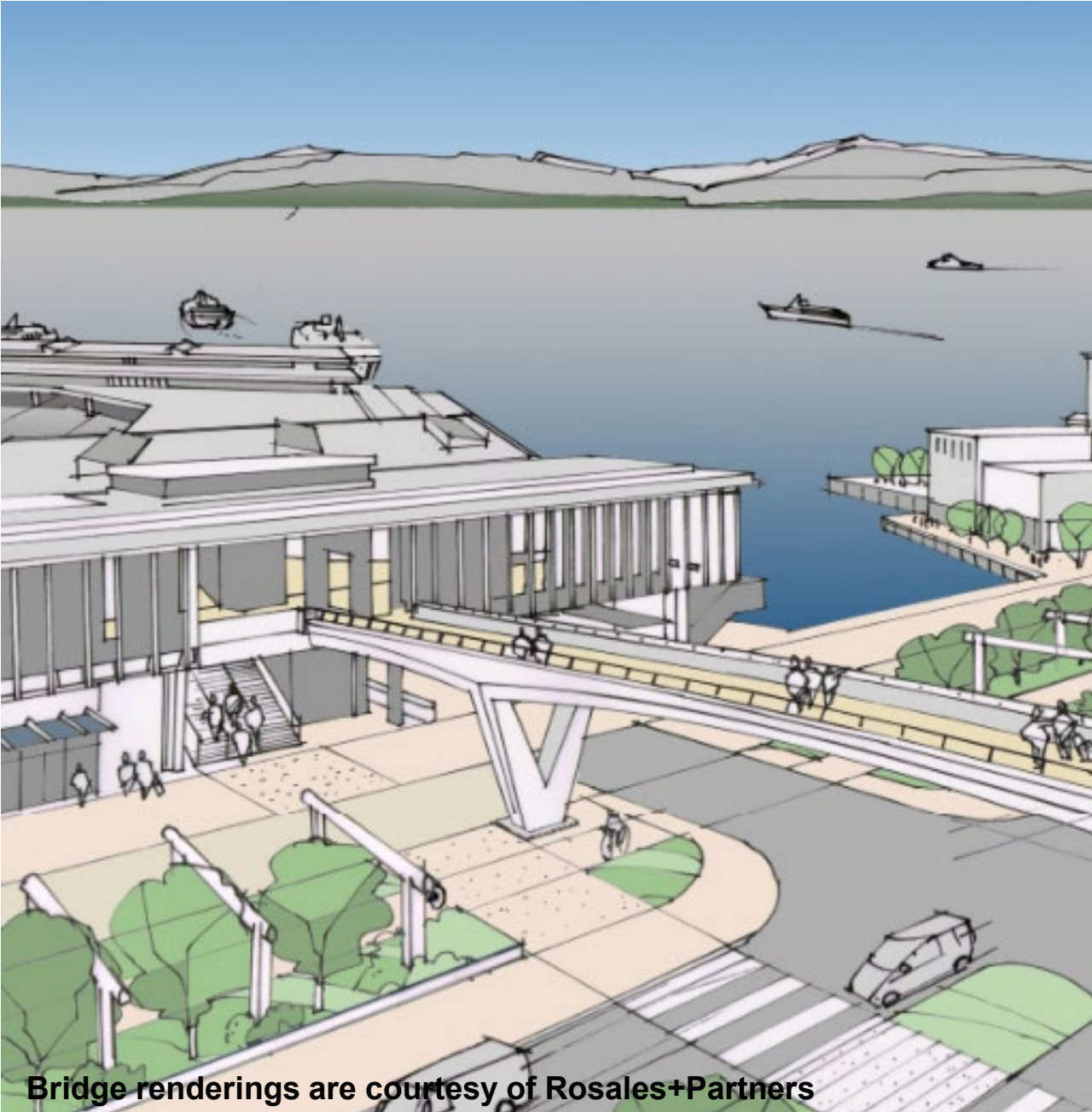




The Marion Street Pedestrian Bridge: A New Icon for the Revitalized Seattle Waterfront

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Don Nguyen, PE, SE, ENV SP, HDR
Stephen Wilson, PE, SE, SDOT

2023 Western Bridge Engineers' Seminar

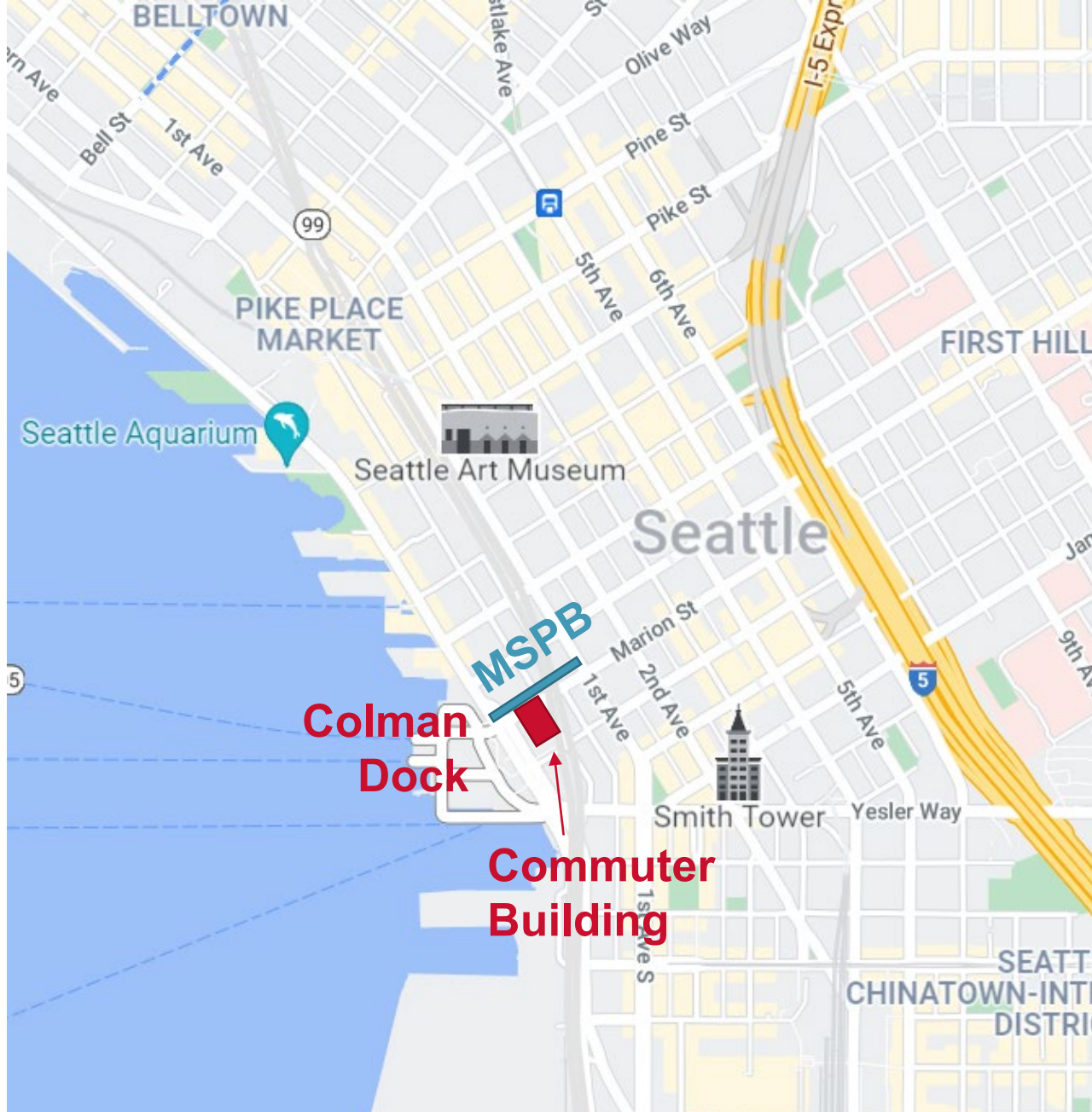


- 01** Project Background
- 02** Preliminary Design and Constraints
- 03** Substructure
- 04** Superstructure
- 05** Transitions
- 06** Aesthetics

Bridge renderings are courtesy of Rosales+Partners



01 Project Background



Owners



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Washington State
Department of Transportation

Design Team



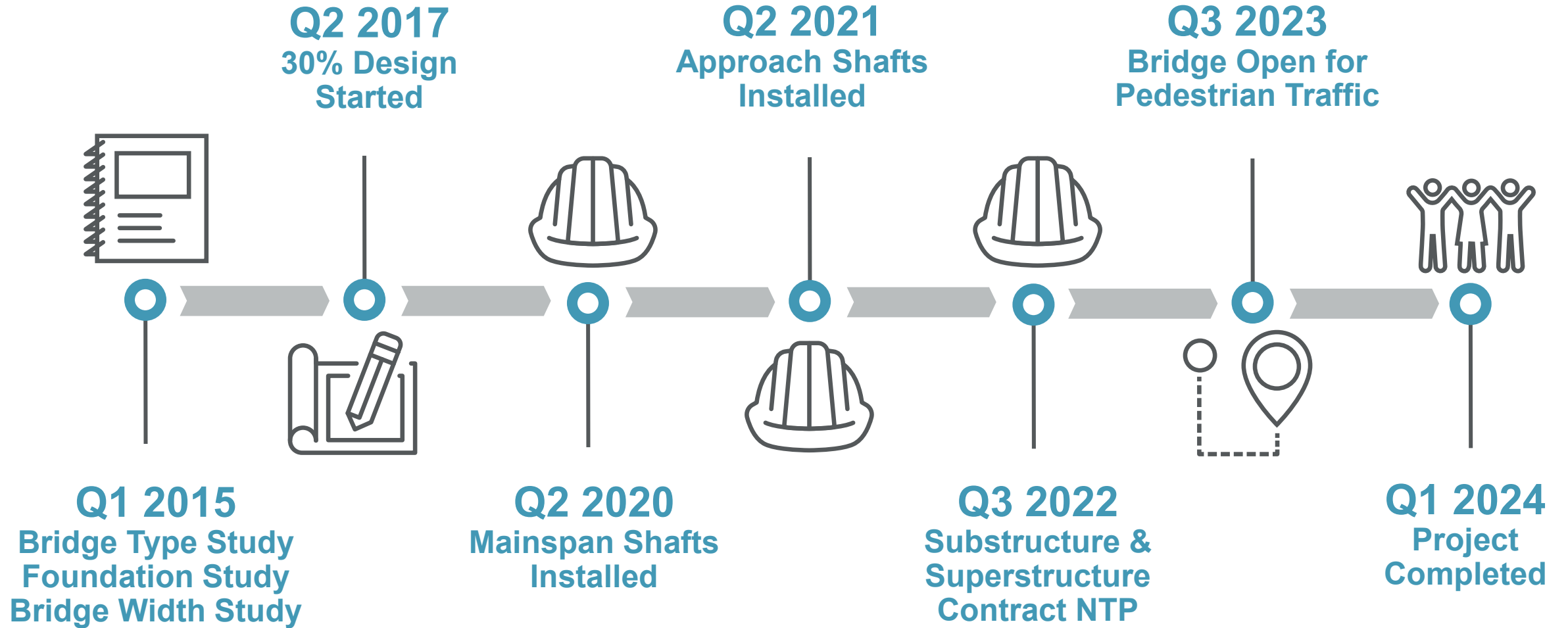
Contractors



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Project Timeline

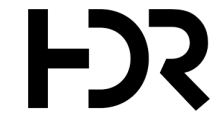


02 Preliminary Design and Constraints



Marion Street Bridge circa 1942

Existing Bridge



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Existing Bridge



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Existing Bridge



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Existing Bridge



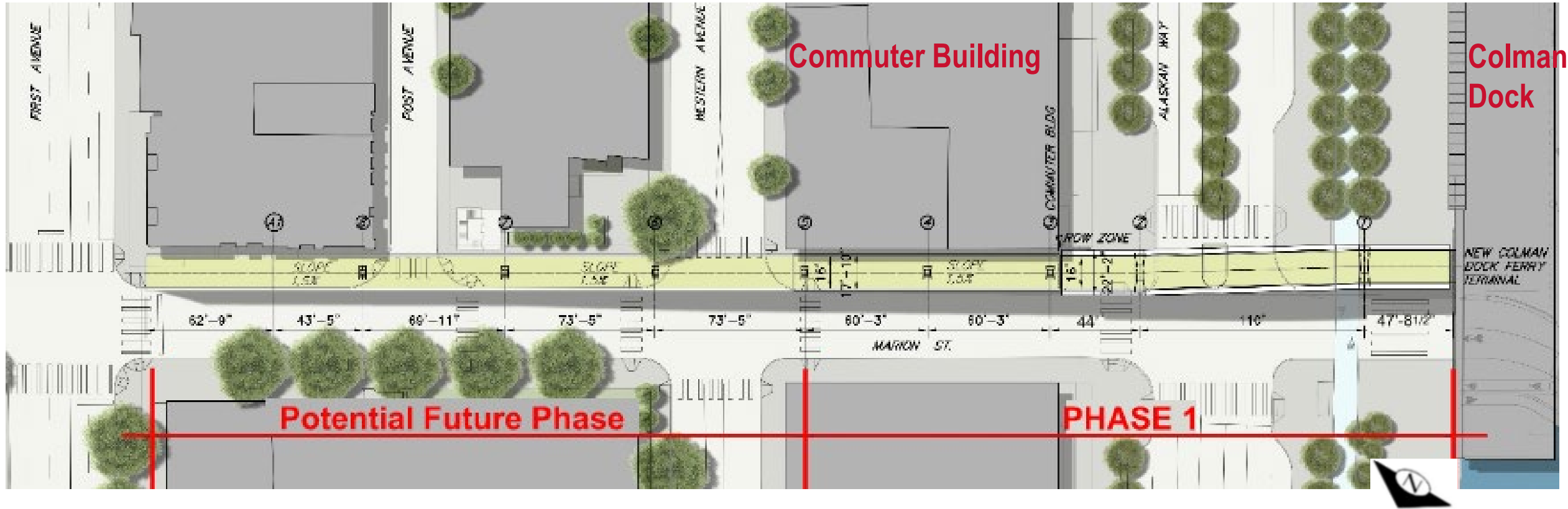
Existing Bridge



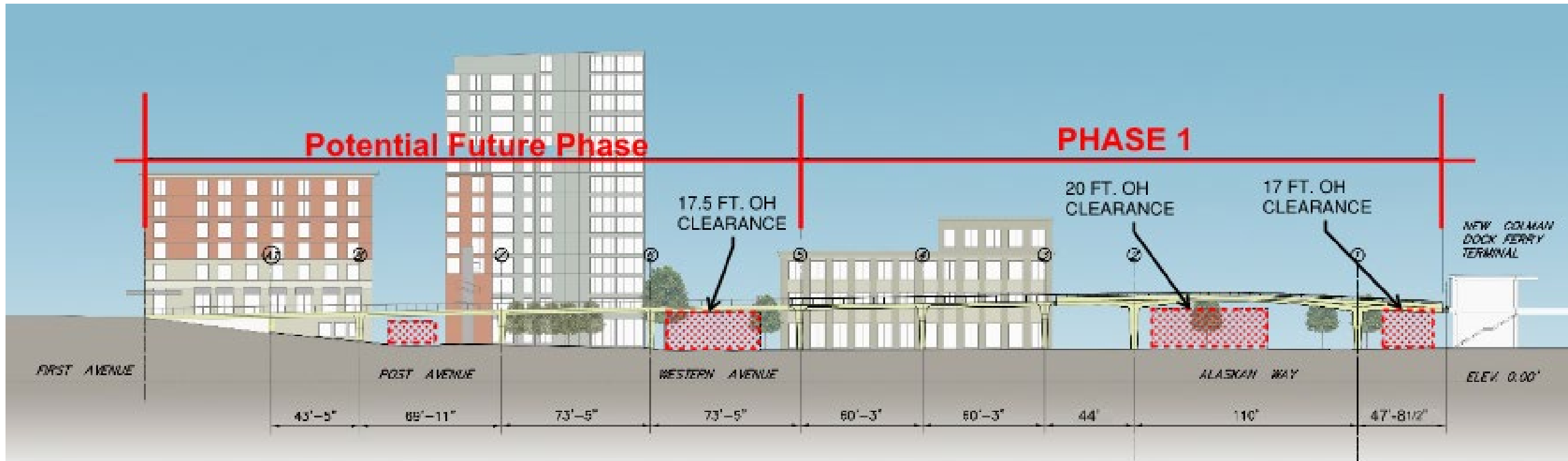
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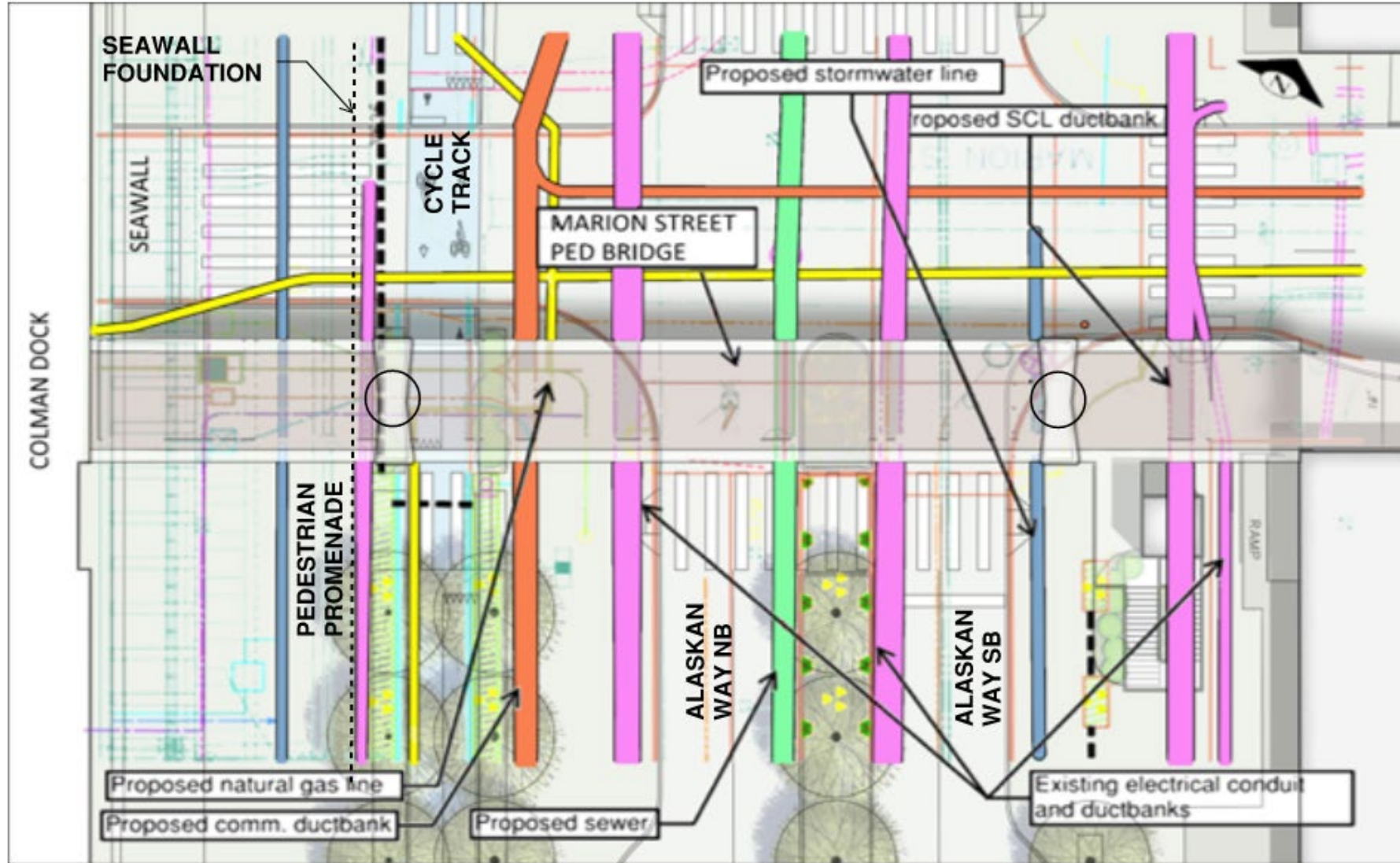
Bridge Layout



Bridge Layout

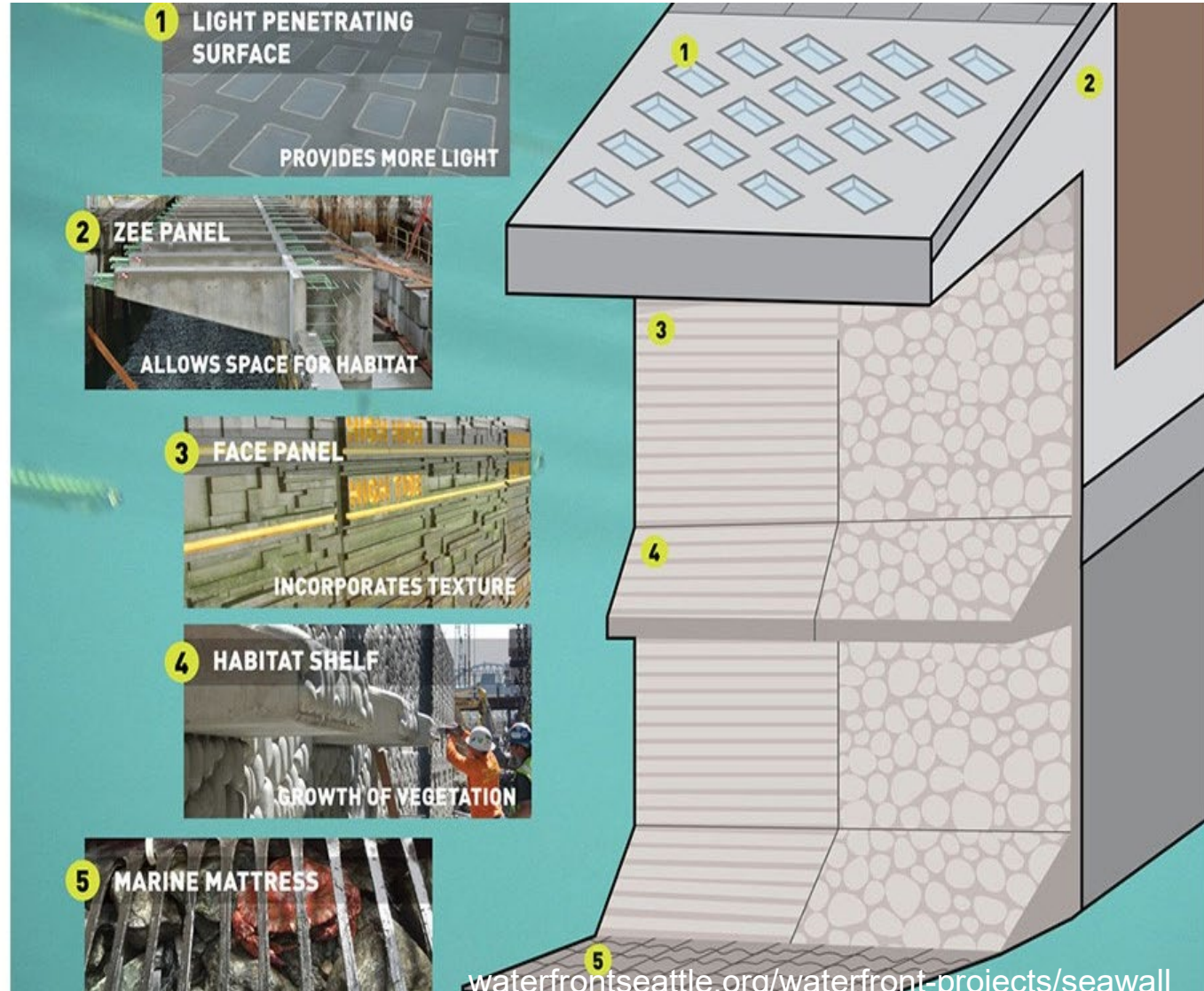
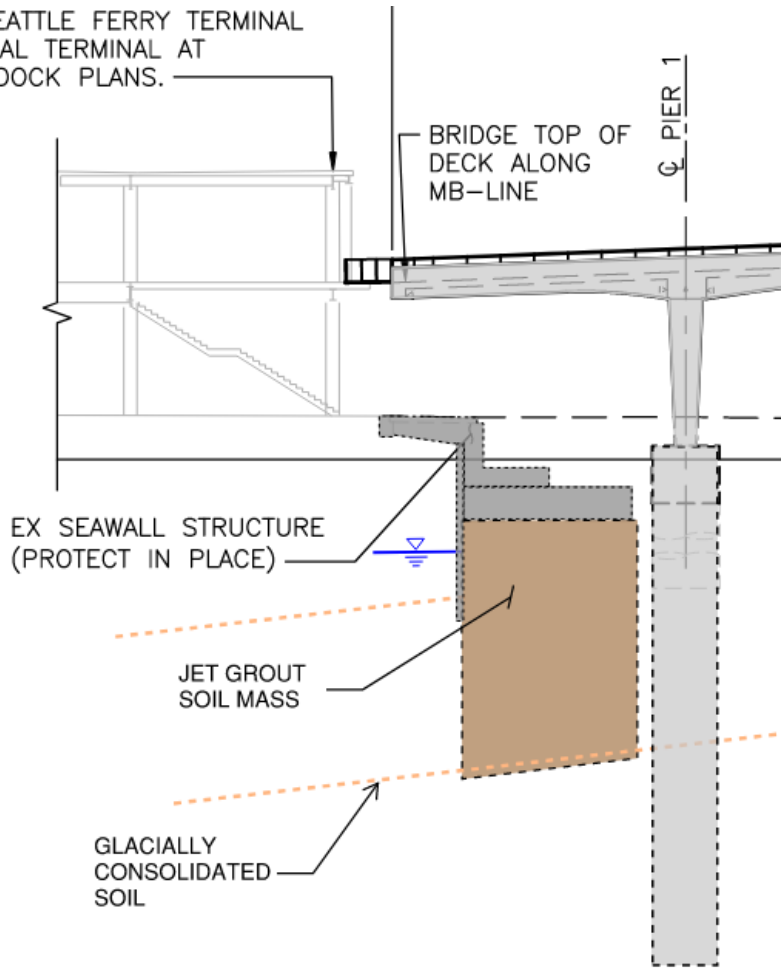


Foundation Locations – Main Span



Foundation Locations – Main Span

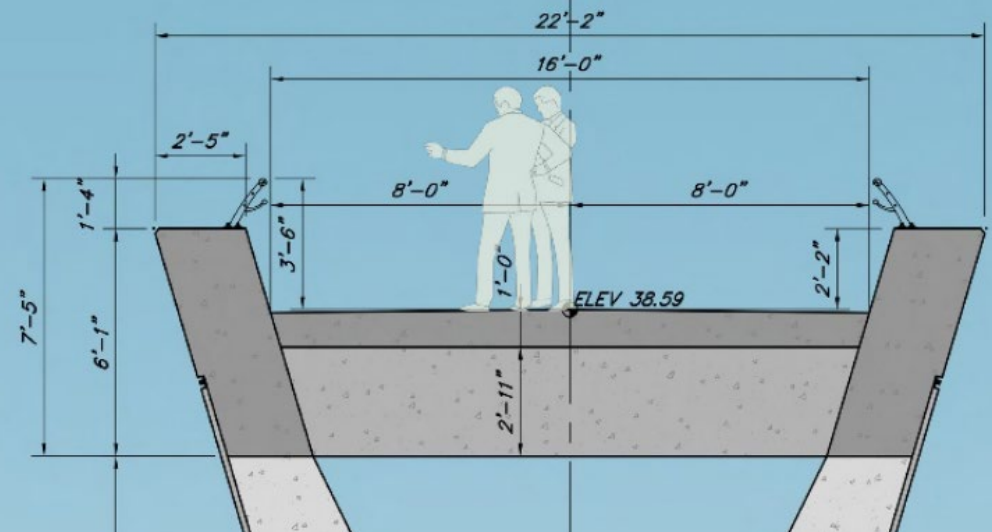
SR519 SEATTLE FERRY TERMINAL
MULTIMODAL TERMINAL AT
COLMAN DOCK PLANS.



Bridge Width Study

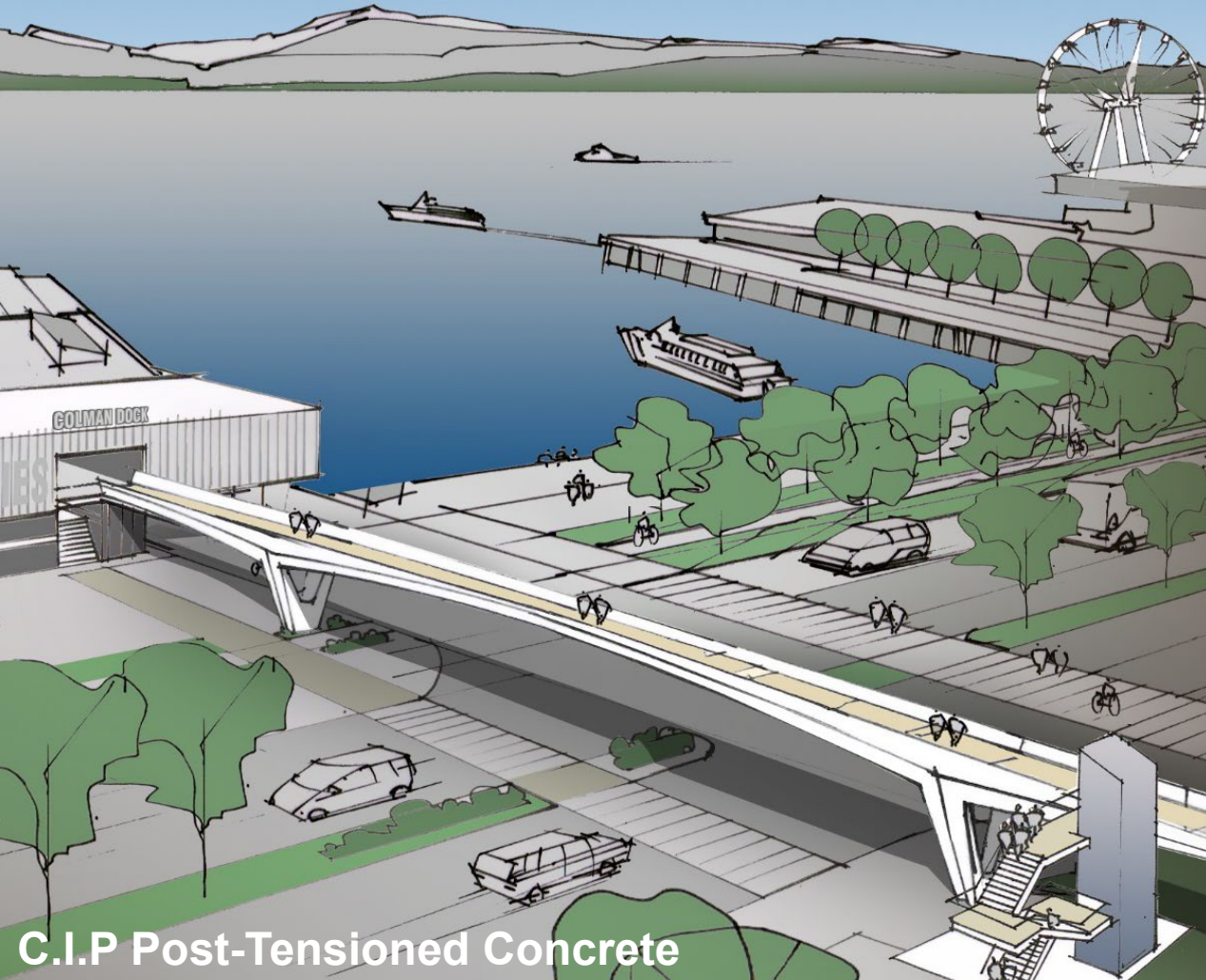
Design criteria

- Level of Service (LOS) C for peak commute times and LOS D for special events
- 30-year pedestrian volume projection (2045)
- TRB *Transit Capacity and Quality of Service Manual*
- Existing bridge - 11 feet wide with inadequate LOS

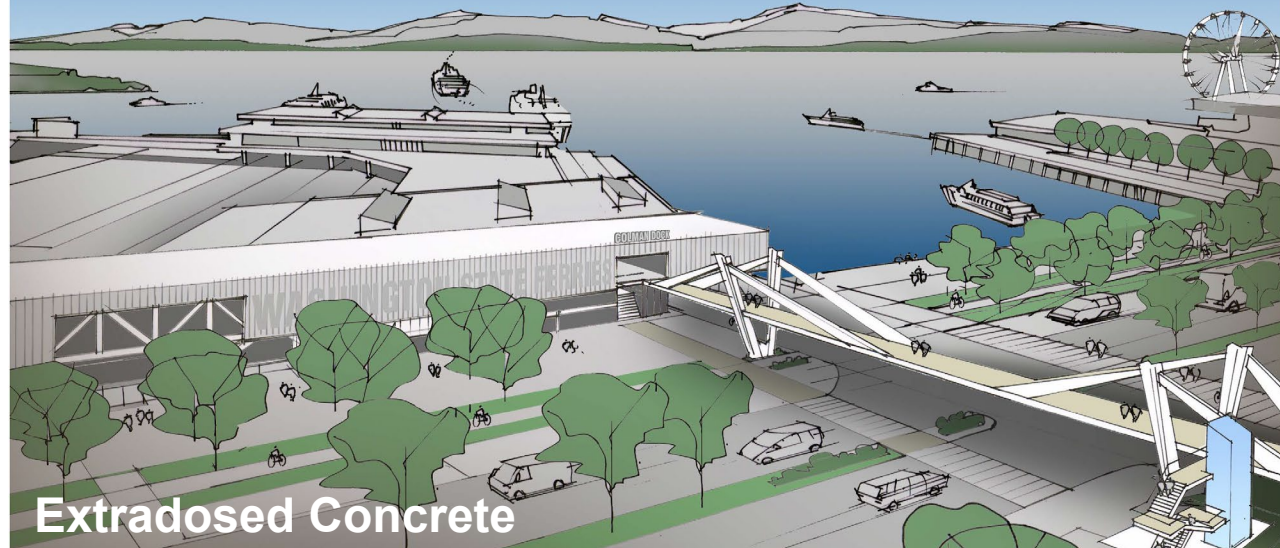


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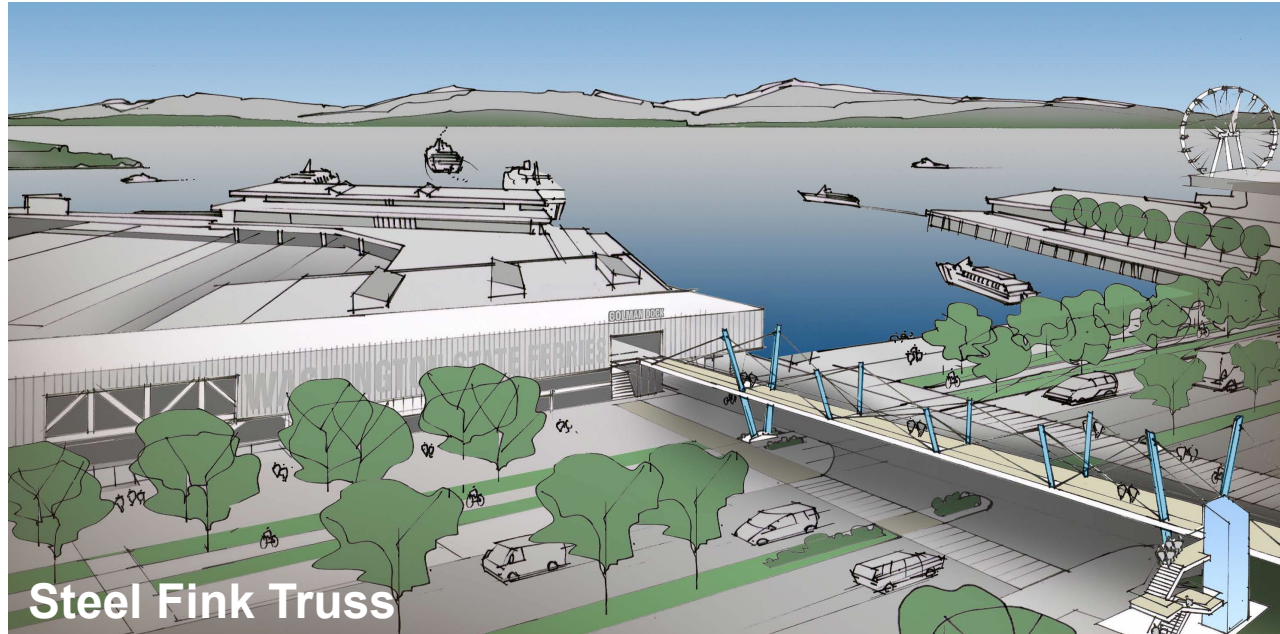
Structure Alternatives



C.I.P Post-Tensioned Concrete



Extradosed Concrete

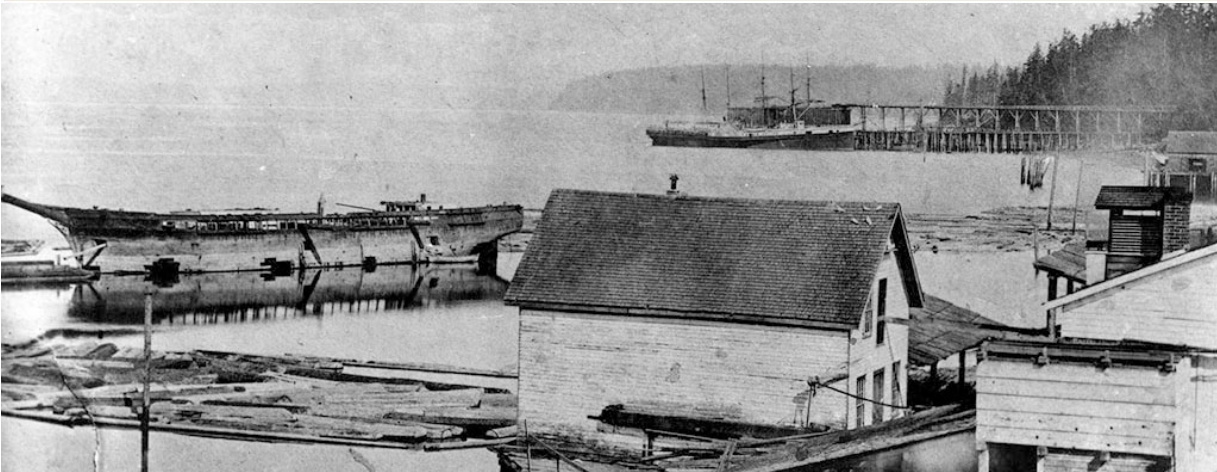
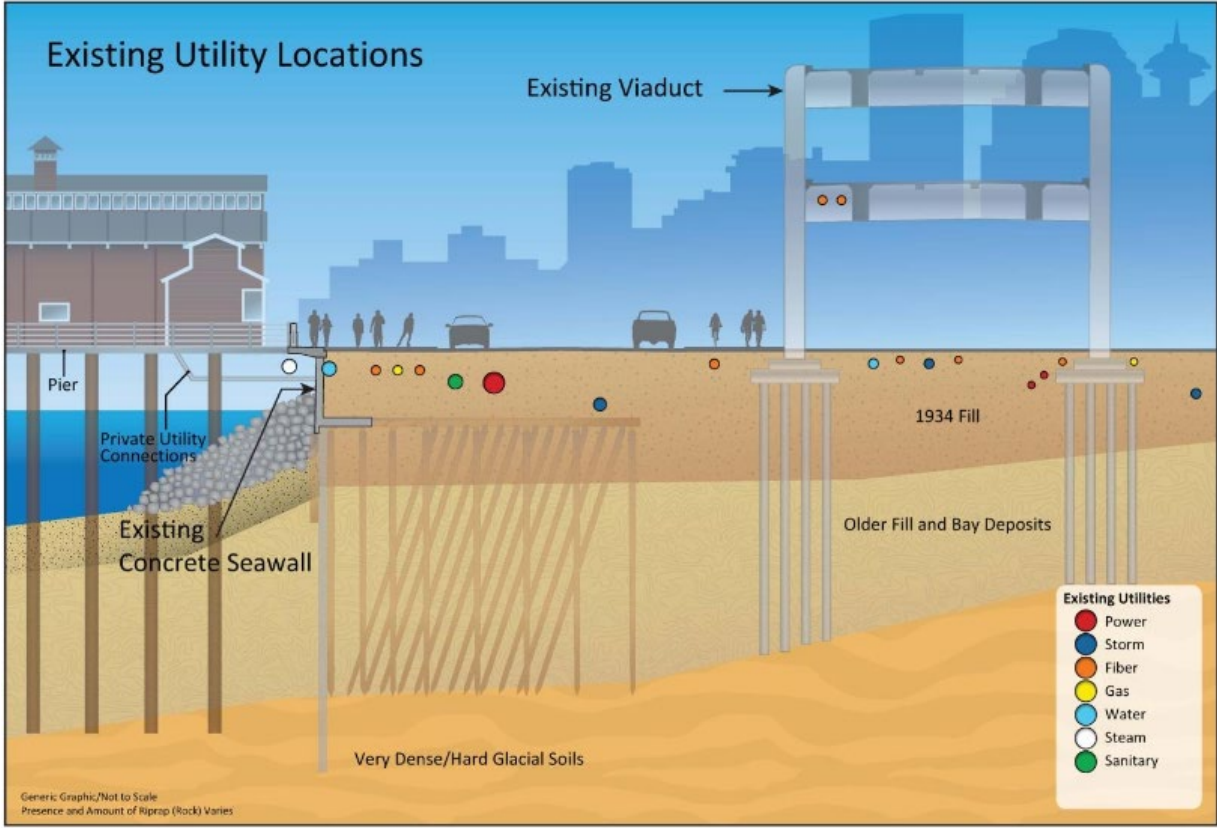


Steel Fink Truss

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03 Foundation & Substructure



Potential Shaft Conflicts

- Pier 1: Piles and tiebacks from seawall temporary shoring abandoned in place
- Pier 2: Abandoned Alaskan Way Viaduct foundation piles
- Pier 2: Existing 12" gas line
- Drills hit nothing
 - Didn't find buried *Windward* abandoned and derelict vessel

Mainspan Shafts



- 9'-10" nominal diameter drilled shafts 80' deep with permanent slip casing
- Completed in two separate construction projects
 - Up to construction joint built with main corridor
 - Top 8.5 ft built with bridge columns and superstructure
- Adjacent to the seawall and improved soil mass



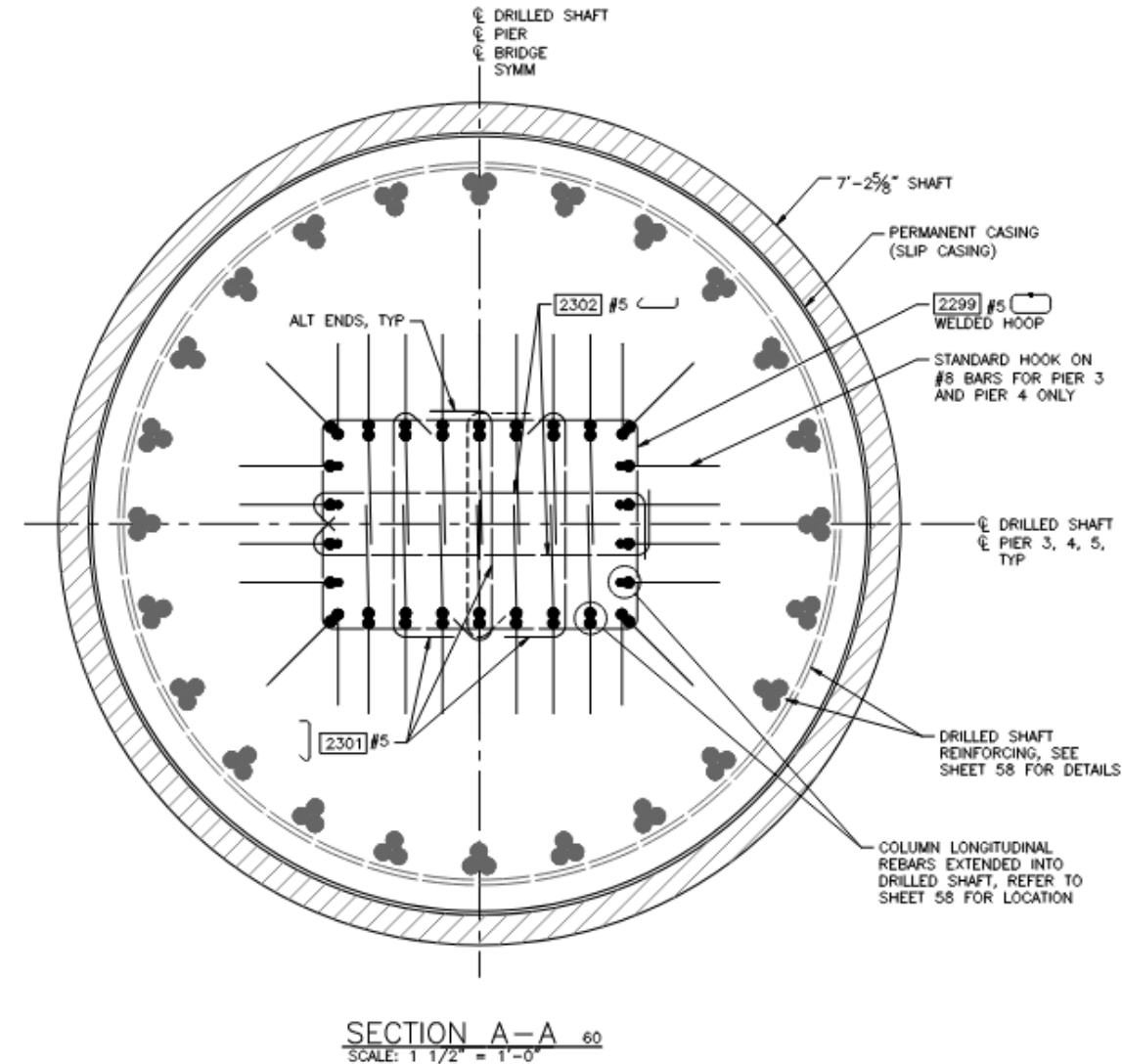
Mainspan Substructure

- 19 different FBMP combos
- V-shaped columns
- Piers 1 & 2 geometry identical above grade
- Tapers in two directions



Approach Shafts

- 7'-2 5/8" nominal diameter drilled shafts 75' deep with permanent slip casing
- Shaft conflict with existing pile
- Monitoring for settlement
- Designed for loading from future underground parking garage

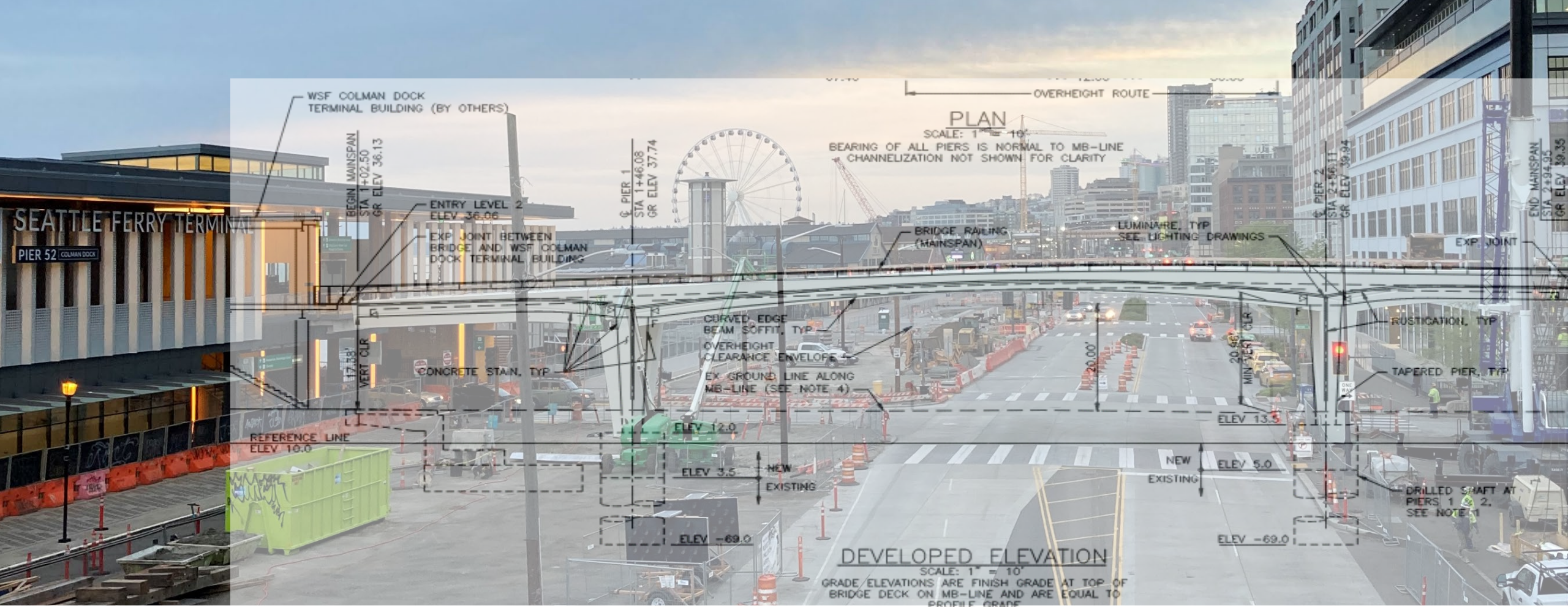


Approach Substructure

- Y-shaped columns
- Column geometry is constant with difference in height taken at the base
- Tapers in two directions cause complex rebar fabrication and install especially within plastic hinge regions



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04 Superstructure



Mainspan Superstructure

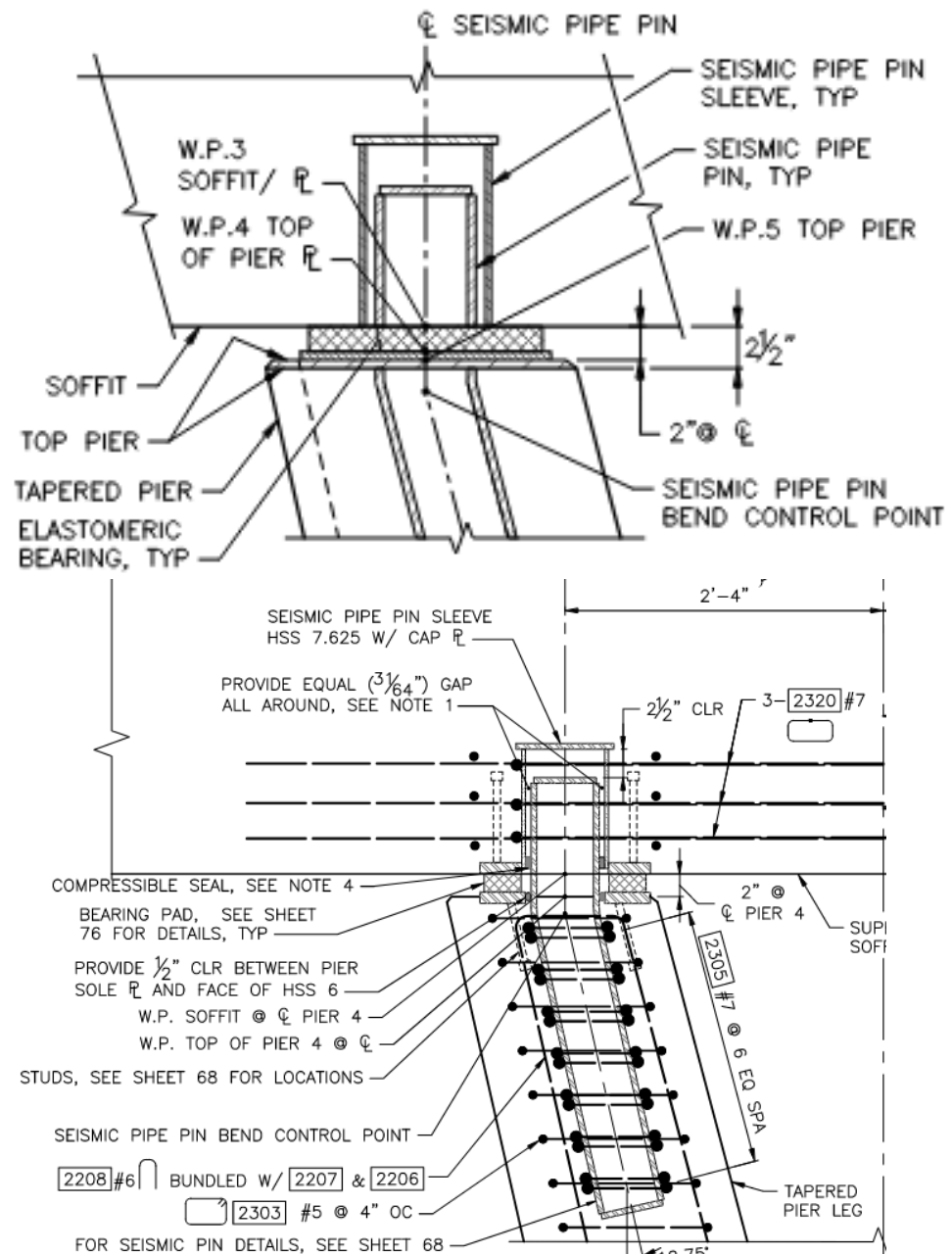
- Integral connections to pier columns
- Post-tensioned, CIP superstructure
- Variable depth edge beams
- 16' wide crowned deck
- Falsework for cantilever loads the seawall



Approach Superstructure

- Spans of 59'-3"
- Seismic pipe pin connections to pier columns
- Post-tensioned, CIP concrete
- Constant depth
- Future phase will match approach structure
- Spans over sidewalk

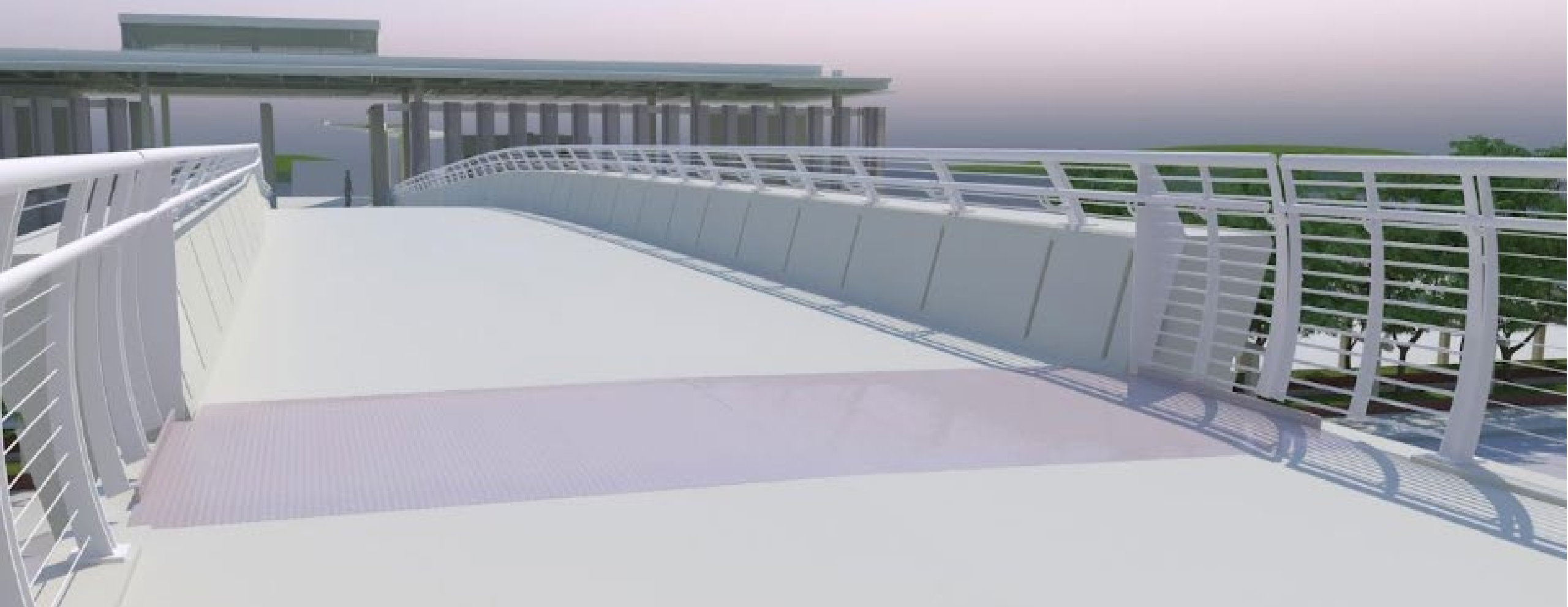




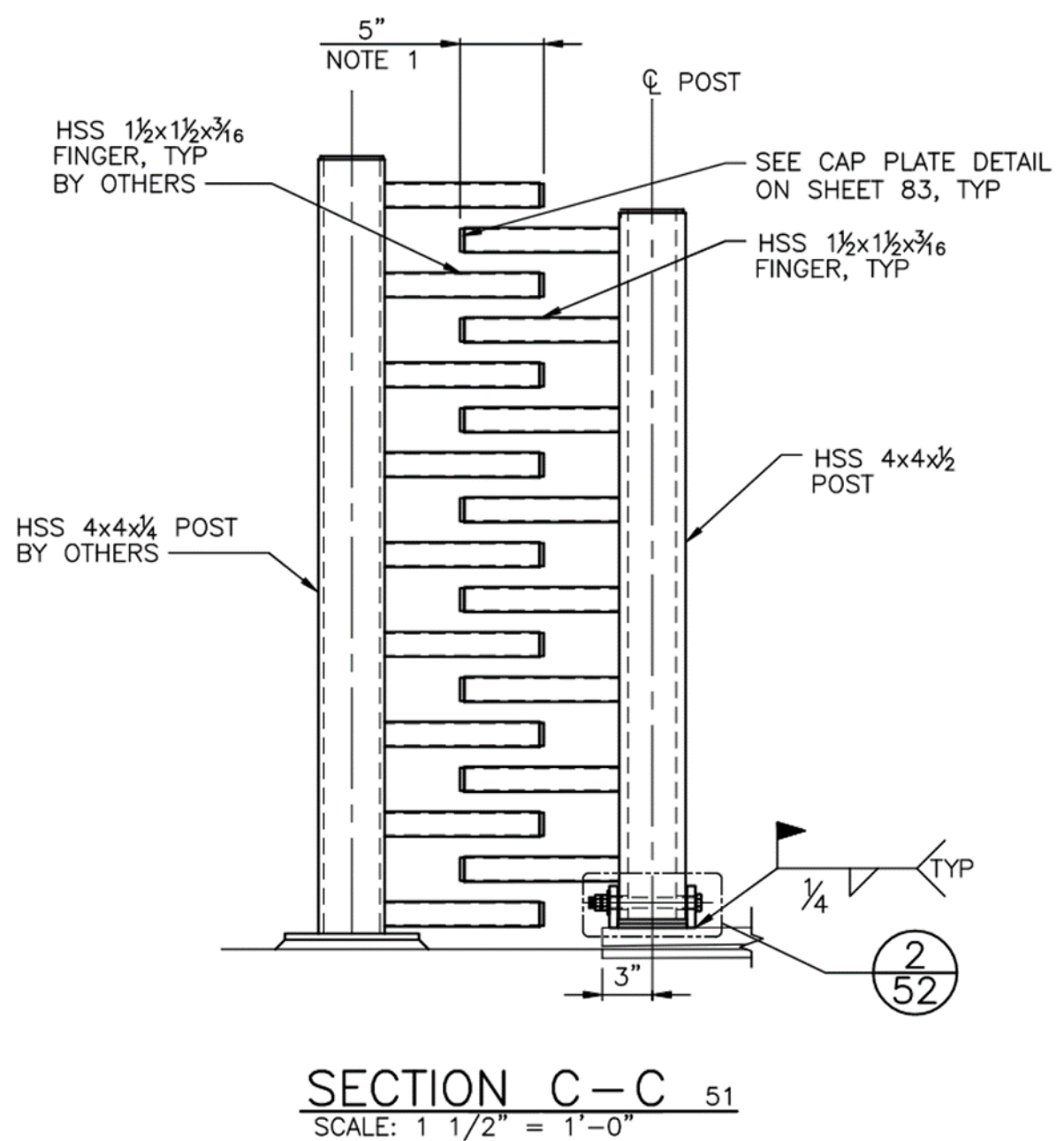
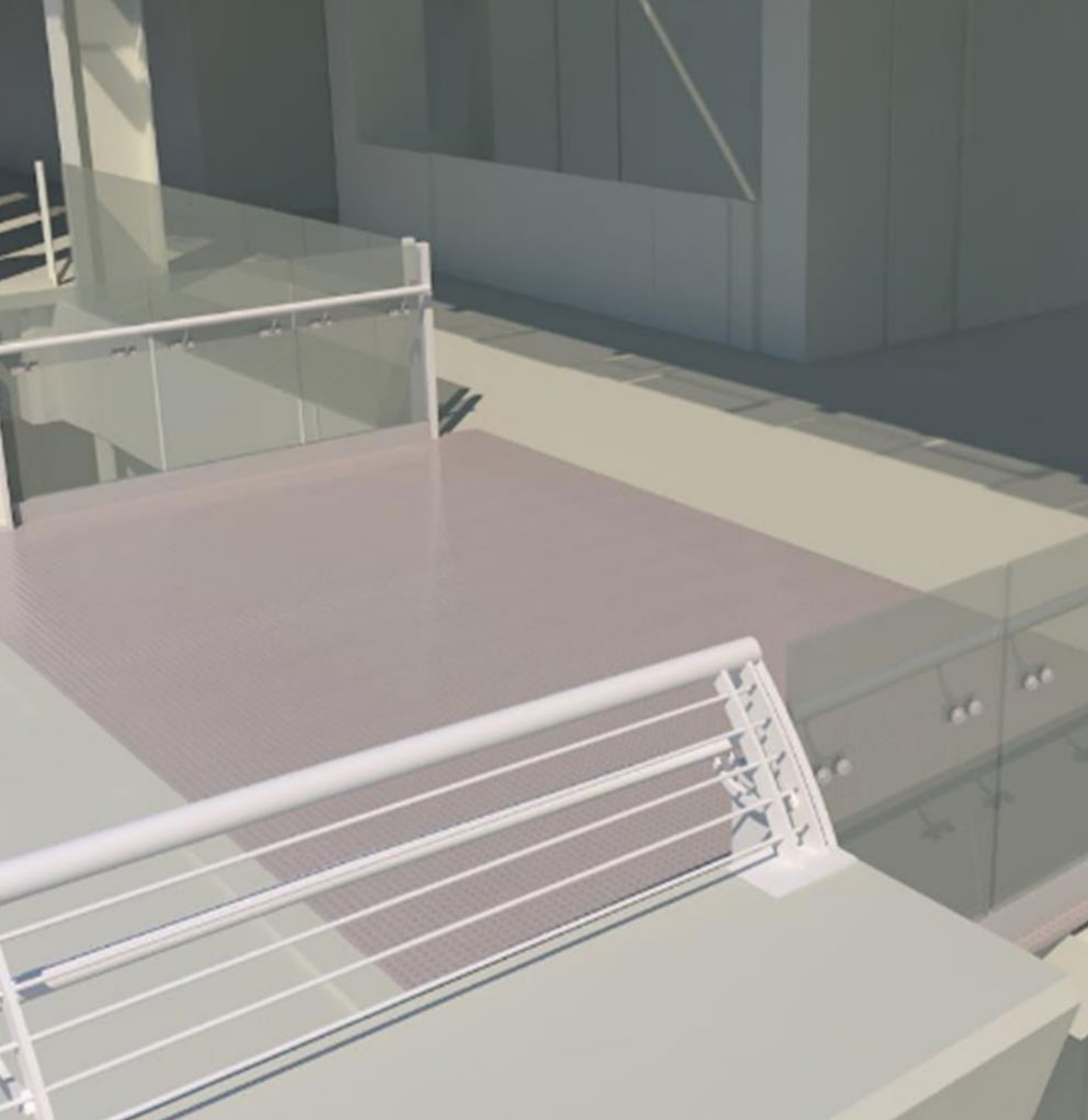
Approach Seismic Pipe Pin

- Pipe pin sleeve placed over pipe pin for service level movements (creep, shrinkage, thermal)
- Compression seal between sleeve and pipe pin
- Reinforced elastomeric bearing pads on steel sole plates
- Heavily reinforced diaphragms and columns including rebar welded onto sleeve and pipe pin
- Pier 5 will have double the pipe pins for future phase connection
- Electrical conduits snake through pipe pin



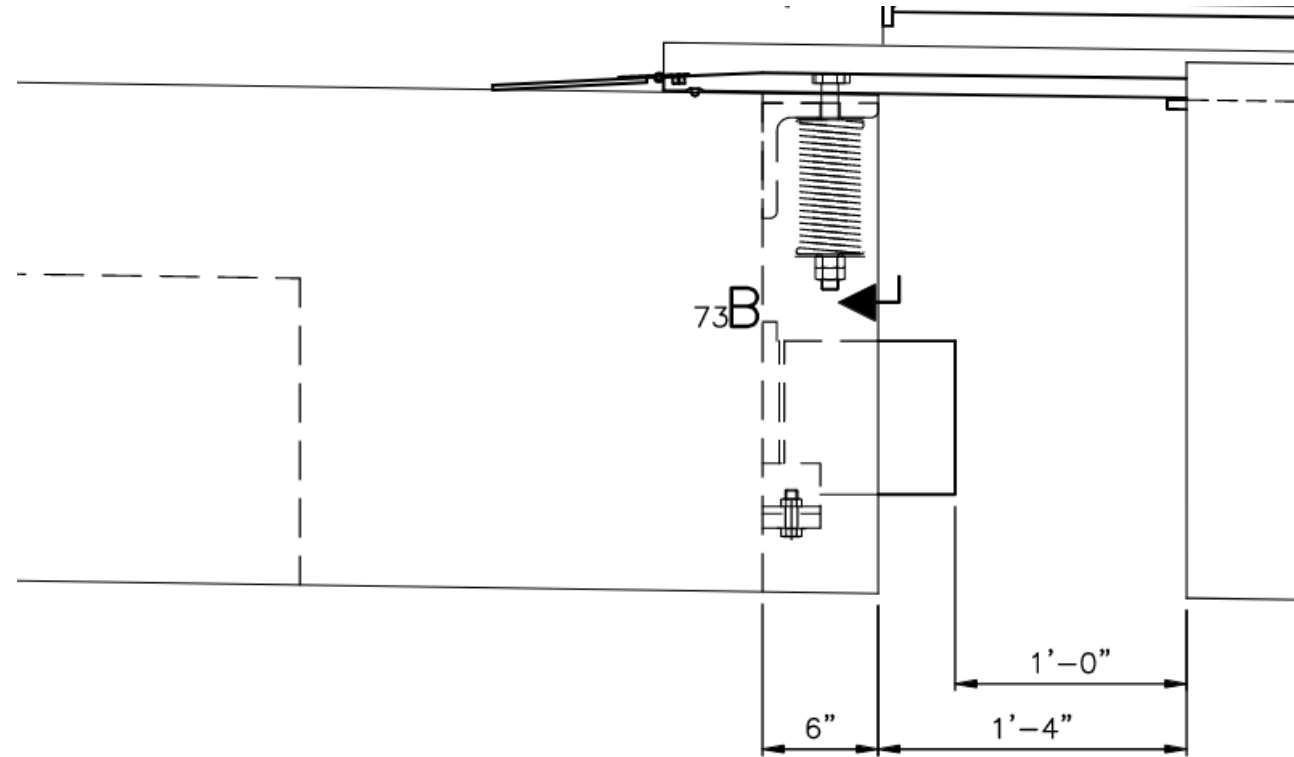
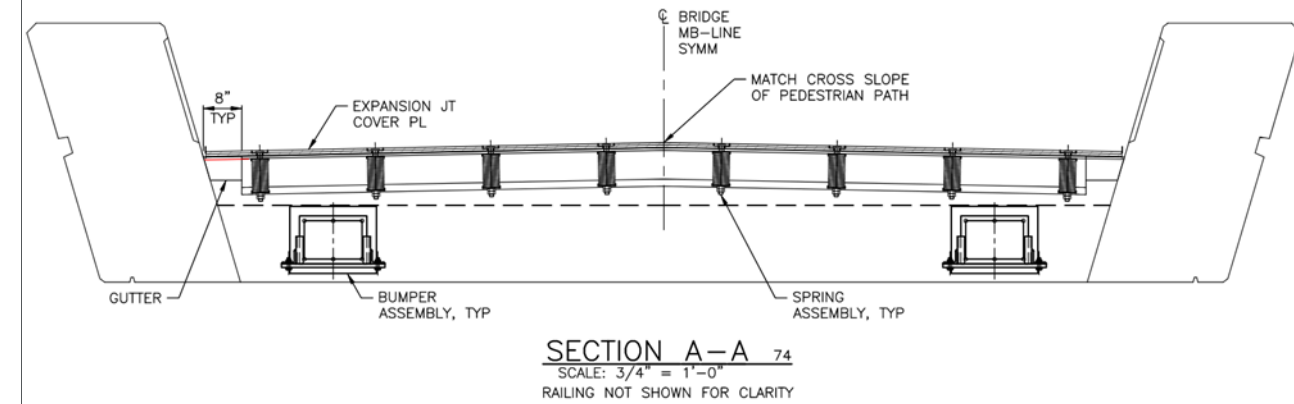


05 Transitions



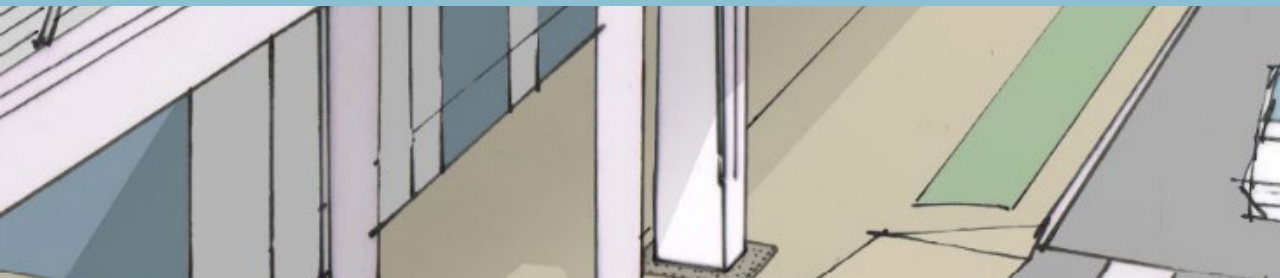
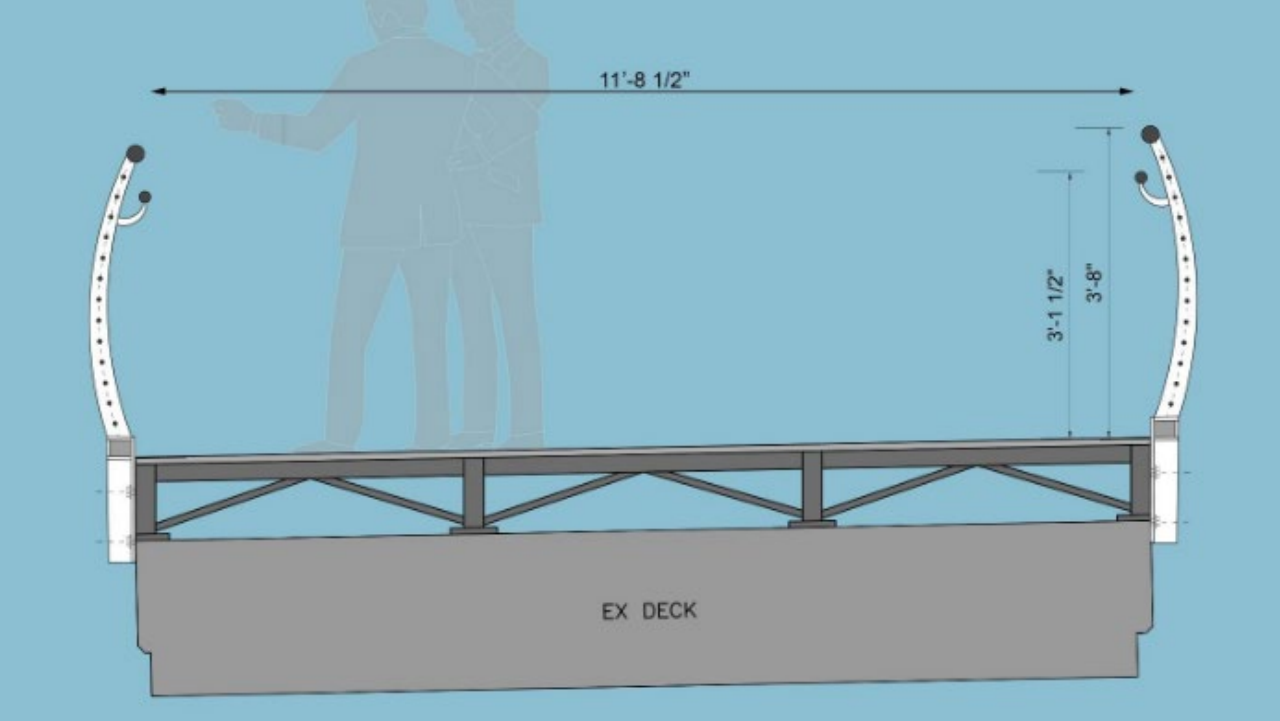
Mainspan to Approach

- Pedestrian railing – rodded bays to emulate cable
- Expansion joint similar to transition to Colman Dock
- Bumper system to reduce needed seismic gap
- Bridge drainage down approach column to hide from view from main corridor



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Approach to Existing Bridge



- Transition bridge – contractor designed using aluminum
- Change in walkable width, offset centerlines, change in height
 - Curved overlook area used in lieu of hard point in walking path
- New pedestrian railing along existing bridge to 1st Ave
- Temp bridge attaches at the existing bridge – swap over access over a weekend



06 Aesthetics





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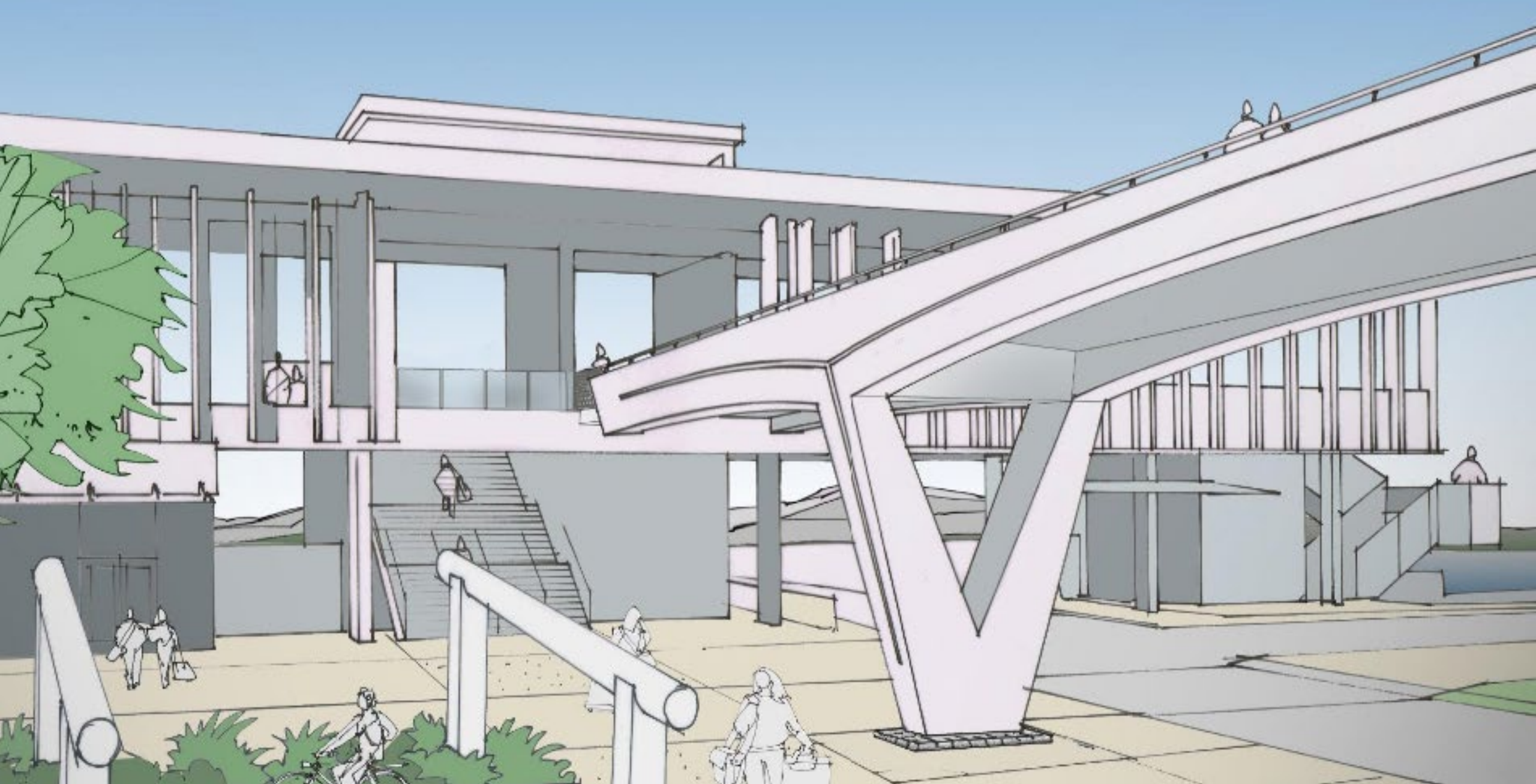
Aesthetics

- Broom finished walking surface
- Visible concrete surfaces use class 1 finish and are stained 'Insignia White'
- Stainless steel used where possible
- Rustication
- Lighting in top rail
- Color optional lighting: underdeck wash lighting, column interior uplights, and column exterior downlights



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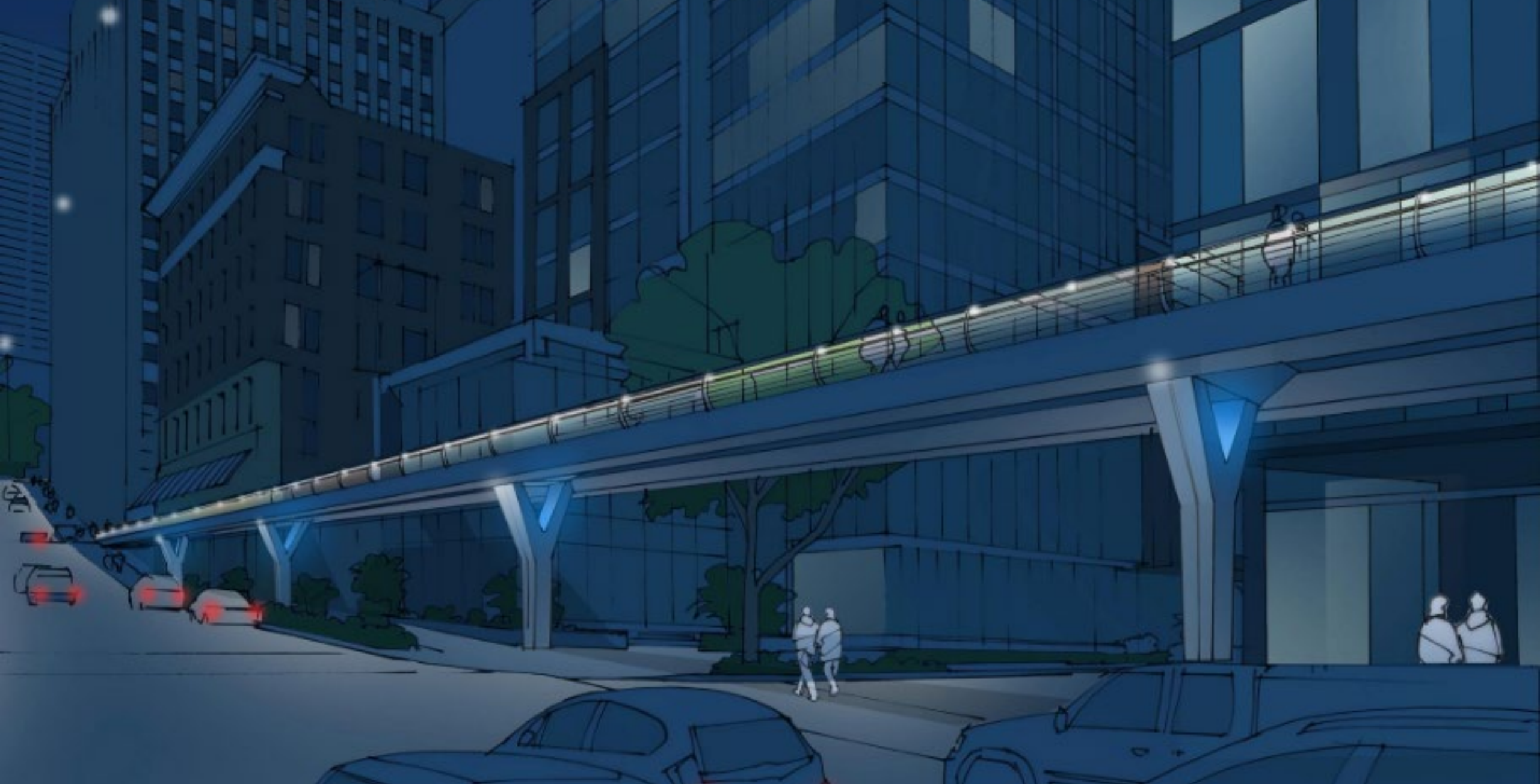
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Any Questions?