WELCOME TO THE ASCE 2016 CONVENTION

BEHIND THE SCENES: DESIGN AND CONSTRUCTION OF THE WORLD'S LONGEST FLOATING BRIDGE

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PDHs available: [provided to you by ASCE]

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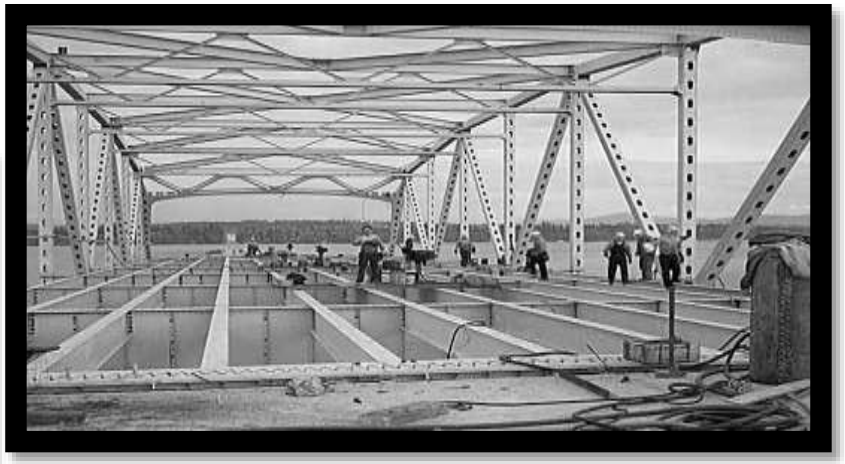
Presentation Outline

- SR 520 Program overview
- New floating bridge design and construction
  - Unique construction methods and techniques
- Next steps for the Program
- Questions and answers

View of the new SR 520 floating bridge under construction on Lake Washington, looking west. The old bridge is visible to the left.

SR 520 Program Overview

The original SR 520 bridge was opened in 1963…



People knew how to have fun in the 1960's!
Photos of original SR 520 construction in the early 1960's, as well as a water skier celebrating the bridge's opening in August 1963.

Improving safety and mobility for the region

Replacing vulnerable structures

The SR 520 program is improving safety by:

- Replacing aging and vulnerable bridge structures currently at risk of failure
- Adding full outside shoulders
- Adding safer, smoother merges and sightlines
- Improving bicycle and pedestrian connectivity

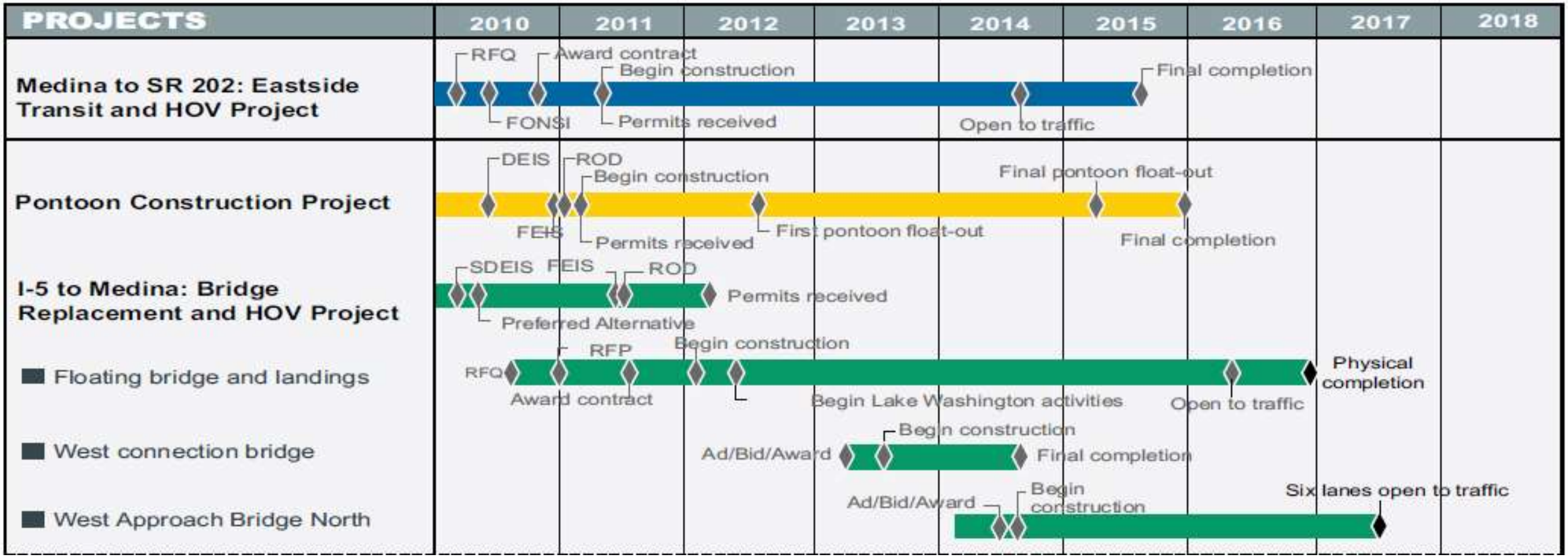
Enhancing mobility

The SR 520 program is enhancing mobility by:

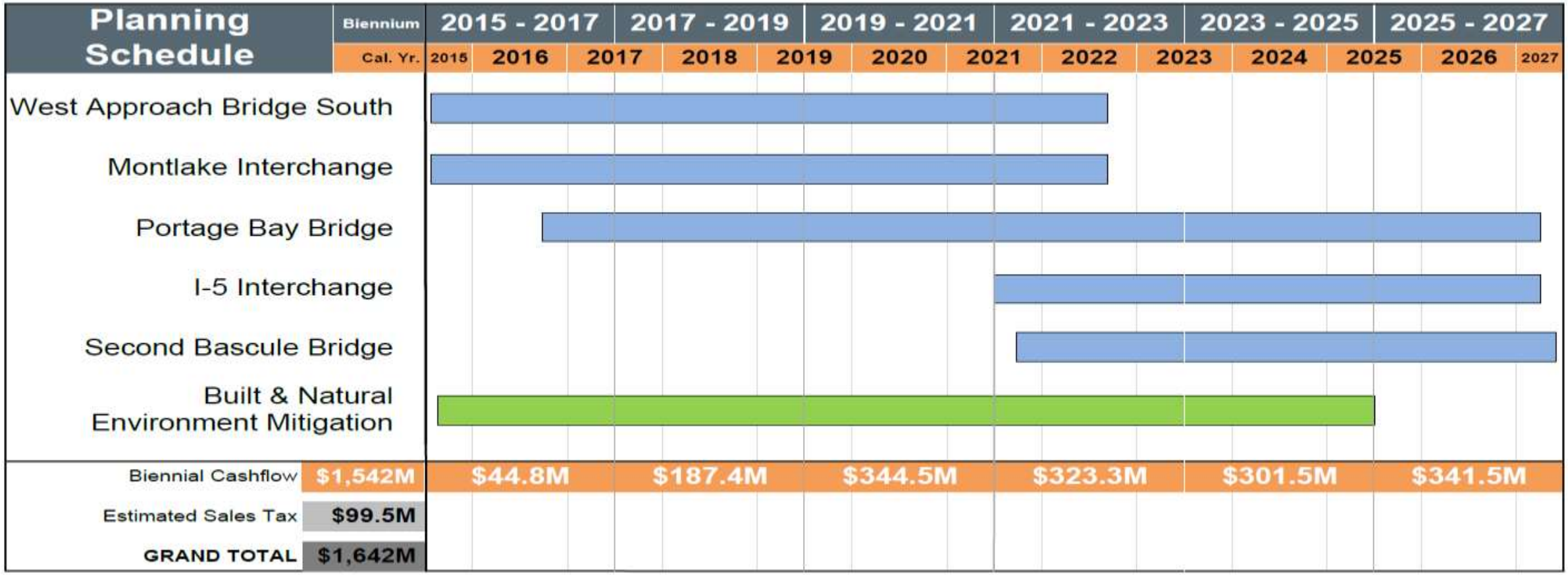
- Adding new transit/HOV lanes for better bus and carpool trip reliability
- Building a new 14-foot-wide bicycle and pedestrian path
- Adding new median transit stops and direct-access ramps along the corridor

What is the SR 520 Bridge Replacement and HOV Program?

SR 520 program timeline / history



Connecting Washington funding for SR 520



*This chart shows generally when **design and construction activities** for the SR 520 Rest of the West are expected to take place.*
The project timeline is still in development.
The next phase will include the West Approach Bridge South and Montlake interchange/lid – construction of that phase is expected to start in 2018. Schedule and information above is for illustrative purposes, and is subject to change.

Eastside Transit and HOV Project

Contractor: Eastside Corridor Constructors
Contract Amount: $363 million

Construction Timeline: Spring 2011 – September 2015
Delivery Method: Design-build

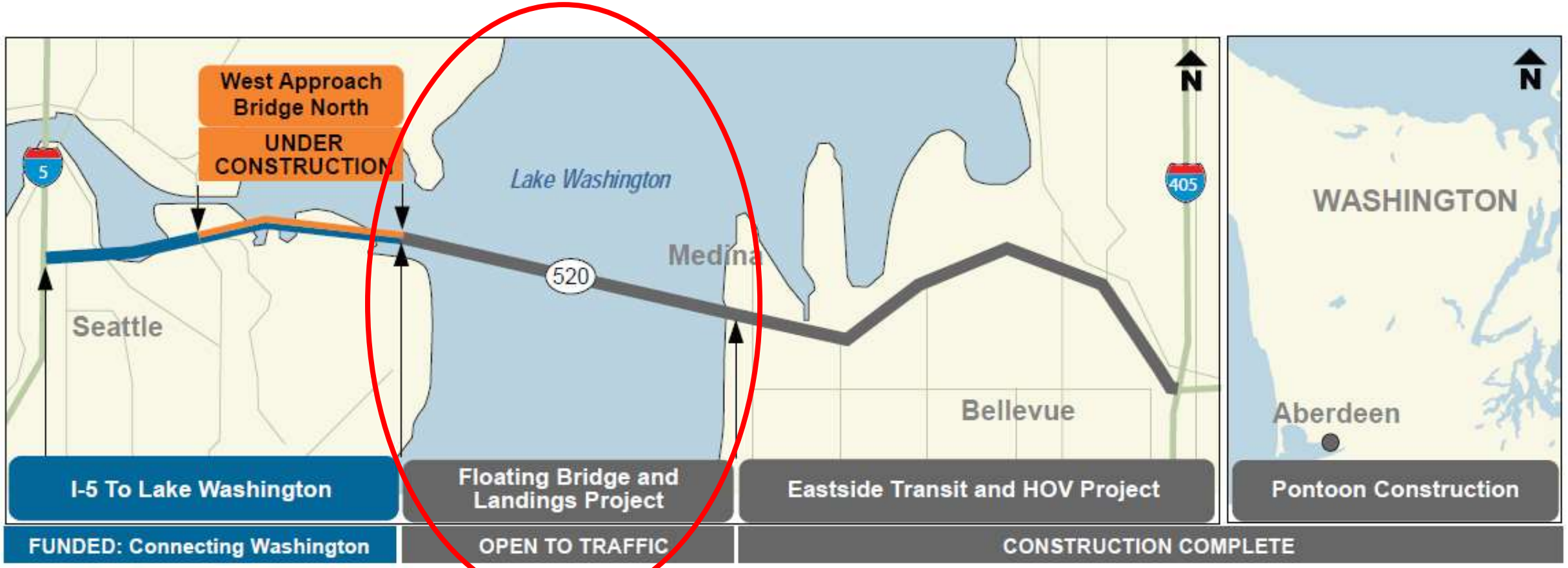
Construction update: Eastside Transit and HOV Project

A look at the SR 520 corridor East of Medina.

The Evergreen Point Road transit facility, completed in 2014.

Construction update: Eastside Transit and HOV Project

Floating Bridge and Landings Project



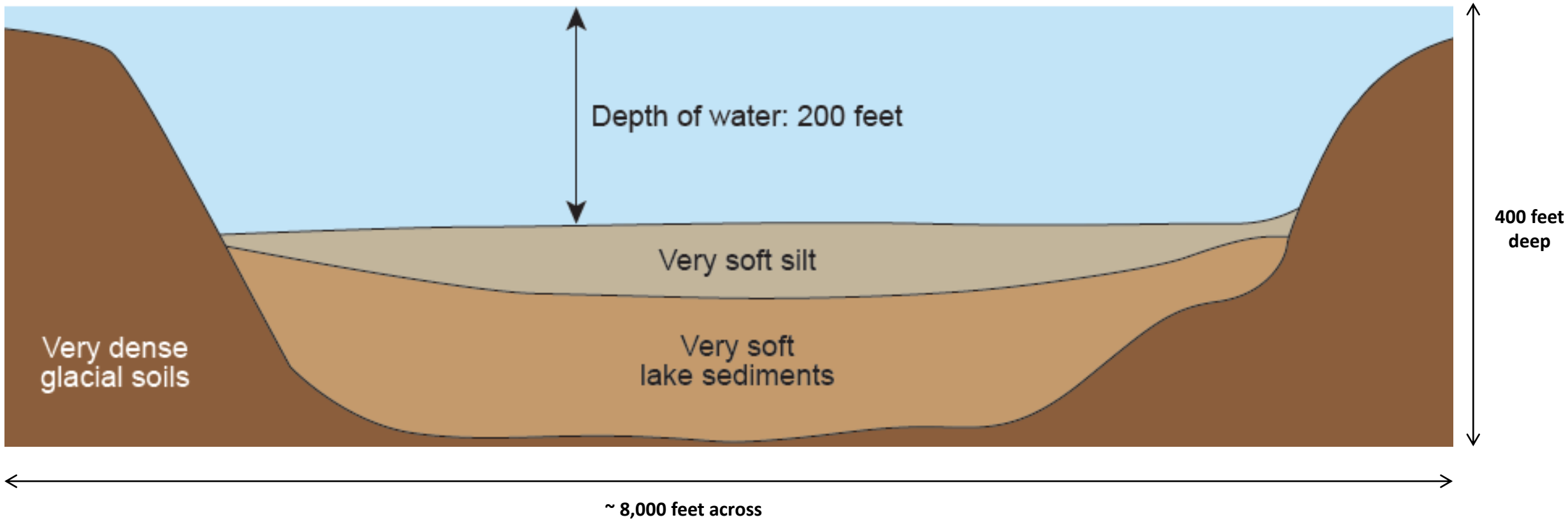
Contractor: Kiewit/General/Manson, Joint Venture
Contract Amount: $760 million

Construction Timeline: Late 2011 – Late 2016
Delivery Method: Design-build

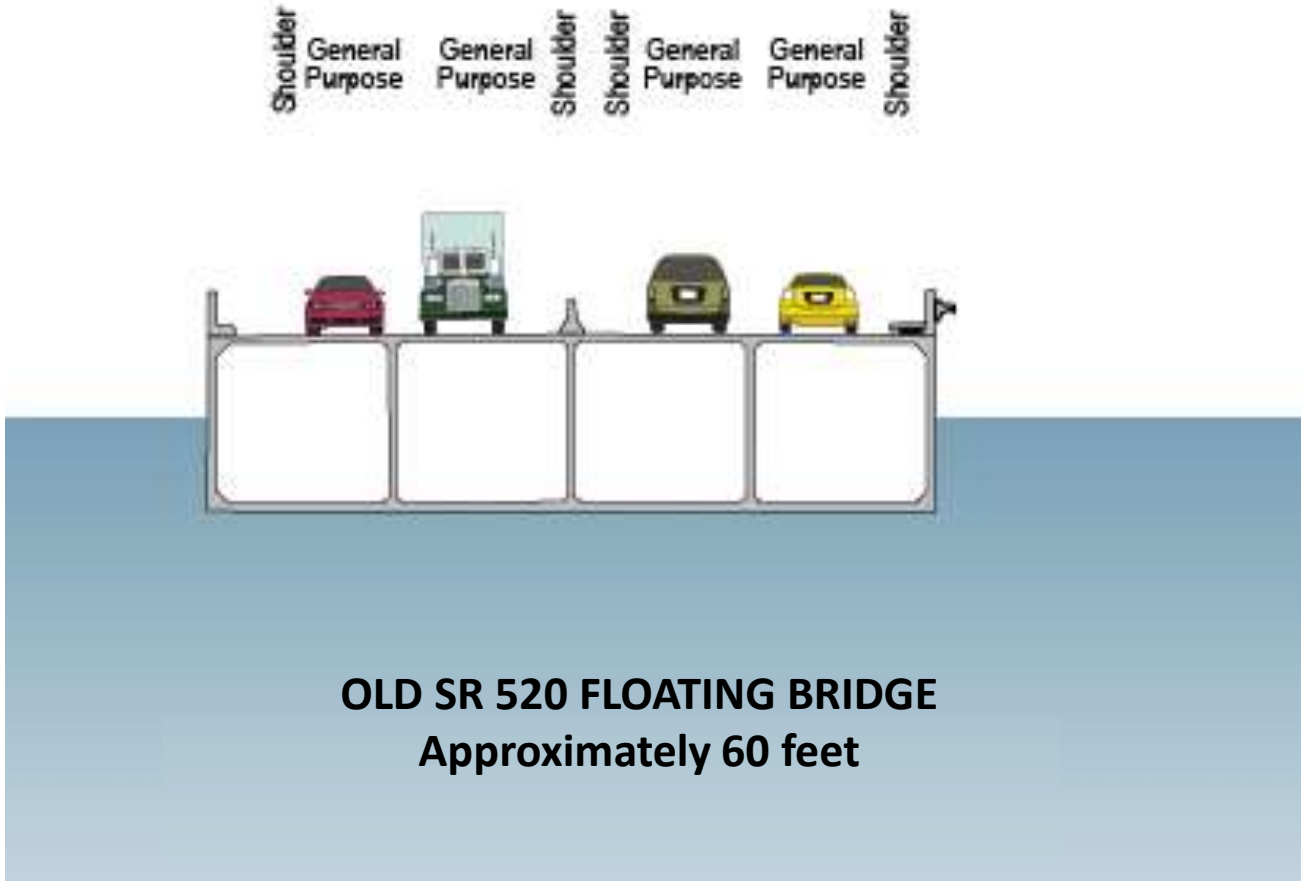
Old floating bridge on Lake Washington

Floating bridge overview

Why is the SR 520 bridge a floating bridge?



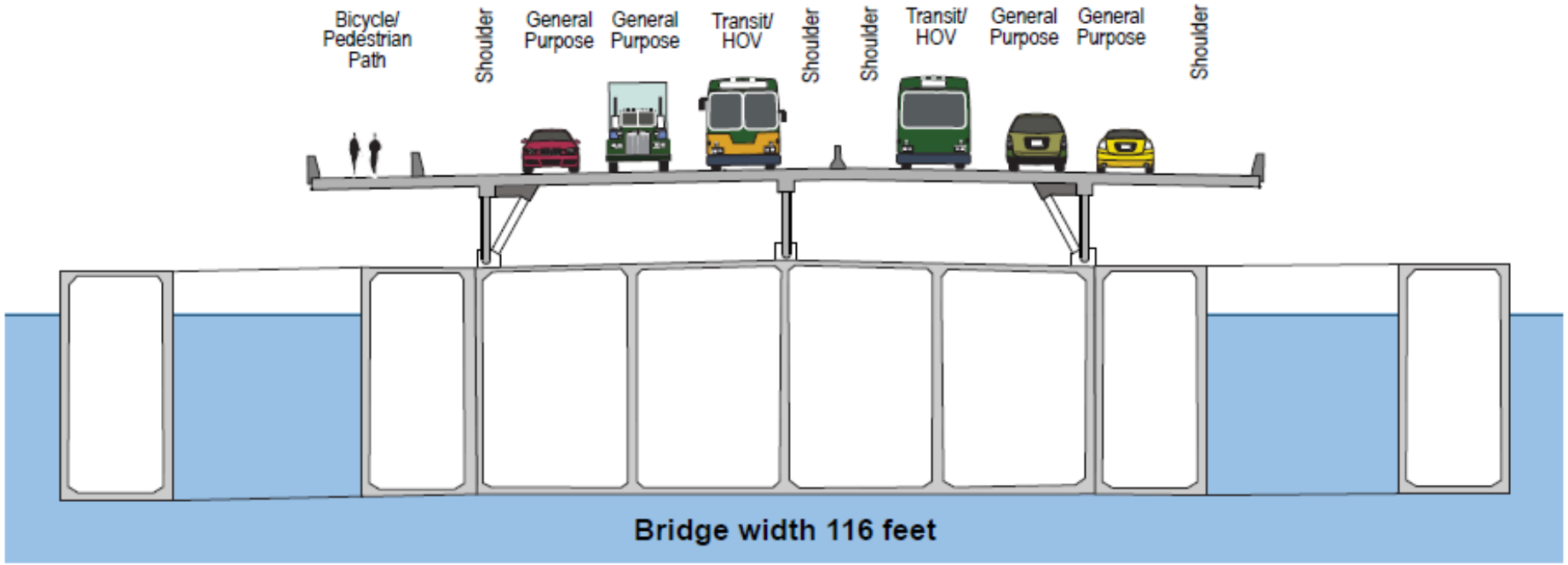
Old SR 520 floating bridge configuration



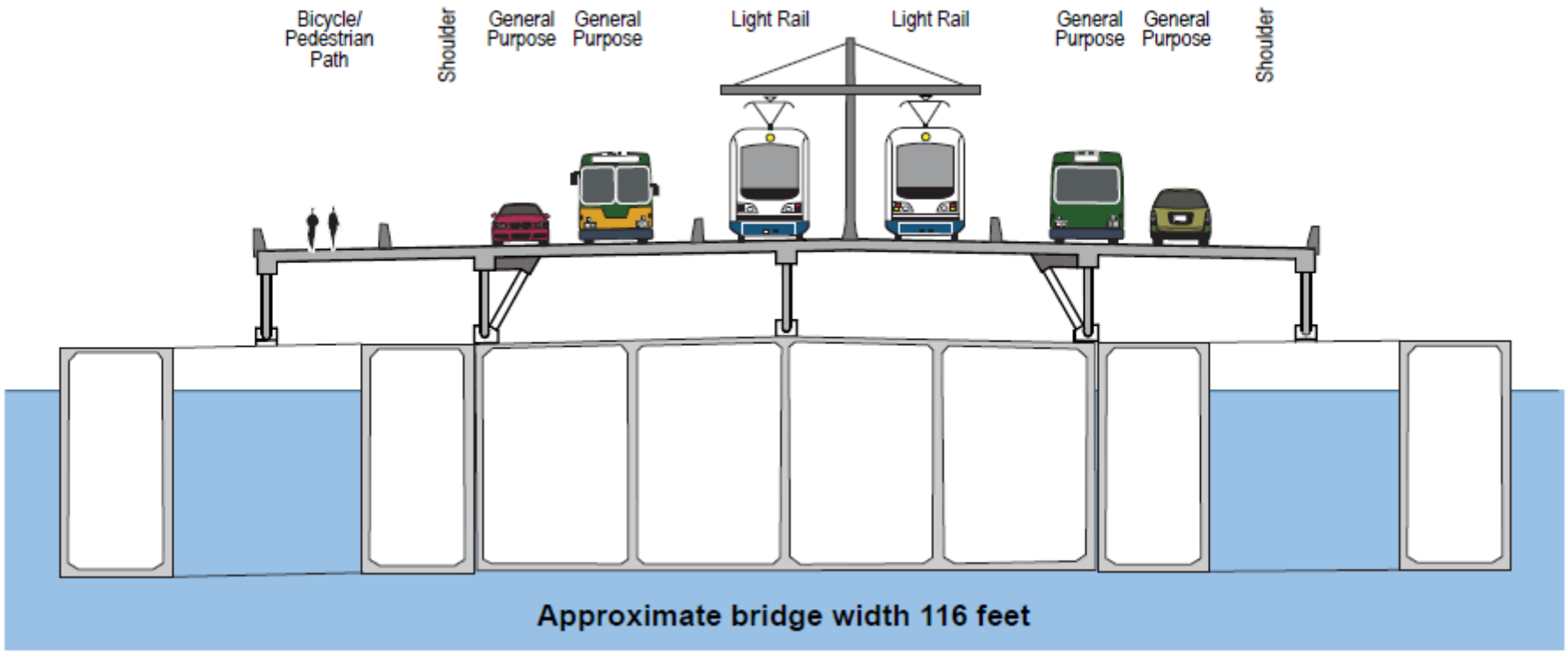
OLD SR 520 FLOATING BRIDGE
Approximately 60 feet

New SR 520 floating bridge configuration

Two general-purpose lanes and one transit/HOV lane in each direction and a bicycle/pedestrian path on the north side of the bridge.

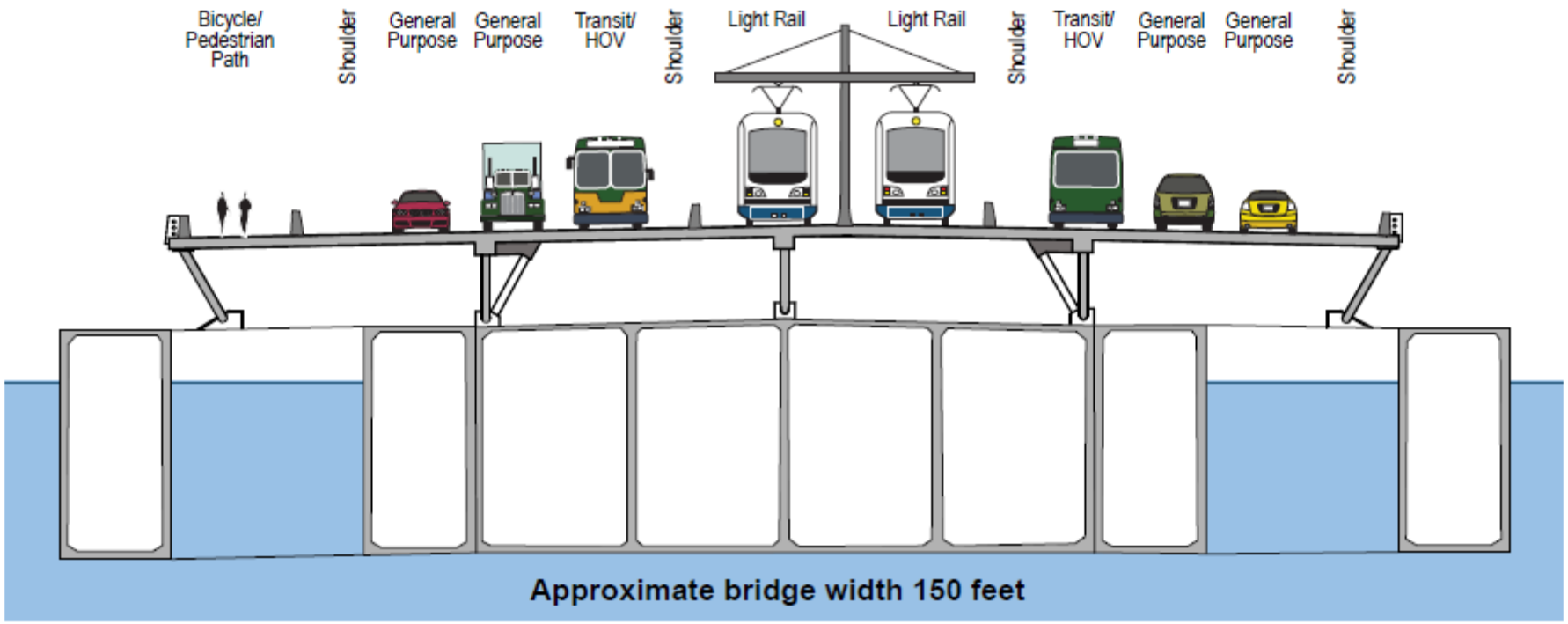


Potential SR 520 bridge configurations that accommodate light rail



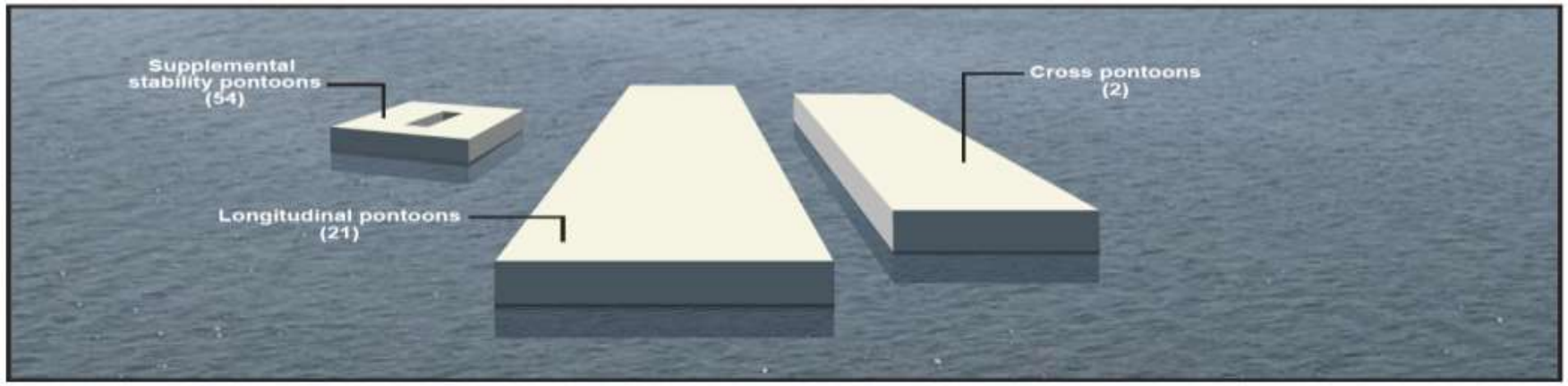
Scenario 1: With light rail displacing the transit/HOV lanes.

Potential SR 520 bridge configurations that accommodate light rail

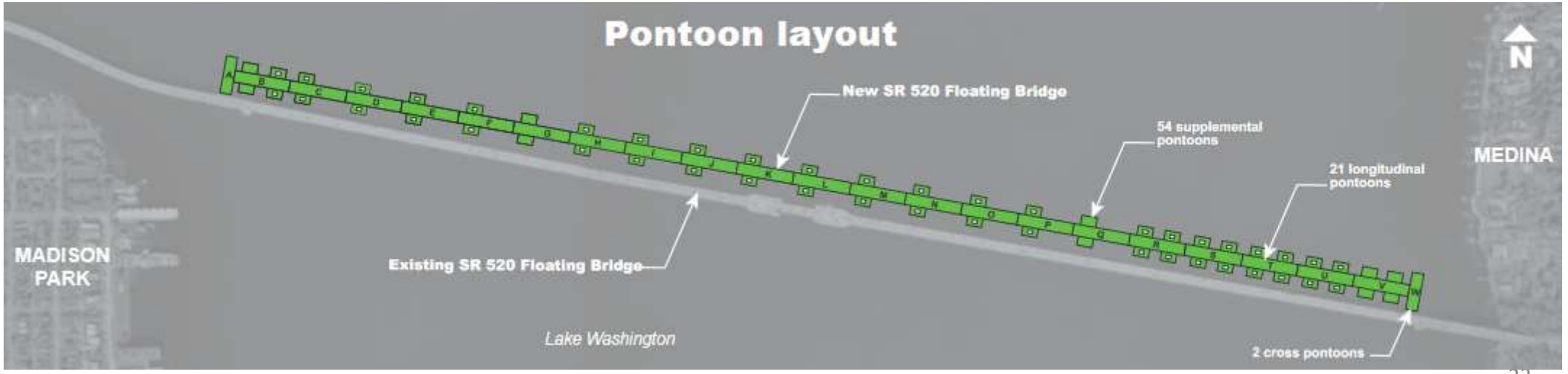


Scenario 2: With light rail in addition to the transit/HOV lanes.

Pontoon types



The three types of pontoons that will support the new SR 520 floating bridge.



Pontoon Construction Project

Contractor: Kiewit-General, JV
Contract Amount: $457 million

Construction Timeline: February 2011 – March 2015
Delivery Method: Design-build

Pontoon construction in Aberdeen

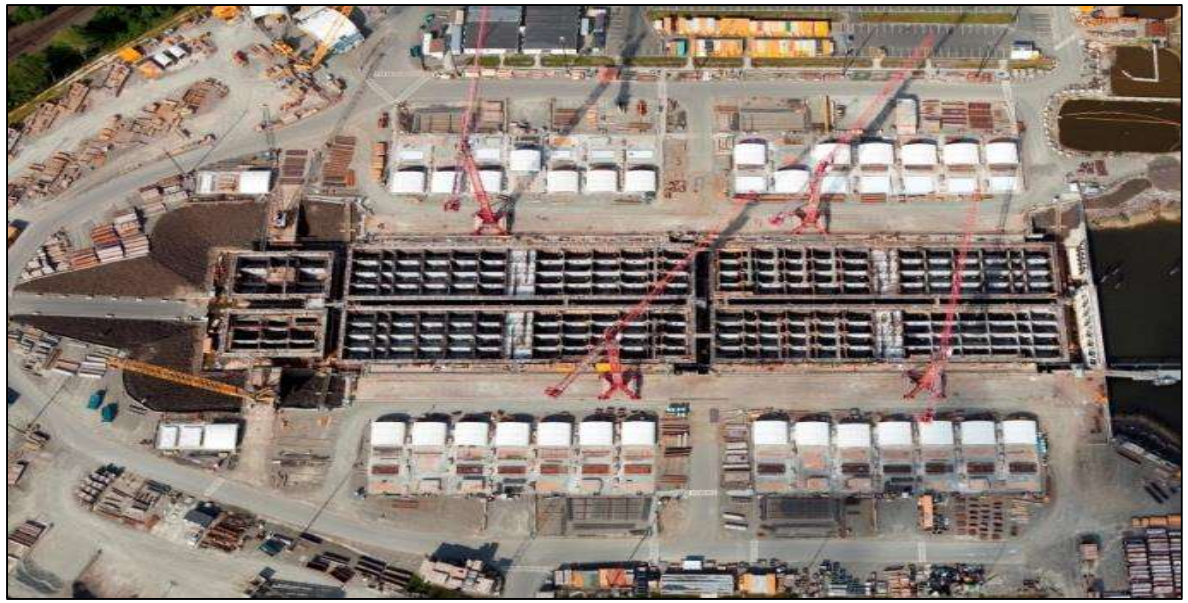
The pontoon construction site in Aberdeen, WA is located on the Chehalis River. Pontoons are floated out after their completion. Photo taken May 2012. Photo credit: Soundview Aerial Photography.

Pontoon Construction in Aberdeen

Aerial view of the casting basin pontoons under construction in May 2012.
Photo credit: Soundview Aerial Photography.

Aberdeen Casting Basin vs. Tacoma Casting Basin

Aberdeen



Casting basin dimensions:

- *900 feet x 200 feet*
- *274 meters x 61 meters*

Pontoons complete: 33 out of 33
Photo credit: Soundview Aerial Photography

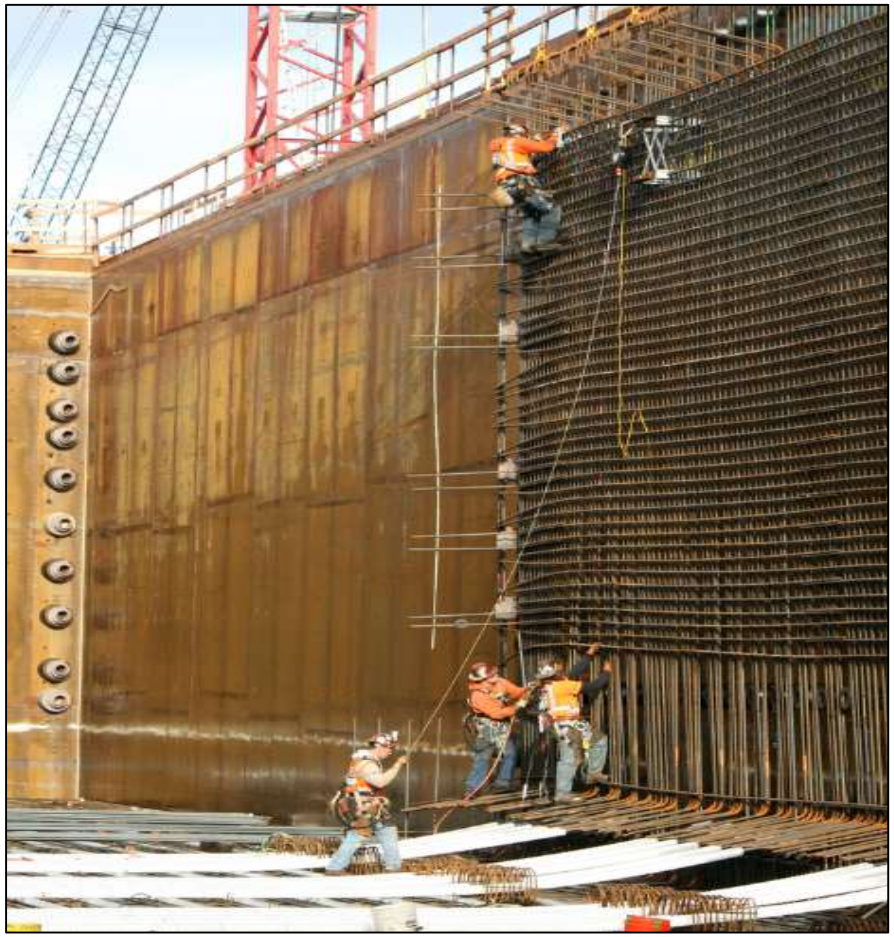
Tacoma

Casting basin dimensions:

- *475 feet x 145 feet*
- *145 meters x 44 meters*

Pontoons complete: 44 out of 44
Photo credit: Aequelis Photography

Pontoon construction in Aberdeen



Interior pontoon construction

Internal pontoon cells take shape

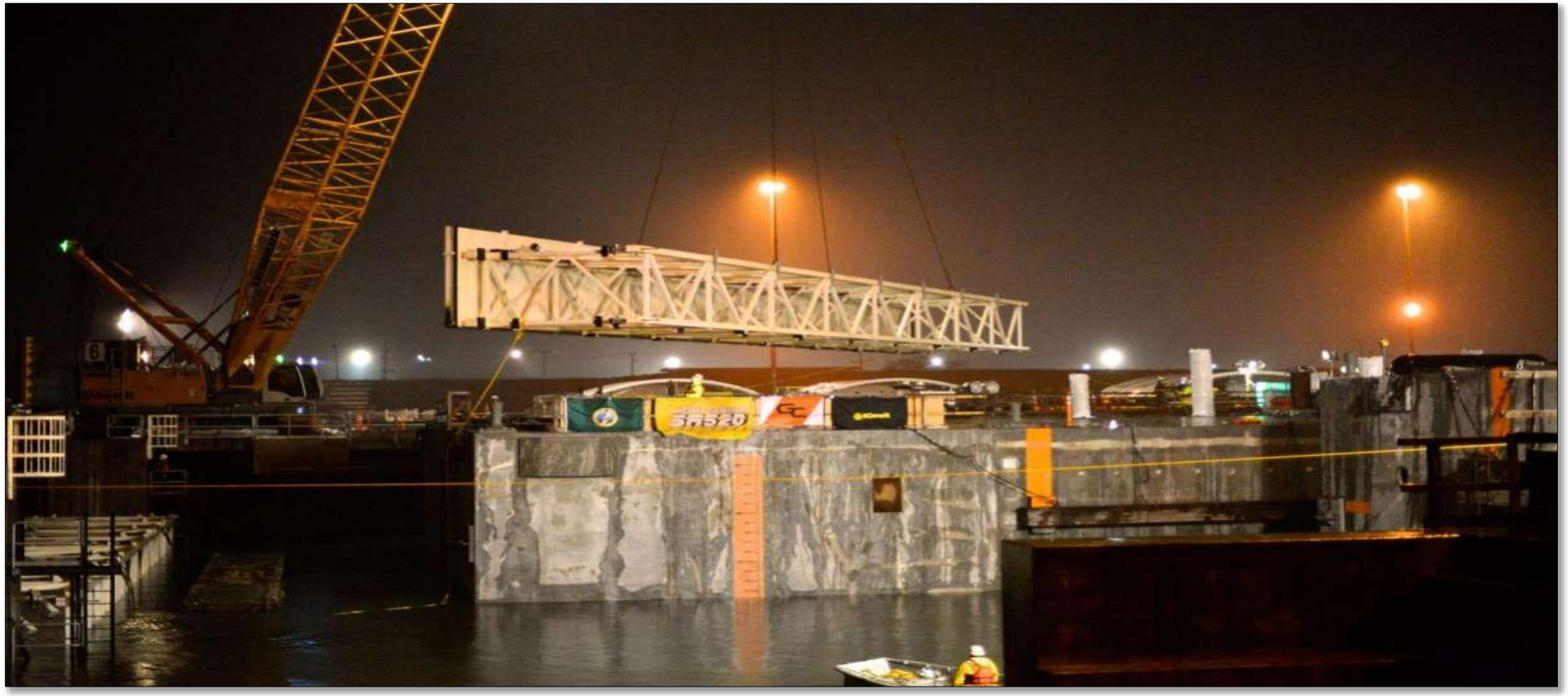
Pontoon construction in Aberdeen – base slab pour

Pontoon construction in Aberdeen – deck pour

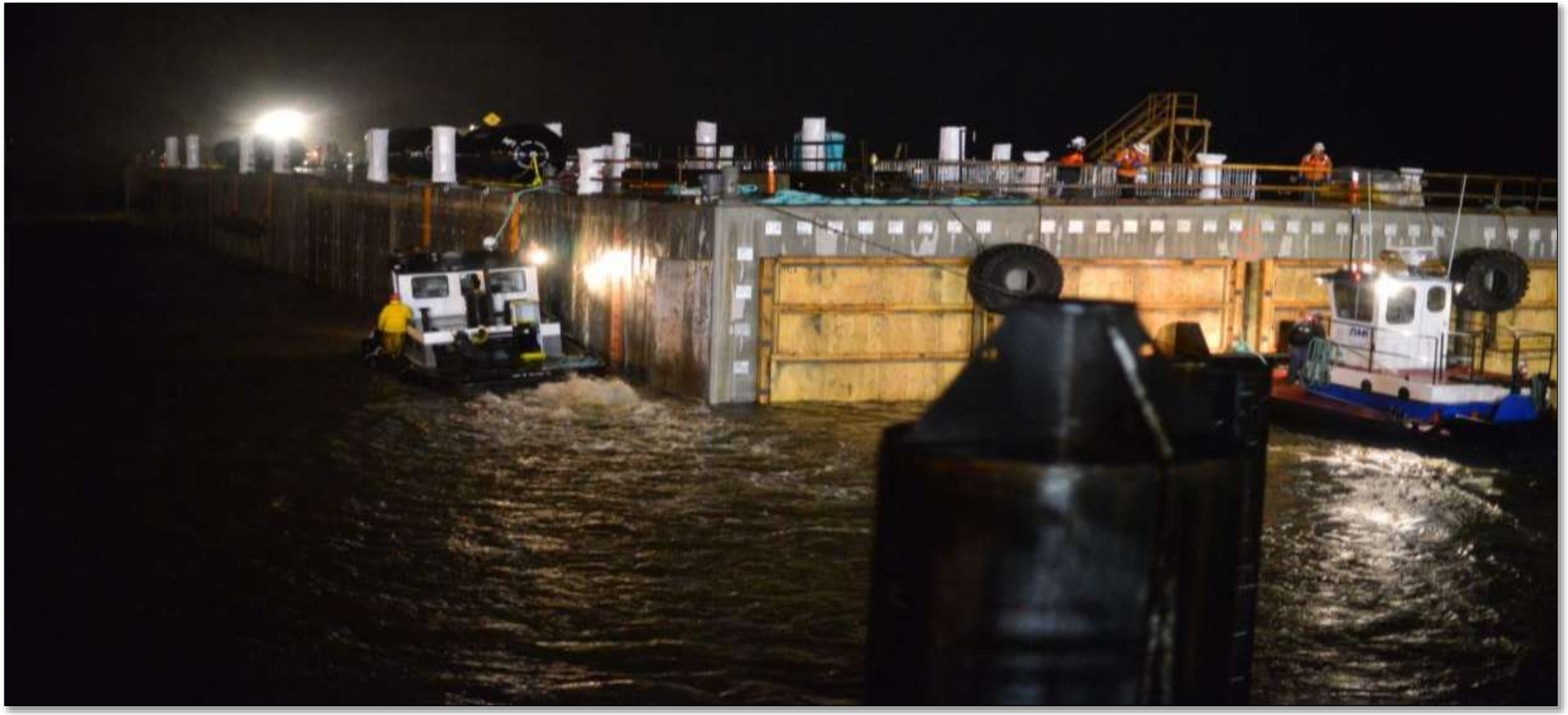
Post-tensioning anchorages

Cycle 1 pontoons near completion in Aberdeen

Lifting a 50-ton gate section



Cycle 2 pontoon float-out



Cycle 2 pontoon float-out time lapse video

Pontoon moorage in Grays Harbor

Pontoon towing: the journey to Lake Washington

Towing distance:
278 nautical miles

Pontoon tow routes to Lake Washington

Pontoon V travels through the Hiram M. Chittenden Locks in Seattle: time-lapse video

Pontoons arrive on Lake Washington

Pontoon P crosses under the Montlake bridge April 2014

Pontoon M arrives at the Ballard Locks May 2014

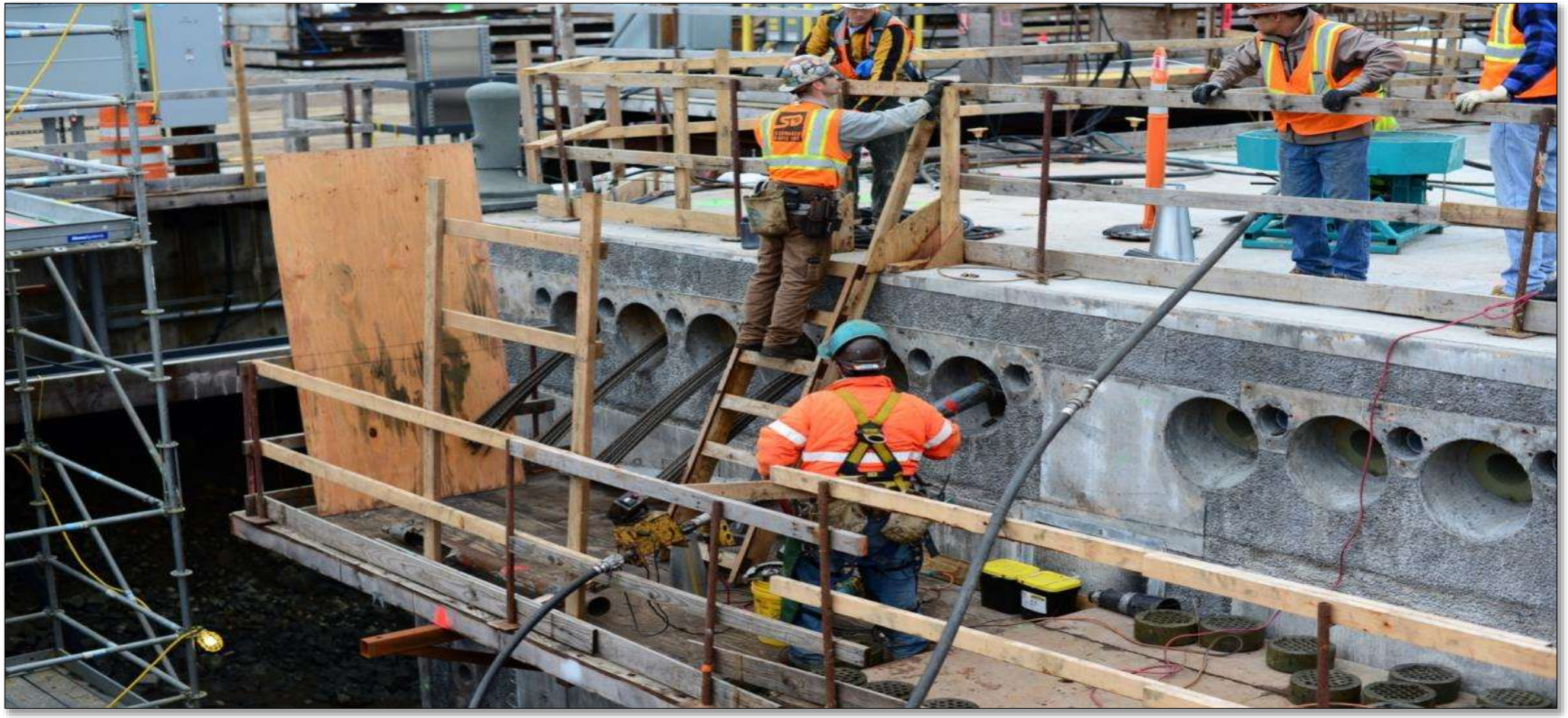
Pontoon J travels past Lake Union in October 2014.

Pontoon GNW travels through the Montlake Cut in October 2014.

Pontoons arrive on Lake Washington

Cycle 1 pontoon repairs

Installing post-tensioning tendons



Pontoon W repairs in Seattle, WA

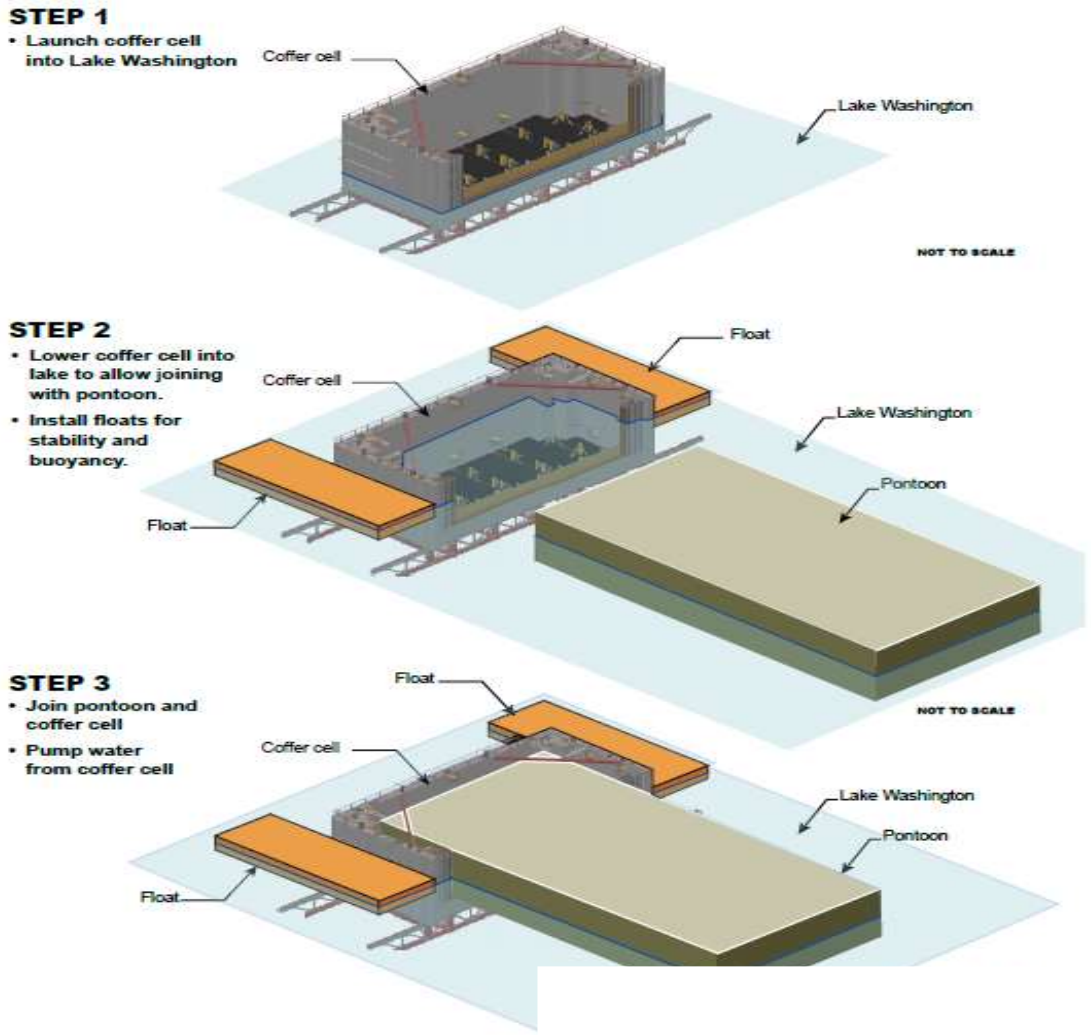
Pontoon W repair drydock

Pontoon T repairs

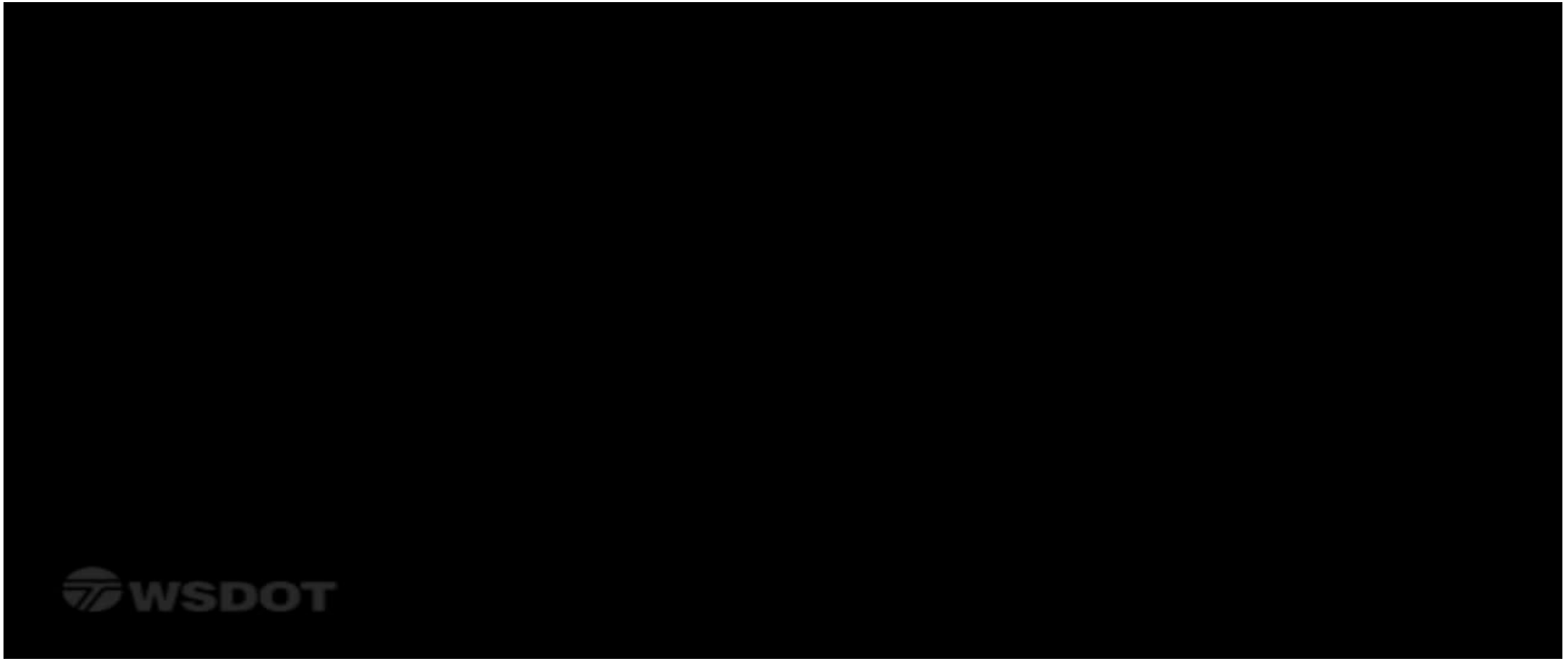
Pontoon T repairs

Carbon fiber/epoxy application video

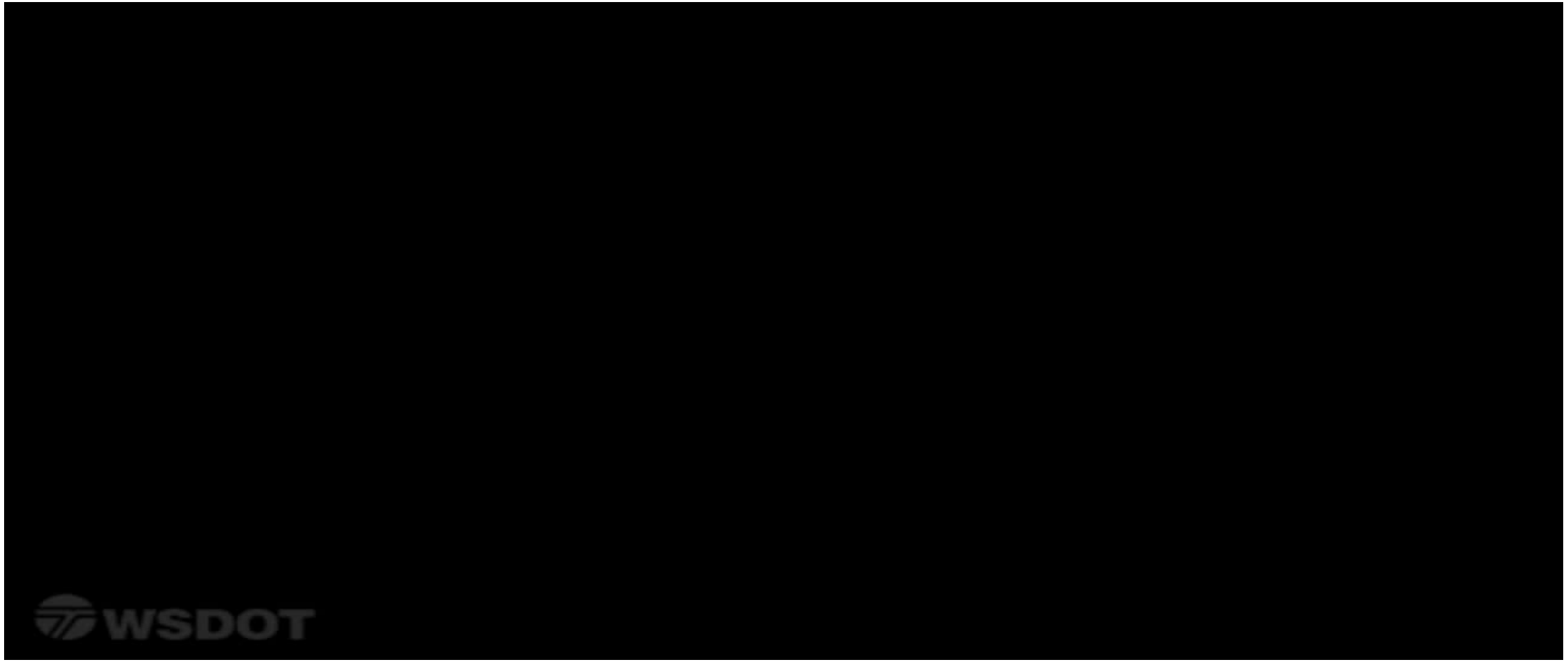
Coffer cell repairs on Lake Washington



Coffer cell launch on Lake Washington

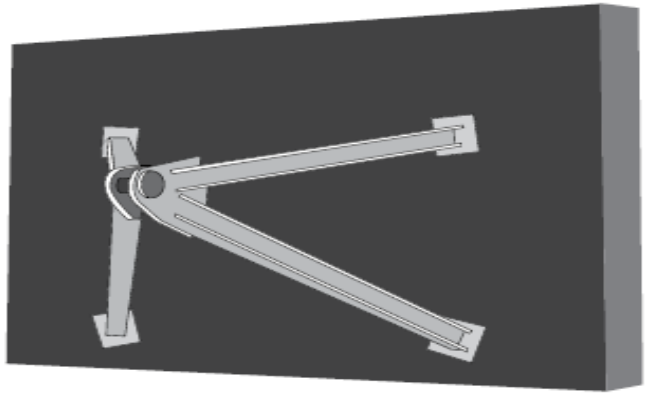
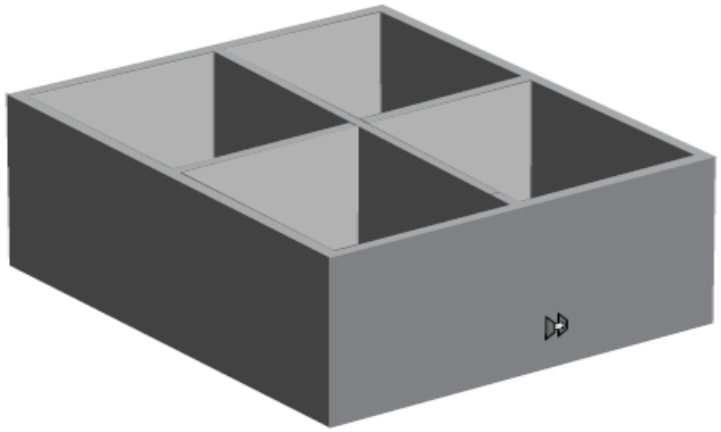


Pontoon repairs (four Cycle One pontoons)

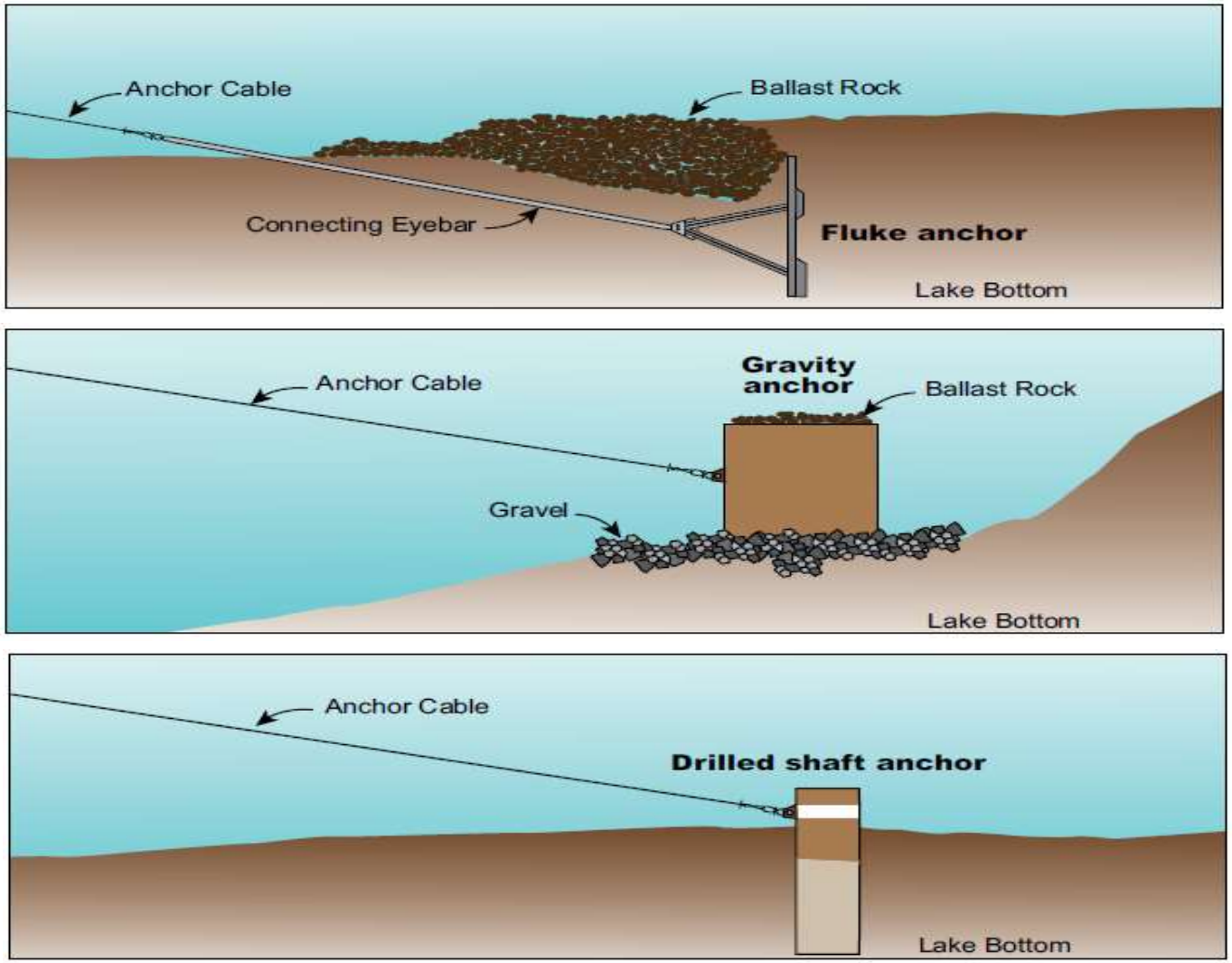


Floating bridge anchors and anchor cables

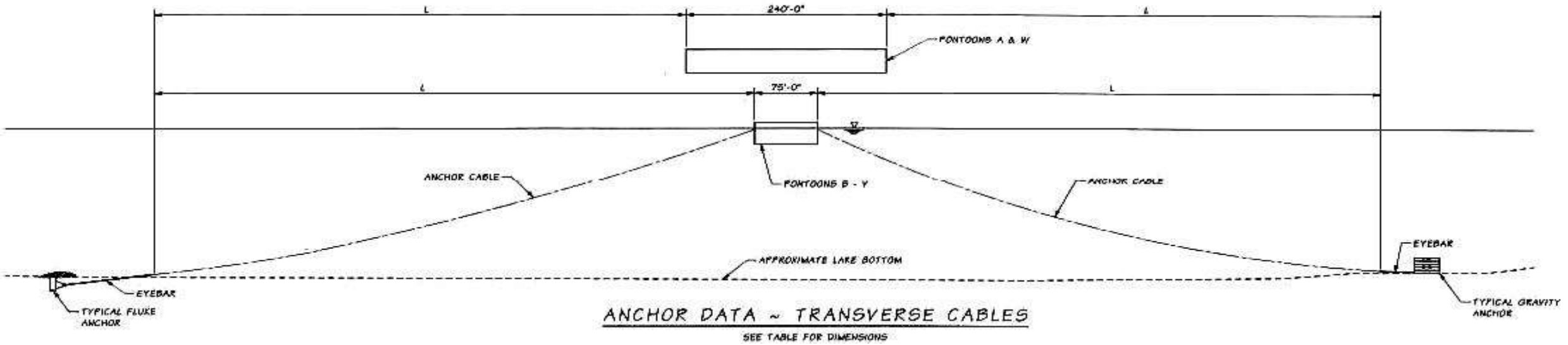
Anchor types

FLUKE ANCHORS	GRAVITY ANCHORS	DRILLED SHAFT ANCHORS
		
Dimensions: 35' X 26' X 17.5'	**Dimensions:** 40' X 40' X 23'	**Dimensions:** 10' diameter drilled shaft, 79'-92' long
Weight: 100 tons	**Weight:** 420 tons as built; 587 tons fully loaded	
Quantity: 45	**Quantity:** 8	**Quantity:** 5
Locations: Deep, soft soils of the lakebed and flat areas.	**Locations:** Solid soils with sloped topography, typically near shore. Underwater grading and installation of gravel creates a level footing for anchor placement.	**Locations:** Solid soils near shore where gravity anchors may cause navigation hazard.
Manufactured: Kenmore	**Manufactured:** Kenmore	**Manufactured:** Concrete cast in place from a barge on Lake Washington

Anchor placement



Anchor placement

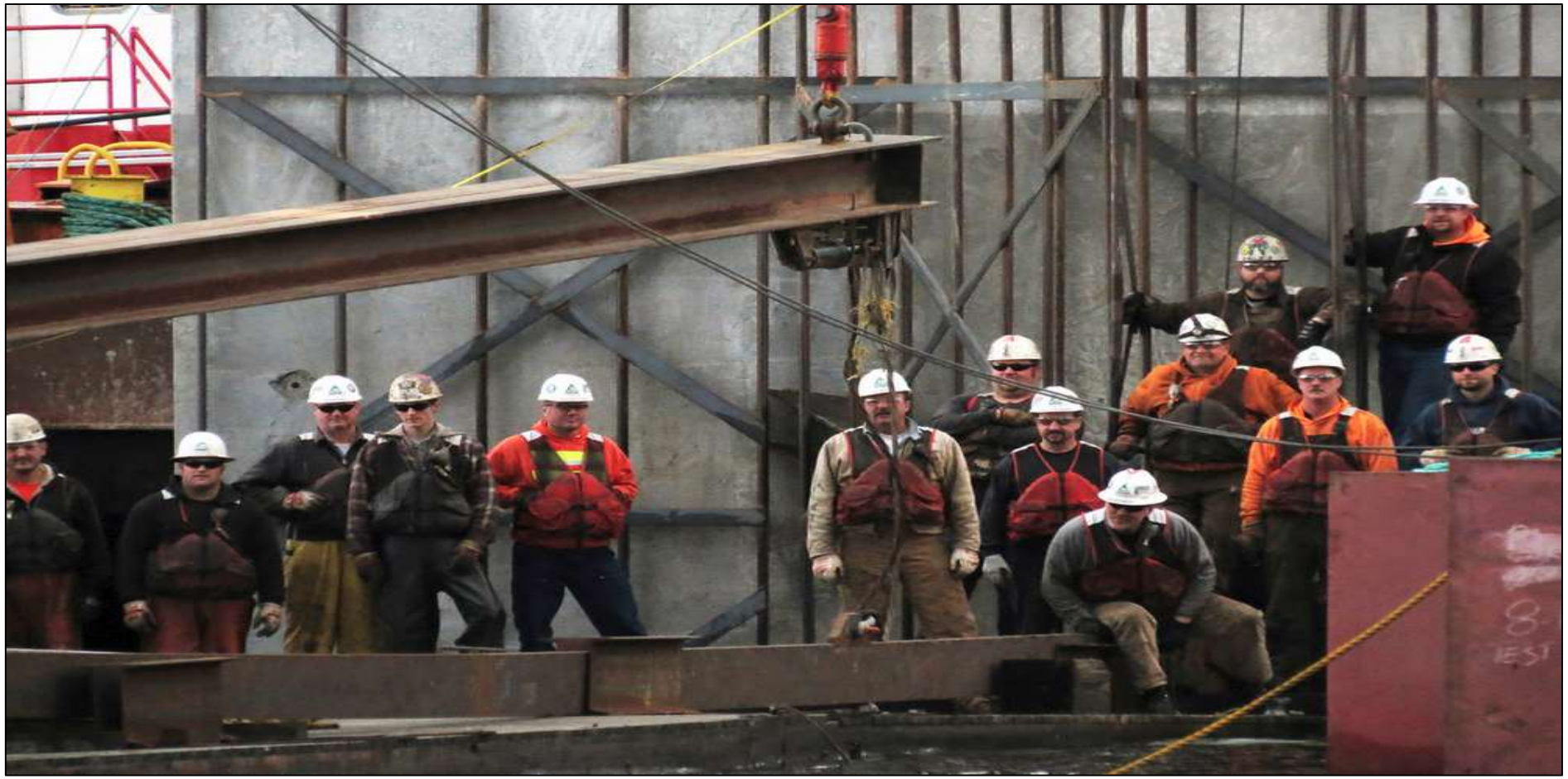


Fluke anchor construction in Kenmore

Gravity anchors transported by barge

Shaft anchors under construction

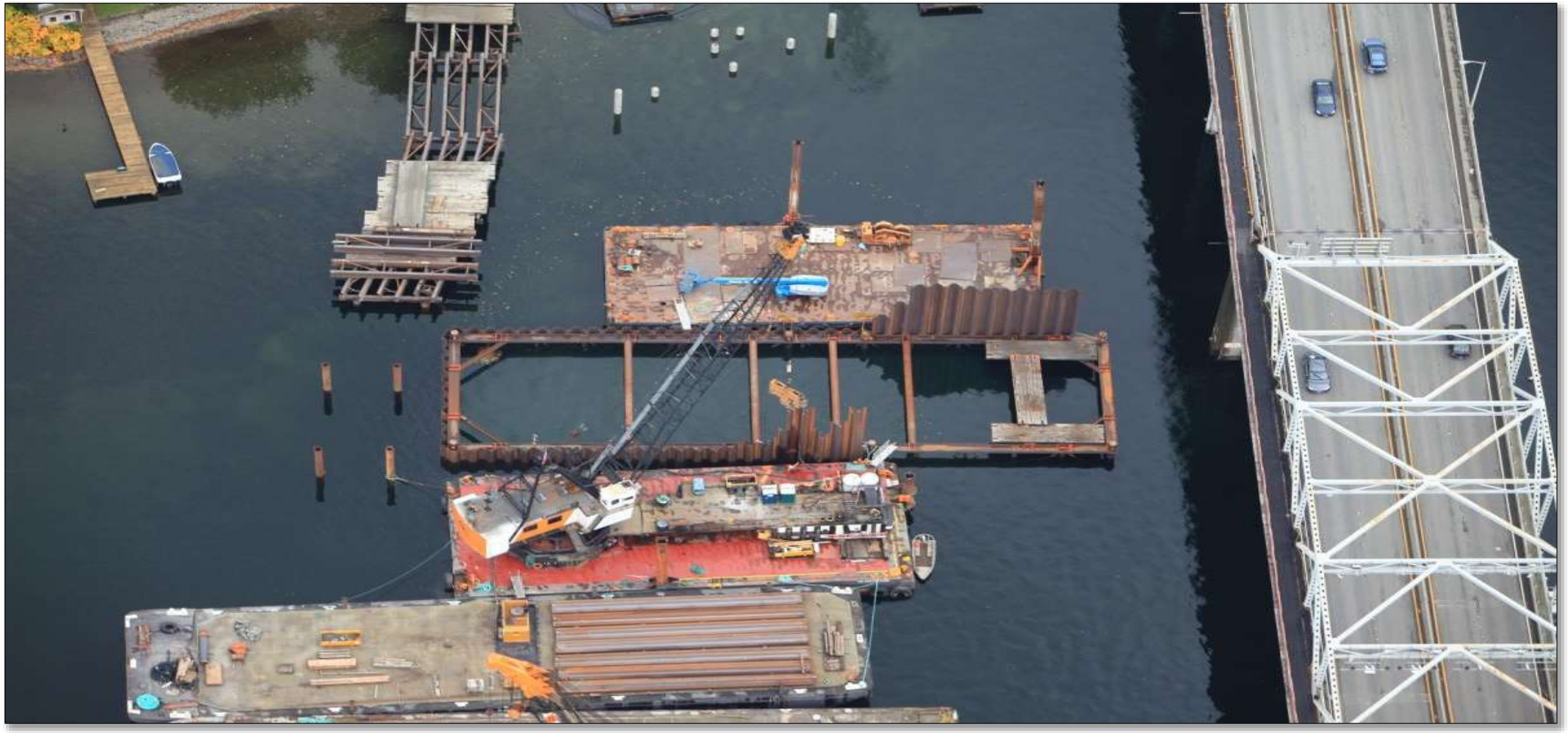
Final anchor placement



New bridge anchor gallery

East approach construction

Cofferdam construction on the east side of Lake Washington



Bridge pier concrete pour

Bridge pier concrete pour

Pier construction

Pier construction

Piers take shape

Pier construction

East Approach Bridge

East Approach Bridge

East Approach Bridge

East Approach Bridge

East Approach Transition Span

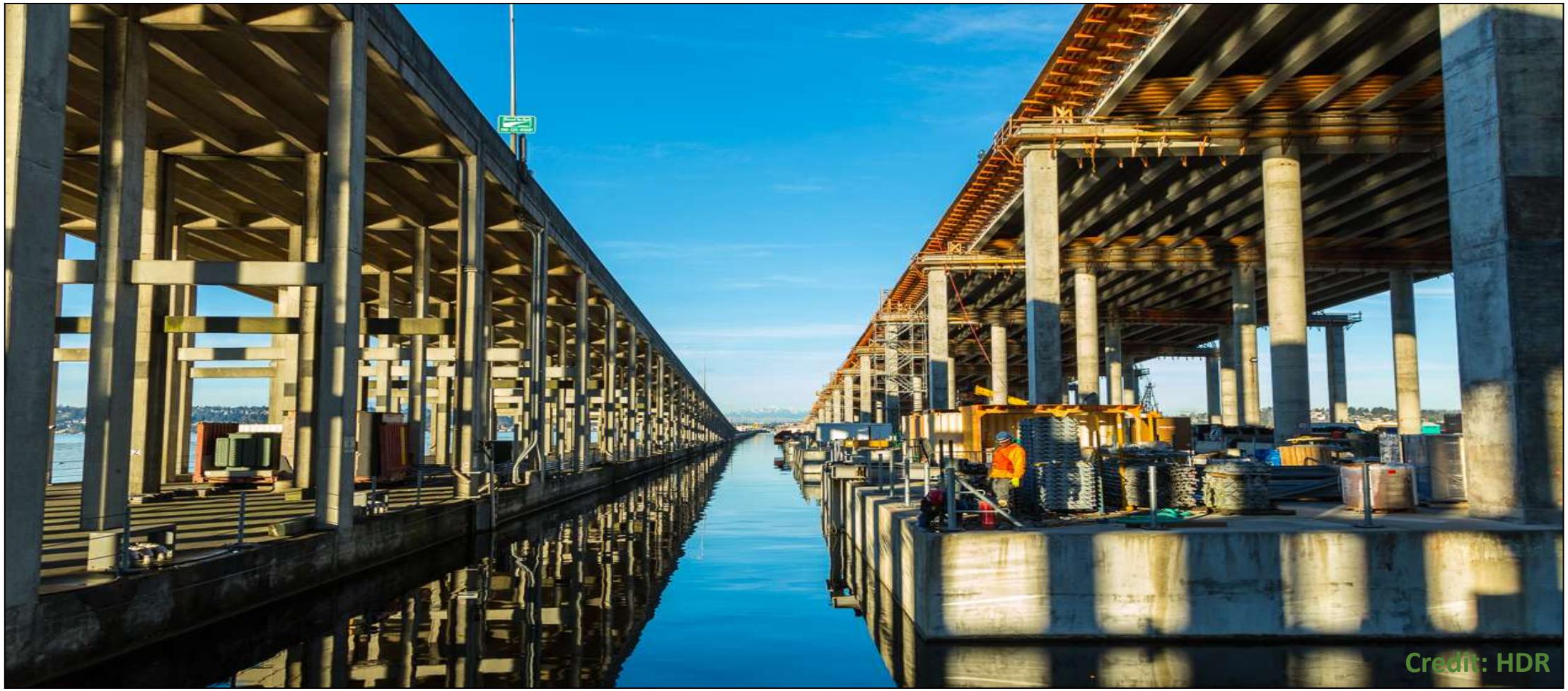
East Approach Bridge

East Approach Transition Span

Bridge maintenance facility

Floating bridge assembly on Lake Washington

Floating bridge assembly on Lake Washington



Floating bridge assembly on Lake Washington

Floating bridge assembly on Lake Washington

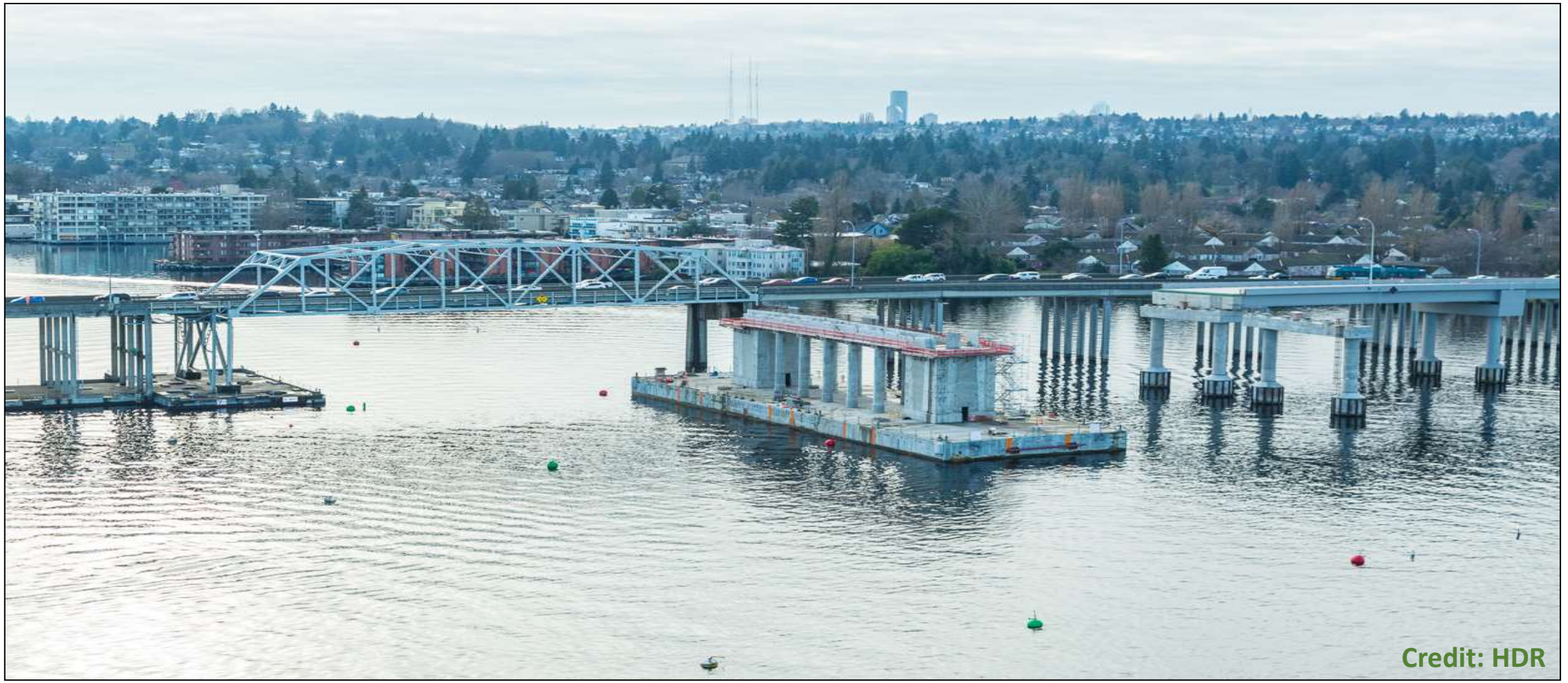
Floating bridge assembly on Lake Washington

Floating bridge assembly on Lake Washington

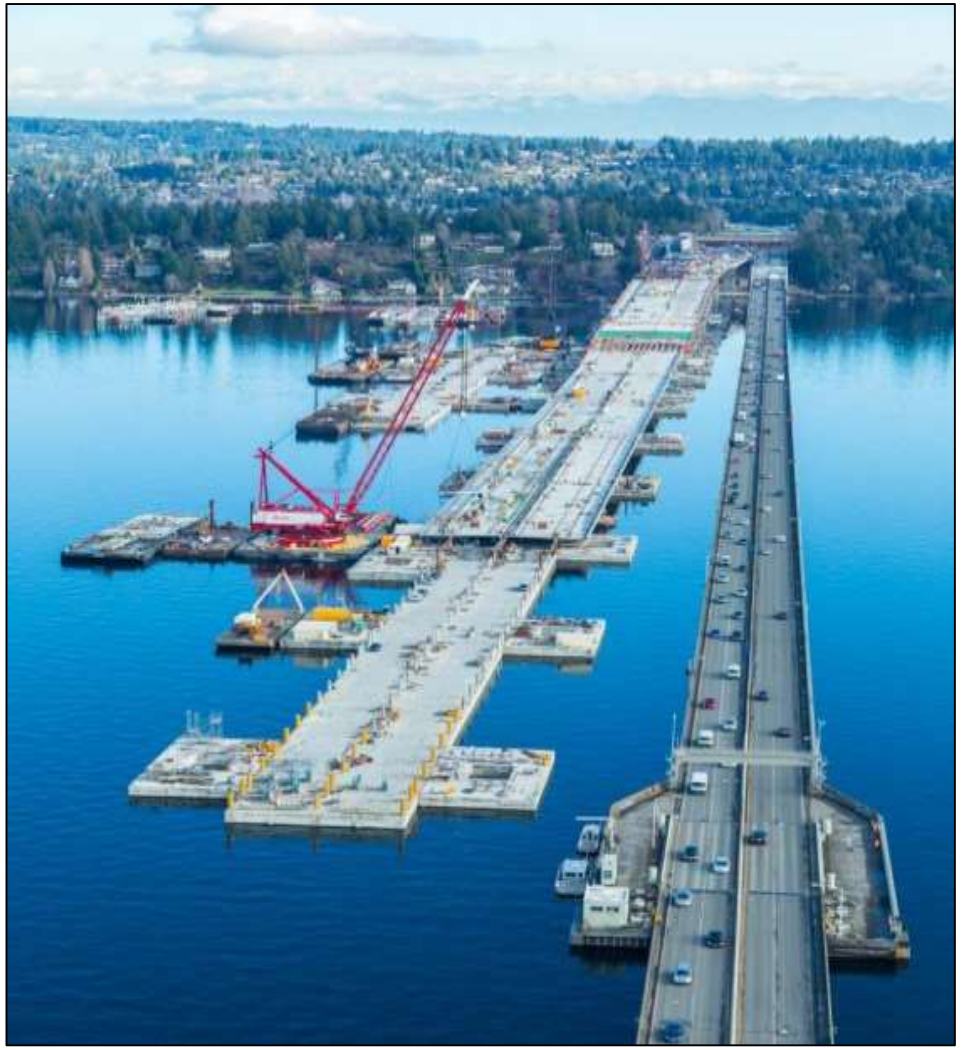
Inside a new SR 520 pontoon

Sentinel and column construction

West end of the floating bridge



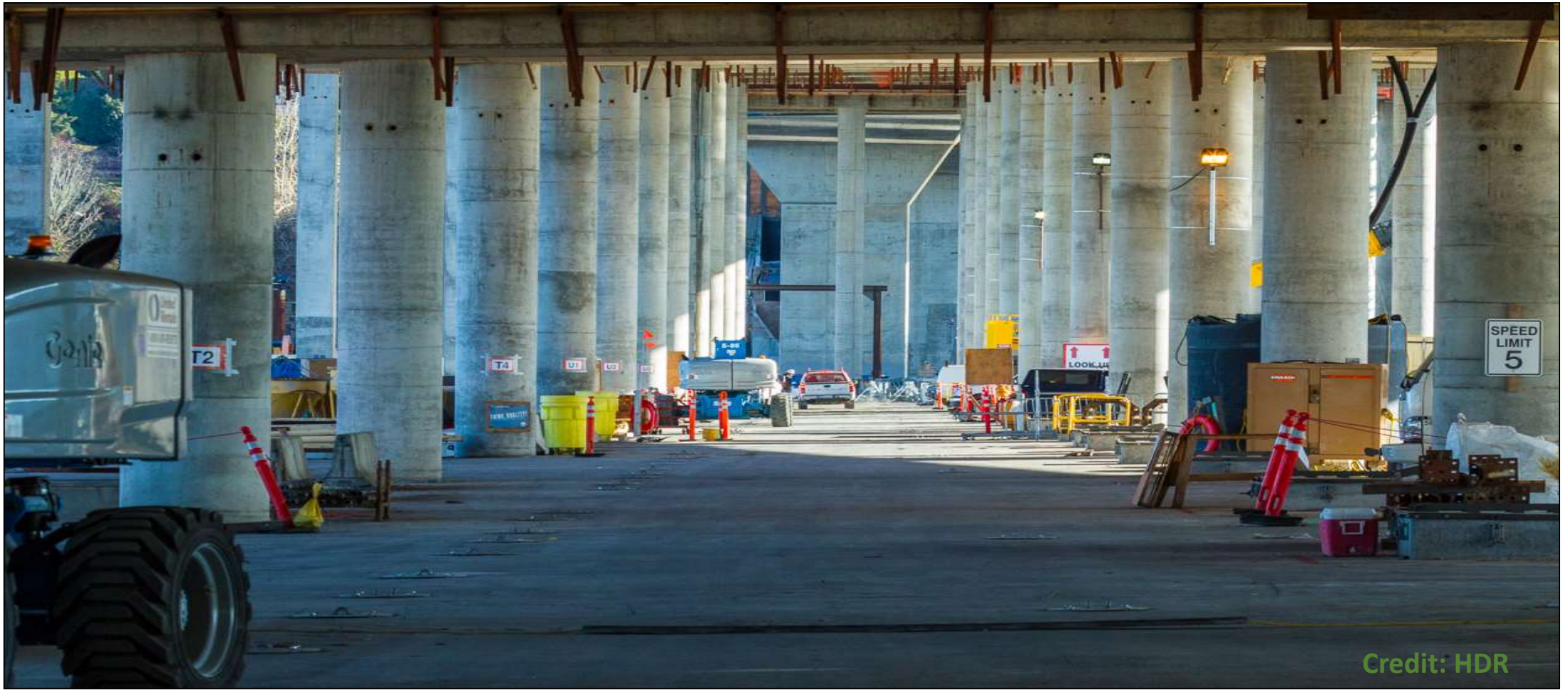
Floating bridge assembly on Lake Washington



High-rise superstructure construction

High-rise superstructure construction

High-rise superstructure construction

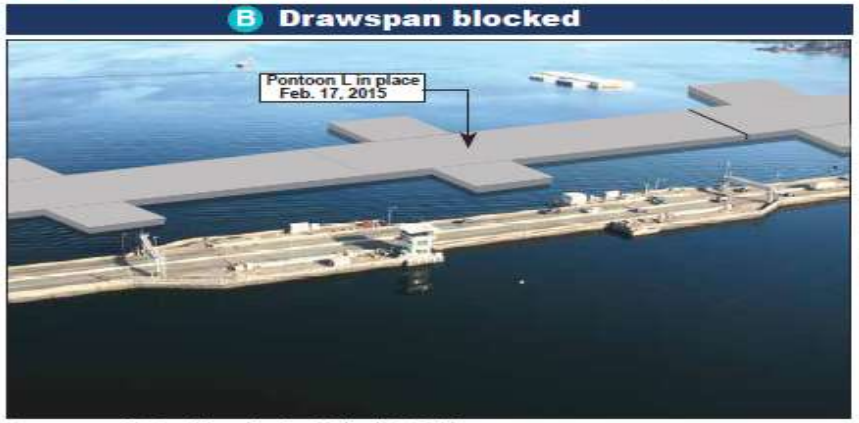


Credit: HDR

Drawspan navigation and Coast Guard coordination

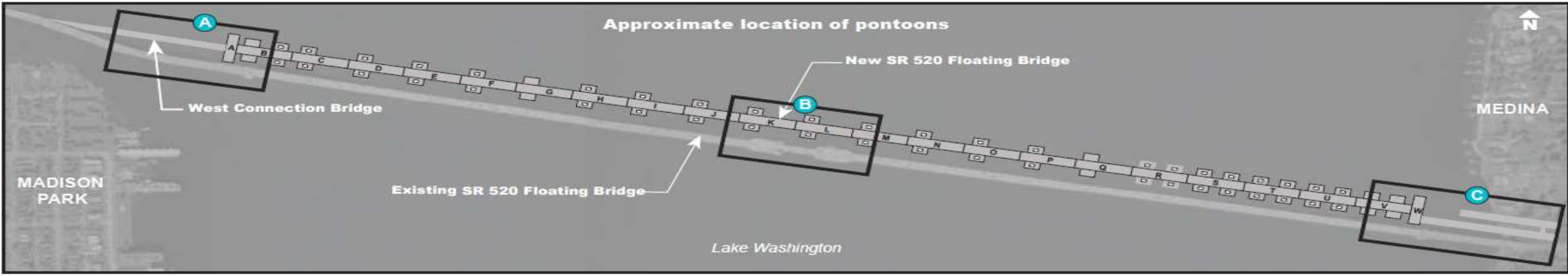
UPDATE: Beginning Tuesday, Feb. 17, 2015 drawspan to be permanently blocked

Current west navigation channel blocked by mid-2015



Drawspan blocked beginning Feb. 17, 2015

East navigation channel open after drawspan is blocked



Floating Bridge deck section construction in Kenmore

Kenmore site (on the north end of Lake Washington) prior to SR 520 construction

Floating bridge deck sections in Kenmore

Floating bridge deck sections built in Kenmore

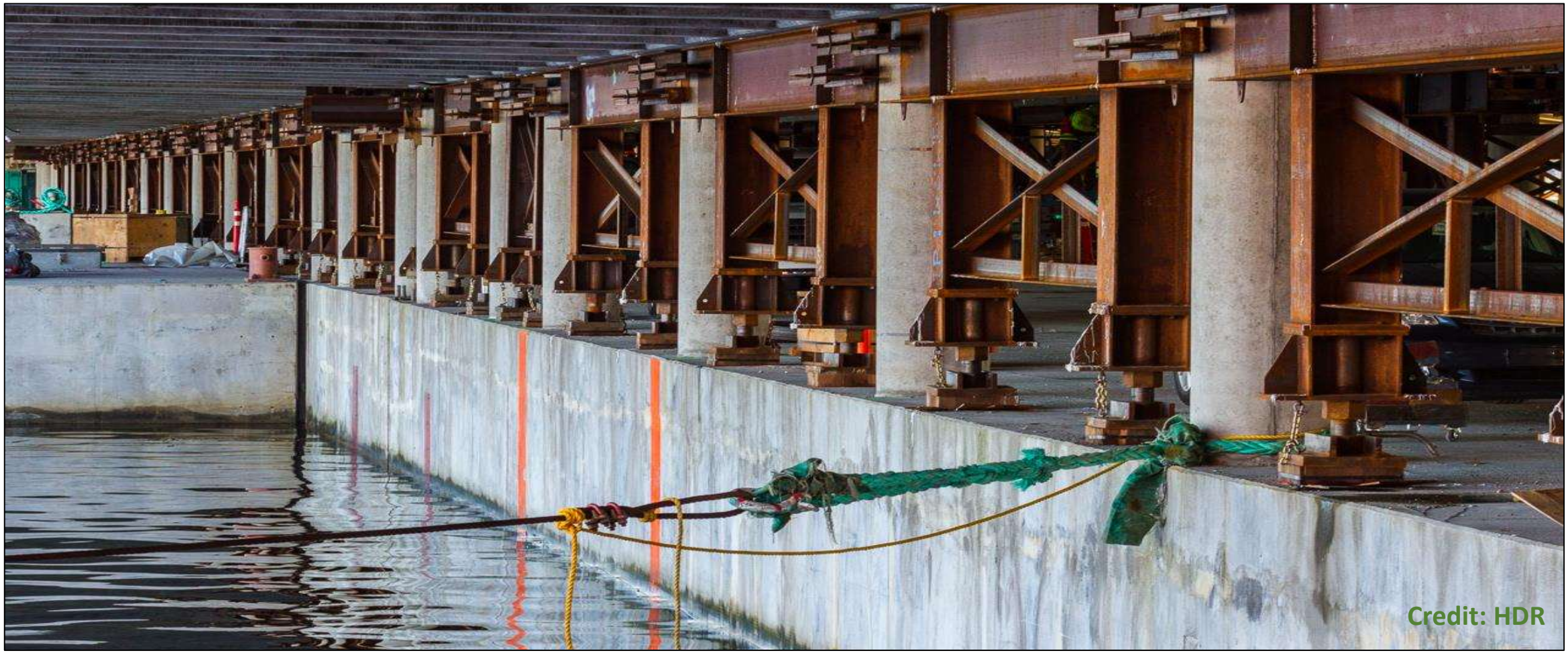
Floating bridge deck sections built in Kenmore

Floating bridge deck sections built in Kenmore

Credit: HDR

Low-rise superstructure construction

Low-rise roadway deck assembly



Low-rise roadway deck assembly

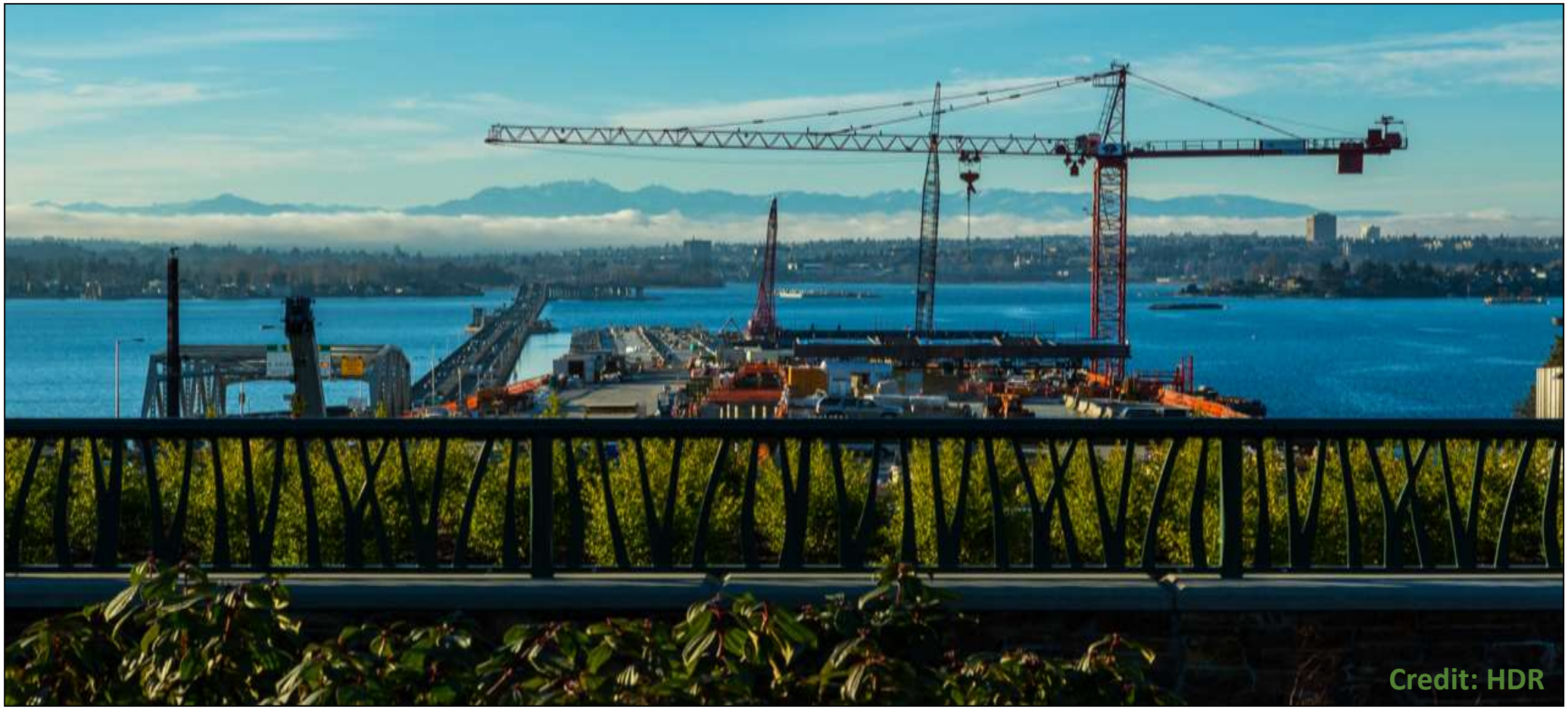
Low-rise roadway deck assembly

Credit: HDR

Low-rise roadway deck assembly

Floating bridge assembly on Lake Washington

Floating Bridge Construction – view from Medina



Floating Bridge Construction

November 2011 , looking west

August 2013 , looking west

February 2015 , looking west

Floating Bridge Grand Opening celebration on April 2-3!

Floating Bridge Grand Opening celebration on April 2-3!

Floating Bridge Grand Opening celebration on April 2-3!

Open to traffic: New SR 520 floating bridge

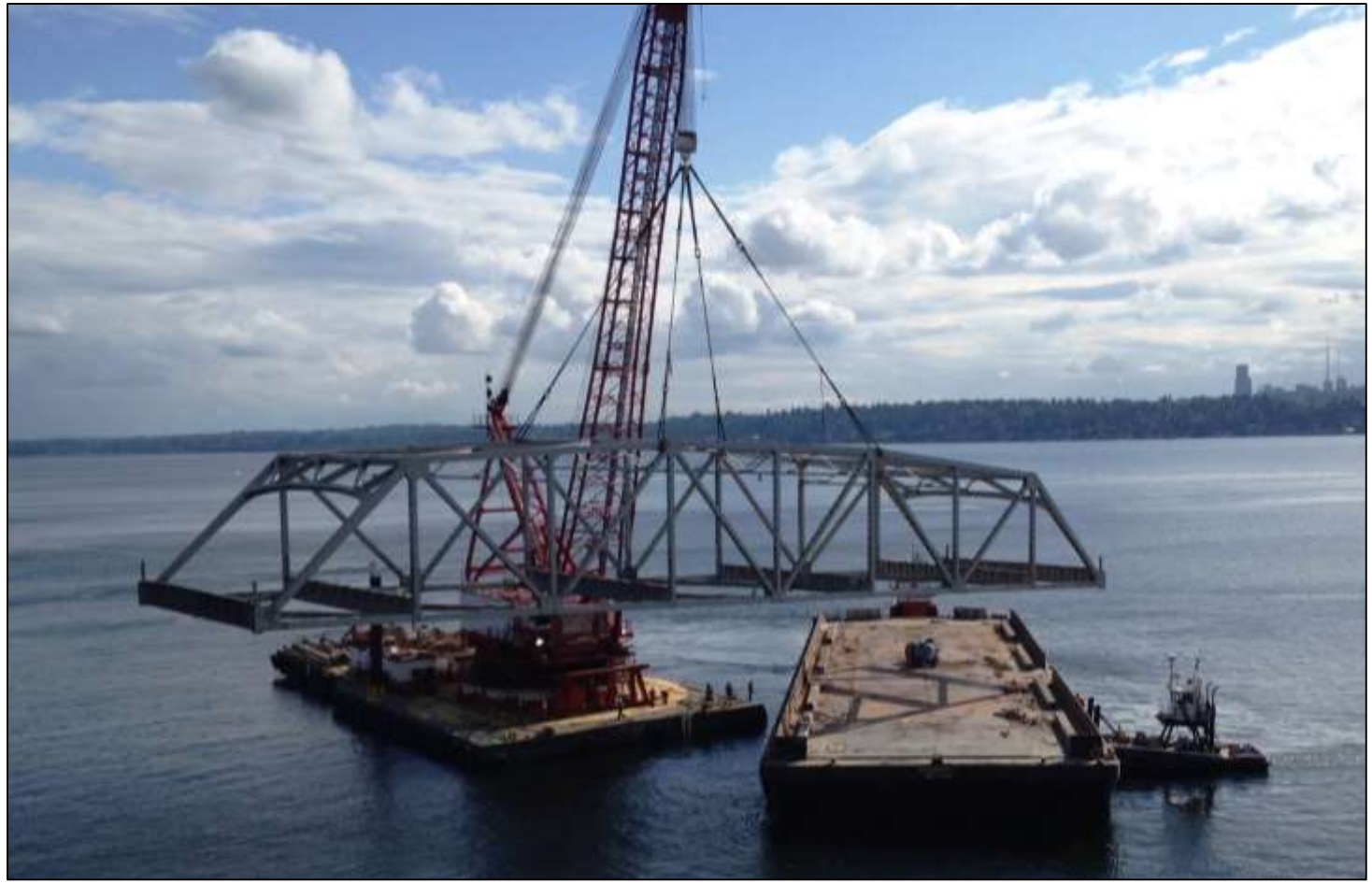
Sentinel on new floating bridge

Completed floating bridge

Completed floating bridge

Decommissioning old floating bridge

Decommissioning old floating bridge – truss removal



Decommissioning old floating bridge – high rise removal

Floating old pontoons off the lake

Floating old pontoons off the lake

West Approach Bridge North Project

Contractor: Flatiron West Inc.
Contract Amount: $202 million

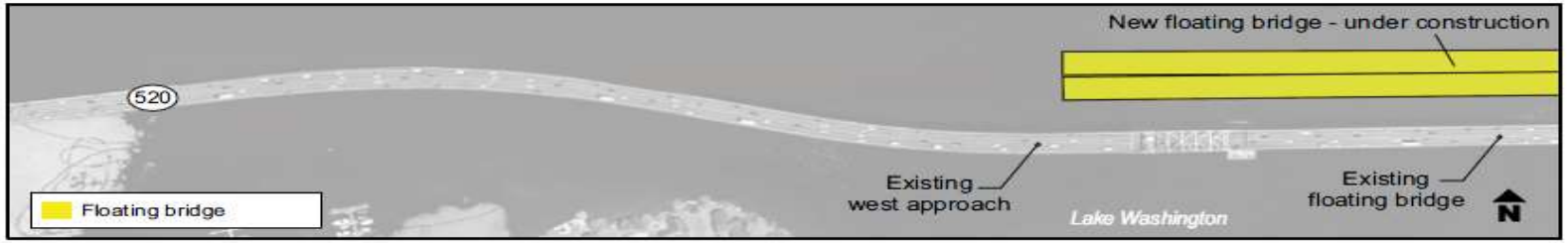
Construction Timeline: Fall 2014 – Summer 2017
Delivery Method: Design-bid-build

West connection bridge (complete)

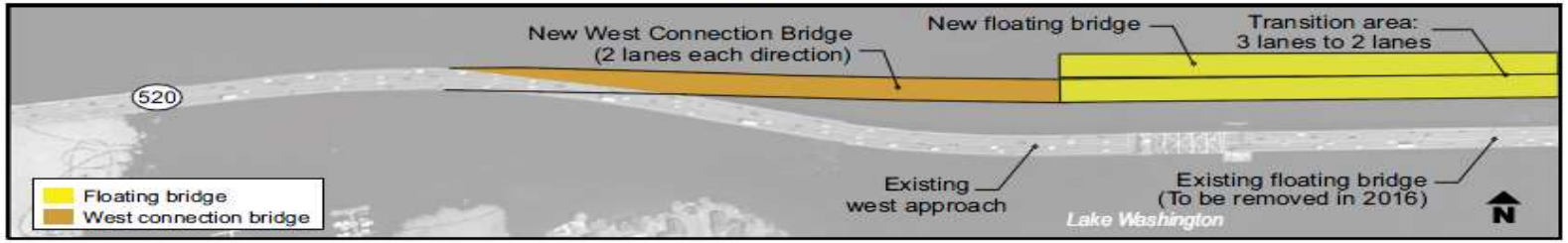
View of the West Connection Bridge.

West Approach Bridges construction sequence

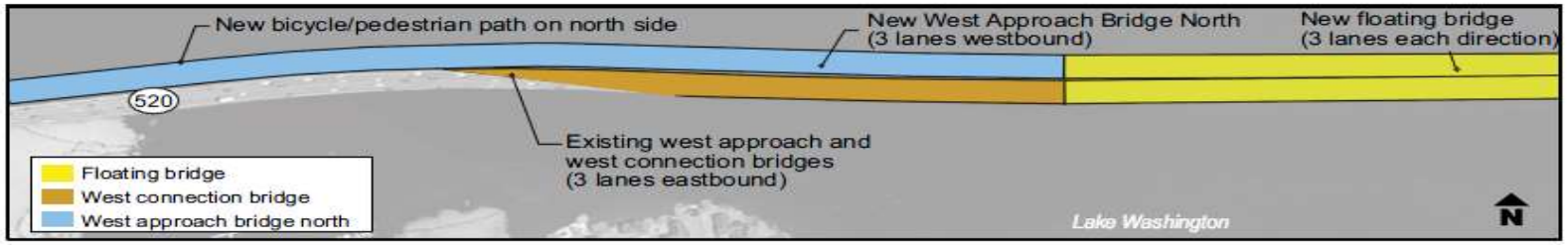
Step 1 - Floating bridge: Work on the new floating bridge is already under way on Lake Washington.



Step 2 - West Connection Bridge: In fall 2014, we completed a interim west connection bridge that will connect the new floating bridge to the existing west approach bridge.



Step 3 - West Approach Bridge North: In fall 2014, we started work on the West Approach Bridge North. When WABN is complete, westbound traffic will travel on the new structure while eastbound traffic will travel on the existing west approach.

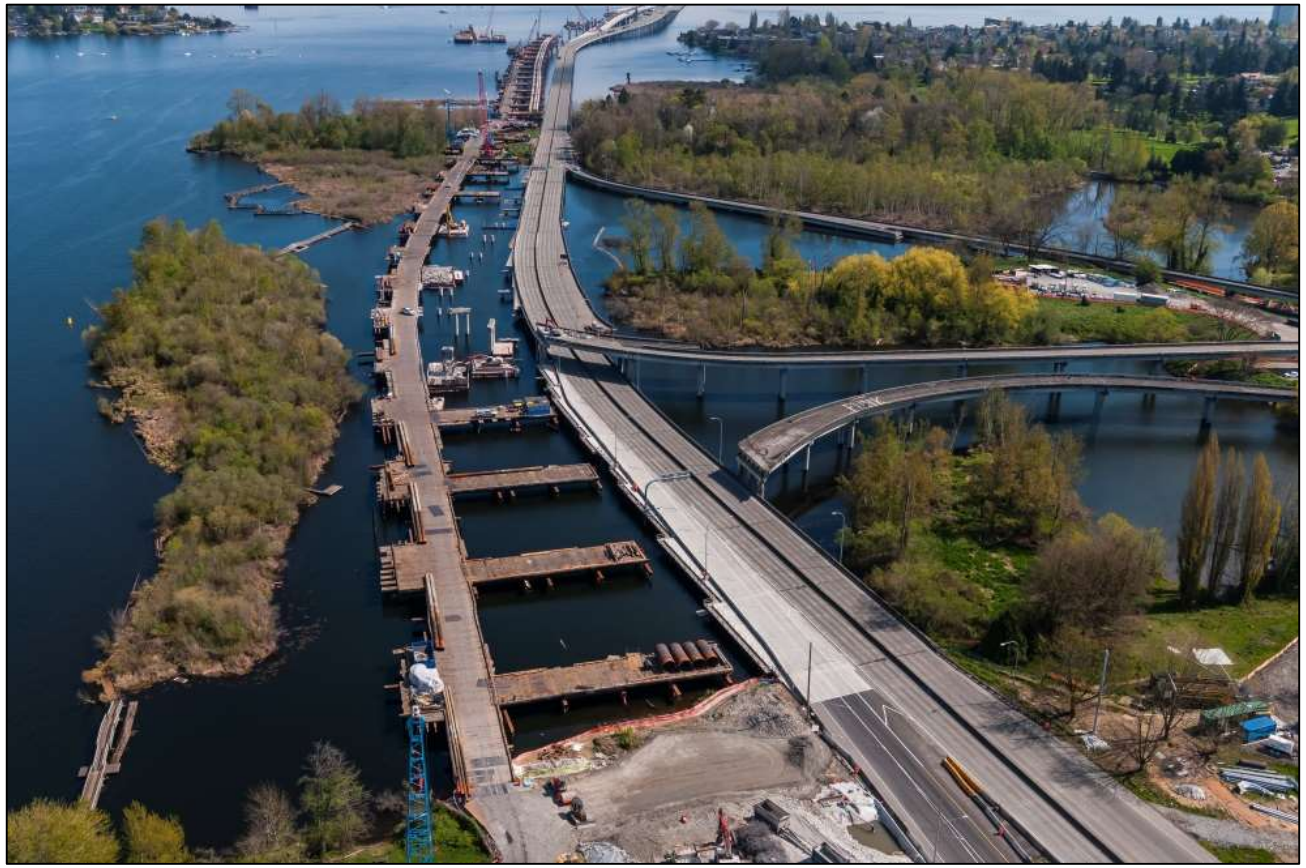


Construction update: West Approach Bridge North

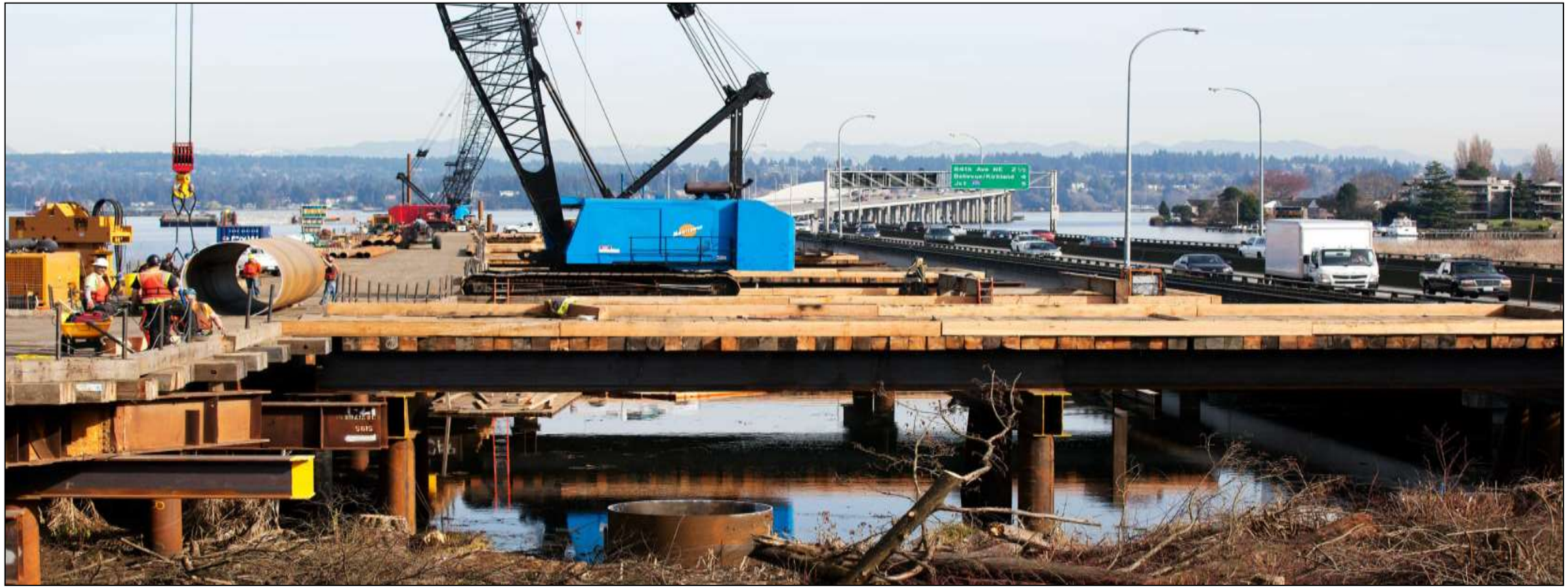
Gov. Inslee, WSDOT Secretary Peterson and other key elected officials broke ground on the West Approach Bridge North project on Oct. 15, 2014, in Seattle.

Crews were busy at work in fall 2014 removing the old unused R.H. Thomson "ramps to nowhere" to make room for the new West Approach Bridge North.

Construction update: West Approach Bridge North



Construction update: West Approach Bridge North



Construction update: West Approach Bridge North

Construction update: West Approach Bridge North

Girder installation

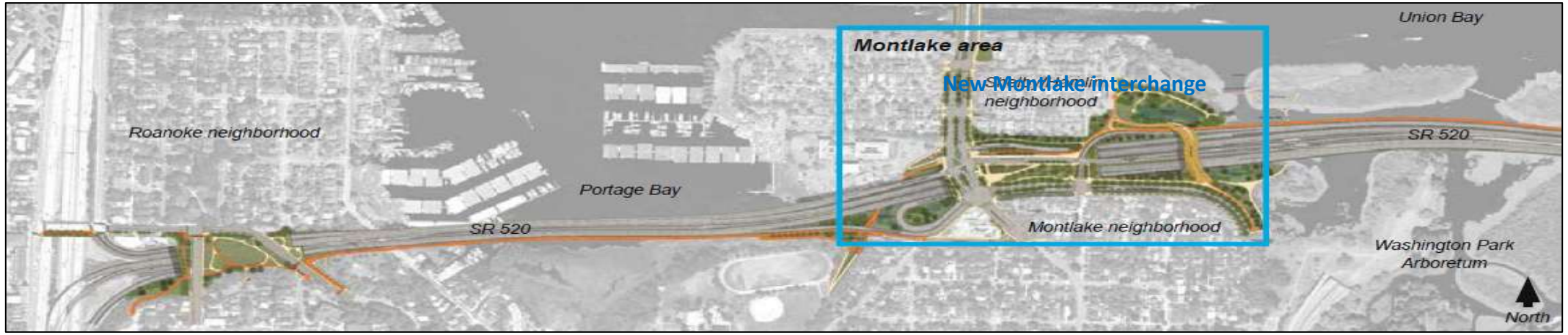
Deck placement

The “Rest of the West” Project

Contractor(s): To be determined
Project Amount: $1.64 billion

Construction Timeline: 2018 – 2027/2029
Delivery Method: Design-build (pending future WSDOT assessments)

"Rest of the West": I-5 to Lake Washington



Renderings of open space on the new Montlake lid (left) and a trail junction that connects to both the Montlake lid and land bridge(right).

Rest of the West Project Overview

Concepts and materials shown may be further refined pending outcomes of ongoing maintenance conversations between WSDOT, the City of Seattle, and King County Metro. For clarity, renderings do not show all utilities, transit infrastructure, and signage.

1. Possible future use of a portion of the NOAA property, approximating the area shown in the FEIS, for a public pedestrian-bike path is subject to agreement by NOAA as part of ongoing mitigation discussion.
2. City owned property under review by the City of Seattle.

Phase 1
Construction to begin by 2018 and last 4-5 years

Phase 2
Estimated to begin as early as 2020 and last 6 years

Phase 3
Estimated to begin as early as 2024 and last 3 years

Design visualization: West Approach Bridge South

Graphic rendering of the new West Approach Bridge South, looking northwest, parallel to the new West Approach Bridge North, which is currently under construction.

Design visualization: Montlake lid and land bridge

Conceptual bird's eye view of the refined Montlake lid and land bridge concept, looking southwest.

Conceptual rendering of the land bridge over SR 520, looking northeast, approaching an outlook viewpoint. The land bridge connects local greenways around the Arboretum and to the University of Washington for a variety of recreation users.

Next steps timeline

- **Summer 2017:** West Approach Bridge North (WABN) scheduled to open to traffic
- **2017:** Award contract for next phase of construction in Seattle (West Approach Bridge South, Montlake lid and land bridge)
- **Early 2018:** Conduct additional pre-construction outreach with contractor
- **2018:** Begin construction of next phase
- **2022-2023:** Complete construction of next phase
- **2027-2029:** Complete construction of entire SR 520 Program

Questions?

For more information:

Visit: www.wsdot.wa.gov/projects/SR520Bridge

E-mail: SR520Bridge@wsdot.wa.gov

Call: 206-770-3554

Mail: SR 520 Bridge Replacement and HOV Program
999 3rd Avenue, Suite 2200
Seattle, WA 98104

THANK YOU FOR ATTENDING **ASCE 2016!**

Reminder:

WE LOOK FORWARD TO SEEING YOU NEXT YEAR AT **ASCE 2017** IN **NEW ORLEANS, LOUISIANA!**