

PROPOSAL for CASCADIA HIGH SPEED RAIL

MULTI-MODAL BRIDGE

TWO I-5 TUNNELS

HAYDEN ISLAND BRIDGE

and I-5 BRIDGE SEISMIC UPGRADE

Why do this alternative:

- Satisfies Coast Guard and FAA height requirements and thus meets the needs of all boat, auto, transit, bike, and pedestrian transport without the steep inclines that the IBR Bridge Proposal has.
- All construction can occur without transportation delays. Viaducts in Vancouver can remain.
- Easily meets federal funding requirements in reducing CO2 emissions and satisfies equity concerns.
- Seismic upgrades to existing I-5 Bridges for long-term use do not necessitate costly environmental measures needed during demolition if or when it is needed.
- Relieves traffic congestion, cheaper to construct, and has little negative impact on the environment and downtown Vancouver.
- Commences the first Cascadia High Speed Rail six-minute link between Portland Rose Quarter and Vancouver Waterfront and other high-speed rail connections between multi-modal transportation hubs and new livable communities.
- Using the existing six lanes on upgraded I-5 Bridges and the new four lanes in tunnels creates options for all traffic, bike, and pedestrian modes without strenuous elevation differences.

Legend

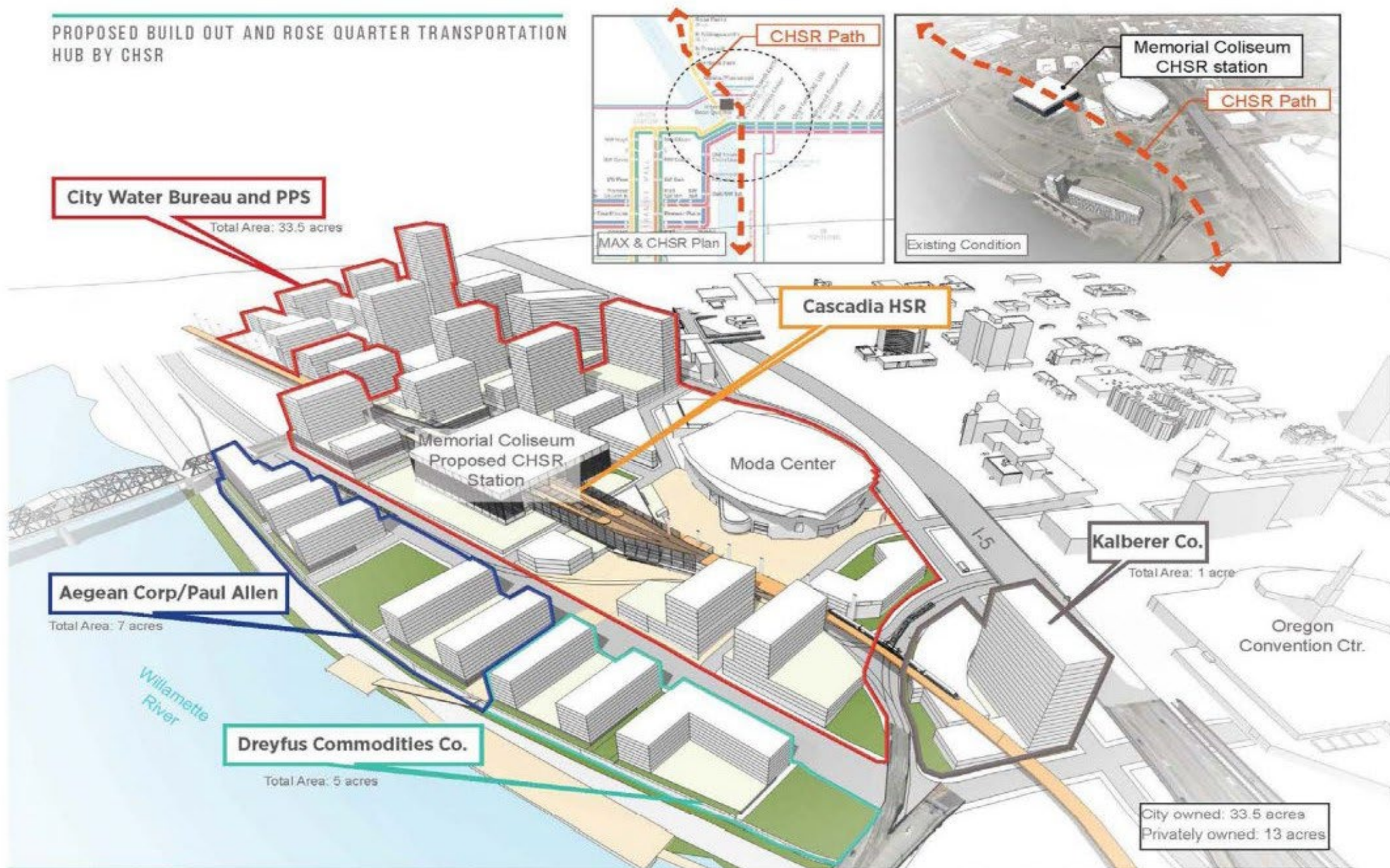
-  Flyover
-  Roadways
-  Tunnels
-  Trench Cuts
-  Roadway Boundarys
-  Roadway Boundarys

X = Closed Roads

Cascadia High-Speed Rail Multi-Modal Bridge

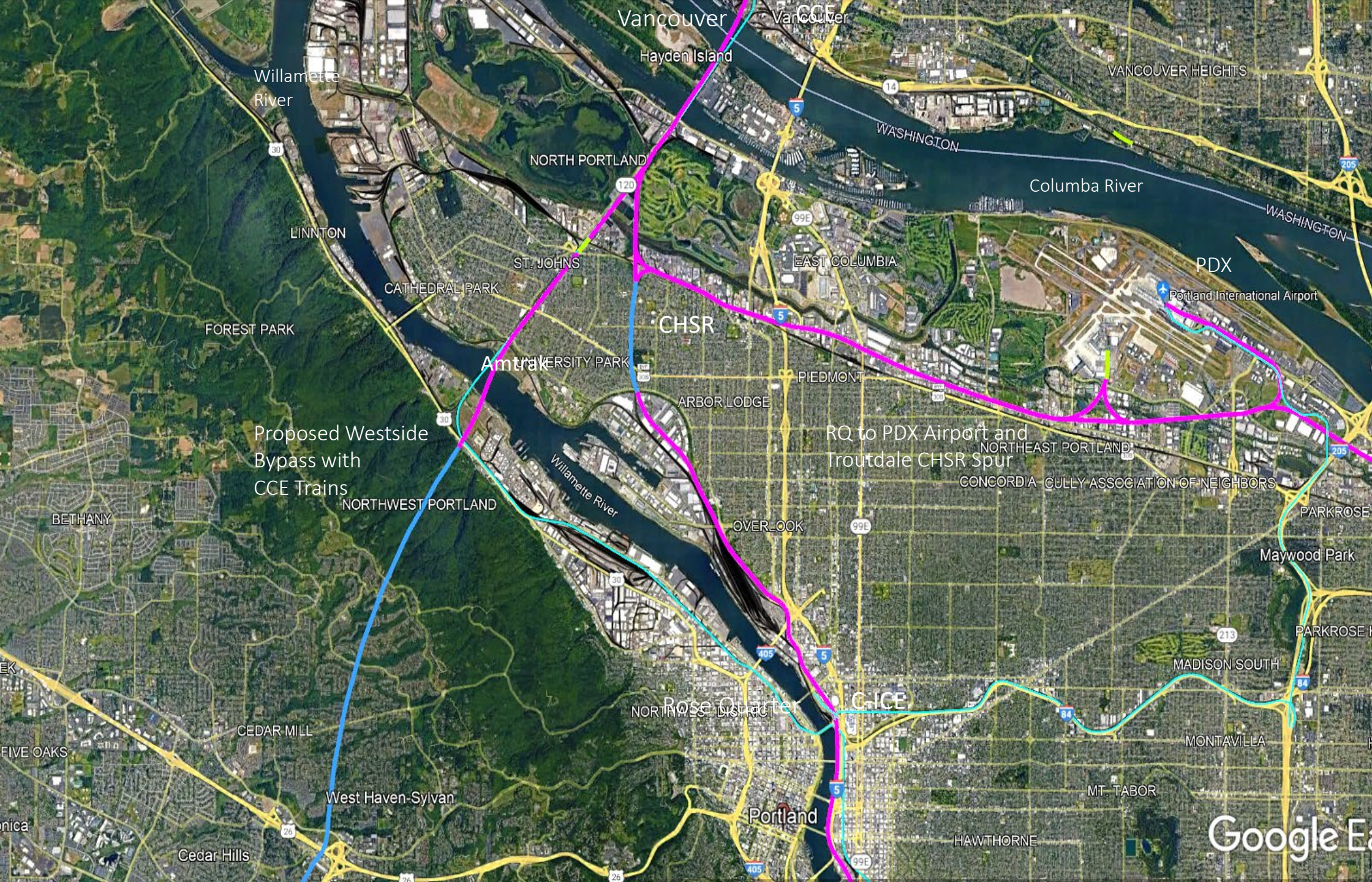
- Is part of the first phase of the CHSR corridor from Portland's Rose Quarter to Seattle, with a travel time of 58 minutes
- Dependable and efficient, not affected by weather, earthquakes, and I-5 congestion delays
- With this double-deck bridge possibility, it can serve CHSR, BNSF, UPRR, and a four-lane expressway from Washington County to Vancouver's NW 78 St I-5 interchange.
- See the Western bypass of Hwy 217 and Hwy 26 as a catalyst for livable, mixed-use developments around Portland RQ and Vancouver Waterfronts' new transportation hub.

PROPOSED BUILD OUT AND ROSE QUARTER TRANSPORTATION HUB BY CHSR

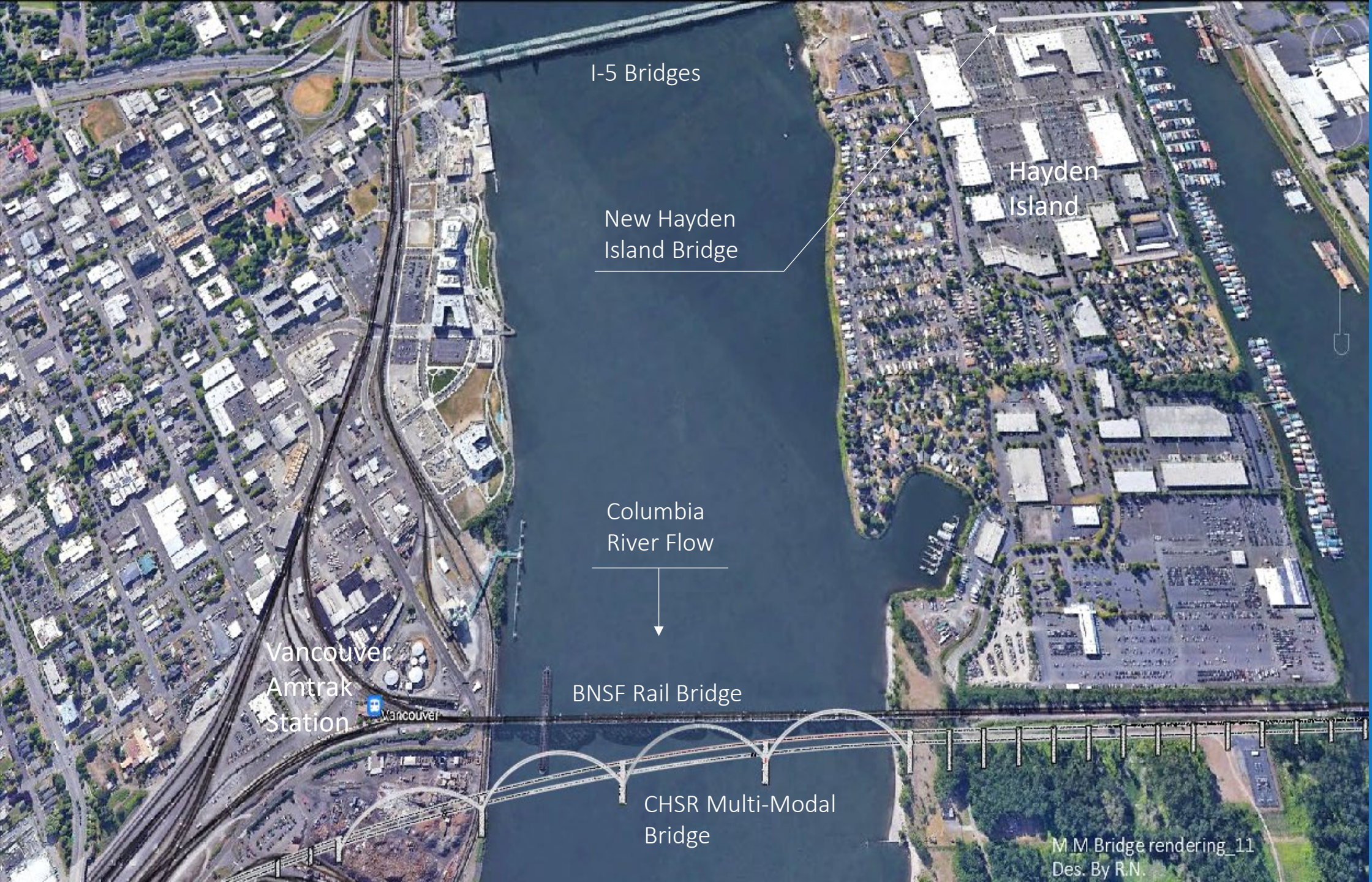


The Rose Quarter Transportation Hub

The proposed phased development is to coincide with the CHSR station and mixed-use opportunities.



CHSR Corridor between Rose Quarter and Vancouver, WA, and other Possible Corridors



Proposed CHSR
Multi-Modal
Bridge, New
Hayden Island
Bridge, and
Existing I-5 and
BNSF RR Bridge

M M Bridge rendering_11
Des. By R.N.



Proposed CHSR Bridge

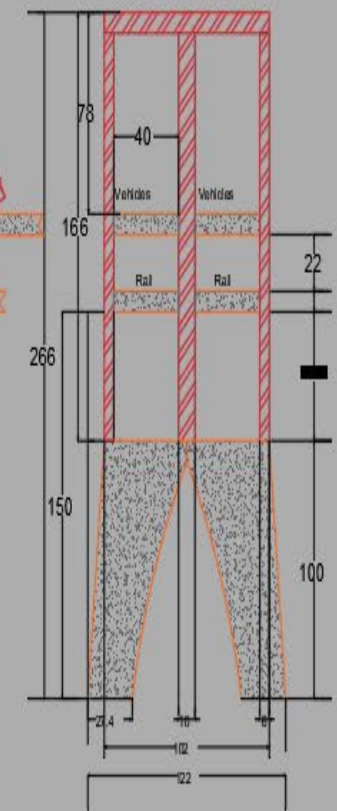
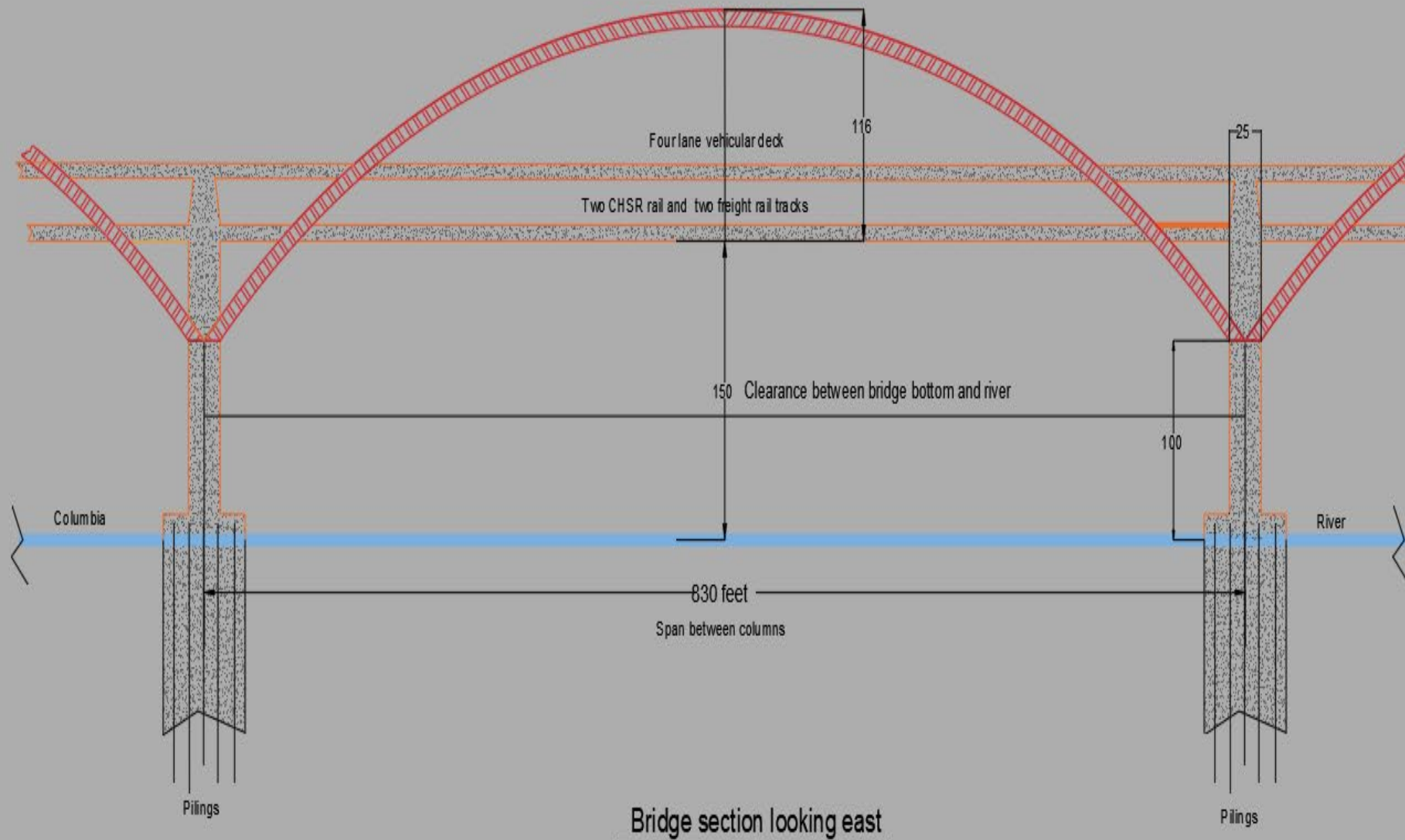
This CHSR bridge will accommodate CHSR tracks, freight tracks, and automotive traffic.



Existing BNSF Rail Bridge

Proposed Four Arched Bridge with Two Decks for CHSR and Freight Rail on the Lower Deck and Future Vehicles on the Upper Deck

The existing BNSF Bridge is in the foreground and 150 ft east of the Cascadia Multi-Modal Bridge.



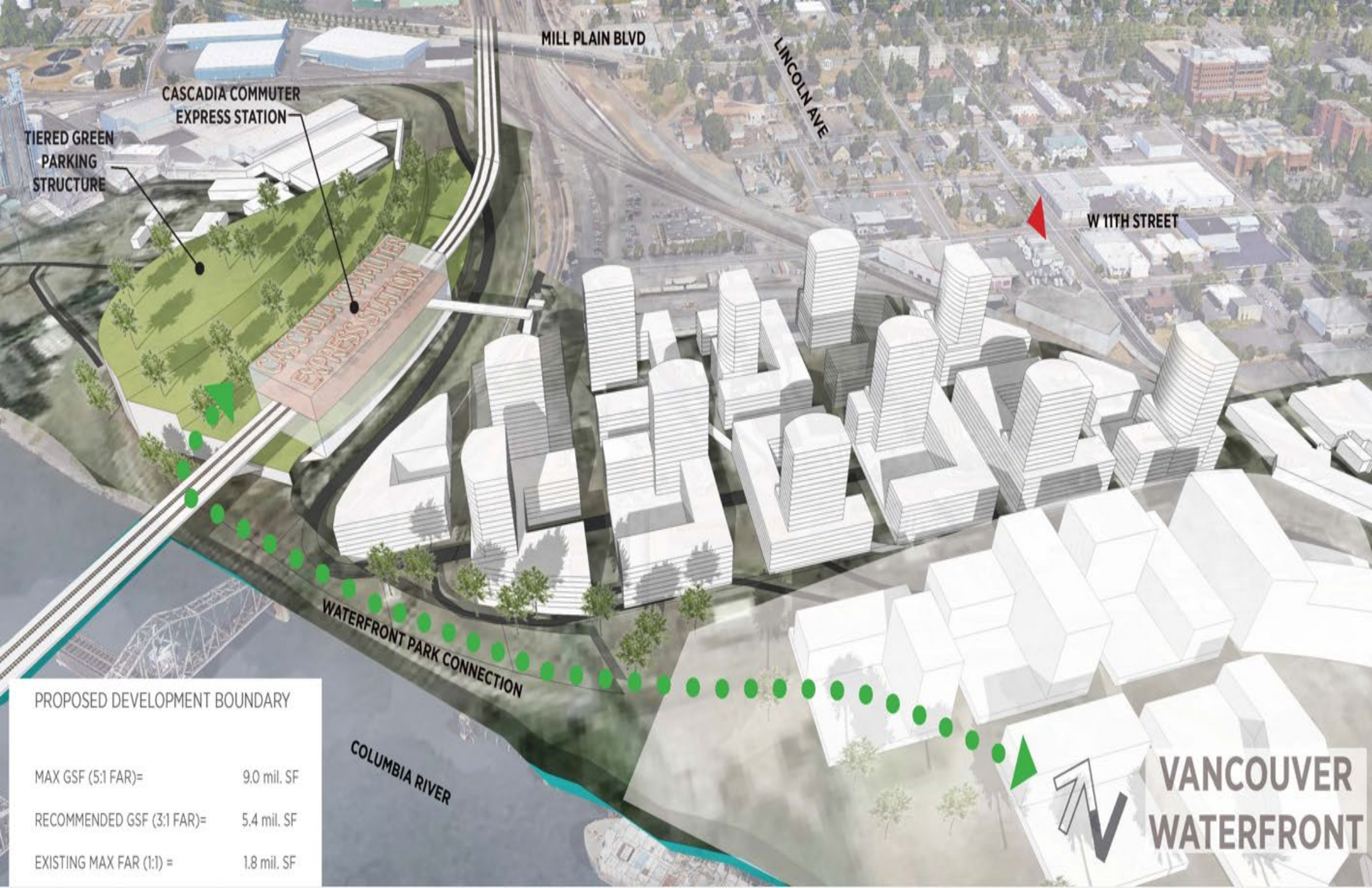
Section looking north

MM bridge cross
section 01
Des by R.N.

CHSR Multi-Modal Arched Bridge

The CHSR bridge has four arches. This design will reduce overall heights to prevent air traffic conflicts.

The CHSR Multi-Modal Bridge has two tracks for CHSR and two for freight rail transport. The upper deck is for future four-lane vehicle traffic.

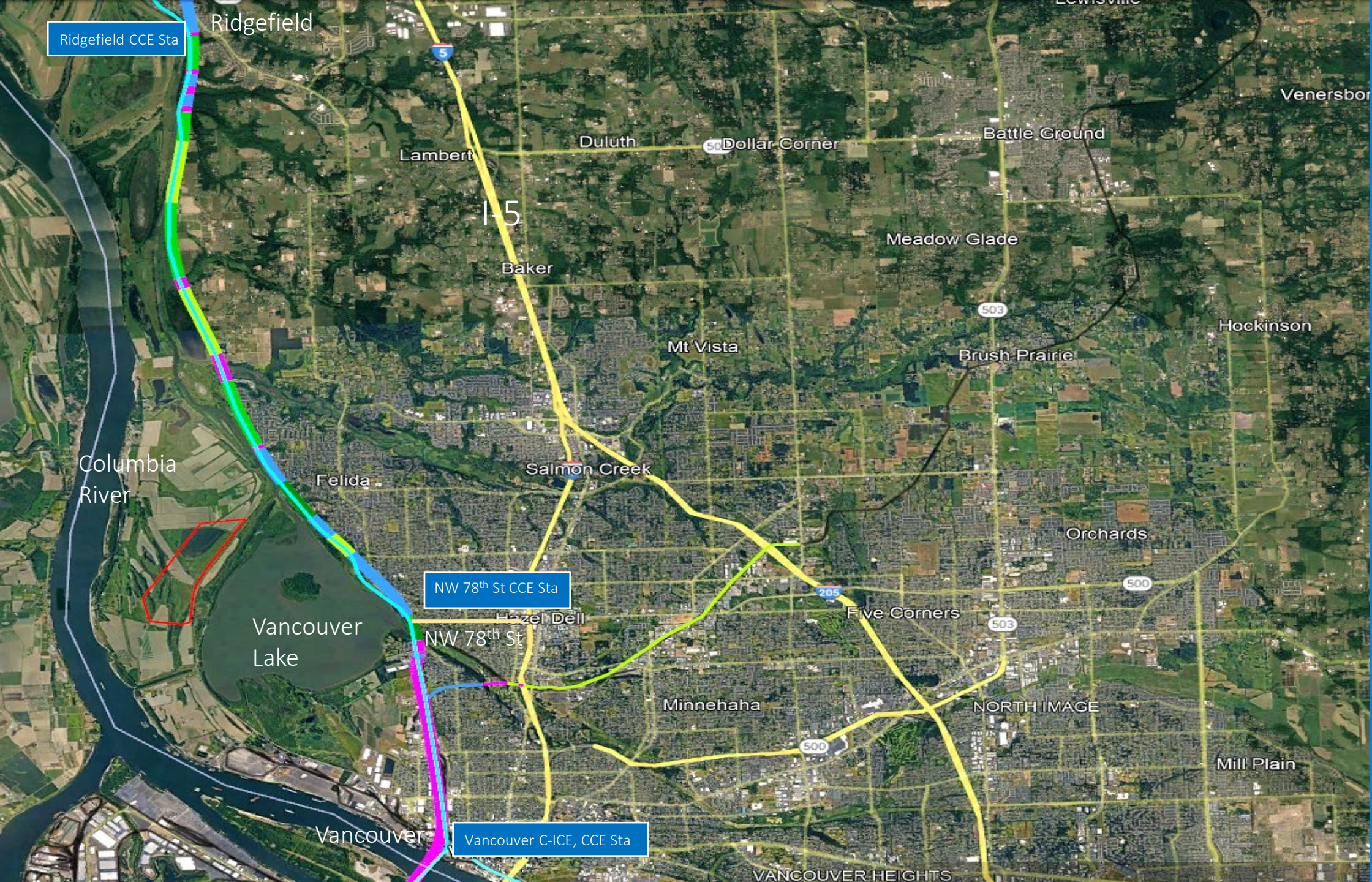


The
Proposed
Vancouver,
WA CHSR
Station

This area can
be developed
for housing and
commercial
buildings.

PROPOSED DEVELOPMENT BOUNDARY

MAX GSF (5:1 FAR)=	9.0 mil. SF
RECOMMENDED GSF (3:1 FAR)=	5.4 mil. SF
EXISTING MAX FAR (1:1) =	1.8 mil. SF



CHSR between
NW 78th St in
Vancouver and
Ridgefield

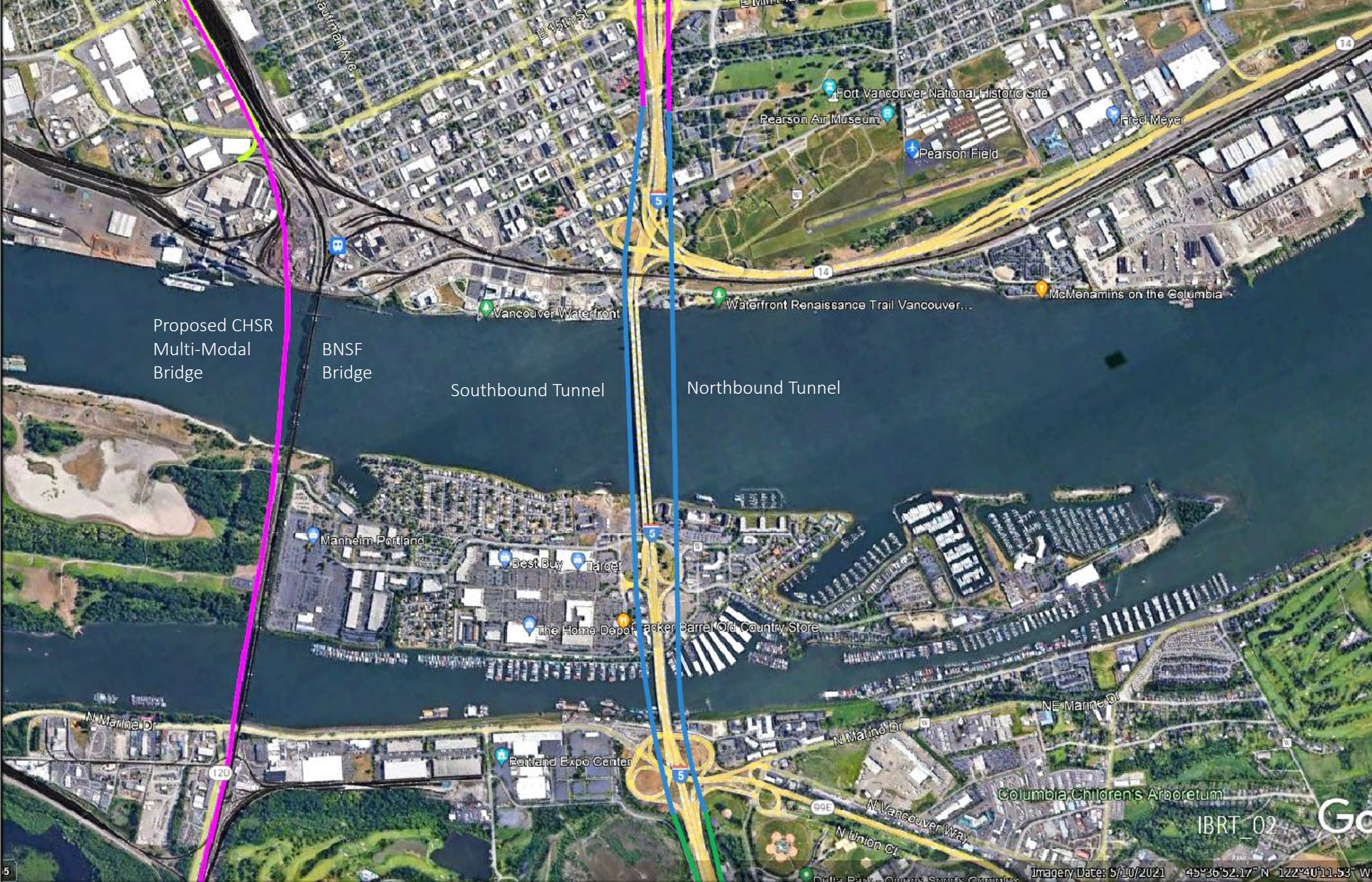
Several miles are
along a hillside
with a 9% slope.

See Stabilization
Plan Addendum.

I-5 Double Tunnel

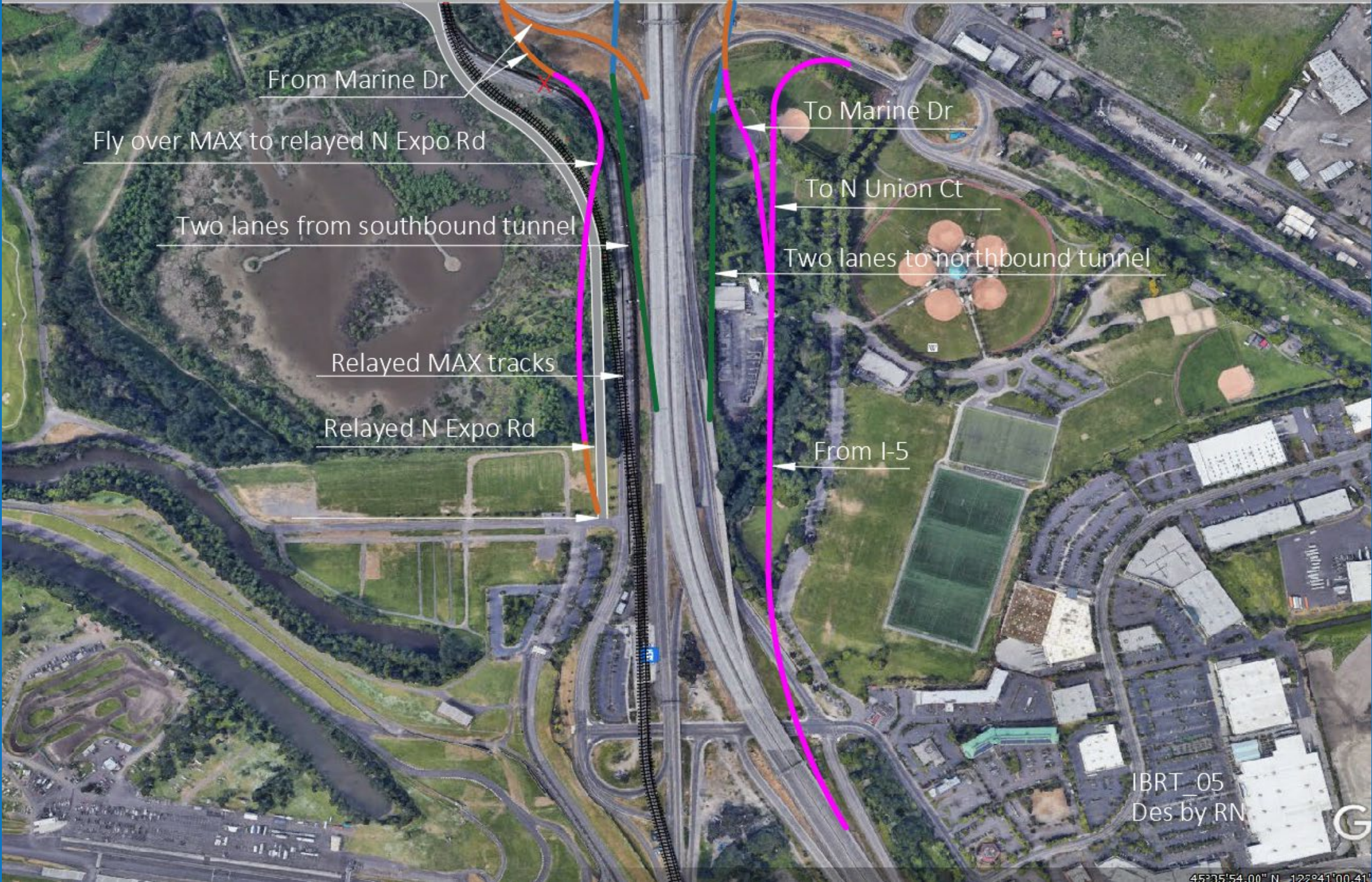
- This tunnel option will be less challenging to construct than the 12 to 18-story bridge option required by the U.S. Army Corps of Engineers. The tunnel option will also significantly minimize traffic disruption during construction.
- The tunnel distances are needed to hold acceptable grade percentages.
- The proposed tunnels are single-bores with two traffic lanes in each tunnel. The double tunnels, with two lanes north and two south, are alternatives to the remaining seismically upgraded existing bridges and the new Cascadia High-Speed Rail Multi-Modal Bridge 1.3 miles to the west of I-5.
- The Oregon and Washington side will receive new on/off ramps to connect with the existing I-5 lanes.

- IBR tunnels_03 pdf
 - Des, by R.N
 - Page 13



View of the I-5
Columbia River
Crossing Tunnels

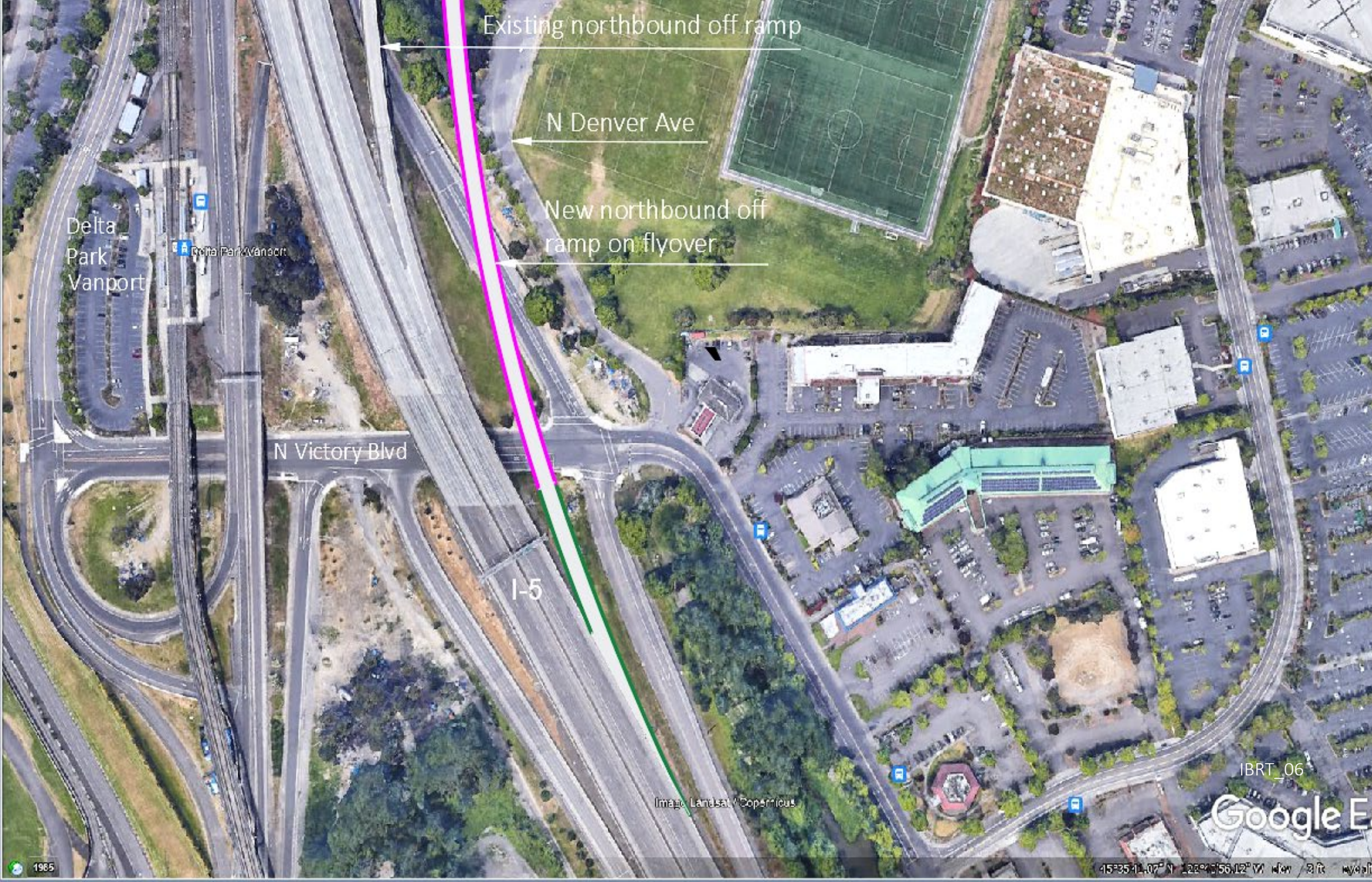
The tunnels are
between Oregon's
I-5 Marine Drive
interchange and
south of
E Evergreen Blvd.



Existing
Midsection
Between N
Victory Blvd and I-
5/Marine Drive
Interchanges.

The connection to
Delta Park must be
on flyovers for safe
passage over the
new tunnel ramps
of the I-5
interchange
connections.

IBRT_05
Des by RN



Delta Park Vanport Area

The new northbound off-ramp will start farther south than the existing one.

This can be constructed with no existing traffic interruptions.

The off-ramp south of N Victory Blvd is in in-fill.



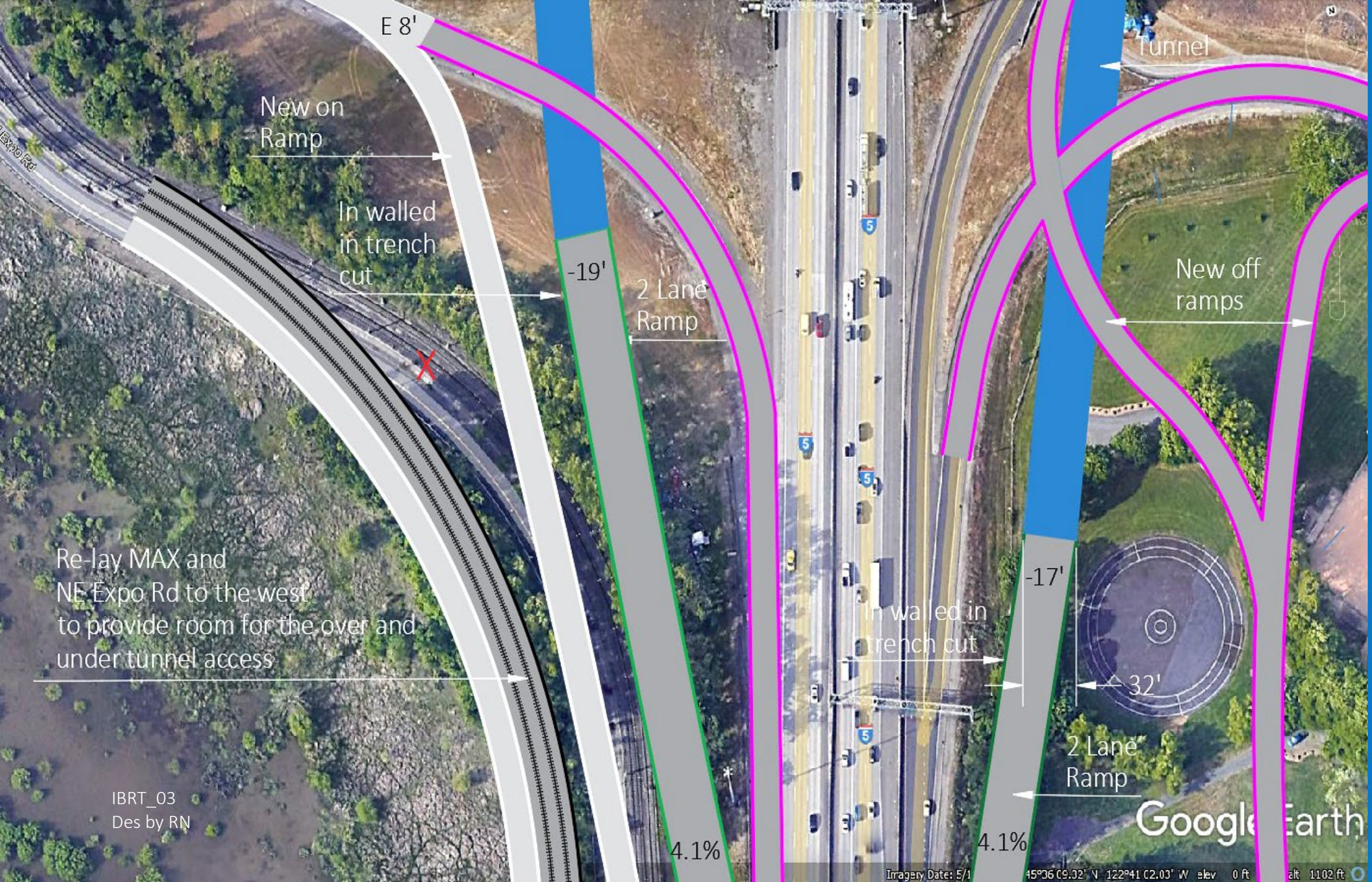
Northbound I-5 Tunnel Entrance Area

The tunnel approach is walled in a trench cut to prevent flooding.

The I-5 will receive a new off-ramp to the east of the existing one. After the new alignment is constructed, the existing off-ramps will be closed.

Important: no existing traffic interruptions will occur during the construction of the tunnels and the new ramps.

On infill as needed



CRC Tunnels

Oregon side for tunnel entrances located south of I-5 and Marine Drive interchanges.

The existing I-5 has northbound traffic lanes on the east and southbound lanes on the west.

The tunnel bore diameter is 32 feet. The lanes have no roadway shoulders.

Approaches are walled to prevent flooding.

Re-lay MAX and NE Expo Rd to the west to provide room for the over and under tunnel access

IBRT_03
Des by RN



Tunnel
Entrances near
E Evergreen
Blvd

To allow the new
roadway to
intersect, the
E Evergreen Blvd
overpass must
be raised by \pm
10 feet.

The tunnel bore
diameter is 32 ft
and \pm 1.96 miles
long per tunnel.

IBRT_07



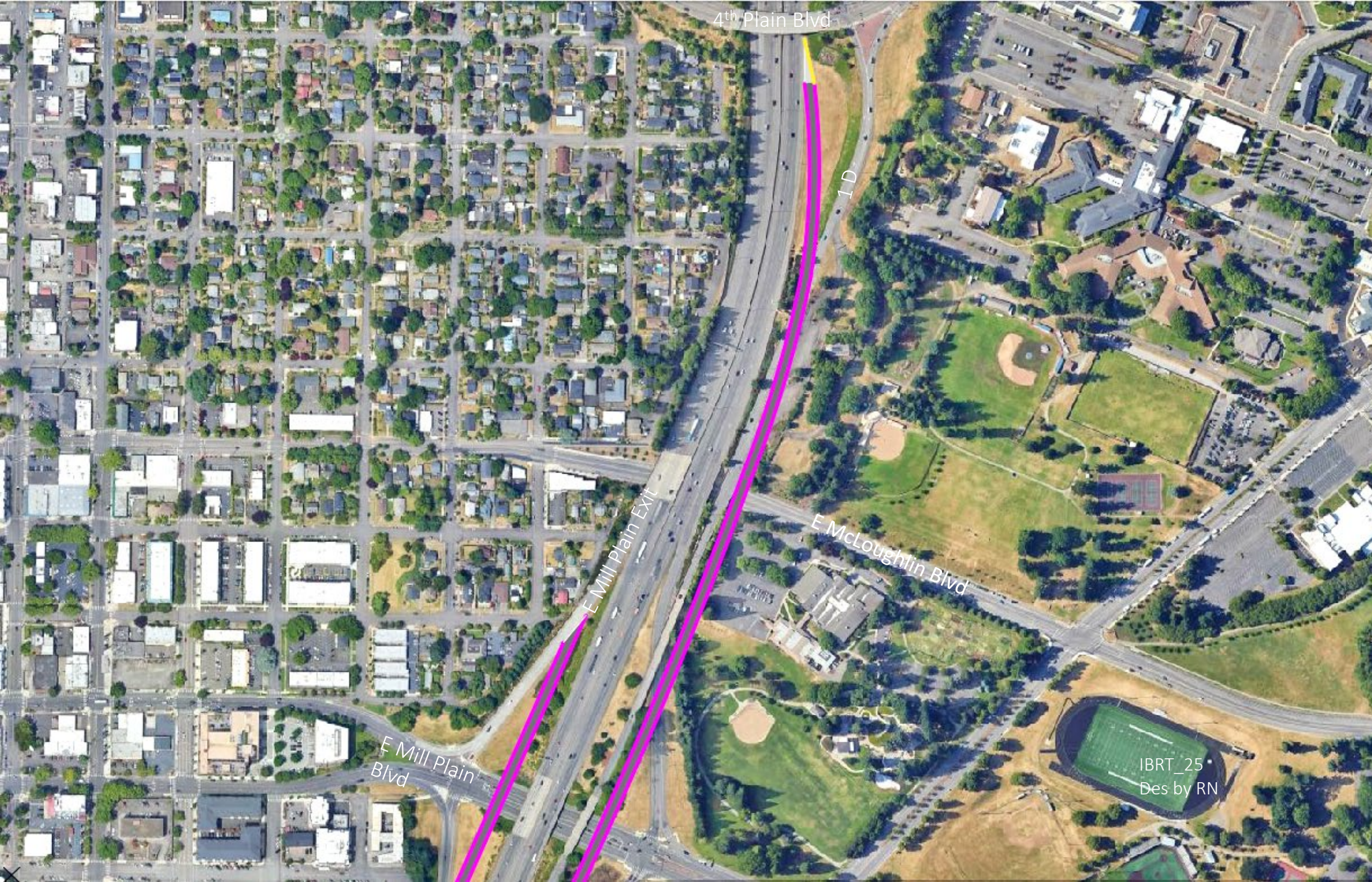


New Tunnels Interchanges at E Mill Plain Blvd

The light gray lanes will intersect with E Mill Plaine Blvd.

The dark grey lanes will fly over E Mill Plain Blvd. and intersect with I-5 north of E Mill Plain Blvd.

The roadway grades are $\pm 4.8\%$



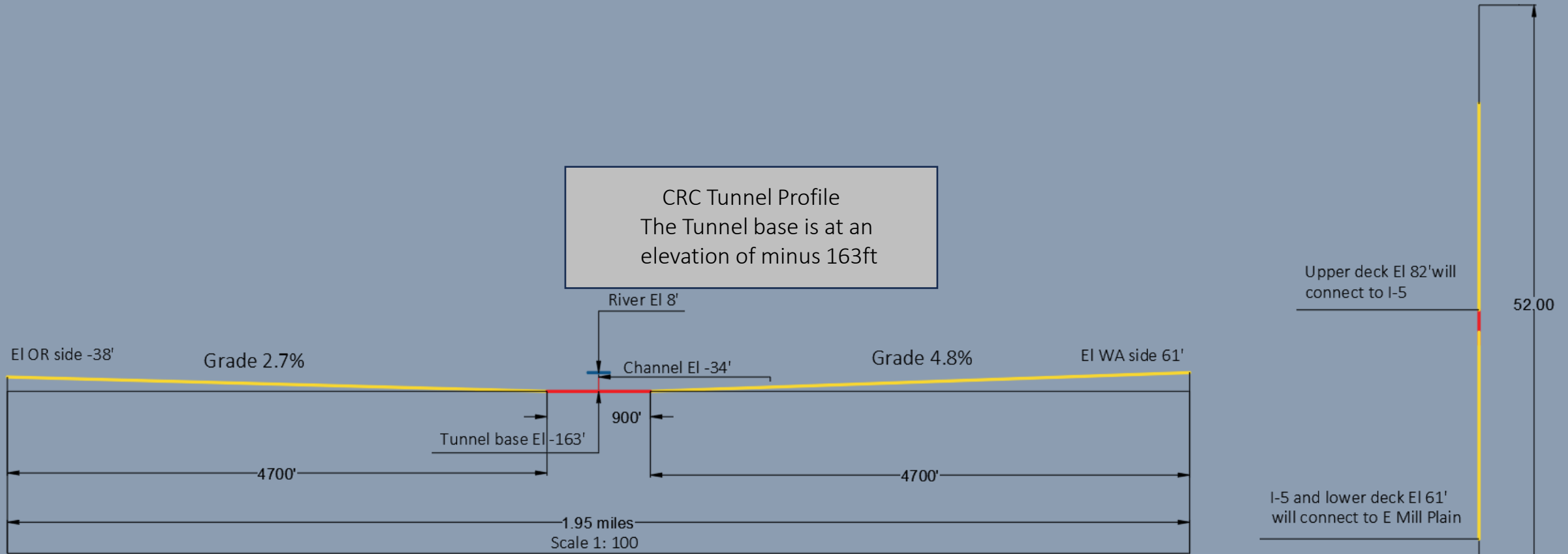
E Mill Plain Blvd Interchange to 4th Plain Blvd

The new two-lane northbound must fly over the existing 1 D roadway and intersect at 4th Plain Blvd with I-5.

The southbound lane will use part of the existing E Mill Plain Blvd exit and then enter the ramp to the southbound tunnel.

Tunnel Profile Dimensions

- Only the lower ramp elevations are indicated in this drawing.
The tunnel base is purposely at $>< -163'$, this will prevent a possible tunnel upheaval in the river during an earthquakes liquified river bottom.
The boring for the tunnel will be challenging for the shielded TBM's, they may encounter large boulders along the line.
The Oregon tunnel entrance side is below sea level and will need initial ground freezing. The answer may be the proposed Multi-Modal Bridge with its additional traffic lanes.



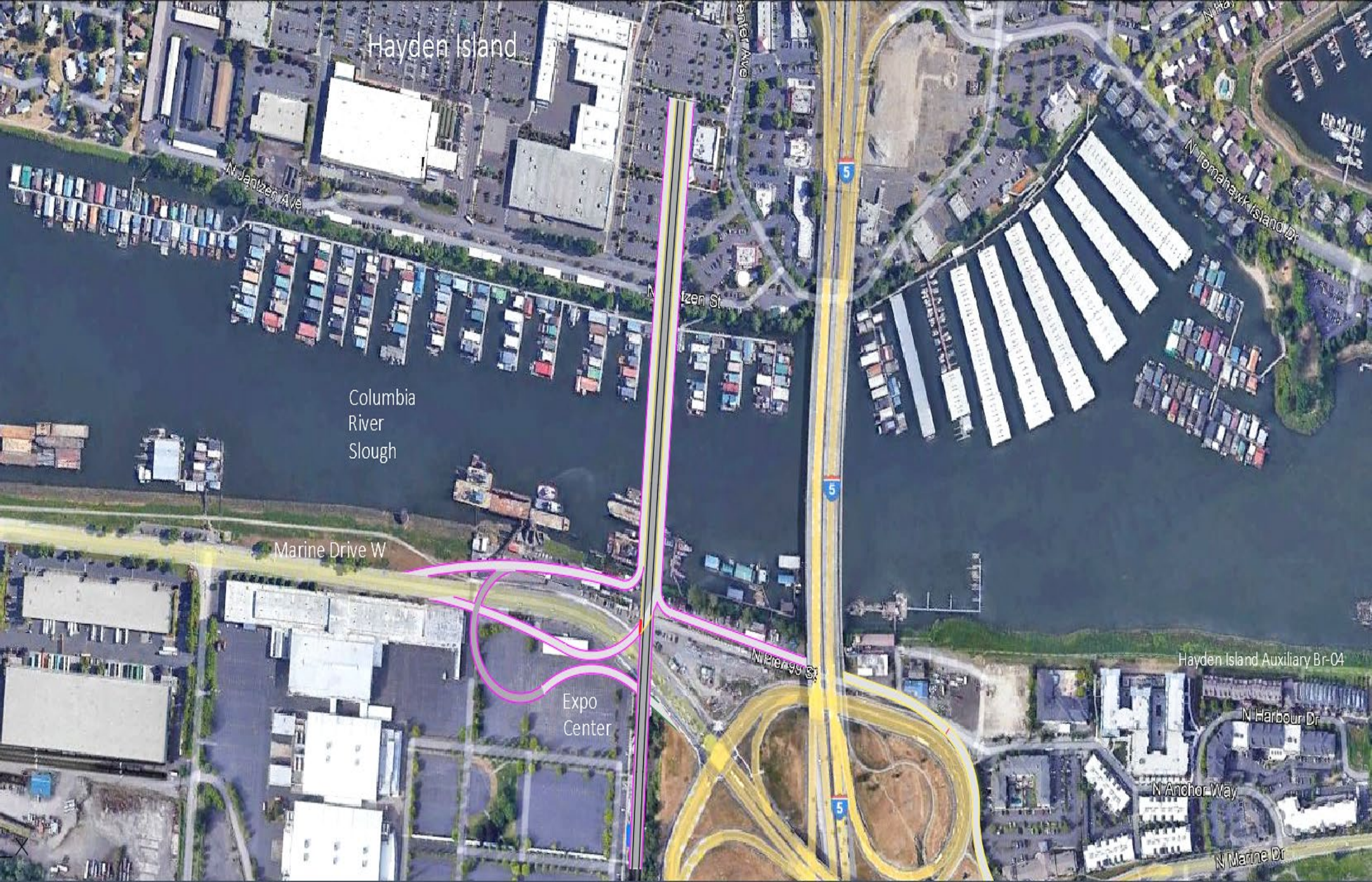
Hayden Island Auxiliary Bridge

- This proposal is to bring MAX and automotive traffic to Hayden Island.
- This auxiliary bridge will relieve traffic on the I-5 bridges by providing alternative motor and MAX access to Hayden Island, reducing the I-5 bottleneck.
- The bridge elevation is the same as the I-5 bridges.
- The interchanges are with Marine Dr. W, N Marine Dr., N Vancouver Way, NE M L K Jr. Blvd., and I-5.
- The automotive traffic has a modern elevated inter-loop layout to eliminate additional traffic signals.

Des. By R.N.

Not to scale

Page 23



Hayden Island

N Janzen Ave

Columbia
River
Slough

Marine Drive W

Expo
Center

Janzen St

N Harbor Dr

Hayden Island Auxiliary Br-04

N Harbor Dr

N Anchor Way

N Marine Dr

Hayden Island Auxiliary Bridge

The MAX line will be in the center arch over the Columbia River Slough at the same elevation as I-5.

Northbound vehicles are parallel to the southbound vehicle corridor on the outside of the MAX corridor/

The N Marine Dr./MLK Jr. Blvd and the northbound W Marine Dr. have new traffic signals.



MAX flyover Extension

The MAX will fly over the W Marine Dr and the Hayden Island Southbound off-ramp.

The current MAX station will require some elevation raising to reduce the grade %. A direct climb would be 9.5%, which is too steep for MAX trains.



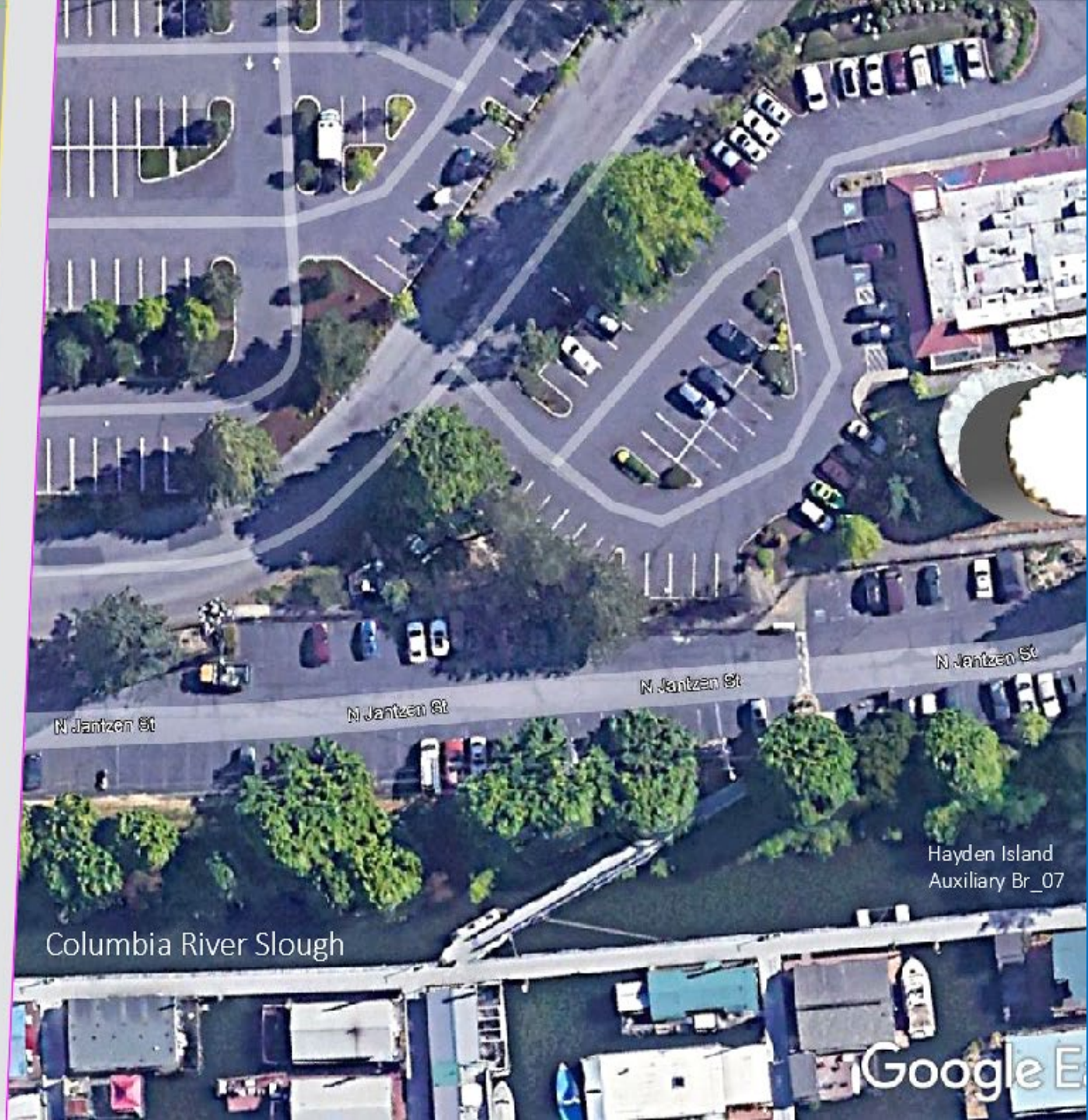
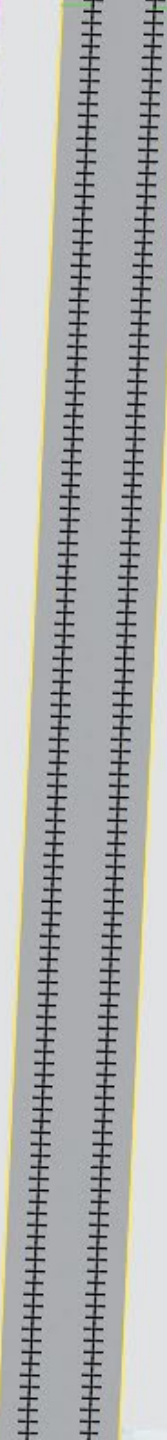
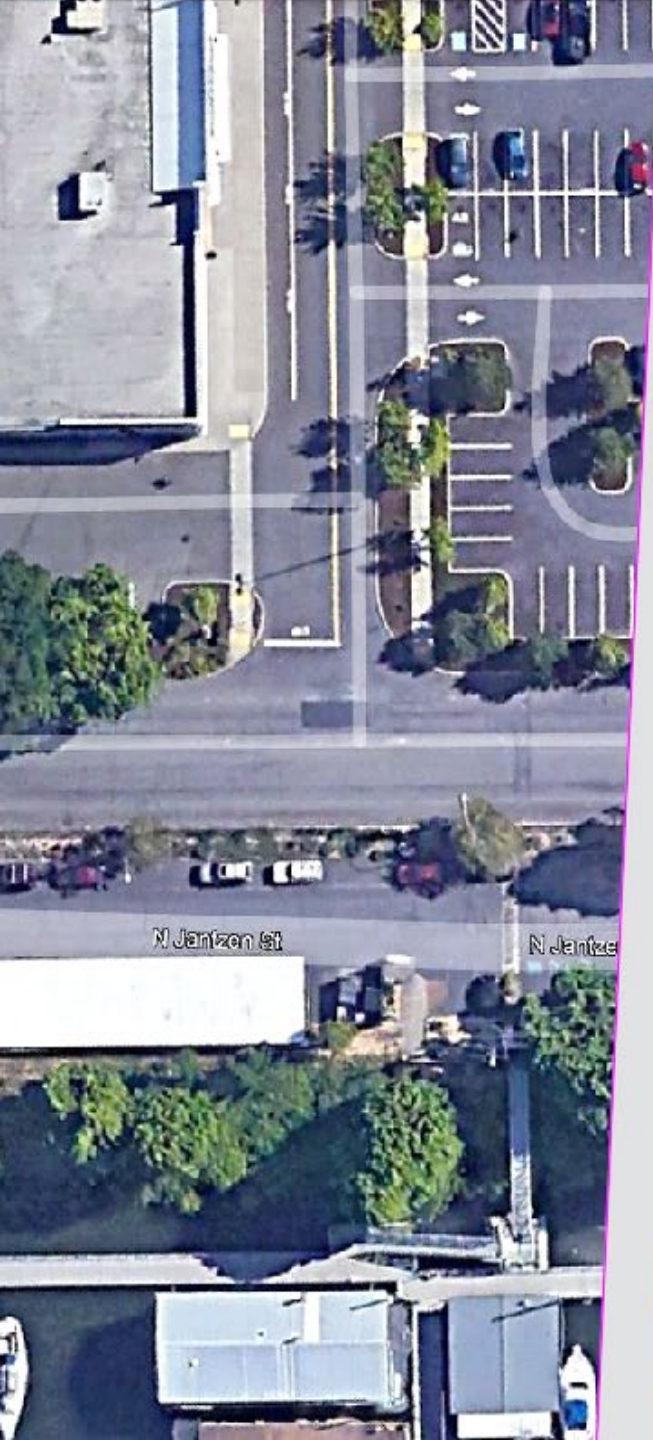
Auxiliary Bridge at the Southside of the Slough

The northbound ramp from W Marine Dr will crossover the MAX tracks. There is a traffic signal on the west side of the MAX tracks.

The bridge elevation is 38' from the southside slough bank, and the Marine Dr elevation is 14'. The MAX grade is 5% from the south end of the existing MAX station.

Hayden Island Auxiliary Br 06

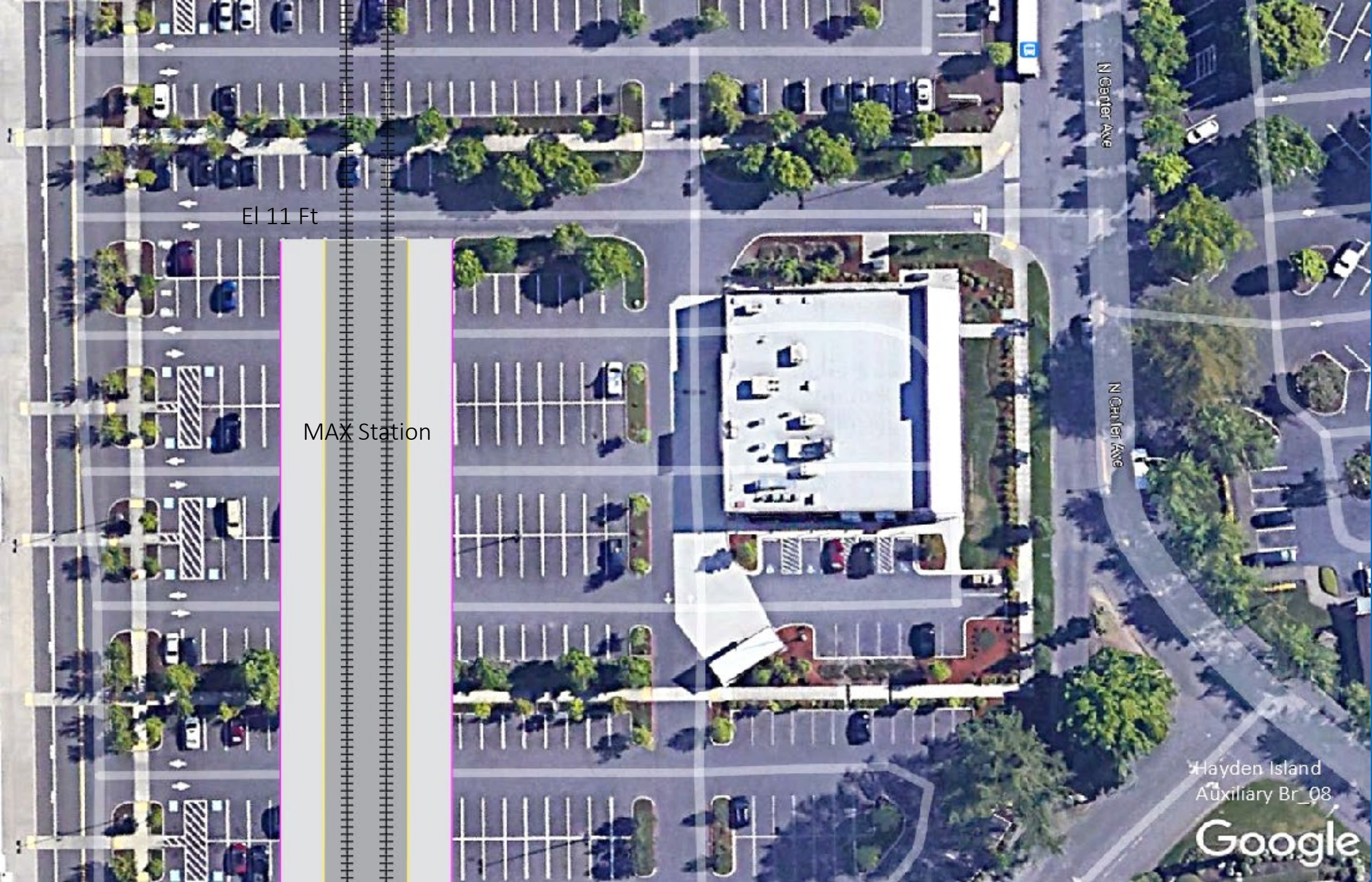
Google E



Northside of the slough.

The bridge elevation is 30 ft above N Janzen Street. The MAX station is north of this point.

MAX and roadway grade is 4%.



Hayden Island Auxiliary Bridge Landing on Ground

The end of the
auxiliary bridge
and the MAX
station is north of
the parking lot.

Hayden Island
Auxiliary Br_08

Google

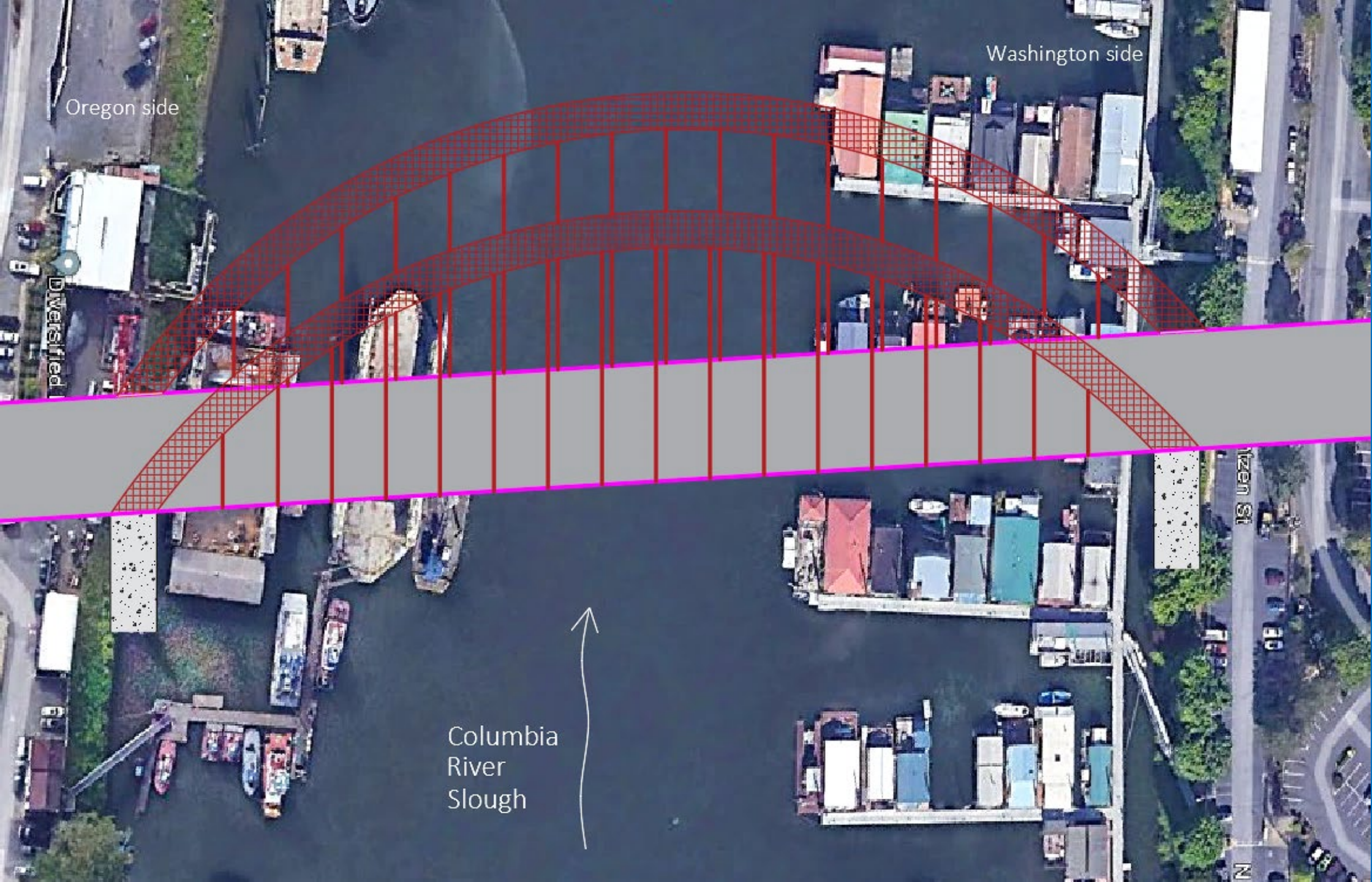


The Columbia River Slough will have an Arch Bridge like the proposed Multi-Modal Bridge, spanning 830.

The construction will be in a lighter format than the Multi-Modal bridge.

The MAX and roadway details are not shown.

The grey fields have regular bridge columns for the bridge.



Hayden Island Auxiliary Arch Bridge Proposal

This bridge is at an elevation of ± 38 feet, and above the Columbia River, Slough and fly over the houseboats.

The MAX tracks, and the single motorway lanes are not shown.

I-5 Bridges Seismic Upgrade

- The pictures below show the possibilities.
- This upgrade can be done with no bridge closures.
- We have the equipment for the pile driving
- Barges can enter the center waterway under the existing bridge crest north of the state line.

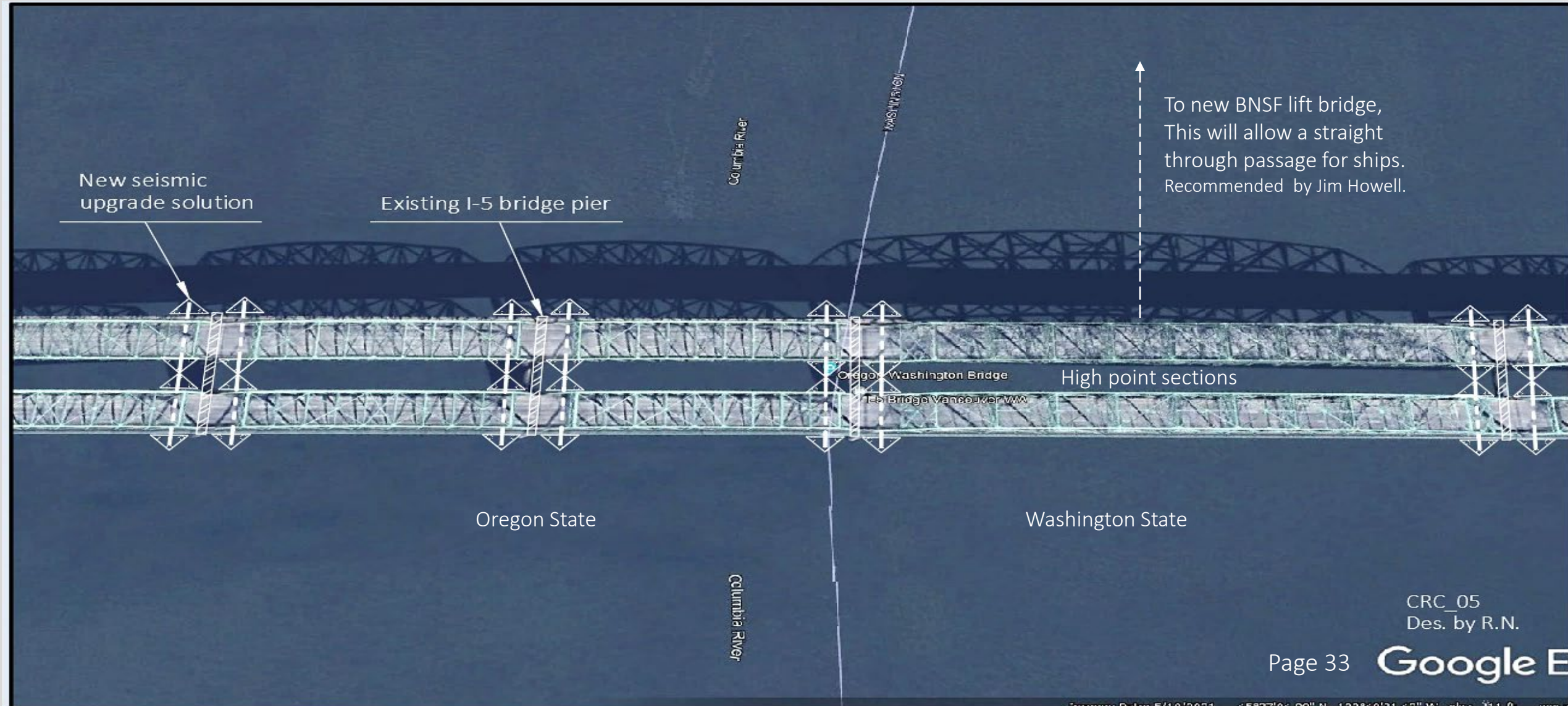


High point section

I-5 bridge undercarriage
with locations for
concrete cross beams

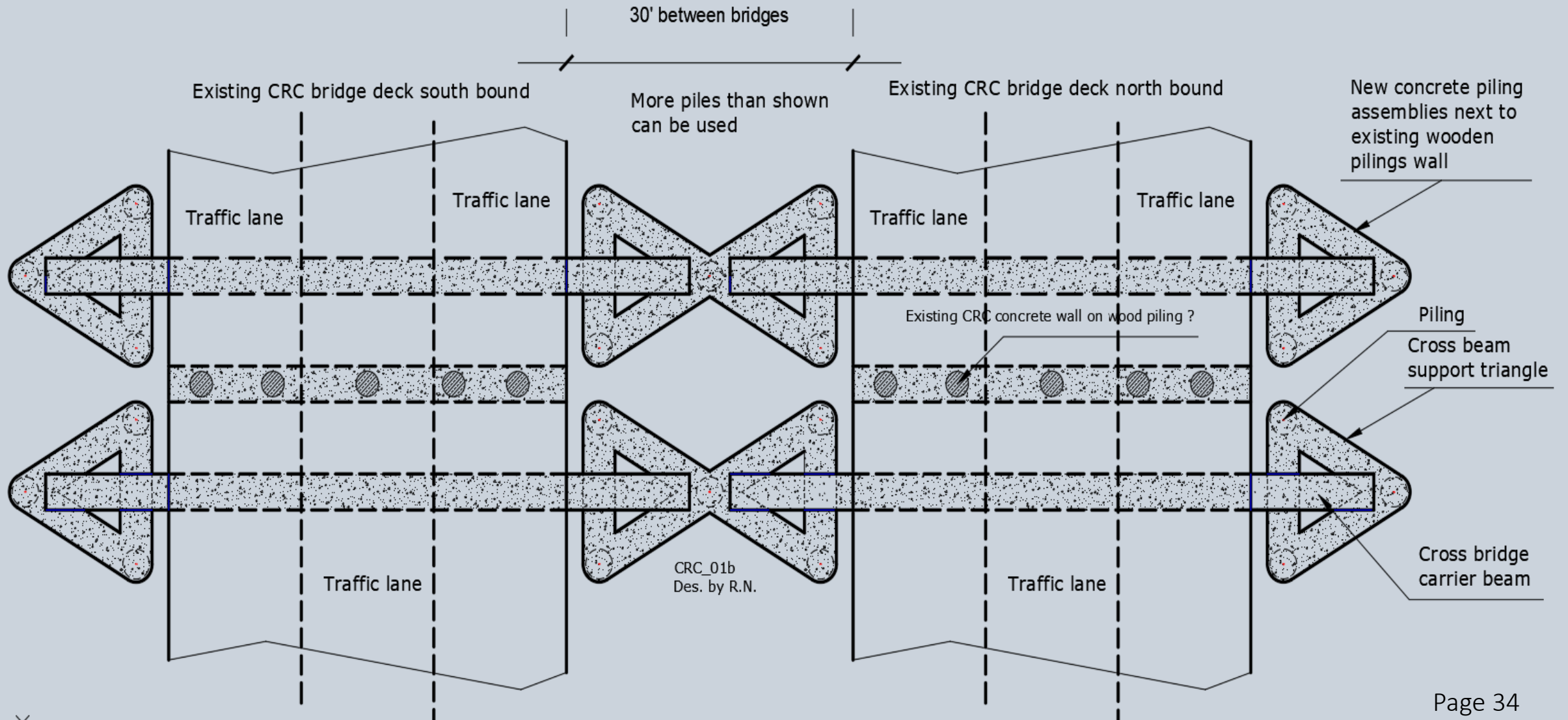
COLUMBIA RIVER CROSSING BETWEEN OREGON AND WASHINGTON

Seismic I-5 Bridge Upgrade Solution and Aerial View of Bridge Sections



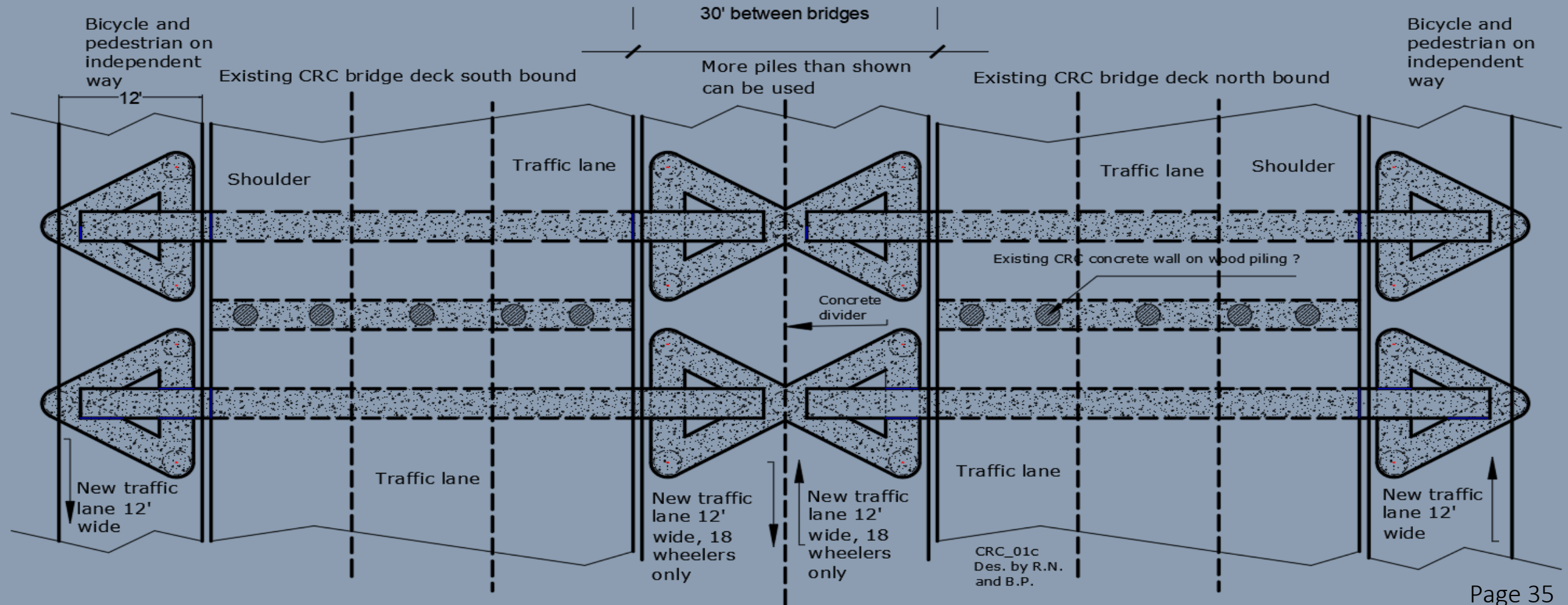
OPTION 1: NEW SEISMIC UPGRADE SOLUTION

Existing Condition



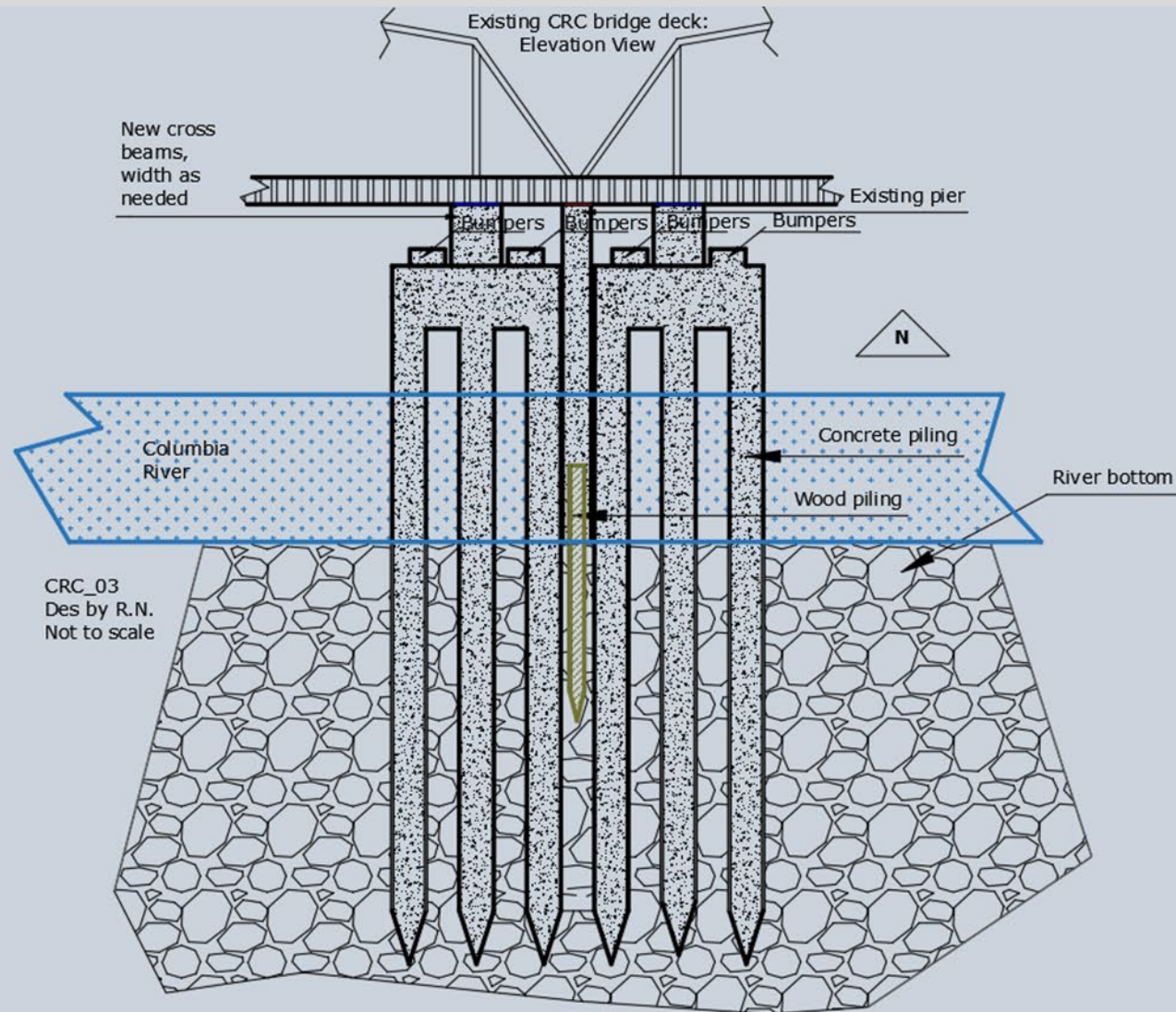
OPTION 2: NEW SEISMIC UPGRADE SOLUTION

Existing Condition



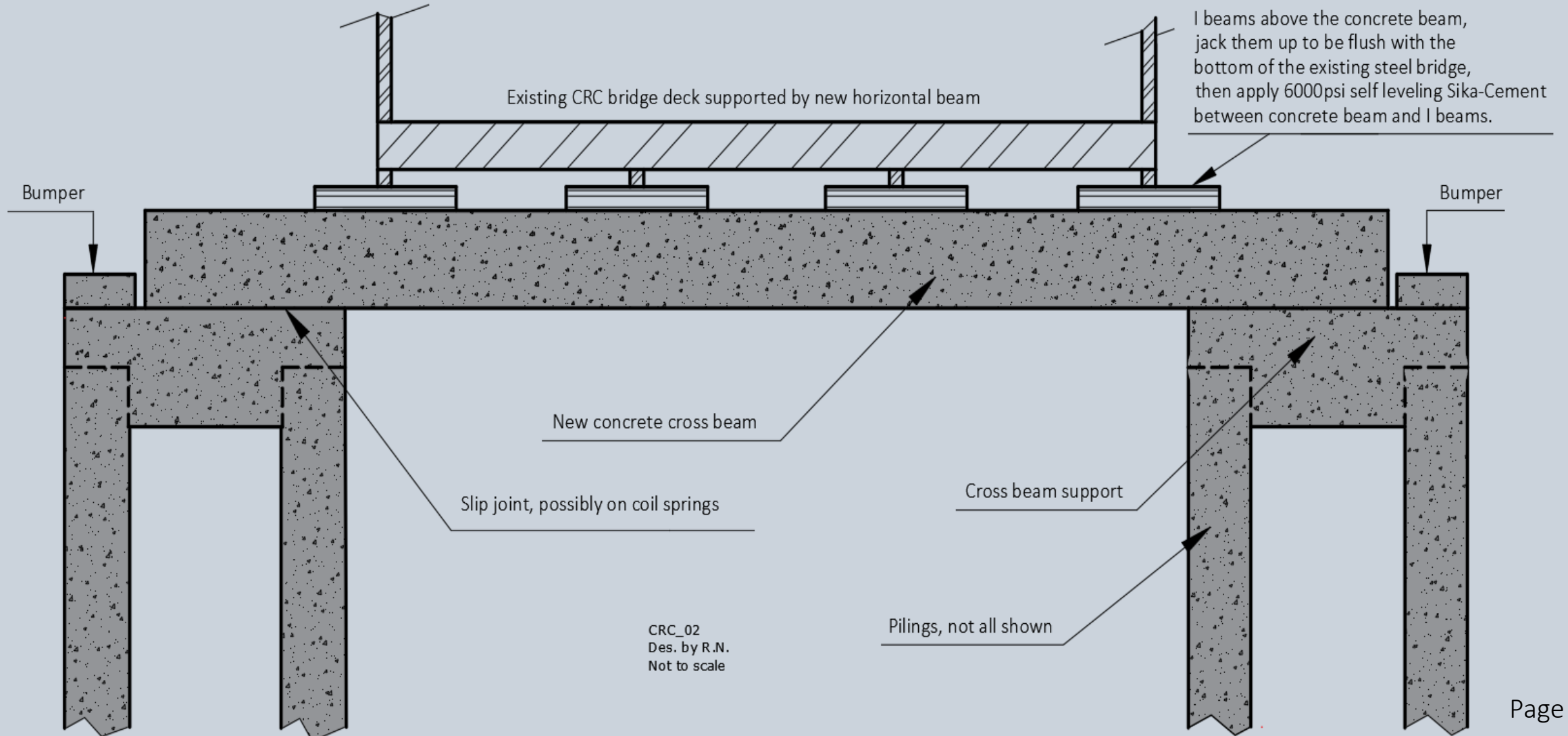
CROSS SECTION VIEW

Center Pile is Wood



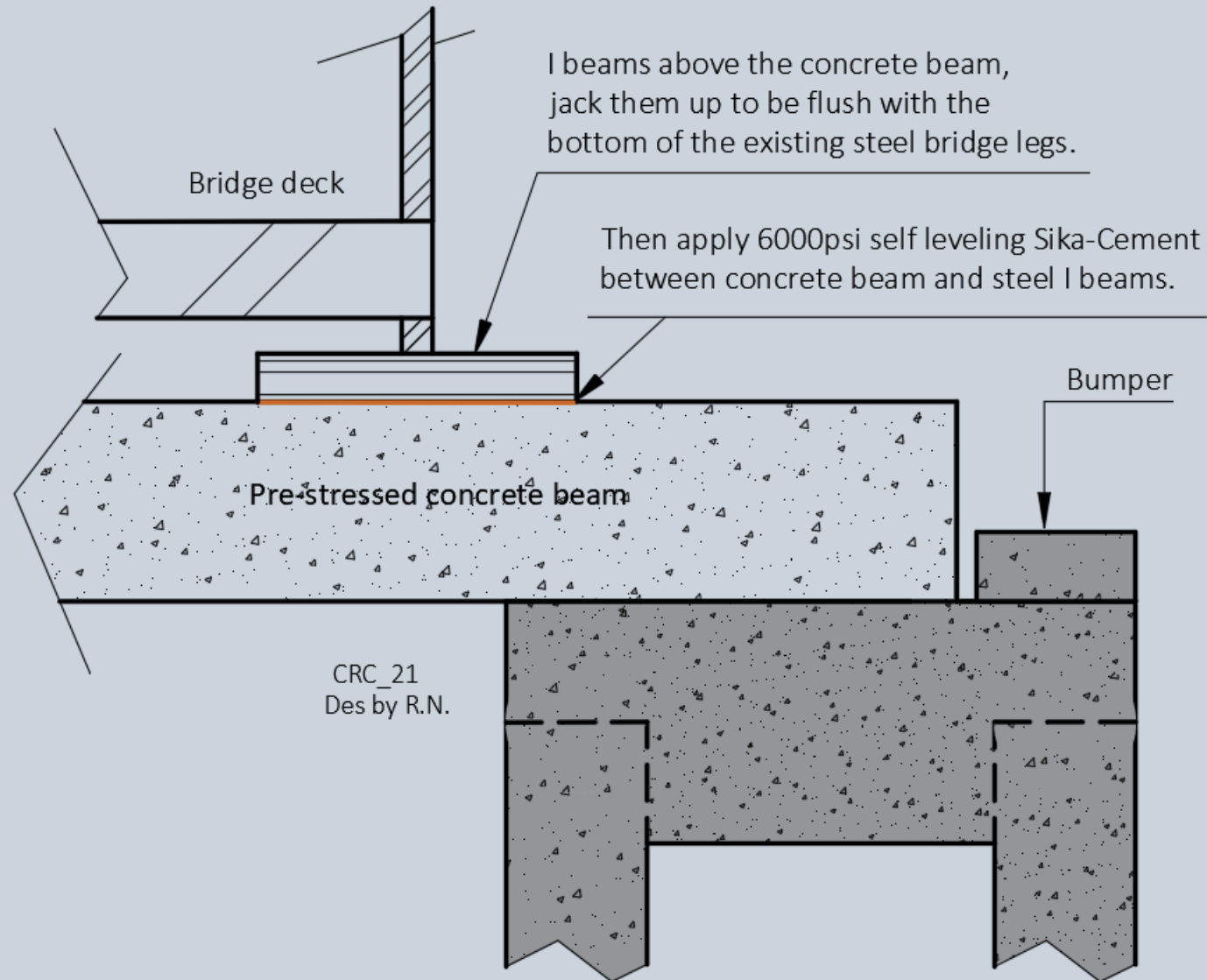
COLUMBIA RIVER CROSSING

Seismic Upgrade Solution in Elevation View



COLUMBIA RIVER BRIDGE BASE

Shoe Above I-Beam Assembly



BRIDGE SHOE DETAIL

Keep I-Beams Flush with Bridge Undercarriage. Apply Sika Cement Shim to Fill Voids.

