Biological Assessment

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

Prepared for
Washington State Department of Transportation

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November 2010

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ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
AKART	all known, available, and reasonable technology
BA	biological assessment
Ballard Locks	Hiram M. Chittenden Locks
BMC	Bellevue Municipal Code
BMP	best management practice
CFR	Code of Federal Regulations
cfs	cubic feet per second
°C	degrees Celsius
CTC	Concrete Technology Corporation
dBA	decibels, A-weighted
dB_{rms}	decibels root mean square
DNR	Washington Department of Natural Resources
DPS	distinct population segment
Ecology	Washington State Department of Ecology
EFH	essential fish habitat
ESA	Endangered Species Act
ESU	evolutionarily significant unit
°F	degrees Fahrenheit

ACRONYMS AND ABBREVIATIONS

FHWA	Federal Highway Administration
FMO	foraging, migration, and overwintering
FR	Federal Register
GPS	global positioning system
HOV	high-occupancy vehicle
HPA	Hydraulic Project Approval
HRM	Highway Runoff Manual (WSDOT)
HUC	Hydrologic Unit Code
I-5	Interstate 5
I-90	Interstate 90
I-405	Interstate 405
LWD	large woody debris
µg/L	micrograms per liter
Mg/L	milligrams per liter
MHHW	mean higher high water
MLLW	mean lower low water
MOHAI	Museum of History and Industry
mph	miles per hour
NEPA	National Environmental Policy Act

ACRONYMS AND ABBREVIATIONS

NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
NWI	National Wetlands Inventory
OHW	ordinary high water
OHWM	ordinary high water mark
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	primary constituent element
PGIS	pollutant-generating impervious surface
RACp	resource agency coordination process
RCW	Revised Code of Washington
RM	river mile
RWB	receiving water body
Seattle Parks	Seattle Department of Parks and Recreation
SEL	sound exposure level
SEPA	State Environmental Policy Act
Services	U.S. Fish and Wildlife Service and National Marine Fisheries Service

ACRONYMS AND ABBREVIATIONS

SMC	Seattle Municipal Code
SPCC	spill prevention, control, and countermeasures
SR	State Route
SWPPP	stormwater pollution prevention plan
TDA	threshold discharge area
TESC	temporary erosion and sediment control
TSS	total suspended solids
TWG	Technical Working Group
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WRIA	water resource inventory area
WSDOT	Washington State Department of Transportation

EXECUTIVE SUMMARY

The State Route (SR) 520, Interstate 5 (I-5) to Medina: Bridge Replacement and High-Occupancy Vehicle (HOV) Project (the SR 520, I-5 to Medina project or the project) is a Washington State Department of Transportation project that is part of the SR 520 Bridge Replacement and HOV Program. The project is partially funded by the Federal Highway Administration. The purpose of the project is to improve safety and mobility in the SR 520 corridor.

The SR 520, I-5 to Medina project will extend approximately 5.2 miles from I-5 in Seattle to 92nd Avenue NE in Yarrow Point. The project will widen the SR 520 corridor to six lanes between I-5 and Evergreen Point Road in Medina. The project will also construct an additional bridge over the Montlake Cut and replace the Portage Bay Bridge, the Union Bay Bridge, and the vulnerable Evergreen Point Bridge with new structures. It will restripe and reconfigure the traffic lanes between Evergreen Point Road and 92nd Avenue NE in Yarrow Point and complete the regional HOV system across SR 520.

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

The project will result in temporary and permanent effects on aquatic species and their habitat, on wetlands, and on parks. The project will provide compensatory mitigation to offset effects on these resources, as required by local, state, and federal regulations. Mitigation for effects on aquatic resources is proposed at six of the nine potential mitigation sites. It will include habitat enhancement activities (e.g., nearshore, shoreline, and riparian habitat) that target species that are listed for protection under the Endangered Species Act (ESA) and other salmonid species and their habitat. Three of the nine potential sites have been identified for wetland mitigation. Mitigation activities at these sites may include limited aquatic habitat enhancement, wetland creation/restoration, and wetland/wetland buffer/riparian enhancement (e.g., removal of nonnative species, planting of native trees and shrubs, and addition of woody debris to improve habitat function). One additional site has been identified for mitigation of effects on Section 6(f) resources; activities at this site may include improvements to both upland and shoreline environments.

WSDOT has evaluated the elements of the SR 520, I-5 to Medina project to determine how the proposed action will affect any threatened or endangered species or designated critical habitat potentially occurring in the action area defined for this biological assessment (BA). This BA summarizes the available information on the potential effects of the project on ESA-listed species and critical habitat within the action area. This BA addresses seven ESA-listed species: Coastal-Puget Sound bull trout distinct population segment (DPS) (*Salvelinus confluentus*), Puget Sound Chinook salmon evolutionarily significant unit (ESU) (*Oncorhynchus tshawytscha*), Puget Sound steelhead DPS (*Oncorhynchus mykiss*), Puget Sound-Georges Basin DPS canary rockfish (*Sebastes pinniger*), Puget Sound-Georges Basin DPS boccacio (*Sebastes paucispinis*), Puget Sound-Georges Basin DPS yelloweye rockfish (*Sebastes ruberrimus*), and southern resident killer whale DPS (*Orcinus orca*). It also addresses designated critical habitat for bull trout, Chinook salmon, and killer whales. Critical habitat has not been proposed or designated for steelhead and the three species of rockfish (Exhibit ES-1). The BA also includes information about species addressed in this BA, but excluded from this consultation, along with the rationale for exclusion.

Potential effects of the project on ESA-listed species and designated critical habitat include changes in water quality, underwater noise levels associated with in-water pile driving, fish handling, artificial lighting, and habitat alterations. The project will implement minimization measures to reduce effects on listed species and proposed and designated critical habitat. Exhibit ES-1 summarizes the listed species and proposed and designated critical habitat addressed in this BA and the effect determinations.

EXHIBIT ES-1.
LISTED SPECIES AND CRITICAL HABITAT ADDRESSED IN THIS BIOLOGICAL ASSESSMENT

Species	Federal Status	Species Effect Determination	Critical Habitat	Critical Habitat Effect Determination
Bull trout (*Salvelinus confluentus*)	Threatened	LAA	Designated[1]	LAA
Chinook salmon (*Oncorhynchus tshawytscha)*	Threatened	LAA	Designated	LAA
Steelhead (*Oncorhynchus mykiss*)	Threatened	LAA	Under development	Not applicable
Boccacio (*Sebastes paucispinis*)	Endangered	NLAA	None designated	Not applicable
Canary rockfish (*Sebastes pinniger*)	Threatened	NLAA	None designated	Not applicable
Yelloweye rockfish (*Sebastes ruberrimus*)	Threatened	NLAA	None designated	Not applicable
Killer whale (*Orcinus orca*)	Endangered	NLAA	Designated	NLAA

LAA = likely to adversely affect
NLAA = not likely to adversely affect

[1] On September 30, 2010, the U.S Fish and Wildlife Service revised designated critical habitat for bull trout. The final results designates entire streams and revises major drainages as critical habitat, renumbers and rewords primary constituent elements, and adds one primary constituent element.

The project may adversely affect Pacific salmon freshwater essential fish habitat (EFH) in Lake Washington, Portage Bay, and Union Bay. However, it will not adversely affect EFH for groundfish or coastal pelagic species.

1. INTRODUCTION

The State Route (SR) 520, Interstate 5 (I-5) to Medina: Bridge Replacement and High-Occupancy Vehicle (HOV) Project (the SR 520, I-5 to Medina project or the project) is one of three independent Washington State Department of Transportation (WSDOT) highway improvement projects that will widen the SR 520 corridor to six lanes, replace the Portage Bay Bridge, the Union Bay Bridge, and the Evergreen Point Bridge with new structures, and construct an additional bridge over the Montlake Cut.

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions do not jeopardize listed species or their habitat. The federal action (nexus) for this project consists of (1) federal funding from the Federal Highway Administration (FHWA), and (2) a requirement for federal permits or authorizations from the U.S. Army Corps of Engineers (USACE) and the U.S. Coast Guard (USCG). FHWA is the lead federal agency for this consultation. The purpose of this biological assessment (BA) is to evaluate the elements of the SR 520, I-5 to Medina project to determine how the proposed action will affect any threatened or endangered species or designated critical habitats that occurs in the action area defined for this BA. This document summarizes the available information on the potential effects of the project on ESA-listed species and critical habitat within the action area.

The project is part of the SR 520 Bridge Replacement and HOV Program, which includes several independent projects that extend from I-5 to Redmond, including the Medina to SR 202: Eastside Transit and HOV Project (the Medina to SR 202 project), the Pontoon Construction Project, and the Lake Washington Congestion Management Project. Separate consultations have occurred for the other projects within the overall program.

1.1 Consultation History with USFWS and NMFS

Since May 2007, WSDOT and representatives of FHWA, the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) (the Services), and other pertinent regulatory entities have been participating in a resource agency coordination process (RACp). The goal of the RACp was to facilitate collaboration with regulatory entities as the project progresses through National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) documentation, ESA consultation, project design, acquisition of permits, and definition of mitigation. The RACp provided a forum for the following:

- Ensuring project consistency with regulations
- Sharing information with regulatory agencies in real time
- Clarifying regulatory agency preferences based on design
- Identifying issues early enough to avoid costly redesigns and schedule delays

- Providing feedback to the project team about how best to comply with anticipated permit requirements
- Testing potential courses of action and airing assumptions in a collaborative environment
- Identifying where regulatory agency requirements differ and developing approaches for reconciling these differences
- Building collaborative relationships

In July 2007, WSDOT and the Services began participating in biweekly meetings of the ESA Steering group, which consists of staff from the WSDOT regional office, the SR 520 project team, FHWA, and the Services. The intent of the steering group was to discuss and attempt to resolve technical issues related to the SR 520, I-5 to Medina project and its effects on listed species and designated critical habitat. The agenda has included developing the framework for the ESA analysis; identifying issues that need to be resolved or those to be developed in white papers and/or workshops; developing a project deconstruction matrix; and reviewing draft sections of the preliminary BA.

In addition to the teams described above, various technical working groups were established to address specific topics or issues, including the following:

- Stormwater management
- Construction of a bridge maintenance facility
- In-water construction
- Mitigation
- Natural resources

Lastly, WSDOT and the Services engaged in several technical workshops to address issues that required dedicated discussion outside the limits of established meetings and where the opinions of outside experts were needed. These technical workshops provided the basis for some of the primary analyses contained in this BA and included the following:

- In-Water Construction Technical Working Group (In-Water TWG) (July 10, 2008)
- Fish Experts Workshop (July 10, 2009)
- Pile Installation Test Program Workshop (February 25, 2009)
- Ecosystem Diagnosis and Treatment Workshops (November 12, 2009, and December 17, 2009)

1.2 Project Overview

The SR 520, I-5 to Medina project is located at the western end of the SR 520 corridor. The western and eastern project limits are the SR 520 interchange with I-5, the main north-south artery through Seattle, and Evergreen Point Road in Medina, east of Lake Washington. The project limits include interchanges at I-5, East Roanoke Street, Montlake Boulevard, and Lake Washington Boulevard, as well as the Montlake Bridge, the Portage Bay Bridge, the Union Bay Bridge, and the Evergreen Point Bridge across Lake Washington.

1.3 Project Location

The SR 520, I-5 to Medina project will be constructed primarily in King County and extend approximately 5.2 miles east of I-5 along the existing SR 520 corridor. The project passes through Medina and Seattle and is located in Section 24, Township 25 North, Range 5 East, and in Sections 20, 21, and 22, Township 25 North, Range 4 East. The project will also involve areas associated with the construction, outfitting, and transport of the pontoons for the floating bridge. WSDOT will construct pontoons at the existing Concrete Technology Corporation (CTC) facility in Tacoma and an existing facility in the Port of Olympia for the pontoon construction. The project may also involve the use of existing industrial sites in Puget Sound, where some of the pontoon outfitting (superstructure construction) may occur, and the commercial shipping lanes between all these locations and Lake Washington. Exhibit 1-1 shows the general project vicinity.

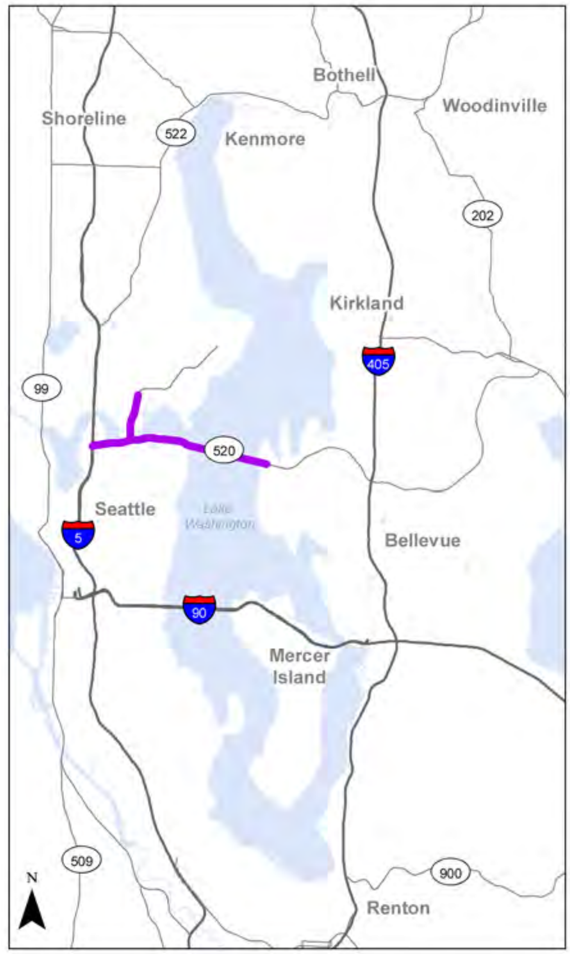

EXHIBIT 1-1.
PROJECT VICINITY MAP

Exhibit 1-2 shows the vicinity of the pontoon fabrication and moorage sites and the route that will be used for delivering the pontoons to Lake Washington.

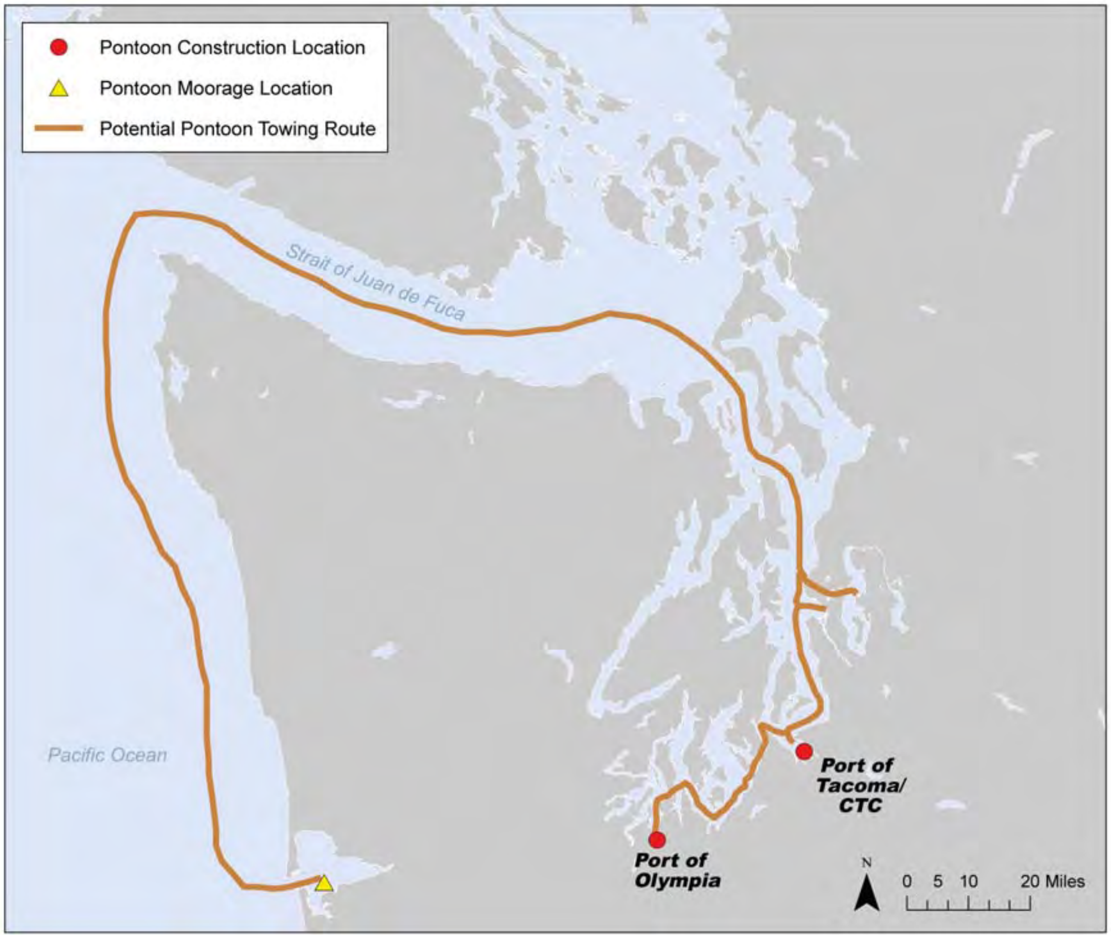

EXHIBIT 1-2.
PONTOON FABRICATION AND MOORAGE SITES AND DELIVERY ROUTE

The SR 520 corridor lies within the Lake Washington/Cedar watershed, one of the two major watersheds within the Cedar-Sammamish water resource inventory area (WRIA 8); 4th order Hydrologic Unit Code (HUC) 17110012, covering about 607 square miles. Lake Washington is the primary water body relevant to the action area, although the action area also includes the shipping lanes in the Lake Washington Ship Canal (Ship Canal), Puget Sound, Strait of Juan de Fuca, Pacific Ocean, and Grays Harbor (WRIA 23) (Exhibit 1-3).

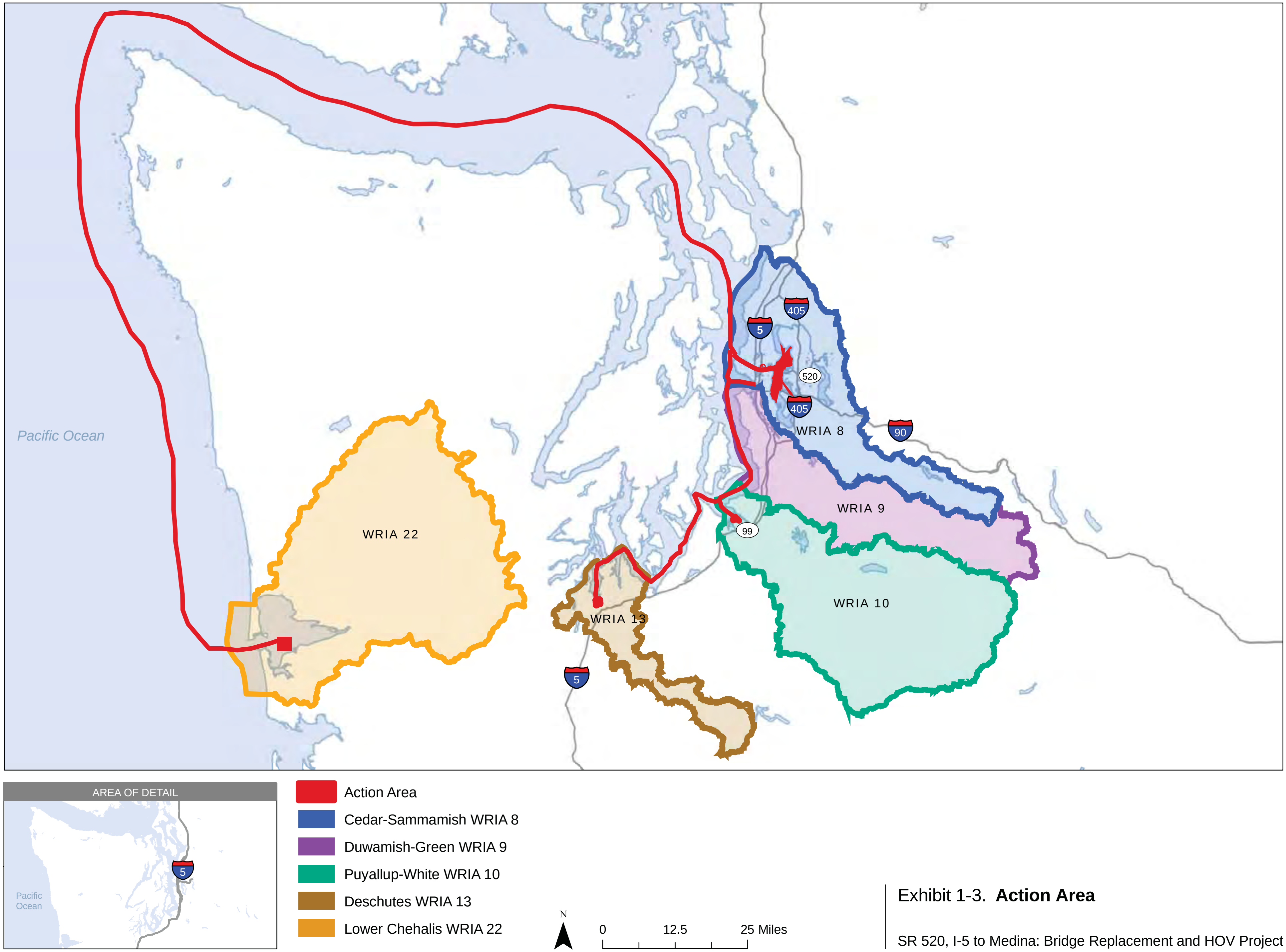

Exhibit 1-3. **Action Area**

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

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1.4 Species and Critical Habitat Addressed in This BA

This BA assesses the potential effects of the SR 520, I-5 to Medina project on listed species and designated critical habitat in the action area and documents appropriate minimization and/or conservation measures that are included in the proposed action. Species lists from the USFWS and NMFS were obtained from the agencies' Web sites on September 2, 2010 (Appendix A). Exhibit 1-4 lists the species and critical habitat addressed in the BA.

EXHIBIT 1-4.
ESA-LISTED SPECIES ADDRESSED IN THIS BIOLOGICAL ASSESSMENT

Species	Scientific Name	Federal Status	Critical Habitat
Killer whale (Southern Resident DPS)	*Orcinus orca*	Endangered	Designated
Bull trout (Coastal-Puget Sound DPS)	*Salvelinus confluentus*	Threatened	Designated
Chinook salmon (Puget Sound ESU)	*Oncorhynchus tshawytscha*	Threatened	Designated
Steelhead (Puget Sound DPS)	*Oncorhynchus* mykiss	Threatened	Under development
Bocaccio (Puget Sound/Georgia Basin DPS)	*Sebastes paucispinis*	Endangered	None designated
Yelloweye rockfish (Puget Sound/Georgia Basin DPS)	*Sebastes ruberrimus*	Threatened	None designated
Canary rockfish (Puget Sound/Georgia Basin DPS)	*Sebastes pinniger*	Threatened	None designated

DPS = distinct population segment
ESU = evolutionarily significant unit

Information on listed species and habitats known to occur or potentially occur in the action area was provided by state and federal agencies (Appendix B). Information about species addressed in this BA, but excluded from this consultation, including the rationale for exclusion, is presented in Section 5 (Exhibit 1-5).

Exclusion was based on at least one of the following:

- A lack of potential effect
- A lack of suitable habitat in the action area
- A lack of documented occurrence in the action area

EXHIBIT 1-5.
SPECIES AND CRITICAL HABITAT NOT ADDRESSED FURTHER IN THIS BIOLOGICAL ASSESSMENT

Species	Scientific Name	Federal Status	Rationale for Exclusion
Invertebrates			
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	Threatened	No suitable habitat or documented occurrence in action area
Sea Turtles			
Leatherback turtle	*Dermochelys coriacea*	Endangered	No effect
Loggerhead turtle	*Caretta caretta*	Threatened	No effect
Green turtle	*Chelonia mydas*	Threatened	No effect
Olive Ridley turtle	*Lepidochelys olivacea*	Threatened	No effect
Birds			
Western snowy plover	*Charadrius alexandrinus nivosus*	Threatened	No suitable habitat or documented occurrence in action area
Short-tailed albatross	*Phoebastria albatrus*	Endangered	No effect
Northern spotted owl	*Strix occidentalis caurina*	Endangered	No suitable habitat or documented occurrence in action area
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	No effect
Marine Mammals			
Blue whale	*Balaenoptera musculus*	Endangered	No effect
Fin whale	*Balaenoptera physalus*	Endangered	No effect
Sei whale	*Balaenoptera borealis*	Endangered	No effect
Sperm whale	*Physeter macrocephalus*	Endangered	No effect
Humpback whale	*Megaptera novaeangliae*	Endangered	No effect
Steller sea lion	*Eumetopias jubatus*	Threatened	No effect
Terrestrial Mammals			
Canada lynx	*Lynx canadensis*	Threatened	No suitable habitat or documented occurrence in action area
Gray wolf	*Canis lupus*	Endangered	No suitable habitat or documented occurrence in action area
Grizzly bear	*Ursus arctos = U. a. horribilis*	Threatened	No suitable habitat or documented occurrence in action area
Fishes			
Chum salmon (Hood Canal summer-run DPS)	*Oncorhynchus keta*	Threatened	No effect
Green sturgeon	*Acipenser medirostris*	Threatened	No effect
Pacific eulachon	*Thaleichthys pacificus*	Threatened	No effect

DPS = distinct population segment

NMFS also identifies coho salmon (*Oncorhynchus kisutch)*and pink salmon (*O. gorbuscha)*, which are not ESA-listed, as potentially occurring in the action area. These species, along with others, were included in the analysis of essential fish habitat (EFH) for the project, provided in Appendix C, as required by the Magnuson-Stevens Fishery Conservation and Management Act.

2. DESCRIPTION OF PROPOSED ACTION

2.1 Project Background and Purpose

SR 520 is a critical link connecting the major population and employment centers of the Puget Sound region on either side of Lake Washington. The uninterrupted movement of people and goods across SR 520 and the floating bridge is essential to the region's economic vitality and quality of life. The floating span of the Evergreen Point Bridge, opened in 1963, now carries approximately 115,000 vehicles per day across the lake, providing east-west access for commuters, freight, transit, and general-purpose traffic. The aging floating bridge is vulnerable to failure in a severe windstorm, and the fixed bridge spans along the corridor do not meet current seismic standards and could collapse in an earthquake. In addition, the corridor currently carries nearly twice as many vehicles as it was originally designed for, resulting in extended congestion and impaired mobility.

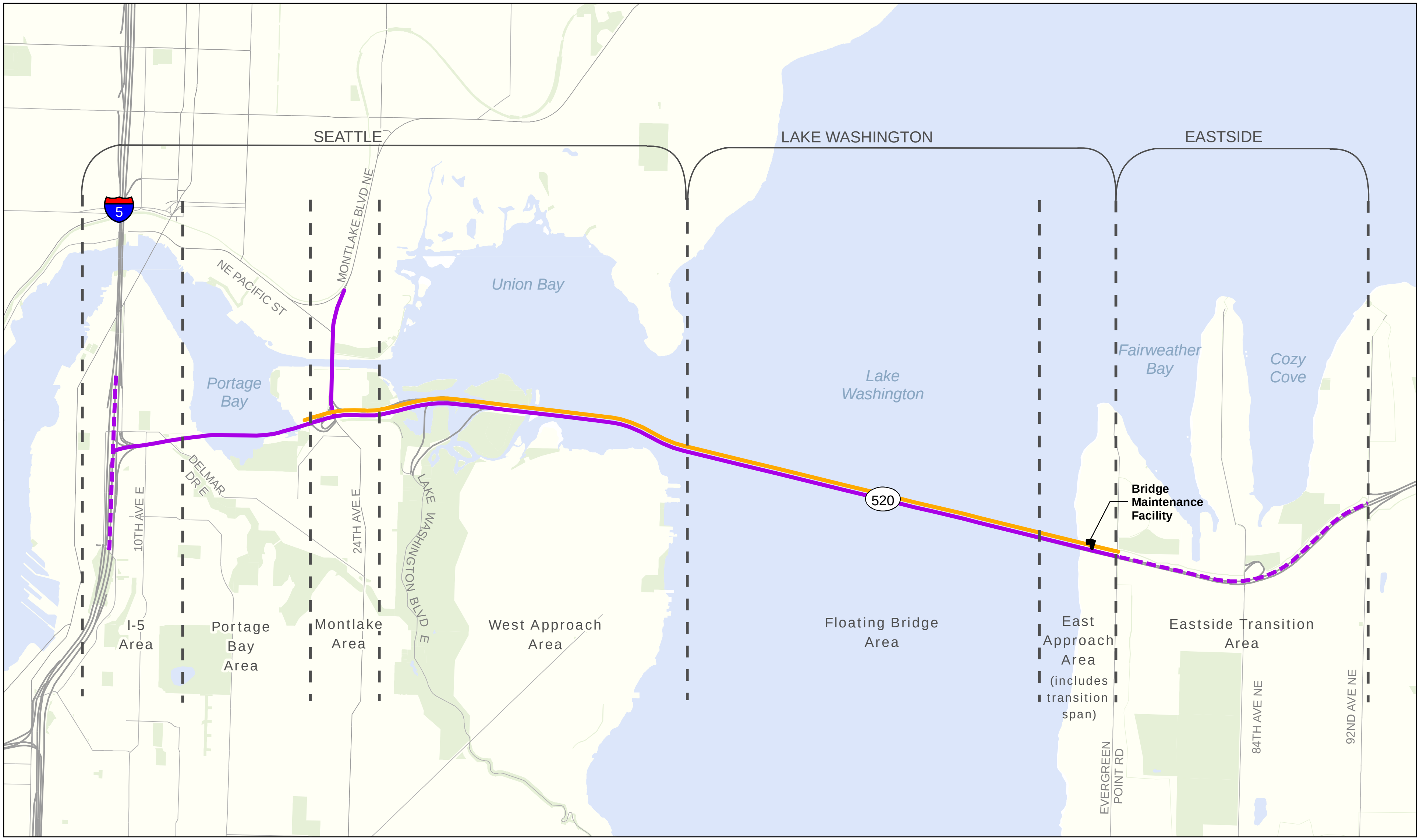
The SR 520, I-5 to Medina project will improve safety and mobility in the SR 520 corridor by replacing the vulnerable bridges and adding HOV lanes to move people more efficiently in transit and carpools. It will ensure the continued availability of SR 520 as a key corridor for transportation and commerce. It is designated as a strategic project by the Puget Sound Regional Council and is included in WSDOT's 2009–2012 Statewide Transportation Improvement Program. In 1999, WSDOT estimated the remaining service life of the floating portion of the Evergreen Point Bridge to be 20 to 25 years, based on its structural condition and the likelihood of severe windstorms. Its life expectancy now is only 10 to 15 years.

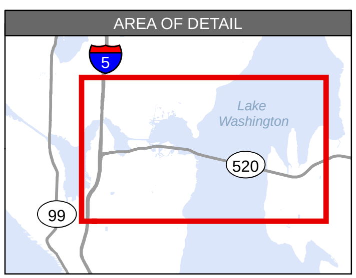
The span was originally designed for a sustained wind speed of 57.5 miles per hour (mph). In 1999, WSDOT rehabilitated the bridge to allow it to withstand sustained winds up to 77 mph. This still falls well short of the current design standard of 92 mph. Moreover, some bridge mechanisms have been damaged in recent storms. The floating pontoons currently float about 1 foot lower than the original design criterion, increasing the likelihood of waves breaking onto the bridge deck. Cracks in the structure allow the seepage of water that WSDOT must pump out on a regular basis. The probability that the bridge will sustain serious structural damage over the next 15 years is extremely high. To bring the Evergreen Point Bridge up to current design standards and eliminate the risk of its catastrophic failure, the existing span must be completely replaced.

The possibility of an earthquake in the Seattle area poses additional risks to other bridges in the SR 520 corridor. The columns of the Portage Bay Bridge and both the west and east approaches to the Evergreen Point Bridge are hollow and do not meet current seismic design standards. Hollow-core columns are difficult and costly to retrofit to currently acceptable seismic protection levels; WSDOT studies indicate that such retrofitting would cost nearly as much as building new structures and would have similar environmental effects. WSDOT estimates that over the next 50 years, there is a 20 percent chance of serious damage to these structures in an earthquake.

2.2 Summary of Proposed Project Elements

The SR 520, I-5 to Medina project will widen the SR 520 corridor to six lanes (Exhibit 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. Exhibit 2-1 shows the project limits and identifies three discrete geographic areas and six subareas within the project limits. The project will replace the Portage Bay Bridge, the Union Bay Bridge, the Evergreen Point Bridge, and the west and east approaches to the Evergreen Point Bridge with new structures. It will complete the regional HOV lane system across SR 520, as called for in the regional and local transportation plans.





- Project Extent
- Denotes Limited Improvement
- Regional Bicycle/Pedestrian Path
- Park

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.

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

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

The new Evergreen Point Bridge will consist of six lanes (two 11-foot-wide outer general-purpose lanes in each direction and one 12-foot-wide inside HOV lane in each direction), a 14-foot-wide bicycle/pedestrian path, 4-foot-wide inside shoulders, and 10-foot-wide outside shoulders (Exhibit 2-2). The combined roadway cross section will typically be about twice as wide as 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.

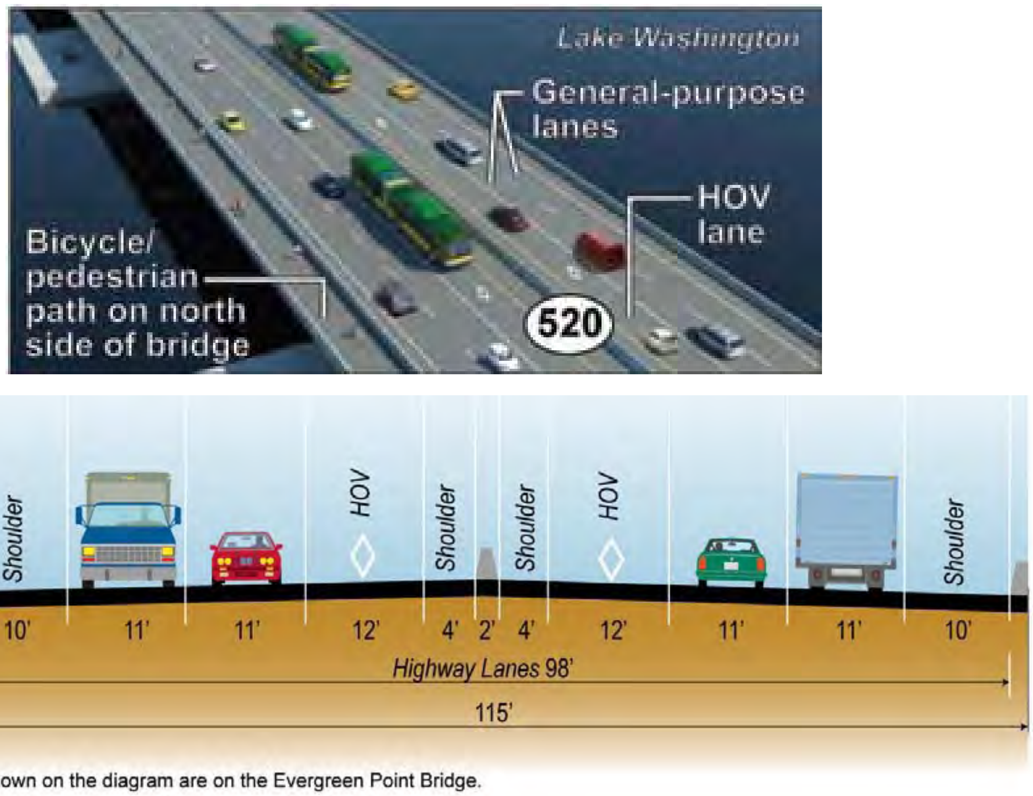


EXHIBIT 2-2.
VISUAL DEPICTION AND TYPICAL CROSS SECTION OF THE PROPOSED REPLACEMENT FOR THE EVERGREEN POINT BRIDGE

The project alignment is similar to the existing configuration except that the floating bridge and its approaches will be shifted to the north. The project configuration will be wider than the existing configuration, and the profile will be generally higher than the existing profile. The design places an emphasis on multimodal transportation by decreasing reliance on single-occupant vehicle travel and facilitating transit connections.

Major features of the project are summarized below; detailed design and construction elements are described in Section 2.3. The description of the major project elements is organized into discrete geographic areas from west to east (Seattle to Medina) in the project area and includes the following elements:

- I-5 interchange area
- Portage Bay Bridge
- Montlake
- West approach
- Floating bridge
- East approach and maintenance facility
- Eastside transition area
- Ancillary project features

2.2.1 I-5 Interchange Area

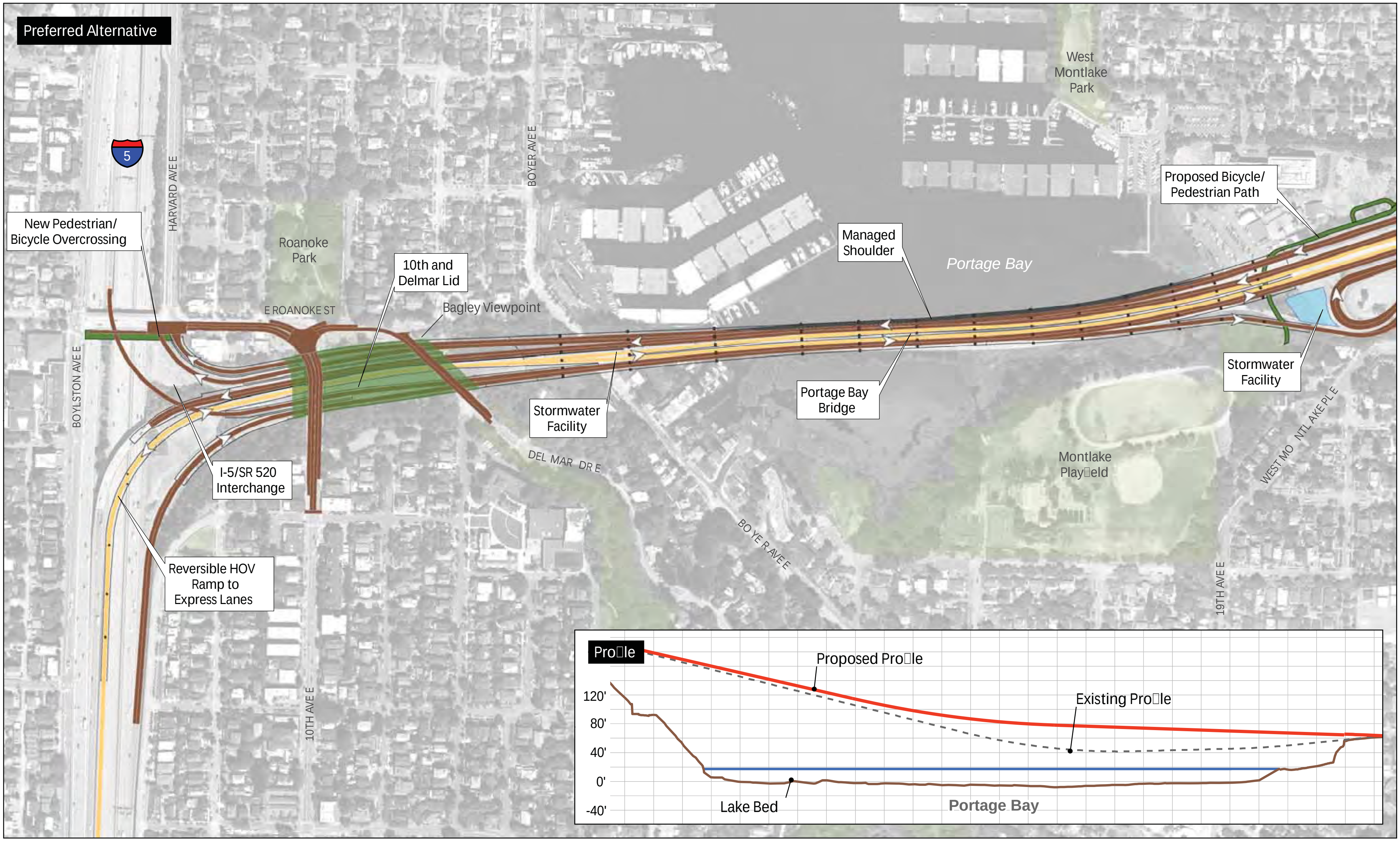
The SR 520 and I-5 interchange ramps will be reconstructed in generally the same configuration as those of the existing interchange. The only exceptions are that a new reversible HOV ramp will connect to the existing I-5 reversible express lanes south of SR 520, and the alignment of the ramp from northbound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

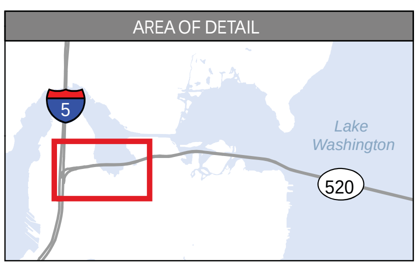
The East Roanoke Street bridge over I-5 will provide an enhanced pedestrian crossing. The 10th Avenue East and Delmar Drive East overcrossing will be rebuilt as part of the proposed lid structure, generally within the same alignment and with a vertical profile similar to the existing overcrossing.

2.2.2 Portage Bay Bridge

The existing Portage Bay Bridge will be replaced with a wider and, in places, higher structure. The height of the western half of the new bridge will match the height of the existing bridge, but the eastern half will be about 14 feet higher than the lower point of the existing bridge near the middle of Portage Bay and will remain higher than the existing bridge throughout the eastern portion of the bridge. The new Portage Bay Bridge will be a fixed-span bridge supported by larger but fewer concrete columns than the existing bridge. The new bridge will begin just east of Delmar Drive, extend across Portage Bay, and end west of Montlake Boulevard.

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. As shown in Exhibit 2-3, the new Portage Bay Bridge will have two general-purpose lanes and an HOV lane in each direction, plus a westbound managed shoulder. The design and construction elements of the Portage Bay Bridge are further described in Section 2.6.2.





- 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.

Exhibit 2-3. **Project Layout – I-5 to Portage Bay**

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

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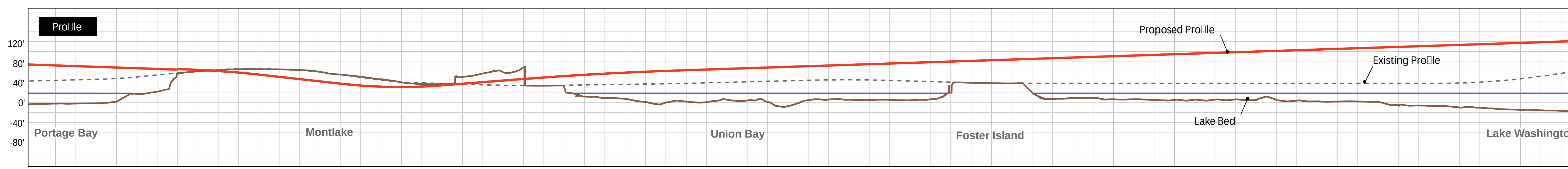
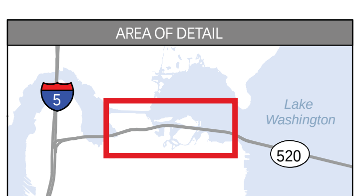
2.2.3 Montlake

The project will maintain the existing location of the Montlake interchange and add a new two-leaf bascule bridge (drawbridge) over the Montlake Cut, parallel to the existing Montlake Bridge. A two-leaf bascule bridge is a movable bridge with counterweights on each landward end that balance the leaves (or spans) as they are raised. Hydraulic or gear mechanical systems are used to operate the bridge. When open, the bridge provides unlimited vertical clearance for boat traffic.

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. 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 the existing alignment; however, the new bridge over SR 520 will be longer and wider than the existing bridge. A longer and wider bridge will be required to accommodate the additional lanes on SR 520 below Montlake Boulevard and to provide wider through lanes, shoulders, a center median, and additional turning lanes on Montlake Boulevard over SR 520. This bridge will be integrated as part of the new Montlake lid over SR 520.

The new bascule bridge will be constructed parallel to and just east of the existing Montlake Bridge. The new bridge will be approximately 60 feet wide, similar to the existing bridge. Each of the two bridges will operate with three lanes; the existing bridge will serve southbound traffic, and the new bridge will serve northbound traffic. In addition to the three travel lanes, each bridge will have a bicycle lane and sidewalks. Exhibit 2-4 shows the project layout from Portage Bay to the west approach, including the Montlake and bascule bridge area. The design and construction elements of the bascule bridge are further described in Section 2.6.3.





- 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.

Exhibit 2-4. **Project Layout – Portage Bay to Lake Washington**

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

2.2.4 West Approach

The SR 520 west approach structure will be replaced with wider fixed-span structures, and the alignment will shift to the north as it approaches the new floating span (Exhibit 2-4). Improvements in this area will also include the removal of the existing Lake Washington Boulevard eastbound on-ramp and westbound off-ramp and the R.H. Thomson Expressway ramps.

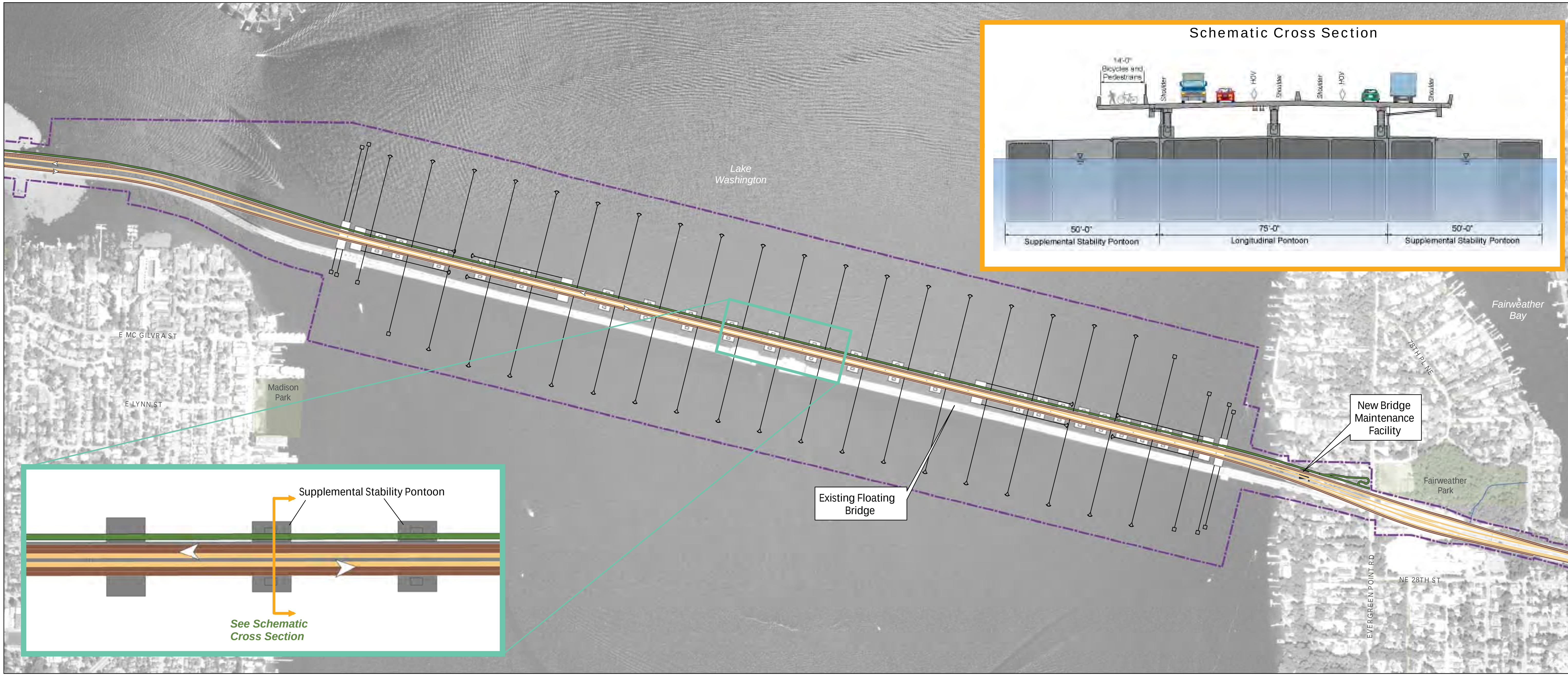
The existing layout of the west approach ranges between 60 and 150 feet in width (typically 60 feet), and the proposed structures will range between 112 and 255 feet in width. The vertical profile of the west approach will be raised by varying degrees relative to the existing profile. The new structures will be supported by concrete columns, but the number of total columns and in-water columns will be reduced relative to existing conditions.

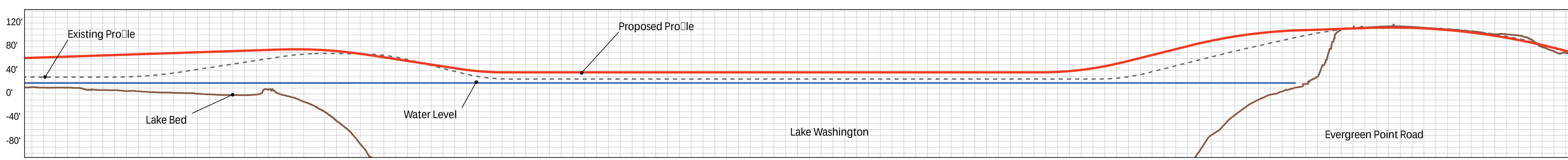
Vessels passing under the new west approach will be able to use two navigation channels: one opening located under the west transition span and the other opening located one span west of the transition span. The minimum span length under consideration for the west navigation channel openings is 150 feet, providing a minimum horizontal opening (channel width) of approximately 130 feet between piers. The minimum overhead vertical clearance for the west navigation channel will be 44 feet (the same as under existing conditions), with a minimum water depth at the west edge of the channel of approximately 23 feet. The design and construction elements of the west approach are further described in Section 2.6.4.

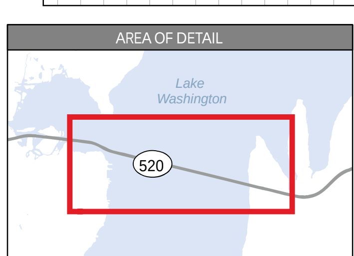
2.2.5 Floating Bridge

The floating bridge will be replaced with a new structure composed of support columns and a roadway deck constructed on a foundation of hollow concrete pontoons that will be connected in series across the deeper portion of the lake. Exhibit 2-5 shows the alignment of the floating bridge and its connections to the west and east approaches.

The new floating span will be located between 190 and 160 feet north of the existing bridge. The new six-lane floating bridge will consist of a single row of 21 longitudinal pontoons, 2 cross pontoons (one at each end of the floating bridge), and 54 supplemental stability pontoons. The new longitudinal pontoons will be larger than the existing ones to provide the flotation needed for wider lanes and shoulders; the supplemental stability pontoons will provide additional buoyancy and stability for a six-lane configuration. 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 (see Section 2.3.13 for a detailed description).







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.

Exhibit 2- 5. **Project Layout – Floating Bridge and Approaches**

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

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The roadway will be supported above the pontoons by concrete columns and rows of three steel trusses spaced 30 to 35 feet apart. Concrete columns will support the higher portions of the roadway at either end of the floating bridge, and the steel trusses will support the lower middle portion of the elevated roadway. The roadway of the new bridge will be approximately 10 feet higher than the existing bridge, and the roadway barrier will be no more than 21 feet above the lake surface. The new pontoons will have a deeper draft than the existing pontoons, extending between 21 and 29 feet below the surface of the water, compared to the existing pontoons, which extend 7 to 11 feet below the water surface. The design and construction elements of the floating bridge are further described in Section 2.3.15.

2.2.6 East Approach and Maintenance Facility

The east approach span will be replaced with a higher and wider structure, and the alignment will be shifted north. The navigation channel under the east approach will be maintained and will have a clear opening of approximately 190 feet wide, with 70 feet (maximum) vertical clearance above high water and a minimum water depth of 21 feet.

The east approach will be supported by 5 in-water columns, fewer than the existing 14 in-water columns, although the proposed columns will be constructed on top of two mudline footings instead of individual shaft footings like the existing columns. The structure will meet the existing highway at grade as it approaches Evergreen Point Road, east of the Lake Washington shoreline. A detailed description of the design and construction elements is provided in Section 2.6.6.

A bridge maintenance facility will be constructed underneath the east approach structure, between the east shore of Lake Washington and Evergreen Point Road. The new bridge maintenance facility will include a 12,000-square-foot two-story maintenance building built into the end abutment slope under the new east approach bridge, a working dock, and parking. The facility will serve as the maintenance crew duty station and provide shop space for small repair work, staging for maintenance materials, and moorage for two work boats that will be used for bridge maintenance activities. The T-shaped maintenance facility dock will be located underneath the new east approach to the Evergreen Point Bridge, extending about 100 feet offshore. The dock will replace the current moorage facility for maintenance vessels at the mid-span of the existing floating bridge. Exhibit 2-6 shows the project layout for the east approach and transition area.

2.2.7 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 Medina to SR 202 project) at Evergreen Point Road (Exhibit 2-6).

In order to connect the ramps and lanes for proper traffic operations, the SR 520 main line 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 Medina to SR 202 project.

2.2.8 Ancillary Project Features

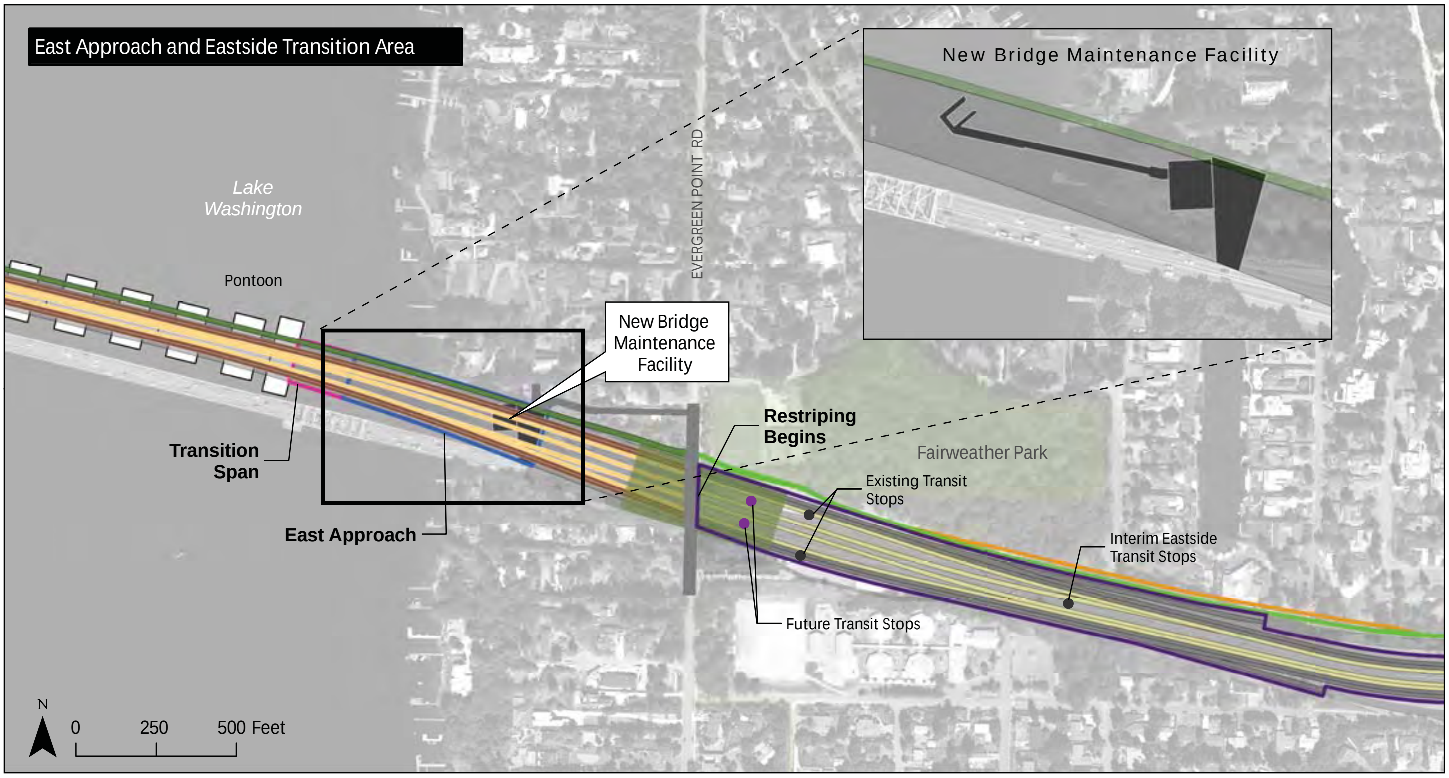
The project also includes ancillary features, such as a regional bicycle and pedestrian path, noise reduction measures, stormwater treatment facilities, and lighting. These features are summarized below.

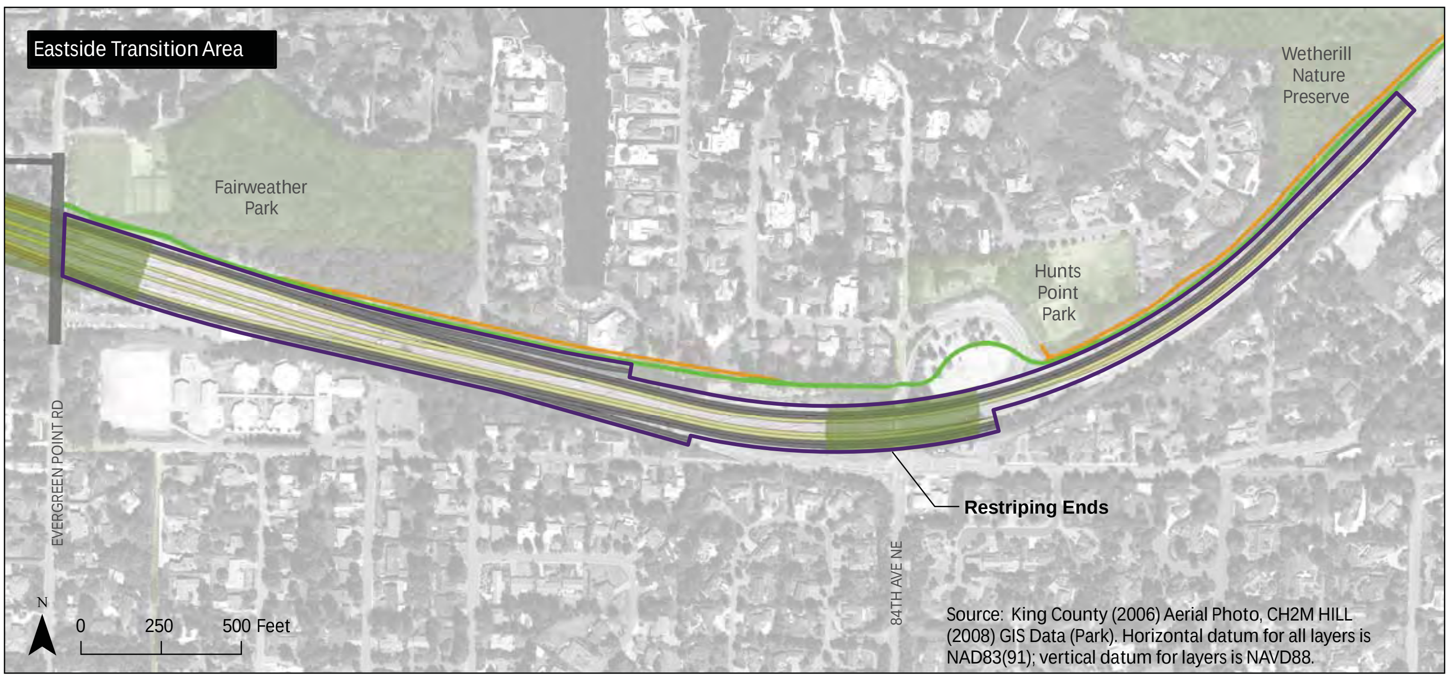
2.2.8.1 Regional Bicycle/Pedestrian Path

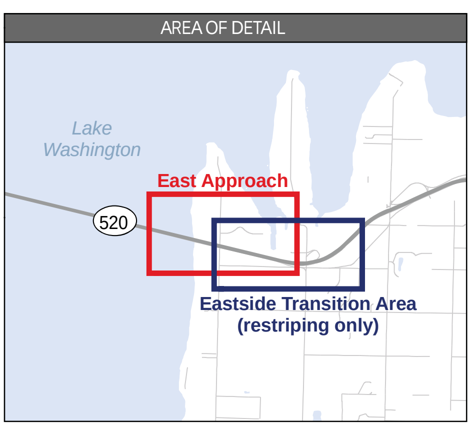
The project includes a 14-foot-wide bicycle/pedestrian path along the north side of SR 520 through the Montlake area and across the Evergreen Point Bridge to the Eastside. On the west side of the lake, the path will connect to the existing Bill Dawson Trail that crosses underneath SR 520 near the eastern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

2.2.8.2 Noise Reduction Measures

Under FHWA regulations (Code of Federal Regulations, Title 23, Part 772 [23 CFR 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 quieter concrete, along with other innovative noise reduction techniques such as noise-absorptive traffic 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 would meet all FHWA and WSDOT requirements for avoidance and minimization of adverse noise effects. However, in the areas where noise walls are warranted, they would 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.







I-5 to Medina Project Elements

- General-purpose lane
- HOV, direct access, and/or transit-only lanes
- Proposed bicycle/pedestrian path
- East Approach
- Transition Span
- Restriping area
- Pontoon

Medina to SR 202 Project Elements

- General-purpose lane
- HOV lane
- Bike path
- Points Loop Trail
- Local road improvements
- Eastside project lid

Exhibit 2-6. **Project Layout – East Approach and Transition Area**

2.2.8.3 Stormwater Treatment Facilities

The project includes the installation of stormwater treatment facilities to collect and treat stormwater runoff. Two types of facility that incorporate stormwater treatment methods approved by the Washington State Department of Ecology (Ecology) have been identified for the project: biofiltration swales and constructed stormwater treatment wetlands. The project will also provide a combination of high-efficiency sweeping and modified catch basins as the stormwater treatment technology for the floating bridge and roadway surfaces that drain to the floating bridge. 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 Wastewater Treatment Plant. A detailed discussion of stormwater treatment is provided in Section 2.7.1.

2.2.8.4 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. A detailed discussion of lighting is provided in Section 2.7.2.

2.3 Description of Construction Activities

This section describes the typical construction activities to be used for the project. This section places an emphasis on project elements that have the potential to affect listed species. Detailed discussions of the project construction (such as quantities, specifications, and impact calculations) are provided in Section 2.6.

Following is an overview of the typical construction activities and associated methods for the proposed in-water, over-water, and upland structures. Some specifics of the construction methods will be determined by the contractor. These activities include the following:

- Staging area establishment
- Materials transport
- Best management practice (BMP) implementation
- Site preparation activities
- Upland facility construction
- Work bridges/falsework construction
- Pile driving
- Drilled shaft construction
- Mudline footing construction
- Cofferdam 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
- Demolition, debris removal, and disposal

Roadway and bridge construction activities will require a variety of construction equipment. The types of equipment and their typical uses are shown in Exhibit 2-7. For certain activities, construction crews may also require more specialized equipment such as pile drivers, dewatering pumps and tanks, and conveyor belts. The use of specialized equipment is described as applicable in the descriptions of project elements in the following subsections.

EXHIBIT 2-7.
TYPICAL CONSTRUCTION EQUIPMENT AND POTENTIAL USE ON THE PROJECT

Equipment	Typical Use
Air compressor	Pneumatic tool power and general maintenance
Backhoe	General construction, excavations
Concrete pump	Concrete pumping
Concrete saw	Concrete removal, utilities access
Crane	Materials handling, removal, and replacement
Excavator	General construction and materials handling
Forklift	Staging area work and materials hauling
Haul truck	Materials handling, general hauling
Jackhammer	Pavement/concrete removal
Loader	General construction and materials handling
Paver	Roadway paving
Pile driver	Support installation for structures and hillsides
Pump	General construction use, water removal
Pneumatic tools	Miscellaneous construction work
Service truck	Equipment repair and maintenance
Tractor trailer	Material removal and delivery
Utility truck	General project work
Vibratory equipment	Activities to shore up hillsides or install piles

2.3.1 Staging Area Establishment

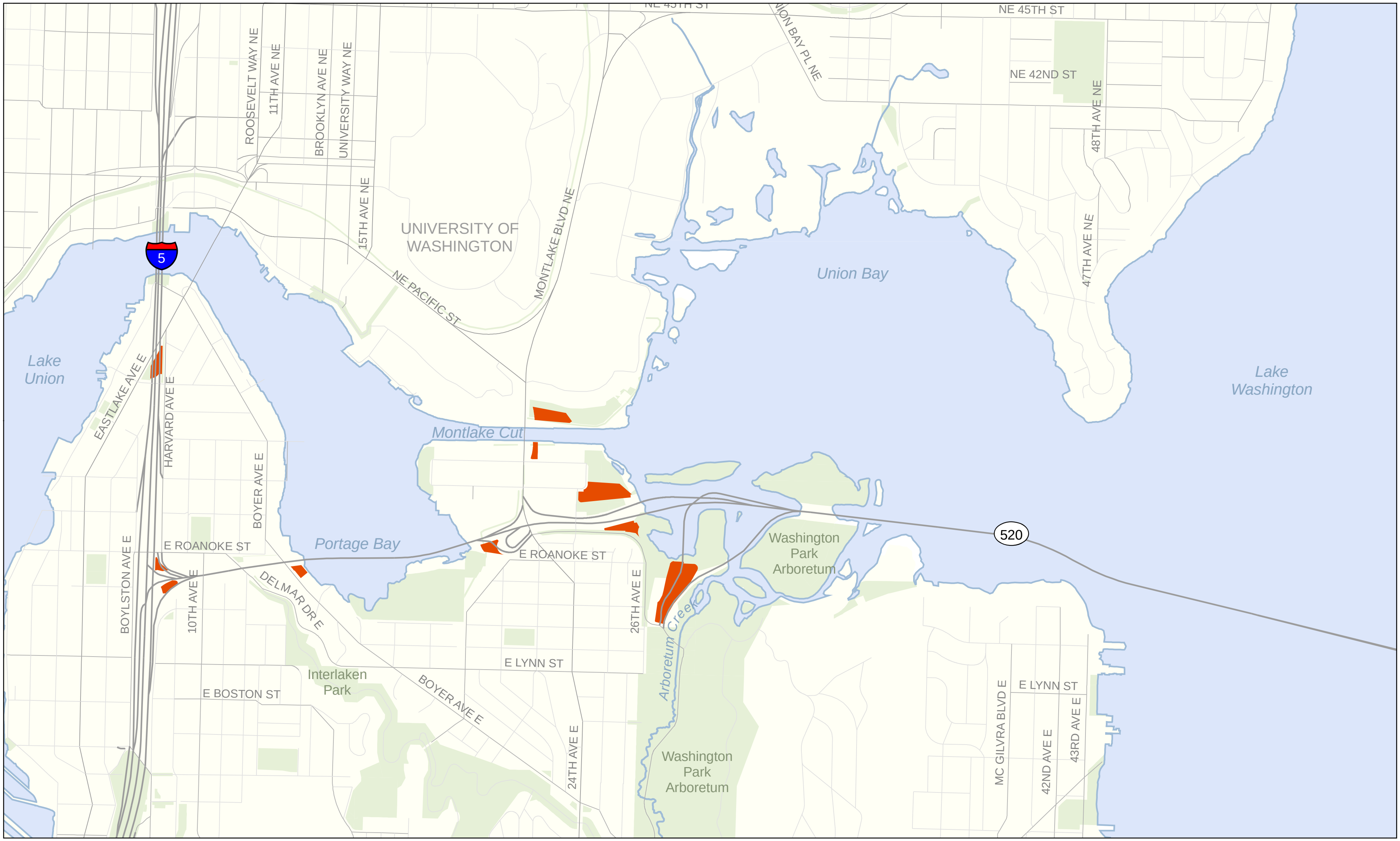
Construction along SR 520 will be staged from both land and water. Land-based construction staging areas (shown in Exhibit 2-8) will be used for delivering and storing construction materials and equipment, contractor offices and storage trailers, and employee parking. These areas will be fenced and typically located adjacent to areas of project construction. Construction staging areas will vary in size and could require grading or excavation to level the site and install drainage improvements, depending on site conditions. Drainage conveyance systems for the movement of stormwater from a collection point to an outfall may consist of drainage pipes and temporary stormwater facilities (such as ponds, vaults, and catch basins) and may use gravity or pumps to move the stormwater.

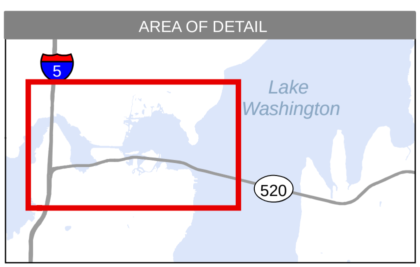
A variety of temporary construction BMPs will be used, including silt fences, berms, storm drain inlet protection, straw bale barriers, and detention or siltation ponds. Temporary driveways will be established from staging areas to the roadway network. Some staging areas may also be equipped with wheel washes that clean truck tires to reduce the amount of dirt and dust tracked off site. Specialized BMPs will be used around concrete-handling areas to prevent water that has come in contact with uncured cement from entering water bodies or stormwater facilities. See Section 2.10 for a complete list of project BMPs.

Project construction activities will occur within WSDOT right-of-way, where possible. Construction areas will be cleared of vegetation and any buildings or structures to provide adequate work space. Retained vegetation will be clearly marked to protect it from harm during clearing and use of the site. Staging area sites that are uneven will be graded flat to facilitate parking, storing materials and equipment, and setting up a construction trailer, if needed. A temporary fence will be installed around construction areas to prevent machinery and equipment, materials storage, and construction activity from intruding into adjacent properties, wetland and stream buffers, and shoreline areas.

Temporary erosion and sediment control (TESC) measures will be used to prevent the runoff of untreated stormwater and sediment from staging areas into city stormwater or sewer facilities, nearby wetlands or water bodies, or adjacent properties. WSDOT will develop and implement a spill prevention, control, and countermeasures (SPCC) plan to prevent and minimize the potential for spills of hazardous materials.

Office trailers, placed on temporary foundations, will be connected to available utilities, including power, telephone, water, and sewer, as needed. Connecting to these utilities may involve installing poles for power lines and excavating trenches to place water and sewer pipelines. After construction is completed, the staging areas will be restored and disconnected from any utilities.





Staging Area

Stream

Park

Source: King County (2005) GIS Data (Streams and Streets), King County (2007) GIS Data (Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

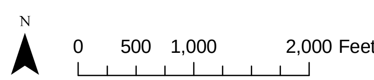


Exhibit 2-8. **Potential Staging Areas**

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

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Work bridges and barges will be used to stage construction over water. Work bridges will be used in shallow-water areas (typically less than 20 feet deep), where the depth is insufficient for the use of barges. Barges could be used to transport materials and employees and to serve as construction work platforms, or they may be moored to serve as over-water staging areas. Tugboats will be used to maneuver barges.

2.3.2 Materials Transport

Materials will be transported to and from the construction sites by trucks and barges. Trucks will travel over designated haul routes, including SR 520, I-5, and Interstate 405 (I-405). All haul routes will require approvals by local jurisdictions.

Potential construction haul routes include both local and regional roadways. Some of the haul routes will use streets that the City of Seattle classifies as "major truck streets." Major truck streets proposed for use during this project include Montlake Boulevard between SR 520 and NE Pacific Street. Other haul routes may also be located on arterial streets.

Haul routes for construction of the east approach will include SR 520, Evergreen Point Road, and 92nd Avenue NE. Temporary driveways would be constructed between the staging areas and the roadway network.

Barges and tugboats will be used extensively for transporting materials such as anchors, piles, sheet piles, steel beams, timber decking, steel hardware, pipe casing, excavation spoils, reinforcing cages and bar, formwork, scaffolding, both light and heavy equipment and vehicles, liquid holding tanks, concrete and concrete trucks, bridge girders or segments, bearings, expansion joints, utility pipes, conduits, and other miscellaneous materials.

Cranes with clamshell buckets and augers will be used to excavate sediment spoils from inside the drilled shafts or cofferdams and load them onto work bridges and barges. BMPs will be used to prevent excavated materials from entering surface waters. Barge-mounted cranes will be used to lift, load, and transfer materials to and from work bridges and barges to the construction locations. To facilitate the handling of materials and the construction of the in-water bridge components, the barge-mounted cranes will typically use spud piles that are integrated with the barge to fix the barge in place in shallow water. In areas of deeper water, anchors will be used to fix the barges in place during construction.

Concrete pumps and buckets will be used to transfer concrete from the mixer trucks to the construction locations. Pumps and hoses will be used to transfer displaced water and slurry to holding tanks or land-based facilities for treatment and reuse or disposal.

Tugboats will tow the floating bridge pontoons to Lake Washington and position them for assembly and will also support the installation of the pontoon anchors and anchor cables. Tugboats and barges will also transport the superstructure for the new bascule bridge over the Montlake Cut, and barge-mounted derricks will be used to lift and hold the sections in place during installation.

2.3.3 Site Preparation Activities

Project construction activities will be limited to areas within WSDOT right-of-way, where possible. Construction areas will be cleared of vegetation and any buildings or structures to provide adequate work space. Retained vegetation will be clearly marked to protect it from harm during clearing and use of the site.

Vegetation clearing will include the removal of branches and tree trunks but will generally leave the soil intact. Grubbing will include the removal of all vegetative matter (roots and debris) from the load-bearing surface of the soil. The TESC measures described below will be implemented before any clearing and grubbing activities.

2.3.4 Upland Facility Construction

Elements of roadway construction required for the project will include roadway excavation, roadway embankments, retaining walls, and paving of the new roadway surface. Construction of temporary roadways during construction activities will also be required. Other upland project construction elements include noise walls, construction and stormwater treatment systems, and landscaping. These upland construction elements are described below.

2.3.4.1 Roadway Excavation

Roadway excavation involves removing the ground surface or other material to the depth and width necessary to achieve a desired grade and slope for a roadway or structure. Material that is removed during excavation could be used as fill at other project construction locations if the materials meet the required standards.

2.3.4.2 Roadway Embankments

A roadway embankment is a raised area of fill often used in roadway approaches. Construction of roadway embankments consists of building up soil or rock to create a new ground surface at the elevation required for the new roadway or structure. Roadway embankments slope downward and away from the roadway; therefore, the higher the embankment, the wider the surface area needed at the base. To avoid later settlement, rollers and hauling equipment must thoroughly compact each layer of soil or rock. Retaining walls will be used to support the embankment fill area where other constraints may exist. For this project, roadway embankments will be constructed primarily in association with the improvements in the Montlake interchange area.

2.3.4.3 Retaining Walls

Retaining walls will be used to minimize the width of the roadway cut or fill. Because retaining walls can be virtually vertical, they result in a much smaller footprint than an earth slope. When a retaining wall is used to support a roadway that is higher than the surrounding ground, this is called a “fill” situation. Retaining walls can also be used for roads that are lower than the surrounding ground, supporting the adjacent soils and preventing them from slumping onto the roadway. Retaining walls are also used in areas where there is a high possibility of erosion, such as near a bridge abutment or water.

A retaining wall is designed to support only the soil load. The wall must have an area of free drainage between the retained soil and the back of the wall to prevent water pressure from developing and adding to the soil load. The drainage is usually provided by placing a layer of clean gravel and drainage pipes against the back of the wall. There are a variety of wall types; the type used depends on the structure it supports, the ground slope being retained, and the available area. Cast-in-place walls and mechanically stabilized earth walls are two types that would be used in constructing the SR 520 roadway. Retaining walls will be used primarily in association with lids and ramps. The major features of each wall type are described below.

Cast-in-Place Walls

Cast-in-place walls are concrete structures used to address the need for roadway cut or fill. Cast-in-place walls typically have a large foundation footing for wall stability, from which a narrower vertical wall rises to retain the soil. Typically, the footing is buried and not visible. Drainage is typically achieved through weep holes in the face of the wall or an underdrain system at the footing.

Mechanically Stabilized Earth Walls

Mechanically stabilized earth walls are typically used only in embankment construction for fill walls. The soil fill behind the wall is reinforced to stabilize the soil layers. These walls are constructed in layers approximately 1 to 3 feet deep; reinforcing material, such as geosynthetic fabric, is placed between layers of soil and attached to the wall face, which retains the soil. The earth in each layer is compacted, and the process is repeated until the necessary wall height is reached.

2.3.4.4 Roadway Paving

Two types of paving will be used for roadway construction: hot mix asphalt and concrete.

Hot Mix Asphalt Pavement

Hot mix asphalt pavement is a surfacing material made of asphalt oil mixed with specially graded crushed rock. Asphalt is a relatively flexible pavement and cannot support heavy traffic loads by itself; therefore, the asphalt is placed on a base of compacted crushed rock. Because of its lower cost and faster installation time, the project will use asphalt paving for temporary roads, temporary lane widening, and permanent surfacing on side streets and arterials that will convey fewer vehicles and vehicles traveling at lower speeds.

Concrete Pavement

Concrete is a more rigid material than asphalt and is strong enough to support heavy loads of traffic. A concrete mix designed for paving, such as Portland cement concrete, will be used on permanent ramps and for the SR 520 main line. Similar to asphalt, the cement will be placed on a thin layer of crushed rock base material. After the concrete pavement hardens sufficiently, lane striping can be applied and the roadway opened to traffic.

2.3.4.5 Temporary Roadways

Project construction will require the closure and demolition of some roadways, bridges, and ramps along the SR 520 corridor. Temporary roadways will be constructed to replace lost traffic functions, using techniques similar to those described above. Stormwater systems and safety elements, such as traffic barriers, will also be installed. Once the temporary roadways are in place, the traffic will be routed to the temporary facility. After the permanent structures are constructed, the temporary roadways will be deconstructed. The locations of temporary roadways that will be constructed along the corridor are identified in Section 2.6.

2.3.4.6 Noise Walls

Noise walls that will be used along the SR 520 corridor to reduce the effects of highway noise will typically be precast panels or cast-in-place walls. These noise walls can be cast in a wide variety of patterns to improve their aesthetics. On bridges, the noise walls will be cast into the traffic barrier. Noise walls are constructed to withstand the forces of wind and seismic loads.

2.3.4.7 Construction Water Treatment Systems

Treatment systems for construction water generally consist of temporary settling storage tanks, filtration systems, transfer pumps, and an outlet. The temporary settling storage tank provides residence time for large solids to settle out. The filtration system removes additional suspended solids larger than an acceptable size (25 microns typical). The pumps provide the pressure needed to move the water through the filter and then to an acceptable discharge location. Once the solids have been filtered out, the clean effluent is then suitable for discharge to a municipal storm drain or an acceptable discharge location. These systems can be located wherever dewatering is necessary, including on a work bridge or a barge.

2.3.4.8 Stormwater Treatment Facilities

Project construction will include the installation of stormwater facilities to collect and treat stormwater runoff from impervious surfaces such as roads, bridges, and other hard surfaces such as staging areas. The type of facility constructed depends on the topography, profile of the road or bridge segment, availability of land, and availability and proximity of an outfall site for collected and treated water. These facilities are described in detail in Section 2.7.1.

2.3.4.9 Landscaping

Temporarily affected natural habitat, vegetation, and neighborhood tree screens will be revegetated with species similar to those removed. Scrub-shrub and forested wetlands that are temporarily affected during construction will be replanted with appropriate wetland vegetation after the construction disturbances end. Areas that will be landscaped are located under the Portage Bay Bridge in Roanoke Park and through Montlake, in particular, at the National Oceanographic and Atmospheric Administration (NOAA) Northwest Fisheries Science Center, East Montlake Park, Foster Island, and the Washington Park Arboretum.

The Museum of History and Industry (MOHAI) site and the remaining portion of East Montlake Park will be redesigned in cooperation with the Seattle Parks and Recreation Department (Seattle Parks). Foster Island will require restoration, including shoreline and buffer restoration. Union Bay will also require revegetation in the areas from which the R.H. Thomson Expressway ramps were removed. The new Montlake lid will also be landscaped.

2.3.5 Work Bridges

Construction work bridges will be built in four general areas along the project alignment: Portage Bay, Union Bay, and Lake Washington near the east and west bridge approaches. Work bridges are proposed in shallow-water areas that will preclude over-water and in-water construction from barges. Each of these shallow-water areas is expected to need two construction work bridges, one on either side (north and south) of the new alignment. Work bridges are expected to also be used for demolition purposes. There will be periods when both the north and south work bridges are functional, depending on the construction requirements. In addition, construction is expected to occur simultaneously in more than one of the four in-water work areas.

The typical layout of a construction work bridge consists of about a 30-foot-wide structure, with heavy timber decking supported by steel beams (Exhibit 2-9). Pile bents (lateral rows of three to four piles) are spaced at 30- to 50-foot intervals, with each pile driven below the mudline to a depth that will provide the capacity to support the large cranes and other construction equipment. The spacing of the pile bents is likely to be maximized to reduce the number of piles needed; however, providing sufficient structural support will be the primary purpose. A vibratory hammer will be used to initially insert the piles; however, an impact hammer will be used to complete the installation and confirm the load-bearing capacity of each pile at the end of the pile-driving process. Noise abatement BMPs will be used to minimize the in-water noise levels during pile-driving activities.

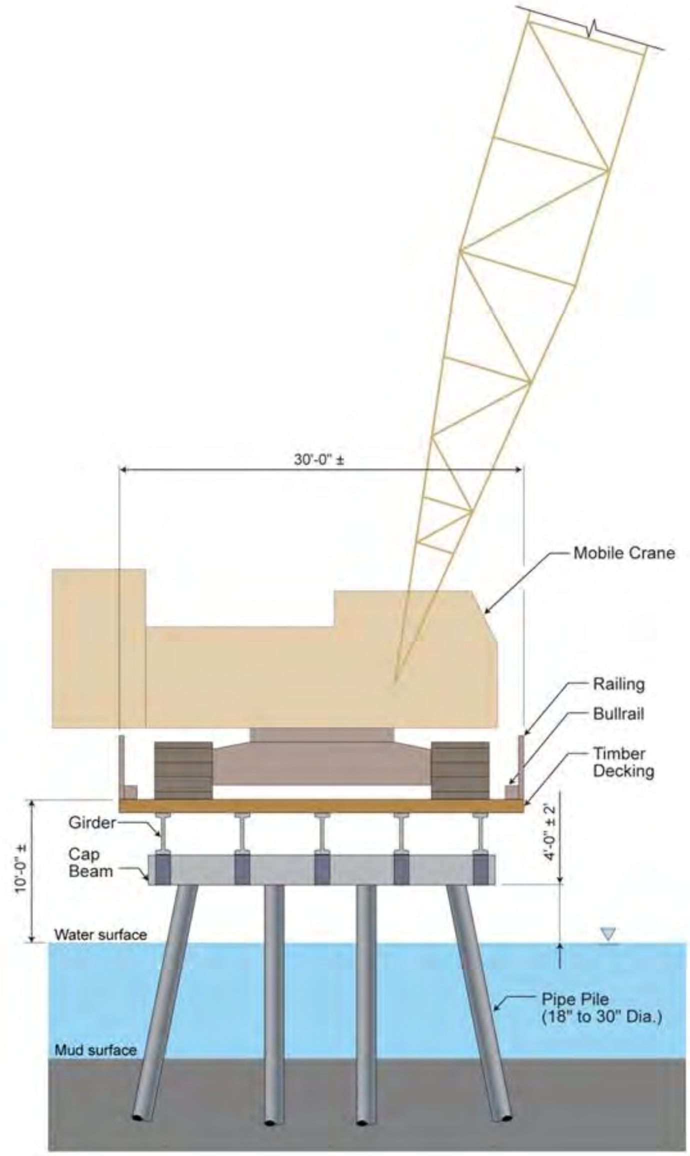


EXHIBIT 2-9.
TYPICAL CROSS SECTION OF A WORK BRIDGE

Work bridges will be built on driven piles installed from a mobile crane (Exhibit 2-10). The crane will begin driving piles from the shore and will progress out toward and into the water. After two lateral rows of piles have been driven, pile driving will cease, and cap beams will be fastened or welded to the tops of the pile rows. The cap beam connects the piles together in a group (pile bent) and provides a transverse support for the longitudinal beams that span between bents. The bents will also likely include battered piles (piles driven into the ground at an angle) for additional lateral support. The crane will lift the longitudinal beams into place between the bents, where they will be welded or bolted to the cap beams and will serve as the support for the timber deck members. After installation of the deck members, the mobile crane will drive out onto the newly constructed span to drive additional waterward pile bents. The sequence of activities described above will be repeated and progression over the water will continue until the work bridge is completed. Multiple pile-driving operations will likely take place simultaneously to construct a single work bridge, such as a work bridge with shoreline connections on both sides (Portage Bay and Union Bay); work may begin at each shoreline and converge in a common location over the water. Multiple work bridges may also be constructed simultaneously in the different construction areas.

EXHIBIT 2-10.
CONSTRUCTION OF A WORK BRIDGE ON PILES DRIVEN FROM A MOBILE CRANE

Work bridge construction requirements are based on the following assumptions:

- Work bridges are required where the water depth is less than about 10 feet at low water, although they may be used at depths of up to 30 feet in the east and west approach areas.
- Work bridges will be used for both new construction and demolition of existing structures.
- The work bridges need to be a minimum of 30 feet wide to allow access for heavy cranes and passage for two-way construction traffic.
- One vertical pile will be required for approximately every 300 square feet of work bridge.
- Work bridge piles will be up to 30-inch-diameter pipe piles.

2.3.6 Falsework

Falsework is a temporary structure that supports permanent bridge structures during construction (Exhibit 2-11). It carries the weight of the permanent structure until the permanent structure is capable of supporting its own weight. For example, falsework often supports cast-in-place concrete formwork that holds the freshly placed concrete of a bridge deck foundation. After the concrete of the major structural elements has hardened and attained sufficient strength for the bridge to support its own weight, the formwork and falsework can be removed. Falsework generally consists of steel pipe and/or timber columns, piles, beams, and bracing elements or scaffolding to support the plywood and dimensional lumber (2 by 4, 4 by 4, etc.) formwork.

EXHIBIT 2-11.
FALSEWORK, A TEMPORARY STRUCTURE TO SUPPORT A PERMANENT BRIDGE STRUCTURE

The falsework design will be similar to the work bridge design, with the exception that the falsework may not require the use of battered piles. The falsework may use a system of lateral bracing with steel members and wire rope. Also, falsework could take advantage of the battered piles used in the work bridge by connecting to the work bridge with structural bracing elements.

Falsework construction techniques are similar to work bridge construction techniques, except that construction does not need to progress from the shoreline out over the water. Falsework can be built from the work bridge (after completion of the work bridge) or barge and can be removed before the work bridge is removed.

2.3.7 Pile Driving

Piles will be installed using a combination of vibratory pile driving and impact pile driving. Pile driving in general will be performed by advancing a crane out along the work bridges as they are completed in a waterward direction. A single crane can be equipped with either a vibratory hammer or an impact hammer, depending on the need (Exhibit 2-12).

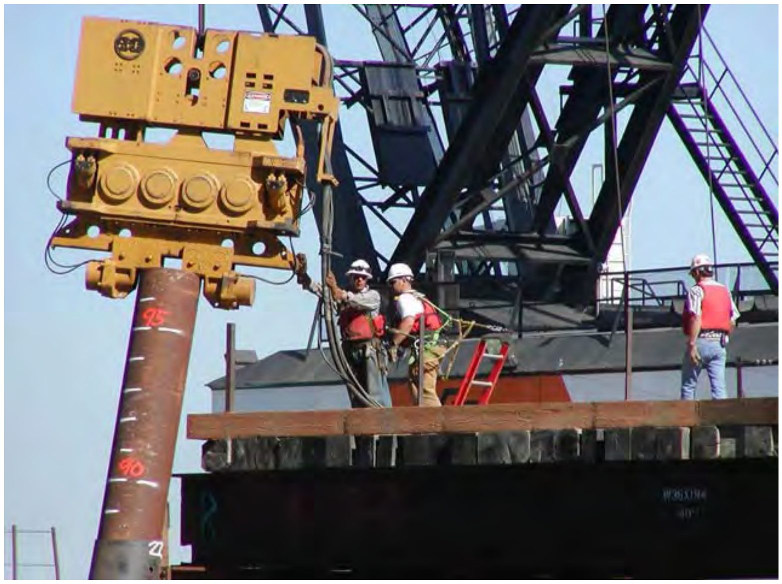


EXHIBIT 2-12.
BATTERED PILE INSTALLATION WITH A VIBRATORY HAMMER

Vibratory pile driving uses a vibratory hammer to create a rapid succession of impacts that liquefy and loosen the soils. The vibratory hammer is also designed with heavy steel weights that load the pile and help push it into the ground. This method is best suited for wet sandy or gravelly soils that contain water, but it can be used in a variety of mixed soils with some success.

The main disadvantages of vibratory pile driving are the following:

- Inability to penetrate into hard and/or dense soils
- Inability to estimate bearing capacity upon completion of driving

Because of these issues, vibratory pile driving cannot be used as the sole installation method for load-bearing piles. Vibratory driving can potentially be used for the initial stages of pile driving, finishing with impact driving to achieve adequate load-bearing capacities and “proof” the pile.

Impact pile driving involves impacting the top (head) of the pile with a large hammer until it develops the desired bearing strength and/or tip elevation (design depth of the pile bottom). Impact driving is the most common and versatile type of pile installation and will be necessary for this project. Impact driving can be performed on a wide variety of pile types and sizes and in almost any soil type. It can also be used successfully where many different soil types are encountered during the driving of a single pile. Impact driving is one commonly used installation method that allows for an estimation of the bearing capacity of the pile. Several widely used methods are available for correlating the hammer input energy and corresponding pile displacement with the ultimate bearing capacity of the pile.

Pile driving will be required to build the construction work bridges in four general areas along the bridge corridor: Portage Bay, Union Bay, and Lake Washington near the east and west approaches to the floating bridge. Each pile-driving crew is expected to install a maximum of eight piles a day at a single work bridge heading, with an average of 500 impact strikes required for each pile. To optimize the use of the proposed in-water construction periods, several pile-driving crews may be working at the same time, and pile driving could occur concurrently at multiple locations. However, for any given section of work bridge (Portage Bay, Union Bay, west and east approach) 16 or fewer piles will be driven in a day, requiring approximately 8,000 pile strikes (500 strikes times 16 piles). The falsework piles will not need to have the same bearing capacity as the work bridges; therefore, they will be installed primarily with a vibratory hammer, but the 16 piles per day limit is still expected to apply to these structures as well. A complete description of pile driving rates and durations are provided in Sections 6.2.1 through 6.2.6.

2.3.8 Drilled Shaft Construction

The fixed portions of the proposed bridges will be supported by reinforced-concrete drilled shaft foundations. Possible equipment to be used for drilled shaft construction is as follows: a vibratory pile-driving hammer, a crane-mounted rotator/oscillator, a crane-mounted drill auger, a crane-mounted rock drill, an excavator grab bucket, a front-end loader, a concrete tremie, a concrete pump truck, ready-mix concrete trucks, concrete vibrators, cross sonic logging testing equipment, pumps, and holding tanks. Typical drilled shafts for this project will be between 6 and 10 feet in diameter and drilled with an auger. A typical installation for this project is expected to require 2 to 7 days of work per shaft, depending on the conditions.

Drilled shafts must be drilled to precise position and plumbness tolerances. These tolerances may be difficult to achieve over open water without an alignment system to serve as a guide. A typical system will consist of a template composed of driven steel piles connected to steel beams. The number of piles needed will likely range from two to four for each shaft; these piles can be vibrated into position.

An alternative guide system may consist of a steel frame or other type of fixed-lead system welded to the barge, which will not require driving template piles. Work bridge piles may also be used as a template and to help position the shafts.

Construction activities related to in-water drilled shafts will be staged from land, work bridges, or barges, typically using a casing pipe or cofferdam to isolate the drilling work from the aquatic habitat (see cofferdam description below). The casing pipe will be lowered by crane to the substrate and vibrated into position (Exhibit 2-13), such that the bottom of the casing is deep enough to prevent the hole from caving in and the top of the casing is above the waterline. After the casing has been installed, a crane will lower the auger and begin to drill into the substrate/soil material, stopping and lifting the auger periodically to pull the substrate/soil out of the hole and deposit it on the land, work bridge, or barge (Exhibit 2-14).

EXHIBIT 2-13.
DRILLED SHAFT CASING INSTALLATION WITH A VIBRATORY HAMMER

EXHIBIT 2-14.
AUGER USED FOR EXCAVATING SOILS INSIDE A DRILLED SHAFT CASING

It may also be necessary to advance the casing during the augering process or to fill the casing with a bentonite slurry to support the walls of the boring hole. The boring spoils, including any bentonite slurry, will be fully contained and transported off site by barge or loaded into dump trucks to be hauled to an approved disposal site.

After the shaft excavation is completed, a prefabricated reinforcing steel shaft cage is lowered into the excavation, and concrete is pumped into the casing, displacing the water or slurry.

The water or slurry will be contained, collected, and treated before reuse or disposal. During the concrete placement, the casing pipe may be gradually extracted but will remain at least partially in place to form the top of the shaft.

2.3.9 Mudline Footing Construction

To gain sufficient load capacity, it may be necessary to have more than one shaft to support each column and shaft caps to transmit loads from the bridge columns to the shaft group. Mudline (lake bed) footings are typically placed at or partially below the mudline. The size of a footing depends on the number and size of shafts in the shaft group. Footings are typically rectangular and extend several feet past the shafts on all four sides. Three mudline footings are expected to be needed in Portage Bay and two in the east approach area.

Mudline footings require the construction of a cofferdam (see cofferdam description below). After the cofferdam is installed and dewatered, a reinforcing cage for the footing can be constructed around the reinforcing rebar cages extending from the previously constructed shafts. Column steel reinforcing will be placed into the footing reinforcing cage and braced before the footing is completed. Concrete formwork for the sides of the footing will then be set, aligned, and braced before the concrete is poured, consolidated, and finished. This process is expected to take approximately 10 days per footing.

Possible equipment to be used for mudline footing (and cofferdam) construction includes a crane, a vibratory hammer, a crane clam bucket attachment for excavation, a concrete pump truck, a concrete tremie, dewatering pumps, and ready-mix concrete trucks. Expected materials include steel sheet piling, steel wide-flange walers, sawdust or other interlock sealant, underwater concrete for seal course, steel reinforcing bar, and structural concrete. Lake bed substrate will be restored above the mudline footings after construction is completed, where feasible.

2.3.10 Cofferdam Construction

Cofferdams are built to isolate in-water construction activities (e.g., drilled shafts and mudline footings) from open water. The cofferdams will be constructed by vibrating template (spud) piles or beams to guide the construction of the sheet pile enclosure. The sheet piles will be vibrated about 20 feet into the substrate, around the perimeter of the work area. Steel walers, frames, and struts will then be installed around the inside perimeter of the sheet piles and supported on the spud piles or from the drilled shafts to provide a template for the layout of the sheet piles on the outside of the frames (Exhibit 2-15). Interlock sealant (e.g., sawdust) may then be applied to sheet pile joints to keep them watertight. Inside the cofferdam, two or more levels of waler frames may be needed for deeper-water applications. Because cofferdams are built in the water and spud pile and sheet pile driving are involved, they will not be built or removed outside the proposed in-water construction periods. However, once the cofferdams are installed, work inside the cofferdam can occur at any time. A typical cofferdam installation for this project is expected to last 2 to 3 weeks.

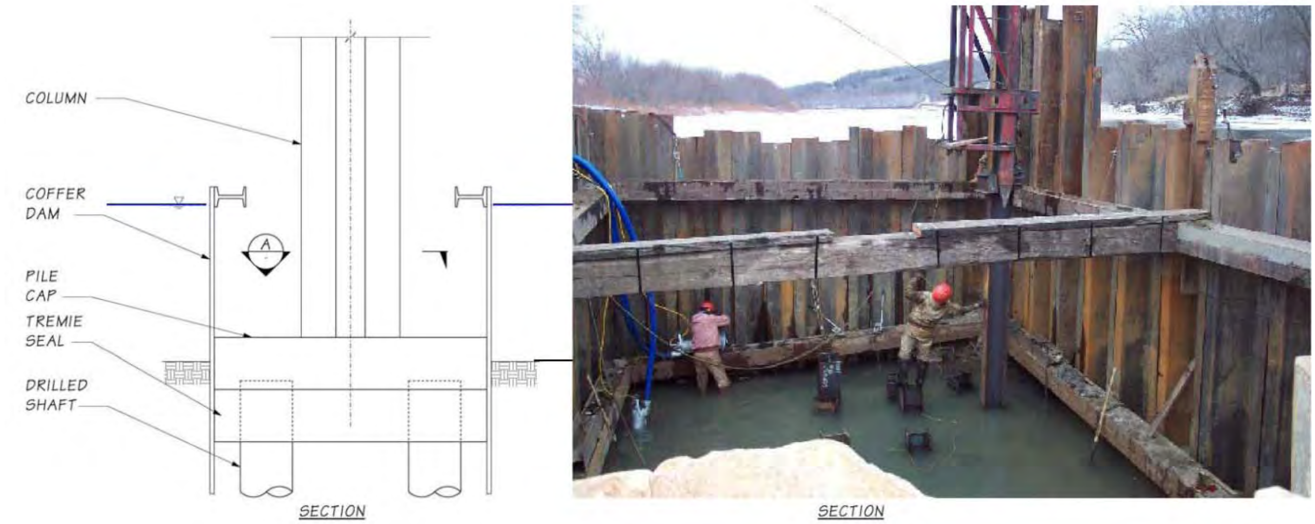


EXHIBIT 2-15.
COFFERDAM CONSTRUCTION

After completion of the cofferdam, any trapped fish will be removed using approved WSDOT fish handling and exclusion protocols or appropriately adapted and approved methods (WSDOT 2009a). The area within the cofferdam will then be excavated below the existing mudline with a clamshell bucket, sealed with concrete, and dewatered. All excavated soils will be transferred into dump trucks on the work bridge or contained on work barges, and hauled off site for proper disposal. Appropriate BMPs, such as containment tarps, will be used to prevent excavated material from entering open-water areas.

When the area inside the cofferdam is excavated, the footing seal will be cast by pumping concrete through a pipe (tremie) into the bottom of the cofferdam and allowed to set underwater (Exhibit 2-16). The seal acts to resist buoyancy of the cofferdam and prevent water inflow after the cofferdam is dewatered. Typically, cofferdams will be about 4 to 6 feet wider than the footing to be constructed. As the concrete seal is poured, water will be pumped from the top of the cofferdam to keep the water level inside and outside of the cofferdam equal to prevent any overflow to the surrounding water. The water coming out of the cofferdam will be stored (e.g., in a Baker tank) and treated before being discharged. After the seal has set sufficiently to withstand the hydrostatic pressure, the cofferdam will be pumped dry, and again, the pumped water will be stored and treated before being discharged. Construction will begin inside the dewatered cofferdam, isolating the work from the open water and preventing effects on water quality.

EXHIBIT 2-16.
CONCRETE PUMP TRUCKS PLACING UNDERWATER CONCRETE FOR A SEAL INSIDE A COFFERDAM

To construct mudline footings, three cofferdams will be installed within Portage Bay, and two will be installed in the east approach area, with additional cofferdams potentially needed for constructing footings in other areas (pending results of geotechnical investigations). Cofferdams will remain in place until the concrete footings, shafts, and/or columns within the structure have cured for at least 72 hours. The cofferdam removal process is described in Section 2.3.17.

2.3.11 Column/Pier Construction

Concrete columns are vertical structural elements that extend from the top of the shaft or footing, connecting the bridge superstructure or pier caps (cross beams) to the foundation (e.g., drilled shaft) below (see Exhibit 2-17). In situations where the bridge profile is close to the water surface, the columns will extend through the entire water column to the top of the shaft (located below the mudline) to balance lateral stiffness between adjacent piers and frames. In-water work to install the columns will be accomplished inside the large-diameter drilled shaft casing or cofferdam to isolate the work from the open water. The casings or cofferdams allow construction access below the waterline to install the column reinforcing steel and column formwork needed to pour the concrete column under dry conditions. The columns will be constructed from work bridges or barges. The construction activities, equipment, and BMPs will be similar to those described above for the drilled shafts.

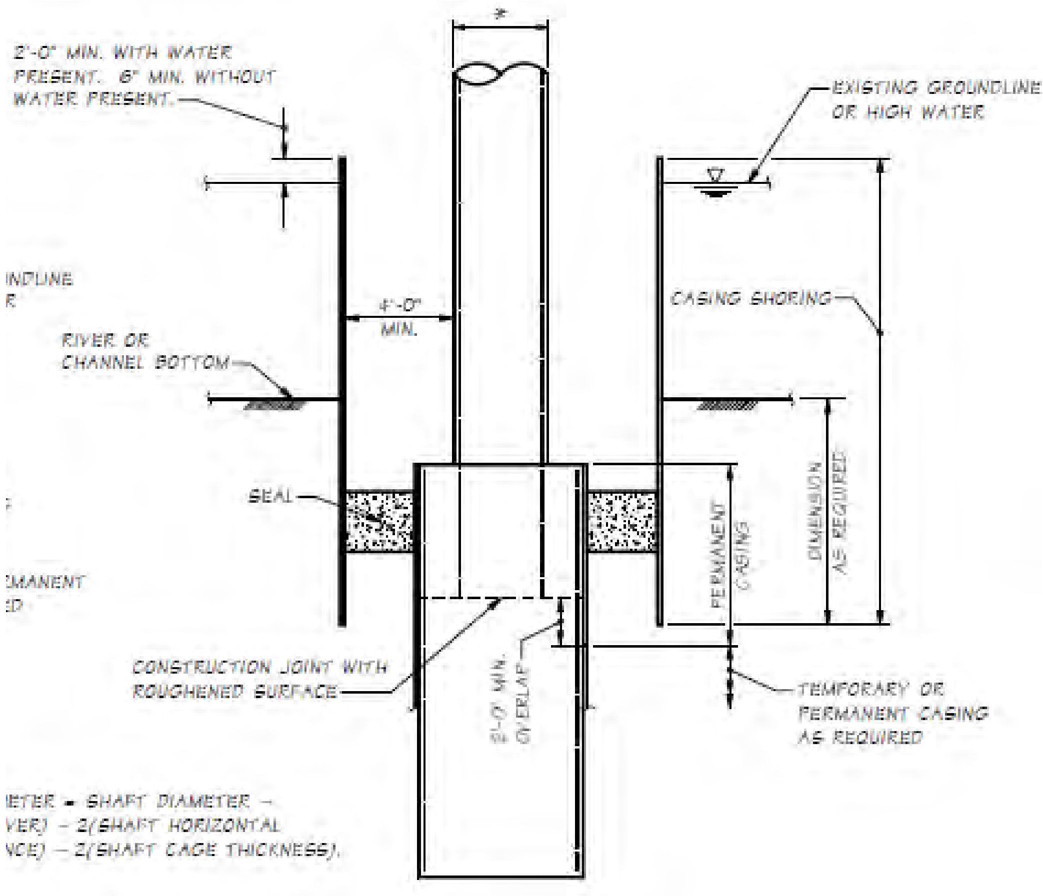


EXHIBIT 2-17.
COLUMN DETAIL FOR BELOW-WATER CONSTRUCTION

The columns are currently expected to be cylindrical; however, the final design may warrant columns of a different shape (e.g., square) to better meet the load-bearing requirements or provide the aesthetic details.

2.3.11.1 Column Construction below the Waterline

During the drilled shaft construction, a large-diameter pipe—called a casing shoring—is placed around the shaft casing. This dewatered casing shoring and seal perform the same function as a cofferdam, allowing construction access below the waterline (see Exhibit 2-15 and the cofferdam description in Section 2.3.9). The reinforcing steel for the column is installed in the shaft transition pour. The column formwork is then set and aligned, and the concrete is placed.

The columns will be constructed from work bridges or barges. Possible equipment to be used for below-water column construction includes cranes, barge-mounted cranes, concrete tremies, and concrete pump trucks.

2.3.12 Fixed Bridge Superstructure Construction

The bridge superstructure will be constructed on top of the support columns, typically with pier caps spanning several individual columns to distribute the weight of the bridge. The pier caps require a soffit-forming system to support the weight of the reinforcing steel and wet concrete. This soffit support system will be supported either directly off the concrete columns or with falsework shoring. Once the soffit support system is in place, the concrete forms will be installed, aligned, and adjusted to grade. Reinforcing steel will be placed and secured within the concrete forms and the concrete poured. After the pier cap concrete has cured and achieved adequate strength, the forms—including the soffit support system—will be removed.

For precast-concrete girder construction, spans between pier caps are set on the pier caps using cranes operating from either work bridges or barges. Roadway deck soffit forms will be supported from the precast girders and will then support the reinforcing steel and fresh concrete for the concrete roadway deck. After the roadway deck concrete has cured and achieved adequate strength, the forms—including the soffit support system—will be removed.

Cast-in-place concrete box girder construction will be used for some of the Portage Bay and east approach structures. Generally, span lengths for cast-in-place box girder bridges are between 100 and 260 feet. It is anticipated that most of the applications for this type of bridge will have a superstructure with the same thickness, although the east approach structure may include a superstructure of variable thickness.

For cast-in-place construction, falsework is constructed first, directly under and adjacent to the bridge area. Forms for the girders and deck are placed on top of the falsework, reinforcing steel is installed inside the forms, and concrete is poured.

Falsework shoring will support the weight of the superstructure during the construction of the cast-in-place box girders. A bottom soffit form will be erected and the bottom slab reinforcing steel and concrete placed. Finally, the top slab soffit forms will be installed, reinforcing steel placed, a screed rails set, and a finishing machine positioned on the rails. The superstructure will then be post-tensioned and traffic barriers will be installed to complete the bridge.

Segmental concrete-balanced cantilever construction may be used where the span lengths are moderate to long and the use of falsework is infeasible, such as over deep water. Span lengths of 200 to 320 feet are typical for constant depth superstructures, and spans of 300 to 600 feet are typical for variable thickness superstructures. Segmental concrete bridges may be either precast or cast-in-place structures. Precast concrete is used whenever there is sufficient repetition in the number of spans and segments to warrant its use.

Segmental concrete-balanced cantilever construction also requires falsework to form a table top or pier table from which to begin construction of the balanced cantilevers. An initial segment of the bridge, approximately 30 to 45 feet long, will be cast on this pier table, which also includes the pier cross beam. Then form travelers, which are mechanical formwork, will be placed on top of the pier table. The forms will be extended out from the pier in both directions, balanced on the pier. For cast-in-place segmental construction, segments are formed at both ends, reinforcing steel is placed, concrete is cast and cured, and the forms are released and moved forward. The cycle time for each segment is approximately 1 week.

2.3.13 Bascule Bridge Construction

The project also includes construction of a new bascule bridge over the Montlake Cut, east of the existing bridge. Most construction activities will be staged from the shoreline; however, derrick barges will also be temporarily positioned in the Montlake Cut and stabilized by spud anchors at the corners of the barge or by tugboats. The upland work will consist of constructing upland pier supports, which will form the foundation for the bridge superstructure. After the upland pier supports are completed, the bascule-leaf structural steel members will be assembled piece by piece on site, or the entire leaf may be assembled off site, barged to the construction site, and erected with several derrick barges. In either case, a barge-mounted derrick will lift the bridge sections into position while they are attached to the support structures.

These activities will likely require periodically closing the Montlake Cut to boat traffic. A total of six closures may be necessary over a 3- to 4-week period, typically only during barge moorage. Any barge moorage for span erection support would occur for less than 48 hours at a time. The Montlake Cut will be only partially closed to over-height marine traffic throughout the over-water construction period because the new bridge deck will be poured during two separate events, leaving one bridge leaf open while the other half is poured. The construction barges will likely be located in the Montlake Cut only during actual bridge assembly work. Based on these closure requirements, it is likely that this work will be scheduled for periods of low use by boat traffic.

2.3.14 Anchor Installation

The new floating bridge will be secured in place with 58 anchors. As with the existing bridge, the two primary anchor types will be (1) gravity anchors for harder lake bed materials and sloped areas (likely 13 such anchors, near the shores), and (2) fluke anchors for soft bottom sediments and flat areas (likely 45 such anchors, middle of the lake). Both types of anchors will be deployed using a barge-mounted crane and connected to the floating pontoons with high-strength steel cables. In addition to these two primary anchor types, shaft anchors could be used in portions of the lake where gravity anchors would pose a navigation hazard. It is estimated that shaft anchors might be more appropriate for the shallowest gravity anchor locations (up to about 6 of these 13 locations).

Gravity and fluke anchors are reinforced-concrete structures that will be built off site, at one of the existing facilities described in Section 2.5 and transported by barge to Lake Washington for installation (Exhibits 2-18 and 2-19).

EXHIBIT 2-18.
FLUKE ANCHOR CONSTRUCTED FOR THE LACEY V. MURROW PROJECT

EXHIBIT 2-19.
GRAVITY ANCHOR SEGMENT INSTALLATION FOR THE LACEY V. MURROW PROJECT

Gravity anchors consist of large concrete blocks stacked on top of one another to provide the necessary weight to hold the pontoons in place. The number of stacked segments that make up each gravity anchor varies depending on the anchor location, which will be determined during final design. Gravity anchors are likely to be as large as 30 feet long by 30 feet wide by 20 feet tall. The installation of gravity anchors requires that the substrate be generally level, although these anchors are primarily specified for use in the sloping portion of the lake bed. Therefore, some excavation and/or fill is typically needed to establish a level footing for anchor installation. Exhibit 2-20 is a diagram of an installed gravity anchor.

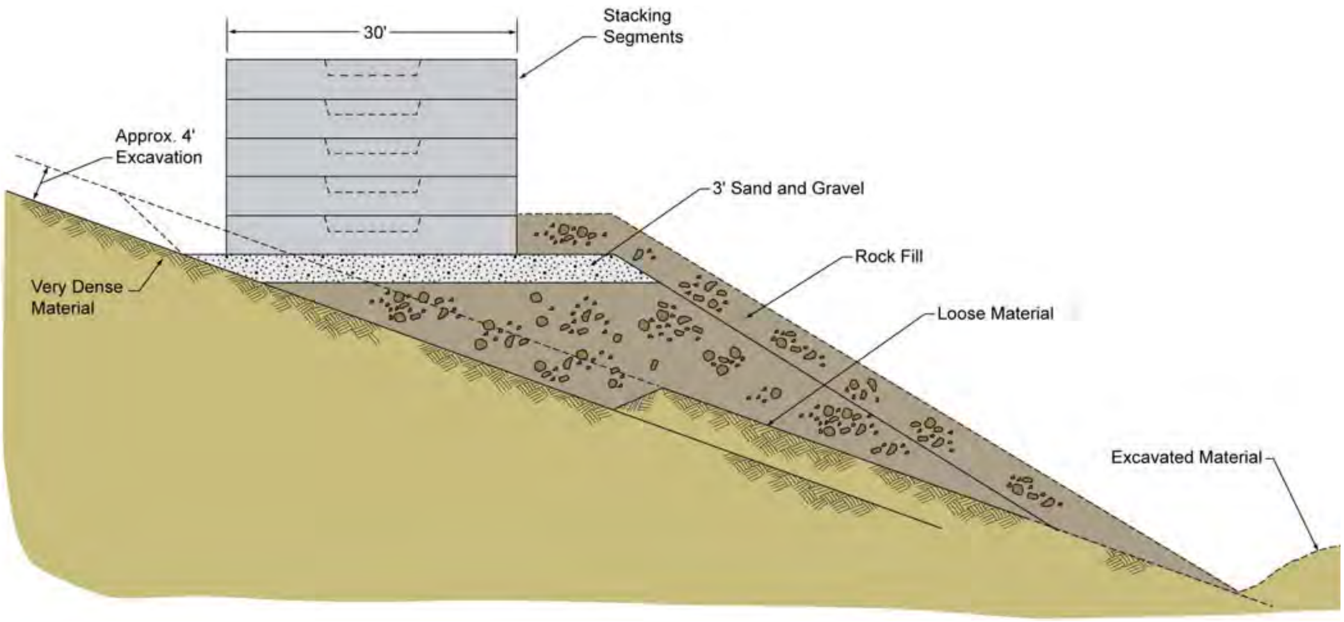


EXHIBIT 2-20.
TYPICAL GRAVITY ANCHOR INSTALLATION ON A SLOPE

Fluke anchors are installed using a combination of their own weight and water-jetting to set them below the mudline (Exhibit 2-21). Water supplied by pumps and hoses is jetted through pipes cast into the concrete anchors. As the high-pressure water exits the bottom of the anchor, it liquefies the soft substrate and allows the anchors to penetrate the substrate. Fluke anchors are likely to be as large as 40 feet long by 20 feet wide by 20 feet tall. Shaft anchors will be constructed in the same manner as the drilled shaft foundation elements (see Section 2.3.7).

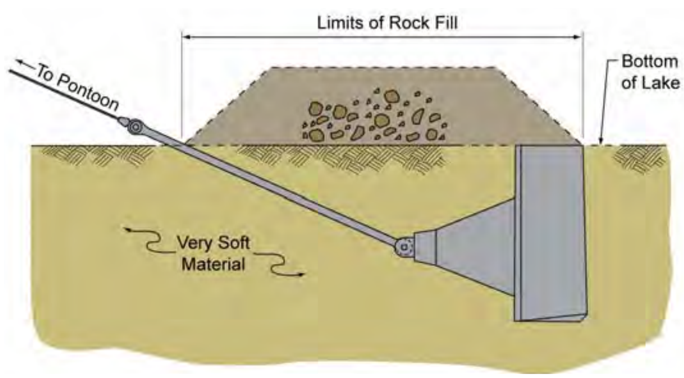


EXHIBIT 2-21.
TYPICAL FLUKE ANCHOR INSTALLATION

Anchors will be constructed at an upland facility and transported to the installation site by barge. Equipment to be used for anchor construction and fabrication will include concrete tremies, concrete pump trucks, ready-mix concrete trucks, concrete vibrators, concrete forms, and welders. Equipment to be used for anchor and cable installation will include barges, tugboats, barge-mounted cranes, and water jets.

Temporary anchors will also be used to hold the pontoons in place before they are finally positioned along the new bridge alignment. Potential temporary anchor types include toggle or ship anchors lowered to the mudline with cranes. However, pile anchors (vibrated into the substrate) could also be used in shallow-water applications.

2.3.15 Pontoon Assembly

The pontoons will be fastened together in their final anchorage locations to assemble the foundation of the floating bridge. In general, pontoon assembly consists of bolting individual floating pontoons together to form a continuous floating structure. Equipment to be used for pontoon assembly will include tugboats, floating barges, floating cranes, dewatering pumps, hydraulic rams, and winches (Exhibit 2-22).

EXHIBIT 2-22.
ROPES, WINCHES, AND ASSOCIATED TACKLE BEING USED TO ALIGN THE PONTOONS AND BRING THEM TOGETHER FOR THE HOOD CANAL FLOATING BRIDGE PROJECT

Initially, individual pontoons are floated into position with the assistance of tugboats. Individual pontoons are then attached to their permanent anchor cables. After installing the joint bolts, hydraulic rams are used to stress the bolts and compress the rubber seal between the pontoons, creating a 3-inch-wide watertight seal between the individual pontoons. The space between the seals is then dewatered and filled with cement grout, which will be fully contained by the watertight rubber seal.

It is expected that the pontoons will be transported to Lake Washington only as they are needed to construct the floating portion of the bridge, and they will not be stored or moored in the lake for extended periods of time. Pontoon assembly activities will not be restricted by the prescriptive in-water construction periods; however, these activities are likely to occur during summer and early fall because of more accurate weather predictability and lower risk of storms.

2.3.16 Floating Bridge Superstructure Outfitting

The term "pontoon outfitting" generally refers to the additional construction needed to complete the superstructure and prepare the bridge to carry traffic. Generally, this work involves the addition of concrete bridge pier support columns, steel trusses, a concrete bridge deck, pedestrian railings, and traffic barriers.

Complete outfitting consists of constructing the trusses and pier cross beams, setting precast-concrete longitudinal beams onto the pier cross beams, and placing the concrete roadway deck. Although some outfitting activities may occur at an offsite facility, those pontoons that are not outfitted or only partially outfitted off site will need to be completed on Lake Washington. After the pontoons are transported to Lake Washington, any remaining outfitting will occur once the pontoons are permanently anchored and assembled in place. Rows of three concrete columns constructed on the pontoons will support the superstructure and roadway above the pontoons. Outfitting activities will be similar to those described for the fixed bridge construction, although construction will be staged primarily from the pontoon deck instead of from barges or work bridges. Transition spans connecting the floating span to the fixed-span approaches will likely be assembled off site and installed as a single truss lifted into place from the barge using large cranes (Exhibit 2-23). BMPs to minimize or eliminate the effects of these construction activities will also be similar to those described for the over-water and in-water construction activities. See Section 2.10 for a list of project BMPs.

EXHIBIT 2-23.
THREE LARGE CRANES LIFTING A TRUSS INTO PLACE FROM A BARGE

2.3.17 Bridge Maintenance Facility and Dock Construction

Construction activities associated with the maintenance facility and dock will include upland excavation and embankment work, retaining wall construction, roadway paving, and in-water and over-water construction to install the dock. Construction techniques associated with the dock will include drilled shaft and precast girder construction. These construction activities will be undertaken in a manner similar to that described above. Appropriate sediment control BMPs will be implemented to prevent the discharge of sediment from the disturbed construction areas into Lake Washington.

Because of the existing groundwater seeps in the east approach area, dewatering of excavated areas will likely be necessary to allow subsurface construction in a dry environment. Water generated from dewatering activities will be stored either in temporary treatment ponds or in portable steel (Baker) tanks. Water will be stored for a sufficient amount of time to allow particles to settle out; alternatively, other methods could be used to reduce suspended particles to meet the discharge water quality requirements before the water is discharged to an approved location.

2.3.18 Demolition, Removal, and Disposal Activities

2.3.18.1 Existing Off-Ramps and Fixed Bridges

The existing off-ramps and fixed bridge superstructures will be completely demolished; the substructures will be completely removed where feasible or demolished to about 2 feet below the mudline. Details related to the presence and timing of this demolition are provided in Sections 2.6.1 through 2.6.6.

The following represents a typical demolition sequence for the ramps and fixed bridges:

Step 1: Deploy containment BMPs that will prevent any demolition materials from entering the water. This action would also include containment of debris and demolition water.

Step 2: Demolish the traffic barriers and rails. Concrete traffic barriers likely would be demolished with an impact hammer (i.e., jack-hammer or excavator attachment) or a combination of saw cutting and impact removal.

Step 3: Remove the superstructure by saw cutting and using an impact hammer. The concrete bridge deck would be cut longitudinally, midway between each girder line. The saw cuts in the bridge deck would be sized to prevent penetrating the complete thickness of the deck, enabling the saw cut water to be contained at the deck level (Exhibit 2-24). Concrete diaphragms, bracing walls that intermittently connect the girders together along the length of the span, would be removed to allow the girders to be lifted. After the deck is cut and the diaphragms are severed, the girders would be removed, one at a time, loaded onto trucks or barges, and then hauled or shipped for offsite demolition.

Step 4: Remove the cross beams by saw cutting, impact hammering, and torch-cutting the reinforcing steel into manageable-sized pieces. Then, each piece would be loaded by crane onto a dump truck or barge (Exhibit 2-25).

Step 5: Remove the entire column/pile by vibratory extraction. This method involves attaching a vibratory hammer and a hook from a crane to the top of the column and simultaneously vibrating and lifting the column. If this method is ineffective, the column would be cut 2 feet below the mudline by divers using an underwater diamond wire saw. At that point, the columns would be loaded onto a barge for subsequent disposal or recycling.

Step 6: Fill any holes or depressions in the substrate resulting from the substructure removal process with native material or other material approved by the environmental permits.

EXHIBIT 2-24.
CUT-WATER CONTAINMENT SYSTEM FOR CUTTING A PONTOON JOINT

EXHIBIT 2-25.
SECTION OF A BRIDGE CROSS BEAM BEING LIFTED BY CRANE AFTER REMOVAL BY SAW CUTTING THROUGH THE COLUMN AND BEAM

2.3.18.2 Existing Transition Spans and Floating Bridge

Demolition of the existing transition spans and floating bridge will consist of similar steps as those described above for the fixed bridges and also will include the following actions:

- Demolition of the transition spans
- Demolition of the elevated floating bridge superstructure
- Removal of the pontoons
- Removal and decommissioning of the anchor cables
- Disposal of the floating bridge and approach structures

Transition Span Demolition

Two truss structures currently serve as transition spans for the existing floating bridge. These structures provide links from the floating structure to the fixed approach structures on each end of the floating bridge.

If practicable, demolition will likely be performed by removing each transition span truss in one piece, as occurred with the recent replacement of a portion of the Hood Canal Bridge (Exhibit 2-26). Two methods can be used to accomplish this task. One method would use floating cranes to lift each truss off its bearings and place it on a barge. The other method would position a barge under each transition span and use jacks to vertically lift each truss off its bearings.

There is a limited availability of floating cranes with the capacity to lift an entire transition span and the ability to be transported through the Hiram M. Chittenden Locks (Ballard Locks), which are no wider than approximately 79 feet. Therefore, it may be necessary to select a demolition method that removes the concrete roadway deck and barriers to reduce weight, then removes the remaining steel truss structure in one piece. Once loaded onto a barge, the steel truss structures would be taken to an offsite location to be demolished or dismantled, and recycled.

EXHIBIT 2-26.
REMOVAL OF THE TRANSITION SPAN FROM THE HOOD CANAL BRIDGE

Elevated Floating Bridge Superstructure Demolition

Approximately 30 percent of the roadway on the existing floating bridge is elevated (Exhibit 2-27). Some or all of the existing bridge deck may need to be removed before the pontoons are transported out of Lake Washington. The contractor will determine the extent of elevated superstructure removal for towing to an offsite demolition site, based on the stability of individual or multiple pontoon sections.

EXHIBIT 2-27.
ELEVATED SUPERSTRUCTURE ON THE EXISTING EVERGREEN POINT BRIDGE

If it is determined that pontoons will be towed in the open ocean, the elevated superstructure and columns will be removed to maintain the stability of the pontoons while under tow. This possibility applies mostly to the pontoons at the end of the bridge, because they have the highest elevated roadway sections and are, therefore, the least stable for towing. If the elevated superstructure and columns are removed from the pontoons, demolition will be the same as that described for fixed bridges, except the columns would be cut flush or near flush with the top of the pontoons. Disposal of the resulting concrete debris would also be as described for the fixed bridges. However, if towing the pontoons in the open ocean is not required, much of the elevated superstructure could remain in place until it leaves Lake Washington, assuming the pontoons are individually stable (Exhibit 2-28). Superstructure demolition could occur on Lake Washington or at an existing facility similar to that used for pontoon outfitting.

EXHIBIT 2-28.
A PONTOON BEING TOWED WITH THE ELEVATED SUPERSTRUCTURE INTACT

Pontoon Removal

Pontoon removal consists of saw cutting the pontoon-to-pontoon joints, disconnecting the anchor cables, and towing the pontoons away. However, it is likely that several pontoons will be removed as a single unit, to improve stability during towing or to reduce the number of towing events. Saw cutting pontoons involves using a diamond wire saw to cut the pontoon-to-pontoon joints. Instead of cutting the entire pontoon-to-pontoon joint in one operation, a few access holes may be drilled vertically in the joint. These access holes allow the diamond wire to be placed through the interior of the joint so as to cut the joint in multiple, smaller operations rather than one larger operation. A steel frame will be used to maintain the integrity of the joint and bridge alignment during the cutting operation. Tugboats may be required to maintain the alignment of the bridge and to alleviate wind and wave stresses on the bridge during demolition. Pumps and hoses will be used to collect the concrete slurry from the cutting operations and transport it to holding tanks or land-based facilities for treatment and reuse or disposal. Silt curtains will also be used to isolate the work area from open-water areas, and monitoring will be used to ensure that turbidity and pH meet the water quality standards. If these standards are exceeded, the work will cease, and the containment and collection facilities will be adjusted to meet the standards.

Anchor and Anchor Cable Removal and Decommissioning

The existing floating bridge has three types of anchors:

- Concrete fluke anchors
- Rock-filled concrete gravity anchors
- Pile anchors

Underwater anchor decommissioning consists of abandoning all anchors in place with the exception of pile anchors. Existing fluke and gravity anchors may be deeply embedded, and removing them would likely cause more temporary disturbance than their removal warrants, although it may be possible to remove portions of the gravity anchors that are not embedded. However, these anchors are in deep water and their removal is not expected to provide substantial biological benefits. Pile anchors occur in shallow-water areas that might benefit from their removal. Therefore, these anchors will be removed to below the mudline, where feasible, using methods similar to those described above for the fixed bridge columns. Typically, anchor cable removal consists of detaching anchor cables at their connection to the pontoons and anchors, then winding the cables onto spools on barges for transport.

Initially, floating cranes will be used to secure the anchor cables near the pontoons while they are being detensioned and detached from the interior of the pontoons. Once the anchor cable is detached, the floating crane can move toward the underwater anchor, winding the cable onto a spool as it nears the anchor. When the floating crane reaches a position directly over the underwater anchor, a diver can detach the anchor cable from the anchor. This operation is not expected to result in the disturbance of the substrate, and standard over-water BMPs will be used on the crane barge to prevent other effects on water quality.

Demolition Materials Disposal

Materials disposal will occur at contractor-provided disposal sites and in accordance with federal, state, and local laws and ordinances. Additionally, the contract may contain special conditions and requirements that pertain to the demolition and disposal of specific structures or to working in specific areas. The contractor will be required to obtain all pertinent permits and approvals for use of any sites to handle, process, or dispose of project-generated debris. If any sites require substantial modifications to the facility or typical operations, and these modifications could affect listed species, consultation might need to be reinitiated.

Materials transport to the disposal sites will be both by land and by water. Barges and tugboats will transport a large portion of the disposal material. Dry bulk disposal barges will pass through the Montlake Cut and the Ballard Locks to disposal sites or transfer facilities that provide access by water. Barges may also travel to temporary transfer facilities at the north and south ends of Lake Washington. Dump trucks and haul trucks will travel over designated haul routes, using city streets as well as state and county highways to reach these disposal sites. Because of the large amount of disposal material and the multimodal transport methods, multiple disposal locations will likely be used.

The contractor will likely have limited space for processing concrete pieces into rubble in the available staging areas; also, it is highly improbable that the contractor will use barges as staging areas for this time-consuming process. The contractor may need to make arrangements with disposal site operators to dispose of large amounts of unprocessed concrete waste. The contractor may be required to break the concrete and separate the reinforcing pieces before disposal at a solid waste facility. The contractor may attempt to coordinate this operation at the disposal site to eliminate double handling of the large amount of construction waste. If such coordination cannot be accomplished, the contractor may need an offsite demolition area for processing large pieces of reinforced concrete into reinforcing steel and concrete rubble. Contract specifications will limit the types of areas in which this activity may occur to existing facilities dedicated to this work or similar purposes. Alternatively, the contractor may elect to barge and haul the unprocessed concrete pieces to local concrete-recycling facilities where they can be crushed by the recycler.

As with past floating bridge projects, all pontoons, including the elevated superstructure of the existing floating bridge, will be made available for purchase. If pontoons cannot be sold to a private entity, they will be towed directly from Lake Washington to an approved site, likely a graving dock or floating dry dock, and demolished. Materials disposal will be the same as that described for fixed bridge structures. Pontoons will not be submerged to the bottom of any water body. Anchor cables and transition span materials will be recycled and/or disposed of in a similar manner.

2.3.18.3 Temporary Structures Removal

The temporary structures include work bridges, falsework, and temporary fixed bridges, as well as cofferdams installed to isolate in-water construction activities from open-water areas.

Work Bridges

The process for removing a work bridge is the reverse of the construction process. The timber deck panels are unbolted and removed. The steel stringer beams and steel cap beams are unbolted or cut off with a blow torch and removed. The piles can then be pulled out by attaching a vibratory pile-driving hammer to the top of the pile and simultaneously vibrating and lifting the pile. The removal will begin over water and progress toward the shoreline until all the in-water structures are removed. Exceptionally stubborn piles that cannot be pulled out will be cut off a minimum of 2 feet below the mudline.

The vibrations are expected to loosen the sediments within and around the piles, causing the sediments within the piles to discharge back into the hole when the pile is extracted. This is expected to minimize turbidity as the piles are vibrated out of the sediment. Any sediment remaining within the piles after they are removed from the water will be properly contained to prevent it from reentering the water, and it will be disposed of at an approved upland site. To further reduce the spread of suspended sediments, a silt curtain may be used in areas likely to be affected by currents and wave action.

It is assumed that work bridge removal will occur entirely from the work bridge and that support barges will not be needed. However, if barges are needed, care will be taken to prevent the barge from grounding and to prevent any disturbance of substrate material by support boats or tugboats.

Falsework

Activities to remove falsework support structures will be staged from the work bridges. This work activity will occur at various times during the construction process as the new bridge components become self-supporting structures. The removal process will be similar to that described above for the work bridges and will be conducted from these bridges before their subsequent removal. Standard over-water BMPs will be used to ensure the containment of demolition and dismantling debris (Section 2.10). After removing the over-water superstructure, the support piles will be extracted in a manner similar to that described in the previous discussion of work bridges. Although new bridge structures will be in place above the falsework piles, iterative cutting of piles and then pulling sequences may be required to extract the piles fully. Any piles that cannot be removed will be cut off below the mudline.

Temporary Fixed Bridge Structures

Activities to remove any temporary fixed bridge structures will be staged from the work bridges or the existing bridge structures. This work will occur after the new permanent bridge components are completed and traffic is diverted onto them. The removal process will be similar to that described above for the existing bridge removal stages and will be conducted from the work bridges or the new permanent bridge structures. Standard over-water BMPs will be used to ensure the containment of demolition and dismantling debris. After removing the over-water superstructure, the support piles will be removed in the same manner as that described above for the existing bridge components.

Cofferdams

To remove a cofferdam, native backfill is placed around the constructed footing or shaft cap, up to the original mudline elevation, and the dewatering pumps are shut off to allow the cofferdam to reflood the interior. If auxiliary pumps are used to reflood the cofferdam, they will be screened according to NMFS fish-screening standards. After the water level within the cofferdam is equalized with the outside water elevation, any temporary turbidity will be allowed to settle until state water quality standards are met within the confines of the structure. The sheet piles will be disconnected from the support structure and removed one at a time with a vibratory hammer. A vibratory hammer will also be used to remove associated waler frames and spud piles. The removed sheet piles and associated cofferdam construction material will be placed on a barge and transferred to an existing facility or staging area for reuse or disposal. Any sheet piles that cannot be separated from the concrete seal course will be cut off at the lowest possible elevation and abandoned with the seal course.

2.4 Project Construction and Operation

The project elements that are expected to result in effects on listed species either during construction or throughout the life of the project include the following:

- Construction and delivery of pontoons and anchors
- Construction of roadways and bridges
- Project operation
- Mitigation measures

Each of the above elements is detailed in the following sections, which describe all of the constituent activities associated with the respective elements and the final state of the project.

2.5 Pontoon and Anchor Construction and Delivery

The design for the new six-lane floating bridge requires 21 longitudinal pontoons, 2 cross pontoons, and 54 supplemental stability pontoons, for a total of 77 pontoons. However, the longitudinal and cross pontoons, as well as 10 supplemental stability pontoons (33 total), will be constructed and stored as part of the separate Pontoon Construction Project to replace the existing four-lane floating bridge if catastrophic failure were to occur (WSDOT 2010b). If the Evergreen Point Bridge does not fail before the planned reconstruction as part of the SR 520, I-5 to Medina project, the pontoons constructed as part of the Pontoon Construction Project will be used to construct the new six-lane floating bridge.

The SR 520, I-5 to Medina project will require the other 44 supplemental stability pontoons to provide buoyancy and stability for the new six-lane floating bridge, as well as additional capacity for stormwater discharge through spill control lagoons in the pontoons. Each supplemental stability pontoon is approximately 100 feet long, 30 feet tall, and between 50 and 60 feet wide. The 44 additional supplemental stability pontoons needed for the six-lane replacement bridge could be constructed beginning as early as November 2011 at existing facilities in the Port of Tacoma (23 supplemental stability pontoons) or the Port of Olympia (21 supplemental stability pontoons). The 58 precast gravity and fluke anchors for the floating bridge are likely to also be fabricated at one or both of these facilities.

Pontoon construction would typically take place 6 days per week, 10 to 16 hours per day for approximately 32 months between November 2012 and February 2014. Some night work will be required for launching the pontoons due to minimum required tide heights. Upland night work may also be required to expedite pontoon construction.

The following subsections describe the fabrication and/or delivery of pontoons from the points of origin to their integration with the floating bridge replacement.

2.5.1 Pontoon and Anchor Construction

The 44 supplemental stability pontoons and 58 anchors will be constructed at the Port of Olympia facility and the Port of Tacoma facility.

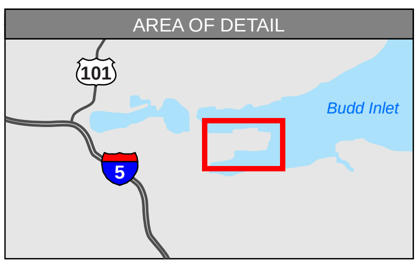
2.5.1.1 Port of Olympia Facility

The Port of Olympia site is located on West Bay of Budd Inlet (Exhibit 2-29). Upland pontoon construction will take place on large concrete slabs called casting beds. A casting bed provides a flat, stable location to maintain tight engineering tolerances for the pontoon to hold its proper shape while being constructed, poured, and cured. Casting beds will be supported by piles to reinforce the ground under the weight of the pontoon. Once a pontoon is cured, it will be either transported off the casting bed to an upland storage facility or loaded directly onto a barge and prepared for marine launch. Preparation of the pontoon construction site will include a geotechnical investigation of the potential casting bed areas, casting bed construction, upland pile driving, light grading, configuration of drainage facilities, and some utility relocation. Site preparation will take approximately 4 months to complete before pontoon construction can begin. WSDOT anticipates that approximately 11 casting beds could be staged at the Port of Olympia Marine Terminal, to construct a total of 21 pontoons. Pontoon construction will typically take place 6 days per week, 10 to 16 hours per day for approximately 13 months between February 2013 and March 2014. Upland night work may also be required to expedite pontoon construction.

The casting beds will be rectangular and measure approximately 60 by 100 feet. A casting bed will be constructed by driving approximately 90 to 100 piles into the ground 60 to 80 feet deep, then casting a 1.5-foot-thick concrete slab on top of the piles. Minor grading will be necessary to cast this slab below grade so that the top will be flush with the ground surface. Casting beds will be constructed to facilitate the capture of stormwater and process water. Available onsite stormwater facilities and temporary construction stormwater BMPs will be used to manage stormwater and construction process water. Temporary BMPs could include Baker tanks. All stormwater and process water discharges associated with the pontoon construction will be discharged in accordance with state and local regulations.

Each casting bed will have a platform structure installed on top to support the pontoon during construction and provide the ability for future transport to a barge. The platform structure will consist of a steel plate on top of steel girders. After all pontoon construction is completed, the construction staging and laydown areas will be restored as needed.

Source: Port of Olympia



N
0 225 450 Feet

Exhibit 2-29. **Port of Olympia Site Layout**

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

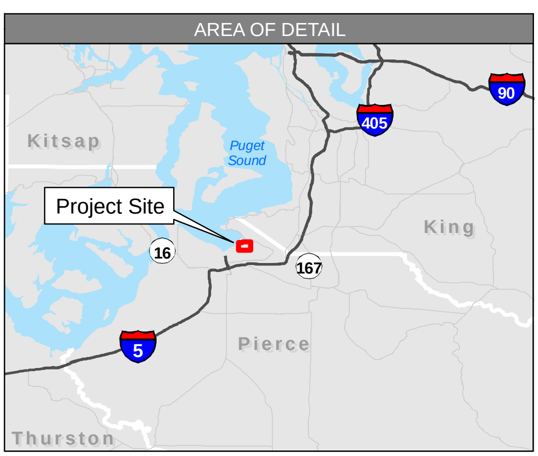
To build the pontoons, concrete will be poured around steel rebar cages surrounded by wooden or steel forms. When the concrete is set, the forms will be removed and the pontoons will be cured on the casting beds. After curing, the pontoons will be moved from the beds and either stored at an upland storage location or readied for marine launch.

Pontoons will be moved using a roller system. To launch pontoons from the upland facility, multiple rows of rollers will be placed beneath the steel plate platform and then jacked up to support the weight of the completed pontoon. A large ramp system of steel plates will be fixed between the edge of the dock and the barge in order to load the pontoons (no in-water work). Two to four pontoons can be rolled onto a single barge at one time, depending on the size of the barge. Once loaded, the barge will be moved out into deep water (greater than 40 feet deep) in south Puget Sound and submerged to float the pontoons off of the steel platforms. The pontoons will then be ready for towing, and the steel platforms will be returned to the casting bed locations for the next cycle of pontoon production. WSDOT estimates that 10 barges trips will be needed to launch all of the pontoons.

2.5.1.2 Port of Tacoma

The Port of Tacoma site is located on Blair Waterway, an inlet of Commencement Bay (Exhibit 2-30). WSDOT may use both an upland casting facility owned by the Port of Tacoma and the CTC casting basin facility as a combined site for the construction of the bridge pontoons. The CTC facility has been its current location and has operated since the mid-1970s and was recently used to construct floating bridge pontoons for the Hood Canal Replacement Project. The CTC facility can build five 100-by-60-foot pontoons at a time. Minor modifications to the terrestrial access ramps into the casting basin may be required, although this will not require any in-water work. Upland casting beds will be constructed with methods similar to those described for Port of Olympia (see Section 2.5.1.1). The pontoon construction and launch procedures will also be similar, although any pontoons built at the adjacent upland Port facility will need to be launched through the CTC casting basin. CTC currently operates the casting basin for an average of two projects per year. This operation includes complete opening cycles for each project that may span several tidal cycles. There are no seasonal restrictions in place for ongoing operations of the casting basin.

The casting basin is concrete and located approximately -1.8 feet relative to mean lower low water (MLLW), with a gate 16 feet thick, about 20 feet high, and over 160 feet long. The gate is located between the casting basin and the Blair Waterway. The interior of the casting basin provides a flat, dry work space where construction occurs. After a project (in this case, a cycle of pontoons) is completed, the basin is flooded in a controlled manner to allow the pontoons to float. A sump at the end of the basin is cleaned to remove any accumulated sediment/debris. The sump is part of the overall stormwater system for the entire CTC property and includes two pumps that discharge to the waterway. The pumps have 6-inch screened inlets and each pump can move up to 900 gallons per minute.



Source: Pierce County (2007) GIS Data. Horizontal datum for all layers is State Plane Washington South NAD 27, vertical datum for layers is NAVD88.

N

0 250 500 Feet

Exhibit 2-30. **Port of Tacoma and Concrete Technology Corporation (CTC) Sites**

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

There are three 36-inch ports in the gate that allow water to flow into and out of the casting basin. The gate has its own power source and pump to maintain the water ballast that holds it in place.

These ports are opened when the tide is at the lowest elevation, preferably less than -1.8 feet MLLW. Tidal action fills the basin through the ports, which are level with the slab of the casting basin. When the tide is approximately +10 feet MLLW, the gate’s water ballast is pumped out until the gate floats, and then tugboats remove the gate and moor it nearby. Once the gate is safely removed from the casting basin, the pontoons will be pulled out by tugboats and transported to either a temporary moorage location or their final destination.

After a commercial diver has inspected the gate opening to remove any rocks or debris that could puncture the hollow concrete gate when being reset in place, the gate is maneuvered back into place by tugboats and is ballasted down with water. Once the gate is in place, seawater is allowed to drain with the ebbing tide through the three ports to the lowest elevation possible before the flooding tide would refill the basin. At this point, the water level in the basin is usually at or near the basin floor elevation. The pumps are then activated to remove the remainder of the water. Any fish, including any ESA-listed fish, that may become stranded as the casting basin is closed and dewatered will be removed according to the 2009 WSDOT Fish Handling Protocols (WSDOT 2009a).

During the construction of the pontoons, the access gates of the casting basin will remain closed. The pontoons will be constructed of steel-reinforced concrete in the same fashion described for the Port of Olympia. Once the concrete sets, the forms will be removed, and the pontoons will cure within the casting basin. BMPs will be used to prevent green concrete from coming in contact with the Blair Waterway.

Before the first set of pontoons is constructed and after the construction of each cycle of pontoons is completed, the basin will be thoroughly cleaned (pressure washed) to prevent delivery of residual chemicals to the Blair Waterway. The constructed pontoons will also be pressure washed within the casting basin before transport; this task will most likely occur simultaneously with the basin washing. All wash water will be collected and treated before discharging, transported to an approved disposal facility or discharged to the existing combined sewer system for treatment.

Because the pontoons will draw more than 13 feet of water, auxiliary buoyancy tanks will be added to the pontoons to reduce their draft so that they will float out of the casting basin during a wider range of high tide elevations. Preliminary WSDOT estimates suggest that up to 23 pontoons could be constructed at the Port of Tacoma: 6 at the upland casting bed and 17 in the CTC casting basin. Under this scenario, WSDOT estimates that up to 10 CTC gate openings would be required to launch the 23 pontoons between August 2012 and June 2014.

Pontoon construction will typically take place 6 days per week, 10 to 16 hours per day for approximately 32 months between November 2012 and February 2014. Some night work will be required for launching pontoons due to minimum required tide heights. Upland night work may also be required to expedite the pontoon construction.

2.5.2 Pontoon Transport

Pontoon transport activities include towing the 33 pontoons constructed as part of the Pontoon Construction Project and moored in Grays Harbor (assuming they have not been deployed because of a catastrophic failure), as well as the additional 44 supplemental stability pontoons built in Puget Sound to support this project (Exhibit 2-31).

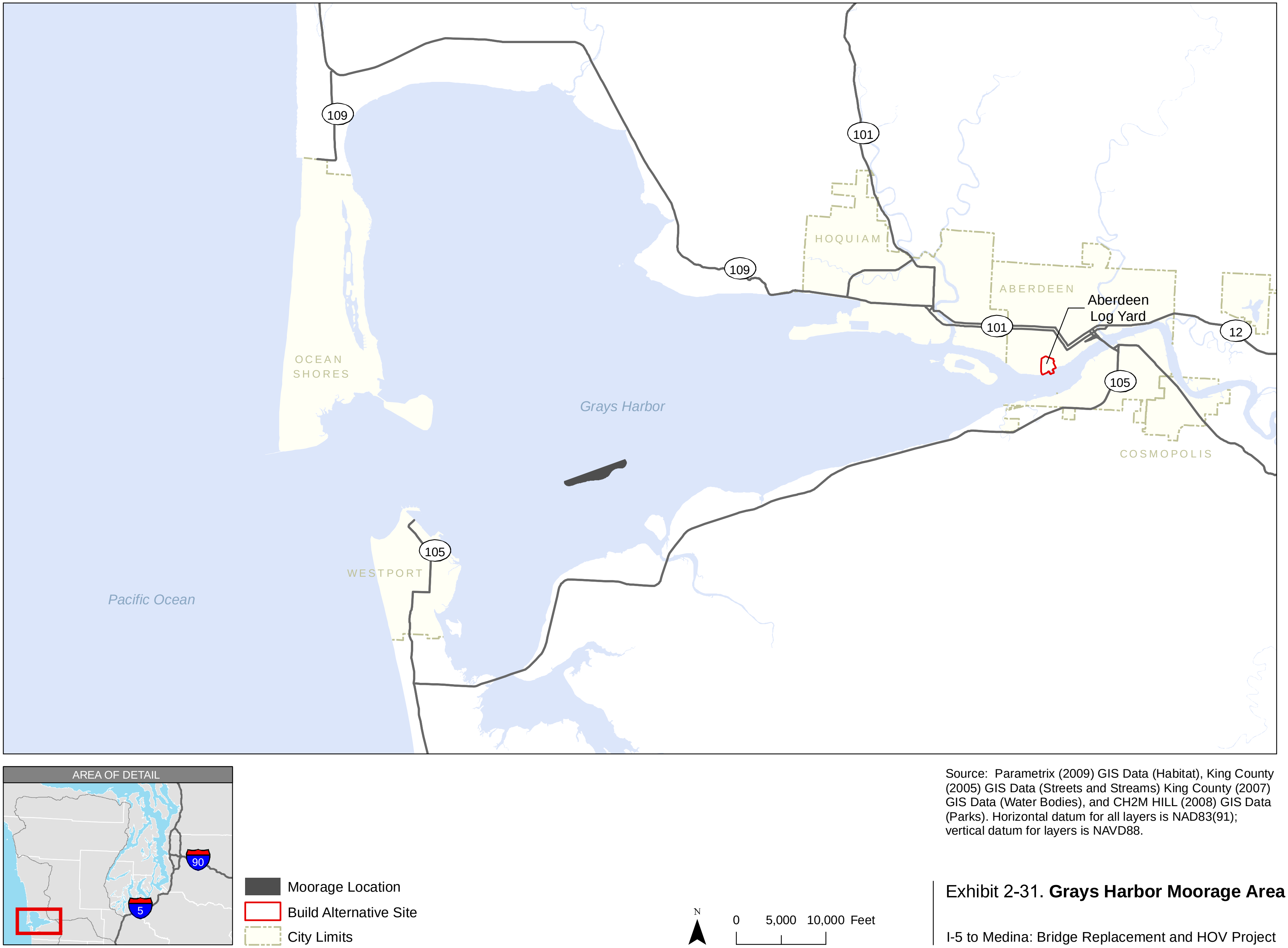
There will be several stages in the transport of the pontoons from the casting basin location to their Lake Washington destination. The pontoons must first be prepared for their voyage, and then the towing requirements must be met before the tugboats can get under way. A description of these stages is provided below.

2.5.2.1 Voyage Preparation

Several tasks will be required to prepare the pontoons for transport. Preparatory work will be conducted at the points of origin.

The surfaces of the pontoons moored in Grays Harbor will be inspected and treated to remove invasive species and marine growth before transport, if necessary (see Section 6.1.3). If moored for 6 months or more, the pontoons will be cleaned, as appropriate. WSDOT is currently completing a study to document the rate of marine growth likely to develop on the pontoons during moorage. If the study suggests that a longer or shorter period should be established for pontoon cleaning, then the 6-month time period will be modified. Pontoons will be cleaned in a manner similar to that used to clean the hulls of large vessels. One technology uses diver-operated scrubbing machines that scrape and scrub the surface of the vessel, removing attached marine growth. This activity will occur at an existing dock in Grays Harbor.

Before towing, the pontoons must be secured with mooring lines and fendering. Second, gravel ballast must be added to the pontoons to trim them for efficient towing. Finally, where not already present, several pieces of equipment required for the voyage will be installed on the pontoons, including watertight hatch covers, navigational lighting, bilge water sensors, list sensors, and global positioning system (GPS) position transmitters.



Source: Parametrix (2009) GIS Data (Habitat), King County (2005) GIS Data (Streets and Streams) King County (2007) GIS Data (Water Bodies), and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 2-31. **Grays Harbor Moorage Area**

I-5 to Medina: Bridge Replacement and HOV Project

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2.5.2.2 Marine Towing

The planned mode of transporting the pontoons from their Grays Harbor moorages is a "wet tow"—using a tugboat to tow the pontoons directly. The tow from Grays Harbor to Lake Washington is an estimated 250 nautical miles. Each pontoon will likely be towed individually; therefore, the number of pontoons that can be towed simultaneously is limited by the number of tugboats available. The tugboats will travel at slow speeds, and each trip will take approximately 76 hours (27 hours in the open ocean). These pontoons will travel north along the Washington coast line within the established Crabber/Towboat shipping lanes, through the Strait of Juan de Fuca into Puget Sound, and into the Lake Washington Ship Canal at Ballard Locks. Ocean-going tugboats moving pontoons from Grays Harbor north to Puget Sound will follow the international rules of right-of-way.

Pontoons towed from the CTC site or the Port of Olympia site will follow typical shipping lanes to Lake Washington via the Ship Canal at Ballard Locks. Exhibit 2-32 shows the coastal towing routes from Grays Harbor, the Port of Olympia, and the CTC facility in Commencement Bay, as well as port locations that may be used to outfit the pontoons.

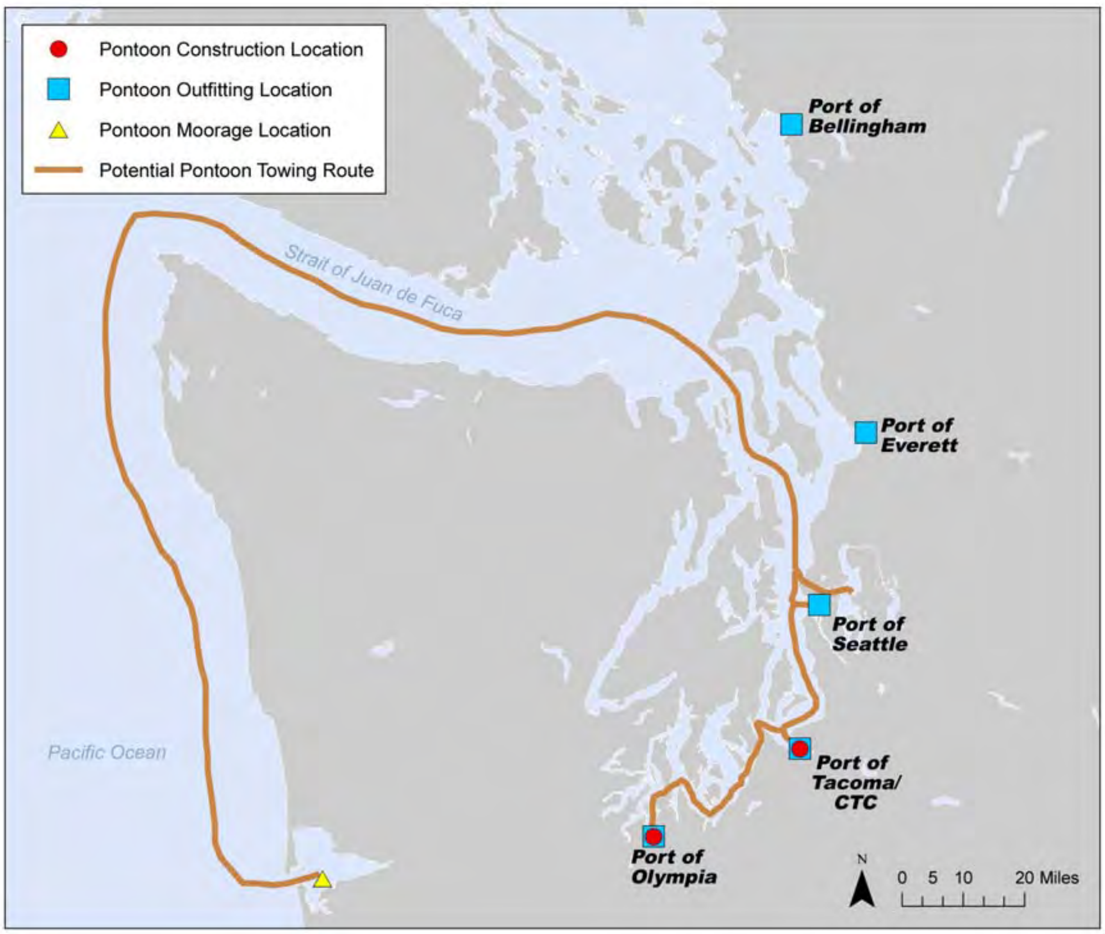


EXHIBIT 2-32.
POTENTIAL PONTOON TOWING ROUTES

Pontoon transport to Puget Sound, and subsequently to Lake Washington, is currently scheduled to occur over a 2-year time frame, between August 2012 and August 2014. All pontoons will enter Lake Washington through the Ship Canal at the Ballard Locks. Tugboat(s) could escort up to two longitudinal pontoons—two pontoons connected together for a total dimension of 75 feet wide by 720 feet long—through the Ballard Locks at a single time. After passing through the Ship Canal, the pontoons will be towed into Lake Washington and placed in the alignment of the new floating bridge. All pontoons are expected to be incorporated into the floating bridge in Lake Washington by 2014.

2.5.3 Pontoon Outfitting

This section describes the project elements required to outfit pontoons with roadway superstructure and other appurtenances necessary for final anchorage in Lake Washington. Pontoon outfitting is a separate operation that is often completed concurrently with other construction operations, thus facilitating a reduction of the construction schedule.

Pontoon outfitting will occur in the existing SR 520 right-of-way in Lake Washington. If it is determined that pontoons need to be outfitted at other locations in Puget Sound, WSDOT proposes to update information related to offsite outfitting for the consultation or reinitiate consultation once specific details are known.

The annual timing (weather restrictions) of pontoon towing from Grays Harbor to Puget Sound may involve additional schedule considerations to decide whether or not to conduct intermediate “outfitting” operations rather than completing all superstructure construction after the pontoons are anchored in their permanent location. Weather window restrictions on Lake Washington and/or fishery closure restrictions also may result in a decision to anchor the pontoons onto their permanent Lake Washington anchorages rather than taking the time for an intermediate outfitting operation.

Information on potential Puget Sound outfitting locations is included in this assessment based on the latest available information. The outfitting locations will be at existing commercial shipping or mooring facilities regularly used by large vessels or barges. Potential locations include the Port of Bellingham, Port of Everett, Port of Seattle, Port of Tacoma, and Port of Olympia. Outfitting and queuing of pontoons could take up to 4 months in these port locations and will be consistent with the typical operation of these facilities. The following site selection criteria apply to potential commercial outfitting locations:

- Only existing deep water berths with appropriate infrastructure would be used for outfitting.
- No improvements and no in-water work would be required at these locations.

Once outfitting construction is completed, pontoons will be towed from the port location through the Ballard Locks and into Lake Washington for incorporation into the floating bridge.

All pontoons must be transported through the Ballard Locks for entry into Lake Washington. These locks have a maximum width of 80 feet and therefore will accommodate only pontoons outfitted to fit within that width (remaining outfitting would occur on Lake Washington). Exhibit 2-33 shows several bridge pontoons being outfitted at an existing site before transport to their permanent anchorages.

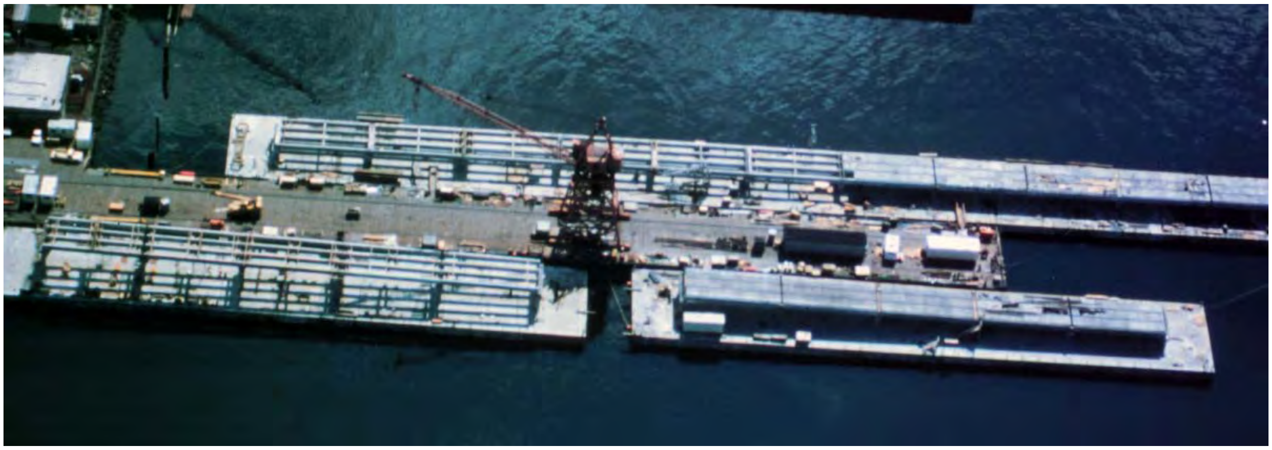


EXHIBIT 2-33.
PONTOON OUTFITTING

It is estimated that up to 11 pontoons may need to be moored temporarily in Puget Sound after being towed from Grays Harbor, to accommodate outfitting or schedule. It is also estimated that individual pontoons may need to be moored for up to 4 months, but it is unlikely that all 11 pontoons will be moored simultaneously. At most, it is estimated that up to 7 pontoons may need to be moored simultaneously. The site selection criteria stated for outfitting locations will also apply to temporary mooring locations.

2.6 Roadway and Bridge Construction

Construction for the SR 520, I-5 to Medina project is planned to begin in 2012, after project permits are received. In order to maintain traffic flow in the corridor, the project will be built in stages. Major construction in the corridor is expected to be completed in 2018. The most vulnerable structures (Evergreen Point Bridge and Portage Bay Bridge) will be built in the first stages of construction, followed by the less vulnerable components (Montlake and I-5 interchanges). Exhibit 2-34 provides an overview of the anticipated construction stages and durations identified for the project.

Construction will occur adjacent to the existing roadway and primarily within existing or acquired WSDOT right-of-way, although some temporary construction easements will be required. Construction activities will take place on land, on work bridges constructed adjacent to the roadway, and from barges floating on the lake and outfitted with cranes. Construction will be sequenced to maintain traffic flow along the corridor. Detailed construction descriptions are included in Section 2.3 for specific project elements.

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

Construction of the SR 520, I-5 to Medina project will span several geographic areas. The following subsections describe the detailed design and construction of the project, from I-5 eastward to the eastern project limit in Medina.

2.6.1 I-5 Interchange Area

Construction activities in the I-5 interchange 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. Three facilities—a bioswale and two media treatment vaults—will be constructed to treat stormwater from this area (see Section 2.7.1). The areas affected by construction and demolition and the duration and sequence of activities are described below. Expected construction activities and durations are as follows:

- 76,000 cubic yards of excavation
- 33,000 square feet of retaining walls
- 10 to 20 daily truck trips (average)
- 70 to 85 daily truck trips (during peak activity)
- 2- to3-year construction duration, excluding mobilization and project closeout

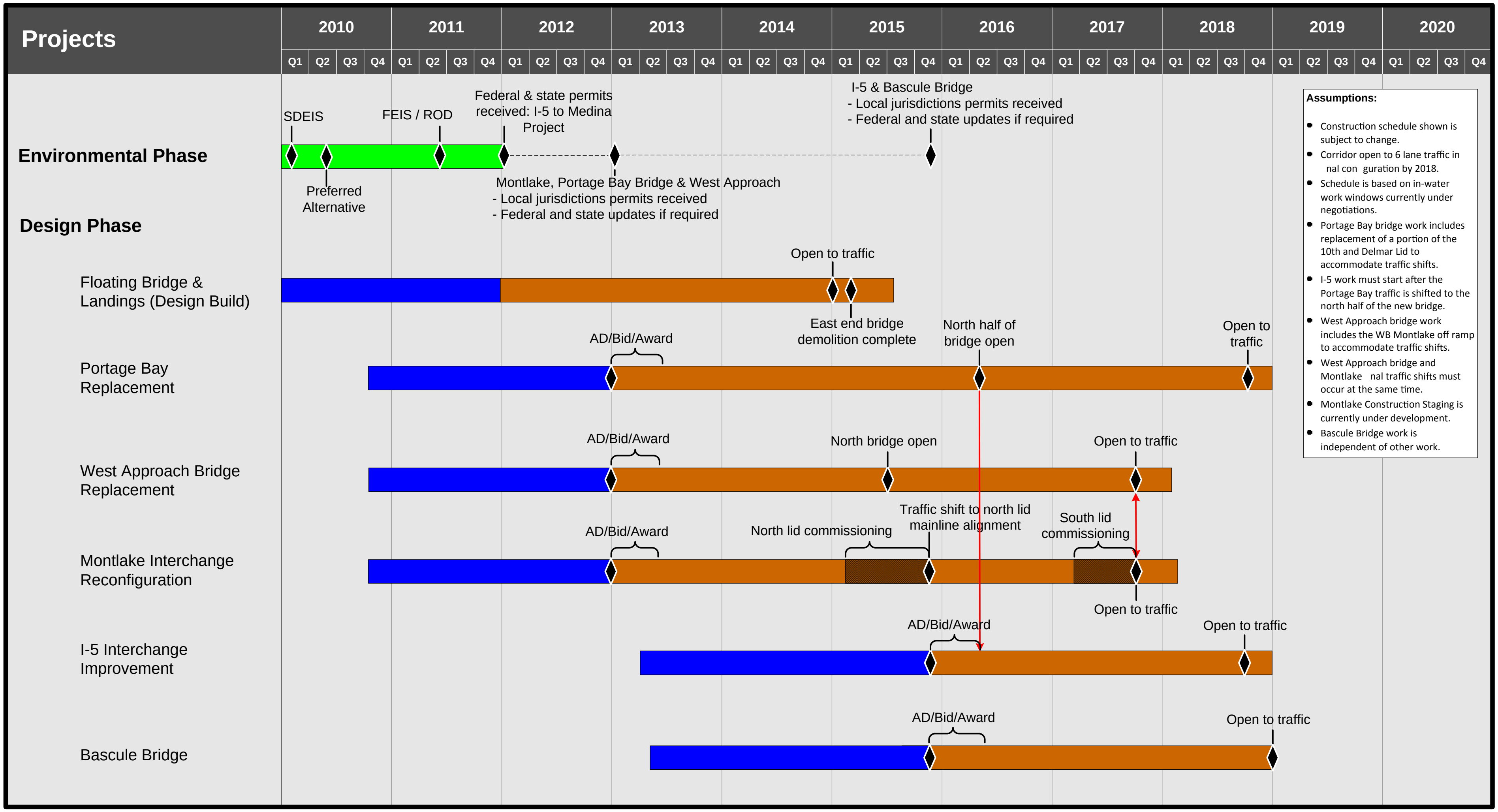
2.6.1.1 I-5/Roanoke Bicycle/Pedestrian Crossing

The project will construct an enhanced bicycle and pedestrian overcrossing adjacent to the existing East Roanoke Street Bridge. This bridge will be widened to the south to include a 14-foot path, and a landscaped area.

2.6.1.2 10th Avenue East/Delmar Drive East Lid

Construction of the 10th Avenue East/Delmar Drive East lid will include abutments and support walls constructed in the median and on both sides of SR 520. The support walls will provide continuous support for the girders that span the roadways underneath. Once the walls are completed, the lid superstructure will be constructed with girders spanning the highway. Retaining walls and support walls for the new lid will be constructed in the median and on both sides of SR 520. The final lid configuration will match the reconstructed 10th Avenue East and Delmar Drive East. Landscaping will be installed in a soil layer on top of the lid structure.

Preliminary



Environmental
Design
Construction

Exhibit 2-34. **Project Delivery Schedule**

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

2.6.1.3 SR 520 Main Line and Ramps

The SR 520 main line and ramps in this area will be reconstructed in generally the same locations as the existing structures. The lanes will be reconstructed from the I-5 interchange (including ramps) to the 10th Avenue East/Delmar Drive East lid. The Harvard off-ramp retaining walls and westbound lanes will be reconstructed first, then the eastbound lanes. Activities will include roadway excavation, and embankment retaining walls will be constructed to support the south end of the reversible HOV ramp and the on- and off-ramps at the I-5 interchange.

2.6.2 Portage Bay Bridge Area

WSDOT will replace the Portage Bay Bridge with a new bridge that will include two general-purpose lanes, an HOV lane in each direction (six lanes total), and a managed (i.e. allowing occasional traffic use) 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 (see Section 2.7.1).

The Portage Bay Bridge substructure will have three main parts: drilled shafts, mudline shaft caps (or mudline footings), and concrete support columns. Collectively, the substructure elements at each pier location 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 (Exhibit 2-35).

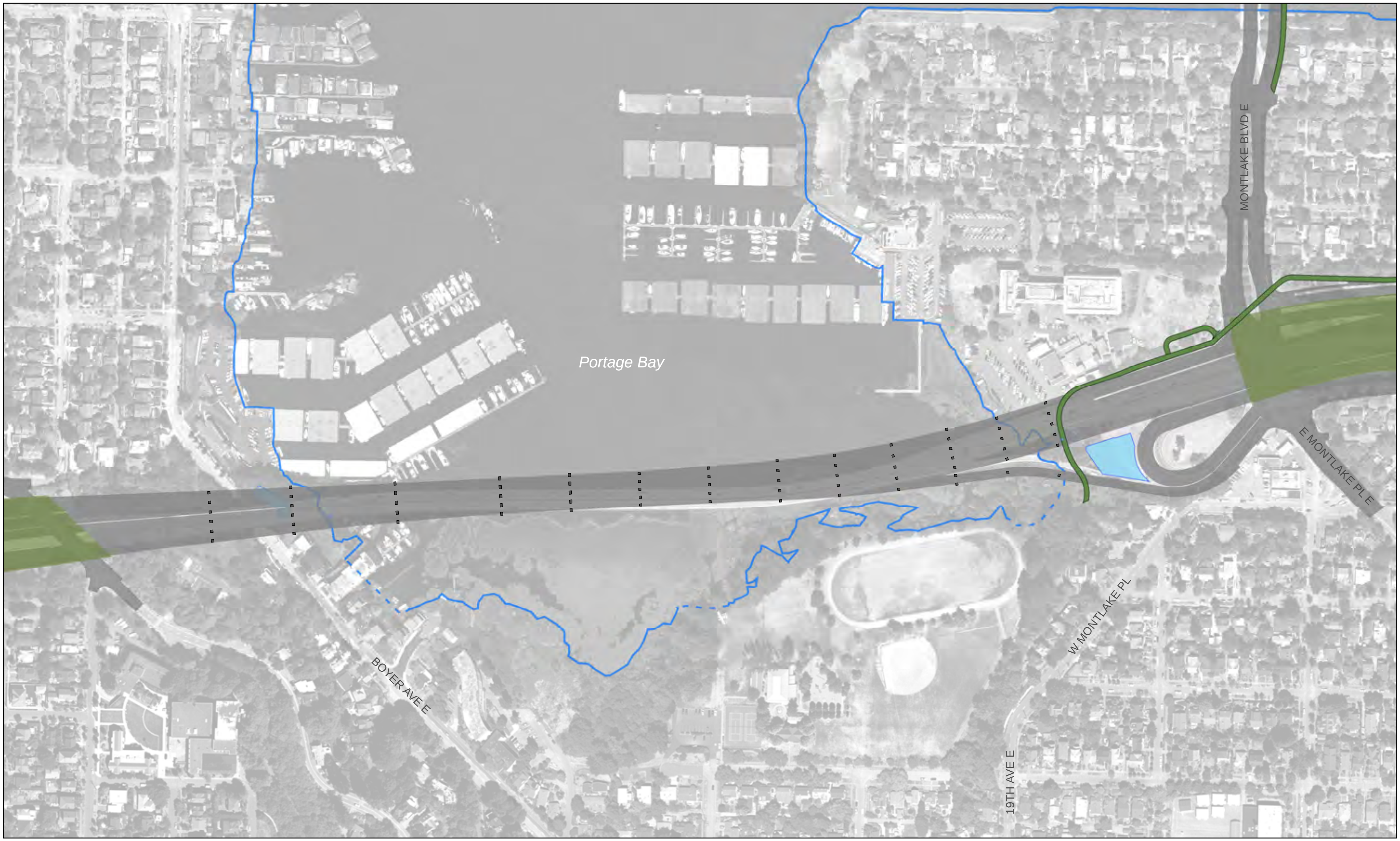
The construction elements include the following:

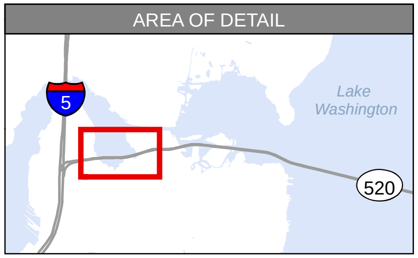
- 75,000 cubic yards of excavation
- 82 drilled shaft foundations
    - 17 upland shafts supporting individual columns
    - 65 in-water shafts: 30 supporting mudline footings and 35 extending through the lake bed and supporting individual columns
- 3 mudline footings at lake bed (capping 10 drilled 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 a diameter of 8 to 10 feet; 65 of these shafts will be constructed in 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 in the lake bed and typically be supported by 10 drilled shafts (i.e., these 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 measure 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 (Exhibit 2-36) 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 thirty-five 7-by-7-foot columns will be supported by individual drilled shafts (Exhibit 2-37). 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 surface water area.

Substructure construction will typically occur from temporary work bridges as described in Section 2.3. 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 acres (1.9 acres over open water) and will consist of about 900 hollow steel piles with a diameter of 24 to 30 inches.





- Column
- Ordinary High Water Mark
- Ordinary High Water Mark (Not Surveyed)
- Bicycle/Pedestrian Path
- Proposed Edge of Pavement
- Lid
- Stormwater Treatment Facility

N

0 125 250 500 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.

Exhibit 2-35. **Plan View Layout of the Portage Bay Bridge**

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

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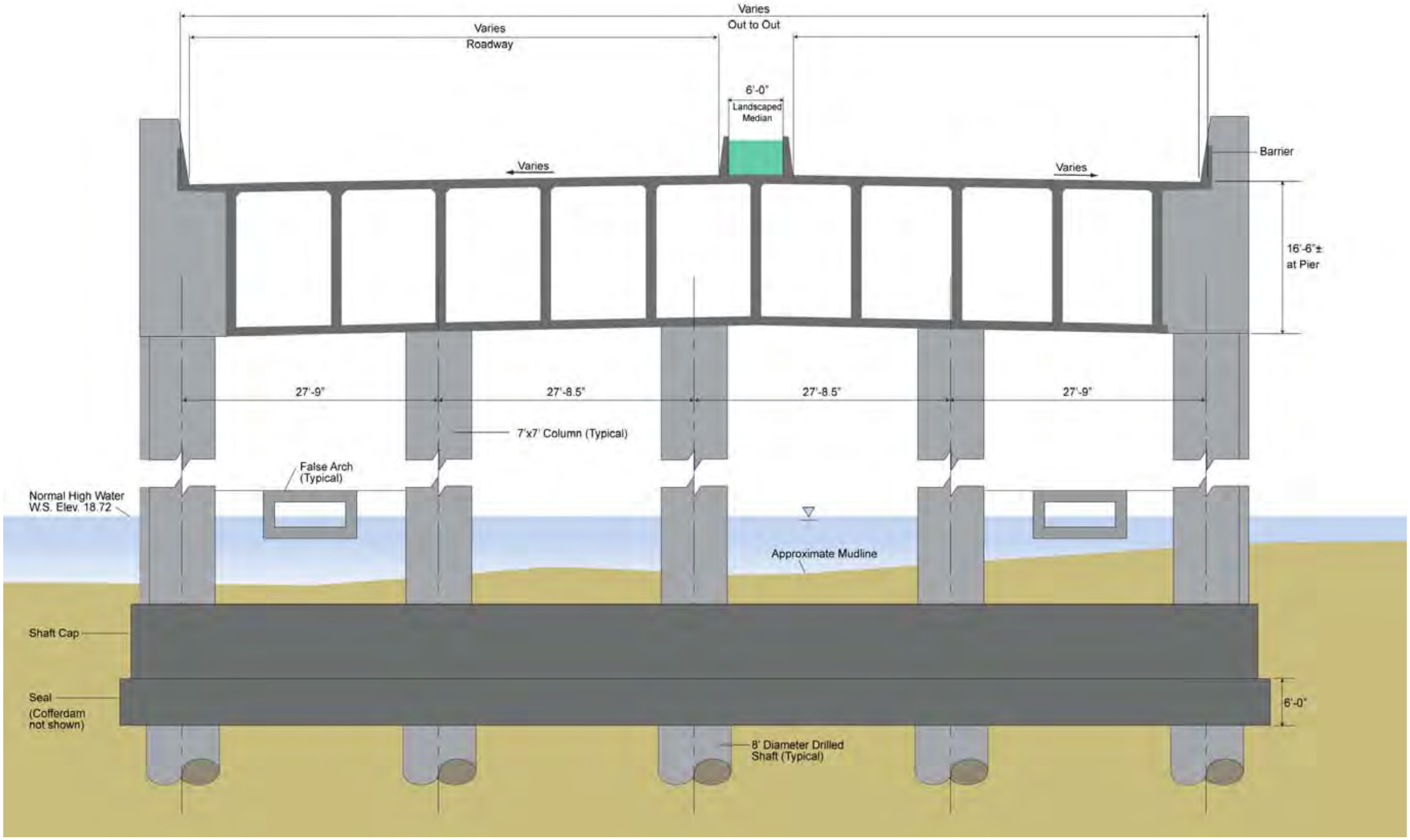


EXHIBIT 2-36.
TYPICAL CROSS SECTION OF THE PORTAGE BAY BRIDGE ON MUDLINE FOOTINGS

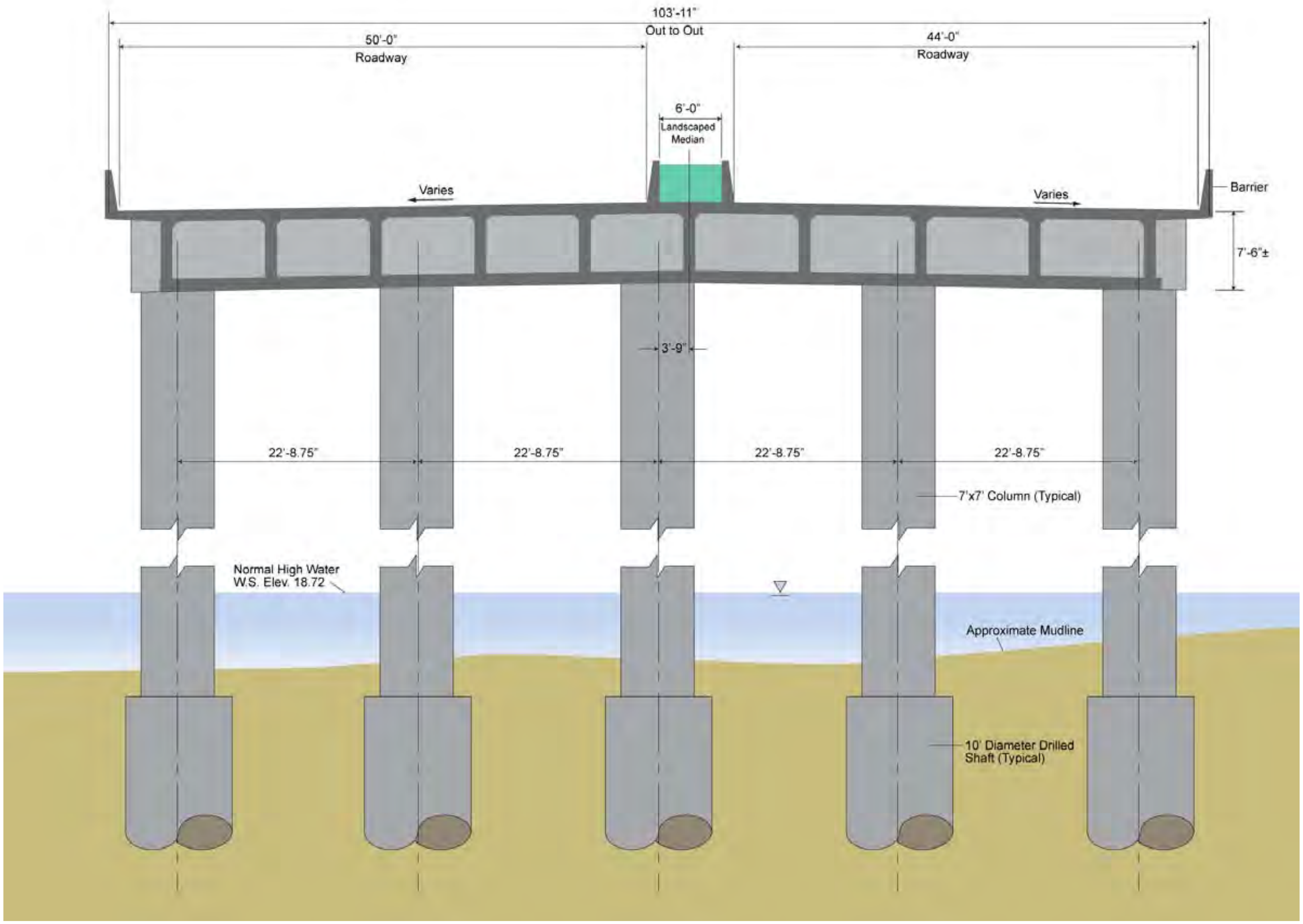


EXHIBIT 2-37.
TYPICAL CROSS SECTION OF THE PORTAGE BAY BRIDGE ON SHAFTS

The completed permanent substructure will 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.

Box girder bridge sections are proposed to be cast in place, 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 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 about 62 to 16 feet above the water (moving west to east). Total over-water cover resulting from the Portage Bay Bridge will be approximately 7.6 acres, representing an increase of approximately 4.5 acres relative to the existing condition. Exhibit 2-38 shows the profile of the proposed Portage Bay Bridge.

Construction activities and durations in this area will occur over a 6-year period and include construction of work bridges and falsework, temporary roadway widening, bridge demolition, and construction of new structures. 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 about 1.8 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. After construction, traffic will be shifted to the newly constructed northern half of the bridge to allow demolition of the existing and temporary south bridge lanes and the construction of the new southern columns and superstructure to complete the new Portage Bay Bridge.

A detailed account of the construction and demolition activities and the duration and sequence of these activities by construction year is provided below and shown in Exhibits 2-39a and 2-39b. The described sequence is based on an estimated schedule.

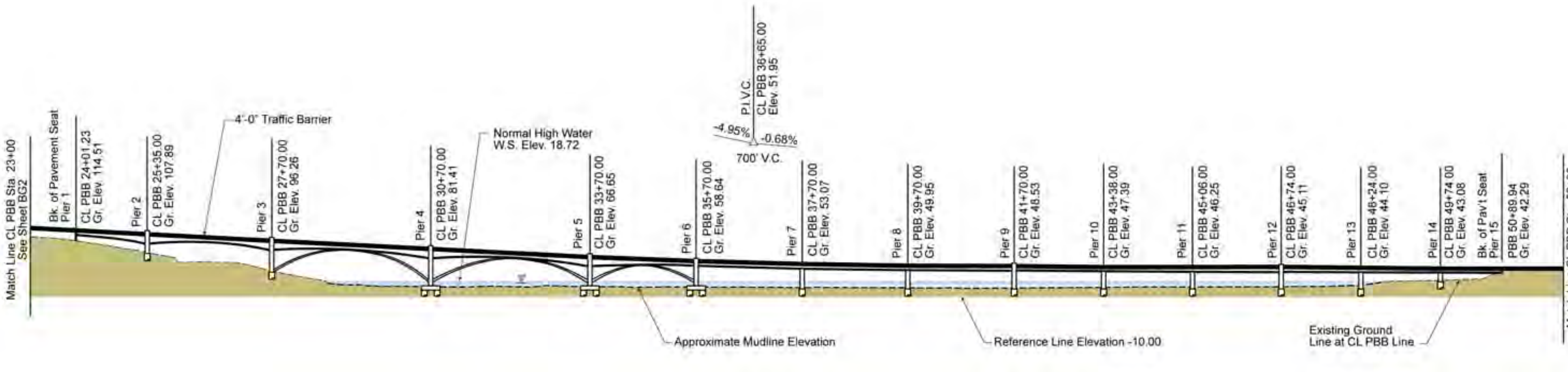
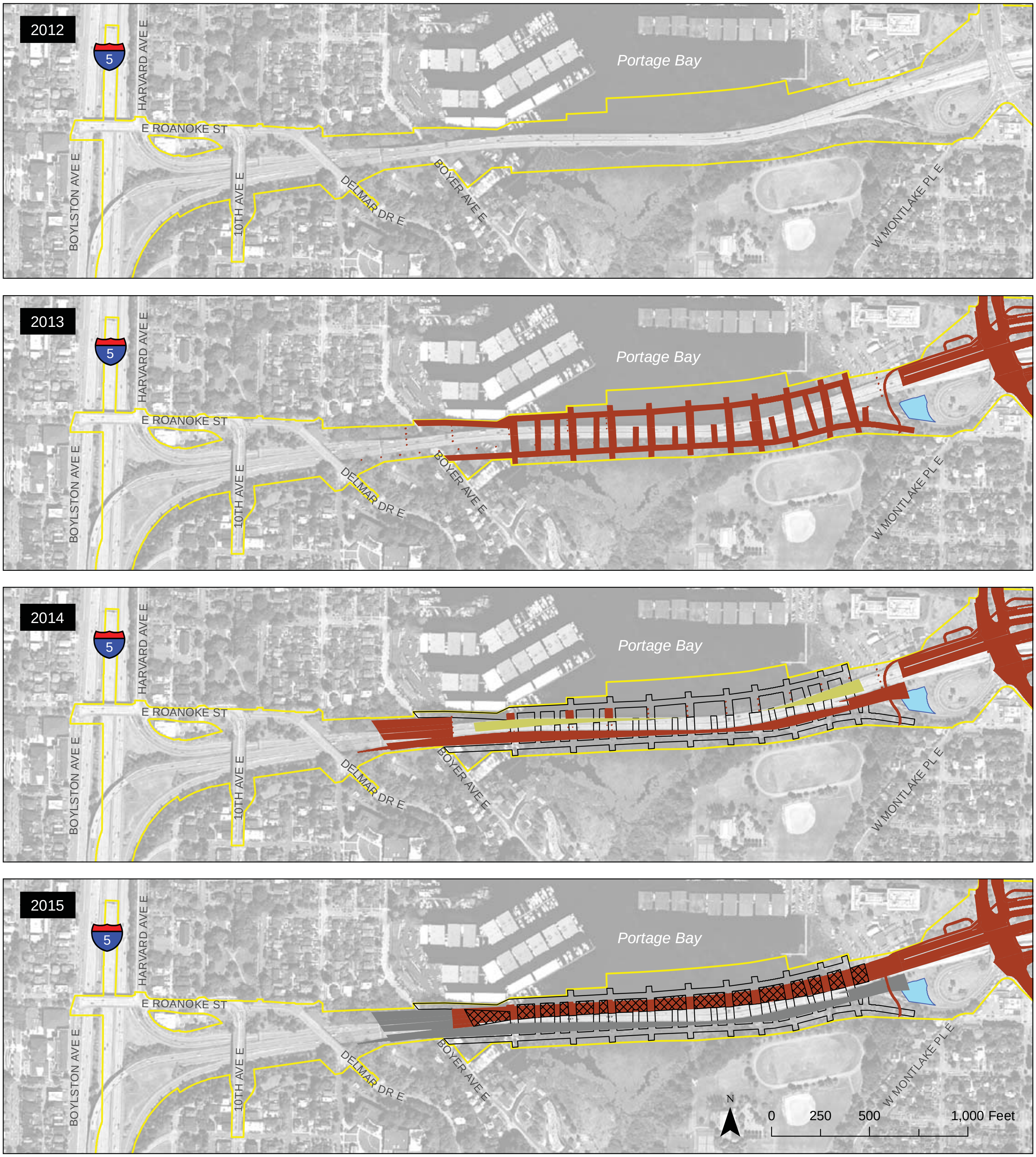
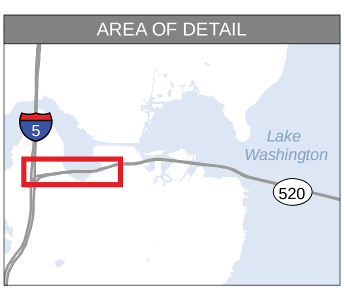


EXHIBIT 2-38.
PROFILE OF THE NEW PORTAGE BAY BRIDGE





- Limits of Construction
- Work Bridge
- False Work
- Portage Bay Bridge Demolition
- Construction in Progress
- Completed Construction
- Stormwater Facility Use as Temporary

Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 2-39a. **Construction Sequence for the Portage Bay Bridge**

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

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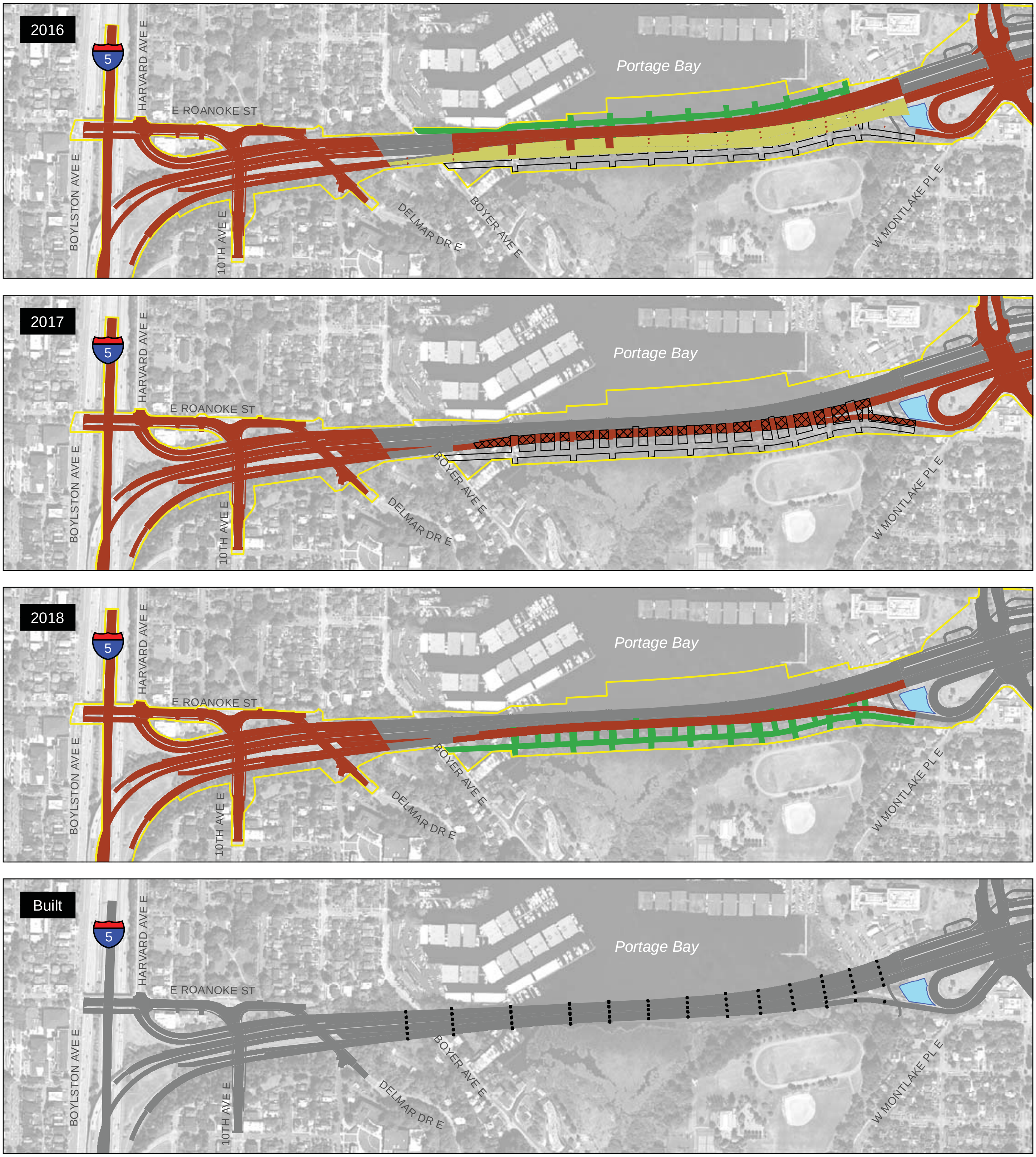

Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

- Limits of Construction
- Work Bridge
- False Work
- Portage Bay Bridge Demolition
- Construction in Progress
- Work Bridge Removal
- Completed Construction
- Bridge Pier Column
- Stormwater Facility Use as Temporary

N

0 250 500 1,000 Feet

Exhibit 2-39b. **Construction Sequence for the Construction Sequence**

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

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2.6.2.1 Construction Year 1 – 2013

During the first construction year, work bridges will be constructed along both the south and north sides of the existing Portage Bay Bridge. Finger piers, constructed perpendicular to and underneath the existing bridge, will provide access to the existing and proposed bridge columns. During the first phase, up to 900 total piles will be driven, at a rate of approximately 16 piles per day, with each pile assumed to require no more than 30 minutes to be driven. These pile-driving activities are expected to occur during the 7-month period from October through April (see Section 2.10.5.3).

Initially, the existing bridge will be temporarily widened to the south; temporary in-water footings and additional columns and superstructure will be placed in line with the existing bridge piers. Construction of these temporary widening structures will consist of the installation of 42 in-water drilled shaft casings to build the support columns and the addition of 1.8 acres of superstructure. Construction on the permanent northern half of the bridge substructure will also begin. As the substructure elements are completed, construction of some of the superstructure (over land) may begin in construction year 1.

2.6.2.2 Construction Year 2 – 2014

After traffic is shifted to the southern portion of the bridge, the northern portion of the existing structure can be demolished and the new bridge constructed. Demolition activities will begin with removal of the superstructure and the in-water vibratory removal (or cutting) of approximately 44 to 45 columns (roughly half the existing columns). Demolition will typically be conducted from the construction work bridges.

Construction on the northern half of the bridge substructure will continue into construction year 2. Completion of the north substructure elements can sequentially follow the progression of demolition. This will involve the installation of 18 drilled shaft casings for the westerly three in-water pier bents within the confines of the three cofferdams (six casings per cofferdam). The cofferdams will occupy a total of approximately 8,200 square feet of substrate for the roughly 1-year period they remain in place. The northern portion of the mudline footings for those three pier bents will be constructed within the dewatered cofferdams. In addition, 21 individual in-water drilled shaft casings will be installed to construct the support columns for the northern half of the new bridge.

2.6.2.3 Construction Year 3 – 2015

As elements of the substructure are completed, construction of the superstructure can begin. This will require the installation of falsework from the work bridges, including driving up to 200 additional piles at the same rate mentioned above. As the falsework and concrete forms are completed, the cast-in-place girders and false arches will be poured, incrementally advancing the northern half of the superstructure.

In construction year 3, the northern half of the new bridge will be completed, and traffic will be shifted to it to allow demolition of the south bridge lanes and construction of the southern half of the new bridge (columns and superstructure). WSDOT expects that the remaining 44 to 45 columns of the existing substructure will be removed during this time, in addition to the 42 temporary shafts/columns that were built in construction year 1.

2.6.2.4 Construction Year 4 – 2016

Construction of the southern half of the substructure will begin in construction year 4. A total of 36 drilled shaft casings will be installed (26 in water). Twelve of the in-water shafts for the three westerly pier bents will be drilled inside the three cofferdams (four shafts per cofferdam). The cofferdams will occupy approximately 5,500 square feet of substrate for the period they remain in place. The south mudline footings are expected to be completed within this year, allowing the removal of the cofferdams.

2.6.2.5 Construction Year 5 – 2017

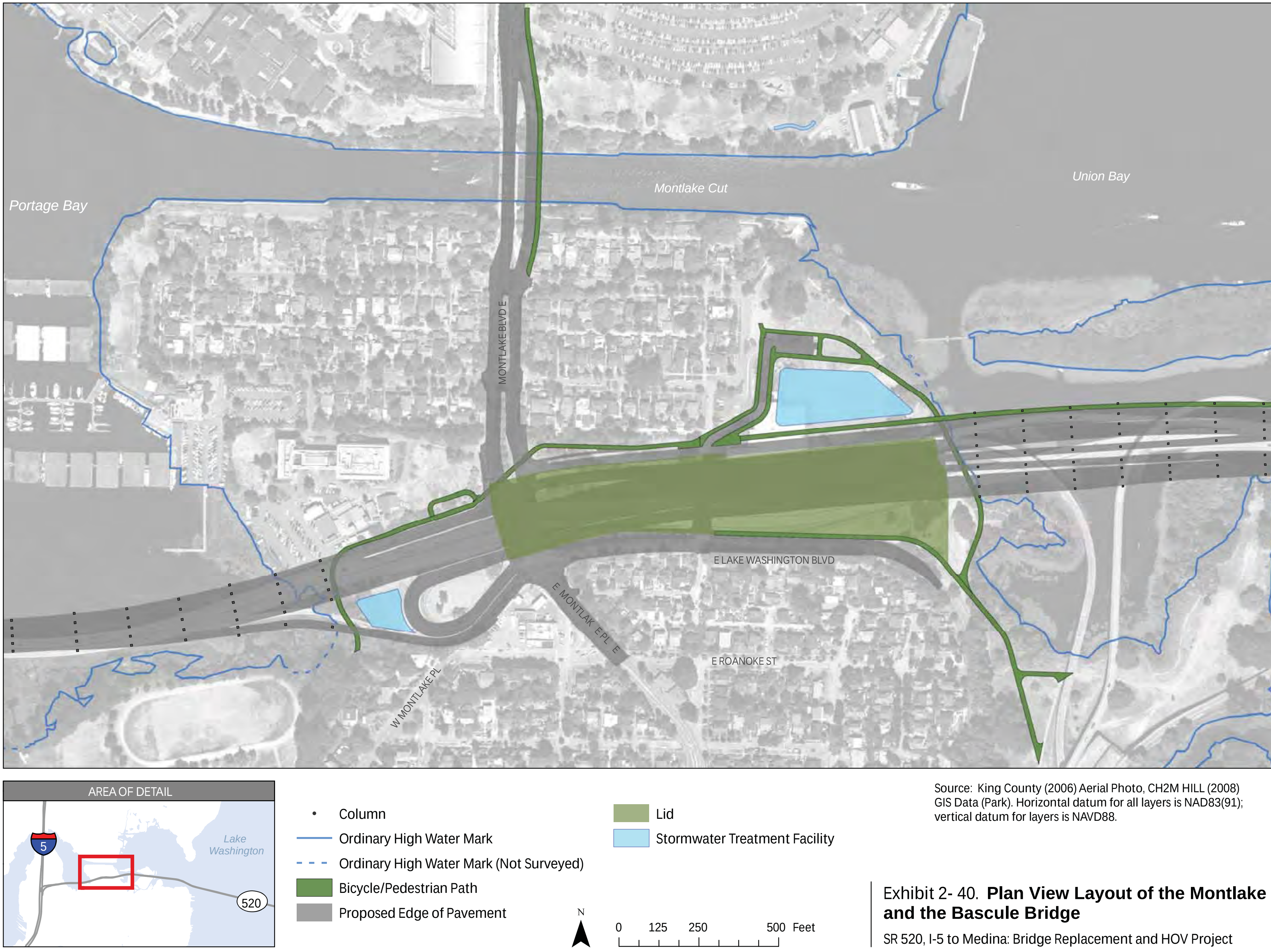
During construction year 5, as construction of the southern half of the substructure progresses, construction of the southern half of the superstructure will begin. This will require the installation of 200 additional falsework piles.

2.6.2.6 Construction Year 6 – 2018

During the construction year 6 (the final construction year), the southern half of the superstructure will be completed, as will the false arch construction. Construction year 6 will also include stormwater routing, bridge lighting, and roadway striping. Traffic will be shifted to the final configuration; the south work bridge and falsework will be dismantled, including the remaining 650 piles; and site cleanup and demobilization will conclude the construction activities.

2.6.3 Montlake Interchange Area

The Montlake interchange area 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 bascule bridge will be constructed over the Montlake Cut. Exhibit 2-40 shows the project layout in the Montlake interchange area, including the bascule bridge.



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.

Exhibit 2- 40. **Plan View Layout of the Montlake Area and the Bascule Bridge**

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

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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 BMPs, are not expected to affect aquatic habitat areas. Potential staging areas include portions of the E-12 parking lot on the University of Washington campus, the unused R.H. Thomson Expressway ramps, the closed Lake Washington Boulevard ramps, and unused WSDOT right-of-way adjacent to SR 520. The upland construction activities will result in the following:

- 92,000 cubic yards of excavation
- 49,000 square feet of retaining walls
- 4-year construction duration, excluding mobilization and project closeout

2.6.3.1 Montlake Lid

The new Montlake lid, replacing the Montlake Boulevard and 24th Avenue East overcrossing structures, will be constructed on reinforced-concrete walls with spread footings within the widened SR 520 footprint. The lids will be constructed in sections across the width of SR 520. The walls will support the girders and cast-in-place decks that span the SR 520 corridor. Lid landscaping will be installed in a soil layer on top of the structure.

The mainline profile in the Montlake interchange area underneath Montlake Boulevard will be lowered by 5 feet. Activities will include roadway excavation, embankment grading, and paving. On- and off-ramps at Montlake Boulevard will remain open to traffic during their reconstruction, with lane shifts using temporary ramp connections as needed.

2.6.3.2 Bascule Bridge

Construction activities in the Montlake interchange area also include the construction of a new bascule bridge over the Montlake Cut, east of the existing bascule bridge. This second bascule bridge is designed to have essentially the same dimensions as the existing bridge (Exhibit 2-41). The bottom of the arched bridge will be approximately 35 feet above the water near the piers and approximately 46 feet above the water at midspan. The proposed bascule bridge deck will be approximately 60 feet wide and have an over-water span of approximately 150 feet. Total over-water cover resulting from the new bascule bridge will be approximately 0.2 acre.

The construction activities will be staged from the shoreline, and except for the temporary use of barges positioned in the Montlake Cut to install the bridge leaves, 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 by the construction of upland cofferdams, installed above the ordinary high water mark (OHWM).

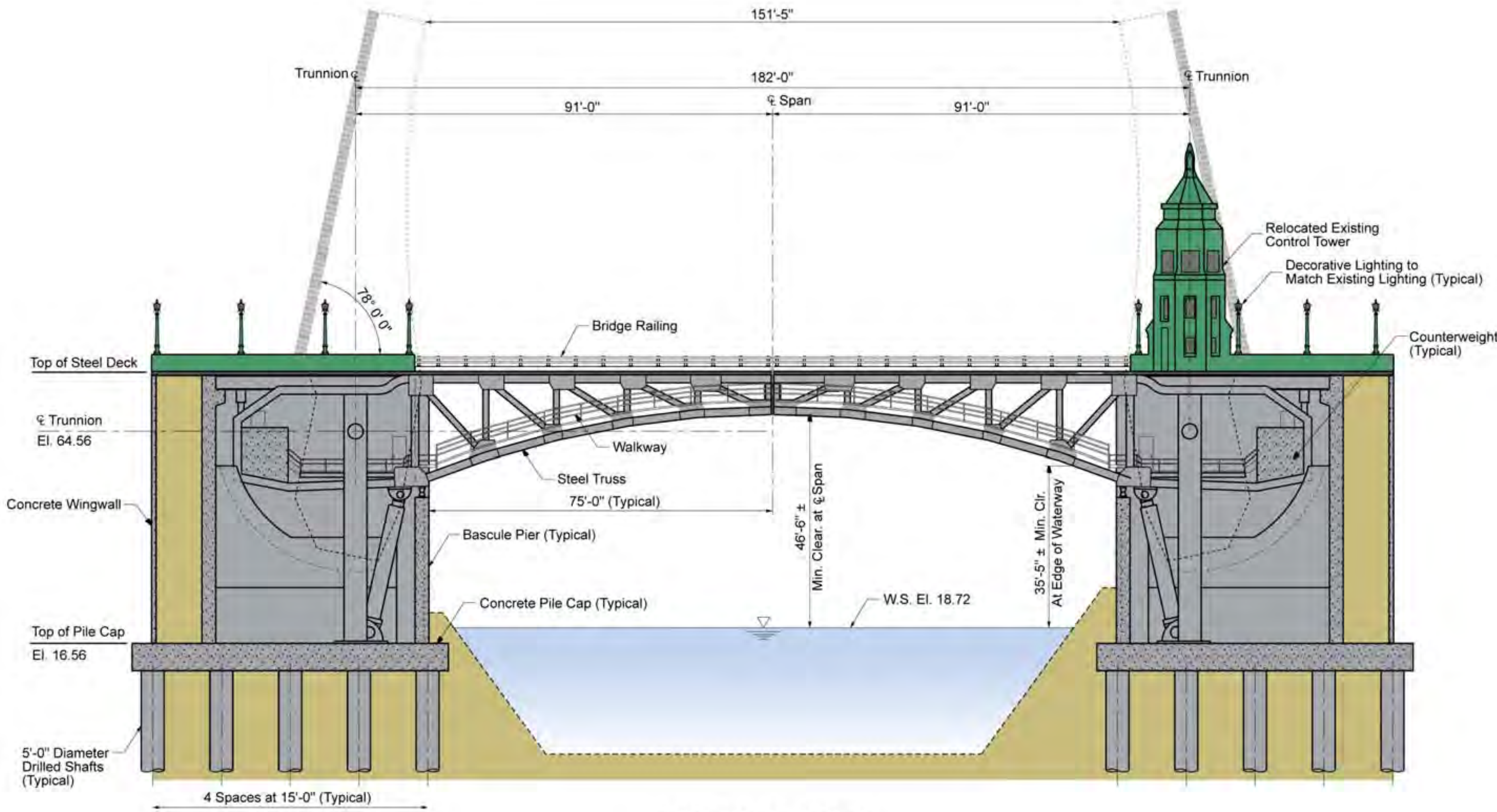
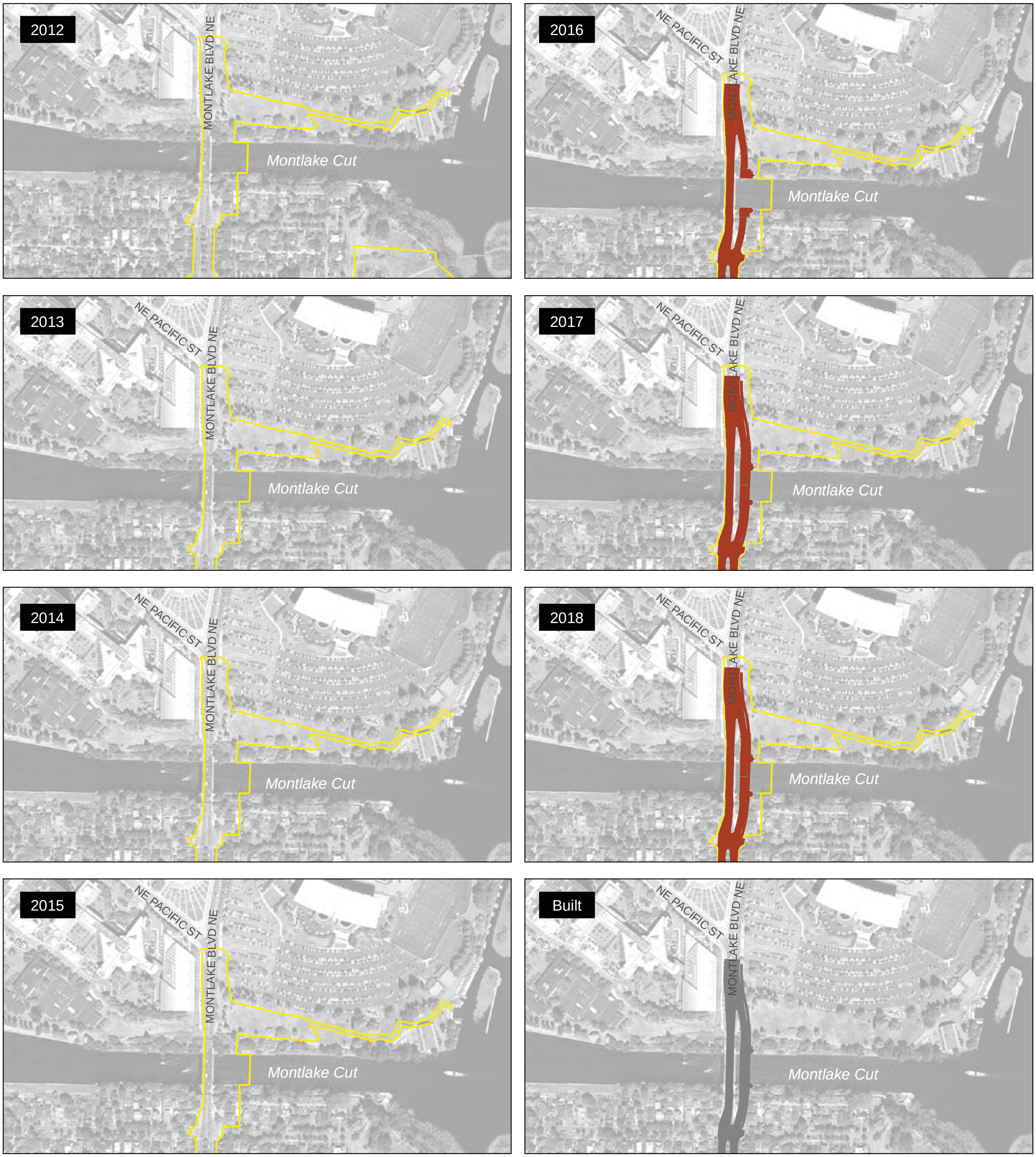


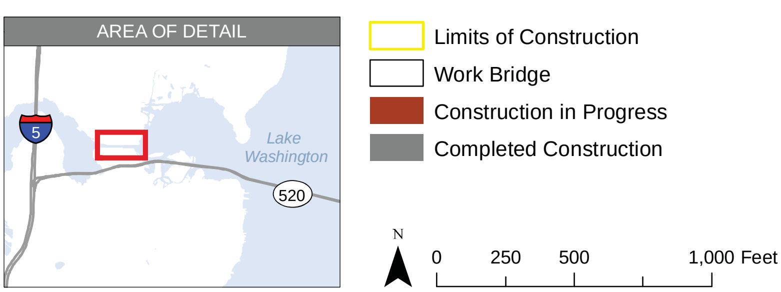
EXHIBIT 2-41.
PROFILE OF THE BASCULE BRIDGE IN THE MONTLAKE AREA

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.

The barge-based 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 actual 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 proposed in-water construction periods to minimize potential effects on migrating ESA-listed juvenile salmonids. Detailed descriptions of the construction for the bascule bridge elements are provided in Section 2.3.12.

If the proposed bascule bridge is designed to include a concrete bridge deck, the deck of each bascule leaf would be poured and cured separately to maintain the full navigation clearance throughout the Montlake Cut. One leaf would be poured and cured, while the other leaf would remain open for vessel passage. Each pour and cure step would take about 3 weeks (6 weeks total). Construction of the bascule piers and the leaf spans is proposed to occur during the latter part of 2017 and extend into 2018. Exhibit 2-42 shows the proposed construction sequence for the bascule bridge. The described sequence is based on an estimated schedule.





Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 2-42. **Construction Sequence for the Bascule Bridge**

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

2.6.4 Union Bay and West Approach Area

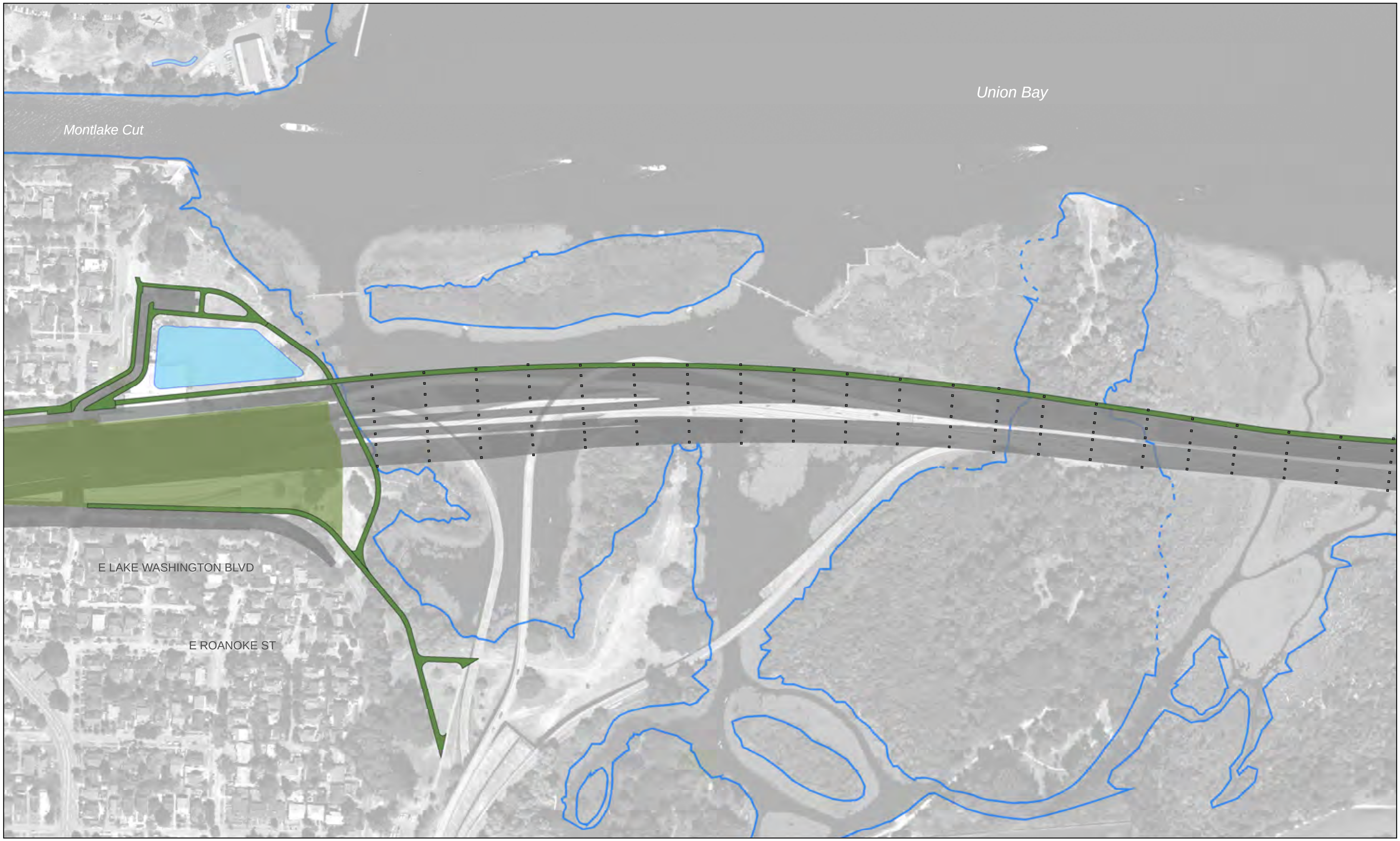
The existing Union Bay Bridge and the west approach will be replaced by two new structures, an eastbound and a westbound bridge structure with a gap between them. The new structures will be continuous fixed-span bridges throughout their length. The west approach will begin in Montlake and extend through Union Bay, across Foster Island, and out into Lake Washington, terminating at the west transition span and the beginning of the floating bridge (Exhibits 2-43a and 2-43b). The combined width of these structures will be greater than the width of the existing bridge. A constructed wetland for enhanced stormwater treatment will be built on the site currently occupied by the MOHAI (see Section 2.7.1). Barges and the staging sites described previously for the Montlake interchange area will be used for construction staging. No construction staging will occur on Foster Island outside of the construction easement.

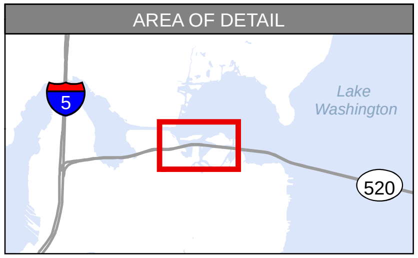
Construction will include a temporary work bridge on Foster Island that will be removed after the permanent structure is completed. Once construction is completed, 2.4 acres of construction easements on Foster and Marsh islands will be returned to park use.

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 to 112 feet at the west transition span, with a gap width ranging between 7 and 40 feet. The width of the existing west approach will vary between 57 and 104 feet. The height of the bridge over water will increase from a minimum of less than 3 feet to about 12 feet near Montlake and from 45 to 48 feet near the west transition span (Exhibits 2-44a and 2-44b). The new structures will be up to 32 feet higher than the existing bridge, with the greatest increase occurring in the area east of Foster Island, which is a primary migration route of juvenile salmonids. 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 transitioning 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





- Column
- Ordinary High Water Mark
- Ordinary High Water Mark (Not Surveyed)
- Bicycle/Pedestrian Path
- Proposed Edge of Pavement
- Lid
- Stormwater Treatment Facility

N

0 125 250 500 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.

Exhibit 2-43a. **Plan View Layout for the West Approach**

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

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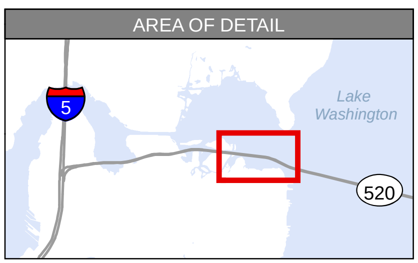

• Column
Ordinary High Water Mark
Ordinary High Water Mark (Not Surveyed)
Interim Connection Bridge
Bicycle/Pedestrian Path
Proposed Edge of Pavement

N

0 125 250 500 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.

Exhibit 2-43b. **Plan View Layout for the West Approach**

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

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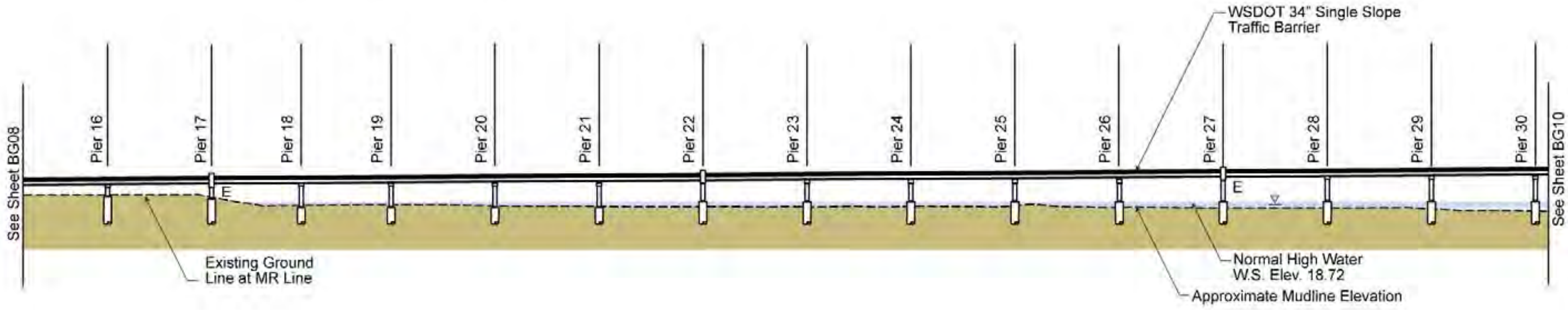


EXHIBIT 2-44a.
PROFILE OF THE WEST APPROACH

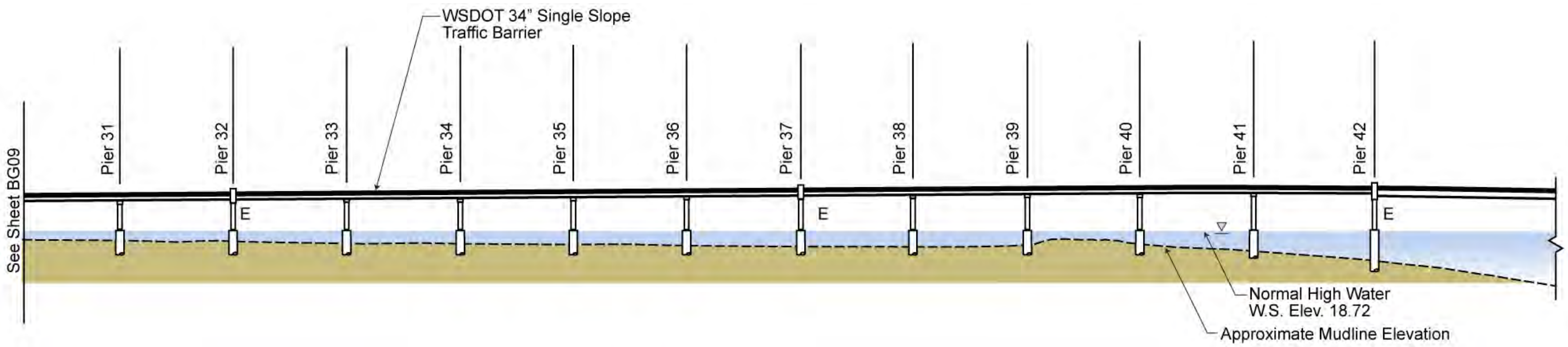


EXHIBIT 2-44b.
PROFILE OF THE WEST APPROACH

The west approach substructure will consist of 42 pier bents: 39 in-water pier bents and an additional three pier bents on Foster Island. Most span lengths will be 150 feet, although the spans between pier bents 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 10-foot-diameter shafts (Exhibit 2-45). No mudline footings or waterline shaft caps are proposed. Of the 254 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 (pier bents 2 to 22) or 7.5-by-7.5-foot (pier bents 23 to 42) square columns built directly on top of the drilled shafts. The westerly one-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 19,000 square feet of substrate area.

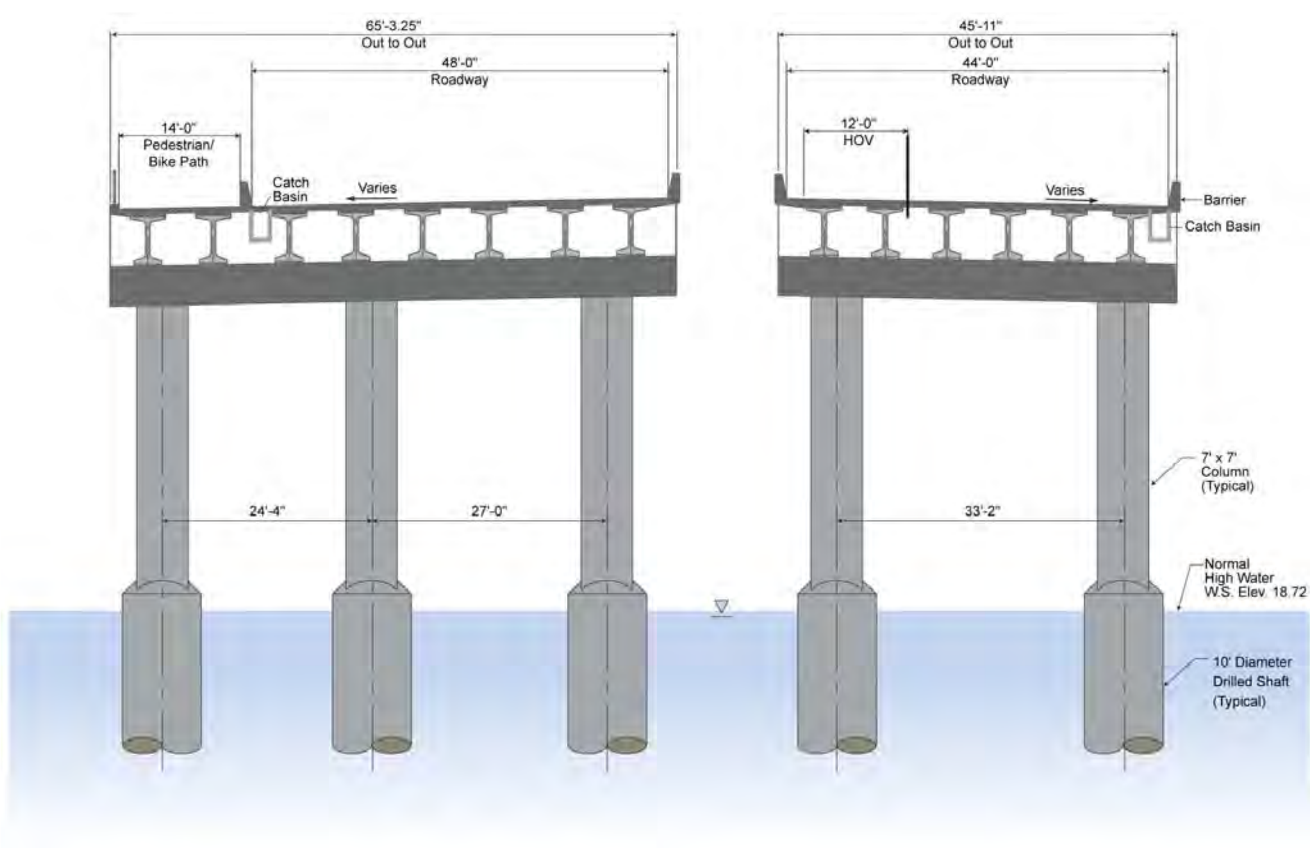
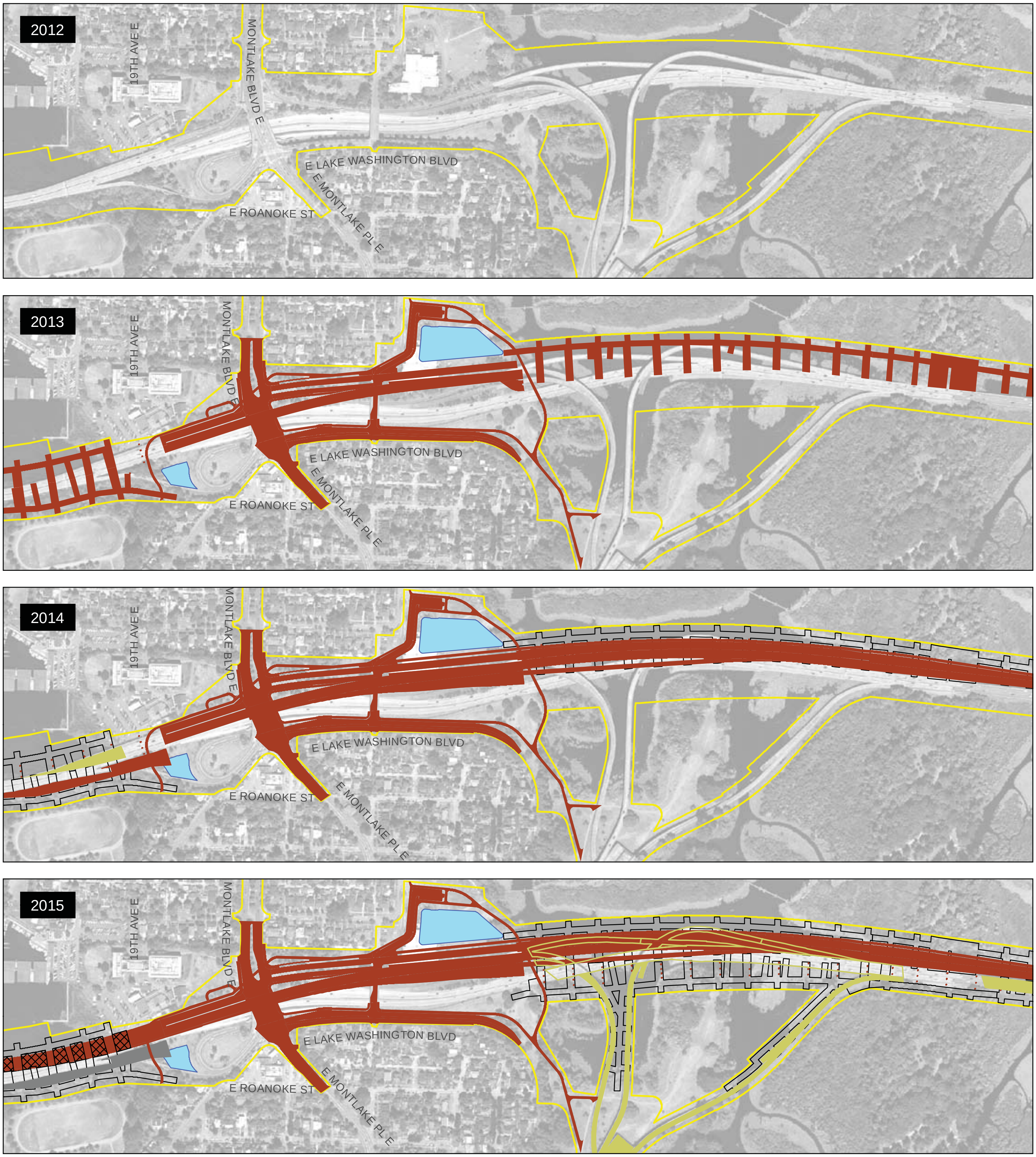


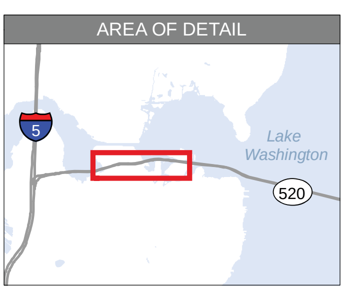
EXHIBIT 2-45.
TYPICAL CROSS SECTION OF THE WEST APPROACH

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, and the eastbound approach structure will be 47 to 108 feet wide (moving east to west). Most 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 travels 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 about 12 to 25 feet above the water in Union Bay, and from 28 to about 48 feet above the water between Foster Island and the west transition span, increasing from west to east. Total over-water cover resulting from the west approach structure will be approximately 19 acres: 8.4 acres in Union Bay and 10.6 acres in Lake Washington. This represents an increase of 2.5 acres of over-water cover in Union Bay and 5.8 acres in Lake Washington, compared to existing conditions.

Like the Portage Bay Bridge, the new bridges in the west approach area will require construction of work bridges adjacent to the existing bridge. The work bridges will allow the new bridges to be built in halves so that traffic flow will not be interrupted. Traffic will use the existing bridge until the northern half of the new bridge is built, then shift to the new north structure while the existing bridge is demolished and the new south structure is built.

Construction activities and durations in this area will occur over a 6-year period. 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 construction sequence is described in the following subsections and is shown in Exhibits 2-46a though 2-46d. The described sequence is based on an estimated schedule.

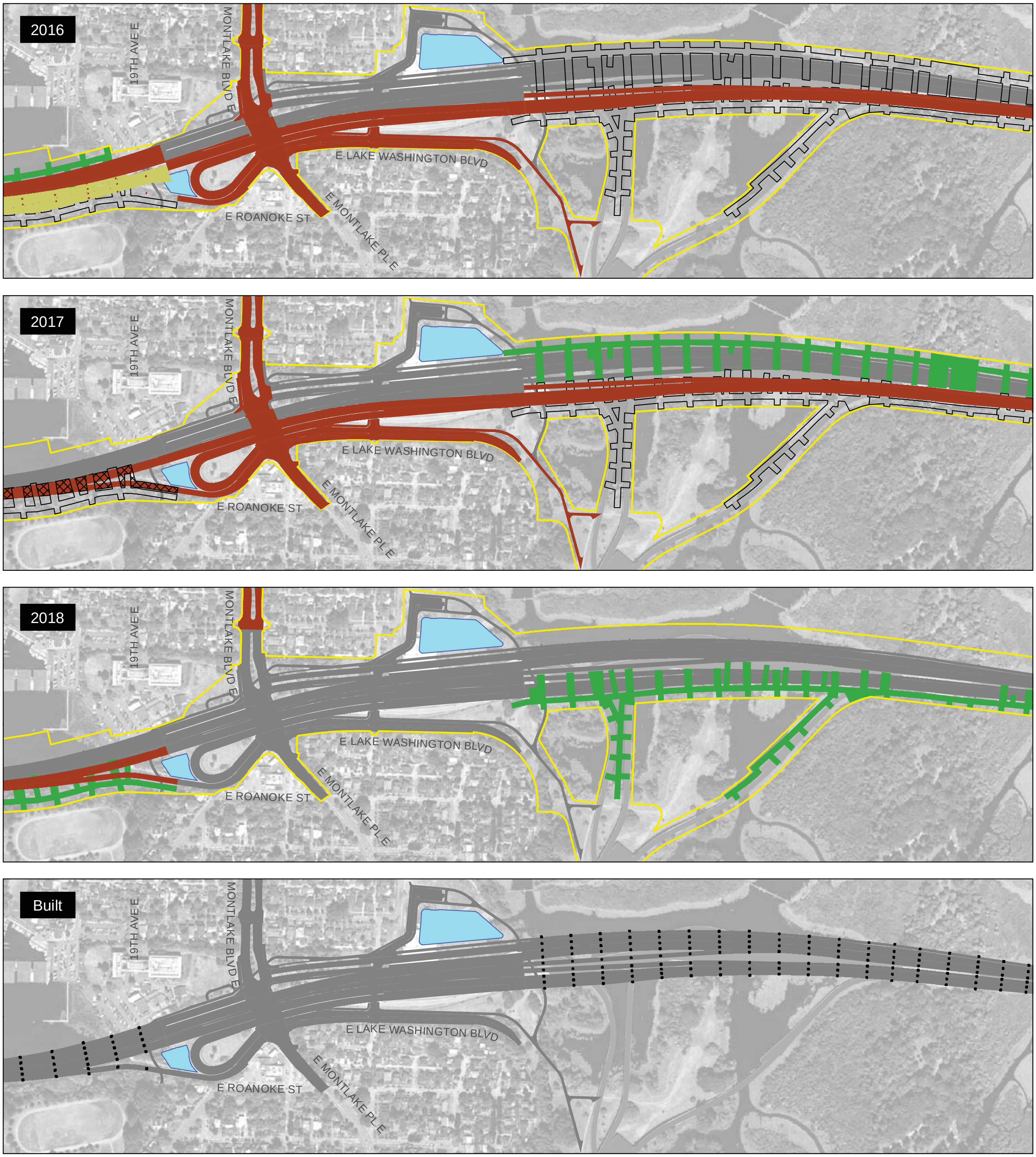




Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 2-46a. **Construction Sequence for the West Approach**

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



Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

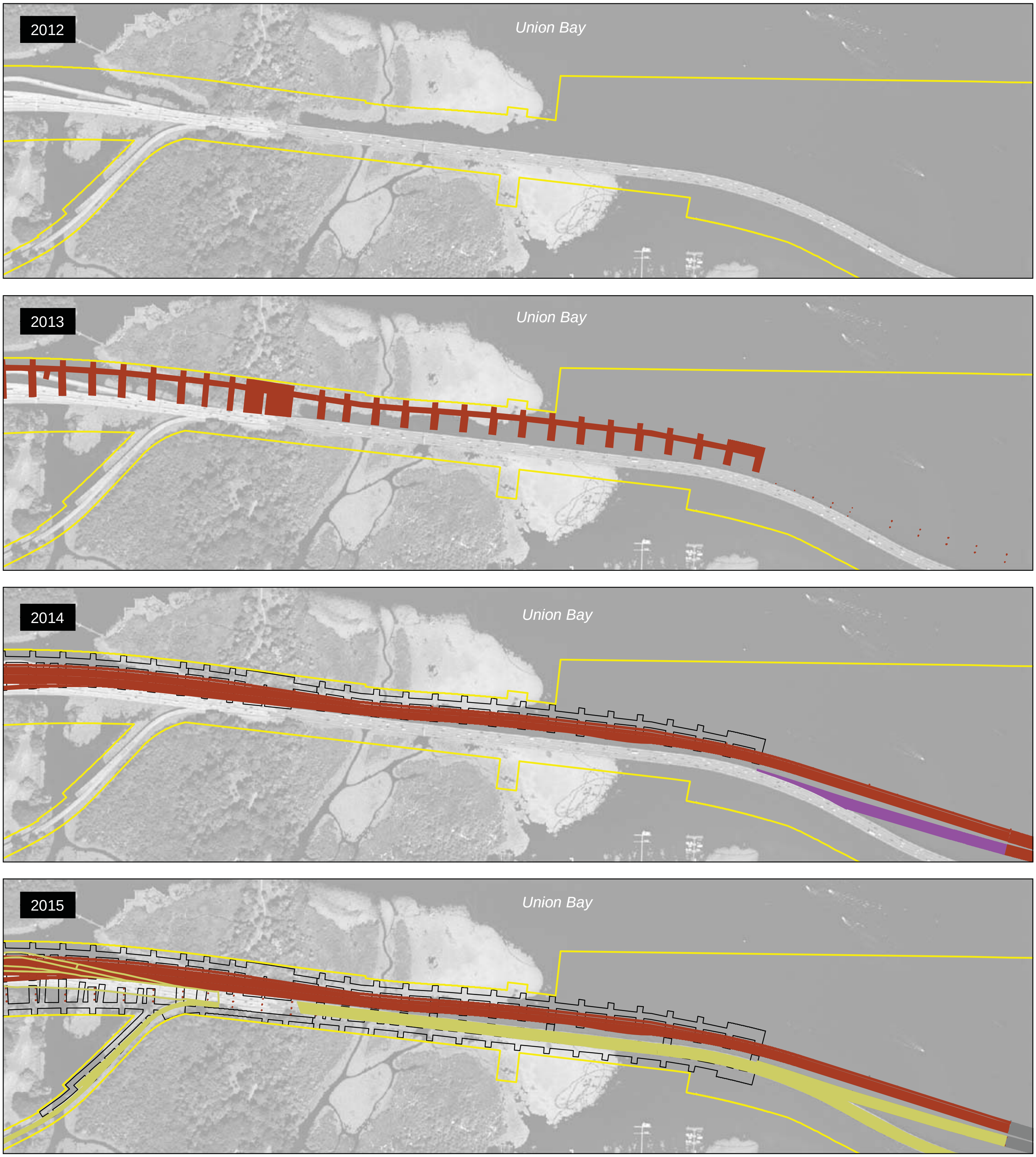
- Limits of Construction
- Work Bridge
- False Work
- Portage Bay Bridge Demolition
- Construction in Progress
- Work Bridge Removal
- Completed Construction
- Bridge Pier Column
- Stormwater Facility Use as Temporary

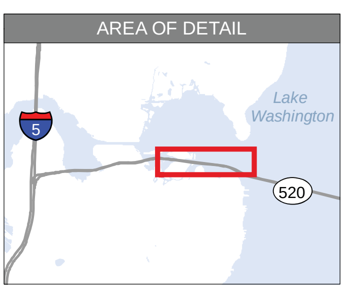
N

0 250 500 1,000 Feet

Exhibit 2-46b. **Construction Sequence for the West Approach**

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





- Limits of Construction
- Work Bridge
- Union Bay Bridge Demolition
- Existing Bridge Demolition
- Interim Connection
- Construction in Progress
- Completed Construction

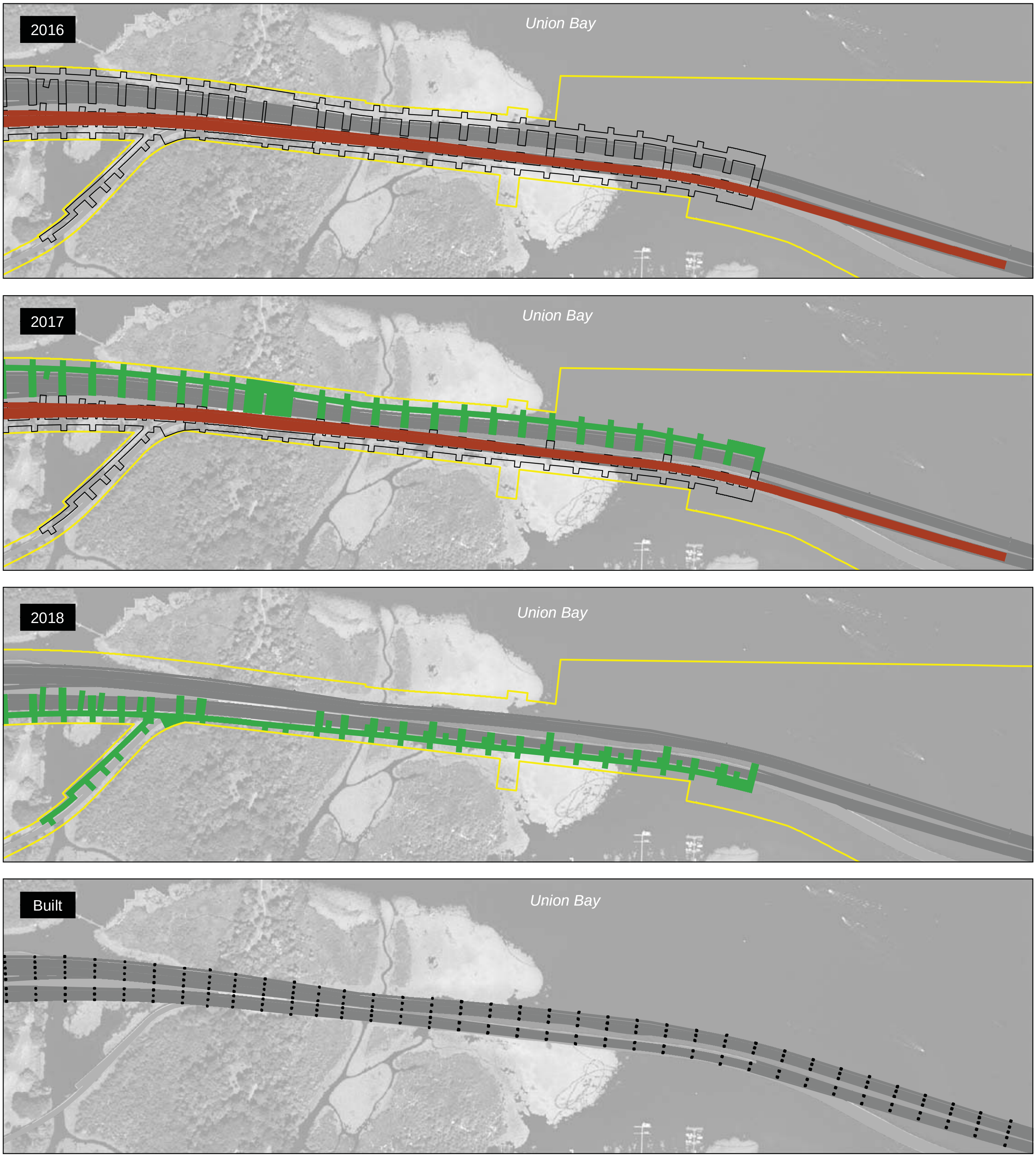
Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

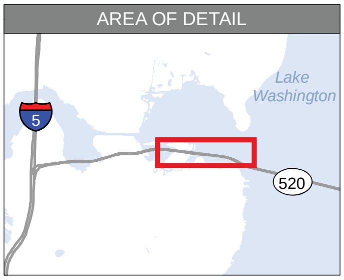
0 250 500 1,000 Feet

Exhibit 2-46c. **Construction Sequence for the West Approach**

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



AREA OF DETAIL



- Anchor & Cable
- Limits of Construction
- Work Bridge
- Work Bridge Removal
- Construction in Progress
- Completed Construction
- Bridge Pier Column

Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

0 250 500 1,000 Feet

Exhibit 2-46d. **Construction Sequence for the West Approach**

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

2.6.4.1 Construction Year 1 – 2013

Within the first construction year, work bridges and finger piers will be constructed along the north side of the existing Union Bay Bridge and the west approach. The first phase of work bridge construction will involve driving up to 950 total piles; 500 in Union Bay and 450 in Lake Washington. These pile-driving activities are expected to occur during a 6-month period beginning in the latter part of 2013. WSDOT anticipates that the north work bridges will cover an over-water area of about 7 acres. They will span from Montlake to Foster Island and extend approximately 1,700 feet out into Lake Washington (i.e. to roughly the 10-foot depth).

Construction on the northern half of the bridge substructure (westbound) will then begin in Union Bay and Lake Washington. To maintain traffic flow, an interim connection between the new floating span (see the following discussion of construction year 2), and the existing west approach span will then be completed in Lake Washington. WSDOT expects that up to 84 drilled shaft casings will be installed: 60 in Union Bay and 24 in Lake Washington. The 24 shafts in Lake Washington will be built from barges. After completion of the interim connection substructure, completion of the 1.4-acre interim superstructure will follow.

2.6.4.2 Construction Year 2 – 2014

Construction of elements of the west approach north substructure in Lake Washington will extend into construction year 2 and require the installation of about 72 drilled shafts. As the substructure elements are completed, construction of the northern half of the west approach superstructure will begin. The superstructure will be constructed from both the north work bridges and barges. WSDOT expects that up to 5.1 acres of superstructure in Union Bay and 7.5 acres of superstructure in Lake Washington could be completed during this period.

2.6.4.3 Construction Year 3 – 2015

After traffic is switched to the interim connection, demolition of the east end of the existing west approach structure will begin. Removal of the bridge superstructure by barge and the removal or cutting of approximately 80 columns will occur. Any remaining construction of the south west approach work bridge will occur, with up to 500 piles installed and an increase of 3.3 acres of over-water shade from the work bridge deck.

Construction will also include the completion of the south work bridge structure in Union Bay, with the installation of about 600 support piles, and 4.3 acres of additional over-water shade. As work bridge construction advances in Union Bay, the existing Lake Washington Boulevard ramps will be demolished to clear the way for the new westbound half of the west approach span through Union Bay. This work will involve the removal or cutting of 89 existing in-water columns.

As the south work bridges are completed, the installation of the drilled shaft casing for the southern half (eastbound) substructure can begin. WSDOT expects that the remaining 86 drilled shaft casings will be installed: 44 in Union Bay and 42 in Lake Washington. The shafts and columns (10 piers) east of the work bridge will be built from barges. Construction of the southern half superstructure is expected to begin commensurate with the level of substructure completion.

2.6.4.4 Construction Year 4 – 2016

In the construction year 4, after construction of the northern half of the superstructure and the traffic shift to the northern half of the bridge, demolition of the existing Union Bay Bridge and west approach will be completed. Approximately 168 columns in the west approach area will be removed, and the interim west approach connection will be dismantled. The construction of the southern west approach substructure will also occur, with the remaining 12 shafts of the interim connection bridge used in the final configuration for the southern substructure. The north work bridges will also be dismantled, and the 950 total piles removed (500 in Union Bay and 450 in the west approach area).

2.6.4.5 Construction Year 5 – 2017

Construction of the southern half of the superstructure will progress into construction year 5. The majority of the 8.4 acres in Union Bay and the 10.6 acres in Lake Washington are expected to be completed by this time. No other activities are proposed in this construction year.

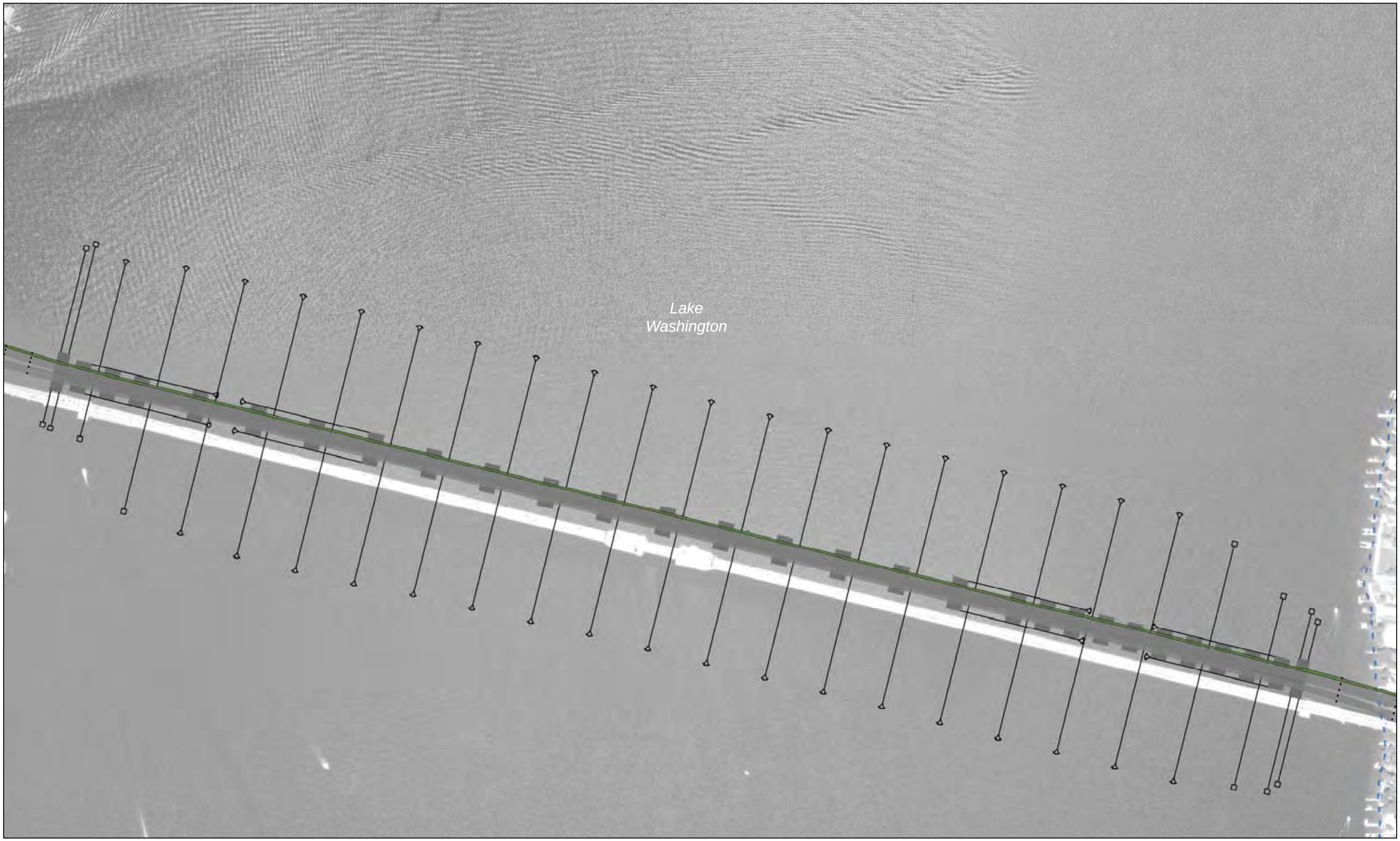
2.6.4.6 Construction Year 6 – 2018

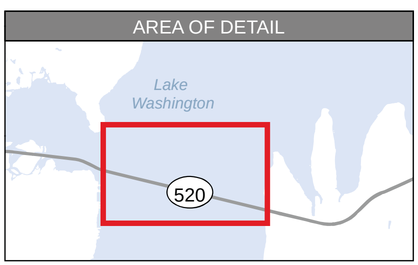
Construction year 6 marks the likely final year for construction of the west approach. Completion of the last portions of the southern half of the superstructure is expected to continue into construction year 6. Once completed, the remaining work bridges will then be dismantled, and up to 1,100 piles will be removed (600 in Union Bay and 500 in the west approach area). The final stage of construction will consist of site cleanup and demobilization.

2.6.5 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 the lake. Exhibit 2-47 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 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.





- Column
- Anchor and Cable
- Ordinary High Water Mark (Not Surveyed)
- Bicycle/Pedestrian Path
- Proposed Edge of Pavement
- Pontoon

N

0 250 500 1,000 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.

Exhibit 2-47. **Plan View Layout of the Floating Bridge**

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

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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 spaced out 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 deep. The cross pontoons will measure 240 feet long by 75 feet wide by 35 feet deep. The supplemental stability pontoons will measure 98 feet long by 50 to 60 feet by 28.5 feet deep. The overall length of the new floating span will be 7,710 feet, compared to the existing 7,580 feet. The total over-water area displaced by the pontoons will increase to 19.9 acres, from the existing 10.8 acres. 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 greater number and size of the new pontoons will 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. As described in Section 2.3.13, the 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 to 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 floating bridge will be approximately 13 feet higher than the existing bridge or approximately 21 feet above the lake surface in the middle portion of the bridge. Roadway deck that extends laterally beyond the width of the pontoons will add an additional 0.9 acre of over-water cover, resulting in a total of 20.8 acres of over-water cover for the floating bridge. Exhibit 2-48 shows a typical cross section of the floating bridge, including the supplemental stability pontoons with stormwater lagoons, and a roadway luminaire. The detailed description of the project elements making up the floating bridge is provided in Section 2.3.15.

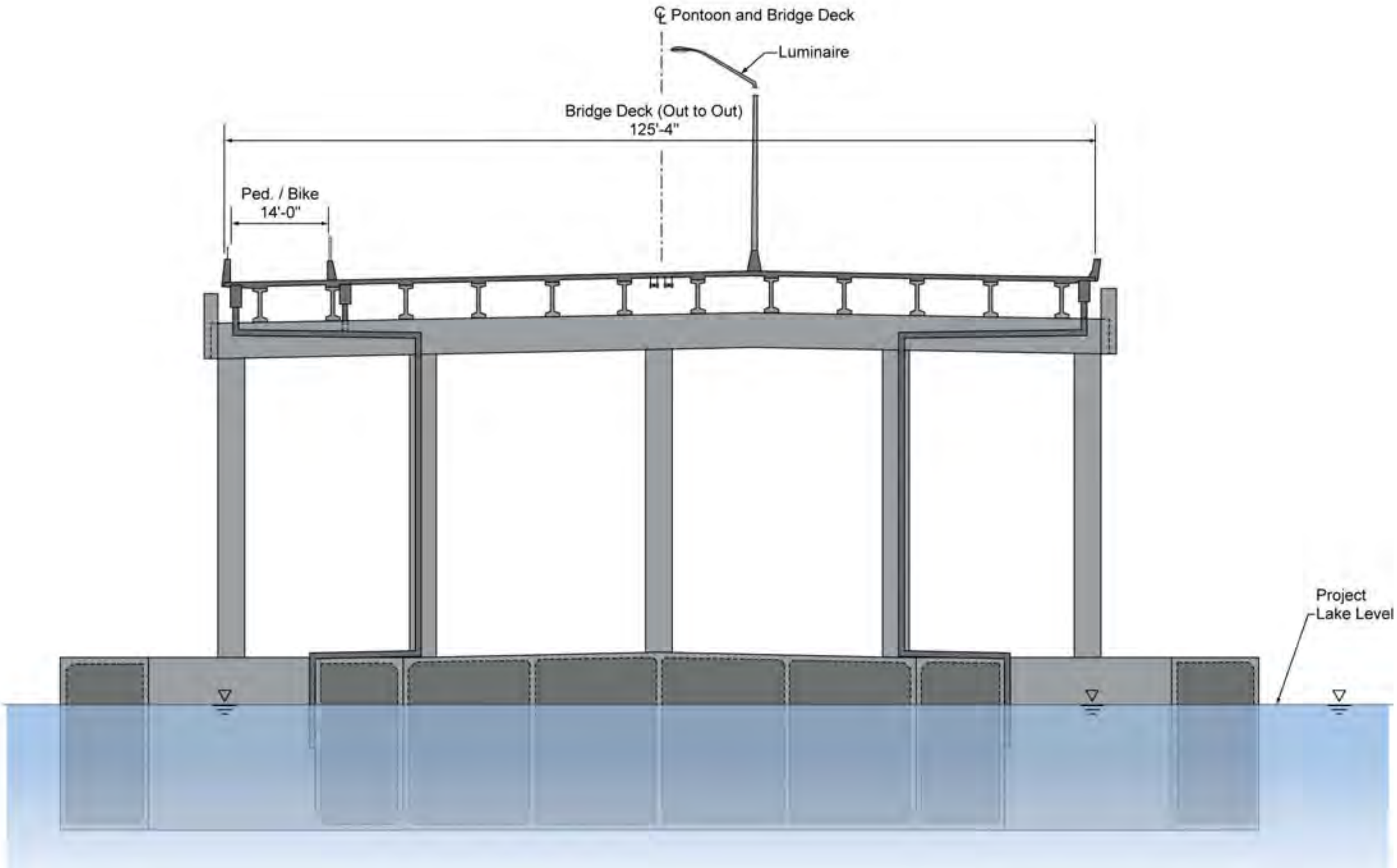
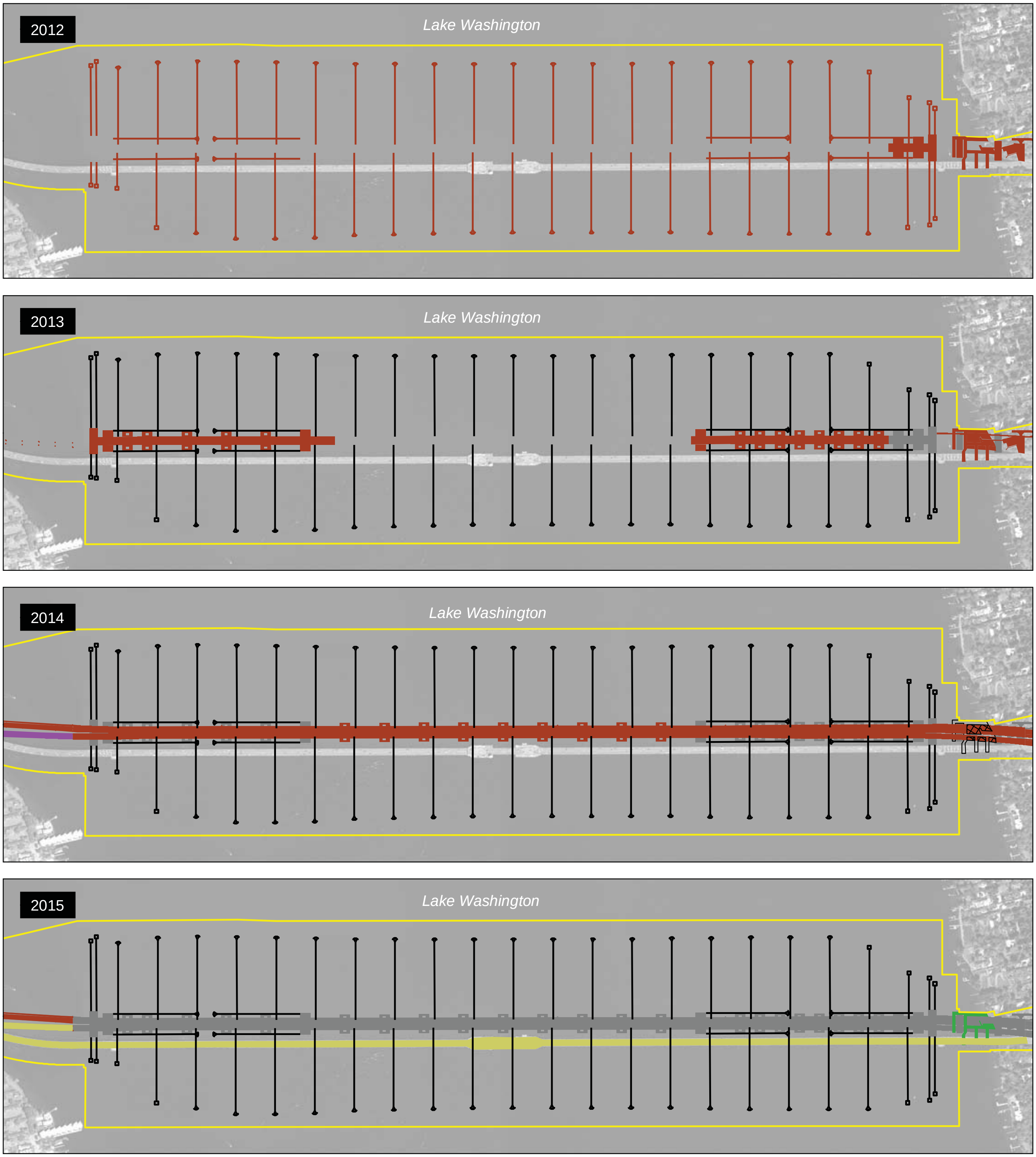


EXHIBIT 2-48.
CROSS SECTION OF THE FLOATING BRIDGE, SHOWING A LUMINAIRE AND STORMWATER LAGOONS

Construction activities associated with pontoon installation will occur over an estimated 3-year period, beginning in 2012 and ending in early 2015. The following subsections describe the sequence of proposed activities during the floating bridge construction. For a detailed description of construction activities related to pontoon assembly and anchorage, refer to Section 2.3.14, Pontoon Assembly. The construction sequence and activities are described in the following subsections and shown in Exhibits 2-49a and 2-49b. The described sequence is based on an estimated schedule.



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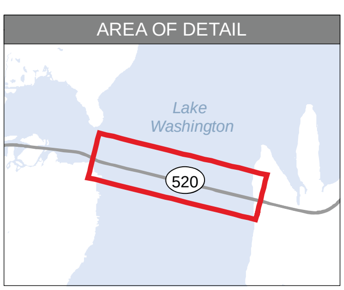


- Anchor & Cable
- Work Bridge
- False Work
- Existing Bridge Demolition
- Interim Connection
- Work Bridge Removal
- Construction in Progress
- Completed Construction
- Limits of Construction

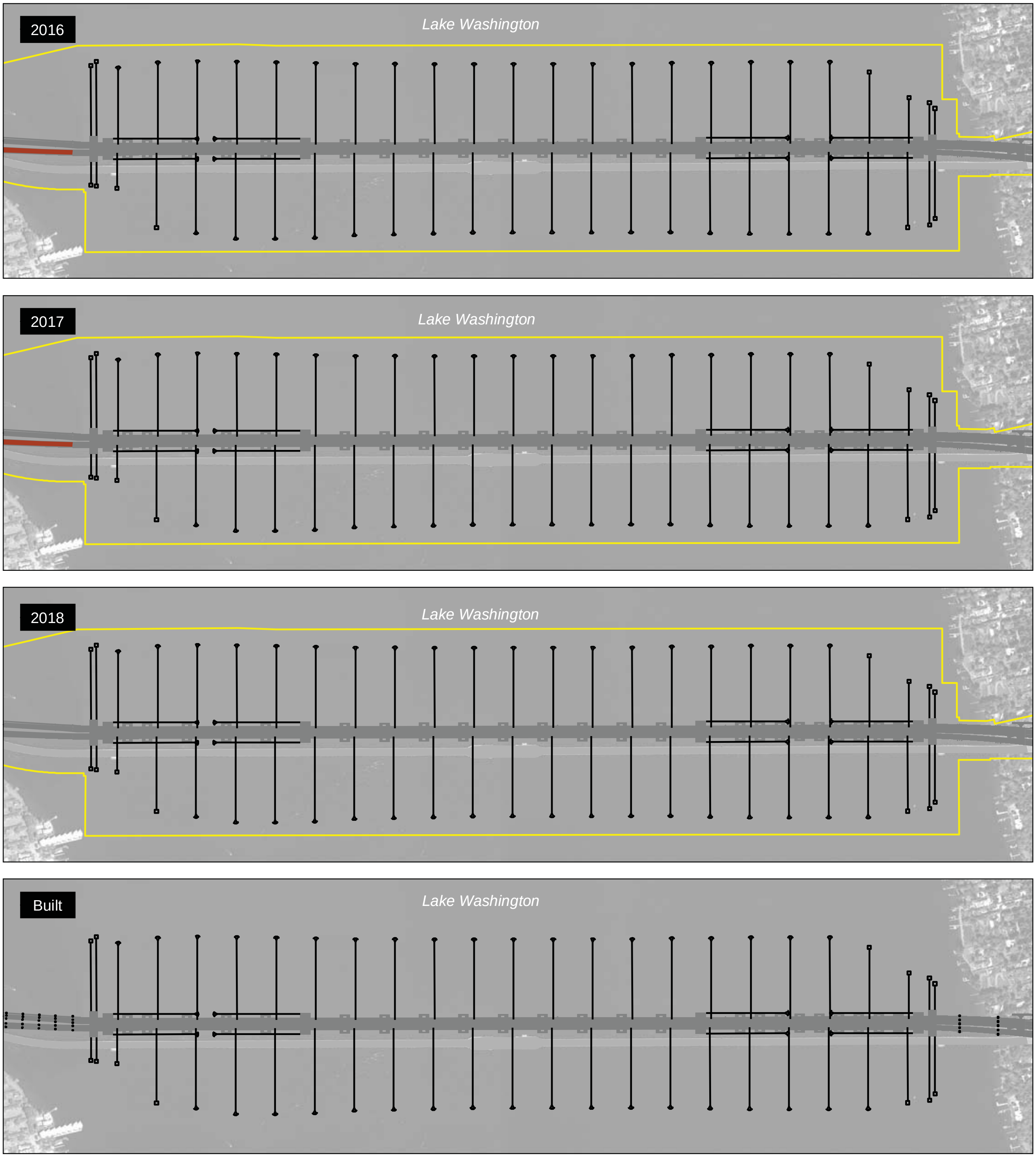
Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

N

0 250 500 1,000 Feet

Exhibit 2-49a. **Construction Sequence for the Floating Bridge**

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



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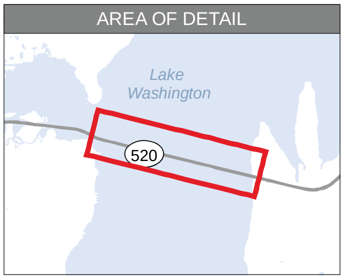


- Anchor & Cable
- Limits of Construction
- Construction in Progress
- Completed Construction
- Bridge Pier Column

Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

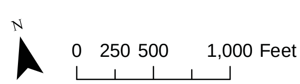


Exhibit 2-49b. **Construction Sequence for the Floating Bridge**

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

2.6.5.1 Construction Year 1 – 2012

The first step of the floating bridge construction is the placement of the anchors. Temporary anchors are proposed for both the east and west ends of the floating span. Temporary anchors may be used to moor the new span or to replace anchors for the existing span where existing anchor lines conflict with the new bridge due to the proximity of the new and existing bridge and the increased draft of the new bridge. A total of about 12 temporary pile anchors will be installed in early 2012 and could remain in place for a total of up to about 22 months. Permanent anchors for the east cross pontoon can be installed but cannot be permanently attached to the east cross pontoon until the existing bridge is removed due to its proximity to the existing bridge. Therefore, temporary anchorage may be required, unless more analysis indicates that temporary anchorage is not required. Temporary anchorage may include the installation of temporary anchors, connection to the existing bridge, or some other means of temporarily holding the bridge in position. Between February and October 2012, all of the 58 permanent anchors will be installed, occupying about 3.3 acres of substrate. As the anchor installation nears completion in the latter part of 2012, the assembly of one end (likely the east end) of the pontoon foundation could begin , with the installation of one cross pontoon and several longitudinal pontoons.

2.6.5.2 Construction Year 2 – 2013

Further assembly of pontoons will cease during the winter months to avoid adverse weather conditions. Floating bridge construction is likely to resume in early 2013 with the beginning of superstructure construction on the assembled pontoons. As the potential for adverse weather conditions subsides in the spring, the longitudinal pontoons will be gradually installed, moving toward the middle of the lake from both ends. Some or all of the longitudinal pontoons could be outfitted with steel trusses before they reach Lake Washington. The remaining pontoons will be outfitted while being incorporated into the new floating bridge. The supplemental stability pontoons will be incrementally installed along the north and south sides of the longitudinal pontoons. Approximately one-half or more of the longitudinal pontoons and supplemental stability pontoons are expected to be installed during this period. Any outfitting activities that have not been completed off site will also occur with the progression of the floating span construction.

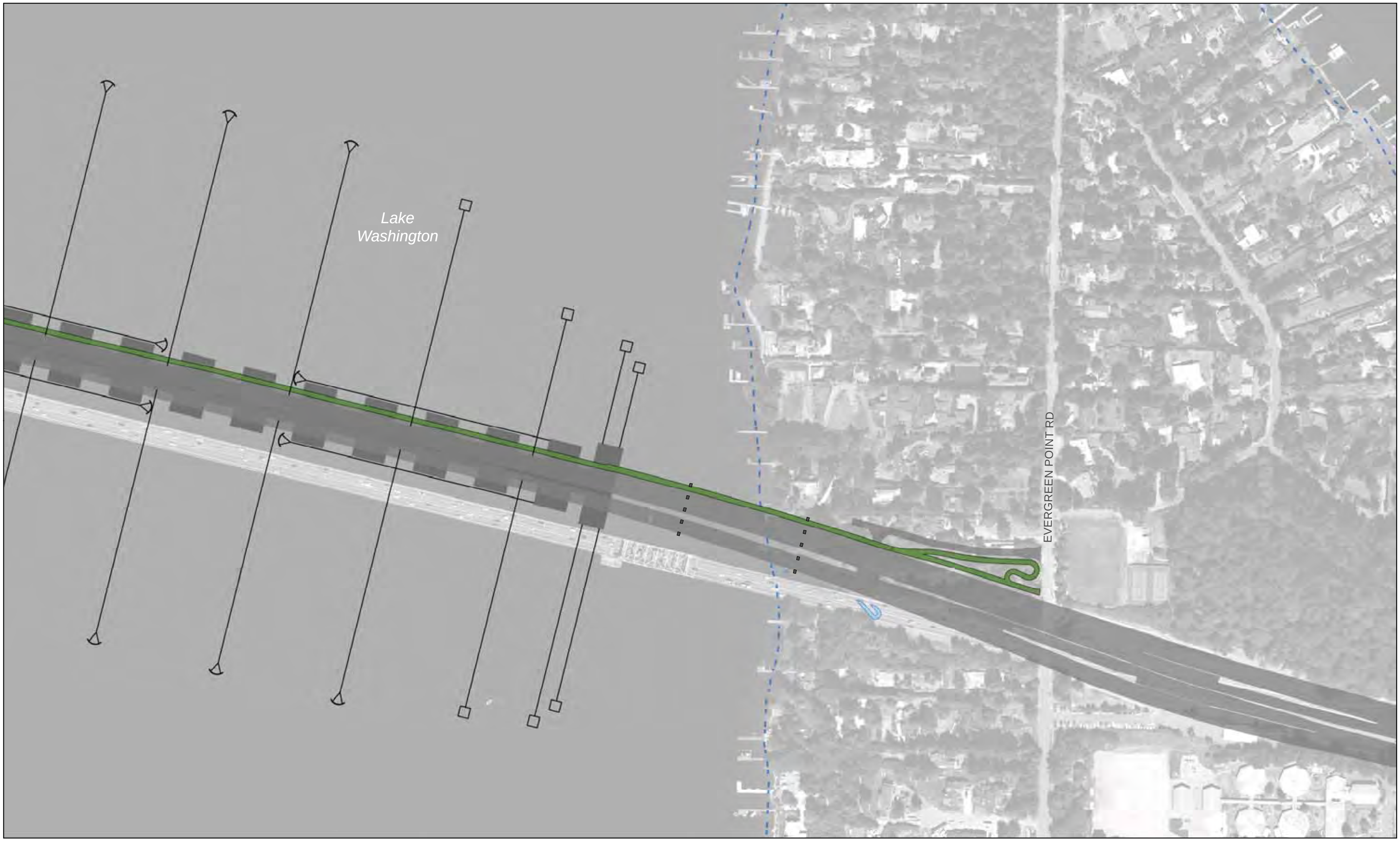
2.6.5.3 Construction Years 3 and 4 – 2014/2015

For approximately the final 15 months of construction, between early 2014 and into 2015, construction will consist of assembling the remaining pontoons, completing the superstructure, adding the east and west transition spans, and dismantling the existing floating span. The floating bridge is scheduled to be open to traffic in the latter part of 2014. Once traffic shifts to the new floating bridge, the existing floating bridge will be dismantled and the pontoon sections will be towed away. The old pontoon sections could be sold for other purposes or hauled to an existing facility for demolition and recycling.

2.6.6 East Approach and Bridge Maintenance Facility

WSDOT will replace the east approach span of the Evergreen Point Bridge with a new span to the north; it 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 (Exhibit 2-50). 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 (Exhibit 2-51).

The east approach will have two column piers. Pier one will be approximately 350 feet (or less) out from the shoreline, and Pier two will be on shore, 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 one will measure approximately 90 by 60 feet for the north bridge and 60 by 50 feet for the south bridge, and together they will occupy approximately 8,300 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 (Exhibit 2-52).



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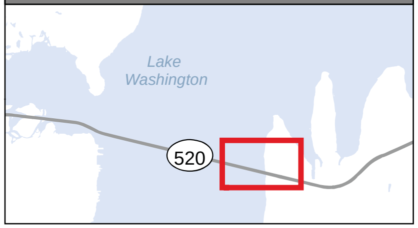

- Column
- Ordinary High Water Mark (Not Surveyed)
- Bicycle/Pedestrian Path
- Proposed Edge of Pavement
- Pontoon
- Stormwater Treatment Facility

N

0 125 250 500 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.

Exhibit 2-50. **Plan View Layout of the East Approach**

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

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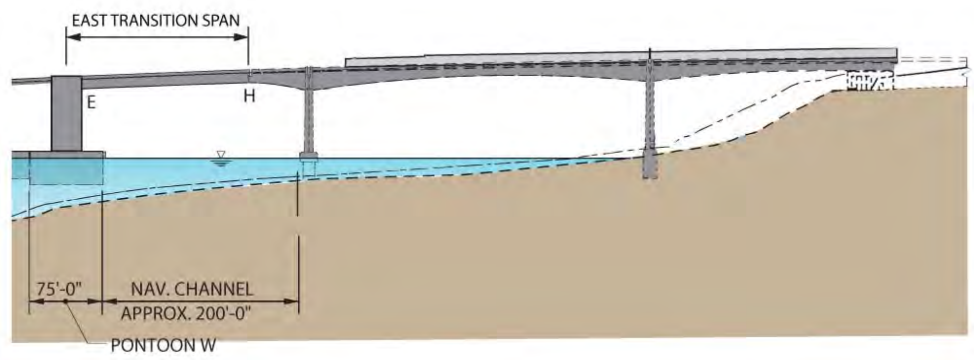


EXHIBIT 2-51.
PROFILE OF THE EAST APPROACH

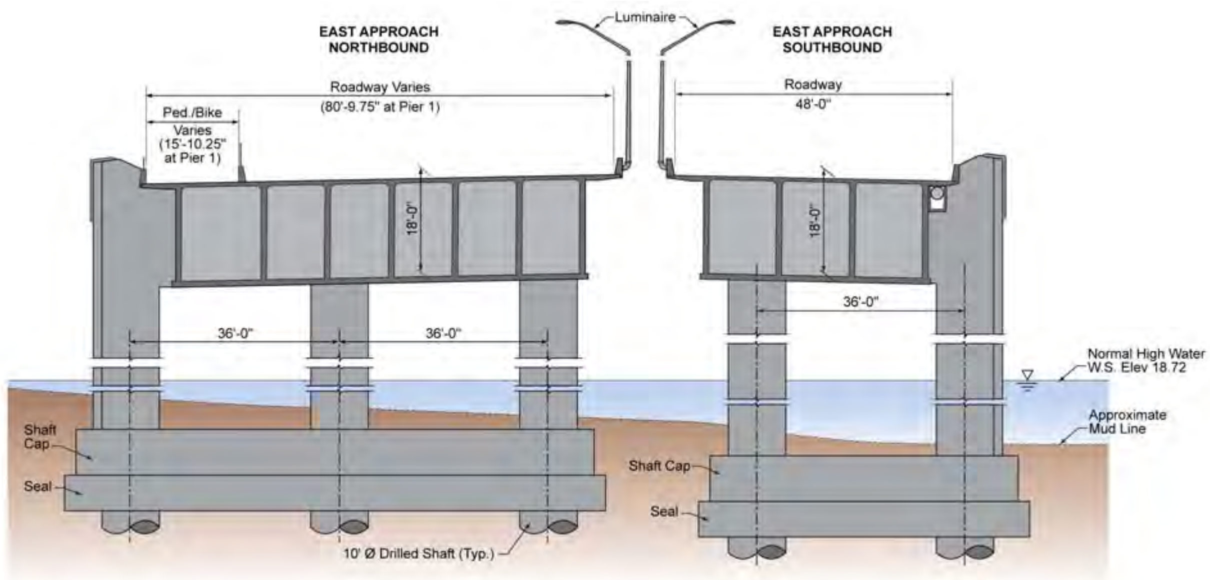


EXHIBIT 2-52.
TYPICAL CROSS SECTION OF THE EAST APPROACH

Approximately 1.4 acres of vegetation will be removed along the east shoreline of Lake Washington for the construction of the bridge maintenance facility. No wetland habitat will be affected in this area. An existing stormwater treatment wetland will be modified to accommodate additional flow from the increased area of impervious surface.

Box girder bridge sections are proposed to be cast-in-place, 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 of the east approach and then widen 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 one to 78 feet above the water at the midpoint of the adjacent (landward) span. Total over-water cover resulting from the east approach span will be approximately 1.3 acres, representing an increase of approximately 1 acre relative to the existing condition.

Construction of the new east approach span will be concurrent with the construction of the floating bridge, over a 3±-year period between 2012 and 2015. Construction will take place from work bridges, barges, and land. Both the north and south approach structures will be constructed simultaneously and completed before traffic is shifted onto the bridge. Detailed descriptions of construction activities related to the east approach span are provided in Section 2.3.16.

The 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. A detailed description of construction activities related to the maintenance facility and dock is provided in Section 2.3.16.

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 perpendicular to the shoreline and extending out no more than 100 feet. The dock stem will be approximately 10 feet wide, and the moorage platform may be as wide as 14 feet. The moorage platform will extend approximately 60 feet in a north-south direction parallel to the existing bathymetry. The over-water cover resulting from the dock will be approximately 1,500 square feet, representing an increase of 600 square feet from that of the existing docks that will be removed. 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.

There will be three or four ladders mounted to the dock to provide access to the boats and a way for people to safely climb onto the dock if they fall into the water. These ladders will extend into the water a short distance. There will be a fender system 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).

The construction sequence in the east approach area is described in the following subsections and shown in Exhibit 2-53. The described sequence is based on an estimated schedule.

2.6.6.1 Construction Year 1 – 2012

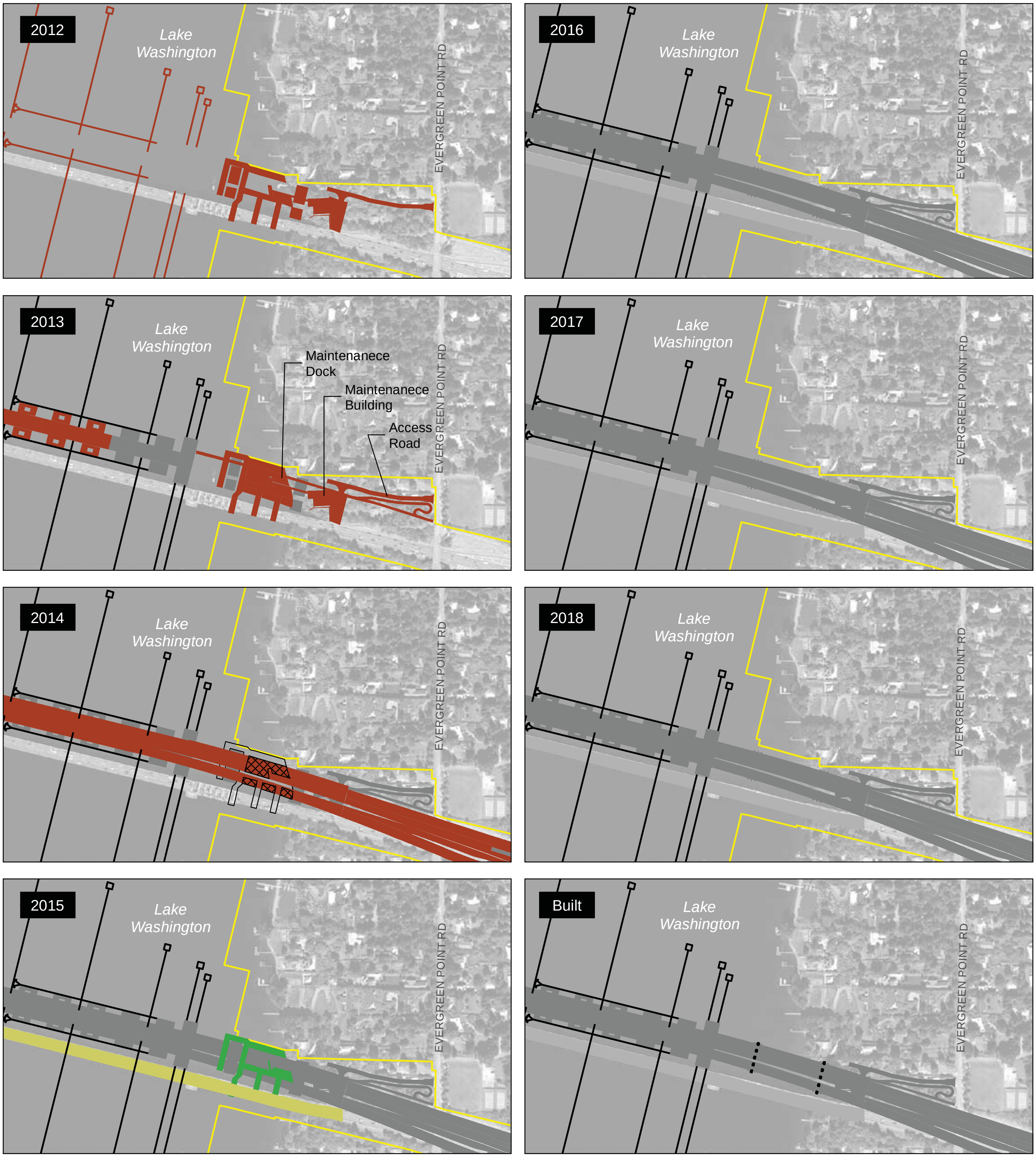
In construction year 1, work bridges, finger piers, and falsework will be constructed along and under the proposed east approach structures, including the maintenance facility dock. The first phase of work bridge construction will involve driving up to 125 piles in Lake Washington. These pile-driving activities are expected to occur during a 3- to 4-month period in the latter part of 2012, possibly extending into 2013. WSDOT anticipates that the work bridges will occupy up to 0.8 acre of over-water cover, extending approximately 380 feet out into Lake Washington (to roughly the 20-foot depth).

As bridge construction work advances, the substructure elements of the east approach and the maintenance facility dock can subsequently be installed. The four 5- to 6-foot-diameter drilled shafts for the dock will be installed. Pier one construction is likely to consist of the installation of the 10 drilled shaft casings and their subsequent containment within a single cofferdam. The cofferdam is expected to occupy roughly 8,950 square feet of substrate area for the year it is expected to be in place. It is likely that a single cofferdam will be installed to construct the two mudline footings of Pier one. After the completion of the mudline footings, the concrete support columns will be constructed. Pier two construction will occur concurrently with Pier one construction, although these activities will be exclusively out of the water.

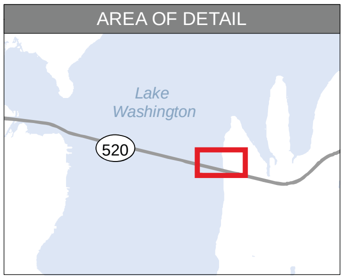
Upland construction of the maintenance facility will also begin during construction year 1; it will involve shoring up slopes, excavating the foundation areas, and constructing the building and retaining walls.

2.6.6.2 Construction Year 2 – 2013

As substructure construction progresses into construction year 2, construction of the superstructure can begin. Additional falsework will be required for superstructure erection, requiring up to 40 additional piles to be driven during this construction year. Completion of the maintenance facility, including site restoration and landscaping, is also expected to occur in construction year 2.



AREA OF DETAIL



- Anchor & Cable
- Limits of Construction
- Work Bridge
- False Work
- Existing Bridge Demolition
- Work Bridge Removal
- Construction in Progress
- Completed Construction

Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

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0 250 500 1,000 Feet

Exhibit 2-53. **Construction Sequence of the East Approach**

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

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2.6.6.3 Construction Year 3 – 2014

In construction year 3, the bridge superstructure will be completed from the work bridges, barges, and land. WSDOT expects that the bridge will be open to traffic in December 2014.

2.6.6.4 Construction Year 4 – 2015

Construction year 4 marks the final year of construction in the east approach area. WSDOT expects that 26 columns of the existing substructure (14 in water) will be removed in the early part of 2015. With the completion of the new superstructure and demolition of the existing structure, the work bridges and falsework will be dismantled and the 165 piles will be removed. The final stage of construction will consist of site cleanup and demobilization.

2.6.7 Eastside Transition Area

The SR 520, I-5 to Medina project will grade and pave the section of roadway between the new east approach and Evergreen Point Road to transition into the Medina to SR 202 project. This work will include lane restriping. This project activity will occur over a 3.5-year period between January 2012 and July 2015.

2.7 Project Operation

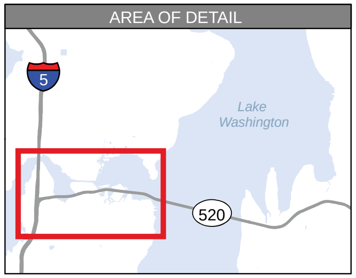
Operation and maintenance of the SR 520, I-5 to Medina project will differ from the existing operation and maintenance and may potentially result in changes to the Lake Washington environment. This section characterizes the long-term operation of the new facility and describes the potential mechanisms of effects on ESA-listed salmonids.

2.7.1 Stormwater

Stormwater treatment for the project is constrained by urban geography and the characteristics of the bridges. Stormwater treatment includes 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 2009c).

The SR 520, I-5 to Medina project will result in 45.20 acres of new pollutant-generating impervious surface (PGIS) and will replace 29.21 acres of existing PGIS, while 16.64 acres of existing PGIS will remain on site (Exhibits 2-54 and 2-55) for a total of 91.05 acres of PGIS after project construction. The amount of post-construction PGIS requiring treatment will be reduced by 7.79 acres as a result of two landscaped lids that will reduce the amount of effective PGIS contributing flow to outfalls. The 7.79 acres under the lids excludes areas where rain may potentially blow in. The areas identified as being under the lids will not generate stormwater flow, and any water on the roadway carried in by vehicles under the lids is expected to evaporate. Areas under the lids will be periodically maintained with sweepers to remove any debris or sediment that accumulates.

AREA OF DETAIL



Surface Water Outfall

- CSO
- E Alison St
- E Garfield St
- RWB-C
- RWB-F
- RWB-G
- RWB-H
- WS-BR2
- WS-C
- WS-D
- WS-G
- WS-J
- WS-PR
- Stream
- Existing Roadway
- Lid Structure
- Stormwater Faciliy
- Proposed Edge of Pavement
- Park

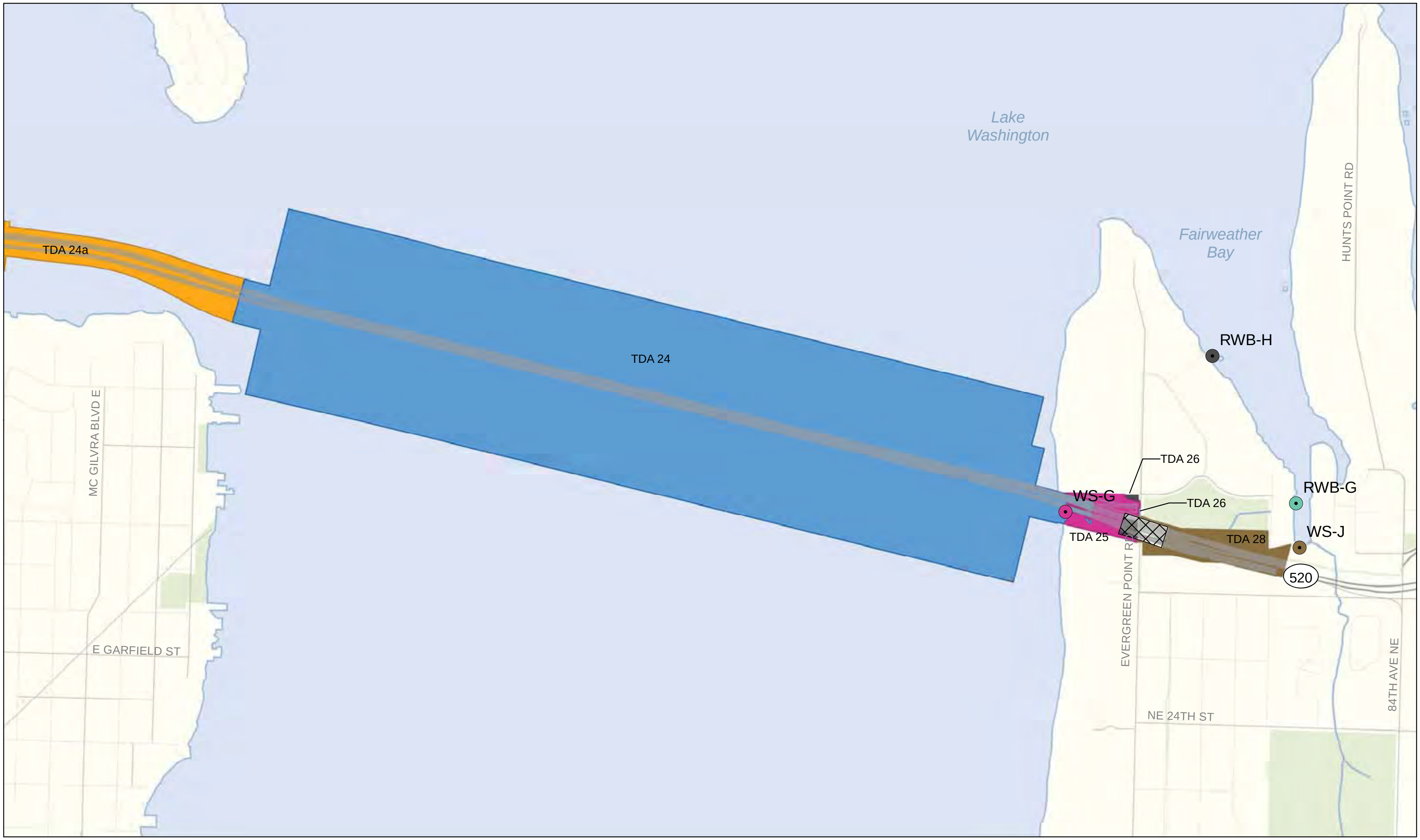
N

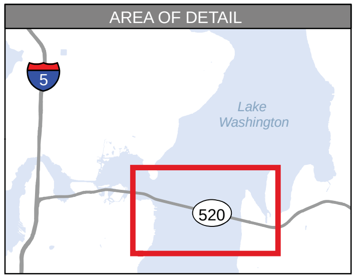
0 500 1,000 Feet

Source: Parametrix (2009) GIS Data (Habitat), King County (2005) GIS Data (Streets and Streams) King County (2007) GIS Data (Water Bodies), and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 2-54. **Surface Water Outfalls for Threshold Discharge Areas in Western Portion of Project Area under Proposed Conditions**

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





Surface Water Outfall

- CSO
- E Alison St
- E Garfield St
- RWB-C
- RWB-F
- RWB-G
- RWB-H
- WS-BR2
- WS-C
- WS-D
- WS-G
- WS-J
- WS-PR
- Stream
- Existing Roadway
- Lid Structure
- Stormwater Faciliy
- Proposed Edge of Pavement
- Park

N

0 500 1,000 Feet

Source: Parametrix (2009) GIS Data (Habitat), King County (2005) GIS Data (Streets and Streams) King County (2007) GIS Data (Water Bodies), and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 2-55. **Surface Water Outfalls for Threshold Discharge Areas in Eastern Portion of Project Area under Proposed Conditions**

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

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All new and replaced PGIS will receive stormwater quality treatment; however, approximately 13.91 acres of existing PGIS within the project area will not be treated after project construction. Areas that will not receive post-construction treatment are existing PGIS that will remain after the project is completed and are primarily areas associated with restriping activities in the I-5 interchange.

Project-related stormwater will be treated by facilities designed on the basis of the requirements in the 2008 WSDOT *Highway Runoff Manual* (HRM) and the WSDOT *Hydraulics Manual*. New and replaced PGIS requires stormwater treatment to a basic level of treatment for Lake Union and Lake Washington. The project will also be providing enhanced treatment for stormwater discharge from SR 520 into Lake Washington to further minimize any effects on the lake due to dissolved metals. Exhibit 2-56 describes the existing and proposed PGIS quantities by stormwater outfall.

EXHIBIT 2-56.
EXISTING AND PROPOSED POLLUTANT-GENERATING IMPERVIOUS SURFACE BY OUTFALL

Outfall (Roadway Segment)	Receiving Water Body	Existing PGIS (acres)	Proposed Existing PGIS to Remain (acres)	Proposed New and Replaced PGIS (acres)	Total Proposed PGIS (acres)	Proposed Water Quality Treatment (acres)
East Garfield Street (I-5 Interchange)	Lake Union	2.45	2.45	0	2.45	0
East Allison Street (I-5 Interchange)	Lake Union	14.25	10.30	4.00	14.30	4.00
WS-C (SR 520, I-5 to Portage Bay Bridge)	Portage Bay (Lake Union)	3.34	0.05	5.42	2.94 (5.47) [a]	2.94
WS-D (SR 520 Portage Bay Bridge)	Portage Bay (Lake Union)	6.47	0.36	8.70	9.06	8.70
WS-BR2 (Montlake Bascule Bridges)	Montlake Cut (Lake Washington)	0.19	0.14	0.13	0.27	0
RWB-C/RWB-D (Local Street – Montlake Blvd)	Union Bay (Lake Washington)	0.02	0.04	0.10	0.14	0.14
Union Bay (Local Street – Lake Washington Blvd)	Union Bay (Lake Washington)	1.28	0.09	0	0.09	0
RWB-F (Local Street – Lake Washington Blvd)	Union Bay (Lake Washington)	0.61	0.30	0.10	0.40	0
WS-PR (SR 520, Montlake to West Approach)	Union Bay (Lake Washington)	12.60	0.34	26.24	21.31 (26.58) [b]	21.31

EXHIBIT 2-56.
EXISTING AND PROPOSED POLLUTANT-GENERATING IMPERVIOUS SURFACE BY OUTFALL

Outfall (Roadway Segment)	Receiving Water Body	Existing PGIS (acres)	Proposed Existing PGIS to Remain (acres)	Proposed New and Replaced PGIS (acres)	Total Proposed PGIS (acres)	Proposed Water Quality Treatment (acres)
WS-BR4 (SR 520 Floating Bridge)	Lake Washington	17.28	0	20.56	20.56	20.56
WS-G (SR 520 East Approach)	Lake Washington	1.75	0.08	1.62	1.70	1.70
WS-J (SR 520, Evergreen Point Road to 84th Avenue)	Fairweather Bay (Lake Washington)	5.42	0.01	4.47	4.48	4.48
RWB-G (Local Street – Evergreen Point Road)	Fairweather Bay (Lake Washington)	0.16	.04	0	0.04	0
Combined Sewer System (Local Streets – Montlake Blvd and 10th and Delmar vicinity)	Puget Sound	5.24	2.44	3.07	5.51	5.51
	Total	**71.06**			**83.25 (91.05)[a, b]**	**69.34**

PGIS = pollutant-generating impervious surface
RWB = receiving water basin
WS = Washington State Department of Transportation
[a] The 10th and Delmar lid will reduce effective PGIS by 2.53 acres, from 5.47 to 2.94 total acres requiring water quality treatment.
[b] The Montlake lid will reduce effective PGIS by 5.27 acres, from 26.58 to 21.31 total acres requiring water quality treatment.

The project will 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.

Since both Lake Washington and Lake Union are flow-exempt water bodies per Ecology, no detention will be required on the separated stormwater system.

2.7.1.1 Stormwater Runoff Treatment Design

Stormwater in the existing project area receives no stormwater treatment before it is discharged 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, the project will provide enhanced treatment to areas where practicable in order to improve water quality and reduce impacts on ESA-listed species and other 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 within the project area will not be altered (disturbed) by the project, stormwater runoff will continue to be collected and discharged to outfalls or the combined sewer system as it is currently.

2.7.1.2 Stormwater Discharges to Combined Sewer Systems

Stormwater entering any combined sewer system will be treated at the West Point Wastewater Treatment Plant before discharge to Puget Sound. The combined sewer system includes overflow outfalls as a safety measure to prevent untreated sewage backups or bursting pipes. The project area is served by City of Seattle combined sewer overflow outfalls 20, 132, 138, 139, and 140 and King County overflow outfalls 014 and 015. As a result of the project, the total area contributing to the combined sewer system will decrease 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.

2.7.1.3 Proposed Stormwater Treatment and Detention Facilities

Stormwater treatment and detention facilities include water quality treatment facilities, outfalls, collection and conveyance systems, and lid drainage systems.

Water Quality Treatment Facilities

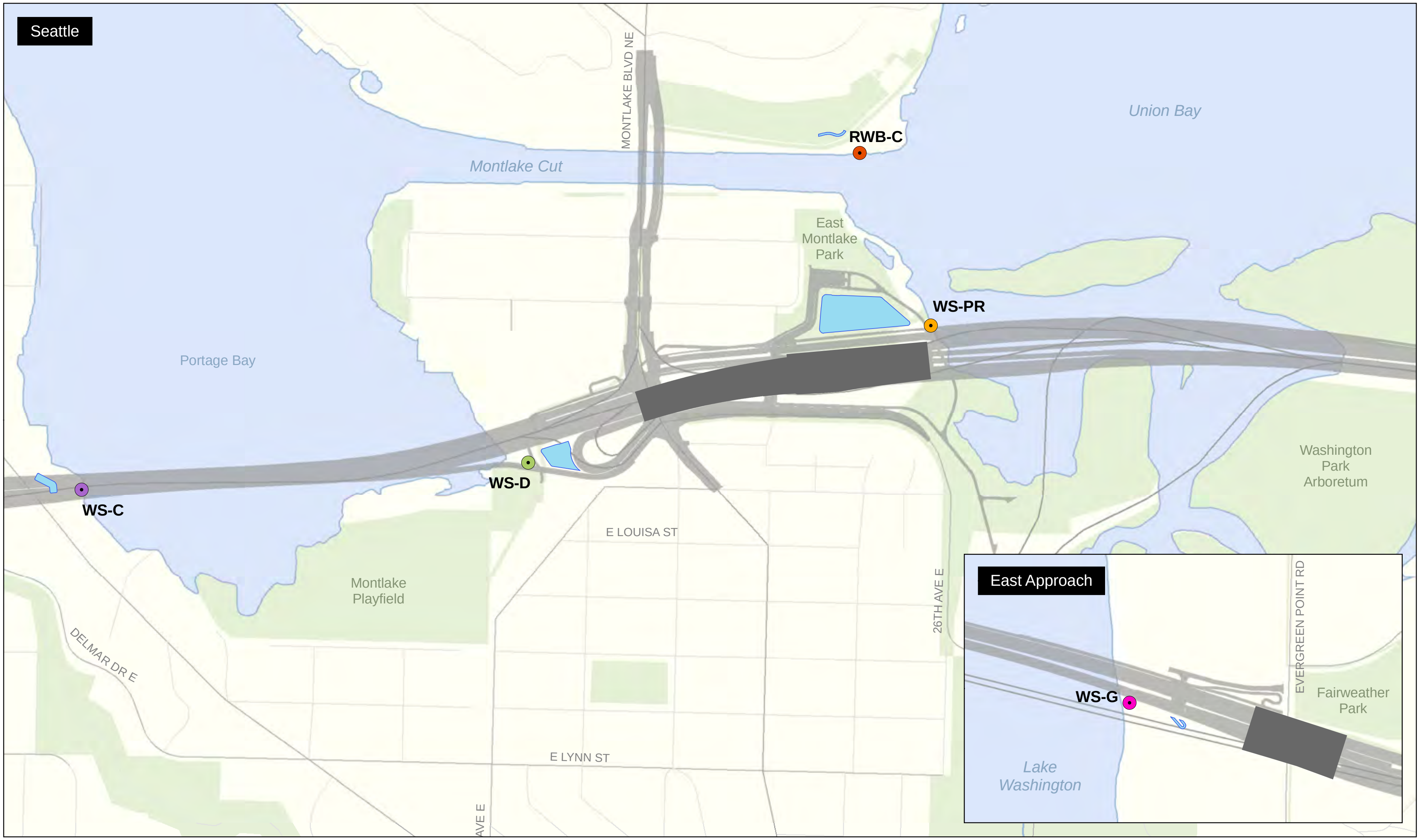
Eight water quality treatment facilities are proposed for the SR 520, I-5 to Medina project, including the floating bridge (WS-BR4), which will receive water quality treatment by measures described in the AKART study performed by WSDOT, summarized in Exhibit 2-57 and shown in Exhibits 2-58 and 2-59.

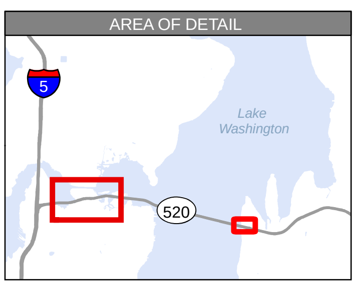
The proposed water quality treatment method was identified through the AKART study (WSDOT 2009c). This study identified the alternative treatment method of high-efficiency sweeping combined with modified catch basin/catch basin cleaning as the technology proposed for the floating bridge. This method was selected because it offers the most reasonable technologies for addressing water quality based on technical feasibility and cost-effectiveness. The proposed strategy includes a monthly sweeping frequency with high-efficiency sweepers, but the frequency may need to be adjusted depending on local seasonal precipitation patterns, pollutant loads, and monitoring results. Modified catch basins are larger than standard catch basin drainage structures, and a scheduled cleaning interval allows for the removal of pollutants trapped in the sump of the catch basin. The enlarged sumps allow increased residence time for sediments to collect before their removal. The catch basins would be cleaned two times per year.

EXHIBIT 2-57
WATER QUALITY TREATMENT FACILITIES

Discharge Point	Receiving Water	Treatment Type	Facility Type	PGIS Treated (acres)
East Allison Street Outfall (I-5)	Lake Union	Basic	Bioswale	4.0
WS-C (West Side Portage Bay)	Portage Bay	Basic	Bioswale	2.94
WS-D (East Side Portage Bay)	Portage Bay	Enhanced	Constructed Stormwater Wetland	8.70
RWB-C/RWB-D (NE Montlake Cut)	Lake Washington (Union Bay)	Basic	Bioswale	0.14
WS-PR (Washington Park Arboretum and MOHAI)	Lake Washington (Union Bay)	Enhanced	Constructed Stormwater Wetland	21.31
WS-BR4 (Floating Bridge)	Lake Washington	AKART	High-Efficiency Sweeping and Modified Catch Basin/Cleaning	20.56
WS-G (Medina Shoreline)	Lake Washington	Basic	Bioswale	1.70
WS-J (Fairweather Bay)	Lake Washington (Fairweather Bay)	Enhanced	Constructed Stormwater Wetland	4.48
West Point Wastewater Treatment Plant	Puget Sound	Secondary	High-rate oxygenated activated sludge	5.51

AKART = all known, available, and reasonable technology
MOHAI = Museum of History and Industry
PGIS = pollutant-generating impervious surface
RWB = receiving water body
WS = WSDOT





Surface Water Outfall
- RWB-C
- WS-C
- WS-D
- WS-G
- WS-PR

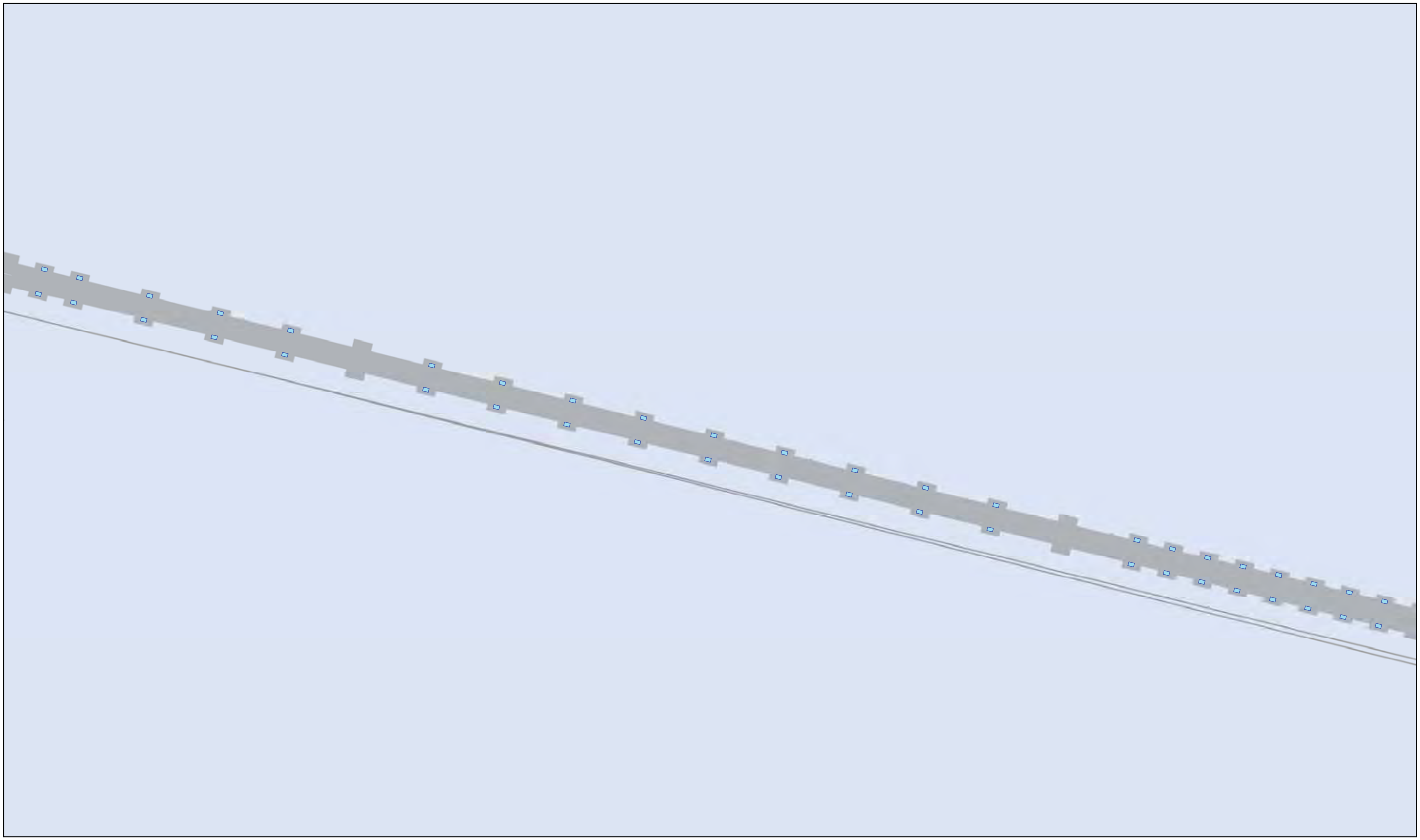
- Stream
- Existing Roadway
- Lid Structure
- Stormwater Facility
- Proposed Edge of Pavement
- Park

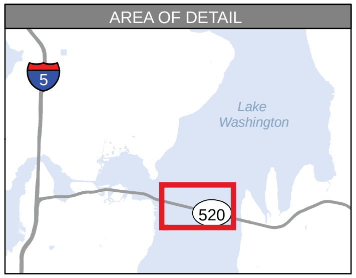
N
0 500 1,000 Feet

Source: Parametrix (2009) GIS Data (Habitat), King County (2005) GIS Data (Streets and Streams) King County (2007) GIS Data (Water Bodies), and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 2-58. **Locations of Water Quality Treatment Facilities**

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





Existing Roadway
Pontoon Stormwater Lagoon
Proposed Edge of Pavement

N
0 500 1,000 Feet

Source: Parametrix (2009) GIS Data (Habitat), King County (2005) GIS Data (Streets and Streams) King County (2007) GIS Data (Water Bodies), and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 2-59. **Pontoon Stormwater Lagoons**

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

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Stormwater Outfalls

The proposed stormwater facilities will use existing outfall locations; however, some outfalls will need to be rebuilt to accommodate increased flow volumes. The proposed surface water outfalls and associated improvements (if needed) are described below:

- The East Garfield Street outfall is an existing 54-inch-diameter outfall that discharges below the lake surface and will not be altered.
- The East Allison Street outfall is an existing 30-inch-diameter outfall that discharges below the lake surface and will not be altered.
- The WS-C outfall is an existing 18-inch-diameter outfall. It will be replaced with a new 18- to 24-inch-diameter outfall pipe that will discharge above OHW to a riprap pad 10 to 20 feet landward of OHW.
- The WS-D outfall is an existing 12-inch-diameter outfall. It will be replaced with a new 24- to 30-inch-diameter outfall pipe that will discharge above OHW to a riprap pad 50 to 75 feet landward of OHW.
- The WS-PR is an existing 8-inch-diameter outfall. It will be a replaced with a 24- to 36-inch-diameter outfall pipe that will discharge above OHW to a riprap pad 15 to 20 feet landward of OHW.
- RWB-C and RWB-D are existing 12-inch-diameter outfalls that will not be altered.
- The floating bridge (WS-BR4) consists of multiple downspouts that direct stormwater discharge from the bridge to catch basin structures that a larger than standard size. Collected stormwater will be discharged to spill control lagoons built into the supplemental stability pontoons. Approximately 44 of the 54 supplemental stability pontoons have 19-by-29-foot discharge and spill control lagoons in the center of the pontoon. Stormwater runoff from the bridge will mix with water in the spill control lagoons, providing some dilution before it flows into Lake Washington.
- Outfalls located on the east side of Lake Washington are existing outfalls (RWB-G) or outfalls constructed as part of the SR 520, Eastside Transit and HOV Project (WS-G and WS-J). Outfalls constructed as part of that project discharge above OHW to flow-dissipation structures that subsequently discharge into Lake Washington.
- The West Point Wastewater Treatment Plant discharges to a diffuser located approximately 3,600 feet offshore at a depth of approximately 240 below MLLW.
- Union Bay and WS-BR2 currently have no planned outfalls. Union Bay currently includes elevated bridge structures with scuppers and adjacent roadway segments where stormwater is dispersed from the roadway structure. WS-BR2 is the Montlake Cut bascule bridge, which does not currently collect any water for treatment because the deck consists of steel grating. The proposed second bascule bridge does not include plans for water collection and treatment. These conditions are expected to continue under the proposed condition.

Collection and Conveyance Systems

The proposed collection and conveyance systems will consist of standard WSDOT catch basin and manhole structures, as required for conveyance per the *Hydraulics Manual* criteria for draining highway surfaces. The minimum pipe size will be 12 inches in diameter and will be installed on grades and at depths necessary for proper clearances and hydraulic performance.

Ditches along the edges of the shoulders are the preferred collection system, except where they are infeasible. Ditches provide additional sediment deposition, flow control capacity (infiltration and storage), and runoff treatment by vegetative filtration. Existing ditches that are displaced due to widening of the pavement prism will be replaced where right-of-way and grading conditions allow.

For the Portage Bay and west approach bridges, the conveyance system will be designed so that stormwater flow volumes that exceed the capacity of the stormwater facility to provide treatment will be released through scuppers on the bridge. The flow will be managed so that all flow up to the design capacity will be routed to the stormwater treatment facility, and only those flows above design capacity will be released from the bridges.

Lid Drainage Systems

The SR 520, I-5 to Medina project includes design features where parts of the roadway will be covered by paved and landscaped lids. Surface drainage from each landscaped lid will consist of area drain inlets on most non-PGIS paved areas and an underdrain system beneath the landscaped areas. The underdrain system will consist of a gravel layer with a perforated pipe network located directly on the structural surface of each lid. Runoff will be collected in both of these systems and routed to low points at the edge of the structural surface of the lid and then tightline routed to either a natural dispersion area or into the road drainage system for treatment and discharge. Any PGIS on the lid will be routed to a roadway drainage system.

2.7.2 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 bridges 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 east approach 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. The lighting will be designed to minimize effects on aquatic habitat, likely by the use of shielded downlights similar to those on the Interstate 90 (I-90) floating bridges.

Artificial lighting currently illuminates most 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.

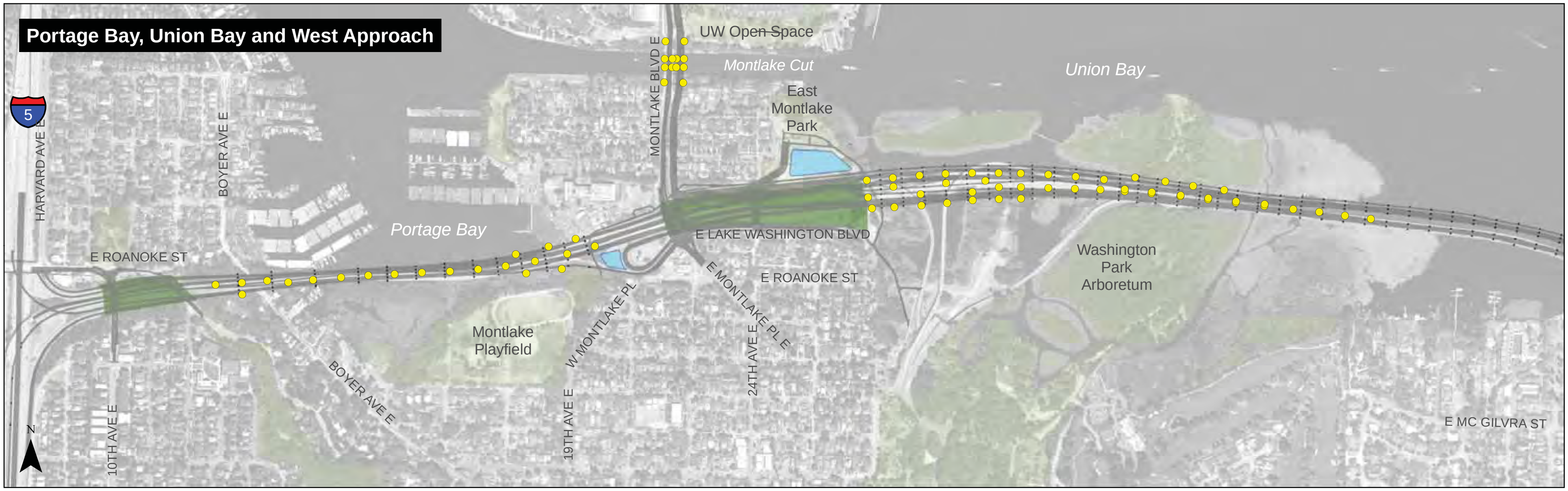
2.7.2.1 Roadway Lighting

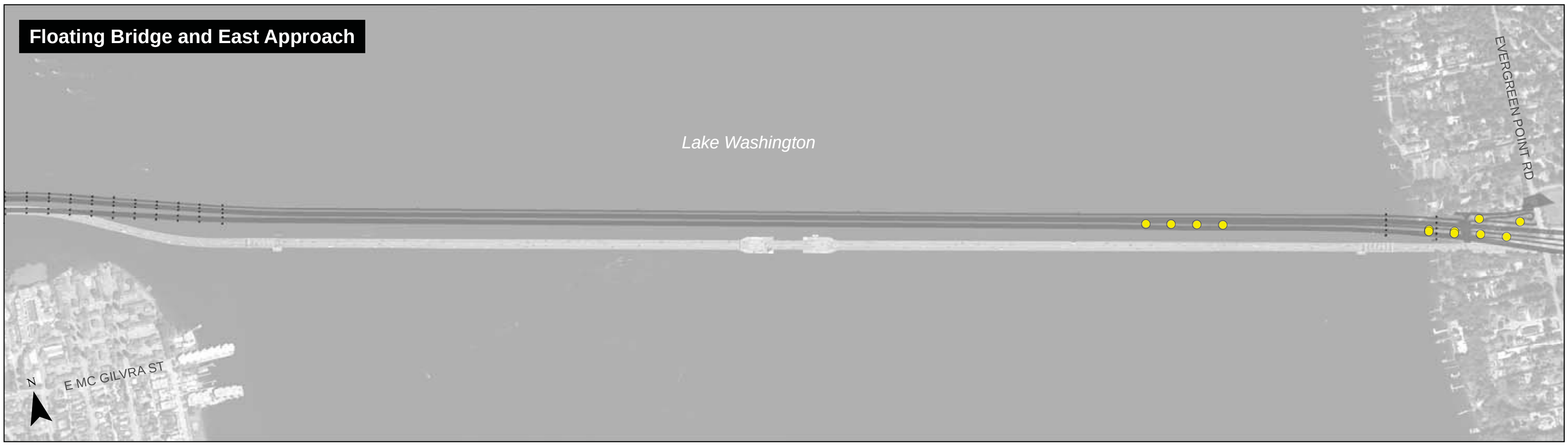
For the replacement structure, overhead lighting will be limited to traffic conflict points (e.g., add lanes, drop lanes, merges, diverges, auxiliary lanes, or weaving sections) and the westernmost portion of the project area between Foster Island and I-5. East of Foster Island, no roadway lighting is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

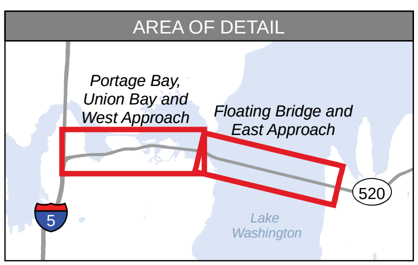
Specifically, a continuous roadway illumination system will be installed from the I-5 interchange to Foster Island, including all major arterial streets within the project area (Exhibit 2-60). To reduce the effects of lighting on the Lake Washington fish habitat, continuous roadway illumination will not be provided from where additional ramp lanes begin and end around the Foster Island area to where the Evergreen Point Flyer stop merges (westbound) back into the westbound HOV lane on the eastern portion of the floating span. This unlit section of the proposed bridge encompasses the primary migration and rearing areas for juvenile Chinook salmon. 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 (see Section 2.6). 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 on the Montlake bridges (6 existing)
- 18 on the Portage Bay Bridge (18 existing)
- 43 on the west approach bridge (52 existing)
- 0 on the floating bridge (44 existing)
- 6 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 located east of the center drawspan of the bridge. Although the shorter lights are not shielded, the taller light standards have shielded light fixtures. Existing nighttime light levels measured 5 to 300 feet from the bridge near Portage Bay and Foster Island ranged from 0.45 to 0.01 foot-candles (WSDOT 2009d).







- Column
- Lighting Source
- Proposed Edge of Pavement
- Stormwater Treatment Facility
- Lid
- Park

0 250 500 1,000 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.

Exhibit 2-60. **Proposed Lighting**

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

2.7.2.2 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 vehicle 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.

2.7.2.3 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. The overhead lights will be on-demand lights that will remain off except during periods of dock use, whereas the low-intensity path lighting will be on at all times. Private aid to navigation lighting will be provided as required.

2.7.3 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, that will be used for staff and materials access to a dock and the maintenance vessel moorage.

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

2.7.3.1 Floating Bridge Maintenance

Because the concrete pontoons and anchor systems are unique structures, specific maintenance activities are required to ensure their long-term function. These activities include inspecting and maintaining the pontoons, anchor cables, navigation fenders, water pumps, and sensors for the pontoons.

Various bridge inspection and maintenance activities staged from the pontoons or maintenance vessel rather than the bridge deck will also be conducted as follows:

- Maintenance of the cathodic protection system, electrical systems, anchor cable adjustments, and saddles, etc.
- Various types of inspections by maintenance personnel and others (watertight inspection, anchor cable inspection, underwater inspection, national bridge inspection, in-depth electrical inspection, and structural inspection).

- Weekly maintenance inspections (sweep-check of the perimeter for navigation lights, vandalism, and visible damage).
- Provision of transport for loads weighing up to 2 tons, including pumps, transformers, hydraulic jacks, etc.
- Annual maintenance inspections (inspection of all pontoons cell by cell for damage or flooding; testing of all water sensors; testing of all heat detection sensors in cells with transformers; ensuring that watertight doors are serviced on a 10-year rotation; and providing service for hydraulic pumps and rams).
- Maintenance and testing of pumps and other emergency equipment located on the pontoons.
- Pre-storm maintenance and inspections (testing of wind alarms and auto-dialers, secure hatches, etc.) and post-storm inspections (visually assessment of pontoon alignment and draft marks, inspection for cracks and flooding, inspection of anchor cable tension, and inspection of expansion joints and utilities at transition spans).

The WSDOT Regional Road Maintenance Program provides ESA coverage for many of the proposed pontoon maintenance activities in accordance with Maintenance Category No. 12, Bridge Maintenance, as described in Part 1 of the Regional Road Maintenance Program.

2.7.3.2 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 (see Section 2.10).

2.7.3.3 Vessel Moorage and Operations

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

2.7.4 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 the storm drains. The surface of existing Montlake Bridge is grated, so any spills on the bridge go directly into the Montlake Cut. The replacement bridge over Lake Washington will discharge 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 interchange area, before it is discharged to adjacent water bodies.

2.8 Natural Resource Mitigation Measures

This section summarizes the available information on compensatory mitigation activities for effects on natural resources associated with the SR 520, I-5 to Medina project. Unavoidable effects on natural resources (e.g. wetland fill) will be mitigated to satisfy federal, state, and local permit requirements. Compensatory mitigation will occur in several areas in order to offset temporary and permanent effects on aquatic habitat, wetlands, and wetland buffers. These mitigation activities are included as part of the proposed action and, therefore, were considered in the evaluation of effects on ESA-listed species and designated critical habitat.

The areas required for mitigation of effects on natural resources were based on requirements of Section 404 of the Clean Water Act (United States Code, Title 33, Section 1251 [33 USC 1251]) administered by USACE, the Water Pollution Control Act (Revised Code of Washington, Chapter 90.48 [90.48 RCW]) administered by Ecology, the Hydraulic Code (77.55 RCW) administered by the Washington Department of Fish and Wildlife (WDFW), and Seattle's Environmentally Critical Areas regulations (Seattle Municipal Code, Chapter 25.09, Section 160 E [SMC 25.09.160 E]). Lastly, in addition to federal, state, and local regulations, WSDOT coordinates with tribal representatives regarding fish, aquatic resources, and habitat issues.

The final mitigation plan will satisfy all pertinent regulatory requirements and will replace affected functions and values at an equal or greater ratio than that provided under existing conditions. WSDOT will fully compensate for habitat displacement and will develop mitigation measures for habitat alteration, in consultation with the regulatory agencies and the City of Seattle. Specific mitigation ratios for permanent and temporary effects on wetlands and aquatic habitat are being developed by WSDOT in cooperation with regulatory agencies. The amount of compensatory mitigation to be provided will be based on these ratios. In addition to the compensatory mitigation, temporarily affected areas will be restored to preconstruction conditions.

In order to fully compensate for wetland and aquatic habitat impacts, WSDOT conducted a broad-based screening exercise to generate a list of the best potential sites, with the greatest potential for mitigation success. The screening exercise for wetland sites is fully documented in the *Initial Wetland Mitigation Report; I-5 to Medina: Bridge Replacement and HOV Project* (WSDOT 2009f). The screening exercise for aquatic sites is fully documented in the

Initial Aquatic Mitigation Report; I-5 to Medina: Bridge Replacement and HOV Project (WSDOT 2009e).

As documented in these reports, initial lists of mitigation opportunities were evaluated and screened through a series of screening steps. Based on a review of existing information, a preliminary site reconnaissance, and coordination with regulatory agencies, the City of Seattle, and the University of Washington, and other stakeholders, the initial list was pared down to the sites with the best potential, and the least risk, for mitigation opportunities. WSDOT advanced only those individual sites that when combined with other identified sites, could provide the types and quantity of ecological uplift to adequately compensate for the project's estimated effects on wetland, riparian, and aquatic habitat. Many of these mitigation actions will result in direct benefits to ESA-listed fish species and their habitat.

It should be noted that important steps in the mitigation planning process have yet to be implemented, and the list of sites is preliminary. Therefore, specific recommended mitigation actions and quantities were estimated on the basis of available data sources and review of aerial photographs. The mitigation proposals may be modified as a result of additional field reconnaissance or based on further coordination with parcel landowners, regulatory agencies, and stakeholders.

2.8.1 Proposed Mitigation and Potential Mitigation Sites

The following sections describe the proposed mitigation for effects on natural resources and provide information on the potential mitigation sites for each type of mitigation, including the activities and actions associated with these sites.

Washington Department of Natural Resources Parcel
Parcel Number: 0723059105
Local Jurisdiction: City of Renton
Ownership: Washington Department of Natural Resources
Legal Description: Northeast quarter, Section 7, Township 23 North, Range 4 East
6th Field HUC: 0171100120302
Approximate Mitigation Area: 3 acres

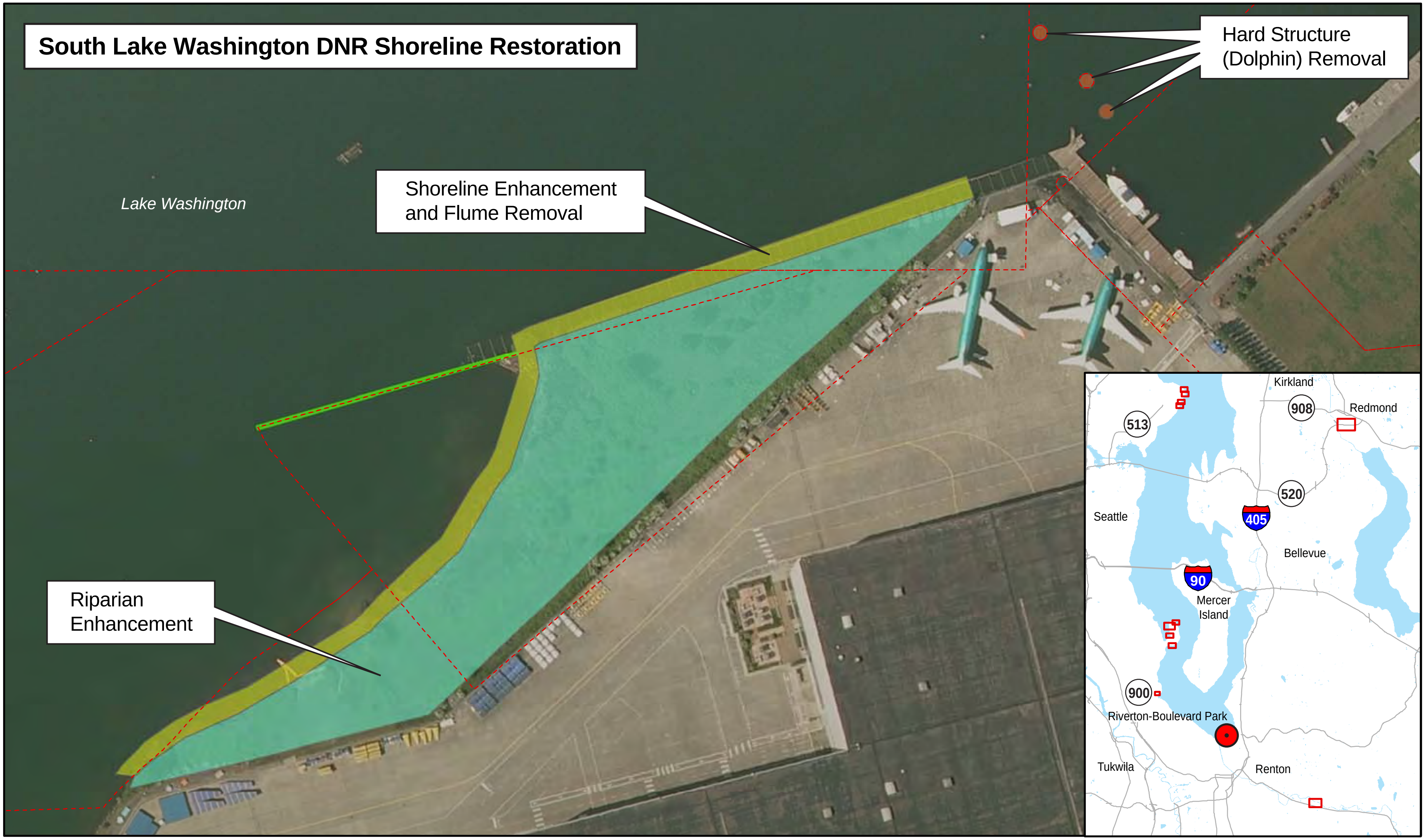
This site is located just east of the mouth of the Cedar River, which serves as an important production site for salmonids, including sockeye salmon, Chinook salmon, coho salmon, and steelhead (Exhibit 2-61). This site is located in the stream/lake interface zone (delta), which has been shown to provide key rearing and feeding opportunities for juvenile salmonids as they enter the lake.

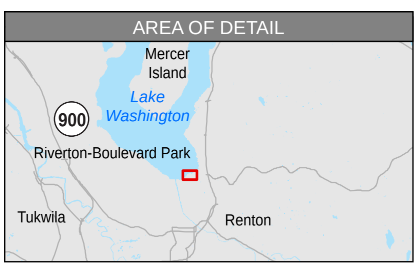
At the site, there is an abandoned flume structure that is about 540 feet long and forms the transition between upland areas and the lake. The existing riparian zone, which consists primarily of small shrubs, is disconnected from the lake by the flume, limiting riparian functions such as overhead cover, leaf litter production, and wood/nutrient recruitment. The existing flume may also be providing habitat for piscivorous predators, such as smallmouth bass, which are often closely associated with both over-water structures and steep-sloping riprap or bulkheads (SPU and USACE 2008).

The primary habitat enhancement goal is to increase growth and survival of outmigrating Chinook salmon fry from the Cedar River by creating suitable nearshore habitat at the site, including both shoreline and riparian habitat.

In order to achieve the habitat enhancement goals for this site, WSDOT is proposing to relocate or remove the existing flume on the site and restore approximately 630 feet of shoreline. Before this process, both sediment and water quality will be monitored to ensure that any contaminated sediment on site is remediated or removed and properly disposed of. The flume will be removed in pieces, likely with a barged crane and/or a vibratory pile rig. Once the flume has been disassembled and removed from the site, the shoreline will be regraded to a constant, gentle slope using heavy equipment located either on the shoreline or on barges. Additional substrate consisting of fine-grained materials and gravels will be installed.

Any nonnative plant species will be removed by physical means (no herbicide spraying will occur) and the entire site within the lake buffer (200 feet) will be replanted with native trees and shrubs. The riparian zone directly adjacent to the shoreline will be planted densely to provide overhead cover and shoreline stabilization.





Flume Removal
Hard Structure Removal
Shoreline Enhancement + Flume Removal
Riparian Enhancement
Parcel

N

0 75 150 Feet

Exhibit 2-61. **Washington Department of Natural Resources Parcel in Renton**

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

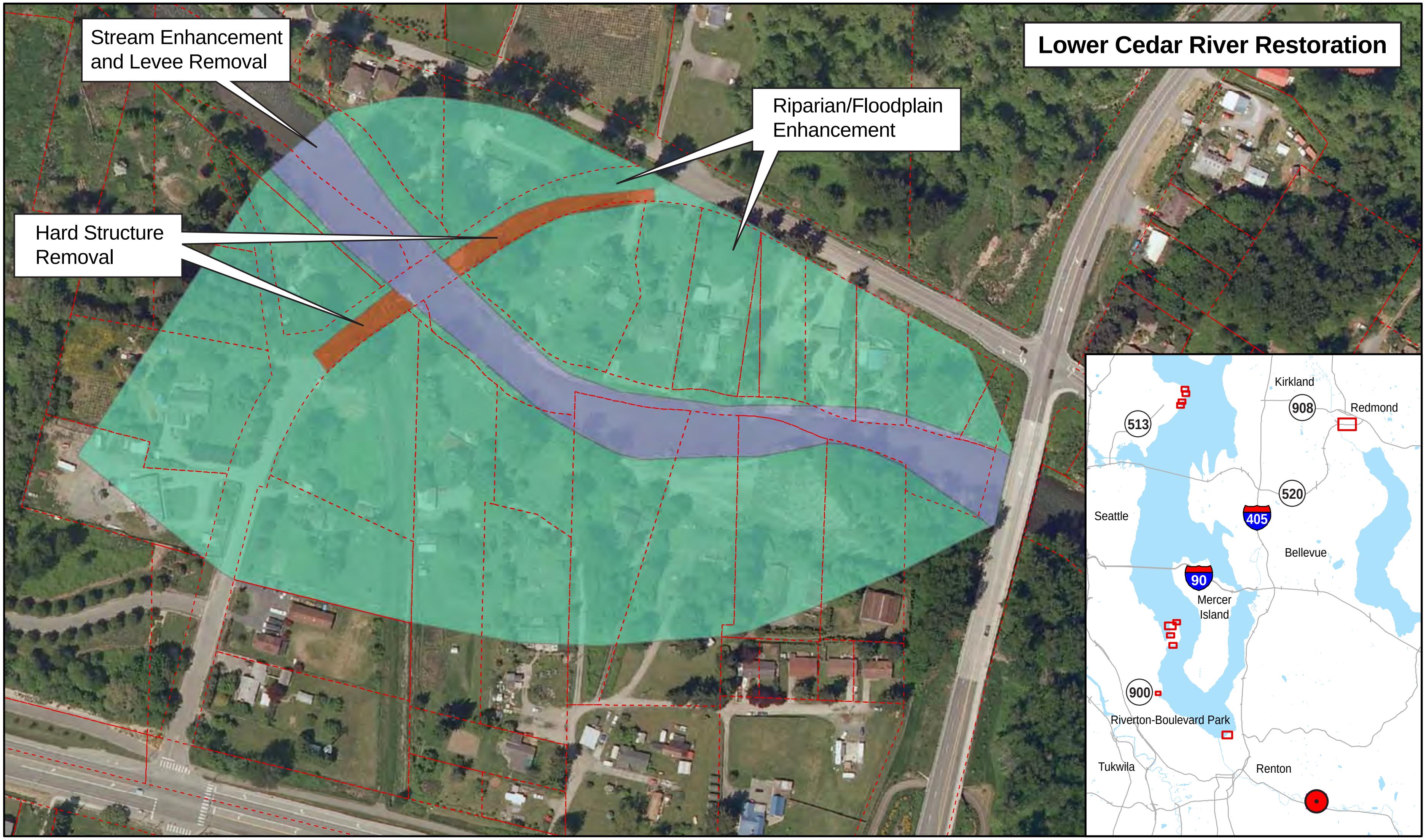
Cedar River

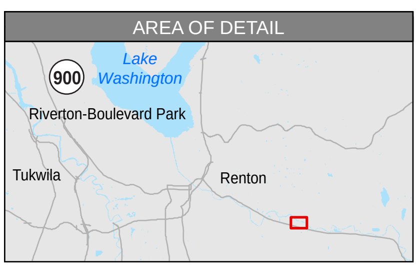
Parcel Numbers: 2323059012, 2323059013, 2323059043, 2323059032, 2323059052, 2323059062, 2323059063, 2323059086, 2323059088, 2323059092, 2323059097, 2323059098, 2323059106, 2323059119, 2323059121, 2323059123, 2323059125, 2323059132, 2323059133, 2323059141, 2323059142, 2323059155, 2323059205
Local Jurisdiction: Unincorporated King County
Ownership: King County and Private
Legal Description: Northwest quarter, Section 23, Township 23 North, Range 5 East
6th Field HUC: 0171100120106
Approximate Mitigation Area: 17 acres

This site is located on the lower Cedar River, at about river mile (RM) 5.3, immediately downstream of the 154th Place SE Bridge over the river (Exhibit 2-62). At the site, there is an existing levee system, with levees along both the north and south bank. At the west (downstream) edge of the site reach, there is an abandoned roadbed along 149th Avenue SE, which constituted the bridge approaches for a former bridge over the Cedar River (the bridge superstructure has since been removed). The site includes 23 separate parcels, distributed on both sides of the river, many of which are currently owned by King County. King County has been actively acquiring parcels at the mitigation site and has already removed some of the private residences and outbuildings from the acquired parcels.

Currently, the river is confined between the levees in this reach, effectively disconnecting it from the floodplain. An unleveed portion on the right (north) downstream bank of the reach has a sloped lateral bar that may provide existing spawning habitat, but most of the remainder of the site is characterized by steep banks.

The primary habitat enhancement goal is to improve shoreline and riverine habitat-forming processes. In order to achieve the habitat enhancement goals for this site, WSDOT is proposing to purchase the remaining private properties in the reach and undertake a levee setback and floodplain restoration project. Initially, all private residences, other structures, and impervious surfaces would be removed from the site. The existing levees would then be removed (about 500 linear feet of levee on the right bank and about 400 linear feet on the left bank), as would the existing road fill associated with the abandoned bridge. The site would be regraded to mimic a naturally occurring floodplain and replanted with native vegetation. New levees would be constructed away from the riverbank to protect adjacent properties and infrastructure. Removal of the levees and floodplain excavation would be accomplished with the use of heavy equipment located on the shoreline. Appropriate BMPs and TESC measures would be implemented as part of the project construction.





Stream Enhancement + Levee Removal
Riparian/Floodplain Enhancement
Hard Structure Removal
Parcel

N

0 100 200 Feet

Exhibit 2-62. **Cedar River Mitigation Site**

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

Seward Park

Parcel Number: 2324049007
Local Jurisdiction: City of Seattle
Ownership: Seattle Parks and Recreation Department
Legal Description: West half, Sections 14, 23, and 24, Township 24 North, Range 4 East
6th Field HUC: 0171100120302
Approximate Mitigation Area: 2 acres

Seward Park is located along the western shore of Lake Washington, between the Cedar River and I-90, an area used by outmigrating Chinook salmon fry from the Cedar River. Seward Park has an extensive Lake Washington shoreline area, with discontinuous segments that vary by the presence of bulkheads, presence of native vegetation, bank height, bank slope, and presence of nuisance aquatic vegetation.

The primary habitat enhancement goal is to increase growth and survival of outmigrating Chinook salmon fry from the Cedar River by creating suitable nearshore habitat at the site, including both shoreline and riparian habitat.

There are four discrete mitigation opportunities on the Seward Park property (Exhibits 2-63 and 2-64). Project 1 is located in the southern portion of the peninsula, due east of the parking lot (Exhibit 2-63). This segment is approximately 250 feet long and has a vertical concrete bulkhead (2.5 feet high and 3 feet wide) along its length and very little riparian vegetation. The vertical elevation gain between the uplands and the lake water level is approximately 6 to 7 feet. Mitigation actions at this site would include bulkhead removal, bank regrading, gravel installation, and riparian revegetation. The shoreline to the east of project 1 was previously restored.

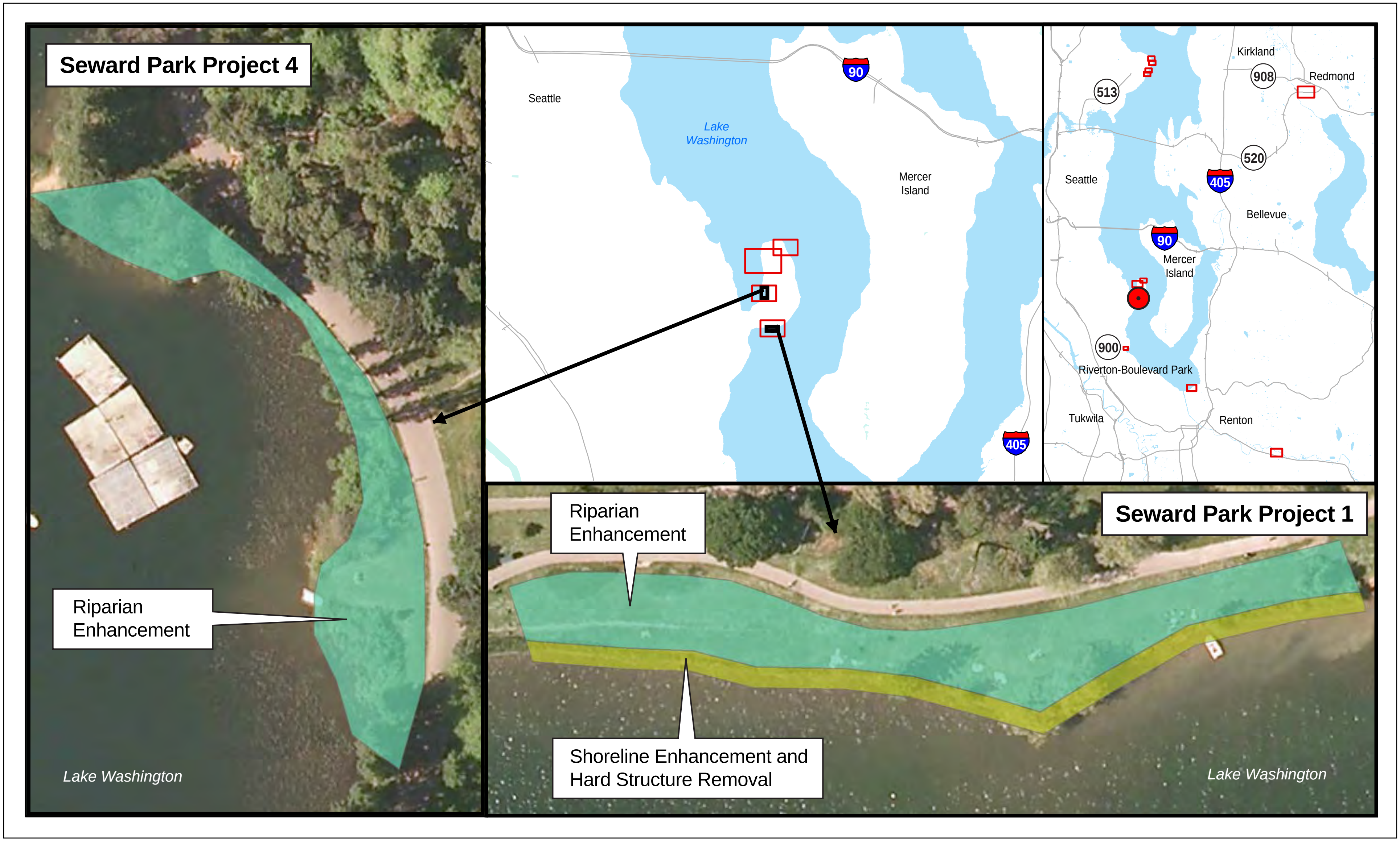
Seward Park project 2 is located in the northeastern portion of the peninsula (Exhibit 2-64). The sum of the two lengths of this segment is approximately 250 feet, with a riprap bulkhead along its length and very little riparian vegetation. The vertical elevation gain between the uplands and the lake water level is approximately 5 feet. Mitigation actions at this site would include bulkhead (riprap) removal, bank regrading (eastern portion), gravel installation, and riparian revegetation. A previously restored segment of the shoreline is adjacent and southeast of project 2. A heavily used swimming area is located adjacent and west of project 2.

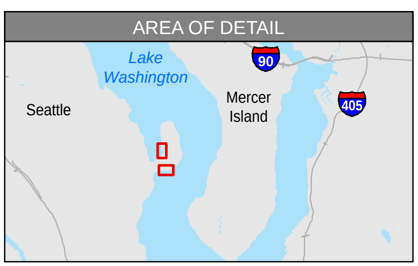
Seward Park project 3 is located in the northwestern portion of the peninsula (Exhibit 2-64). The sum of the two lengths of this segment is approximately 400 feet, and there is very little riparian vegetation. A small restoration project that occurred between the two portions of this segment included bank resloping and installation of large woody debris (LWD) along the shoreline. Mitigation actions at this site would include riparian revegetation. The northern portion of this segment would require only underplanting (enhancement) below existing trees. The southern portion of this segment would require full revegetation (creation). The park path is very close to the shoreline along both portions of this segment and would limit revegetation to a 5- to 10-foot width.

Seward Park project 4 is located in the northwestern portion of the peninsula (Exhibit 2-63). The length of this segment is approximately 150 feet, with sporadic trees and no understory vegetation. Mitigation actions at this site would include only underplanting (enhancement) below existing trees. The average width of enhancement would be about 15 feet. The adjacent nearshore is infested with water lily beds that would need to be removed to provide viable habitat for juvenile salmonids.

For all mitigation actions in Seward Park that require in-water work for bulkhead/rubble removal and/or bank resloping, both sediment and water quality would be monitored during construction. All debris and excavated soils would be removed and properly disposed of. The shoreline would be regraded to a constant, gentle slope with the use of heavy equipment located on the shoreline. Along all the regraded shorelines, additional substrate consisting of fish-friendly materials (small and medium gravels) would be installed.

Any nonnative plant species would be removed by physical means (no herbicide spraying would occur), and the entire area within the lake buffer on the mitigation site would be replanted with native trees and shrubs. The riparian zone directly adjacent to the shoreline would be planted densely to provide overhead cover and shoreline stabilization.





Shoreline Enhancement + Hard Structure Removal

Riparian Enhancement

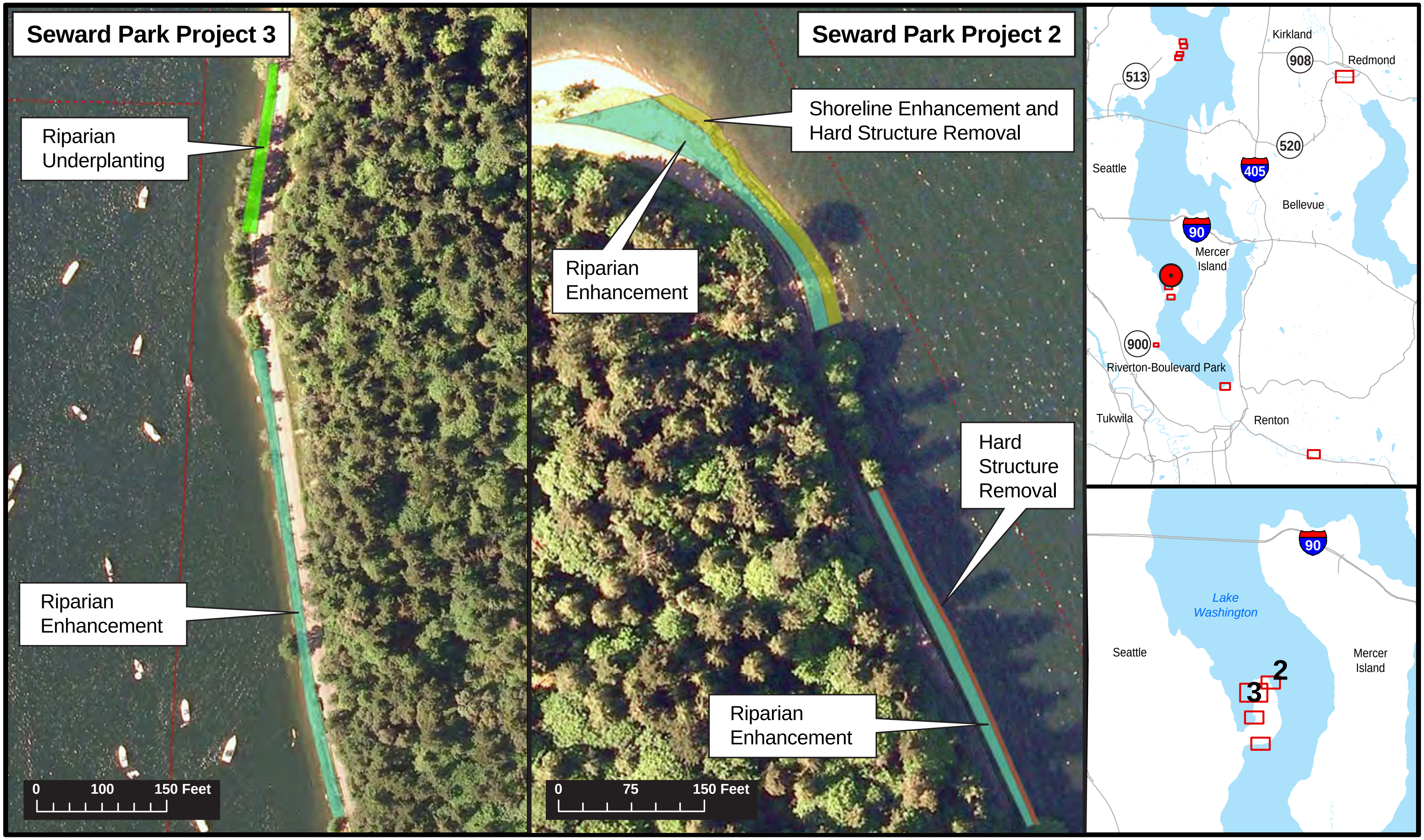
Parcel

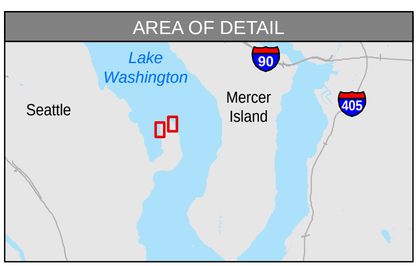
N

0 50 100 Feet

Exhibit 2-63. **Seward Park Mitigation Site, Projects 1 and 4**

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





- Hard Structure Removal
- Shoreline Enhancement + Hard Structure Removal
- Riparian Underplanting
- Riparian Enhancement
- Parcel

N

Exhibit 2-64. **Seward Park Mitigation Site, Projects 2 and 3**

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

Magnuson Park

Parcel Number: 0225049061
Local Jurisdiction: City of Seattle
Ownership: Seattle Parks and Recreation Department
Legal Description: Southeast quarter, Section 2 and Southwest quarter, Section 1, Township 24 North, Range 4 East
6th Field HUC: 0171100120302
Approximate Mitigation Area: 1 acre

This site is located along the west shore of Lake Washington, north of the project area for the SR 520, I-5 to Medina project. The Magnuson Park shoreline is primarily used by juvenile Chinook salmon from the north Lake Washington tributaries and the Sammamish/ Issaquah Creek system as they migrate toward the Lake Washington Ship Canal. Magnuson Park has an extensive shoreline area, with discontinuous segments that vary by the presence of bulkheads, presence of native vegetation, bank height, and bank slope.

The collective mitigation projects in Magnuson Park would focus on benefitting the small portion of juvenile Chinook salmon that still require shallow-water rearing and foraging habitat.

There are four discrete mitigation opportunities on the Magnuson Park property. Magnuson Park project 1 is located south of the boat launch (Exhibit 2-65). The length of this segment is approximately 200 feet, with very little functional riparian vegetation. A 2-foot vertical bank is actively eroding and has concrete/asphalt rubble along the shore. Mitigation actions at this site would include bank resloping, gravel augmentation, LWD installation, and revegetation. The average width of enhancement would be 50 feet.

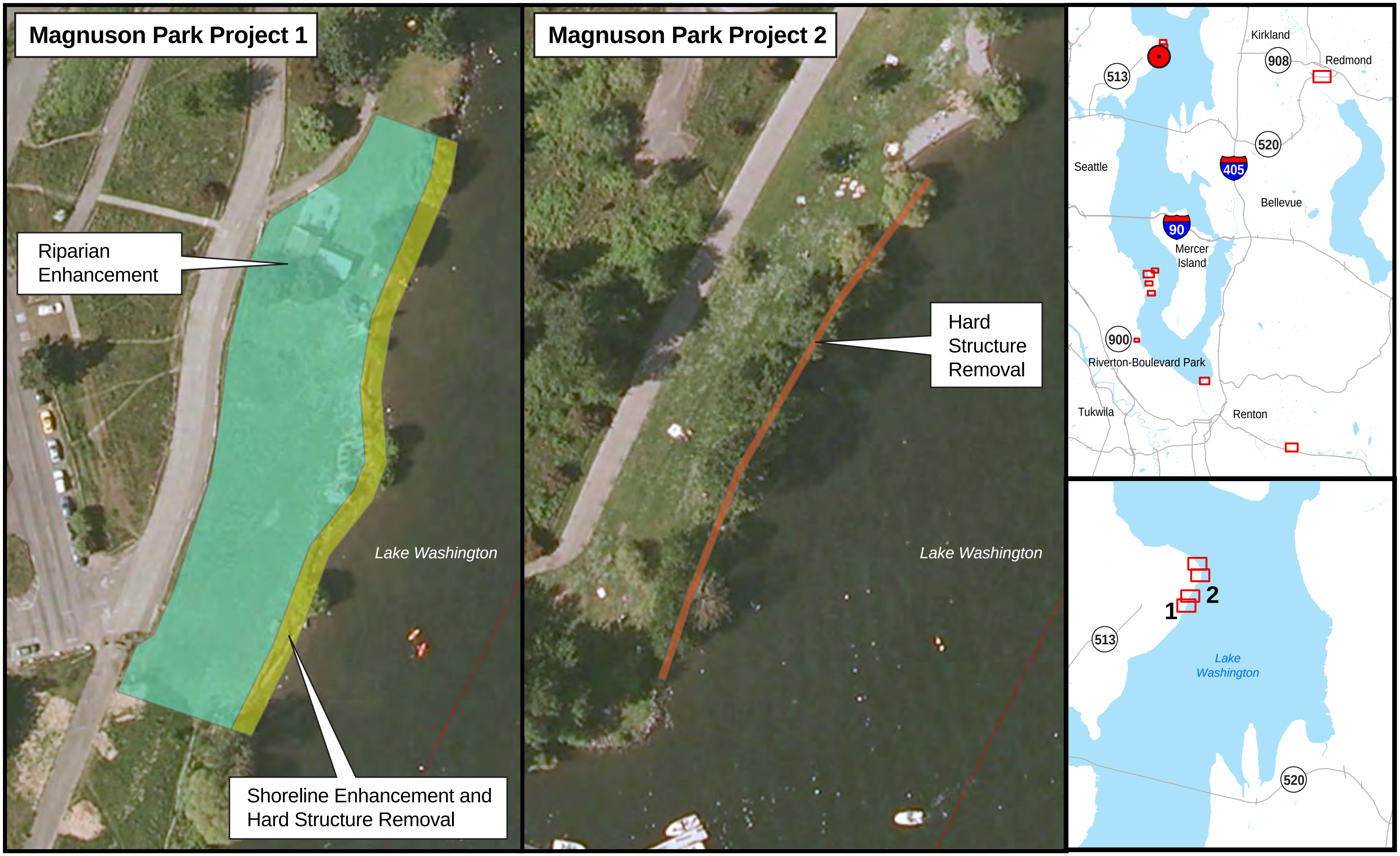
Magnuson Park project 2 is located north of the boat launch (Exhibit 2-65). The length of this segment is approximately 250 feet, with a narrow band of functional riparian vegetation that provides fish cover. However, a 2-foot-wide concrete bulkhead about 5 feet waterward of the shoreline prevents fish from accessing this functional shoreline. Mitigation actions at this site would include removal of this bulkhead. The root structure of the bank vegetation would prevent shoreline erosion.

Magnuson Park project 3 is located north of the designated swimming area (Exhibit 2-66). The length of this segment is approximately 450 feet, with very little riparian vegetation. The average bank height is 5 to 10 feet, with pockets of gradually sloped beach. The nearshore bathymetry along this reach is shallow; therefore, it has the potential to provide high-quality habitat for juvenile Chinook salmon. Mitigation actions at this site would include revegetation of the shoreline and installation of LWD to increase fish cover.

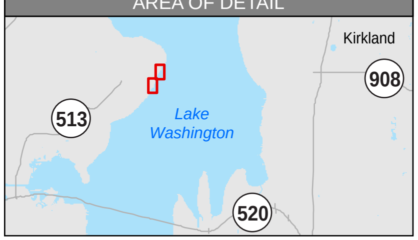
Magnuson Park project 4 is located at the north end of the Magnuson Park shoreline (Exhibit 2-66). The length of this segment is approximately 350 feet, with very little riparian vegetation. The average bank height is less than 5 feet along the southern 100 feet of the segment. The remainder of the shoreline has a bank height of around 10 feet. Mitigation actions at this site would include bank resloping along the 100 feet of low bank, revegetation of the shoreline, and installation of LWD along the entire segment to increase fish cover.

For all mitigation actions at Magnuson Park that require in-water work for bulkhead/rubble removal and/or bank resloping, both sediment and water quality would be monitored during construction. All debris and excavated soils would be removed and properly disposed of. The shoreline would be regraded to a constant, gentle slope with the use of heavy equipment located on the shoreline. Along all the regraded shorelines, additional substrate consisting of fish-friendly materials (small and medium gravels) would be installed.

Any nonnative plant species would be removed by physical means (no herbicide spraying would occur), and the entire lake buffer would be replanted with native trees and shrubs. The riparian zone directly adjacent to the shoreline would be planted densely to provide overhead cover and shoreline stabilization.



AREA OF DETAIL



Hard Structure Removal

Shoreline Enhancement + Hard Structure Removal

Riparian Enhancement

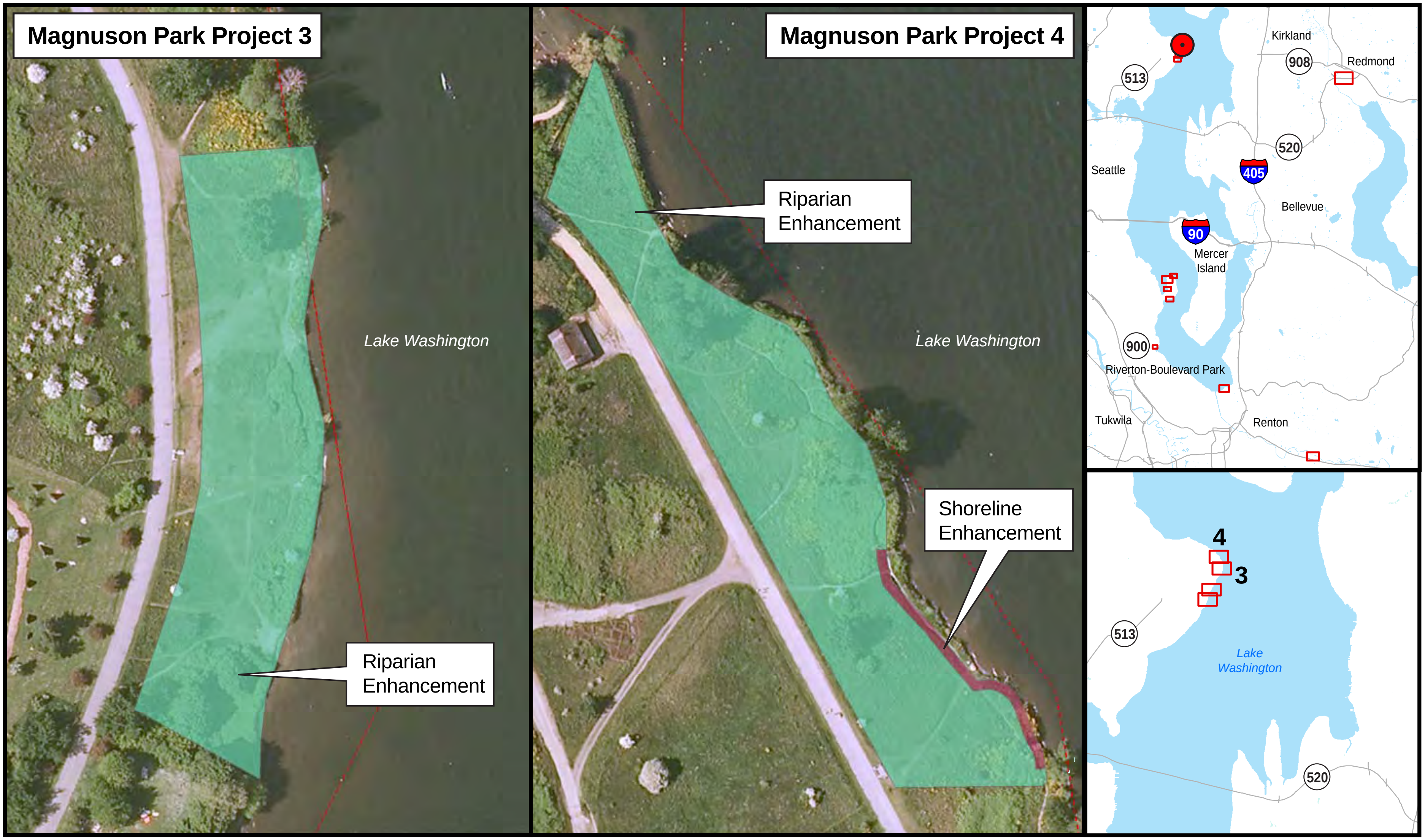
Parcel

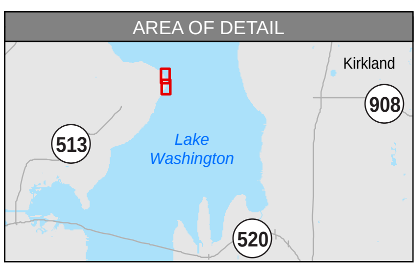
N

0 50 100 Feet

Exhibit 2-65. **Magnuson Park Mitigation Site, Projects 1 and 2**

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





Shoreline Enhancement
Riparian Enhancement
Parcel

N
0 75 150 Feet

Exhibit 2-66. **Magnuson Park Mitigation Site, Projects 3 and 4**

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

Beer Sheeva Park

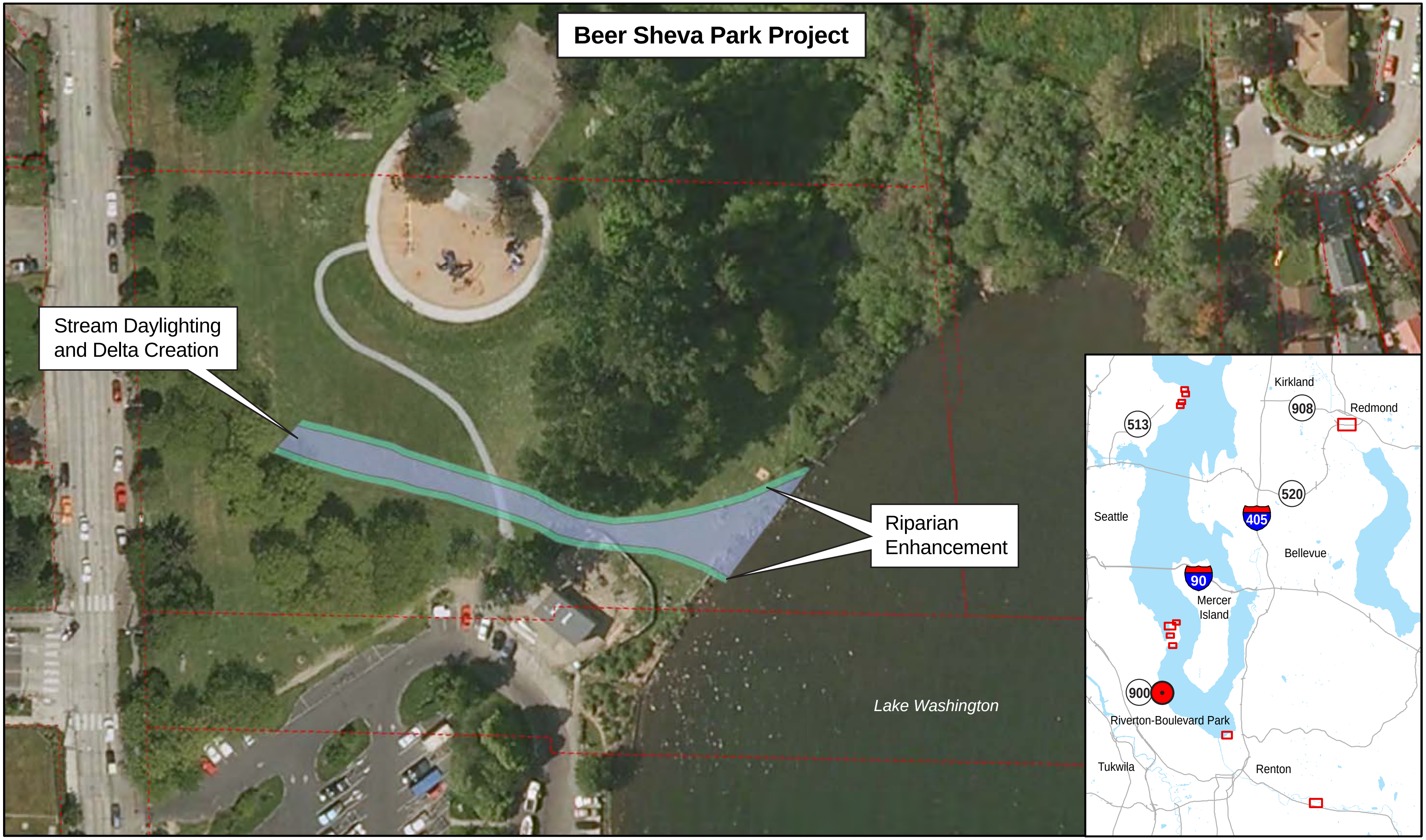
Parcel Numbers: 3524049013
Local Jurisdiction: City of Seattle
Ownership: Seattle Parks and Recreation Department
Legal Description: Southwest quarter, Section 35, Township 24 North, Range 4 East
6th Field HUC: 0171100120302
Approximate Mitigation Area: <1 acre

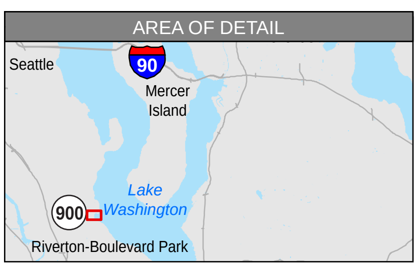
This site is located along the southwest shoreline of Lake Washington, between Seward Park and the Cedar River (Exhibit 2-67). Juvenile Chinook salmon have been found at the Beer Sheva Park in high densities (Tabor et al. 2006). The existing shoreline at Beer Sheeva Park is composed of an up to 3-foot-high unarmored bank with logs and boulders along the water line. Coarse gravel is the dominant sediment type below the water line, and the shoreline on the mitigation site has little to no riparian vegetation.

Mitigation actions at the Beer Sheeva Park would include daylighting the lower 300 feet of Mapes Creek within the park and creating a small delta along the park shoreline. A narrow riparian zone that is compatible with park uses would be planted along the creek and delta.

The mitigation actions at Beer Sheeva Park would require in-water work for stream daylighting and delta creation. To the extent possible, channel and delta creation would occur under dry conditions, with the use of heavy equipment located on land. Water quality would be monitored during construction. All debris and excavated soils would be removed and properly disposed of. Additional substrate consisting of fish-friendly materials (small and medium gravels) would be installed along the newly constructed channel, created delta area, and regraded shoreline.

Any nonnative plant species would be removed by physical means (no herbicide spraying would occur), and the daylighted stream would be replanted with native trees and shrubs to provide overhead cover and bank stabilization.





Stream Daylighting + Delta Creation

Riparian Enhancement

Parcel

N

0 50 100 Feet

Exhibit 2-67. **Beer Sheeva Park Mitigation Site**

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

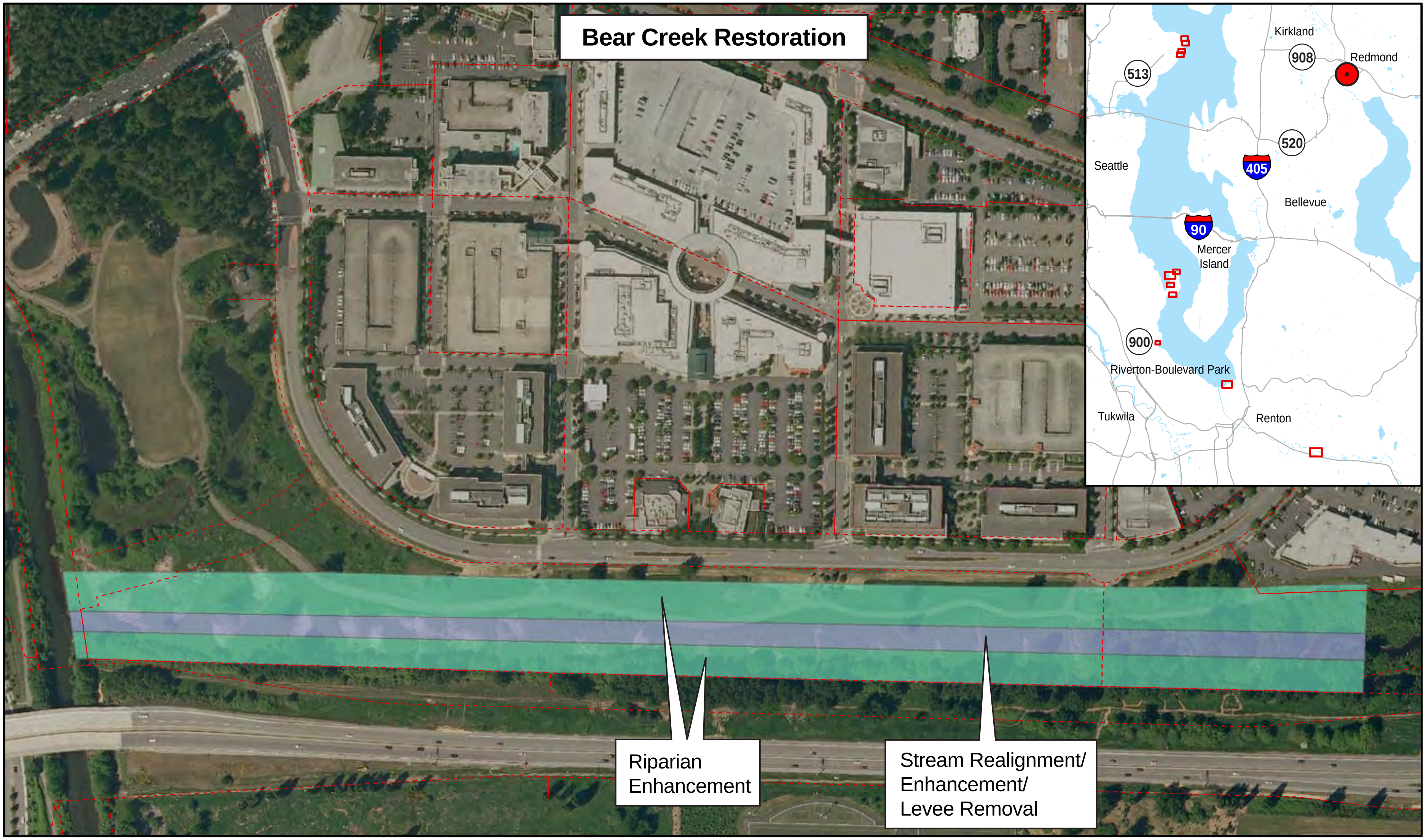
Bear Creek

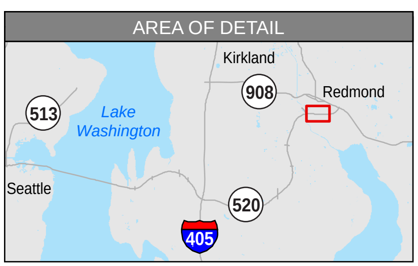
Parcel Numbers: 1125059098, 1225059261, 7202410180, 7202410190, 7202410260
Local Jurisdiction: City of Redmond
Ownership: WSDOT, City of Redmond, and Private
Legal Description: Sections 11 and 12, Township 25 North, Range 5 East
6th Field HUC: 0171100120401
Approximate Mitigation Area: 15 acres

The site is located on Bear Creek, from its confluence with the Sammamish River to 3,000 feet upstream (Exhibit 2-68). The upstream boundary of the site is contiguous with a 1,100 foot-long reach of Bear Creek (RM 0.6 to RM 0.9) that was previously enhanced by WSDOT. WSDOT has funded construction of the Bear Creek Restoration Project through the City of Redmond. This project has already undergone consultation with the NMFS (NMFS tracking no. 2009/04429 [NMFS 2009c]).

The primary habitat enhancement goal is to increase the long-term spawning and rearing success of the Bear Creek Chinook salmon subpopulation by increasing the amount of available habitat, improving habitat complexity, increasing riparian cover, improving water quality (temperature), and increasing the prey base.

The project will construct a new channel north of the existing channel. To increase channel sinuosity, the new channel will be 340 feet longer than the existing channel. Sections of the existing stream channel will connect to the new channel in places to provide 1,440 feet of off-channel habitat. The project will fill the remainder of the existing stream channel with gravels excavated from the new channel. The new channel will include 1,300 linear feet of pool habitat with LWD bank stabilization. A total of 3,000 pieces of LWD will be added to the stream channel. Approximately 91 trees larger than 6 inches in diameter will be replaced with 6,000 trees and shrubs covering 12.53 acres. The project will result in the creation of 1.25 acres of wetlands that will contribute flood attenuation and storage functions.





Stream Enhancement/Enhancement/Levee Removal

Riparian Enhancement

Parcel

N

0 150 300 Feet

Exhibit 2-68. **Bear Creek Mitigation Site**

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

Union Bay Natural Area

Parcel Numbers: 1625049001
Local Jurisdiction: City of Seattle
Ownership: University of Washington
Legal Description: Sections 15 and 16, Township 25 North, Range 4 East
6th Field HUC: 0171100120301
Approximate Mitigation Area: up to 20 acres

This site is located north of Union Bay and east of the University of Washington (Exhibit 2-69). It covers approximately 111 acres and formerly served as the Montlake Landfill, which was in operation from 1933 until the late 1960s. Most of the shoreline is characterized by relatively sparse vegetation, and some nonnative shrub species are present within the shoreline buffer. Offshore areas include large areas dominated by dense Eurasian watermilfoil (*Myriophyllum spicatum*) and water lilies (*Nymphaea odorata)*. Some areas of the shoreline have moderately steep slopes and varying substrate sizes, and some LWD is present along the shoreline.

The primary habitat enhancement goal is to increase the quality and quantity of wetlands on the site and to connect the created wetlands to University Slough. Habitat enhancement actions would be developed by WSDOT to be consistent with the current uses of the site and the long-term goals of the University of Washington and other stakeholders. The University of Washington has developed a master plan for this area, identifying habitat restoration in several areas. Of particular value is the intention of the University to use the Union Bay Natural Area in support of academic research and as an outdoor teaching laboratory. Proposed mitigation activities would incorporate this special use of the site. WSDOT proposes a mixture of mitigation activities at the Union Bay Natural Area mitigation site that includes wetland creation in the area along the east side of University Slough, wetland restoration, rehabilitation and/or enhancement along the shorelines of Shoveller’s Pond and the central pond, and shoreline and buffer enhancement activities throughout the other portions of the site.

In areas where wetland are to be created, rehabilitated, or enhanced, the surface would be graded and elevations established to provide appropriate wetland hydrology. The wetland areas would be planted with trees, shrubs, and emergent vegetation zones to increase the diversity and interspersion of habitats, and the associated upland and buffer areas would be enhanced with native trees, shrub, and herbaceous species to improve the habitat quality and increase screening of wetland.

Expected activities at the Union Bay Natural Area mitigation site may include clearing of vegetation; grading to remove fill materials, match the local water table, and create topographic variation on the site; importation and placement of clean fill materials and soil amendments; surface contouring; and planting of native herbaceous and woody species. Supplemental irrigation may be required during the vegetation installation or establishment period. Ongoing maintenance activities (such as removal of invasive plants or replacement of dead native plants) and monitoring would continue through the performance monitoring period (estimated to be 10 years).

Equipment to be used may include heavy equipment (e.g., excavators, graders, backhoes, and dump trucks), as well as a variety of manual tools. BMPs and TESC procedures would be used to limit the extent of offsite siltation.

Exhibit 2-69. **Union Bay Natural Area Mitigation Site**

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

WSDOT-Owned Peninsula

Parcel Numbers: 212504UNKN
Local Jurisdiction: City of Seattle
Ownership: WSDOT
Legal Description: Northeast quarter, Section 21, Township 25 North, Range 4 East
6th Field HUC: 0171100120302
Approximate Mitigation Area: up to 4 acres

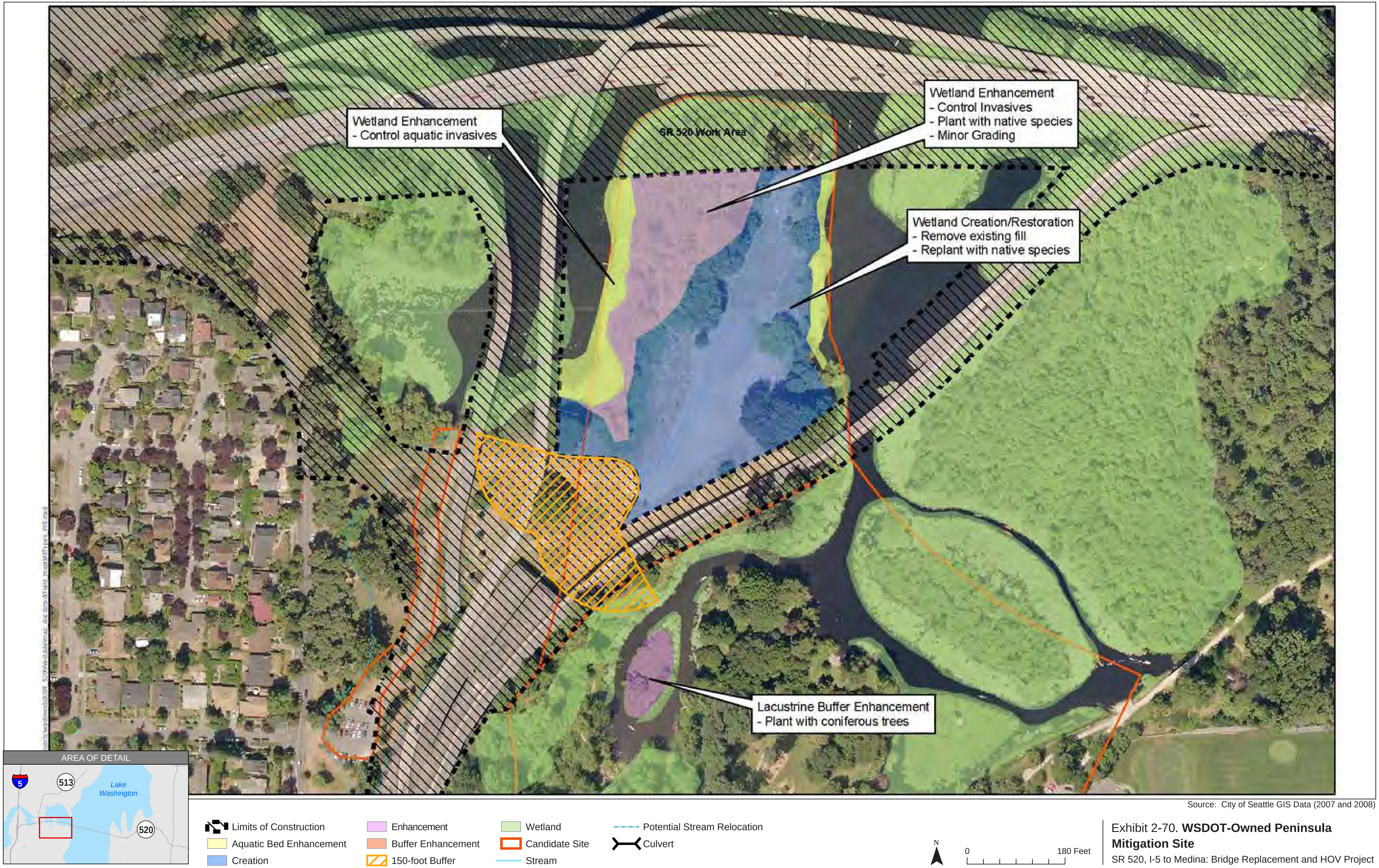
The WSDOT-owned peninsula is located in the immediate vicinity of the Lake Washington Boulevard on-ramps and off-ramps north of the Washington Park Arboretum and immediately south of SR 520 (Exhibit 2-70). The northern tip of the peninsula is within the impact area of the SR 520, I-5 to Medina project. It covers approximately 8.3 acres and includes approximately 1,600 feet of the Lake Washington shoreline. Wetland LWS-4 (a Category II lake-fringe wetland) is located on the WSDOT-owned peninsula. Vegetation in the wetland is dominated by Pacific willow, birch, sweet gum, creeping buttercup, and reed canarygrass.

The primary aquatic habitat enhancement goal is to generally increase nearshore habitat functions on the site, including functions associated with shoreline and riparian areas.

Wetland creation/restoration would occur in the eastern portion of the peninsula. The peninsula would be excavated to near lake level and planted with native species, creating a variety of wetland habitats. Existing wetlands on the site would be enhanced, by the removal of nonnative species and installation of native species that would increase the diversity of the habitat.

The wetland creation and enhancement activities would be buffered from adjacent land uses. Proposed buffers widths would be consistent with applicable regulations. Nonnative species in the buffer area would be removed, and the buffer area would be replanted with an assemblage of native trees and shrubs. The riparian zone directly adjacent to the shoreline would be planted densely to provide overhead cover and shoreline stabilization. These actions would be performed in conjunction with wetland mitigation to establish a functioning ecological continuum, with increased habitat diversity that supports natural riparian and shoreline functions.

Since the WSDOT peninsula will be used for staging and construction activities associated with the SR 520, I-5 to Medina project, as described in Section 2.3.1, mitigation activities at this site would be conducted after completion of the bridge construction. The proposed activities would be similar to those described for the Union Bay Natural Area mitigation site (e.g. clearing, grading to remove excess fill, reestablishing elevations consistent with the water table, and replanting with native species). The equipment used, the BMPs, and the TESC measures would also be similar.



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

Exhibit 2-70. **WSDOT-Owned Peninsula Mitigation Site**

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

Washington Park Arboretum

Parcel Numbers: 2125049044
Local Jurisdiction: City of Seattle
Ownership: City of Seattle Parks and Recreation Department
Legal Description: East half, Sections 21 and 28, Township 25 North, Range 4 East
6th Field HUC: 0171100120302
Approximate Mitigation Areas: up to 4 acres

The Washington Park Arboretum is a 230-acre park located at the south end of Union Bay (Exhibit 2-71). The arboretum is located entirely within one parcel (2125049044), extending from 40th Avenue East and East Madison Avenue on the south to SR 520 and Lake Washington on the north. The arboretum is cooperatively managed by the University of Washington and the City of Seattle. Wetlands located in the arboretum include Category III lake-fringe wetlands (LWS-2, LWS-3, and LWS-5) and a Category II riverine wetland (unnamed) that is associated with Arboretum Creek. Lake-fringe wetlands on this site include forested, scrub-shrub, emergent, and floating aquatic vegetation. The primary habitat enhancement goal is to generally increase wetland habitat functions at the site, including functions associated riparian areas.

Four separate areas in the arboretum are proposed for wetland and riparian enhancements. Three of them are located adjacent to Arboretum Creek, and one is located within the arboretum waterways. The first potential mitigation area is located near the headwaters of Arboretum Creek, where there is an inline pond in the stream created by a man-made dam. The pond has aquatic vegetation and emergent plants along the edge, and the buffer is mostly grass with a few large trees. Upslope it appears that there are seeps that have been drained. Much of the upslope vegetation is grass, with some scattered trees and shrubs. In this area, wetland functions would be improved by surface recontouring and the planting of native shrub and tree components. In addition, seep wetlands would be created by the removal of existing French drains and surface contouring, and the areas would be planted with native trees and shrubs to create and enhance wetland functions. The buffer areas would also be improved by the installation of native trees and shrubs.

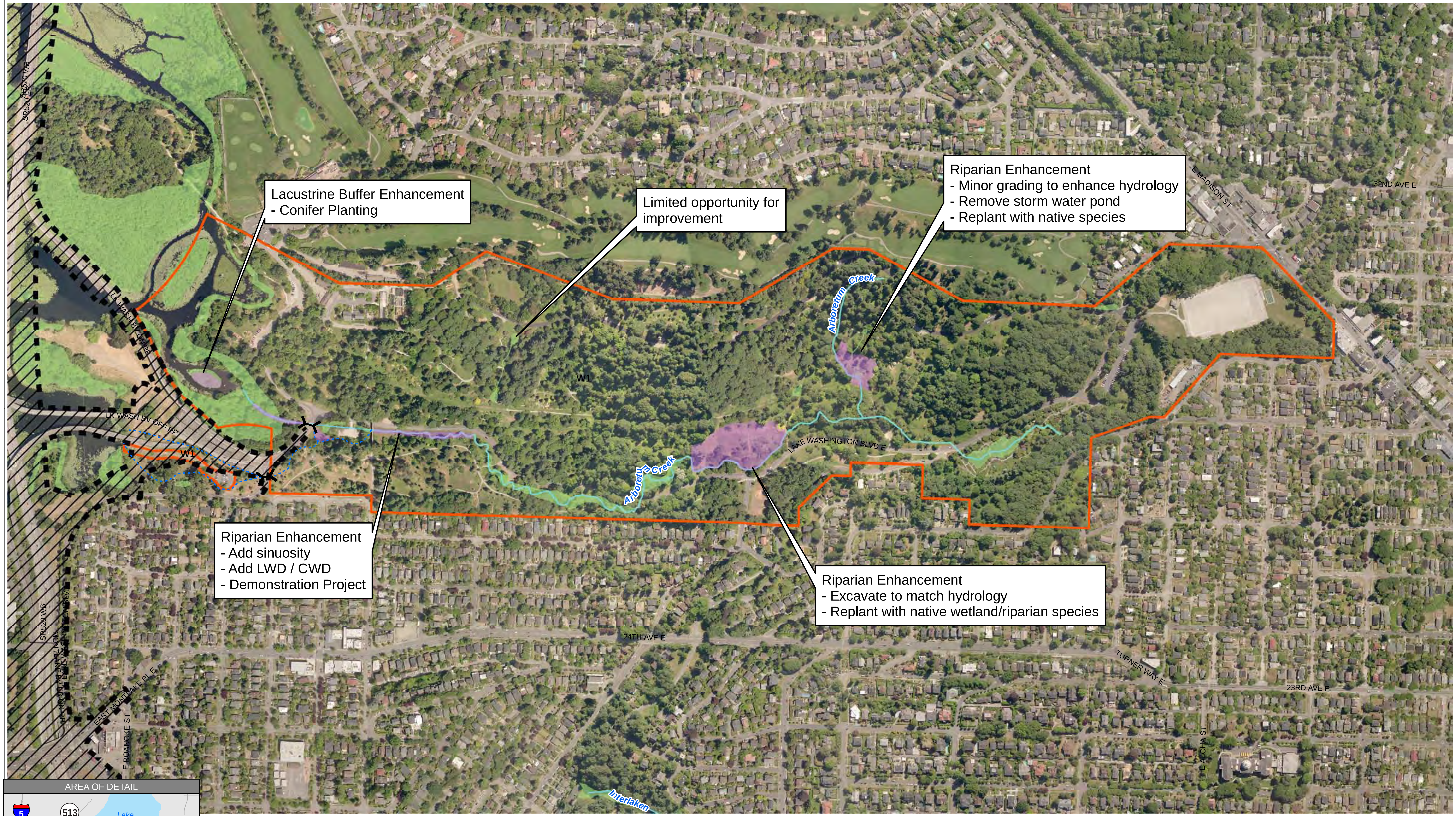
The second potential enhancement area, which is located along the main stem of Arboretum Creek, covers approximately 2.4 acres. The area is located on a slope above Arboretum Creek and immediately east of Azalea Way, the main pedestrian route through the arboretum. Vegetation in this area is dominated by nonnative grasses, including reed canarygrass. Few specimen plants are located in this area. Proposed activities in this area could include recontouring the surface to create seep/slope wetland and/or to create riparian wetlands along Arboretum Creek, and replanting the area with native trees and shrubs to establish a mixed wetland and upland community in the riparian corridor of Arboretum Creek.

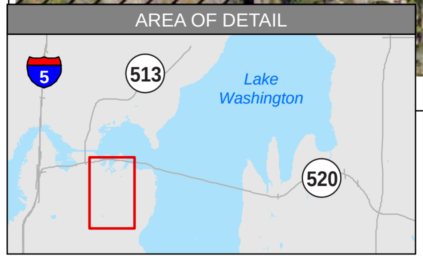
The third potential enhancement area is located at the south end of Arboretum Creek, immediately adjacent to Lake Washington Boulevard and upstream of the pedestrian crossing bridge. Arboretum Creek is confined to a narrow, relatively straight channel in this area, immediately alongside the paved road surface. Vegetation in the area consists of common roadside herbs and grasses, and the area is frequently mowed. A coniferous upland forest is located west of Arboretum Creek. The proposed mitigation activities for this area include excavation and grading to establish a shallow bench for Arboretum Creek and possibly realigning the creek into a more sinuous channel and incorporating LWD, if conditions at this location allow. The area would also be replanted with native trees and shrubs to provide cover, improve stream shading, and provide additional habitat niches.

The fourth potential enhancement area is located in an island wetland in Willow Bay. The wetland would be improved by planting native trees. Removal of invasive species is not proposed in this area.

As a whole, the proposed mitigation activities are expected to enhance riparian buffer functions by the removal of invasive species; planting of native trees, shrubs, and herbaceous species; improvements in stream shading; and increases in the amount of native insects and detritus in Arboretum Creek's food web.

The proposed activities at the selected mitigation site would include activities similar to those at the other wetland mitigation sites (e.g. clearing, grading, and replanting with native species). The equipment used, the BMPs, and the TESC measures are expected to be similar to those for the other mitigation sites.





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

- Limits of Construction
- Aquatic Bed Enhancement
- Creation
- Enhancement
- Buffer Enhancement
- Wetland
- Candidate Site
- Culvert
- Stream Relocation Alternative
- Stream

N

0 500 Feet

Exhibit 2-71. **Washington Park Arboretum Mitigation Site**

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

2.8.2 Minimization Measures and BMPs

The natural resource mitigation activities will likely require in-water work, including shoreline regrading and the removal of bulkheads and docks. However, appropriate BMPs will be applied and all work will be conducted within the proposed in-water construction periods. These measures are expected to minimize the exposure risk for juvenile salmonid that is associated with construction activities, and significant long-term water quality impacts are not expected if erosion control BMPs, stormwater treatment facilities, and spill containment measures are properly implemented, monitored, and maintained during construction of the habitat enhancement sites. However, even with BMPs, some minor and short-term water quality effects are possible. In addition to the BMPs described in Section 2.10, the following general BMPs and impact minimization measures will be implemented for natural resource mitigation activities:

- Temporary storage of excavated materials will not occur within the 100-year floodplain between October 1 and May 1. Material used within 12 hours of deposition will not be considered temporary.
- No excavated material will be placed in the existing water bodies. Excavated material will be removed to a location that will prevent its reentry into waters of the state.
- Where practicable for soil stability, native vegetation will be planted in areas disturbed by construction activities.
- A 3-year monitoring plan and adaptive management of revegetated areas will be implemented to ensure 100 percent survival of vegetation by stem count at the end of 1 year and 80 percent survival at the end of the 3-year monitoring period.
- Before, during, and immediately after isolation and dewatering of the in-water work area, fish from the isolated area will be captured and released using methods that minimize the risk of fish injury, in accordance with the WSDOT protocols for such activities (WSDOT 2009a).
- Seasonal restrictions (i.e., in-water construction periods) will be applied to the project to avoid or minimize potential impacts on fish species based on the Hydraulic Project Approval (HPA) issued by WDFW. The general in-water construction period for water bodies in the action area is July 1 to August 31.
- All in-water work will conform to the requirements of the applicable HPA.
- All construction activities will comply with water quality standards set forth in the Implementing Agreement (Ecology 1998) and the state of Washington Surface Water Quality Standards (Washington Administrative Code, Chapter 173-201A [WAC 173-201A]).
- During the bulkhead/dock removal process, as much of the existing structure as possible will be removed before final dismantling of the structure, to minimize the potential for

entry of material and debris into receiving waters. This material includes all roadbed material, decking, concrete curbs, etc.

- For any sites on which in-water work will occur and that have been previously identified as having potential sediment contamination issues, the sediment will be tested to determine the type and concentration of contaminants present. All contamination will be remediated or removed/disposed of in a manner that minimizes entrainment into surface waters.
- Revegetation of construction easements and other areas will occur either during project construction or after project construction is completed. All disturbed riparian vegetation will be replanted. Trees will be planted when consistent with highway safety standards. Riparian vegetation will be replanted with species native to the action area.
- Where practicable, excavation activities will be accomplished under dry conditions. All surface water flowing toward the excavation will be diverted by the use of cofferdams and/or berms. Cofferdams and berms will be constructed of sandbags, clean rock, steel sheeting, or other non-erodible material.
- Bank shaping will be limited to the minimum necessary.
- If equipment use within the wetted perimeter of a wetland or stream is permitted, the following provisions will apply:
    - Equipment will be thoroughly cleaned of mud, petroleum products, or other deleterious material.
    - Turning and spinning within the streambed will be avoided.
    - The streambed will be returned to pre-project condition at project completion.
    - The amount and duration of in-stream work with machinery will be limited to the minimum necessary to complete the work.
    - There will be no visible sheen from petroleum products in the receiving water as a result of project activities.
- Mitigation sites will adhere to an integrated vegetation and pest management principles that includes both mechanical removal (cutting and/or mowing) and focused application of a non-residual herbicide with low non-target toxicity. Herbicide formulations and applications will comply with the herbicide’s Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) label requirements, the NPDES General Permit for Aquatic Noxious Weed Control (State of Washington Department of Ecology Permit No. WAG-993000), and local noxious weed requirements, including as these pertain to schedule, notification, monitoring, and compliance.

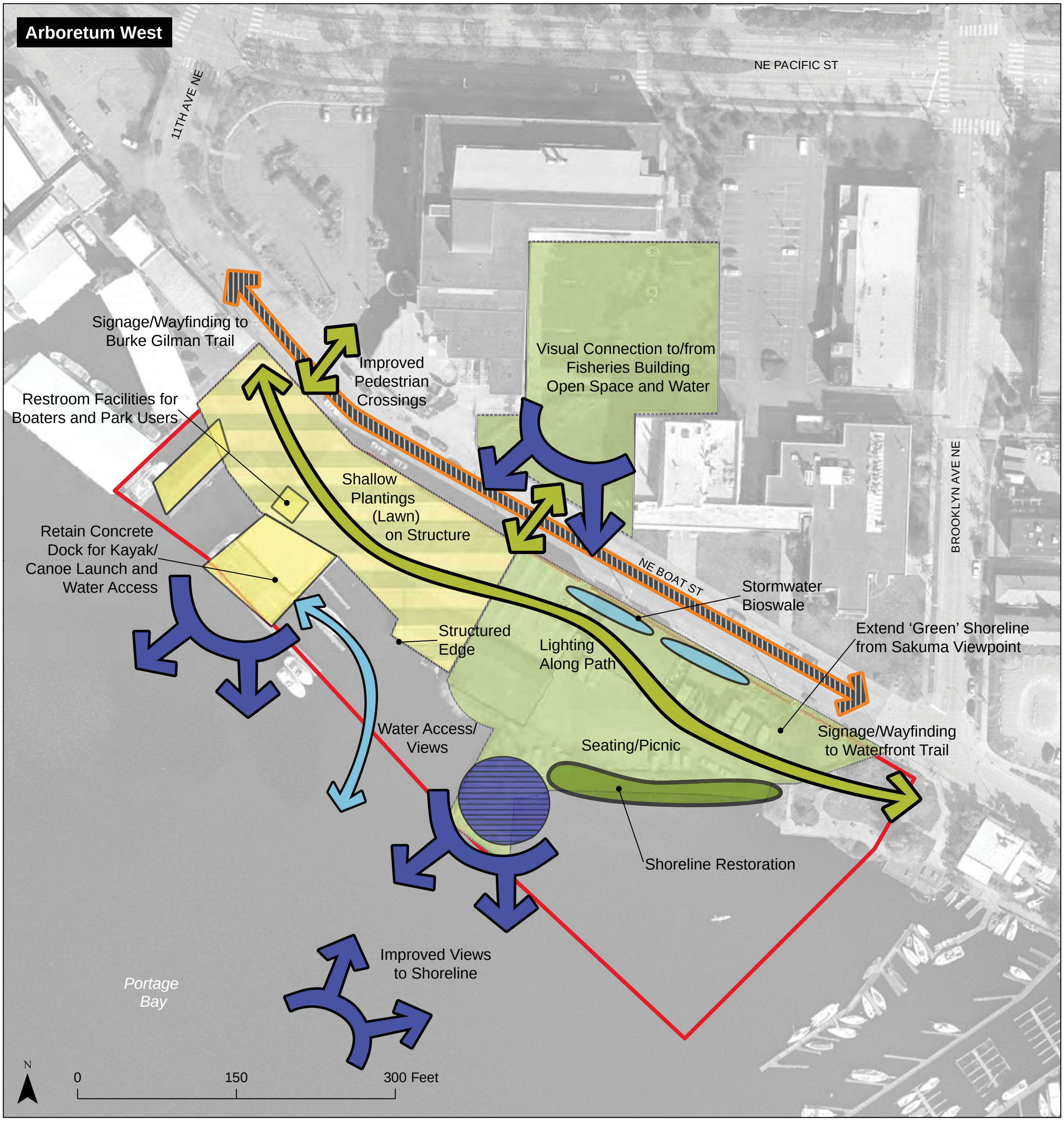
2.9 Mitigation for Effects on Section 6(f) Resources

The SR 520, I-5 to Medina project will affect two Section 6(f) resources in the action area—the Ship Canal Waterside Trail and the Arboretum Waterfront Trail. The project will also affect two parks associated with the trails—East Montlake Park and the Washington Park Arboretum. The parks are not Section 6(f) resources; however, the parks provide access to the Section 6(f) trails, thereby affecting the parks during or after project construction that, in a way, may affect the trails. Therefore, the trails are considered to be affected by the project.

The project will provide mitigation to compensate for effects on these Section 6(f) resources. Currently, the Arboretum West Site is the only Section 6(f) replacement site being considered for mitigation. At this time, it is anticipated that WSDOT will acquire this site for use as replacement site for affected Section 6(f) resources; however, Seattle Parks will be responsible for the design and construction of the site. The activities identified are based on preliminary concepts for the site.

The 4.12-acre Arboretum West Site is owned by the University of Washington and is located on Portage Bay, off NE Boat Street. It consists of one parcel of land located 3/4 of a mile from the intersection of East Montlake Avenue and Lake Washington Boulevard. The preliminary concept for this site provides a recreational facility that complements existing recreational use along the shoreline of Portage Bay.

A conceptual plan of the Section 6(f) mitigation opportunities at the Arboretum West Site is shown in Exhibit 2-72.



Potential Section 6(f) Replacement Site
Existing View
Pedestrian Circulation
Bicycle/Arterial
Boat Traffic
Revegetation/Stabilization
Open Space/Park
Structure/Dock
Gathering Area

Source: King County (2005) GIS Data (Streams and Streets), King County (2007) GIS Data (Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 2-72. **Concept Drawing for the Arboretum West Site**

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

2.10 Avoidance and Minimization Measures

BMPs will be used during all construction activities to eliminate or minimize potential environmental effects. Many of these BMPs are standard and will apply universally to many project construction activities, including upland staging areas. This section discusses provisional BMPs that WSDOT anticipates will be included as construction commitments for the project.

2.10.1 Temporary Stormwater Management Strategy

The temporary stormwater management strategy is to aid in reducing the risk of potential pollutants being discharged to a watercourse that may cause or contribute to the exceedances of water quality standards during construction and demolition activities. The strategy is to use BMPs and adhere to regulatory requirements to manage construction-related stormwater runoff and thereby minimize environmental impacts. The plan will include planning system design and water quality monitoring and sampling. The components of the temporary stormwater management strategy are listed below.

2.10.1.1 Stormwater Pollution Prevention Plan

The stormwater pollution prevention plan (SWPPP) is prepared to meet National Pollutant Discharge Elimination System (NPDES) permit requirements for stormwater discharges from construction sites. The SWPPP will address the following elements:

- Planning and organization
  - Formation of a pollution prevention team
  - Building on preexisting plans
- Assessment
  - Development of a site plan
  - Material inventory
  - Record of past spills and leaks
  - Non-stormwater discharges
  - Site evaluation summary
- BMP identification
  - Preventive maintenance
  - Spill prevention and response
  - Sediment and erosion control
  - Management of runoff
- Implementation
  - Implementation of appropriate controls

    - Employee training
- Evaluation and monitoring
    - Annual site compliance evaluation
    - Recordkeeping and internal reporting
    - Plan revisions

2.10.1.2 Temporary Erosion and Sediment Control Plan

TESC is required to prevent erosive forces from damaging project sites, adjacent properties, and the environment. A TESC plan will be prepared and implemented to minimize and control pollution and erosion due to stormwater runoff. It will address the following elements:

- Marking clearing limits
- Establishing construction access
- Controlling flow rates
- Installing sediment controls
- Stabilizing soils
- Protecting slopes
- Protecting drain inlets
- Stabilizing channels and outlets
- Controlling pollutants
- Controlling dewatering
- Maintaining BMPs
- Managing the project

2.10.1.3 Spill Prevention, Control, and Countermeasures Plan

WSDOT requires the implementation of an SPCC plan on all projects to prevent and minimize spills that may contaminate soil or nearby waters. The plan is prepared by the contractor as a contract requirement and is submitted to the project engineer before the initiation of any onsite construction activities.

Spill avoidance and containment BMPs will include the following:

- Maintain all construction equipment in order to minimize the risk of fuel and fluid leaks or spills.
- Implement spill control and emergency response plans for fueling and concrete activity areas. All spill-control materials will be present on the site before and during construction.

- If a leak or spill should occur, cease all work until the source of the leak is identified and corrected and the contaminants have been removed from the site.
- Clean all equipment that is used for in-water work before operations waterward of the OHWM. Remove external oil and grease as well as dirt and mud. Prohibit the discharge of untreated wash and rinse water into local waters. Ensure that all construction equipment working in the water, particularly pile-driving machines, use vegetable-based hydraulic fluid.
- Conduct refueling activities within a designated refueling area away from the shoreline, streams, or any designated wetland areas.
- Minimize refueling activities on work bridges whenever feasible, and ensure that appropriate spill containment and cleanup equipment is on hand and in use as needed during any refueling of equipment on work bridges.
- Inspect daily all vehicles operating within 150 feet of any water body for fluid leaks before leaving the vehicle staging area. Repair any leaks detected before the vehicle resumes operation. When not in use, store vehicles in the vehicle staging area.
- Modify off-pavement construction entrances according to WSDOT standard plans to reduce the spread of dirt from the project site.

2.10.1.4 Concrete Containment and Disposal Plan

A concrete containment and disposal plan for handling and managing concrete both during construction of bridge columns and their footings and during demolition of the existing bridge will be developed to maintain water quality.

2.10.1.5 Water Quality Sampling, Recording, and Reporting Procedures

All projects with greater than 1 acre of soil disturbance, except federal and tribal land, that may discharge construction stormwater to waters of the state are required to seek coverage under the NPDES construction stormwater general permit. Sampling guidance for meeting permit requirements is listed in the WSDOT HRM, Section 6-8.

2.10.2 Land-Based Construction – Best Management Practices

The following BMPs and procedures are to be implemented for the proper use, storage, and disposal of materials and equipment on land-based construction limits, staging areas, or similar locations that minimize or eliminate the discharge of potential pollutants to a watercourse or waters of the state. These procedures will be implemented for construction materials and wastes (solid and liquid), soil or dredging materials, or any other materials that may cause or contribute to exceedance of water quality standards.

Upland construction BMPs will involve the following:

- Clearly define construction limits with stakes and a high-visibility fence before beginning ground-disturbing activities. No disturbance will occur beyond these limits.
- Minimize vegetation and soil disturbance to the extent possible.
- Avoid or reduce adverse impacts on critical areas during project construction, including shoreline buffers. These measures will include clearing, grading, and stormwater management.
- Protect designated sensitive areas, including the shoreline, with silt fencing. All silt fencing will be removed when construction is completed.
- Control all stormwater discharges from construction sites and ensure that NPDES permit requirements are met.

Construction BMPs to control dust and limit impacts on air quality include the following:

- Wet down fill material and dust on site.
- Ensure adequate freeboard to prevent soil particles from blowing away during transport.
- Remove dirt, dust, and debris from the roadway on a regularly scheduled basis in accordance with final permitting requirements.
- Minimize potential erosion from areas of disturbed soil by stabilizing and/or revegetating cleared areas in accordance with the TESC plan.
- Wet down concrete structures during demolition activities.

2.10.3 Over-Water Work – Best Management Practices

The following BMPs and procedures are expected to be implemented at a minimum for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads (e.g., work bridges), or similar locations that minimize or eliminate the discharge of potential pollutants to a watercourse or waters of the state. These procedures will be implemented for construction materials and wastes (solid and liquid), soil or dredging materials, or any other materials that may cause or contribute to exceedance of water quality standards.

2.10.3.1 Construction Stormwater Pollution Prevention Planning

Preparation of a SWPPP, TESC plan, and SPCC plan will be completed before any construction or demolition activities.

2.10.3.2 Watertight Curbs, Bull Rails, or Toe Boards

Watertight curbs, bull rails, or toe boards will be installed around the perimeter of a work bridge, platform, or barge to contain potential spills and prevent materials, tools, and debris from leaving the over-water structure. These applications will be installed with a minimum vertical height of 10 inches.

2.10.3.3 Oil Containment Boom

An oil containment boom is a floating barrier that can be used to contain oil and helps to prevent the spread of an oil spill by confining the oil to the area in which it has been discharged. The purpose of containment is not only to localize the spill and thus minimize pollution but also to assist in the removal of the oil.

2.10.3.4 Floating Sediment Curtain

These barriers can aid in controlling the settling of suspended solids (silt) in water by providing a controlled area of containment. This condition of suspension (turbidity) is usually created by the disruption of natural conditions resulting from construction or dredging in the aquatic environment. The containment of solids that can settle out is desirable to reduce the impact area.

2.10.3.5 Tie Downs

Tie downs can be used to secure all materials, which can aid in preventing discharges to receiving waters via wind.

2.10.3.6 Absorbent Materials

Absorbent materials will be placed under all vehicles and equipment on docks, barges, or other over-water structures. Absorbent materials will be applied immediately on small spills and promptly removed and disposed of properly. An adequate supply of spill cleanup materials such as absorbent materials will be maintained and available on site.

2.10.3.7 Equipment Maintenance and Inspection

Inspections of vehicles and construction equipment will occur daily. Vehicles will be inspected before they enter any over-water work zone. Vehicles and equipment will be kept free of excessive buildup of oil and grease.

Land-based fueling stations will be used to the extent practicable.

Offsite repair shops will also be used to the extent practicable. These businesses are better equipped to properly handle vehicle fluids and spills. Performing this work off site can also be economical by eliminating the need for a separate maintenance area. If a leaking line cannot be repaired, the equipment will be removed from over-water areas.

If maintenance must take place on site, only designated areas located away from drainage courses, will be used. Dedicated maintenance areas will be protected from stormwater run-on and runoff.

2.10.3.8 Cover and Catchment Measures

Portable tents, drop cloths, tarps, blankets, sheeting, netting, and plywood panels will be used to cover work areas, temporary stockpile materials, and demolition debris. Nets, tarps, platforms, scaffolds, blankets, barges, and/or floats will be used to contain and control debris beneath structures being constructed or demolished. Vacuums, diverters, squeegees, absorption materials, holding tanks, and existing drainage systems will be used to control and contain concrete-laden water. These BMPs will also facilitate the suppression and dispersal of fugitive dust generated during the demolition process.

2.10.3.9 Construction Water Treatment Systems

These systems generally consist of temporary settling storage tanks, filtration systems, transfer pumps, and an outlet. The temporary settling storage tank provides residence time for the large solids to settle out. The filtration system will be provided to remove additional suspended solids less than an acceptable size (typically 25 microns). The pumps provide the pressure needed to move the water through the filter and then to an acceptable discharge location. Once the solid contaminants are filtered out, the clean effluent is then suitable for discharge to a municipal storm drain or an acceptable discharge location. These systems will be located on work bridges and barges.

2.10.3.10 Spill Containment Kits and Containment Products

These pre-manufactured products will aid in spill containment and cleanup. These kits and products will be kept on site and within construction vehicles for easy deployment.

2.10.3.11 Alternative Lubricants and Fuels

Eco-friendly lubricants and fuel sources (e.g., vegetable-based products) will be used for in-water and over-water construction where practicable.

2.10.3.12 Barges and Floats

Barges and floats can be used to store stockpile materials, store construction equipment, transport demolition debris, and store water containment systems and water storage tanks. The barges and floats can also be used as a catchment for demolition debris if located below a proposed demolition activity.

Protection will be required to prevent debris and water from entering adjacent live traffic lanes and prevent the spread of such material over a larger area. Such occurrences can be prevented by installing temporary barriers and protective panels, and containing or vacuuming water generated during the use of concrete saws.

2.10.3.13 Pontoon Outfitting

Pontoons will be moored in water at least as deep as -20 feet MLLW and located so submerged vegetation will not be shaded and, except for periods during inclement weather or moving heavy loads on and off the pontoons, the pontoon will be moored to provide at least 15 feet of separation between the pier and the pontoon.

2.10.4 In-Water Work – Best Management Practices

In addition to applicable BMPs described above for over-water work, the following BMPs apply where demolition activity will occur in waters of the state. These procedures will be implemented to contain construction materials and wastes (solid and liquid), soil or dredging materials, or any other materials that may cause or contribute to the exceedances of water quality standards.

2.10.4.1 Underwater Containment System/Temporary Cofferdam

These systems will be implemented to prevent sediment, concrete, and steel debris from mixing with waters of the state. Examples include a temporary cofferdam, an oversized steel casing, or another type of approved underwater containment system. This application will allow demolition work to be completed on and around an underwater structure, while isolating the work zone. The system will also allow work to be completed at or below the mudline. Construction water and slurry within the containment system will be removed, treated, and pumped to an acceptable discharge location upon completion of the demolition. Fresh concrete will be prevented from coming in contact with waters of the state.

2.10.4.2 Sediment Testing

Prior to their disposal, sediments excavated from the lakebed will be tested for the presence of contaminants. If contaminated sediments are encountered, containment BMPs will be implemented to avoid or minimize the introduction of contaminated sediments to the water column.

2.10.4.3 Noise Attenuation

Bubble curtains will be installed during in-water impact pile driving.

2.10.4.4 Timing Restrictions

In-water construction will adhere to the proposed in-water construction timing dates shown in Exhibit 2-73. The proposed dates were developed through a series of in-water construction technical working groups consisting of representatives from WSDOT, the services, WDFW, the Muckleshoot Indian Tribe, and local fish experts. Each in-water construction period is predicated on the nature of the construction activity, the habitat function zones described in Section 4.8, and the expected timing of fish use in the habitat function zone.

EXHIBIT 2-73.
PROPOSED IN-WATER CONSTRUCTION PERIODS FOR THE VARIOUS PROJECT ELEMENTS

Project Element	Proposed In-Water Construction Timing
Portage Bay [a]	
Work bridge/falsework pile installation	September 1 to April 30
Work bridge deck	N/A
Cofferdam – vibratory	August 16 to April 30
Mudline footings in cofferdam	N/A
Drilled shaft – vibratory	August 16 to April 30
Bridge superstructure	N/A
Materials transport	N/A
Column demolition	N/A
Pile removal	August 16 to April 30
Cofferdam removal	August 16 to April 30
Union Bay and West Approach – Salmonid Habitat Zone 4 [b]	
Work bridge pile installation	September 1 to April 30
Work bridge deck	N/A
Drilled shaft – vibratory	N/A
Bridge superstructure	N/A
Materials transport	N/A
Column demolition	N/A
Pile removal	N/A
West Approach – Salmonid Habitat Zone 6 [b]	
Work bridge pile installation	October 1 to April 15
Work bridge deck	N/A
Drilled shaft -–vibratory	August 1 to March 31
Bridge superstructure	N/A
Materials transport	N/A
Column demolition	N/A
Pile removal	August 1 to March 31
West Approach Connection Bridge [b]	
Work bridge deck	N/A
Drilled shaft – vibratory	August 1 to March 31
Bridge superstructure	N/A
Materials transport	N/A
Column demolition	N/A

EXHIBIT 2-73.
PROPOSED IN-WATER CONSTRUCTION PERIODS FOR THE VARIOUS PROJECT ELEMENTS

Project Element	Proposed In-Water Construction Timing
Floating Bridge [b]	
Temporary pile anchors – vibratory	July 16 to March 15
Gravity or shaft anchor installation –west end	July 16 to March 15
Gravity or shaft anchor installation – east end	September 1 to May 15
Fluke anchor installation	N/A
Pontoon assembly	N/A
Bridge outfitting/superstructure	N/A
Materials transport	N/A
Pile removal	July 16 to March 15
East Approach [c]	
Work bridge/falsework pile installation	August 16 to March 15
Work bridge deck	N/A
Cofferdam – vibratory	September 1 to May 15
Mudline footings in cofferdam	N/A
Drilled shaft – vibratory	September 1 to May 15
Bridge superstructure	N/A
Materials transport	N/A
Column demolition	N/A
Pile removal	July 1 to March 15
Cofferdam removal	July 1 to March 15

[a] Published In-Water Construction Timing October 1 to April 15
[b] Timing July 16 to March 15 north of bridge and July 16 to April 30 south of existing bridge
[c] Published In-Water Construction Timing July 16 to March 15
N/A = not applicable