Attachment 9

Conceptual Aquatic Mitigation Plan

Washington State Department of Transportation

SR 520 Bridge Replacement and HOV Program

I-5 to Medina: Bridge Replacement and HOV Project

Conceptual Aquatic Mitigation Plan

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

Prepared for

Washington State Department of Transportation

and

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Washington State Department of Transportation

SR 520 Bridge Replacement and HOV Program

I-5 to Medina: Bridge Replacement and HOV Project

Conceptual Aquatic Mitigation Plan

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

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Executive Summary

The Washington State Department of Transportation (WSDOT) is proposing to construct the 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. 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 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 aquatic resources evaluated in the *Conceptual Aquatic Mitigation Plan* analysis occur within and adjacent to 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 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 aquatic mitigation plan assumes that WSDOT will select the preferred alternative; thus, it presents the design and impacts associated with the preferred alternative. Formal selection of the construction site will be described in the Final EIS and Record of Decision (ROD) expected in 2011. During construction, the project will affect the Lake Washington Ship Canal and Lake Washington, aquatic resources that are regulated by federal, state, or local agencies.

This aquatic mitigation plan serves to:

- Identify the project's impacts on aquatic resources;

- Describe project actions and design features that will minimize or avoid impacts on aquatic resources; and

- Describe proposed compensatory mitigation to offset unavoidable impacts to aquatic resources.

The mitigation plan presented in this document is based on the most current information on project impacts and on characteristics of the mitigation site. WSDOT will continue to develop and modify the mitigation concept in response to additional technical studies and analyses as they are completed.

Aquatic Resources Impacts

A diverse group of native and non-native fish species inhabit the Lake Washington watershed, including several species of native salmon and trout such as Chinook (*Onchorhynchus tshawytscha*), coho (*O. kisutch*), and sockeye (*O. nerka*) salmon; and steelhead *(O. mykiss*), rainbow (*O. mykiss irideus*), and cutthroat trout (*O. clarki clarki*). Most of these species are likely to occur at least occasionally in the project area, which is located within a primary migration corridor for all anadromous salmonids spawned in the watershed. The project has the potential to affect several life history stages of anadromous fish, primarily rearing and migrating juveniles. Adults could also be affected as they pass through the project area during the return to their natal streams, and some sockeye salmon spawn on the beaches in the east approach area. In addition to discussing these species, this report presents information on fish species that are significant predators on salmonids in Lake Washington, including bass and pikeminnow.

Construction and operation of the preferred alternative will result in long-term operational impacts and short-term construction impacts to the species and life history stages of the salmonids mentioned above. Project construction may result in long-term impacts to shoreline and open-water habitats in the project area. The largest impacts are associated with construction of a wider floating bridge, bridge approaches, and interchanges. The impacts include (1) loss of benthic habitat due to placement of larger (although fewer) bridge columns, (2) increased over-water bridge structure that could result in an increase in the amount or intensity of in-water shade, and (3) changes in habitat complexity due to new arrangements of in-water piers and columns. Short-term construction impacts to the aquatic environment include pile driving, the construction of cofferdams, construction lighting, and anchor placement and other in-water work.

The mitigation team developed a conceptual model to characterize the interaction between anadromous salmonids and the aquatic habitat in the project area. The model is based on existing literature on salmonid habitat functions and features in Lake Washington. It uses the primary life history stages of anadromous salmonids as surrogates for related population-level metrics (i.e., survival, growth, fitness, and reproductive success) to represent all

anadromous salmonids in the Lake Washington system, although the importance of specific habitat features varies by species.

The mitigation team reviewed the proposed project actions to determine the scope and scale of the impacts on relevant aquatic functions in the project area. Potential changes in aquatic functions were analyzed based on their effects on salmonid life history stages and populations. Based on this review, WSDOT determined which impact metrics best represented important aquatic impacts. The three primary metrics are as follows:

1. Area of over-water shading, which is tied to changes in juvenile salmonid outmigration.
2. Benthic fill, representing the physical displacement of aquatic habitat.
3. Habitat complexity, representing alterations in predation on juvenile salmonids.

A mitigation framework was created to assess impacts and resulting mitigation needs, based on salmonid life histories and habitat utilization. The framework was used to establish a methodology to assess both impacts and mitigation uplift. Impacts were assigned based on the two-dimensional area of affected habitat, modified by a geographic (spatial) factor called the Fish Function Modifier (this modifier accounts for differences in fish utilization). The resulting impacts are calculated in acres. The methodology also calculates temporary impacts by integrating the temporal aspect of the impact structures, and therefore results in impacts based on the integration of both impact area and duration (service-acre years).

Under the mitigation approach used by WSDOT, compensation is required for unavoidable adverse impacts that exist after avoidance and minimization measures have been employed. With the exception of the three impact metrics listed above, other types of construction impacts, including in-water noise, temporary lighting, in-water turbidity/contaminants, and barge operation and moorage, have been avoided and/or minimized to the extent that compensatory mitigation will not be required. Similarly, potential operational effects such as stormwater discharge and permanent bridge lighting have also been sufficiently minimized through project design; therefore, any residual effects will be insignificant and will not require compensatory mitigation. This document describes the specific avoidance and minimization measures employed for potential construction and operational impacts.

Based on the types and locations of potential impacts, the project has the greatest potential to affect juvenile salmonids in the rearing/feeding and migration life history stages; impacts during these life history stages could result in decreases in juvenile growth, survival, and fitness. The impact assessment characterized effects on aquatic resources based on area (acreage) of bridge structures and related changes to salmonid life history stages. The raw area calculations were adjusted based on the use of specific impact zones by salmonids, including the amount and type of fish utilization. This application of the Fish Function Modifier factor adjusted the impacts according to their ecological relevance (in several cases

the modified impact acreage is less than the un-modified impact area). The specific metrics for habitat impacts were calculated and the modified totals are 7.30 acres of permanent impacts and 24.92 acre-years of temporary impacts (one acre-year is defined as one acre of impact over one year). The modified totals are broken down as follows:

- Permanent shading impacts of 6.94 acres and temporary shading impacts of 21.38 acre-years.
- Permanent benthic fill impacts of 0.37 acre.
- Temporary habitat complexity impacts of 3.54 acre-years (no permanent habitat complexity impacts result from the project).

Aquatic Resources Mitigation

To offset project impacts that could not be adequately avoided or minimized, WSDOT focused on mitigation projects that would benefit the same salmonid species and life history phases to which impacts could occur. Because on-site, in-kind opportunities were not feasible, WSDOT sought off-site mitigation opportunities that addressed the same functions and values that could be affected by the project.

The same conceptual model and impact assessment methodology used for calculation of impacts were also applied to the various mitigation sites to translate the type and amount of functional uplift at a given site to habitat acres. The acres were adjusted using the Fish Function Modifier, using the same criteria used for the impact sites. WSDOT also recognizes that some types of mitigation, such as riparian or floodplain enhancement, offer less direct improvement of aquatic habitat than do other types of mitigation that occur directly in the aquatic environment, such as beach creation or in-water structure removal. Therefore, WSDOT has reduced the mitigation credit for these activities to accurately calculate uplift to fish survival, growth, and fitness.

Using the methods listed above, it was determined that a suite of seven mitigation sites, located in various key locations in the Lake Washington basin, will offset the temporary and permanent impacts of the project (Table ES-1). These seven sites were chosen primarily for the salmonid life history stages that will be enhanced (juvenile rearing and outmigration), although most of the sites will also have direct benefits to spawning salmonids. The entire mitigation package will equal about 8.59 acres of permanent mitigation credit and 35.15 acre-years of temporary mitigation credit, which will provide mitigation for project impacts sufficient to meet federal, state, and local regulatory requirements.

Table ES-1. Mitigation Sites, Activities, and Credits

Mitigation Site	Mitigation Actions	Species/ Life Stage Addressed	Permanent Mitigation Credit (acres)	Temporary Mitigation Credit (acre-years)
Seward Park	Shoreline Enhancement + Hard Structure Removal, Riparian Restoration	Chinook (Juvenile Rearing/Feeding, Juvenile Migration), Sockeye (Spawning, Juvenile Rearing/ Feeding)	0	15.53
Magnuson Park	Shoreline Enhancement + Hard Structure Removal, Riparian Restoration	Chinook (Juvenile Rearing/Feeding, Juvenile Migration) Sockeye (Spawning, Juvenile Rearing/Feeding)	0	12.60
Taylor Creek	Channel and Delta Restoration, Riparian + Floodplain Restoration, Shoreline and Marsh Creation	Chinook (Rearing/Feeding) Sockeye (Spawning, Rearing/Feeding) Coho (Spawning, Rearing/Feeding)	0	7.02
South Lake Washington Shoreline Restoration (DNR) site	Shoreline Enhancement + Hard Structure Removal, Riparian Restoration, Dolphin Removal	Chinook (Juvenile Rearing/Feeding, Juvenile Migration) Sockeye (Juvenile Rearing/Feeding)	1.68	0
Bear Creek	Stream Enhancement, Riparian Restoration	Chinook (Spawning, Rearing/Feeding) Sockeye (Spawning, Rearing/Feeding) Coho (Rearing/Feeding)	4.55	0
Cedar River/ Elliot Bridge	River Margin and Aquatic Off-channel Creation, Riparian + Floodplain Restoration	Chinook (Spawning, Rearing/Feeding) Sockeye (Spawning, Rearing/Feeding) Coho (Spawning, Rearing/Feeding) Steelhead (Spawning, Rearing/Feeding)	1.76	0
East Approach	Spawning Gravel Supplementation	Sockeye (Spawning)	0.60	0
			8.59	**35.15**

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Appendix D. Mitigation Accounting

Acronyms and Abbreviations

AKART	all known, available, and reasonable technology
BMPs	best management practices
C	Celsius
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter
CWA	Clean Water Act
dB	decibel
DDD	metabolite of DDT
DDE	breakdown product of DDT
DDT	dichlorodiphenyltrichloroethane
DNR	Washington State Department of Natural Resources
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
ELJs	engineered logjams
ESA	Endangered Species Act
F	Fahrenheit
FHWA	Federal Highway Administration
FHWG	Fisheries Hydroacoustic Working Group
HOV	high-occupancy vehicle
HPA	Hydraulic Project Approval
HRM	*Highway Runoff Manual*
LWD	large woody debris
m	meter
mg/L	milligrams per liter
mm	millimeter
NAVD	North American Vertical Datum

NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRTWG	Natural Resources Technical Working Group
OHW	ordinary high water
OHWM	ordinary high water mark
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PGIS	pollutant-generating impervious surface
PSPL	Puget Sound Power and Light
ppm	parts per million
ROD	Record of Decision
SEL	sound exposure level
SPCC	Spill Prevention Control and Countermeasures (Plan)
SPL	sound pressure level
SPU	Seattle Public Utilities
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
TCDD	dioxin
TESC	Temporary Erosion and Sediment Control (Plan)
TSS	total suspended solids
TWG	Technical Work Group
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington State Department of Fish and Wildlife
WQPMP	Water Quality Protection and Monitoring Plan

WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation
WWTIT	Western Washington Treaty Indian Tribes

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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 1-1). Construction of the project will have permanent and temporary impacts to fish habitat and aquatic resources.

This report identifies the project's permanent and temporary impacts to aquatic habitat and species, and describes the mitigation strategy for the project. Permanent and temporary impacts discussed in this report will result from over-water structure, benthic fill, and changes in in-water habitat complexity associated with the construction and operation of a widened roadway and accessory facilities. 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 Wetland Mitigation Report* (WSDOT 2011a, in preparation), discusses wetland impacts resulting from this project and mitigation for these impacts. For the purposes of this 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 used in part to obtain the following permits:

- U.S. Army Corps of Engineers (USACE) – Clean Water Act (CWA) Section 404, Individual Permit and Section 10 Rivers and Harbors Act of 1899.
- 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 – Shoreline Substantial Development Permit and Critical Areas Review.
- City of Medina– Shoreline Substantial Development Permit and Critical Areas Review.

Overall site conditions are discussed in the project Biological Assessment (WSDOT 2010a) and the Ecosystems Discipline Report, SR 520, I-5 to Medina: Bridge Replacement and HOV Project (appendix to WSDOT 2010b).

WSDOT is coordinating technical and planning efforts for the SR 520, I-5 to Medina Project through two teams: the Mitigation Core Team and the Mitigation Technical Work Group (which includes the Aquatic Resources Technical Work Group).

The Mitigation Core Team serves as a steering group for mitigation planning activities and is led by Shane Cherry. The Mitigation Core Team is multi-disciplinary, composed of engineers, planners, and biologists from WSDOT HQ Environmental Services, the SR 520 Program, and private consulting companies. The Mitigation Core Team includes (or has included) the following individuals: Bill Leonard (WSDOT, initiation through December 2007), Paul Fendt (Parametrix, initiation through March 2008), Ken Sargent (Headwaters Environmental Consulting), Michelle Meade (WSDOT), Phil Bloch (WSDOT), Shane Cherry (Confluence Environmental), Jeff Meyer (Parametrix), Gretchen Lux (WSDOT, replaced Bill Leonard in December 2007), and Beth Peterson (HDR Engineering, Inc).

The Aquatic Resources Technical Work Group is led by Phil Bloch, and provides technical detail and policy guidance to team members conducting analyses and preparing aquatic resource mitigation planning products. This group consists of Michelle Meade (WSDOT), Shane Cherry (Confluence Environmental), Chris Cziesla (Confluence Environmental), Beth Peterson (HDR Engineering, Inc.), Pete Lawson (Parametrix), and Chad Wiseman (HDR Engineering, Inc., from January 2010).

WSDOT engaged regulatory agencies, the University of Washington, and the Muckleshoot Indian Tribe in a collaborative Natural Resources Technical Working Group (NRTWG) process to assist in identification and refinement of effect mechanisms on aquatic resources and in the development of appropriate mitigation measures. To observe existing conditions, WSDOT also conducted field trips with NRTWG members to the Evergreen Point Bridge across Union Bay and the I-90 bridge across Mercer Slough.

An Initial Aquatic Mitigation Plan (WSDOT 2009c) was prepared in 2009, incorporating field investigations, scientific research, and the collective knowledge from the NRTWG and WSDOT project mitigation teams. The initial plan was submitted to the NRTWG for review and comment. In addition, the general methodologies for calculating project impacts and mitigation benefits were discussed, including potential project impacts, appropriate metrics to measure these impacts, and the general types of mitigation to offset these impacts. The NRTWG meetings in which impacts and compensatory mitigation were discussed were held from June to October 2010. The goal of the meetings was to clearly identify a set of impacts to aquatic resources associated with the project, and to then identify a list of potential mitigation sites that had the greatest potential to directly mitigate for the types and amounts

of project effects. In some cases, the specific metrics and methods presented in the NRTWG meetings has changed slightly, based on refinements to project design or additional scientific information. All the changes are based on the best available science, which is discussed in the appropriate sections of this document. Likewise, each of the mitigation sites initially proposed in the NRTWG meetings underwent detailed additional analysis prior to inclusion in the conceptual aquatic mitigation plan, resulting in slightly altered and refined mitigation concepts.

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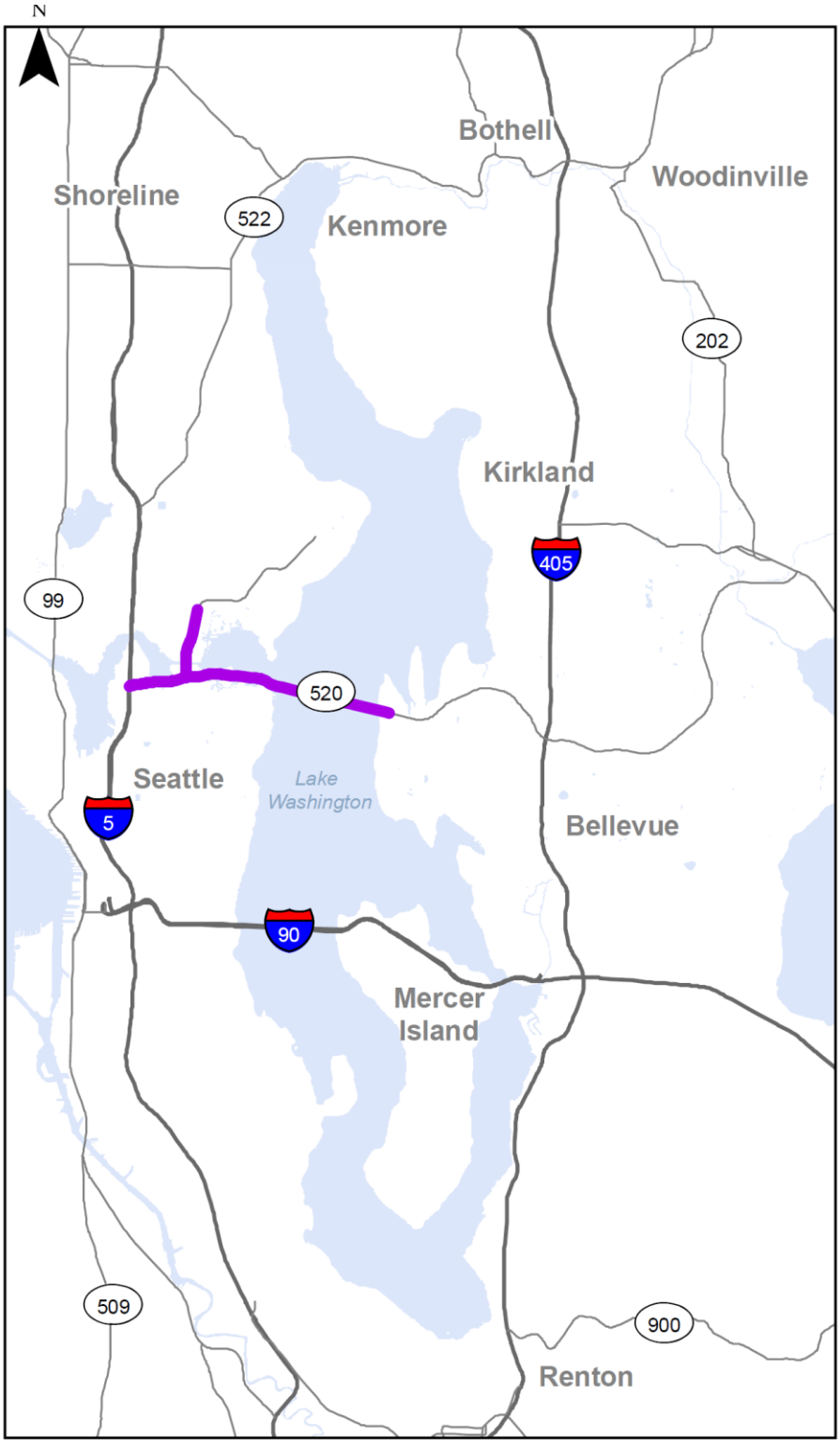

Figure 1-1.
Project Vicinity Map

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2. Project Description

The SR 520, I-5 to Medina Project will widen the SR 520 corridor to six lanes (Figure 2-1) from I-5 in Seattle to Evergreen Point Road in Medina, and restripe and reconfigure the traffic lanes between Evergreen Point Road and 92nd Avenue NE in Yarrow Point. The proposed SR 520 bridge will be six lanes (two 11-foot-wide outer general-purpose lanes in each direction and one 12-foot-wide inside HOV lane in each direction), and include a 14-foot-wide bicycle/pedestrian path), 4-foot-wide inside shoulders, and 10-foot-wide outside shoulders. The width of the combined roadway cross-section (115 feet) will be greater than the existing width of 60 feet, although in places the eastbound and westbound lanes will consist of separate structures with a gap between them. The additional roadway width is needed to accommodate the new HOV lanes and the wider, safer travel lanes and shoulders.

Major elements of the project are discussed below in Section 2.1, while construction activities are summarized in Section 2.2. Operational elements of the project that have some potential to affect aquatic species or habitats (stormwater, lighting, etc.) are discussed in Section 2.3. For detailed design and construction elements, see the project Biological Assessment (WSDOT 2010a) and Supplemental Draft Environmental Impact Statement (EIS) (WSDOT 2010b) for the SR 520, I-5 to Medina Project.

2.1 Proposed Project Elements

To simplify the description of the proposed project, the sections below discuss project features in seven subareas within the project limits. Figure 2-1 shows the project limits and identifies the six subareas, as well as three discrete geographic areas (Seattle, Lake Washington, and the Eastside) that were incorporated into the Endangered Species Act (ESA) consultation and National Environmental Policy Act (NEPA) analysis.

2.1.1. I-5 Interchange Area

The SR 520 and I-5 interchange ramps will be reconstructed in generally the same configuration as those for the existing interchange. The only exceptions are that a new reversible HOV ramp will connect to the existing I-5 reversible express lanes south of SR 520, and the alignment of the ramp from northbound I-5 to eastbound SR 520 will shift to the south.

The East Roanoke Street bridge over I-5 will provide an enhanced pedestrian crossing. The 10th Avenue East and Delmar Drive East overcrossing will be rebuilt as part of the proposed lid structure, generally within the same alignment and with a similar vertical profile as the existing overcrossing.

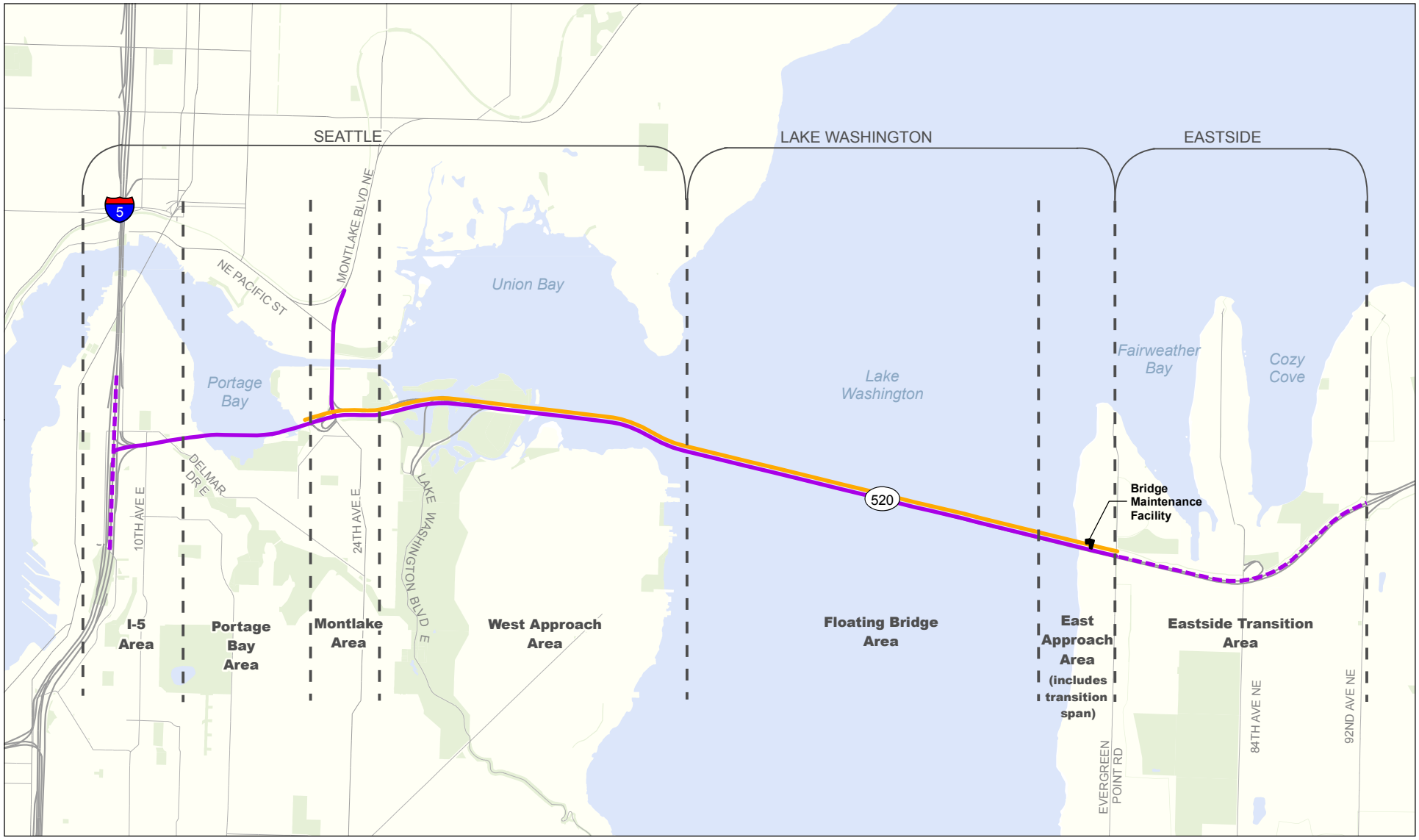
Construction activities and durations in the I-5 area will occur over a 2- to 3-year period. Activities in this area will include roadway reconstruction, excavation and embankment grading, retaining wall and abutment construction, and paving. Up to two staging areas will be located within the existing right-of-way. Construction will result in the temporary clearing of approximately 2.9 acres of vegetation. Three facilities—a bioswale and two media treatment vaults—will be constructed to treat stormwater from the I-5 interchange area. No aquatic areas will be affected by the construction and demolition activities.

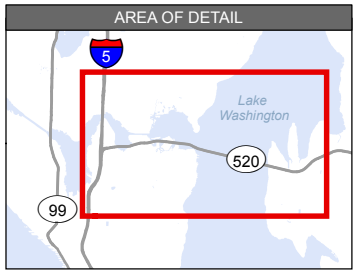
2.1.2. Portage Bay Area

WSDOT will replace the Portage Bay Bridge with a new bridge that will include two general-purpose lanes in each direction, an HOV lane in each direction (six lanes total), and a westbound shoulder. Connections between the new bridge and the exit lanes and ramps to Roanoke Street and northbound I-5 will be configured much as they are currently. Two facilities–one basic treatment bioswale and one constructed wetland for enhanced treatment—will be constructed to treat stormwater from this area.

The height of the western half of the new bridge will match that of the existing bridge, but the eastern half will be higher (Figure 2-2). The new bridge will be about 14 feet higher than the existing bridge's lowest point near the middle of Portage Bay, and will remain at a greater height above the water than the existing bridge throughout the eastern portion. The new bridge will be supported by larger, but fewer, concrete columns than the existing bridge. It will begin just east of Delmar Drive, extend across Portage Bay, and end west of Montlake Boulevard. The new Portage Bay Bridge will be a fixed-span bridge. The adjacent interchange ramps to I-5 and Montlake Boulevard will add width near the west and east ends of the bridge as they taper on and off the freeway.

The Portage Bay Bridge substructure will have three main parts: drilled shafts, shaft caps, and concrete support columns. Collectively, the substructure elements constitute a pier bent. The Portage Bay Bridge superstructure will consist of two main parts: cast-in-place box girders that span between the bridge piers, and the roadway slab (bridge deck). The superstructure will also include false arches for aesthetic treatments under the westerly three over-water spans. The bridge configuration will range between 105 and 143 feet wide, compared to the 61- to 75-foot-wide existing bridge. The maximum over-water height of the western half of the new bridge will increase from 55 feet to approximately 62 feet, and the height of the eastern half will increase from 5 to 16 feet.





Project Extent

Denotes Limited Improvement

Regional Bicycle/Pedestrian Path

Park

N

0 1,000 2,000 4,000 Feet

Source: King County (2005) GIS Data (Stream and Street), King County (2007) GIS Data (Waterbody), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Figure 2-1. **Geographic Areas within the Project Limits**

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

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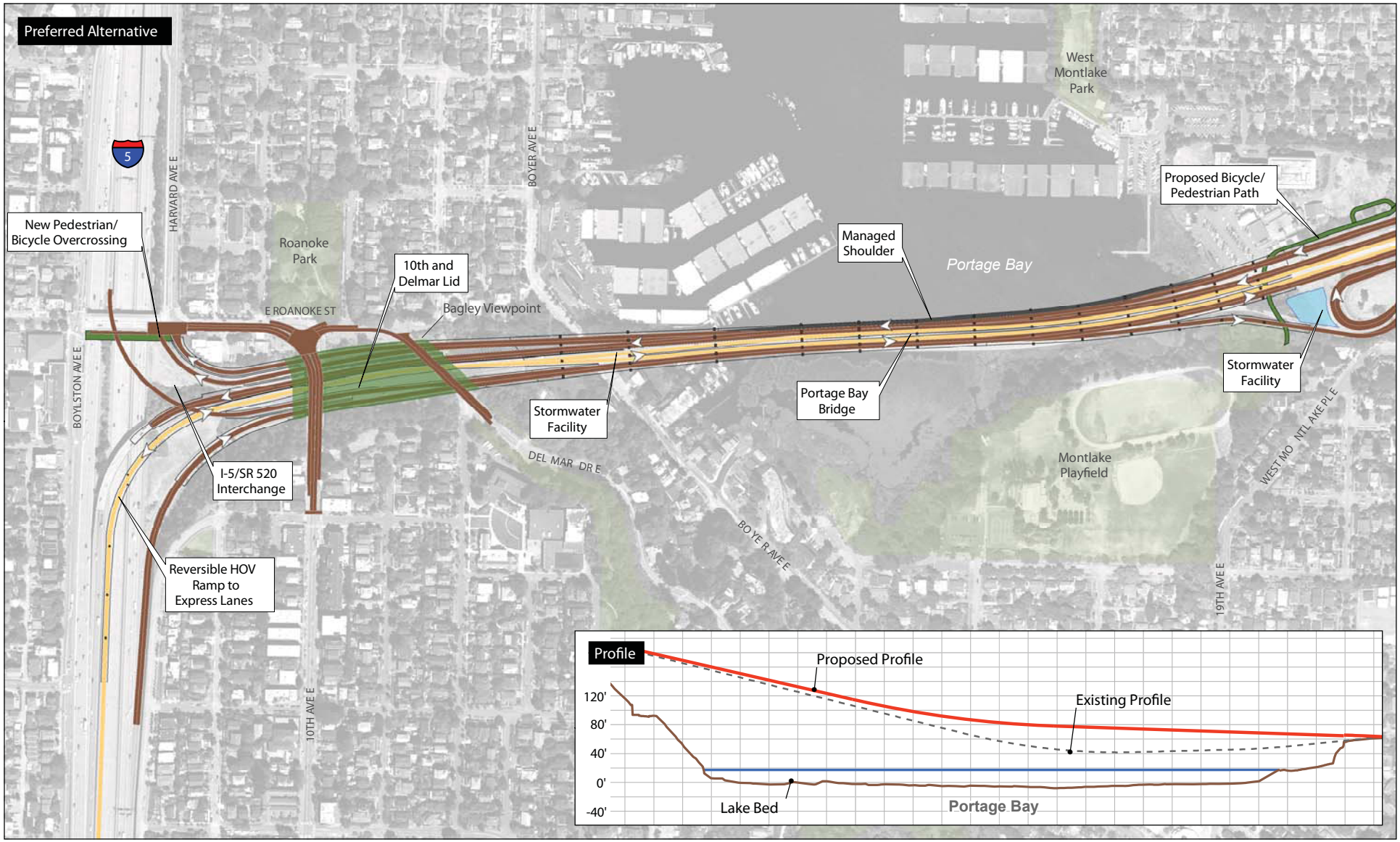

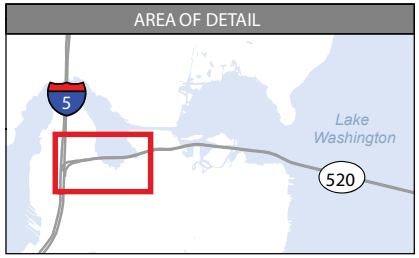

- Column
- General-Purpose Lane
- HOV, Direct Access, and/or Transit-Only Lane
- Westbound Managed Shoulder
- Proposed Bicycle/Pedestrian Path
- Lid
- Park

N

0 200 400 800 Feet

Source: King County (2006) Aerial Photo, CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Figure 2-2. **Project Layout – I-5 to Portage Bay**

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

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The construction elements include the following:

- 75,000 cubic yards of excavation
- 82 drilled shaft foundations
- 17 upland shafts supporting individual columns
- 65 in-water shafts: 30 supporting mudline footings and 35 extending through the lake bed and supporting individual columns
- 3 mudline footings at lake bed (capping 10 drilled shafts each)
- 67 permanent concrete columns (50 in-water)
- 900 work bridge support piles
- 400 falsework piles
- 5- to 6-year construction duration, excluding mobilization and project closeout

Starting with the bottom foundation elements, the new bridge substructure will consist of a total of 82 drilled shafts with diameters of 8 to 10 feet; 65 of these shafts will be constructed in the water. Thirty-five of the proposed in-water shafts will intersect with the substrate, resulting in approximately 3,000 square feet of substrate displacement. Each mudline footing will consist of a rectangular concrete block embedded into the lake bed, and will typically be supported by 10 drilled shafts each (i.e., the remaining 30 shafts will terminate at mudline footings). The mudline footings will be constructed at the three westerly in-water pier bents (i.e., those with the longest span lengths) to tie the multiple shafts together and distribute the load from the columns. Two footings will be 116-by-35 feet, and one footing will measure 125-by-35 feet. These three footings will occupy approximately 12,500 square feet (0.3 acre) of bottom substrate.

The Portage Bay Bridge will be supported by 50 in-water columns (ranging in size from 7-by-7 feet to 7-by-10 feet). The support columns will be constructed either on top of the mudline footing or directly on top of the drilled shaft, and each pier bent will consist of five columns. Each of the three mudline footings will support five 7-by-10-foot bridge support columns extending from the top of the footing to the bottom of the bridge superstructure. The remaining 35 columns (7 feet in diameter) will be supported by individual drilled shafts. These columns will replace the 76 in-water columns (4.5 feet in diameter) currently supporting the Portage Bay Bridge. The columns will occupy approximately 4,000 feet of the lake's surface.

Substructure construction will occur from temporary work bridges. The work bridges will ultimately be designed by the contractor and will be built along the outer edge of both the north and south sides of the proposed structure. Finger piers will typically span beneath the existing and proposed bridge structures at regular intervals, connecting the north and south work bridges. The work bridges will not exceed 4.1 acres (1.9 acres over open water) and will consist of 900 steel piles with diameters of 24 to 30 inches.

The completed permanent substructure will then consist of 11 in-water pier bents, with span distances (length between pier bents) ranging between 300 and 116 feet, moving from west to east. In-place casting of box girder bridge sections is proposed, which requires the use of falsework to support the concrete forms. Two falsework structures will be built, each supported by no more than 200 piles. Cast-in-place box girders generally allow for longer span lengths. The completed superstructure will have an over-water width of 124 feet at the west end, narrowing to 105 feet in the middle, and then widening to 143 feet in the east end. The bottom of the bridge deck will range from 62 to 16 feet above the water (moving west to east). Total over-water cover resulting from the Portage Bay Bridge will be approximately 4.5 acres.

Construction activities and durations in this area will occur over a 5- to 6-year period and will include construction of work bridges, falsework, and structures, as well as bridge demolition. The new Portage Bay Bridge will be built in halves (north and south) so that traffic flow will not be interrupted.

To accommodate four lanes of traffic for the duration of the project, construction must be sequentially staged by temporarily widening the existing Portage Bay Bridge to the south. Approximately 42 temporary 8-foot-diameter drilled shafts/columns, occupying about 4,000 square feet, and 2.5 acres of additional superstructure will be constructed on the south side of the existing bridge. Traffic will be diverted to this expanded southern half of the bridge to allow the northern half of the existing bridge to be demolished and the northern half of the new bridge to be constructed. Following construction, traffic will be shifted to the newly constructed northern half of the proposed bridge to allow demolition of the existing and temporary south bridge lanes and construction of the new southern columns and superstructure to complete the proposed Portage Bay Bridge.

A detailed account of the construction and demolition activities and the duration and sequence of these activities by construction season is provided in the Biological Assessment (WSDOT 2010a). Construction seasons are structured around the published in-water construction period of October 1 to April 15.[1]

[1] Some in-water construction elements (see Table 5-2) may occur outside of the published work window, as presented to the In-Water Technical Work Group (TWG) participants.

2.1.3. Montlake Area

The Montlake interchange will be widened to the north to accommodate a shift in the mainline alignment, HOV lanes and ramps, and the widened mainline ramps. The Montlake Boulevard and 24th Avenue East overcrossing structures will be demolished and replaced with a lid structure, and a new two-leaf bascule bridge (drawbridge) will be constructed over the Montlake Cut.

Montlake Interchange

The SR 520 interchange with Montlake Boulevard will be similar to the existing interchange, connecting to the University District via Montlake Boulevard and the existing and new bascule bridges (Figure 2-3). A large new lid will be provided over SR 520 in the Montlake area, configured for transit and bicycle/pedestrian connectivity. The alignment of Montlake Boulevard over SR 520 will be similar to that of the existing alignment; however, the new bridge over SR 520 will be longer and wider than the existing bridge and provide wider through lanes, shoulders, a center median, and additional turning lanes on Montlake Boulevard over SR 520. This bridge will be integrated as part of the new Montlake lid over SR 520.

Construction activities in this area will occur over about a 4-year period and will include roadway reconstruction, excavation, retaining wall and abutment construction, and paving. However, most of these construction activities will occur in upland areas, and with proper implementation of best management practices (BMPs), are not expected to affect aquatic habitat areas.

Bascule Bridge

Construction activities in the Montlake area also include constructing a new bascule bridge over the Montlake Cut, east of the existing bascule bridge. This new bridge will be approximately 60 feet wide, similar to the existing bridge. The two bridges will each operate with three lanes: the existing bridge will serve southbound traffic with three lanes, and the new bridge will serve northbound traffic with three lanes. In addition to the three travel lanes, each bridge will have a bicycle lane and sidewalks.

The bridge construction activities will be staged from the shoreline, and except for the temporary use of barges positioned in the Montlake Cut, no in-water construction activities are expected. Upland construction activities will occur outside and east of the existing Montlake Boulevard roadway and will consist of constructing upland pier supports to form the foundation for the bridge superstructure. Upland pier construction will be isolated from the water through the construction of cofferdams installed upland of the ordinary high water mark (OHWM).

After the upland pier supports are completed, the bascule-leaf structural steel members will be attached to the piers. A barge-mounted derrick will lift the bridge sections into position while they are attached to the support structures.

These on-water activities will likely require closing the Montlake Cut to boat traffic periodically over a 3- to 4-week period, typically for less than 48 hours at a time. The construction barges will be located in the Montlake Cut only during bridge assembly work. Based on these closure requirements, it is likely that this work will be scheduled during the winter months, when reduced boat traffic through the area is expected.

This schedule will also coincide with the typical in-water work windows to minimize potential effects on migrating juvenile salmonids. Construction of the bascule piers and the leaf spans is proposed to occur during the latter part of 2017 and extend into 2018.

2.1.4. Union Bay and West Approach Area

The existing Union Bay Bridge and the west approach will be replaced by two new west approach structures: an eastbound bridge and a westbound bridge with a gap between the structures. The new west approach structures will be continuous fixed-span bridges throughout their lengths. The west approach will begin in Montlake and extend through Union Bay, across Foster Island, and into Lake Washington, terminating at the west transition span and the beginning of the floating bridge (see Figure 2-3). The combined width of the west approach structures will be wider than the existing bridge. A constructed wetland for enhanced stormwater treatment will be built on the site occupied by the Museum of History and Industry. Barges and the staging sites described above for the Montlake interchange area will be used for construction staging. No construction staging will occur on Foster Island outside of the construction easement. Construction will include a temporary work bridge on Foster Island that will be removed after the permanent structure has been completed.

Like the Portage Bay Bridge, substructure elements will include drilled shafts and concrete support columns; however, no mudline footings are planned. The superstructure will consist of precast-concrete girders (which will not require falsework) and the roadway deck. The spans of the new bridges will be longer than those of the existing bridge (i.e., the pier bents will be farther apart). The increase in span length will result in fewer in-water columns and foundation shafts. Overall, the width of the new west approach will range between 252 feet near Montlake and 112 feet at the west transition span, with a gap width ranging between 7 and 40 feet. The width of the existing west approach varies between 57 and 104 feet. The height of the bridge over water will increase from a minimum of less than 3 feet to 11.6 feet near Montlake and from 45 to 48 feet near the west transition span. The proposed structure will have a constant grade, whereas the existing structure remains low from Montlake to east of Foster Island.

The construction elements include the following:

- 50,000 cubic yards of excavation
- 254 drilled shafts (233 in-water, with 46 extending above the lake bed, and 87 transition to columns at the mudline)
- 254 permanent concrete columns (233 in-water and 87 extending below the lake bed)
- 2,050 work bridge support piles
- 6-year construction duration, excluding mobilization and project closeout

The west approach substructure will consist of 42 pier bents: 39 in-water pier bents and an additional 3 pier bents on Foster Island. Most span lengths will be 150 feet, although spans #13 to #14 and #17 to #18 (on either side of Foster Island) will be 129 feet in length, and span #41 (the easternmost span before the transition span) will be 160 feet in length.

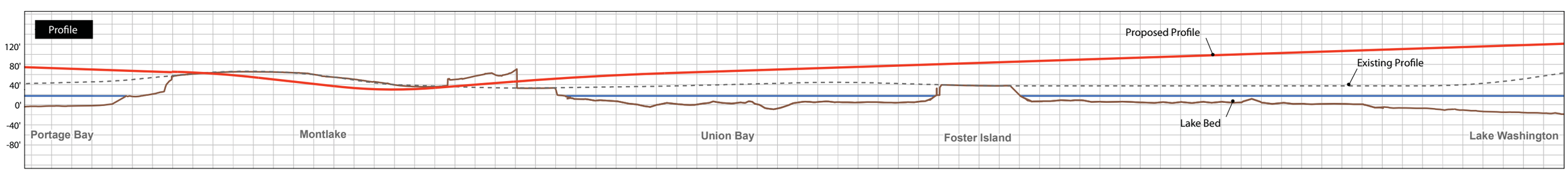
The west approach pier bents will consist of drilled shafts with columns attached directly to the shafts. No mudline footings or waterline shaft caps are proposed. Of the 254 10-foot-diameter shafts supporting the west approach, 233 will occur in the water. The Union Bay section (between Montlake and Foster Island) will consist of 104 in-water shafts, and the Lake Washington section (east of Foster Island) will consist of 129 in-water shafts. The bridge superstructure will be supported by either 6-by-6-foot (piers #2 to #22) or 7.5-by-7.5-foot (piers #23 to #42) square columns built on top of the drilled shafts. The westerly half of the shaft-to-column connections will occur below the mudline. For the easterly 21 pier bents (those in the deepest water), the drilled shafts will extend up through the water, and the connection to the columns will be above the surface water elevation. The shafts and columns combined will occupy approximately 13,000 square feet of substrate and water plane area.

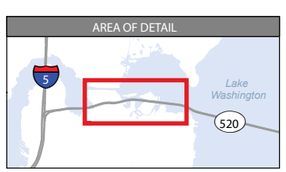
The west approach is expected to consist of precast girders with a cast-in-place deck. The westbound structure will be 66 to 145 feet wide, while the eastbound approach structure will be 47 to 108 feet wide (moving east to west). The majority of the westbound structure will have a 66-foot deck width (approximately the easterly half-mile); however, as the span approaches Foster Island (within 840 feet), the deck width will increase gradually to 145 feet as it extends through Union Bay and makes landfall at the Lake Washington shoreline at Montlake. Through Union Bay, the combined deck width will range from 200 to 233 feet. The bottom of the bridge deck will range from 11 to 25 feet above the water in Union Bay, and from 28 to 68 feet above the water between Foster Island and the west transition span.

The new west approach area bridges will require construction of work bridges on both the north and south sides of the existing west approach structures and along the existing Lake Washington Boulevard ramps. The construction work bridges will allow the new bridges to

be built in halves so that traffic flow will not be interrupted. These work bridges will be in place for 3 to 5 years. Work bridges constructed adjacent to the Lake Washington Boulevard on- and off-ramps will be in place for 2 years, to facilitate demolition of these existing ramps.

The northern portion of the new west approach will be constructed first, with traffic diverted to this structure while the existing west approach bridge is demolished and construction of the southern half of the new west approach begins. Construction activities in this area will occur over a 5- to 6-year period.





- Column
- Existing Regional Bicycle/Pedestrian Path
- Proposed Bicycle/Pedestrian Path
- General-Purpose Lane
- HOV, Direct Access, and/or Transit-Only Lane
- Westbound Managed Shoulder
- Stormwater Treatment Facility
- Lid
- Park

N

0 250 500 1,000 Feet

Source: King County (2006) Aerial Photo, King County (2008) GIS Data (Stream), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Figure 2-3. **Project Layout – Portage Bay to Lake Washington**

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

2.1.5. Evergreen Point Floating Bridge Area

The floating bridge will be replaced by an elevated roadway deck, likely supported by a combination of concrete columns and steel trusses on a foundation of hollow concrete pontoons connected in series across the deepest portion of Lake Washington. Figure 2-4 shows the alignment of the floating bridge and its connections to the west and east approaches.

The new floating span will be located approximately 190 feet north of the existing bridge (measured from centerline to centerline). The new floating bridge will consist of two 11-foot-wide general purpose lanes in each direction and one 12-foot-wide HOV lane in each direction, along with 4-foot-wide inside shoulders and 10-foot-wide outside shoulders. A 14-foot-wide bicycle and pedestrian path with several scenic vantage points and pullouts will be located on the north side of the bridge. The project will eliminate the drawspan opening on the Evergreen Point Bridge.

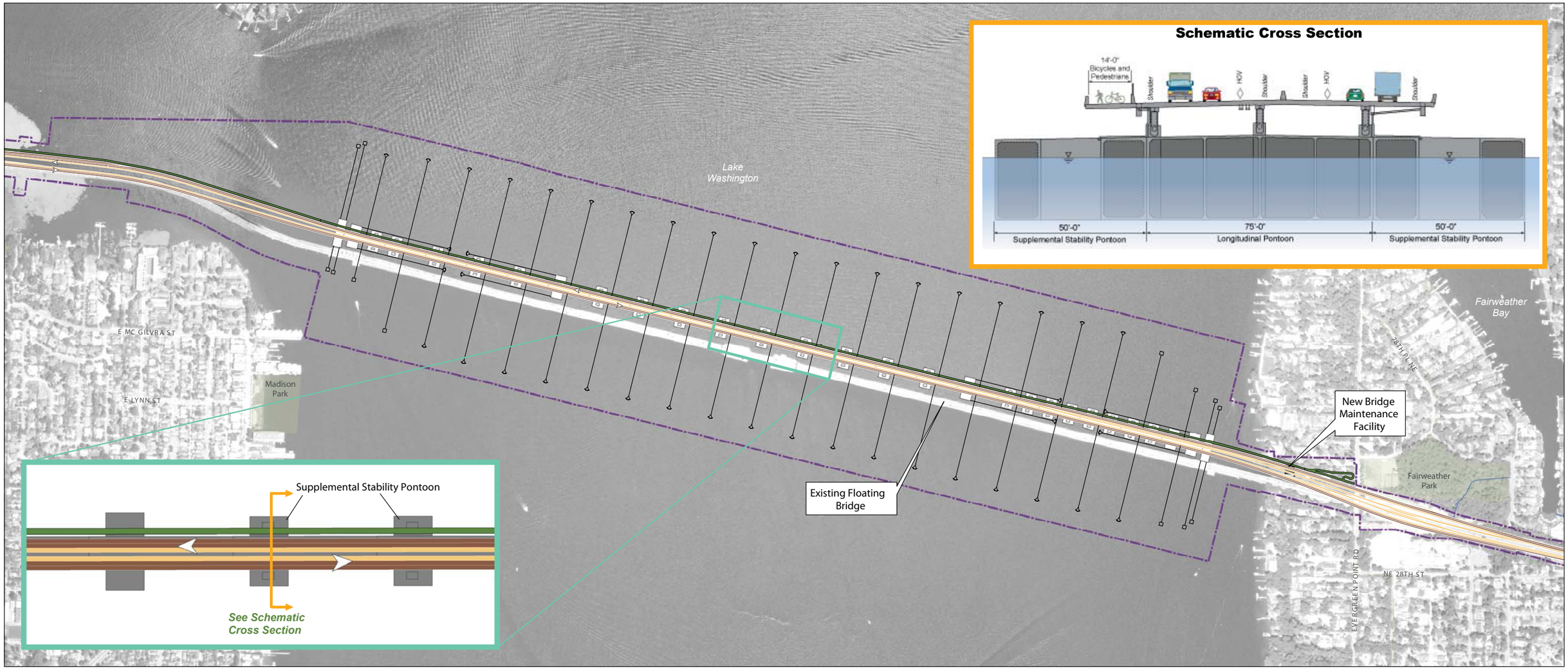
The foundation of the floating bridge will consist of a single row of 21 longitudinal pontoons connected end to end, two cross pontoons (one at each end), and 54 supplemental stability pontoons along the row of longitudinal pontoons (27 on each side). The longitudinal pontoons will measure 360-feet-long by 75-feet-wide by 28.5-feet-vertically. The cross pontoons will measure 240-feet-long by 75-feet-wide by 35-feet-vertically. The supplemental stability pontoons will measure 98-feet-long by 50- to 60-feet-wide by 28.5-feet-vertically. The overall length of the new floating span will be 7,710 feet, compared to the existing 7,580 feet. The new pontoons will have a deeper draft than the existing pontoons, typically ranging from 21.5 to 27.5 feet below the surface of the water, compared to existing pontoons at 7 to 14.5 feet below the water surface. The number and size of the new pontoons will be larger than the existing ones to provide the flotation needed for additional lanes, wider lanes, the bicycle/pedestrian path, and shoulders.

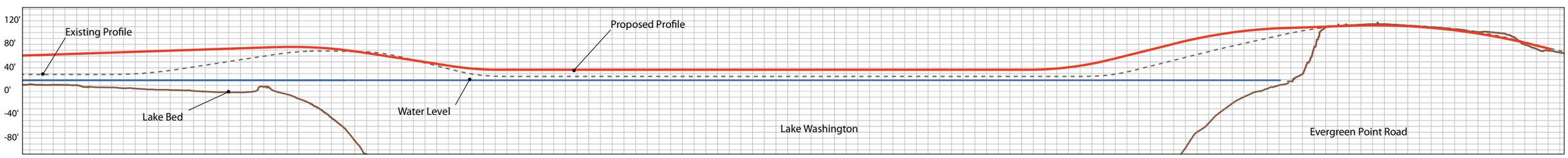
As with the existing floating bridge, the floating pontoons for the new bridge will be anchored to the lake bottom to hold the bridge in place. Anchor types are likely to consist of fluke anchors for the deepest anchor locations (180 feet deep or more), gravity anchors for shallower, sloped anchor locations (likely between 60 and 180 feet), and shaft anchors in the shallowest locations (likely less than 60 feet). A total of 58 anchors are proposed: 45 fluke anchors, up to 13 gravity anchors (if no shaft anchors are used), or a combination of gravity anchors and up to 6 shaft anchors. Shaft anchors are most likely to be used in the shallower waters in the northeastern and southwestern corners of the floating span layout.

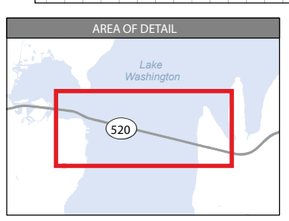
The roadway will likely be supported above the pontoons by rows of three 10-foot-tall concrete columns spaced 30 to 35 feet apart, transversely, at both ends of the bridge. These rows of columns will be longitudinally spaced about 90 feet apart across the floating bridge. The roadway through the middle portion of the span will likely be supported above the

pontoons by three lines of steel trusses in the middle portion of the bridge. The truss lines will likely be spaced 30 to 35 feet apart transversely. The roadway of the new bridge will be approximately 13 feet higher than the existing bridge and approximately 21 feet above the lake surface in the middle portion of the bridge.

Construction activities associated with pontoon installation will occur over an estimated 3-year period, beginning in 2012. The construction activities related to the floating bridge do not involve pile driving, cofferdam installation, or other activities that have the potential to substantially affect aquatic species; construction is not expected to be limited to in-water construction windows. Therefore, the sequence of activities refers to the calendar year as opposed to in-water work seasons.







- Anchor and Cable
- Pontoons
- Limits of Construction
- Proposed Bicycle/Pedestrian Path
- General-Purpose Lane
- HOV, Direct Access, and/or Transit-Only Lane
- Park

N

0 500 1,000 2,000 Feet

Source: King County (2006) Aerial Photo, CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Figure 2-4. **Project Layout – Floating Bridge and Approaches**

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

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2.1.6. East Approach and Maintenance Facility Area

WSDOT will replace the east approach span of the Evergreen Point Bridge with a new structure that is both higher and wider, and the alignment will be shifted north. The new east approach will consist of an eastbound and westbound structure with a gap in the middle. The east approach will span the east end of the floating bridge to the high bluff along the Medina shoreline. Like the Portage Bay Bridge, the east approach substructure will consist of drilled shafts, mudline footings, and concrete support columns. The superstructure will also consist of cast-in-place concrete girders and the roadway deck. The combined width of the north and south structures will range from 134 to 152 feet, from west to east. The structure will be approximately 660 feet long and range from 66 to 78 feet above the water surface.

The east approach will have two column piers. Pier #1 will be approximately 350 feet (or less) out from the shoreline, and Pier #2 will be onshore, several feet from the shoreline. Each column pier foundation will consist of ten 10-foot-diameter drilled shafts and two mudline footings to transfer column forces into the shaft group. The two in-water mudline footings making up Pier #1 will measure approximately 90-by-50 feet for the north bridge and 50-by-50 feet for the south bridge, and together will occupy approximately 7,000 square feet of substrate. The two in-water footings will support a total of five rectangular bridge columns, each measuring 11-by-7.5 feet or roughly 420 square feet.

In-place casting of box girder bridge sections is proposed, which will require the use of falsework to support the concrete forms. The completed superstructure will have an over-water width of 83 and 51 feet (for the north and south bridges, respectively) at the west end, and then widening to 91 and 61 feet (north and south, respectively) at the east end. The gap between the bridges will gradually widen from 6 feet at the west end to 10 feet at the east end. The bottom of the bridge deck will range from a low of about 66 feet above the water at Pier #1 to 78 feet above the water at the midpoint of the adjacent (landward) span. An existing stormwater treatment wetland will be modified to accommodate additional flow from the increased area of impervious surface.

Construction of the new east approach span will be concurrent with the floating bridge construction, over a 3-year period starting in 2012. Construction will take place from work bridges, barges, and land. The north and south approach structures will be constructed simultaneously and completed before traffic is shifted onto the bridge.

Maintenance Facility

A new bridge maintenance facility will be built at the same time as the east approach structure. Permanent and temporary access roads, retaining walls, a building, and a dock will be constructed while the east approach structure is being built. The facility will consist of a 12,000-square-foot, two-story maintenance building to house personnel and equipment, and a

parking facility constructed in the hillside under the proposed approach span, as well as a working dock.

The proposed dock design will likely consist of a T-shaped (hammerhead) dock, with the moorage platform extending no more than 100 feet perpendicular to the shoreline. The dock stem will be approximately 10 feet wide, and the moorage platform may be as much as 14 feet wide. Both the walkway to the dock, as well as the dock itself, will be constructed of fish-friendly grated decking, allowing light to penetrate below the structure. The moorage platform will extend approximately 60 feet in a north–south direction parallel to existing bathymetry. No creosote-treated wood will be used in the construction of the dock. Two work boats, as large as 32 and 50 feet long, may be moored at the dock. The dock may be supported by up to five columns measuring 3 feet in diameter and resting on 5- or 6-foot-diameter drilled shafts. Vibratory installation of up to 20 piles may be needed to support the shaft drilling rig.

Three or four ladders will be mounted to the dock for safety and to provide access to the boats. These ladders will extend into the water a short distance. A fender system will be mounted to the dock to protect the boats and dock from damage. Fender spacing will be approximately 3 feet on-center along the mooring area and will extend approximately 5 feet below ordinary high water (OHW).

2.1.7. Eastside Transition Area

Once the east approach and floating portions of the Evergreen Point Bridge have been replaced, grading and paving operations will occur east to Evergreen Point Road, and the Evergreen Point Road transit stop will be relocated to the inside median (constructed as part of the SR 520, Medina to SR 202: Eastside Transit and HOV Project) at Evergreen Point Road.

In order to make ramps and lanes connect for proper traffic operations, the SR 520 mainline will be restriped, beginning at the east end of the physical improvements near Evergreen Point Road and extending east to 92nd Avenue NE. Lane restriping is needed to tie into improvements that are part of the SR 520, Medina to SR 202: Eastside Transit and HOV Project. This project activity will occur over a 3.5-year period starting in January 2012.

2.1.8. Ancillary Project Features

The project also includes ancillary features such as a regional bicycle and pedestrian path, noise reduction measures, stormwater treatment facilities, and lighting. These features are summarized below.

Regional Bicycle/Pedestrian Path

The project includes a 14-foot-wide bicycle/pedestrian path along the north side of SR 520 through the Montlake area and across the Evergreen Point Bridge to the Eastside. On the west side of the lake, the path will connect to the existing Bill Dawson Trail that crosses underneath SR 520 near the eastern shore of Portage Bay. It will also connect to the Montlake lid and East Montlake Park. On the east side of the lake, the path will connect to the bicycle/pedestrian path built as part of the SR 520, Medina to SR 202: Eastside Transit and HOV Project.

A new path beginning in East Montlake Park will connect to a proposed new trail in the Washington Park Arboretum, creating a loop trail. The portion of the existing Arboretum Waterfront Trail that crosses SR 520 at Foster Island will also be restored or replaced after construction of the SR 520 west approach structure.

Noise Reduction Measures

Under Federal Highway Administration (FHWA) regulations (23 CFR Part 772), noise abatement measures must be considered when highway noise levels approach or exceed the FHWA noise abatement criteria thresholds, as they do along much of the SR 520 corridor. The project will be constructed with the use of quieter concrete, along with other innovative noise reduction techniques such as noise-absorptive crash barriers. Although these measures will reduce noise levels, they will not achieve the same reductions as noise walls, which are WSDOT's standard noise mitigation method. Noise modeling completed for the project indicates that throughout most of the SR 520 corridor, noise walls will meet all FHWA and WSDOT requirements for avoidance and minimization of negative noise effects. However, in the areas where noise walls are warranted, they will be constructed only if approved by the affected communities. WSDOT and FHWA will continue to work with the affected property owners to make a final determination of reasonable and feasible mitigation measures for project-related noise effects.

Stormwater Treatment Facilities

The project includes the installation of stormwater treatment facilities to collect and treat stormwater runoff. Two facility types incorporating stormwater treatment methods approved by Ecology have been identified for the project biofiltration swales and constructed stormwater treatment wetlands. A portion of the land-based drainages associated with local streets currently discharges to the Seattle combined sewer system and/or the King County Metro combined sewer system. Those discharges are treated at the King County West Point Treatment Plant.

Lighting

The project includes roadway lighting, pedestrian lighting, and lighting for the maintenance facility dock. Roadway lighting will be limited to areas that constitute conflict points, such

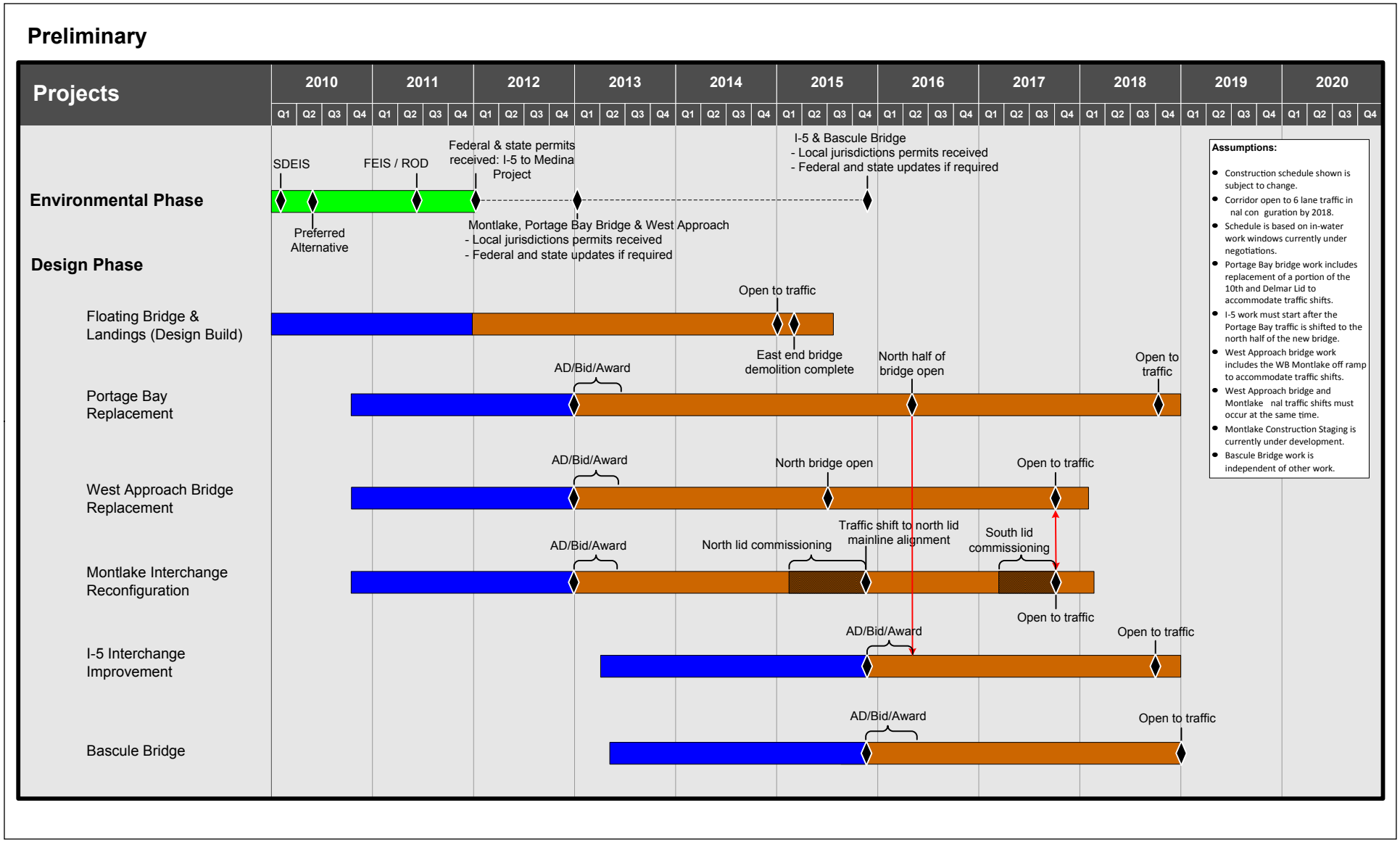
as merge lanes. All lighting will be designed to minimize spillage onto adjacent aquatic habitat.

2.2 Construction Activities

Project construction activities, sequencing, and scheduling within the project area have the potential to affect aquatic habitat and fish resources. A list of the typical construction activities and associated methods expected to be used for the proposed in-water, over-water, and upland structures is provided below. These activities include the following:

- Staging area establishment
- Implementation of BMPs
- Site preparation activities
- Work bridges/falsework construction
- Pile driving
- Drilled shaft construction
- Mudline footing construction
- Cofferdam construction
- Waterline shaft cap construction
- Column/pier construction
- Fixed bridge superstructure construction
- Bascule bridge construction
- Anchor installation
- Pontoon assembly
- Floating bridge superstructure outfitting
- Bridge maintenance facility and dock construction
- Materials transport, handling, and storage
- Demolition

Figure 2-5 shows a preliminary project construction schedule.



Environmental
Design
Construction

Figure 2-5. **Project Delivery Schedule**

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

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2.3 Project Operation

Operation and maintenance of the SR 520, I-5 to Medina Project will differ from the existing operation and maintenance and have the potential to result in changes to the Lake Washington environment. The following section characterizes the long-term operation of the new facility and potential mechanisms of effects on aquatic species and habitats.

2.3.1. Stormwater

Stormwater treatment for the project is constrained by urban geography and the characteristics of the bridges. Stormwater treatment includes using the combined sewer system, conventional treatment BMPs, and—in the case of the floating bridge portion of the project—an innovative stormwater treatment approach identified in an " all known, available, and reasonable technology" (AKART) study (WSDOT 2010c).

The SR 520, I-5 to Medina Project will result in 42.6 acres of new pollutant-generating impervious surface (PGIS) and will replace 25.7 acres of existing PGIS, while 21.4 acres of existing PGIS will remain on-site for a total PGIS of 89.7 acres after project construction. The amount of post-construction PGIS requiring treatment will be reduced by 6.3 acres due to two landscaped lids, which will reduce the amount of effective PGIS contributing flows to outfalls. All new and replaced PGIS will receive stormwater quality treatment; however, approximately 13.12 acres of existing PGIS within the project limits will not be treated after project construction. Areas not receiving post-construction treatment are primarily associated with restriping activities in the I-5 interchange. Project stormwater will be treated by facilities that will be designed based on requirements identified in WSDOT's 2008 *Highway Runoff Manual* (HRM) and *Hydraulics Manual* (WSDOT 2010f). New and replaced PGIS requires stormwater treatment to a basic level of treatment for Lake Union and Lake Washington. The project will also provide enhanced treatment to stormwater discharging to Lake Washington from SR 520 to further minimize any effects on the lake due to dissolved metals.

The project proposes to provide water quality treatment for new and replaced PGIS wherever practicable; however, in some areas where stormwater currently flows to the combined sewer system, flows will continue to be routed to the combined sewer system for treatment and discharge. Contributions to the combined storm and sewer systems will be treated by the West Point Wastewater Treatment Plant and discharged to Puget Sound. The project will reduce the total area contributing to the combined sewer system by approximately 1.25 acres; however, the amount of PGIS contributing to the combined sewer system will increase slightly (0.27 acre) because of the conversion of existing surfaces to PGIS. WSDOT will provide detention for stormwater entering the combined system where required by the Seattle code. Since both Lake Washington and Lake Union are flow-exempt water bodies per Ecology, no detention will be required on the separate stormwater system.

The existing project corridor has no stormwater treatment prior to discharges into Lake Union, Lake Washington, or the combined sewer system. All proposed PGIS (new and replaced) draining to both water bodies will receive basic or enhanced treatment. While enhanced treatment is not required, WSDOT will provide for enhanced treatment where practicable to improve water quality and reduce effects on aquatic life. When insufficient space is available to provide enhanced treatment for a specific outfall, basic treatment will be included in the stormwater treatment design. For this project, stormwater wetlands are the proposed enhanced treatment BMP, and bioswales will be the BMPs used for basic treatment. Oil control will be provided for roadway intersections with an average daily traffic count greater than or equal to 15,000 vehicles, as prescribed by the HRM. Where existing PGIS located within the project area will not be altered (disturbed) by the project, it will not be redirected to a water quality facility.

The project will reduce the discharge concentrations of total suspended solids, and total and dissolved zinc and copper. More importantly, the project will reduce the total loading of these substances discharged into the receiving environment (Lake Washington and the Ship Canal), including reductions in both dissolved copper and dissolved zinc loading (WSDOT 2010a). In addition, the current floating bridge drainage system is leaching high levels of zinc, and the WSDOT (2005) stormwater monitoring report suggests that dissolved zinc may decrease dramatically in some areas of Lake Washington as a result of the proposed project because the drainage system of the new bridge will use materials constructed of alternative materials. Overall, all stormwater discharges will comply with Clean Water Act standards and will meet state water quality standards for the protection of aquatic life.

2.3.2. Artificial Lighting

Similar to the current roadway lighting configuration, continuous lighting will be provided along the SR 520 corridor from I-5 to Foster Island and on bridge or tunnel structures crossing the Montlake Cut. Except for the interim west approach connection, no roadway lighting is proposed for the fixed portions of the bridge east of Foster Island. The floating bridge will include six luminaires in the easternmost portion to illuminate a transit merge point. Recessed lighting will illuminate the proposed bicycle and pedestrian path along the west approach structure and the Evergreen Point Bridge. Lighting will be designed to minimize effects on aquatic habitat, likely through the use of shielded downlights similar to those on the I-90 floating bridges.

Artificial lighting currently illuminates the majority of the SR 520 corridor, including the entire existing bridge structure. The proposed design will reduce the overall artificial lighting for the replacement bridge. Artificial lighting from the roadway luminaires, pedestrian walkway, vehicles, and the maintenance facility dock is discussed below.

Roadway Lighting

For the replacement structure, overhead lighting will be limited to traffic conflict points (e.g., add lanes, drop lanes, merges, diverges, auxiliary lanes, or weaving sections) and the westernmost portion of the project between Foster Island and I-5. East of Foster Island, no roadway lighting is proposed, thus reducing the amount of light reaching the water surface compared to existing conditions.

Specifically, a continuous roadway illumination system will be installed from the I-5 interchange to Foster Island, including all major arterial streets within the construction limits. To reduce the effects of lighting on the Lake Washington fish habitat, roadway illumination will not be continuous in the section from where additional ramp lanes begin and end around the Foster Island area, to where the Evergreen Point Flyer stop merges (westbound) into the westbound HOV lane on the eastern portion of the floating span. This unlit section of the proposed bridge generally encompasses the primary migration areas of juvenile Chinook salmon (*Onchorhynchus tshawytscha*), located in the west approach area in the transition area between Lake Washington and the Ship Canal (Fresh et al. 2001; City of Seattle and USACE 2008; Celedonia et al. 2008b). However, a portion of the west approach span and a portion of the floating span in the vicinity of the west navigation channel will have temporary roadway illumination during interim traffic configurations. This interim lighting is expected to be in place for approximately 18 months. The approximate number of lights on each structure will be as follows:

- 12 lights on the Montlake bridges (6 existing)
- 18 lights on the Portage Bay Bridge (18 existing)
- 43 lights on the west approach bridge (52 existing)
- No lights on the floating bridge (44 existing)
- 6 lights on the east approach bridge (4 existing)

The existing roadway lighting on the floating bridge consists of WSDOT-standard cobra-head, flat-glass, high-pressure sodium light fixtures with Type III, 250-watt medium cut-off lights. These lights are staggered on both sides of the roadway at intervals of about 350 feet. The lights are mounted 30 to 40 feet above the roadway, with the shorter light standards occurring east of the center drawspan of the bridge. While the shorter lights are not shielded, the taller light standards have shielded light fixtures. Existing nighttime light levels extend up to 5 to 300 feet from the bridge near Portage Bay, and Foster Island has light levels measured from 0.45 to 0.01 foot candles (WSDOT 2009a).

Pedestrian Lighting

Lighting for the shared use pedestrian and bicycle pathway on the bridge will be similar to the design used for the pedestrian pathway lighting on the I-90 floating bridge. The proposed design provides lighting fixtures recessed into the concrete barrier that separates the vehicular lanes and the pedestrian/bicycle path. Model predictions suggest that this design will prevent walkway lighting from reaching the lake surface. The maximum light level simulated was 0.05 foot candles.

Maintenance Dock Lighting

Lighting proposed for the maintenance dock beneath the east approach will have up to four Class C dock luminaires, in addition to path lighting. Overhead lights will be on-demand and will remain off except during dock use, while low-intensity path lighting will be on at all times. Private aids to navigation will be provided as required.

2.3.3. Maintenance Facility Operation

The proposed maintenance facility will be located directly beneath the east approach, built into the hillside along the Medina shoreline. The facility will consist of an upper-level parking area with elevator and stair access to lower-level office and shop spaces. The shop space will open to a level terrace, roughly at lake level for staff and materials access to a dock, and the maintenance vessel moorage.

Several distinct operational elements are associated with the maintenance facility. In addition to lighting, operational elements that have some potential to affect listed salmonids include handling and transport of petrochemicals, and vessel moorage and operations.

Handling and Transport of Petrochemicals

Petrochemicals necessary for the operation and maintenance of the floating span will include fuels, lubricants, and hydraulic fluids. Much of the handling of these materials will occur on upland portions of the facility; however, fueling of the maintenance vessels and transport of some of these materials to the pontoons will occur over water. Activities to limit risks associated with material handling will include hazardous materials training for staff, use of properly functioning and secure containment devices, and implementation of BMPs such as drip pans and absorbent pads (refer to BMPs described in Section 5).

Vessel Moorage and Operations

The facility dock is expected to be used almost daily for mooring of maintenance vessels. The large maintenance vessel is expected to be in the 40- to 50-foot-long range and powered by an inboard diesel engine; the small maintenance vessel is expected to be in the 20- to 30-foot-long range. The dock will extend approximately 100 feet perpendicular from the shoreline, with boat moorage at the end in approximately 8 feet of water (relative to high lake level—18.72 feet).

2.3.4. Spill Control

Currently, any spills that occur on the existing bridge drain directly into Lake Washington, Union Bay, and Portage Bay if the quantities of spilled materials are large enough to reach storm drains. The existing Montlake Bridge is grated, so any spills on this bridge flow directly into the Montlake Cut. The replacement bridge over Lake Washington will discharge these spills into the adjacent spill control lagoons within the supplemental stability pontoons, allowing subsequent cleanup of floatable materials. Similarly, the replacement bridge structures over the Montlake Cut, including Portage Bay and Union Bay, will collect and route stormwater to treatment ponds in the Montlake area, before it is discharged to adjacent water bodies.

Traffic Noise and Vibration

Vehicle traffic on the floating portion of the Evergreen Point Bridge produces noise and vibration through movement of tires on the roadway. Although much of that sound is deflected into the air, some of the noise is transmitted into and through the pontoons to Lake Washington and, to a lesser extent, through the solid concrete support columns or anchor cables.

The existing bridge likely transmits more of the traffic noise to the water than the proposed replacement bridge will transmit, because the existing bridge's roadway sits directly on the surface of the pontoons, while the replacement bridge deck will be constructed on columns and trusses to elevate it above the pontoons. This design places the bridge deck typically about 22 feet higher than the existing deck and about 10 feet above the pontoons. The new design will provide reduced transmission of noise to the pontoons; however, the degree of the reduction in noise level is unknown. Underwater noise monitoring during the SR 520 Test Pile Program (Illingworth and Rodkin, Inc. 2010) did not detect measurable levels of noise in the water obviously attributable to roadway noise from the existing 520 bridge.

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