SR 520 Program

Tulane Engineering Forum

Infrastructure Session

April 21, 2017

Dave Becher, P.E.
SR 520 Program Director of Construction
WSDOT
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, looking west.
SR 520 Program Overview
The original SR 520 bridge 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
Floating Bridge and Landings Project
Washington State – location of four of the world’s longest floating bridges
Location of the SR 520 floating bridge

Contractor: Kiewit/General/Manson, Joint Venture
Contract Award Amount: $586 million

Construction Timeline: Late 2011 – 2017
Delivery Method: Design-build
Old floating bridge on Lake Washington
Floating bridge overview
Why is the SR 520 bridge a floating bridge?

- Very dense glacial soils
- Very soft silt
- Very soft lake sediments
- Depth of water: 200 feet
- ~8,000 feet across
- 400 feet deep

~8,000 feet across
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.
Pontoon types

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

- Supplemental stability pontoons (64)
- Longitudinal pontoons (21)
- Cross pontoons (2)

Pontoon layout:

- New SR 520 Floating Bridge
- 54 supplemental pontoons
- 21 longitudinal pontoons
- 2 cross pontoons
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
Interior pontoon construction
Post-tensioning anchorages
Cycle 1 pontoons near completion in Aberdeen
Lifting a 50-ton gate section
Cycle 2 pontoon float-out time lapse video
Pontoon towing: the journey to Lake Washington
Pontoon tow routes to Lake Washington
Aberdeen Casting Basin and Tacoma Casting Basin

Aberdeen

Casting basin dimensions:
- 900 feet x 200 feet
- 274 meters x 61 meters

Pontoon complete: 33 out of 33

Photo credit: Soundview Aerial Photography

Tacoma

Casting basin dimensions:
- 475 feet x 145 feet
- 145 meters x 44 meters

Pontoon complete: 44 out of 44

Photo credit: Aequelis Photography
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 J travels past Lake Union in October 2014.

Pontoon M arrives at the Ballard Locks May 2014

Pontoon GNW travels through the Montlake Cut in October 2014.
Floating bridge anchors and anchor cables
## Anchor types

<table>
<thead>
<tr>
<th>FLUKE ANCHORS</th>
<th>GRAVITY ANCHORS</th>
<th>DRILLED SHAFT ANCHORS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions:</strong> 35’ X 26’ X 17.5’</td>
<td><strong>Dimensions:</strong> 40’ X 40’ X 23’</td>
<td><strong>Dimensions:</strong> 10’ diameter drilled shaft, 79’-82’ long</td>
</tr>
<tr>
<td><strong>Weight:</strong> 100 tons</td>
<td><strong>Weight:</strong> 420 tons as built; 587 tons fully loaded</td>
<td><strong>Quantity:</strong> 5</td>
</tr>
<tr>
<td><strong>Quantity:</strong> 45</td>
<td><strong>Quantity:</strong> 8</td>
<td><strong>Locations:</strong> Solid soils near shore where gravity anchors may cause navigation hazard.</td>
</tr>
<tr>
<td><strong>Locations:</strong> Deep, soft soils of the lakebed and flat areas.</td>
<td><strong>Locations:</strong> Solid soils with sloped topography, typically near shore. Underwater grading and installation of gravel creates a level footing for anchor placement.</td>
<td><strong>Manufactured:</strong> Concrete cast in place from a barge on Lake Washington</td>
</tr>
<tr>
<td><strong>Manufactured:</strong> Kenmore</td>
<td><strong>Manufactured:</strong> Kenmore</td>
<td></td>
</tr>
</tbody>
</table>

![Fluke Anchor Diagram](image1)

![Gravity Anchor Diagram](image2)

![Drilled Shaft Anchor Diagram](image3)
Anchor placement
Fluke and gravity anchors
East approach construction
Cofferdam construction on the east side of Lake Washington
Bridge pier concrete pour
Pier construction
Cantilever construction
Cantilever construction
East Approach Bridge
East Approach Transition Span
East Approach Bridge

Credit: HDR
Bridge maintenance facility

View of SR 520 Maintenance building, looking north

View of SR 520 Maintenance building, looking east
Floating bridge assembly on Lake Washington
Floating bridge assembly on Lake Washington

1963 SR 520 Floating Bridge, looking west. (Nov. 2011)

1963 SR 520 Floating Bridge and new bridge under construction, looking west. (Feb. 2015)

New SR 520 Floating bridge, looking west. (Feb. 2017)
Floating bridge assembly on Lake Washington

Credit: HDR
Floating bridge assembly on Lake Washington
Inside a new SR 520 pontoon
Floating bridge assembly on Lake Washington
High-rise superstructure construction
Floating Bridge deck section construction in Kenmore
Floating bridge deck sections in Kenmore
Floating bridge deck sections built in Kenmore

Credit: HDR
Low-rise superstructure construction
Low-rise roadway deck assembly

Credit: HDR
Low-rise roadway deck assembly
Floating bridge assembly on Lake Washington

Credit: HDR
Floating Bridge Grand Opening Celebration on April 2 – 3, 2016!
Floating Bridge Grand Opening Celebration on April 2 – 3, 2016!
Open to traffic: New SR 520 floating bridge
Sentinel on new floating bridge

*East sentinel, looking northwest. (Jan. 2017)*

*West sentinels, looking southwest. (Jan. 2017)*
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
Delivery challenges and successes

Project timelines

- Environmental and design processes: 2000 – 2011
- Construction: 2011 – 2017
- Total contract value: $1.2 billion

Former WA Governor Christine Gregoire and Program Director Julie Meredith on the newly opened floating bridge.
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