1995 it was officially closed. Ninety acres were transferred to
32 Seattle and the University of Washington. In 2004, the Seattle City Council approved a wetland
33 and sports field master plan for the area that included a wetland mitigation site (Seattle Parks
34 2011). In 2009, the sports field and a wetland mitigation site were constructed as Phase 2 of the

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

3 **5.4.5. Rationale for Site Selection**

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

7 **5.4.6. Mitigation Site Existing Conditions**

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

22 **Uplands**

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

26



Wetland Enhancement Potential Activities
 - Grade to extend hydroperiod
 - Replant with native woody species

Wetland Establishment Potential Activities
 - Grade surfaces
 - Plant with native woody species

Lagoon Creation Opportunity
 - Create open water lagoon to complete hydrologic connection to the lake
 - Create fringe wetlands

Road will be removed by Seattle Parks

Magnuson Park Phase I

Beach Dr. Ve

D:\GISDATA\projects\wash\sr_520\Westis\delmap_docs\mxd\for_Mit_Report\Magnuson_revised_Feb2011.mxd

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

- 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

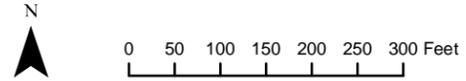


Figure 8
Magnuson Park Mitigation Concept

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

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1 **Wetlands**

2 Three wetlands have been delineated on-site. These wetlands are identified as K1,
3 K2, and K3 (Sheldon and Associates 2005).

4 All three are depressional wetlands
5 receiving most of their water from direct
6 precipitation or the immediate watershed.

7 Wetland K2 and K3 have no defined
8 outlets, and Wetland K1 drains into a
9 central ditch that flows south under Beach
10 Drive, into the proposed Phase 3 lagoon,
11 and on into Lake Washington. Wetland K1

12 (3.16 acres) has an emergent and forested area. The emergent area is dominated primarily by
13 reed canarygrass, bentgrass, and soft rush. The forested area, along the ditch, is dominated by
14 black cottonwood, willows and Douglas spirea. Wetland K2 (2.78 acres) is dominated by velvet
15 grass and bentgrass with areas of black cottonwood, English hawthorns, white poplars, and
16 Douglas spirea (*Spiraea douglasii*). This wetland has a large patch of slough sedge (*Carex
17 obnupta*). Wetland K3 (0.73 acres) is dominated by bent grasses, velvet grass, and soft rush.
18 Himalayan blackberry, Scot's broom, and English hawthorn are scattered throughout the
19 wetland. Wetlands K1 and K2 are Category III wetlands, while Wetland K3 is a Category IV
20 wetland. Wetlands K1 and K2 are Category III wetlands, while Wetland K3 is a Category IV
21 wetland (Table 17)
22 (Hruby 2004).



23

24

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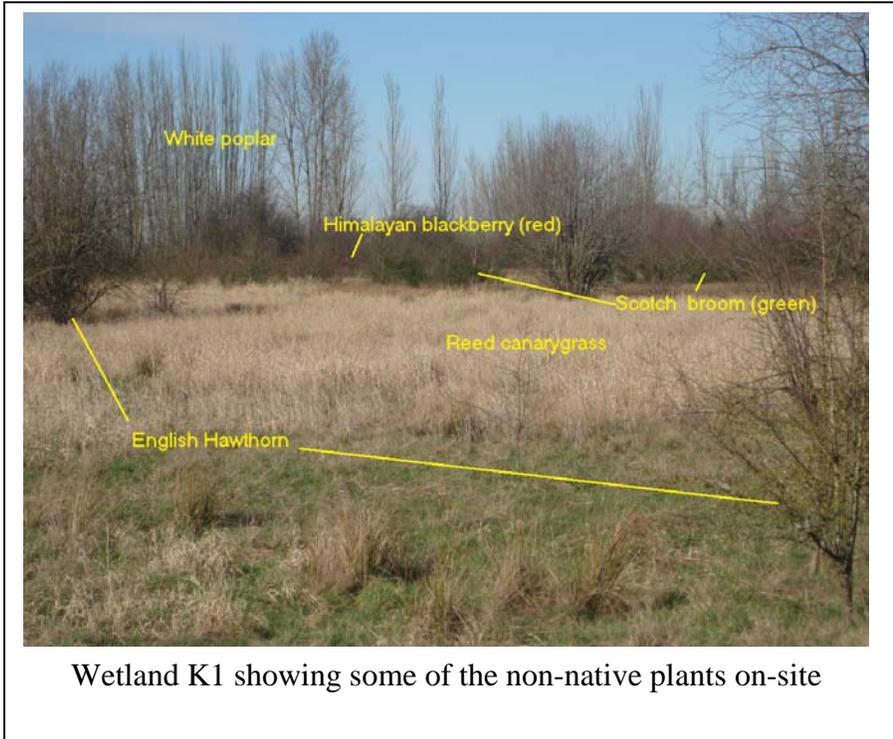
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1 **Table 17. Magnuson Park Mitigation Site Wetland Summary**

Location	Peninsula on west side of lake Washington - north of SR 520	
 <p data-bbox="240 793 815 825"><i>Wetland K1 facing west across center of site</i></p>	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
 <p data-bbox="256 1346 794 1377"><i>Wetland K2, north end of site facing north</i></p>	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.

1

2 **Wildlife Habitat and Use**

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

13 **5.4.7. Mitigation Site Design**

14 The basic elements of the mitigation design include the following:

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

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

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

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

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

1 **5.4.8. Site Constraints**

2 The following constraints apply to the Magnuson Park Mitigation Site:

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

14 **5.4.9. Site Hydrology**

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

22 **Stream Flow**

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

25 **Groundwater**

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

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

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

3 **5.4.10. Invasive Species**

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

8 **5.4.11. Grading Design**

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

15 **5.4.12. Planting Design**

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

21

1 **Table 18. Proposed Typical Planting List for Wetland Areas**

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

2

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

5 **5.4.13. Habitat Features**

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

- 9 • Downed logs
- 10 • Standing snags
- 11 • Bat boxes
- 12 • Brush piles

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

15 **5.4.14. Buffers and Uplands**

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

22

1 **Table 19. Proposed Typical Planting List for Upland Buffer Areas**

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

3

4 **5.4.15. Site Protection**

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

10 **5.4.16. Implementation Schedule**

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

- 13 • Wetland delineation

- 1 • Soil studies
- 2 • Shallow groundwater monitoring
- 3 • Permit applications
- 4 • Permit approval

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

7 **5.4.17. Ecological Benefits**

8 **Wetland Functions**

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

13 *Improved Functional Attributes*

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

25

1 *New Functional Attributes*

- 2 • Additional wetland area adding functions
- 3 • Areas of permanent and seasonal inundation
- 4 • New habitat features
- 5

1
2

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.	

3
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6
7

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

1 **Buffer Functions**

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

- 5 • 110-foot standard buffer along roads and paved trails.
- 6 • Increased buffer planting density and vertical structure to improve screening of created
7 wetland from ongoing park activities.
- 8 • Control of invasive species.
- 9 • Improved upland and edge habitat function through planting with appropriate native trees
10 and shrubs.

11

1 **5.5 Elliott Bridge Reach Mitigation Site**

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

4 **5.5.1. Site Location**

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

9 **5.5.2. Landscape Perspective**

10 **Landscape Position**

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

14 **5.5.3. Ecological Connectivity**

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

21 **5.5.4. Historic and Current Land Use**

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

1 into the mid 1930s (King County IMAP aerial). The golf course located downstream of Ron
2 Regis Park was originally developed in 1927 as the Cedar River Golf Club. The name was
3 changed to Maplewood Golf Club in the 1940s, and the City of Renton acquired the course in
4 1985. The agricultural parcels were subdivided into smaller residential lots and developed in the
5 1950s (King County IMAP Assessor's Data Report). The Elliott Bridge was removed in 2005,
6 and replaced with a new structure upstream of the site, that carries 154th Place SE over the Cedar
7 River. Parcels in the Elliott Bridge Reach site have remained in residential use until purchased by
8 King County in the mid 2000s as part of the Levee Setback program. Structures have been
9 removed from four of the purchased parcels.

10 **5.5.5. Rationale for Site Selection**

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

13 **5.5.6. Mitigation Site Existing Conditions**

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

16 **Uplands**

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

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

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

3 **Wetlands and streams**

4 The following section provides a description of wetland conditions at the Elliott Bridge Reach
5 Mitigation Site. Wetland functions at the mitigation site were evaluated using the *Washington*
6 *State Wetland Rating System for Western Washington – Revised* (Hruby 2004). Additional
7 discussion of wetland function at the Elliott Bridge Reach Mitigation Site is provided in Section
8 5.5.17.

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

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

15 **Wildlife Habitat and Use**

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

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

27

1 **Table 21. Elliott Bridge Reach Mitigation Site Wetland Summary**

Location	Banks of the Cedar River near 154 th Place SE in Renton	
 <p data-bbox="201 674 699 743"><i>Elliott Bridge Reach Mitigation Site, Parcel 2323059142 facing north.</i></p>	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
 <p data-bbox="201 1115 699 1184"><i>Open area in Parcel 2323059141 facing north.</i></p>	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.	

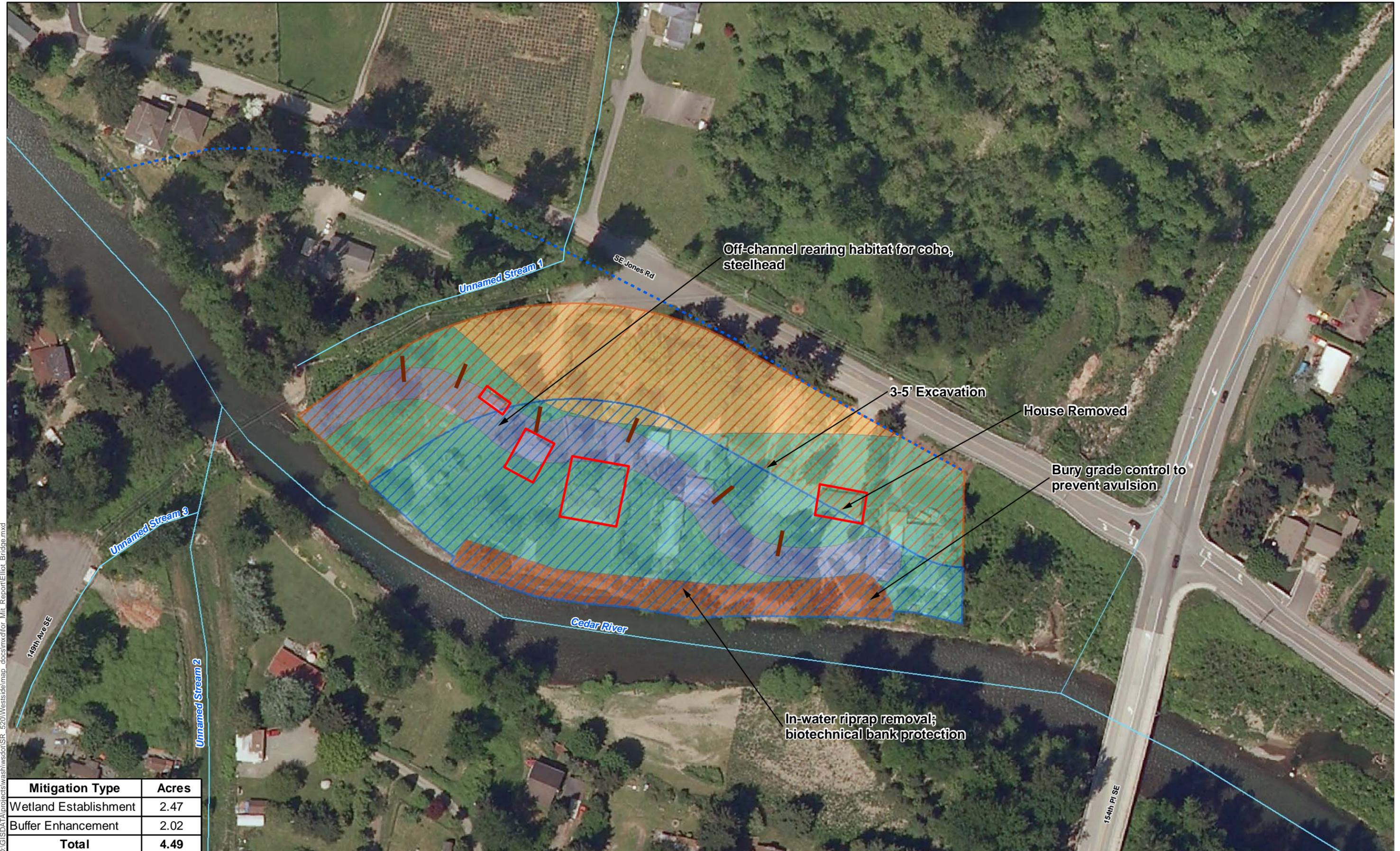
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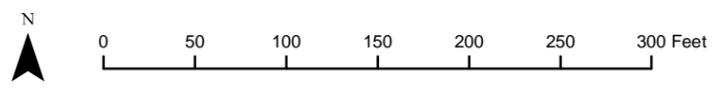
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Mitigation Type	Acres
Wetland Establishment	2.47
Buffer Enhancement	2.02
Total	4.49

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



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

Figure 9
Elliott Bridge Reach Mitigation Concept
 SR 520, I-5 to Medina: Bridge Replacement and HOV Project

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3

1 **5.5.7. Mitigation Site Design**

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

10 **5.5.8. Site Constraints**

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

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

16 **5.5.9. Site Hydrology**

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

21 **Stream Flow**

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

25 **Groundwater**

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

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

3 **5.5.10. Invasive Species**

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

9 **5.5.11. Grading Design**

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

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

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

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

1 **5.5.12. Planting Design**

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

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

16 **5.5.13. Habitat Features**

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

- 20 • Downed logs
- 21 • Standing snags
- 22 • Bat boxes
- 23 • Brush piles

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

25 **5.5.14. Buffers and Uplands**

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

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

3 **5.5.15. Site Protection**

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

8 **5.5.16. Implementation Schedule**

9 A complete implementation schedule for this mitigation has not yet been developed. Additional
10 studies and benchmarks to be completed are expected to be similar to those listed in Section
11 5.1.16.

12 **5.5.17. Ecological Benefits**

13 **Wetland Functions**

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

- 16 • Establishment of 2.47 acres of wetland
- 17 • Enhancement of 2.02 acres of wetland buffer

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

21 A summary is provided in Table 22.

22 ***Improved Functional Attributes:***

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

1 ***New Functional Attributes:***

- 2 • Additional functional floodplain and floodplain wetland
- 3 • Natural side channel configuration
- 4 • Side channel habitat for salmonids and other fish species
- 5 • Corridors of riparian habitat to shade new side channel
- 6 • A new source for natural LWD recruitment
- 7 • Shading provided that assists in maintaining low water temperatures desirable for fish
- 8 habitat
- 9

1 **Table 22. Existing and Proposed Wetland Functions at the Elliott Bridge Reach**
 2 **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

3 ^a L = Low
 4 M = Moderate
 5 H = High.
 6 For the proposed mitigation + indicates an improvement in functional attribute.
 7
 8

1 **Buffer Functions**

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

- 6 • Improved screening of wetlands from off-site activities.
- 7 • Control of invasive species.
- 8 • Improved habitat function over existing disturbed conditions by planting with appropriate
9 native trees and shrubs to provide additional forage and cover.
- 10 • Improved connectivity between habitats upstream and downstream of the site along the
11 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 29.95 acres 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.

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

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

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

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

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

11 Increase structural complexity of wetlands by adding additional vegetation types.

12 Improve wildlife habitat value by adding constructed habitat.

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

15 Screen wetland from nearby human activities.

16 Improve adjacent upland habitat by increasing native plant diversity.

17 Improve wildlife habitat value by adding constructed habitat.

18 **UBNA Mitigation Site**

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

20 Establish wetlands by removing or grading upland fill.

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

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

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

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

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

3 Increase structural complexity of wetlands by adding additional vegetation types.

4 Improve wildlife habitat value by adding constructed habitat features.

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

6 Screen wetland from nearby human activities.

7 Improve adjacent upland habitat by increasing native plant diversity.

8 **Arboretum Creek Mitigation Site**

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

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

13 Screen Arboretum Creek from nearby human activities.

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

16 **Magnuson Park Mitigation Site**

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

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

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

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

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

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

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

28 Increase structural complexity of wetlands by adding additional vegetation types.

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

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

4 Screen wetlands from nearby human activities.

5 Improve adjacent upland habitat by increasing native plant diversity.

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

8 **Elliott Bridge Reach Mitigation Site**

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

10 Establish additional wetlands by removing upland soil.

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

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

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

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

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

20 Screen established wetlands from nearby human activities.

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

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

25 **6.1.3. Performance Standards**

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

1 characteristics described in *Method for Assessing Wetland Functions* (Hruby et al. 1999a and
2 1999b) or other approved methods. These performance standards measure structural attributes
3 that serve as indicators of wetland functions. Methods to monitor each performance standard are
4 described in general terms.

5 **Hydrologic Performance**

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

12 **Performance Standard**

13 *Year 1*

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

15 *Years 1, 3, 5, and 7*

16 Soils in the wetland will be inundated or saturated to the surface, or the water table will be within
17 12 inches of the surface for 28 or more consecutive days during the growing season in years
18 when rainfall is within or above the normal range of the 30-year average.

19 *Year 10*

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

- 21 • The WSDOT-Owned Peninsula Mitigation Site will contain at least 1.68 acres of re-
22 established wetlands.
- 23 • The Union Bay Natural Area Mitigation Site will contain at least 2.53 acres of newly
24 established wetlands.
- 25 • The Magnuson Park Mitigation Site will contain at least 2.91 acres of palustrine
26 wetlands.
- 27 • The Elliott Bridge Reach Mitigation Site will contain at least 2.47 acres of
28 riverine/palustrine wetlands.

1 **Wetland Vegetation**

2 The performance standards for wetland vegetation document the establishment of wetland plant
3 communities. Native wetland vegetation (facultative and wetter species), both planted and
4 volunteer, will be counted to achieve the density performance standard. Native species
5 colonizing portions of the site will be included in the cover. The performance standards listed
6 below relate to wetland establishment and re-establishment Objectives PENINSULA 1, UBNA
7 1, MAGNUSON 1, and ELLIOTT 1 and wetland enhancement Objectives PENINSULA 2,
8 UBNA 2, MAGNUSON 2, and ELLIOTT 2.

9 **Performance Standard**

10 *Year 1*

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

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

15 *Year 3*

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

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

20 *Year 5*

21 Forested and scrub-shrub habitats: Cover of native, wetland woody species will provide at least
22 35 percent cover in the wetland.

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

25 *Year 7*

26 Forested and scrub-shrub habitats: Cover of native, wetland woody species will provide at least
27 50 percent cover in the wetland.

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

3 ***Year 10***

4 Forested and Scrub-shrub habitats: Cover of native, wetland woody species will provide at least
5 70 percent cover in the wetland.

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

8 **Wetland and Riparian Buffer Vegetation Performance**

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

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

18 **Performance Standards**

19 ***Year 1 and Year 3***

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

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

24 ***Year 5***

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

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

3 ***Year 7***

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

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

8 ***Year 10***

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

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

13 **Habitat Structure Performance Standard**

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

17 **Performance Standards**

18 ***Year 1***

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

21 **6.2 On-Site Temporary Impact Area Revegetation**

22 **6.2.1. Goals**

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

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

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

5 **6.2.2. Objectives**

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

7 Replant disturbed forested and shrub areas with appropriate woody species.

8 Replant disturbed emergent areas with appropriate native emergent species.

9 **6.2.3. Performance Standards**

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

18 **Wetland Vegetation**

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

23 **Performance Standard**

24 *Year 1*

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

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

1 ***Year 3***

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

4 ***Year 5***

5 Forested and scrub-shrub habitats: Cover of native wetland woody species will provide at least
6 35 percent cover in the revegetated wetland.

7 .

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.

1 **7.1.3. All Areas**

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

8 **Table 23. Monitoring Report Recipients**

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

9

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

12 **7.2 Contingency Plan**

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

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

23 **Hydrology**

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

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

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

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

12 **Vegetation**

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

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

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

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

- 8 ◦ Replace plants.

- 9 ◦ Plant less preferable species.

- 10 ◦ Adjust plant species and/or communities.

- 11 ◦ Install temporary fenced enclosures around some of the forested and/or shrub
12 communities.

- 13 ◦ Vandalism – To prevent vegetation disturbance from vandalism, fences and sensitive
14 area signage will be installed.

15 **Wildlife Structures**

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

20 **7.3 Site Management**

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

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

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

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

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

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Appendix A – Wetland Impact Summaries

Table A1. Wetland PBN-1 Summary

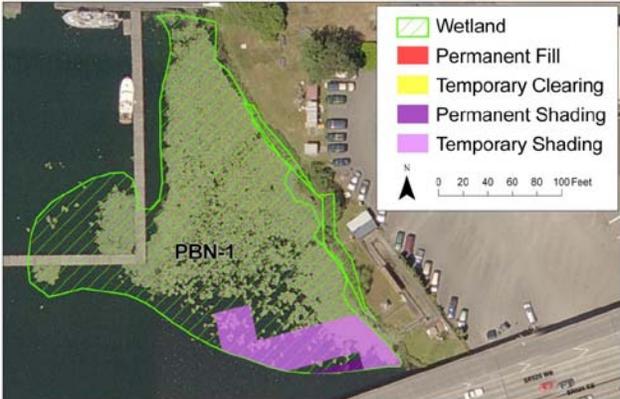
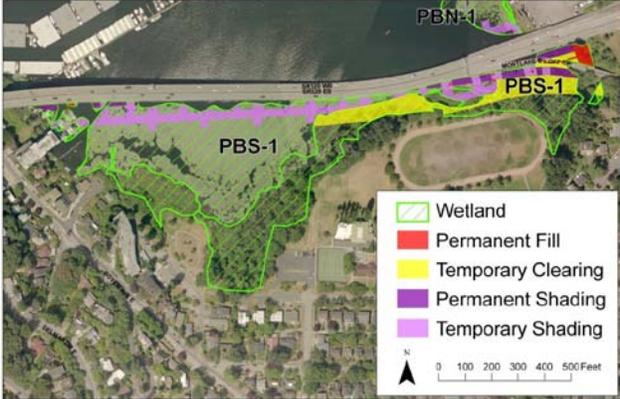
WETLAND PBN-1 – INFORMATION SUMMARY					
Location:	Wetland PBN-1 is located north of SR 520 on the east side of Portage Bay.				
	Local Jurisdiction	Seattle			
	WRIA	8			
	Ecology Rating (Hruby 2004)	IV			
	Seattle Rating	IV			
	Seattle Standard Buffer Width	50 feet			
	Wetland Size	0.92 acre			
	Cowardin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

Table A2. Wetland PBS-1 Summary

WETLAND PBS-1 – INFORMATION SUMMARY					
Location:	Wetland PBS-1 is located south of SR 520 along the south shore of Portage Bay.				
	Local Jurisdiction	Seattle			
	WRIA	8			
	Ecology Rating (Hruby 2004)	III			
	Seattle Rating	III			
	Seattle Standard Buffer Width	85 feet			
	Wetland Size	12.74 acres			
	Cowardin Classification	L2AB, PFO, PEM			
	HGM Classification	Lake Fringe/Slope			
	Wetland Rating System				
	Water Quality Score	18			
Hydrology Score	8				
Habitat Score	22				
Total Score	48				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	0.13	Temporary Fill	-	
	Permanent Shading	0.53	Temporary Clearing	1.25	
Buffer Impact	Permanent Fill	0.31	Temporary Shading	1.23	
	Permanent Shading	0.04	Temporary Fill	-	
			Temporary Clearing	0.65	
			Temporary Shading	-	
Dominant Vegetation Impact	Reed canarygrass (<i>Phalaris arundinacea</i>), English ivy (<i>Hedera helix</i>), black cottonwood (<i>Populus balsamifera</i>), and Pacific willow (<i>Salix lucida</i>). 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.
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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	16			
Hydrology Score	7				
Habitat Score	13				
Total Score	36				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	0	Temporary Fill	-	
	Permanent Shading	0	Temporary Clearing	0.02	
Buffer Impact	Permanent Fill	0.04	Temporary Fill	-	
	Permanent Shading	-	Temporary Clearing	0.08	
			Temporary Shading	-	
Dominant Vegetation Impact	Creeping buttercup (<i>Ranunculus repens</i>), Himalayan blackberry (<i>Rubus armeniacus</i>), bentgrass (<i>Agrostis</i> sp.), and Japanese knotweed (<i>Polygonum cuspidatum</i>). 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 (<i>Alnus rubra</i>) 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	18			
Hydrology Score	8				
Habitat Score	25				
Total Score	51				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	0.01	Temporary Fill	-	
	Permanent Shading	0.75	Temporary Clearing	0.32	
Buffer Impact	Permanent Shading	0.43	Temporary Shading	1.01	
	Permanent Fill	<0.01	Temporary Fill	-	
	Temporary Clearing		Temporary Clearing	0.21	
Dominant Vegetation Impact	Rose spiraea (<i>Spiraea douglasii</i>), red-osier dogwood (<i>Cornus sericea</i>), American white waterlily (<i>Nymphaea odorata</i>), 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 (<i>Fraxinus latifolia</i>), 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.
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Table A5. Wetland LWN-2 Summary

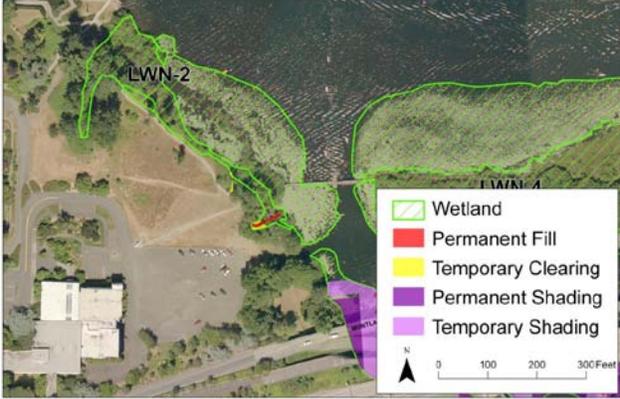
WETLAND LWN-2 – INFORMATION SUMMARY					
Location:	Wetland LWN-2 is located north of SR 520, in the vicinity of McCurdy Park, and the northwest corner of the Washington Park Arboretum.				
	Local Jurisdiction	Seattle			
	WRIA	8			
	Ecology Rating (Hruby 2004)	III			
	Seattle Rating	III			
	Seattle Standard 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	18			
Hydrology Score	8				
Habitat Score	18				
Total Score	44				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	0.02	Temporary Fill	-	
	Permanent Shading	0.81	Temporary Clearing	0.01	
Buffer Impact	Permanent Fill	0.29	Temporary Shading	0.10	
	Permanent Shading	0.02	Temporary Fill	-	
			Temporary Clearing	0.09	
			Temporary Shading	-	
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-term 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	18			
Hydrology Score	8				
Habitat Score	23				
Total Score	49				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	0.01	Temporary Fill	-	
	Permanent Shading	1.05	Temporary Clearing	0.38	
Buffer Impact	Permanent Fill	<0.01	Temporary Shading	0.31	
	Permanent Shading	0.23	Temporary Fill	-	
			Temporary Clearing	0.16	
			Temporary Shading	-	
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	18			
Hydrology Score	12				
Habitat Score	19				
Total Score	49				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	-	Temporary Fill	-	
	Permanent Shading	-	Temporary Clearing	-	
Buffer Impact	Permanent Fill	-	Temporary Shading	0.01	
	Permanent Shading	-	Temporary Fill	-	
			Temporary Clearing	-	
Dominant Vegetation Impact	Willows (<i>Salix</i> 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	18			
Hydrology Score	4				
Habitat Score	26				
Total Score	48				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	-	Temporary Fill	-	
	Permanent Shading	-	Temporary Clearing	-	
			Temporary Shading	-	
Buffer Impact	Permanent Fill	-	Temporary Fill	-	
	Permanent Shading	-	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 interspersed 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	6			
	Hydrology Score	4			
	Habitat Score	14			
Total Score	24				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	-	Temporary Fill	-	
	Permanent Shading	-	Temporary Clearing	-	
			Temporary Shading	-	
Buffer Impact	Permanent Fill	-	Temporary Fill	-	
	Permanent Shading	-	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 interspersions, 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			20	
Hydrology Score			12		
Habitat Score			24		
Total Score			56		
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	0.001	Temporary Fill	-	
	Permanent Shading	0.04	Temporary Clearing	0.06	
Buffer Impact	Permanent Fill	<0.01	Temporary Fill	0.14	
	Permanent Shading	0.03	Temporary Clearing	0.01	
			Temporary Shading	-	
Dominant Vegetation Impact	American white waterlily, Himalayan blackberry, salmonberry (<i>Rubus spectabilis</i>), 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 area 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.
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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	18			
Hydrology Score	12				
Habitat Score	24				
Total Score	54				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	0.005	Temporary Fill	-	
	Permanent Shading	0.53	Temporary Clearing	0.16	
Buffer Impact	Permanent Fill	<0.01	Temporary Shading	0.73	
	Permanent Shading	<0.01-	Temporary Fill	-	
			Temporary Clearing	0.18	
			Temporary Shading	-	
Dominant Vegetation Impact	Birch (<i>Betula sp.</i>), salmonberry, slough sedge (<i>Carex obnupta</i>), 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 interspersions, 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 (<i>Rubus ursinus</i>), English ivy, and Indian plum (<i>Oemleria cerasiformis</i>). 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	8			
Hydrology Score	7				
Habitat Score	13				
Total Score	28				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	-	Temporary Fill	-	
	Permanent Shading	-	Temporary Clearing	-	
Buffer Impact	Permanent Fill	-	Temporary Shading	-	
	Permanent Shading	-	Temporary Fill	-	
			Temporary Clearing	-	
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	18			
	Hydrology Score	12			
	Habitat Score	25			
Total Score	55				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	0.09	Temporary Fill	-	
	Permanent Shading	1.15	Temporary Clearing	0.60	
Buffer Impact	Permanent Shading	0.53	Temporary Shading	0.53	
	Permanent Fill	1.21	Temporary Fill	-	
	Permanent Shading	0.02	Temporary Clearing	0.40	
			Temporary Shading	0.03	
Dominant Vegetation Impact	Pacific willow, creeping buttercup, sweet gum (<i>Liquidambar</i> 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.
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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	4			
Hydrology Score	2				
Habitat Score	13				
Total Score	19				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	0.02	Temporary Fill	-	
	Permanent Shading	-	Temporary Clearing	0.02	
Buffer Impact	Permanent Fill	0.01	Temporary Shading	-	
	Permanent Shading	-	Temporary Clearing	0.10	
			Temporary Shading	-	
Dominant Vegetation Impact	Willow, bluegrass (<i>Poa</i> 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	20			
Hydrology Score	12				
Habitat Score	26				
Total Score	58				
Wetland and Buffer Impact Summary					
Wetland Impact	Permanent Fill	-	Temporary Fill	-	
	Permanent Shading	-	Temporary Clearing	-	
Buffer Impact	Permanent Fill	-	Temporary Clearing	0.03	
	Permanent Shading	-	Temporary Shading	-	
			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

