IMPACT STATEMENT

Legislation title: Support TIGER grant application to seek federal funds to design and construct Outer Powell Boulevard Transportation Safety Project Segment 2 and 3 from SE 116th Avenue to 162nd Avenue, in substantial conformance with 2012 Outer Powell Boulevard Conceptual Design Plan. (Resolution)

Contact name: **Art Pearce**
Contact phone: 823-7791
Presenter name: **Art Pearce & Mark Lear**

Purpose of proposed legislation and background information:
The purpose of this legislation is to show the City of Portland's support to be a co-applicant with ODOT on a TIGER grant application to seek federal funds to design and construct the Outer Powell Boulevard Transportation Safety Project Segments 2 and 3 from SE 116th Avenue to 162nd Avenue, in substantial conformance with 2012 Outer Powell Boulevard Conceptual Design Plan.

Southeast Powell Boulevard is an important corridor serving many modes of transportation and a major route linking southeast Portland with the Central City and Gresham. Outer Powell Blvd is a High Crash Corridor, lacks continuous sidewalks, and is substandard for all modes.

The Outer Powell Conceptual Design Plan, from approximately SE 99th Avenue to SE 174th Avenue, identifies improvements that will allow SE Powell Boulevard to continue serving vehicle traffic movement while also improving the safety, accessibility and the aesthetic environment for pedestrians, cyclists and transit riders. With the passage of Resolution No. 36931 on June 7, 2012, City Council adopted the Outer Powell Conceptual Design as Non-Binding City Policy and supported further implementation

Financial and budgetary impacts:
This project has a positive financial impact by increasing the likelihood that the City will receive external grant funding, increasing our ability to cover non-SDC eligible costs, and by decreasing pressure on discretionary revenues that would otherwise be required to complete these projects.

The current TIGER grant request builds off of recent efforts to get additional funding for this project. State Representative Shemia Fagan, State Representative Jessica Vega-Pederson and others in the East Portland Delegation secured $20 Million from the Oregon State Legislature for Outer Powell Boulevard. In addition to this funding, PBOT has secured $3 Million of Regional MTIP 2016-2018 funds for Outer Powell Boulevard.

Since ODOT will be the project manager for this project, PBOT is not anticipating any increase in existing staffing levels.

Community impacts and community involvement:
City Council authorized an agreement with the Oregon Department of Transportation to accept a federal Transportation and Growth Management grant to develop an Outer Powell Conceptual Design Plan from approximately SE 96th Avenue to SE 174th Avenue.

The East Portland Action Plan (EPAP) Committee in recognition of the importance of future improvements to Outer Powell Blvd provided the Portland Bureau of Transportation (PBOT) the required local match for the Transportation Growth Management grant used to fund this project. Community members throughout the corridor contributed to the planning process through a community workshop, three open houses, and monthly Citizen Working Group meetings between April 2010 and January 2012. Since 2012, ODOT has continued with additional extensive public outreach to further refine the proposed project.

ODOT has led additional broad and inclusive stakeholder outreach in 2014 and 2015 through their Outer Powell Transportation Safety Project. This outreach was a part of the plan refinement phase and Federal National Environmental Policy Act (NEPA) review process. It included a Community Advisory Group, targeted outreach to community groups of many cultures, corridor walks in multiple languages, bike rides, open houses, online input and more. The ODOT project is based on the recommendations of the Outer Powell Conceptual Design Plan. Learn more: www.outerpowellsafety.org/

The East Portland Land Use and Transportation Committee (EPLUTC) and the East Portland Action Plan jointly affirm that improving outer SE Powell Boulevard, in accordance with the 2012 'Outer Powell Boulevard Conceptual Design Plan,' was their number one transportation priority in 2014 – East Portland represents 20% of the City of Portland and includes 13 Neighborhood Associations and over 150,000 Portlanders living roughly east of I-205 to the Gresham border.

The East Portland Action Plan Committee encourages PBOT to seek all large Federal, State, Metro, City, and TIGER funding opportunities to fund and implement the Outer Powell Conceptual Design Plan.

The Outer Powell Transportation Safety Project is in alignment with the 2035 Comprehensive Plan guidance to use an equity lens when making infrastructure decisions. Building this project will address existing infrastructure deficiencies, particularly for walking, biking and access to transit. It will help ensure that low-income communities, communities of color and people with disabilities have equitable access, especially to sidewalks, parks and safe streets.

The Outer Powell Transportation Safety Project will help support key policies in Portland's Comprehensive Plan Update and vision for 2035. In particular, providing continuous sidewalk corridors, better bicycle facilities, more frequent enhanced crossings, better access to transit, greener stormwater management facilities, minimal roadway widening and improved safety for all modes with this project are all in alignment with the Plan's five guiding principles of Economic Prosperity, Human Health, Environmental Health, Equity and Resilience.

As a prime example, the Outer Powell Transportation Safety Project will help create healthy and connected complete neighborhoods by providing safe and convenient access for people of all ages and abilities to more of the goods and services needed in daily life. 'Increasing access to complete neighborhoods' is a key part of the Plan's 'Human Health' guiding principle.

For additional information on the extensive public involvement and community input on these projects please contact April Bertelsen (503) 823-6177.

Budgetary Impact Worksheet

Does this action change appropriations?

☐ **YES**: Please complete the information below.
☐ **NO**: Skip this section

Fund	Fund Center	Commitment Item	Functional Area	Funded Program	Grant	Sponsored Program	Amount

KK 4-15-16

ALTERNATIVES ANALYSIS REPORT

FOR

Sullivan's Crossing Bicycle and Pedestrian Bridge over I-84

Using Alternative Alignments

April 25, 2016

PBOT

PORTLAND BUREAU OF TRANSPORTATION

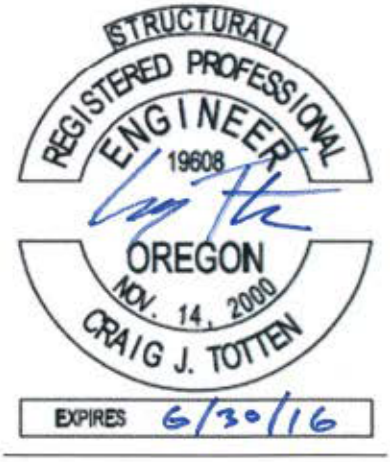
Prepared for:

David O'Longaigh, S.E

Supervising Engineer, Bridges & Structures
Portland Bureau of Transportation

Prepared By:

KPFF Consulting Engineers
Contributors: Architectural Applications and GRI



EXECUTIVE SUMMARY

The proposed Sullivan's Crossing Bicycle and Pedestrian Bridge will provide a pedestrian and bicycle connection from NE 7th Avenue in the Lloyd District to the intersection of NE 8th Avenue & NE Glisan Street (Alignment 1) or to NE 7th & Flanders Street (Alignment 2) in the Central Eastside Industrial District. The project will form a key link in the "Green Loop" described in the Central City Plan. The objective of this work was to evaluate multiple bridge type alternatives for a range of criteria and provide reliable cost information to PBOT before applying for funding.

Alignment 1 is nominally 340' in length and spans across easements controlled by PBOT, UPRR, I-84, and ODOT. However, during the course of this alternatives analysis, it was determined that the south approach to all bridge options along Alignment 1 may hinder truck movements through the intersection of NE 8th Ave. and NE Glisan St. Therefore, Alignment 2 has been added to these evaluations. Alignment 2 is nominally 470' in length and spans the same easements and features as Alignment 1. Only the preferred alternative from Alignment 1 was evaluated for Alignment 2.

The structural, urban, and cost implications of five separate bridge types were studied for implementation along Alignment 1. The five options were:

Alignment 1	
Option #	**Option Name**
1A -	**Pre-manufactured two-span (140'-180'), steel through-truss**
1B -	**Pre-manufactured single-span (320') Steel Tied Arch with Bottom Chord Truss**
2 -	**Torsional Suspension with Back-stayed Masts**
3 -	**Over/Under- (340 ft. Span) Steel Suspension**
4 -	**Deck-Tied, Steel Arch (363 ft.) with Drop-In Span**

Option 4, which is the preferred bridge type alternative along Alignment 1, was also evaluated for use on Alignment 2. This bridge option is referred to as Option 5.

Alignment 2	
5	**Deck-Tied, Steel Arch (470 ft.) with Drop-In Span**

Option 2 was eliminated from further consideration due to bridge pier location conflict with ODOT's plans for possible future interstate widening. Studies of the remaining options were completed to a 15% development level. The developed options were evaluated by project stakeholders on a series of jointly established criteria that included i) costs, ii) aesthetics, iii) community, iv) schedule, v) risks & constructability, vi) environmental impacts, vii) permitting, and various other criteria.

While none of the options studied has been definitively selected at this stage of the project, Option 4 displays considerable merit, including comparatively high rankings for aesthetics, community issues, constructability, and ease of inspection. It also compares favorably in terms of total cost. Option 5 has similar characteristics and merits as Option 4 with the primary differences being longer bridge length, higher costs, and avoidance of impacts to truck traffic through the NE 8th Ave. & NE Glisan St. intersection This information will enable PBOT to advance the project into subsequent phases of planning, fund raising, and coordination. All options studied in this report as well as additional alternatives may be reconsidered and evaluated in more detail in support of the development of a final bridge design for the site.

Table of Contents

I. INTRODUCTION & PROJECT BACKGROUND

The proposed Sullivan's Crossing Bicycle and Pedestrian Bridge will provide a pedestrian and bicycle connection over Interstate 84 and UPRR from NE 7th Avenue in the Lloyd District to the intersection of NE 8th Avenue & NE Glisan Street (Alignment 1) or to NE 7th Ave & Flanders St. (Alignment 2) in the Central Eastside Industrial District. An aerial view of the proposed alignments are shown in Figure 1. A view of the site from the 12th Avenue Bridge over I-84 is shown in Figure 2. The project will form a key link in the City's "Green Loop" further described in the Central City Plan and shown graphically in Figure 3.

The need for a bridge has been recognized by multiple stakeholder groups. The excerpt below from the Central City 2035 North/Northeast Quadrant Plan (October, 2012), summarizes the context

> *The Lloyd District is surrounded in the south and west by natural and man-made barriers. To the south there is Sullivan's Gulch, the active Union Pacific line, the light rail line and the I-84 freeway separating Lloyd from the Central Eastside.*
>
> *Three bridges connect these two areas: the overpasses at MLK and Grand and the 12th Avenue Bridge. These bridges serve the needs of all modes, concentrating high numbers of vehicles with transit lines, trucks, pedestrians and cyclists. The Grand and MLK overpasses are loud and have substandard sidewalks and fast moving vehicles. Conflicts between vehicle and pedestrian needs are most present at Grand and Everett, where there is an on-ramp onto I-84 with a free right turn for vehicles. Pedestrian crossing is not allowed at this leg of the intersection.*
>
> *There are no bicycle lanes on the MLK and Grand bridges. Streetcar tracks have been installed as part of the Streetcar Loop project, which precludes adding bike lanes adjacent to the curbs. The 12th Avenue Bridge has recently received bicycle infrastructure improvements; however, the 12th Avenue Bridge is located too far east to serve most travelers to and through the district.*
>
> *These factors support the need for an additional crossing to serve pedestrians and cyclists with a safe and convenient new connection with direct access to the heart of the Lloyd District. Given the presence of existing bicycle lanes on NE 7th in the Lloyd District and of a building in good condition at the end of NE 9th in the Central Eastside that would need to be demolished to provide a 9th Avenue to 9th Avenue connection, the best alternative routes are from NE 7th in the Lloyd District to either 7th or 8th (shortest distance) in the Central Eastside.*

The Scope of Work presented in this report is intended to provide an Alternatives Analysis to identify constraints, challenges and approximate costs associated with four potential bridge types along Alignment 1 and 1 bridge type option along Alignment 2.

The planned bridge along Alignment 1 will be approximately 340 ft. long by 24 ft. wide and span over seven (7) lanes of I-84 traffic, two (2) active mainline railroad tracks, and Sullivan's Gulch. The embankment at the north end of the proposed bridge location between UPRR and NE Lloyd Boulevard is owned by PBOT. The embankment at the south end of the proposed bridge is owned by ODOT. For all Alignment 1 options studied, the deck elevation for the bridge's northern and

southern tie-ins will be approximately at elevations +111' and +99', respectively. This vertical profile will result in a continuous slope of the bridge deck at a gradient of less than 4%.

The planned bridge along Alignment 2 will be approximately 470 ft. long (130 ft. longer than Alignment 1). It will have the same width, span the same properties, and have a similar north abutment location as described for Alignment 1. Bridge Option 5 will have a different south abutment location than Options 1-4.

Five different bridge types were initially considered and presented to PBOT as part of an earlier task of work. Of these five options, four were selected by PBOT to be advanced to a 15% level of design and costing for placement along Alignment 1. The most preferred of these 4 options was then evaluated with placement along Alignment 2 and advanced to a 15% level of design and costing. These five options are presented and compared in this report.

Two pre-manufactured bridge types have been included in the alternatives analysis in order to capture a low-cost benchmark for the project. A series of evaluation criteria were developed by the design team and each of the options studied was then evaluated against these measures. The bridge options studied and resulting evaluation criteria are detailed in subsequent sections of this report.

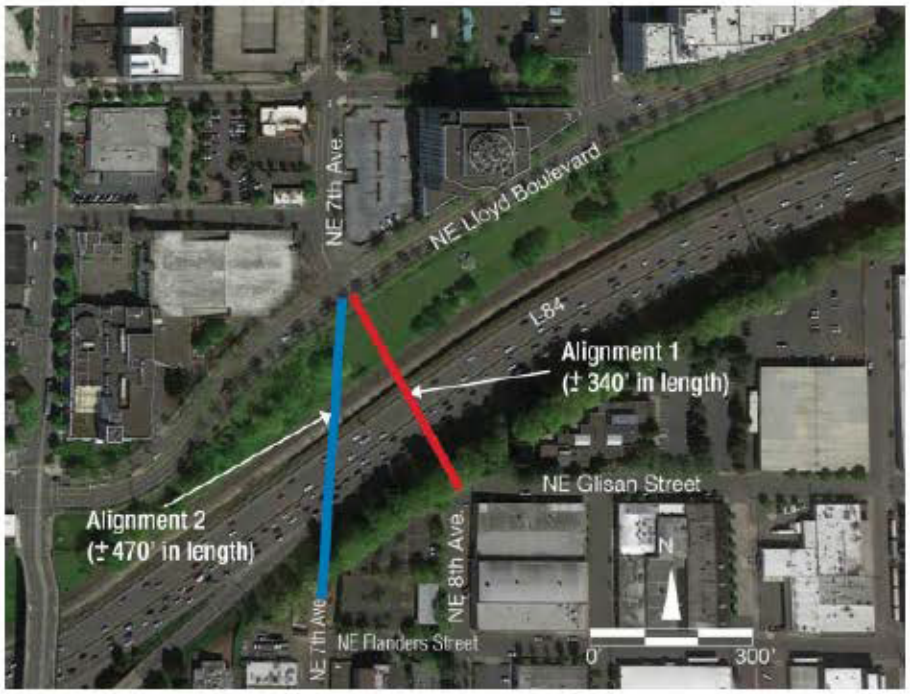


FIGURE 1: Potential Bridge Alignments

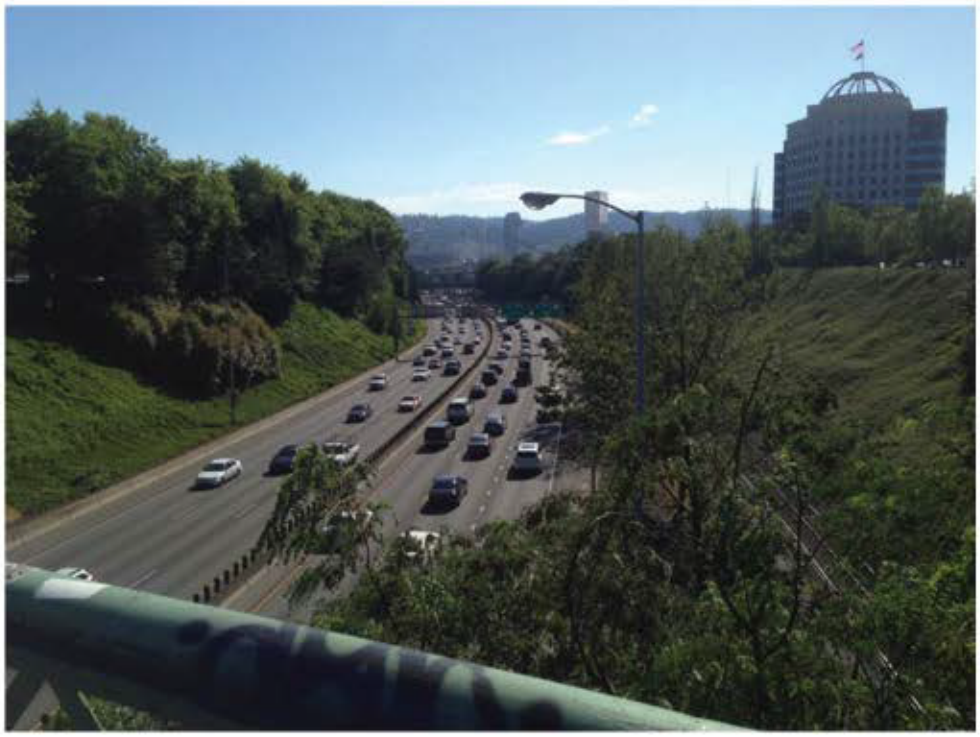


FIGURE 2: View Looking West from 12th Avenue Bridge

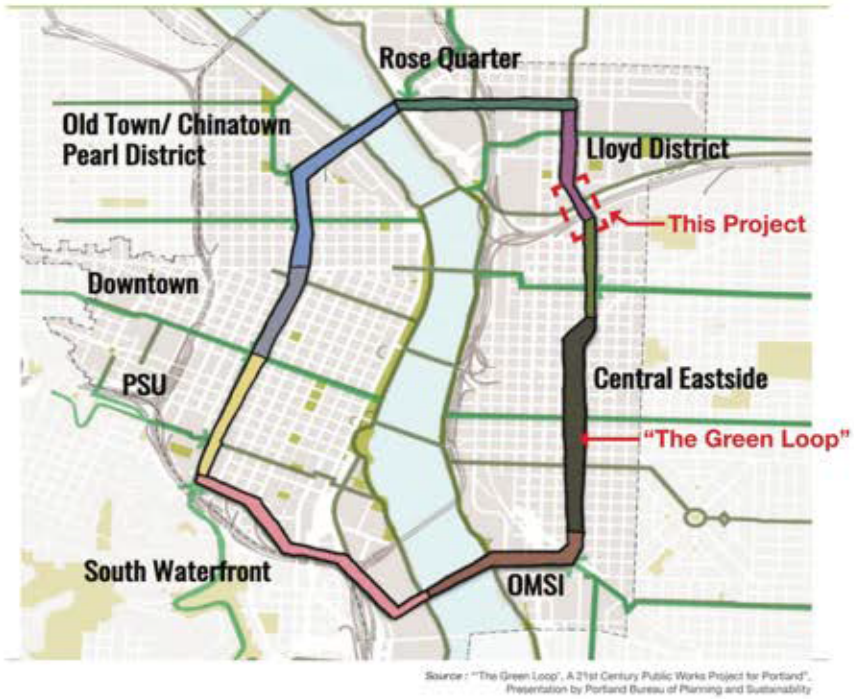


FIGURE 3: The Green Loop Walking and Bike Path

II. DESIGN CRITERIA & PROJECT CONSTRAINTS

The pedestrian bridge would be designed in accordance with the *AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges* with additional emergency vehicle live loading in accordance with an HS-20 truck per *AASHTO LRFD Bridge Design Specifications*. Additional design criteria and project constraints are outlined below:

Deck Dimensions: The deck width shall be a minimum of 24 ft. clear from inside face of rails and include two 6 ft. wide bicycle lanes in the center flanked by two 6 ft. wide pedestrian sidewalks. The sidewalks would be raised and separated from the bicycle lanes by a mountable curb. All options studied used this deck arrangement. See Figure 4 for a typical deck section. PBOT requires access across the bridge be provided for emergency vehicles. Therefore, hindrances or obstructions that reduce the usable width for an emergency vehicle is undesirable.

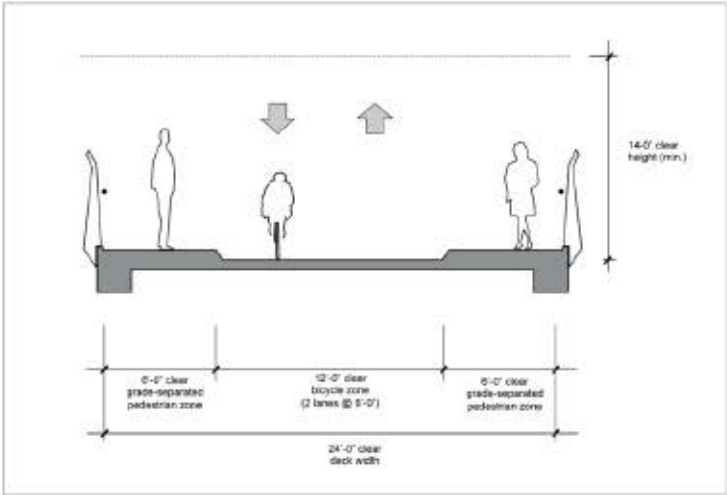


FIGURE 4: Bridge Deck Dimensions

Horizontal Alignment: Three possible horizontal alignments were identified for consideration prior to the initiation of this phase of work. The general alignment from NE 7th Avenue in the Lloyd District to the intersection of NE 8th Avenue and NE Glisan Street in the Central Eastside Industrial District was selected as one potential alignment. Another alignment that shifted the bridge's south abutment to the intersection of NE 7th Ave. & NE Flanders St. was selected as a second potential alignment. (See Figure 1).

Vertical Alignment: The profile for the bridge along both horizontal alignments would be a straight profile between the two landing sites. For Alignment 1, the vertical grade difference between the two ends is approximately 12 ft., which across the length of the bridge would result in a profile grade of less than 4%. The vertical profile for Bridge Option 5 would also be less than 4%. Both profiles would be less than ADA maximum grade of 5%. All bridge options must maintain a minimum vertical clearance of 17 ft. 6 in. above I-84 and 23 ft. 6 in. above the UPRR tracks. These clearances must be maintained throughout construction as well as for the permanent structure.

Geotechnical Conditions: GRI evaluated subsurface conditions based on past borings in the area and their local experience. No new borings were completed as part of this design scope. Based on this data and the anticipated bridge loads, deep foundations founded in the underlying gravel layer will likely be required. The most feasible deep foundation types include: drilled shafts, continuous flight auger piles, and auger cast piles. The foundations will need to be embedded into the dense gravel layer that is likely 50 ft. to 90 ft. below ground surface along the bridge's planned alignment. Size of shafts and required embedments will depend on final design loads; however, preliminarily, shaft diameters between 24 in. and 36 in. with embedments of 20 ft. to 30 ft. appear sufficient for bridge loads. Although no seismic analysis of the site was completed, GRI expects the risk of

seismically-induced soil liquefaction to be low. GRI's foundation memorandum dated December 2, 2015 is included in Appendix D of this report.

Hazardous Materials: GRI evaluated the potential for encountering hazardous materials along the proposed bridge alignment. Based on a research of available records and historical photographs, there is a possibility of encountering chemicals or petroleum products in excavations at the north and south bridge abutments due to gas stations having been located there in the past. GRI's hazardous material memorandum dated December 2, 2015 is included in Appendix E of this report.

Easements and Rights of Way: The design team considered right-of-way and easement constraints as potential bridge support locations were analyzed. ODOT's right-of-way extends 200 ft. from the south embankment, across I-84 and north to the existing retaining wall next to UPRR. ODOT stated during a meeting with the design team held on November 13, 2015, that the embankment to the south of I-84 should be preserved as an unencumbered easement in order to preserve their ability to add an eastbound lane in the future. In the same meeting, ODOT stated that it would be permissible to place a new bridge support within a strip of their R/W north of I-84 WB's outside shoulder. A copy of this meeting's Meeting Minutes is included in Appendix F. UPRR R/W begins north of ODOT's R/W and extends 30 ft. to either side of the track centerlines. All bridge options avoid placing any permanent or temporary installations on UPRR R/W.

Schedule: Bridge work over the interstate and UPRR will have schedule restrictions. Lane closures on the interstate will be restricted to late evening and early morning. Full interstate closures would likely be required when erecting long bridge assemblies over traffic and would be restricted to 4 hours on Sunday mornings. UPRR will require Railroad flaggers when the work is within 25 ft. laterally of their nearest track, including overhead. Most overhead work will need to cease when trains are present or approaching. Longer track closure periods for such work as erecting girders over the tracks will need to be coordinated well in advance with the Railroad. These allowable closure windows are typically 4 hours or less, and can change depending on daily train schedules.

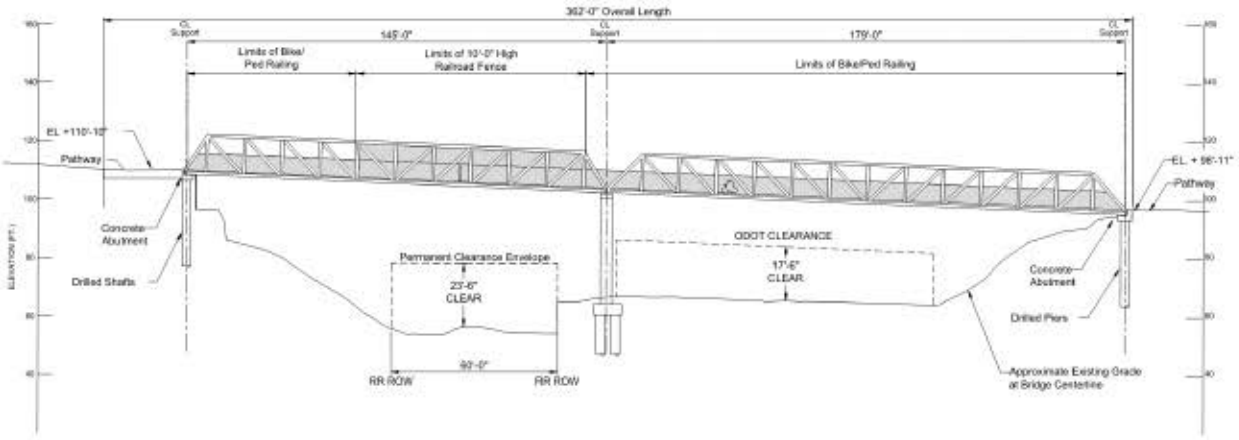
Possible Road Diet: PBOT is considering the possibility of narrowing NE Lloyd Boulevard in the vicinity of the north bridge landing by implementing a 'Road Diet" approach to reduce congestion at this critical junction. See Appendix C for PBOT's conceptual street re-design drawings.

Utilities: There are currently no plans for large utilities to be carried by the bridge. However, it is possible that some utilities, such as water, that currently are carried by less seismically resilient, nearby structures over I-84 and UPRR could be relocated to the new pedestrian bridge. Utilities placement will need to be considered in subsequent design phases. There is a buried sewer pipe along NE Lloyd Boulevard and another buried sewer pipe running along the south side of NE Lloyd Blvd. The latter sewer pipe is near the planned north bridge abutment and final design should confirm avoidance of it. There are overhead electric and communication lines along the south side of NE Lloyd Boulevard in the vicinity of the new crossing's north landing. These overhead utilities may need to be relocated to facilitate constructing the new bridge and approaches.

Other Constraints: ODOT has several overhead interstate guide signs mounted on the existing NE Grand Ave Bridge west of the planned new bridge alignment. Also, there is an existing overhead interstate sign bridge in line with NE 11th Avenue. Subsequent designs will need to coordinate with ODOT and analyze how the new bridge may impact sightlines to these signs. Adjustments to the signs, or possibly the bridge, may be necessary.

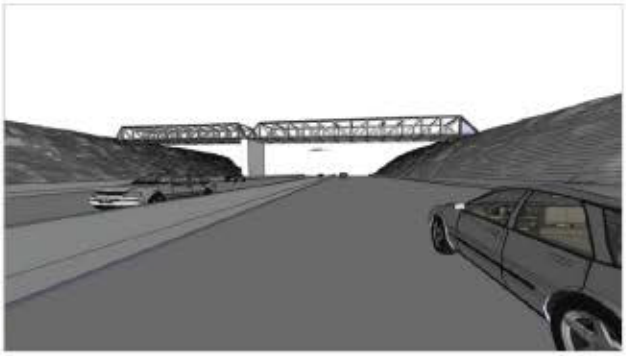
III. ALTERNATIVES STUDIED

Option 1 – Pre-manufactured two-span (140'-180') steel through-truss:



Option 1A – Elevation

Option 1A – Precedent Images



Option 1A – Perspective Renderings

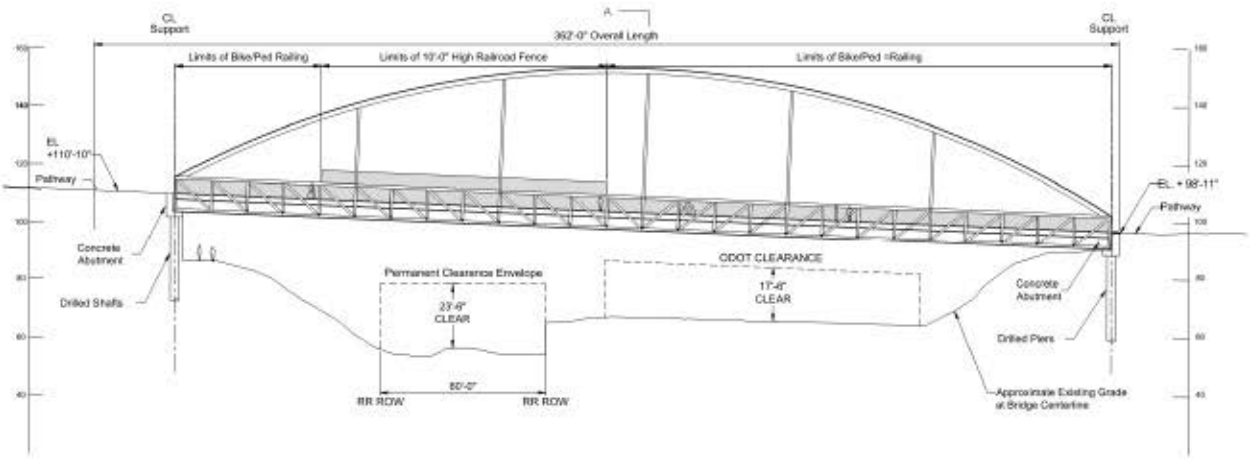
Significance:
This option was selected as one of two pre-manufactured bridge type solutions included in the study to provide a low-cost benchmark for the project.

Description:
Bridge option would consist of two pre-manufactured steel through-trusses with an intermediate pier located in ODOT R/W between the outside shoulder of I-84 WB and UPRR. The deck would consist of a cast-in-place concrete deck on stay-in-place metal deck forms spanning between steel deck stringers. Overall deck width would be 24 ft. with two 6 ft. raised sidewalks and two 6 ft. bike lanes. The above-deck, H-shaped truss would consist of a pair of side trusses connected with one row of braces below the deck. The steel materials would consist of weathering or painted steel in W-shaped or tube sections. Bike and pedestrian railing would be connected to the inside faces of the side trusses.

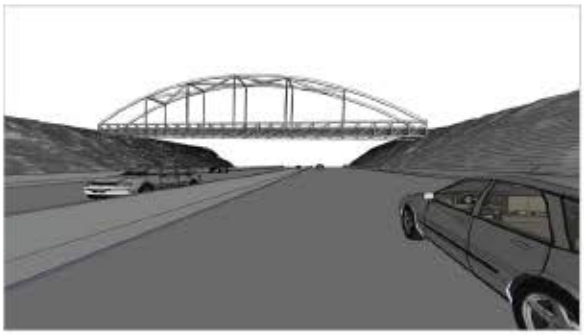
End abutments would consist of concrete caps founded on drilled concrete foundations extended down into the underlying dense gravels. The intermediate pier would consist of a concrete pier cap and concrete column founded on drilled concrete foundations and concrete foundation cap.

Construction:
Construction of the intermediate pier would occur between the outside shoulder of I-84 WB and the Railroad R/W. Therefore, this option would require more temporary access off of the interstate. The bridge superstructure would be delivered in sections that would be assembled on-site. The southern bridge span would be erected in a single crane pick over both directions of I-84. This would require a complete a closure of I-84 while the bridge span is erected. The northern bridge span would be erected in a single crane pick over the railroad. This would require careful advanced coordination with the Railroad to establish an acceptable train closure window of several hours.

Option 1B – Pre-manufactured single-span (320') steel tied arch with bottom chord truss:



Option 1B – Elevation



Option 1B – Perspective Views

Option 1B – Precedent Images

Significance:
This option was selected as the second of two pre-manufactured bridge type solutions included in the study to provide a potential low-cost benchmark for the project.

Description:
Bridge option would consist of a pre-manufactured steel arch with steel trusses forming the bottom chords, or ties, of the arch. The deck's steel stringers would be suspended from cables off of the overhead arch. A cast-in-place concrete deck on stay-in-place metal deck forms would span between the deck stringers. Overall clear deck width would be 24 ft. with two 6 ft. raised sidewalks and two 6 ft. bike lanes. The concrete deck and bottom chord trusses would serve as a tension tie between the ends of the arch. The steel arch members extending above the trusses would be connected with braces at necessary intervals. The steel would consist of weathering or painted steel tube sections. Bike and pedestrian railing would be connected to the inside faces of the side trusses members.

End abutments would consist of concrete caps founded on drilled concrete foundations extended down into the underlying dense gravels.

Construction:
The bridge superstructure would be delivered in sections and assembled on-site. It would be technically possible to fully assemble the entire bridge and lift it into place, however, this would require coordinating the simultaneous closure of both I-84 and the UPRR tracks which may not be practical. It is therefore possible that a temporary support tower will be required between the outside shoulder of I-84 WB and the Railroad R/W with temporary access requirements from I-84 similar to Alternative 1A. The bridge would then be erected in two sections with closures to I-84 and UPRR similar to Alternative 1A. After the two sections are in place they would be connected and the temporary support tower removed.

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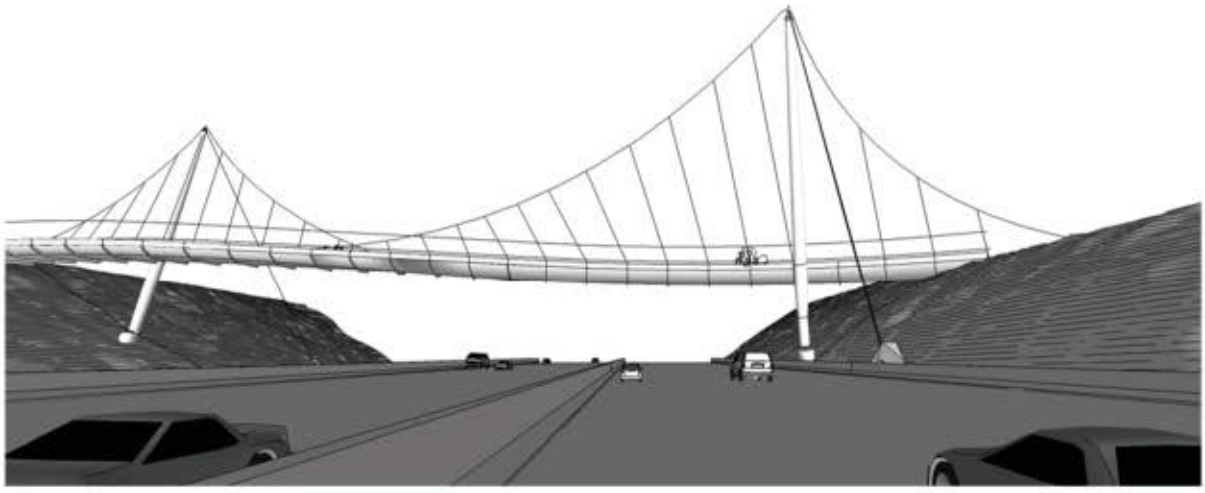
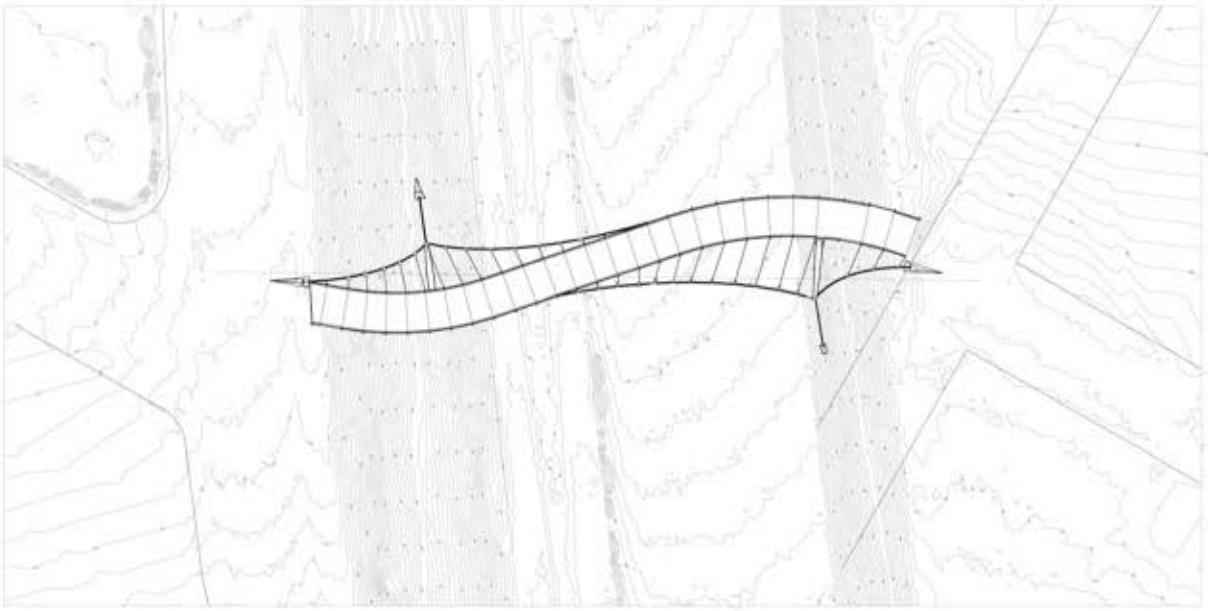
Option 2 – S-curved Suspension with Back-stayed Masts:



Perspective Driving East

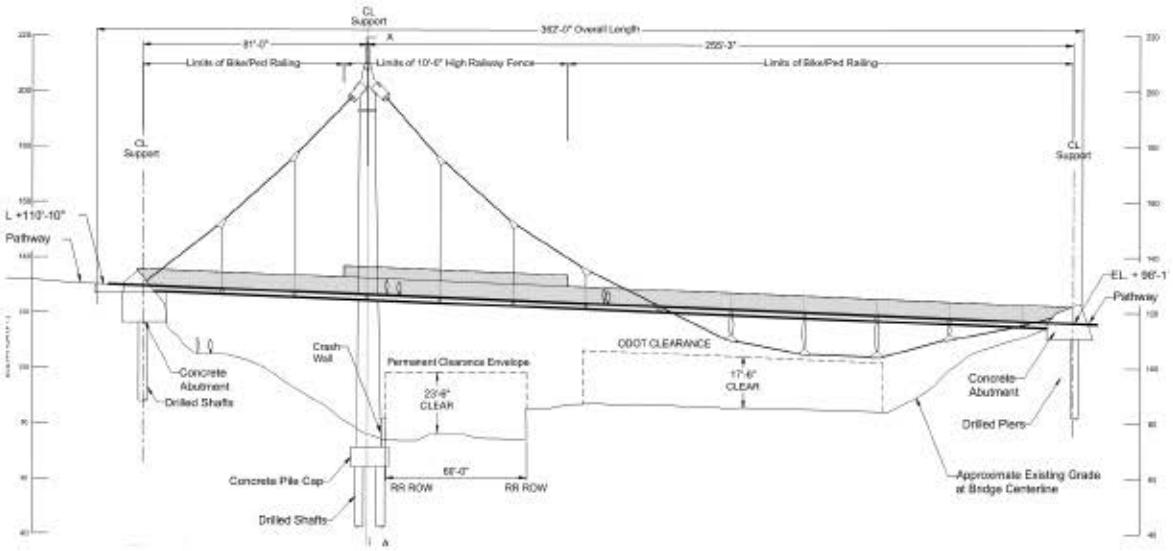


Plan

Bridge option would have consisted of two steel masts with backstay cables each located at the nominal center of curvature of an S-shaped deck. The S-shaped deck in plan would have aligned with 7th Avenue at the north and 8th Avenue to the south.

This option was subsequently eliminated after ODOT stated its plans to preserve the ability to widen I-84 with additional lanes to the south for I-84 EB in the future. This would have conflicted with one of the planned pier locations for the bridge.

Option 3 – Over/Under- (340 ft. Span) Steel Suspension:



Option 3 – Elevation

Option 3 – Perspective Renderings

Option 3 – Precedent Images

Significance:
This option enables a suspension bridge utilizing a single mast located within the PBOT-controlled ROW to the north of the RR alignment. The longer south span is resolved structurally by allowing the catenary arc of the suspension cables to drop below the deck level before rising again to an anchor point at the south abutment. The north portion of the bridge deck is suspended on hangers from the primary cable while the south section is supported on struts above the cable.

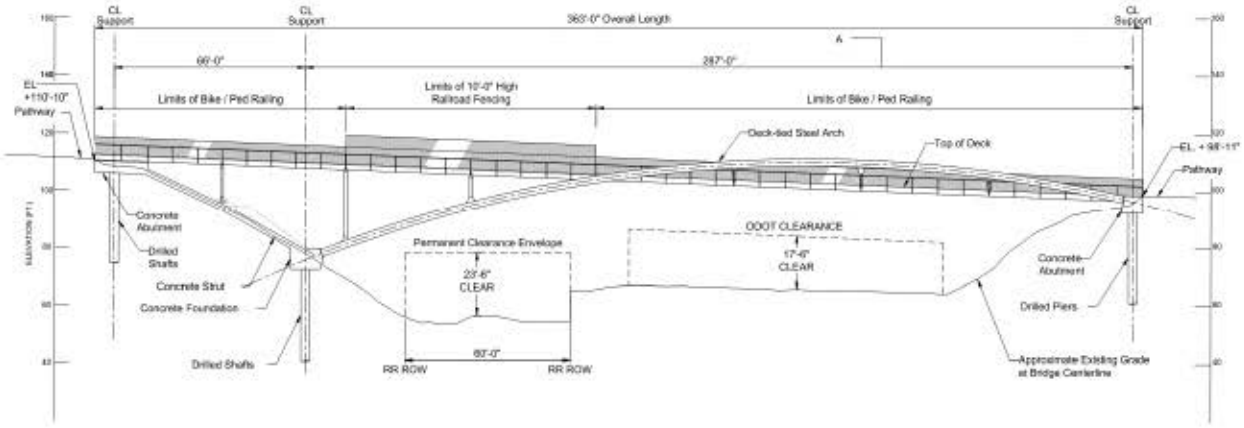
Notably, the mast is located on the centerline of the bridge with the deck splitting into two symmetrical lanes passing it on either side.

Description:
Bridge option would consist of one steel pylon supporting dual primary suspension cables anchored at the north and south abutments. The deck would consist of a cast-in-place concrete deck on stay-in-place metal deck forms spanning between steel deck stringers. The stringers would span between steel crossbeams suspended from down-hanging cables and supported by steel posts where main suspension cables arc below the deck. Overall deck width would vary along the length of the bridge; 24 ft. at the ends and widening out to 28 ft. (24 ft. + tower width) at the tower. At a minimum, two 6 ft. raised sidewalks and two 6 ft. bike lanes would be maintained. The steel would consist of painted steel fabricated sections. Bike and pedestrian railing would be connected to the edges of the deck assembly.

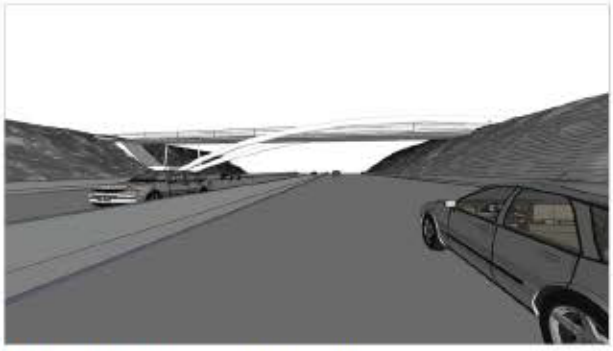
End abutments would consist of concrete caps founded on drilled concrete foundations extended down into the underlying dense gravels. End abutments would have relatively small or no vertical downward forces from the bridge and would instead be designed for large lateral and uplift loads resulting from the tensioned suspension cables. The intermediate pier would provide the bridge's vertical support and would consist of a streel tower founded on a concrete cap and deep foundations.

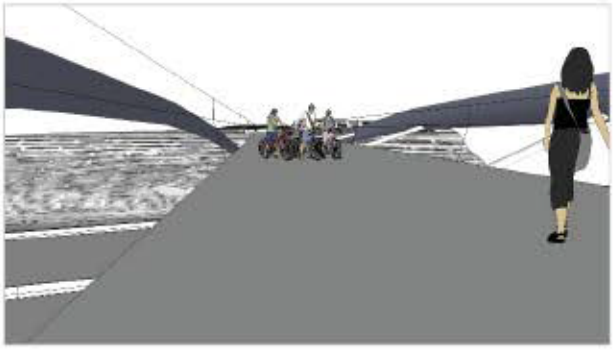
Construction:
The mast would be erected first followed by the cable installation. The deck superstructure would then be erected in sections and connected together. Closures of I-84 and UPRR tracks would be required for the cable and deck erection south of the mast, however, it would be possible to make these closures independently of each other and thereby avoid the need to make a difficult concurrent closure of both. This alternative will likely have the most significant temporary impacts to UPRR and I-84 traffic of all the options considered.

Option 4 – Deck-Tied, Steel Arch (363 ft.) with Drop-In Span:



Option 4 – Elevation





Option 4 – Perspective Renderings

Option 4 – Precedent Image

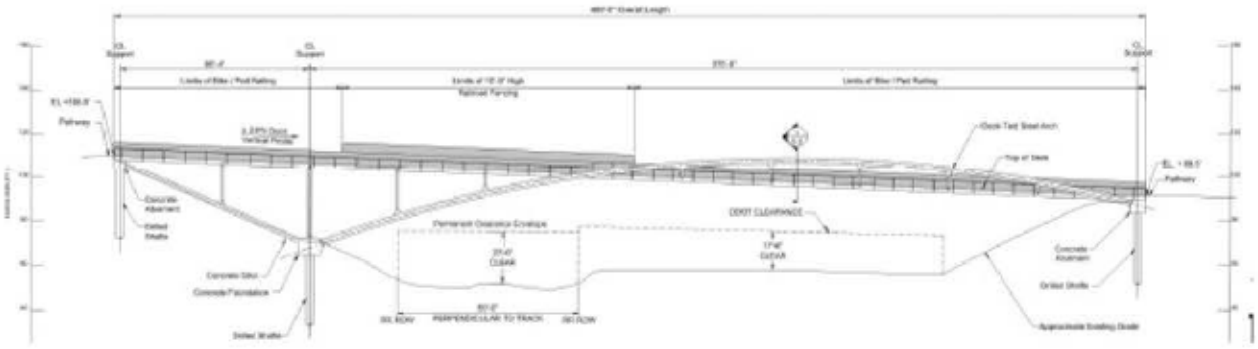
Significance:
This option creates a unique opportunity in terms of constructability over the UPRR easement. The northern portion of the span would be built with the benefit of temporary support in the easement to the north of I-84. The southern portion of the span would then be installed as a single, symmetrical tied arch to complete the structure.

Description:
Bridge option would consist of steel tube arch members with steel struts and/or hangers supporting the deck off the arches at necessary intervals. The deck would consist of a cast-in-place concrete deck on stay-in-place metal deck forms spanning between steel deck stringers. Overall deck width would be 24 ft. with two 6 ft. raised sidewalks and two 6 ft. bike lanes. The steel would consist of painted steel tube sections. Bike and pedestrian railing would be connected to the inside faces of the arch members.

End abutments would consist of concrete caps founded on drilled concrete foundations extended down into the underlying dense gravels.

Construction:
Bridge superstructure would be pre-assembled on the ground and then erected in several pieces, thus minimizing the amount of work over the railroad and I-84. The sections of the bridge structure from the temporary falsework to the north abutment would be constructed first. Then the next section over the railroad would be erected, with the temporary falsework tower between I-84 and the Railroad R/W serving as its southern vertical support. Finally, the main arch section spanning over I-84 would be erected and spliced at the temporary falsework tower to the already-erected arch sections. The main arch section is likely too wide to be completely assembled off-site and trucked to the project. Therefore, this section may need to be spliced longitudinally, or assembled on-site (for example, along NE 8th Avenue) and launched.

Option 5 – Deck Tied , Steel Arch (470 ft.) with Drop-in Span
(equal to Option 4 relocated to Alignment 2)



Option 5 – Elevation

Option 5 – Perspective Renderings

Option 5 – Precedent Image

Significance:

Similar to Option 4, this option creates a unique opportunity in terms of constructability over the UPRR easement. The northern portion of the span would be built with the benefit of temporary support in the easement to the north of I-84. The southern portion of the span would then be installed as a single, symmetrical tied arch to complete the structure.

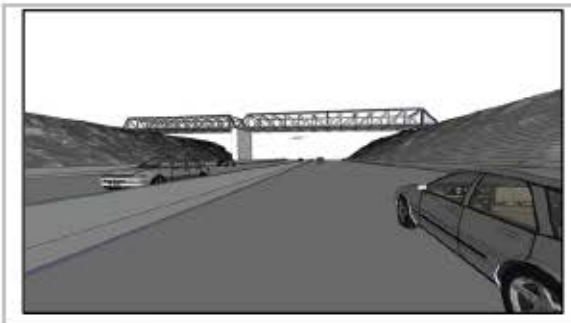
Also, the re-alignment of the south abutment to NE 7th Ave. & NE Flanders St. will avoid negative impacts to local truck traffic that may occur with Option 4's south approach location.

Description:
See Option 4.

Construction:
The construction of Option 5 would be similar to Option 4 with the following exceptions:

- Span assemblies would be longer, and therefore heavier than for Option 4 , thus requiring larger cranes or more and smaller sections for erection.
- On-site assembly and staging would need to occur on NE 7th Ave. rather than NE 8th Ave.

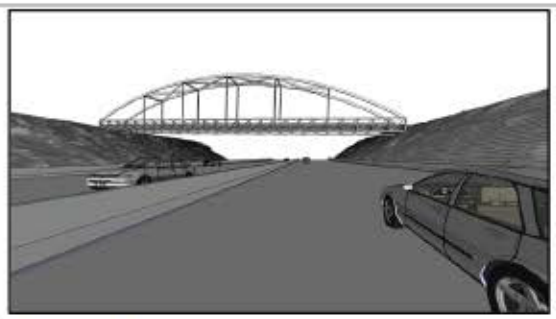
The five evaluated bridge options are summarized below along with key characteristics and costs. Note, costs are in terms of YR 2019 dollars.



Option 1A
Two-span (140'-180'), pre-manufactured steel through-truss

- Selected as low-cost benchmark
- Single pier constructed outside ROW
- Least aesthetically/experientially pleasing

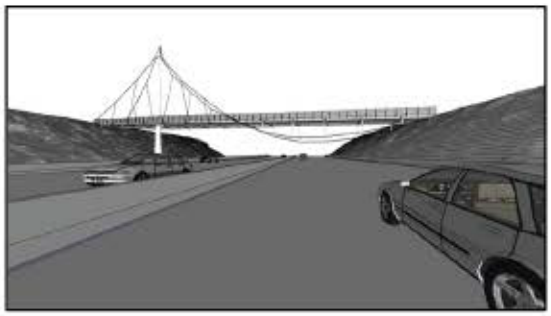
Estimated Cost = $7.0M



Option 1B
Single-span (320'), Single Span Pre-manufactured Steel Tied Arch with Bottom Chord Truss

- Highest cost option
- Erected in sections over I-84 & RR
- Deck at mid-truss level is experientially less desirable

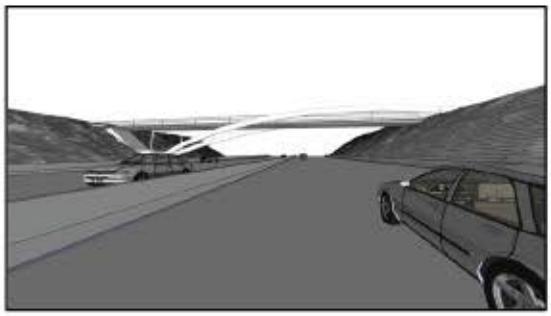
Estimated Cost = $12.6M



Option 3
Over/Under- (340 ft. Span) Steel Suspension

- Unique single-mast suspension approach
- Atypical erection sequence drives cost
- Iconic mast/cable structure

Estimated Cost = $11.4M



Options 4 (Alignment 1) and 5 (Alignment 2)
Deck-Tied, Steel Arch with Drop-In Span

- Asymmetric arch creates gateway
- Erection minimizes disruption
- Graceful aesthetics & experience

Estimated Cost = $8.5M Option 4
= $12.5 M Option 5

FIGURE 5: Bridge Options Summary

Note: All views are taken from the west side of the bridge looking east

IV. COST ESTIMATES

Initial design and construction costs for each option are summarized in Table 1. More detailed breakdowns of costs for each option are provided in Appendix C.

Table 1: Summary of Bridge Option Design and Construction Costs

Option # / Description	Construction Total	PE + CE Total	Inflation 3 Years @ 2%	Total Overall Cost	Difference from Lowest Cost Option
	($million)	($million)	($million)	($million)	($million)
1a 2-span pre-manufactured steel H-truss	$4.7M	$1.9M	$0.4M	$7.0M	$0 Lowest Cost Option
1b Single span, pre-manufactured steel tied arch with bottom chord truss	$8.5M	$3.4M	$0.7M	$12.6M	+$5.6M
3 Over-Under steel suspension	$7.4M	$3.35M	$0.65M	$11.4M	+$4.4M
4 Deck-tied steel arch with drop-in span (along Alignment 1)	$5.5M	$2.5M	$0.5M	$8.5M	+$1.5M
5 Deck-tied steel arch with drop-in span (along Alignment 2)	$8.5M	$3.4M	$0.7M	$12.5M	+$5.5M

Table Notes:

1. Construction Total for each option includes the following allowances:
    a. 10% mobilization
    b. 5% TP&DT (Temporary Protection and Direction of Traffic)
    c. 30% contingency
    d. Street Improvements at ends of bridge = $500,000
    e. Landscape and lighting improvements at ends of bridge = $100,000
2. PE = Preliminary engineering; CE = Construction Engineering. Allowances applied to each option:
    a. PE = Options 1a, 1b and 5 @ 20% of Construction total; Options 3 and 4 @ 25% of Construction total
    b. CE = 20% of Construction total (all options)
3. Total Overall Cost = Construction Total + (PE+CE Total) + Inflation over 3 years @ 2%/year
4. All estimates have been rounded to the nearest $100,000
5. Estimates assume no right-of-way acquisition costs
6. Total overall cost is in terms of Year 2019 costs

Risks to Project Cost:

Aspects of the project that pose significant risks to project cost include the following:

- Steel Material Costs: Steel material costs can be volatile. For example, steel prices in 2008 spiked over 25% from average costs in 2007 (Source: ODOT Steel Index Graph February 2016). All bridge options utilize significant amounts of structural steel and reinforcing steel and will therefore be sensitive to market fluctuations in steel costs.

- Underground Conditions: Investigative underground borings and in-depth resource surveys have not been completed for the site. Thus, there is risk that actual conditions may be different from those assumed for this preliminary analysis. Changes that could have significant cost impacts include: poorer soils for foundation support, liquefiable soils, underground obstructions, archaeological resources, and contaminated soils.

- Railroad Coordination: The Railroad is cautious regarding new structures being placed over and beside their right-of-way. There is risk that the railroad may assign significant restrictions on construction or final bridge characteristics (alignment, profile, fencing, lighting, crash walls, etc.) that may increase project costs. Also, it can be problematic to coordinate and establish firm work windows in advance with the Railroad, which can jeopardize construction productivity and lead to delays and stand-by time.

- Existing ODOT Structures: There are several overhead motorist direction signs present along I-84 near the proposed bridge crossing. There is risk that the bridge may obscure motorists' site lines for viewing these signs. Modifications to the existing signs may be required which would add costs to the project.

- Working over I-84: ODOT will require that bridge construction not impact interstate traffic during most parts of the day. Therefore, much of the overhead work may need to be completed late at night and over weekends. These constraints impart additional risks to the project and can lead to reduced productivity, more labor overtime, less efficient work scheduling, and additional large equipment rental costs.

V. EVALUATION CRITERIA & EVALUATION MATRIX

Table 2, on the following page, compares the four bridge options for Alignment 1 across a variety of evaluation criteria. The evaluation criteria were jointly developed by PBOT project staff and the design team and are intended to capture the key characteristics related to constructing, maintaining and using the bridge. Short explanations for the ranking process of each criterium are provided after the table.

Option 5 was not re-compared against Options 1-4. However, it would have similar ratings as Option 4 except with higher construction costs. The Options 1a, 1b, and 3 would have proportional cost increases if used along Alignment 2. Option 1b may be infeasible for the significantly longer span associated with Alignment 2.

Table 2: Bridge Options Evaluation Matrix

BRIDGE OPTIONS EVALUATION MATRIX					
		OPTION			
Evaluation Characteristic		1A	1B	3	4*
COSTS		**$7.0M**	**$12.6M**	**$11.4M**	**$8.5M**
	Overall Cost	4	1	2	3
	Long-term Maintenance	1	2	3	4
AESTHETICS					
	Beauty	1	2	4	3
	Unique Sense of Place	1	2	3	4
COMMUNITY					
	Impacts to Private Property	4	4	4	4
	Potential for Local and MWESB Participation	1	1	4	4
	User Comfort	1	2	3	4
	Emergency Vehicle Access	4	4	1	4
SCHEDULE					
	Design	4	4	1	2
	Permitting	4	1	2	3
	Construction	3	2	1	4
RISKS AND CONSTRUCTABILITY					
	Subsurface Conditions	1	4	1	3
	Erection	4	1	2	3
	Delivery and Staging of Materials	2	1	3	4
	Roadway Impacts	3	1	2	4
ENVIRONMENTAL IMPACTS					
	Wetland Impacts	Unknown	Unknown	Unknown	Unknown
	HAZMAT Risk	3	4	1	2
PERMITTING					
	UPRR Permitting	4	1	2	3
	ODOT Permitting	3	1	2	4
OTHER					
	Ease of Inspection	2	1	2	4
	Accommodations for Utilities	4	4	4	4
	TOTAL SCORE[1]	**54**	**43**	**47**	**70**

[1] Scoring total assumes uniform weighting of characteristics

* Evaluations for Option 5 are similar to Option 4, except for higher construction costs.

Scoring Legend: 4 = Highest Ranking Option, 1 = Lowest Ranking Option

Costs:

Overall Cost: Conceptual costs for construction and design have been estimated by the Design Team for each option. Construction cost estimates are based on preliminary quantity takeoffs and unit prices established from a combination of costing inputs. These unit cost inputs include historical bridge costs for the region, feedback from local contractors and fabricators, and past experience of the design team. Refer to Table 1 for additional costing details.

Long-term Maintenance Costs: The Design Team assigned higher rankings to those options with fewer individual elements to inspect and maintain. Similarly, options with simpler structural systems are ranked higher.

Aesthetics:

Beauty: A subjective characteristic of the elegance of the structure as viewed both from the bridge and away from it. Rankings are the average rankings assigned by PBOT project staff during the December 14, 2015 design meeting.

Unique Sense of Place: A subjective characteristic assessing the structure's overall context. Options that blend and fit most appropriately, given its location and its significance as a major entry "portal" to the city, were assigned higher rankings. Rankings are the average rankings assigned by PBOT project staff during the December 14, 2015 design meeting.

Community:

Impacts to Non-PBOT Property: Options with permanent impacts to ODOT, UPRR, or private property are assigned lower rankings than those without permanent impacts.

Potential for Local Contractor and MWESB Participation: Options that would likely not be fabricated locally are assigned lower rankings.

User Comfort: This criterium compares the bridge users' experience. Those options with open views and fewer concealed areas are ranked higher. Rankings are the average rankings assigned by PBOT project staff during the December 14, 2015 design meeting.

Emergency Vehicle Access: Options that facilitate unhindered access across the bridge for emergency vehicles are ranked higher

Schedule:

Design Schedule: Options with greater design complexity are assigned lower rankings. More complex structures will likely require longer design time and design reviews.

Permitting Schedule: Options that have greater impacts to the Railroad or ODOT and greater disturbances to areas that may include contaminated soils are assigned lower rankings.

Construction Schedule: Options with expected shorter construction schedules are assigned higher rankings.

Risks and Constructability:
Subsurface Conditions: Options with larger and / or more numerous foundations are assigned lower rankings. Options with lower foundation loads are assigned higher rankings.

Bridge Erection: Options that can be erected with more simple / lighter crane picks and with fewer elevated field splices are ranked higher.

Delivery and Staging of Materials: Options that do not require large staging areas are ranked higher. Options that would likely be delivered from local suppliers are also ranked higher.

Roadway Impacts: Options that cause more disturbances to I-84 traffic during construction are assigned lower rankings. All options along Alignment 1 would have similar impacts to roadway tie-ins at the ends of the bridge. Option 5 along Alignment 5 would have fewer impacts to local truck traffic at the south bridge approach.

Environmental Impacts:
Wetland Impacts: Location or presence of wetlands within the bridge alignment is unknown at this time. All options are assigned similar rankings.

Hazardous Materials Risk: Options with larger and / or more numerous foundations are at a higher risk of encountering contaminated soils and are assigned lower rankings.

Permitting:
UPRR Permitting: Options needing more construction access near and above UPRR R/W are assigned lower rankings. All bridge options would satisfy minimum permanent Railroad clearances and would require similar levels of Railroad permitting effort.

ODOT Permitting: Options that impact ODOT R/W may require additional permits and easement agreements from ODOT. Those options are assigned lower rankings. Options that have higher impacts to I-84 traffic during construction are also assigned lower rankings.

Other:
Ease of Inspection: Options with easier access and fewer pieces to inspect are assigned higher rankings. Also, options that may have more fracture critical elements are assigned lower rankings.

Accommodation for Utilities: Bridge options could accommodate utility crossings equally well and are assigned the same ratings.

V. CONCLUSION & NEXT STEPS

Five potential bridge types have been objectively evaluated to fill the stated need for a bicycle / pedestrian connection in the designated location. None of the options studied has been definitively selected at this stage of the project. However, Options 4 and 5 display considerable merit, including comparatively high rankings for aesthetics, community issues, constructability, and ease of inspection. Many of these pragmatic advantages result from the two-step construction sequence conceived for Options 4 and 5. The ability to construct the arch portion of the span to the north on temporary supports with minimal impacts to both the railroad and the highway and then to drop in the tied arch span across the interstate to the south simplifies the construction sequence. The simplicity of the bridge form as a single, asymmetrical arched form creates a graceful shape acting as a gateway for motorists passing below and providing a unique environment for bicyclists and pedestrian above.

The south approach to Options 1-4 (Alignment 1) may potentially have a negative impact to local truck traffic travelling through the intersection of NE 8th Ave. & NE Glisan St. Option 5 (Alignment 2) would avoid these impacts to truck traffic while still providing the same bridge type as the preferred option (Option 4) along Alignment 1; however at a higher cost.

The intended purpose of this phase of work is to provide an Alternatives Analysis to identify constraints, risks, challenges and approximate costs associated with potential bridge types. This information will enable PBOT to advance the project into subsequent phases of planning, fund raising, and coordination. All options studied in this report as well as additional alternatives may be reconsidered and evaluated in more detail in support of the development of a final bridge design for the site.

Appendix A
Bridge Options Drawings

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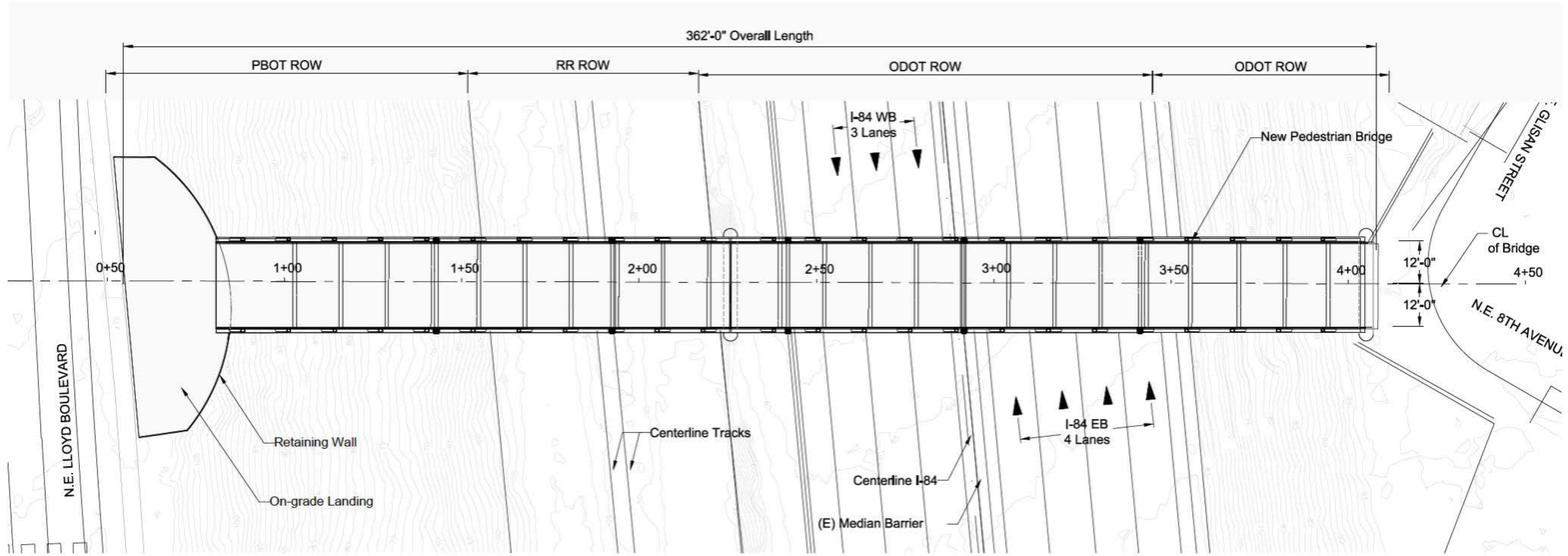

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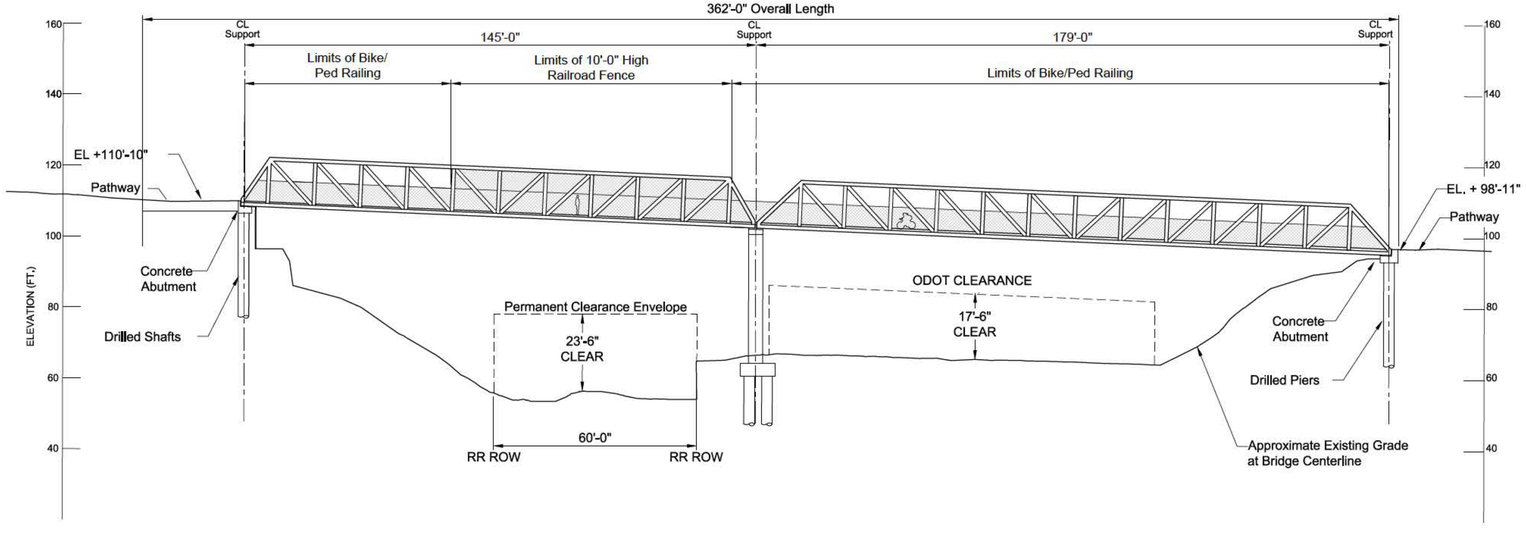

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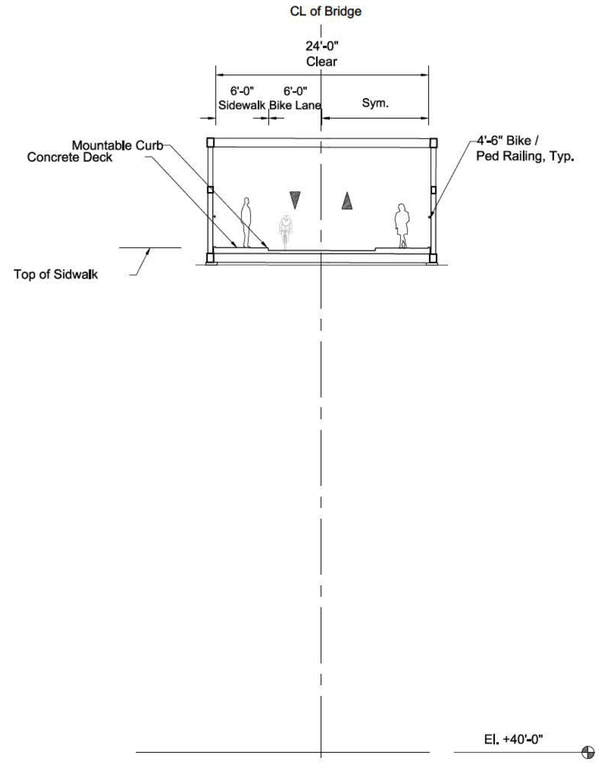

3 **Section A-A**
1/8" = 1'-0"

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NO.	DATE	DESCRIPTION	APPD.
1	1/29/16	15% Development	

REVISION

DESIGNED BY	DATE APPROVED
–	-
CAD BY	
JB	Feb 2016
CHECKED BY	
CT	Feb 2016

APPROVALS:

DIVISION ENGINEER — REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER — REG. PROF. ENGR. NO. 51538PE

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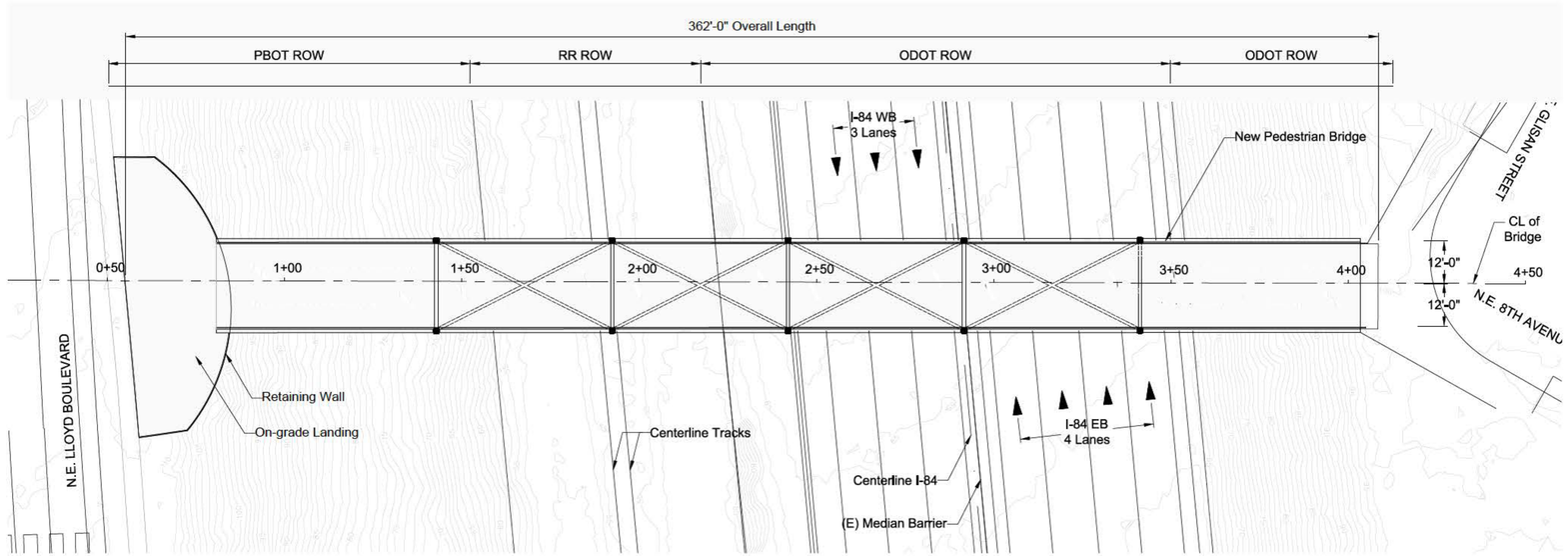
STEVE TOWNSEN, P.E., CITY ENGINEER

CITY OF PORTLAND, OREGON 1851

SULLIVAN'S CROSSING
BICYCLE AND PEDESTRIAN BRIDGE OVER I-84
OPTION 1A - TWO-SPAN PRE-MANUFACTURED STEEL THROUGH TRUSS

1/4 SECTION –
PROJECT NO. –
SHEET NO. 1



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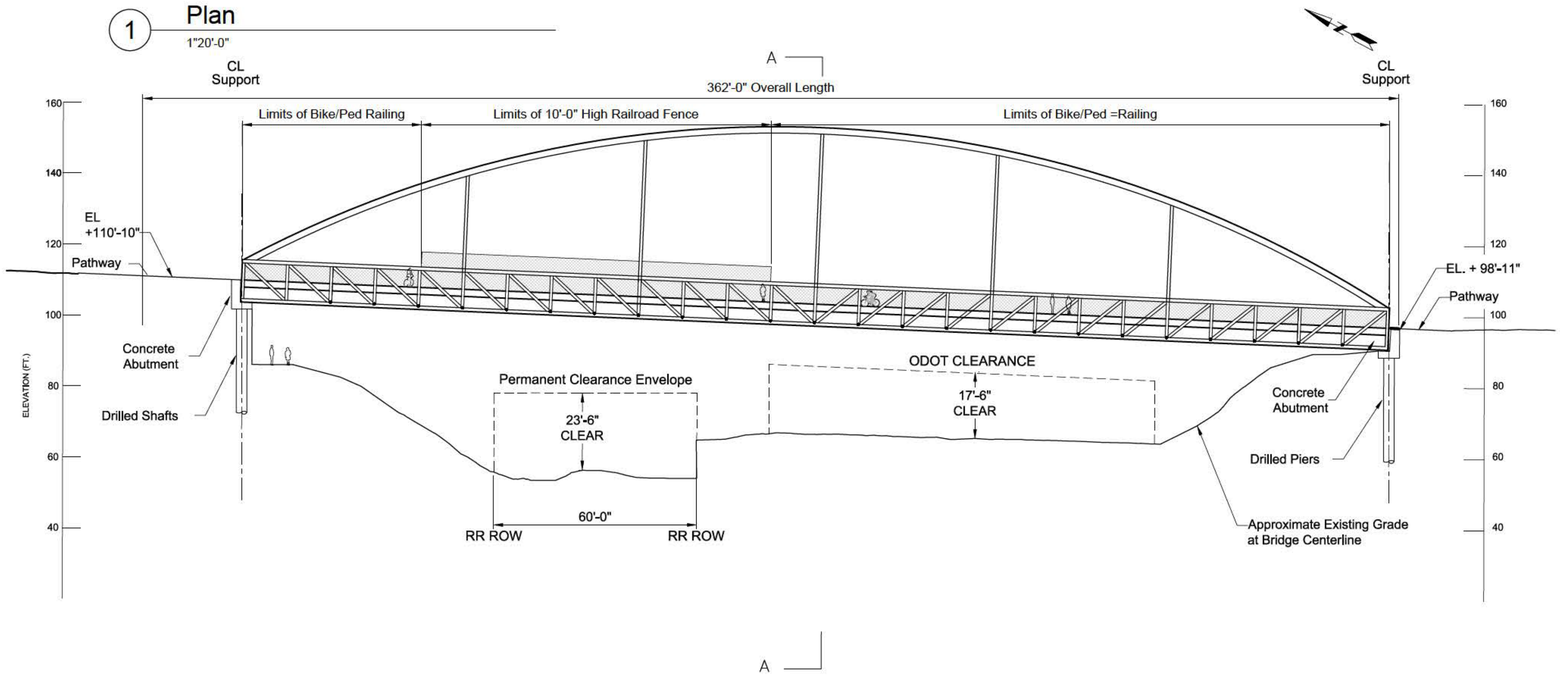

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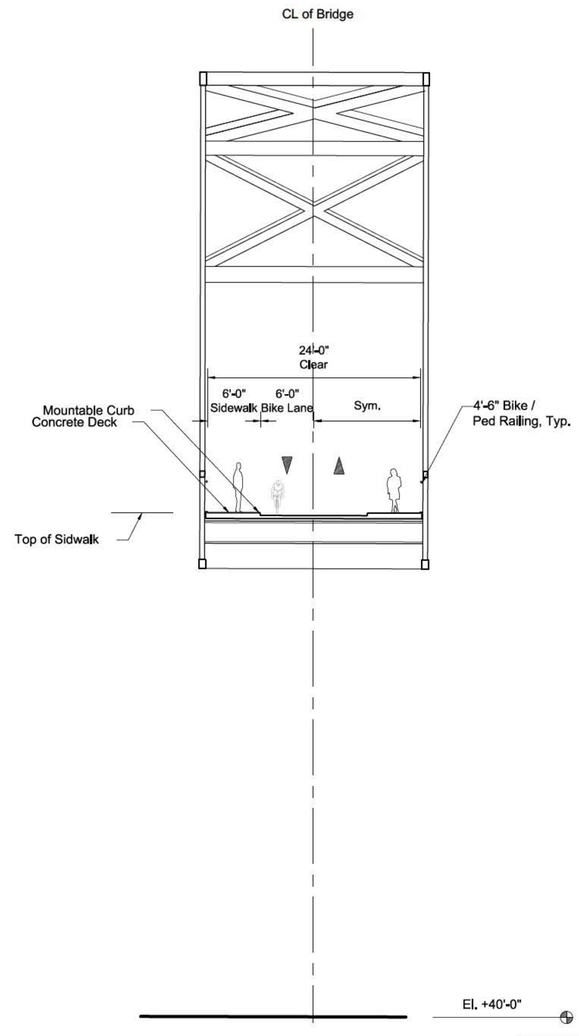

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1/8" = 1'-0"

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SULLIVAN'S CROSSING
BICYCLE AND PEDESTRIAN BRIDGE OVER I-84
OPTION 1B- SINGLE SPAN PRE-MANUFACTURED STEEL TIED ARCH

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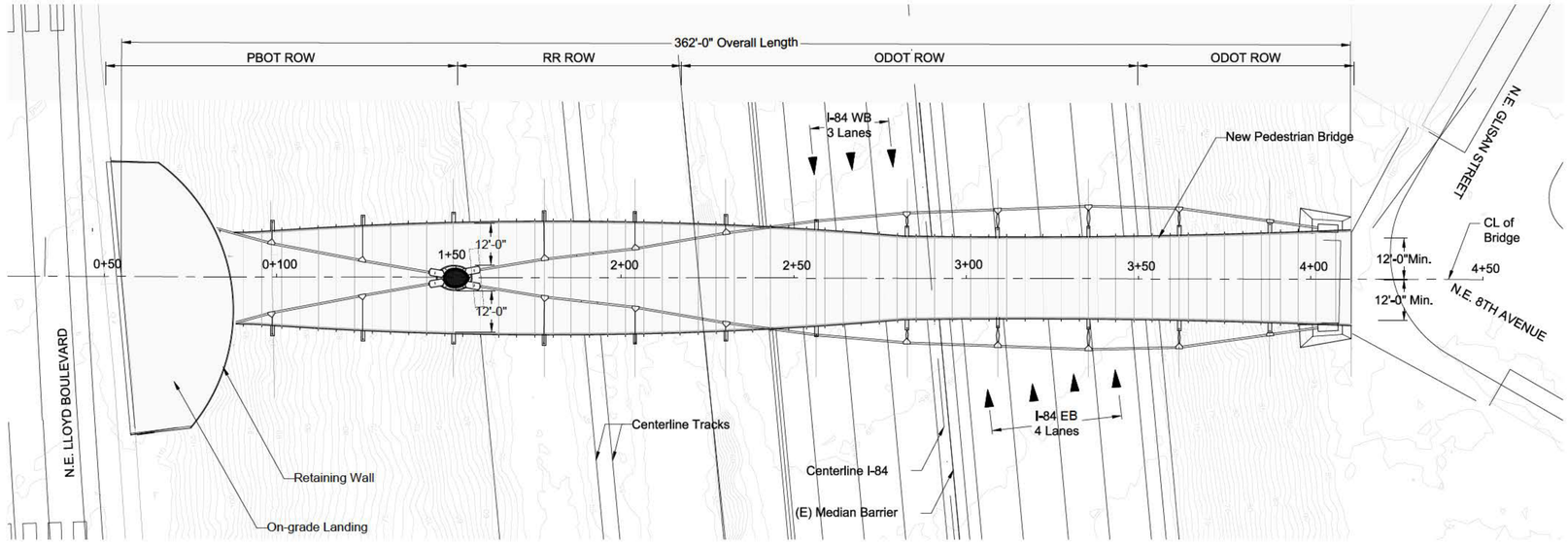

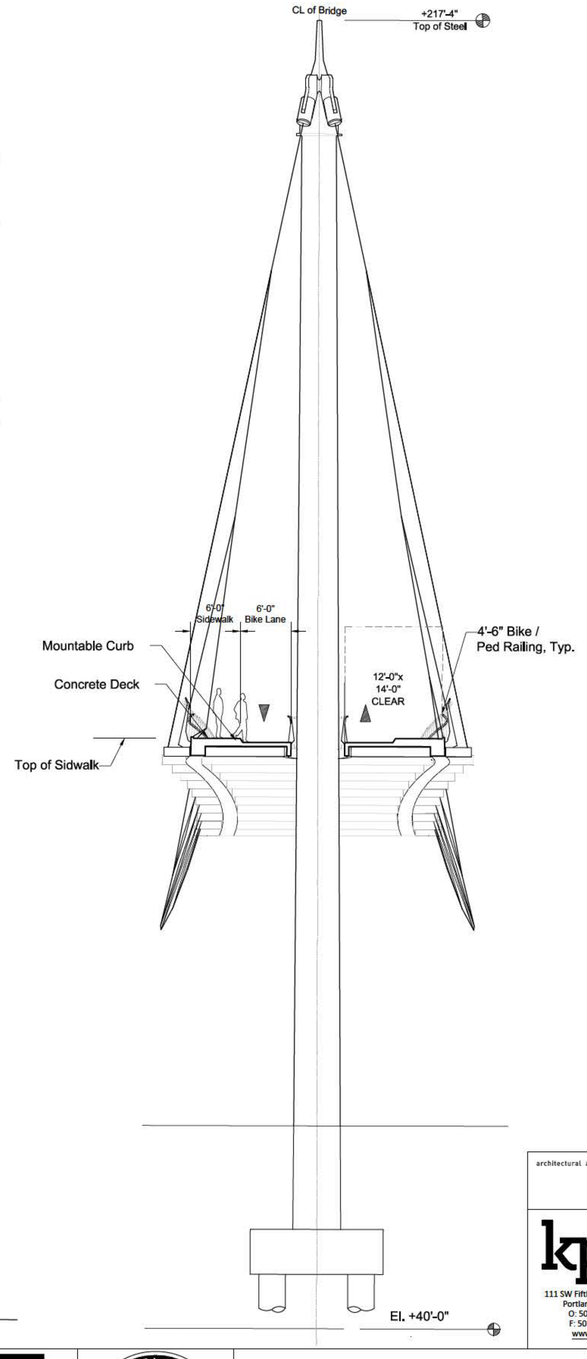

1 Plan

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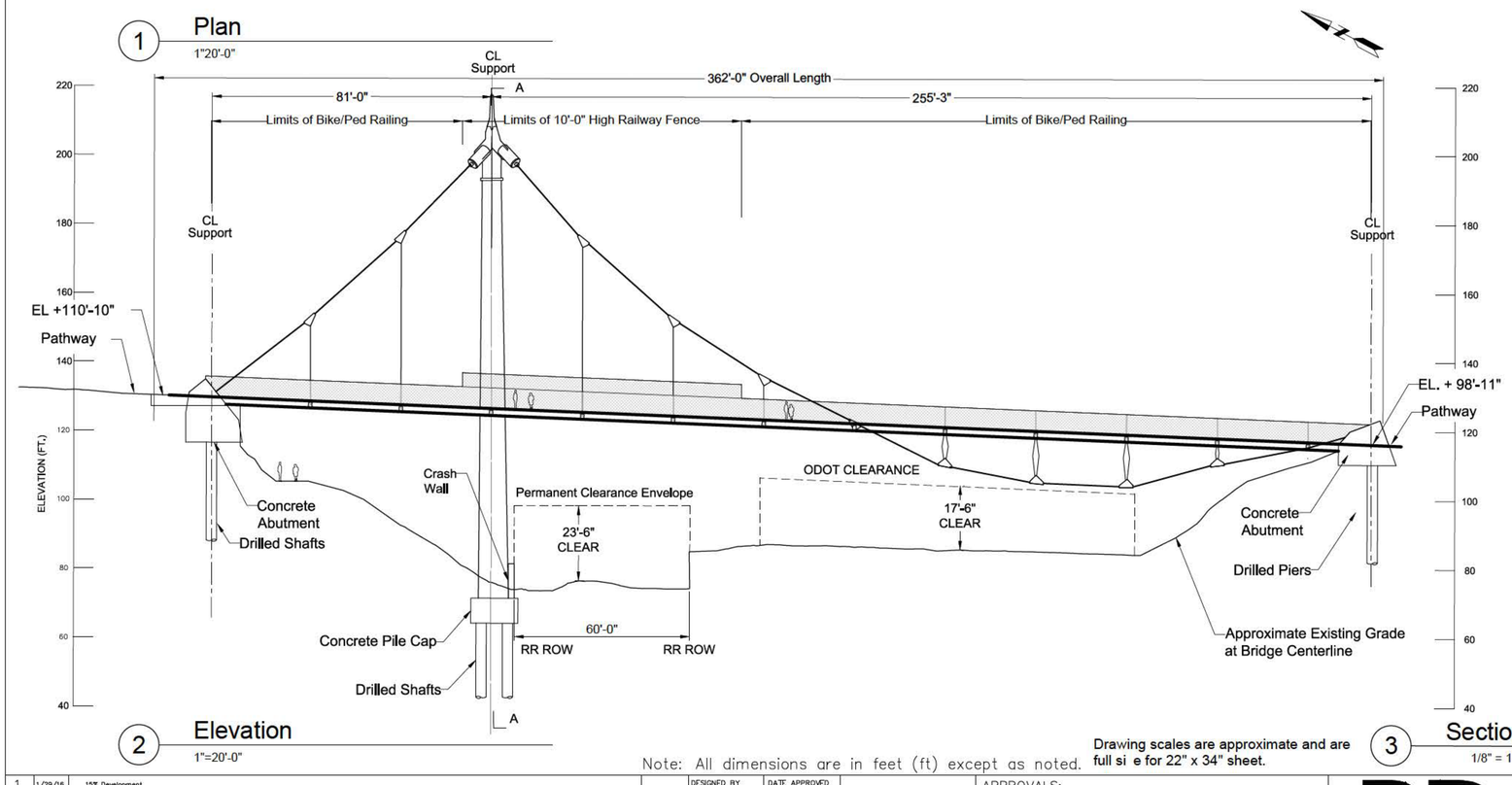

2 Elevation

1"=20'-0"

3 Section A-A

1/8" = 1'-0"

Note: All dimensions are in feet (ft) except as noted.

Drawing scales are approximate and are full si e for 22" x 34" sheet.

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SULLIVAN'S CROSSING
BICYCLE AND PEDESTRIAN BRIDGE OVER I-84-
OPTION 3 - OVER / UNDER STEEL SUSPENSION

1/4 SECTION -

PROJECT NO. -

SHEET NO. 3

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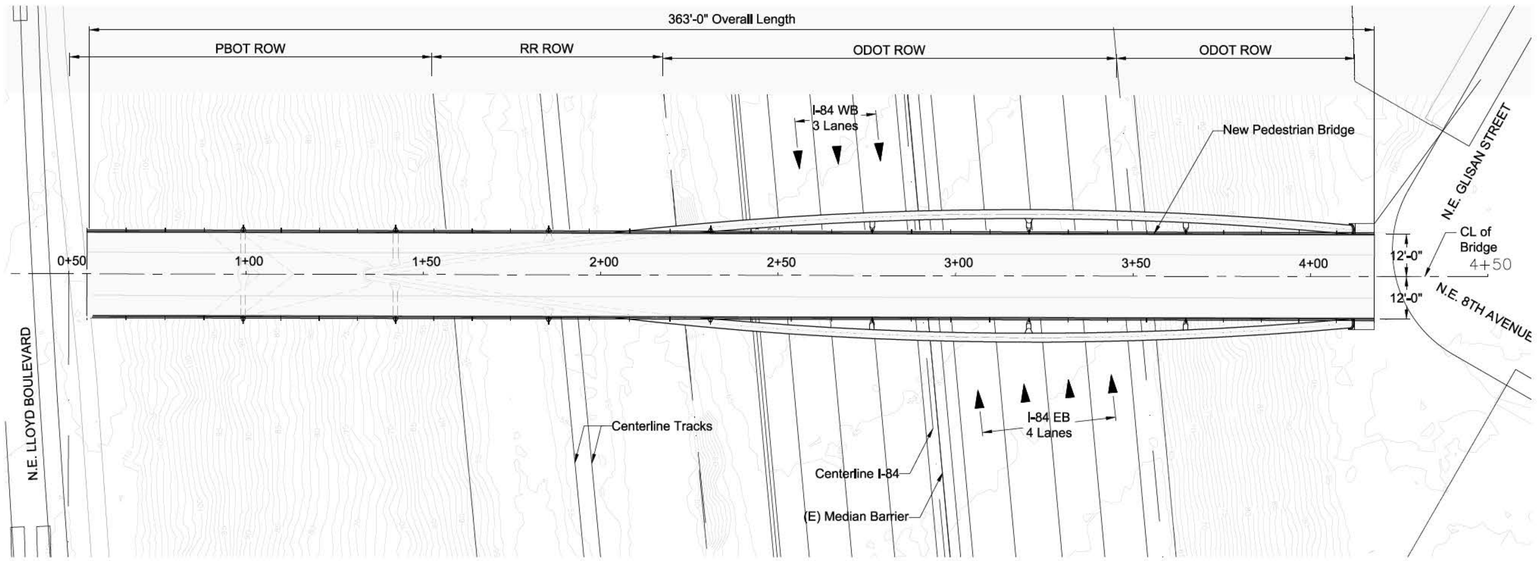

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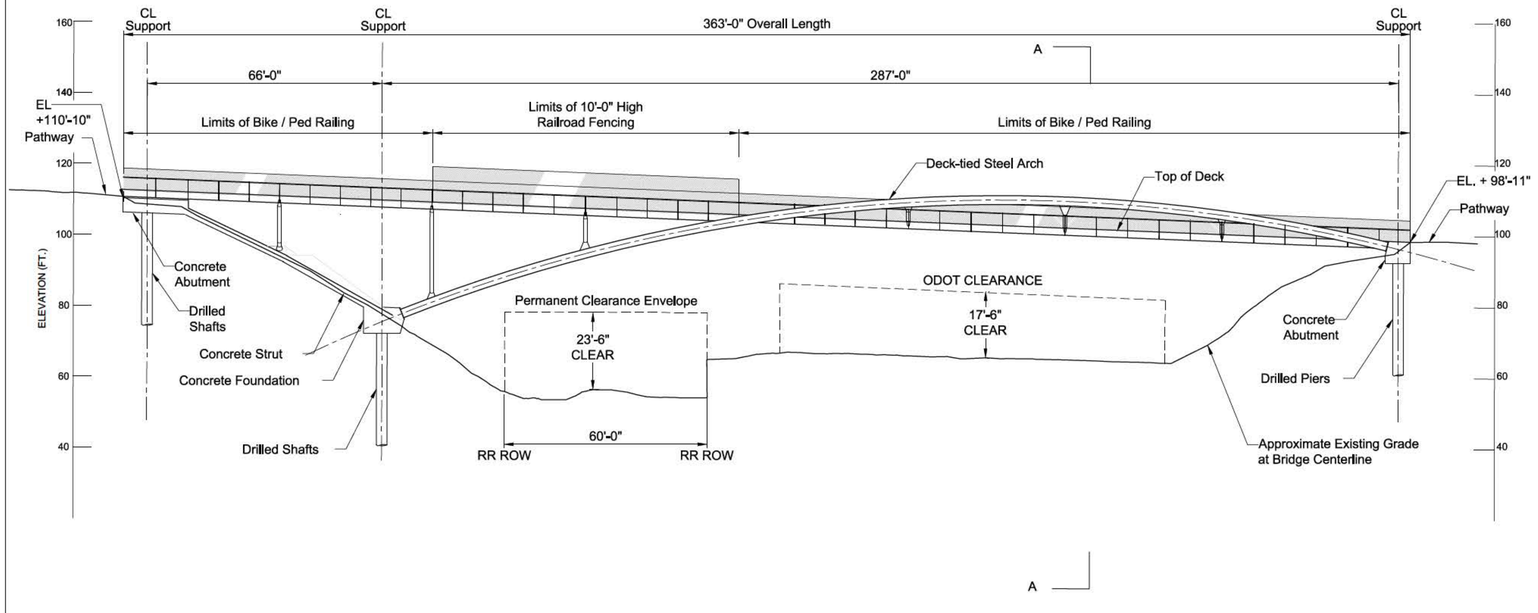

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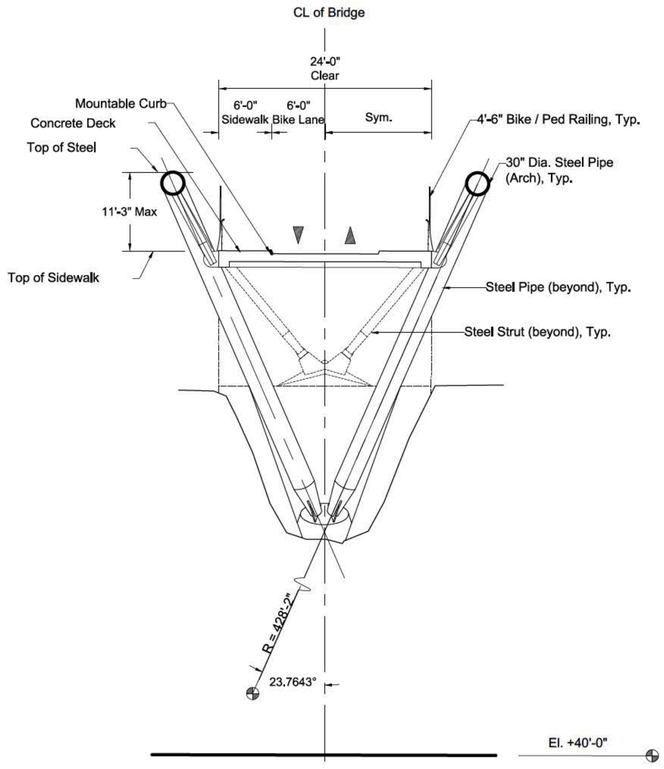

3 **Section A-A**
1/8" = 1'-0"

15% DESIGN
JANUARY 26, 2016

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CITY OF PORTLAND, OREGON 1851

SULLIVAN'S CROSSING
BICYCLE AND PEDESTRIAN BRIDGE
OVER I-84
OPTION 4 - DECK-TIED STEEL ARCH
WITH DROP-IN SPAN

1/4 SECTION	-
PROJECT NO.	-
SHEET NO.	4

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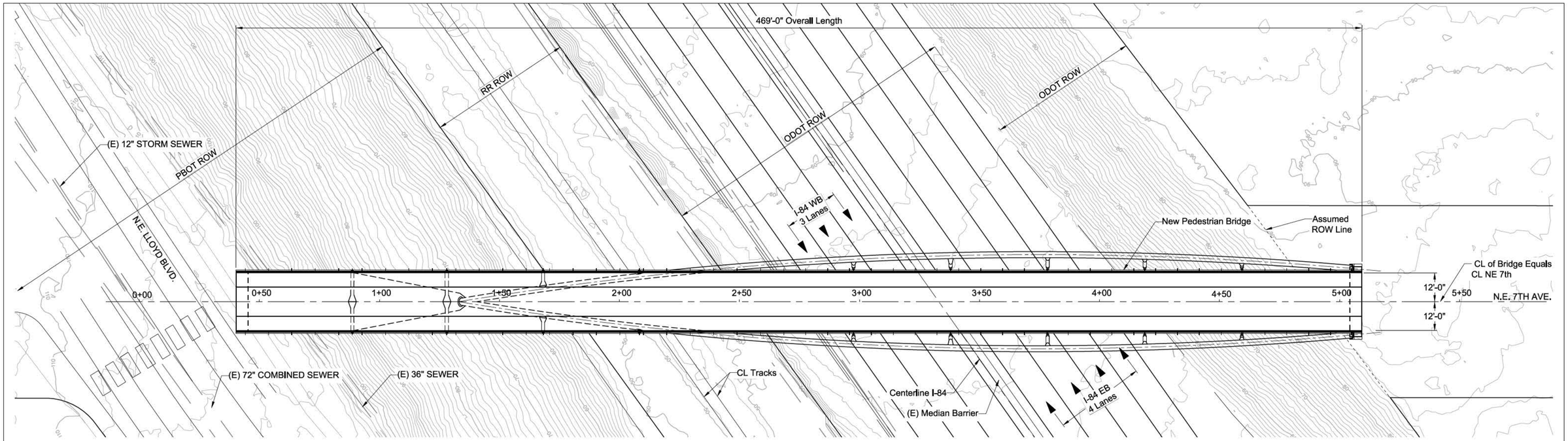
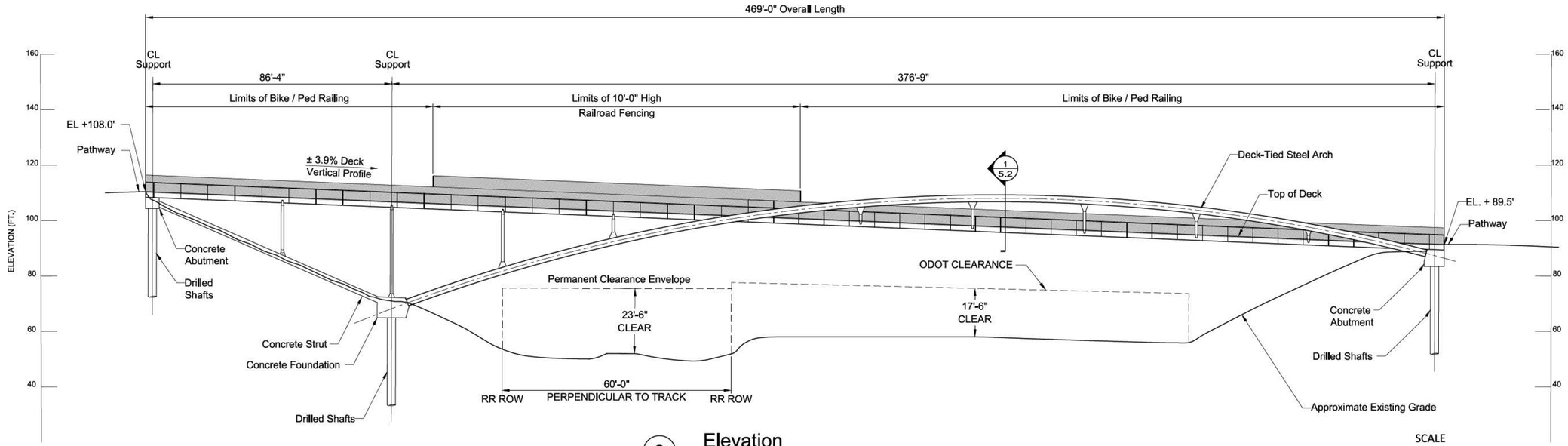


1 **Plan**
1"=20'-0"



2 **Elevation**
1"=20'-0"

SCALE
20 0 10 20 40
1 INCH = 20 FEET

Note: All dimensions are in feet (ft) except as noted.

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

DESIGNED BY	DATE APPROVED
–	-
CAD BY	
JB	Apr. 2016
CHECKED BY	
CT	Apr. 2016

APPROVALS:

DIVISION ENGINEER — REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER — REG. PROF. ENGR. NO. 51538PE

PBOT
PORTLAND BUREAU OF TRANSPORTATION
STEVE NOVICK — COMMISSIONER
STEVE TOWNSEN, P.E. — CITY ENGINEER

SULLIVAN'S CROSSING BICYCLE AND PEDESTRIAN BRIDGE OVER I-84
OPTION 5 - DECK-TIED STEEL ARCH ALIGNED WITH NE 7TH AVE. WITH DROP-IN SPAN

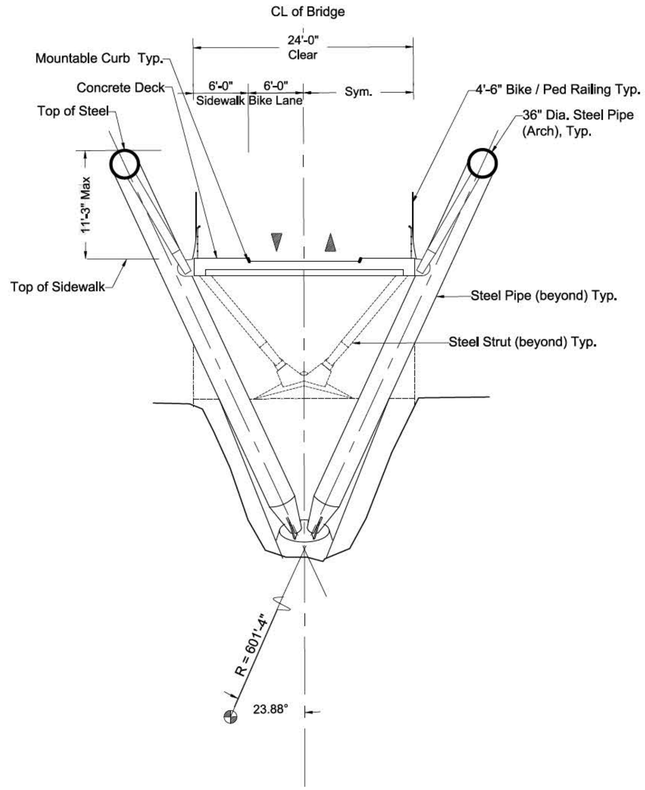
1/4 SECTION

PROJECT NO.

SHEET NO.
5.1

15% DESIGN
APRIL 12, 2016

architectural applications a2
kpff
111 SW Fifth Ave., Suite 2500
Portland, OR 97204
O: 503.227.3251
F: 503.227.7980
www.kpff.com



1 BRIDGE SECTION

1/8" = 1'-0"

15% DESIGN
APRIL 12, 2016

SCALE

1 .5 0 .5 1 2

1/8 INCH = 1 FOOT

Note: All dimensions are in feet (ft) except as noted.

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NO.	DATE	DESCRIPTION	APPD.
		REVISION	

DESIGNED BY	DATE APPROVED
–	-
CAD BY	
JB	Apr. 2016
CHECKED BY	
CT	Apr. 2016

APPROVALS:

DIVISION ENGINEER — REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER — REG. PROF. ENGR. NO. 51538PE

PBOT
PORTLAND BUREAU OF TRANSPORTATION
STEVE NOVICK — COMMISSIONER
STEVE TOWNSEN, P.E. — CITY ENGINEER

CITY OF PORTLAND OREGON 1851

SULLIVAN'S CROSSING BICYCLE AND PEDESTRIAN BRIDGE OVER I-84 OPTION 5 - DECK-TIED STEEL ARCH WITH DROP-IN SPAN ALONG ALIGNMENT 2

1/4 SECTION	
PROJECT NO.	
SHEET NO.	5.2

File: G:\e\p\2014\214268.10-Pedestrian_Bridge_Over_I-84\NE 7th to 8th Bike Bridge over UPRR I-84_SCHEME 4.dwg TAB:Layout1 (2)
Plotted: 4/14/16 at 12:01pm By: jwilkes
XREFs:

Appendix B
Bridge Cost Estimate Breakdowns

kpff

SULLIVAN'S CROSSING BIKE & PEDESTRIAN BRIDGE
CITY OF PORTLAND - BUREAU OF TRANSPORTATION

BRIDGE OPTION 1A
2 SPAN, PRE-MANUFACTURED STEEL H-TRUSS
PRELIMINARY COST ESTIMATE

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
	TEMPORARY FEATURES AND APPURTENANCES				
1	MOBILIZATION	1	LS	10%	$330,540
2	TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC	1	LS	5%	$157,400
3	RAILROAD FLAGGERS	10	DAY	$ 2,000.00	$20,000
				Subtotal	$507,940
	DRAINAGE AND SEWERS				
4	BRIDGE DRAINAGE DEVICES	1	LS	$30,000.00	$30,000
				Subtotal	$30,000
	STRUCTURE				
5	STRUCTURE EXCAVATION	50	CUYD	$100.00	$5,000
6	SHORING, CRIBBING AND COFFERDAMS	1	ALLOWANCE	$50,000.00	$50,000
7	RETAINING WALLS	1	ALLOWANCE	$100,000.00	$100,000
8	DRILLED SHAFT COMPLETE - 24" DIAMETER	760	LF	$600.00	$456,000
9	REINFORCEMENT	78,000	LB	$1.50	$117,000
10	FOUNDATION CONCRETE, CLASS 4000	210	CUYD	$500.00	$105,000
11	DECK CONCRETE, CLASS HPC 4000	180	CUYD	$750.00	$135,000
12	STRUCTURAL STEEL, (PRE-MANUFACTURED, F.O.B. SITE)[3]	1	LS	$920,000.00	$920,000
13	STEEL ERECTION	1	ALLOWANCE	$200,000.00	$200,000
14	BRIDGE RAILING	650	FOOT	$200.00	$130,000
15	LIGHTING ON BRIDGE	650	FOOT	$200.00	$130,000
				Subtotal	$2,348,000
	PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES				
16	STREET IMPROVEMENTS - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$250,000.00	$250,000
17	STREET IMPROVEMENTS - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$250,000.00	$250,000
				Subtotal	$500,000
	RIGHT OF WAY DEVELOPMENT AND CONTROL				
18	RIGHT-OF-WAY ACQUISITION	0	ALLOWANCE	$0.00	$0
				Subtotal	$0
	MISCELLANEOUS ITEMS				
19	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$50,000.00	$50,000
20	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$50,000.00	$50,000
21	CONTAMINATED SOIL HANDLING AND TREATMENT	1	ALLOWANCE	$150,000.00	$150,000
				Subtotal	$250,000

		CONSTRUCTION SUBTOTAL	**$3,635,940**
		CONTINGENCY (30.%)	**$1,090,782**
	TOTAL CONSTRUCTION COSTS	**CONSTRUCTION TOTAL**	**$4,726,722**
		PRELIMINARY ENGINEERING (20.%)	**$945,344**
		CONSTRUCTION ENGINEERING (20.%)	**$945,344**
		INFLATION 3 YEARS @ 2% (6.1%)	**$403,662**
	TOTAL OVERALL COST	**TOTAL**	**$7,021,000**

SULLIVAN'S CROSSING BIKE & PEDESTRIAN BRIDGE
CITY OF PORTLAND - BUREAU OF TRANSPORTATION

BRIDGE OPTION 1B
SINGLE SPAN, PRE-MANUFACTURED STEEL TIED ARCH WITH BOTTOM CHORD TRUSS
PRELIMINARY COST ESTIMATE

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
	TEMPORARY FEATURES AND APPURTENANCES				
1	MOBILIZATION	1	LS	10%	$593,670
2	TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC	1	LS	5%	$282,700
3	RAILROAD FLAGGERS	30	DAY	$ 2,000.00	$60,000
				Subtotal	$936,370
	DRAINAGE AND SEWERS				
4	BRIDGE DRAINAGE DEVICES	1	LS	$30,000.00	$30,000
				Subtotal	$30,000
	STRUCTURE				
5	STRUCTURE EXCAVATION	50	CUYD	$100.00	$5,000
6	SHORING, CRIBBING AND COFFERDAMS	1	ALLOWANCE	$50,000.00	$50,000
7	RETAINING WALLS	1	ALLOWANCE	$100,000.00	$100,000
8	DRILLED SHAFT COMPLETE - 24" DIAMETER	520	LF	$600.00	$312,000
9	REINFORCEMENT	48,000	LB	$1.50	$72,000
10	FOUNDATION CONCRETE, CLASS 4000	60	CUYD	$500.00	$30,000
11	DECK CONCRETE, CLASS HPC 4000	180	CUYD	$750.00	$135,000
12	STRUCTURAL STEEL	1	LS	$3,600,000.00	$3,600,000
13	STEEL ERECTION	1	ALLOWANCE	$300,000.00	$300,000
14	BRIDGE RAILING	650	FOOT	$200.00	$130,000
15	LIGHTING ON BRIDGE	650	FOOT	$200.00	$130,000
				Subtotal	$4,864,000
	PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES				
16	STREET IMPROVEMENTS - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$250,000.00	$250,000
17	STREET IMPROVEMENTS - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$250,000.00	$250,000
				Subtotal	$500,000
	RIGHT OF WAY DEVELOPMENT AND CONTROL				
18	RIGHT-OF-WAY ACQUISITION	0	ALLOWANCE	$0.00	$0
				Subtotal	$0
	MISCELLANEOUS ITEMS				
19	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$50,000.00	$50,000
20	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$50,000.00	$50,000
21	CONTAMINATED SOIL HANDLING AND TREATMENT	1	ALLOWANCE	$100,000.00	$100,000
				Subtotal	$200,000

		CONSTRUCTION SUBTOTAL	**$6,530,370**
		CONTINGENCY (30.%)	**$1,959,111**
	TOTAL CONSTRUCTION COSTS	**CONSTRUCTION TOTAL**	**$8,489,481**
		PRELIMINARY ENGINEERING (20.%)	**$1,697,896**
		CONSTRUCTION ENGINEERING (20.%)	**$1,697,896**
		INFLATION 3 YEARS @ 2% (6.1%)	**$725,002**
	TOTAL OVERALL COST	**TOTAL**	**$12,610,000**

SULLIVAN'S CROSSING BIKE & PEDESTRIAN BRIDGE
CITY OF PORTLAND - BUREAU OF TRANSPORTATION

BRIDGE OPTION 3
OVER-UNDER STEEL SUSPENSION
PRELIMINARY COST ESTIMATE

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
	TEMPORARY FEATURES AND APPURTENANCES				
1	MOBILIZATION	1	LS	10%	$519,943
2	TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC	1	LS	5%	$247,592
3	RAILROAD FLAGGERS	80	DAY	$ 2,000.00	$160,000
				Subtotal	$927,535
	DRAINAGE AND SEWERS				
4	BRIDGE DRAINAGE DEVICES	1	LS	$30,000.00	$30,000
				Subtotal	$30,000
	STRUCTURE				
5	STRUCTURE EXCAVATION	100	CUYD	$100.00	$10,000
6	SHORING, CRIBBING AND COFFERDAMS	1	ALLOWANCE	$50,000.00	$50,000
7	RETAINING WALLS	1	ALLOWANCE	$50,000.00	$50,000
8	DRILLED SHAFT COMPLETE - 24" DIAMETER	720	LF	$600.00	$432,000
9	REINFORCEMENT	41,000	LB	$1.50	$61,500
10	FOUNDATION CONCRETE, CLASS 4000	90	CUYD	$500.00	$45,000
11	DECK CONCRETE, CLASS HPC 4000	200	CUYD	$750.00	$150,000
12	STRUCTURAL STEEL	170,000	LB	$2.50	$425,000
13	STEEL ERECTION	1	ALLOWANCE	$350,000.00	$350,000
14	TOWER STEEL	550,000	LB	$3.00	$1,650,000
15	BRIDGE RAILING	700	FOOT	$350.00	$245,000
16	MAIN SUSPENSION CABLE 4" DIAMETER	800	FOOT	$245.00	$196,000
17	SUSPENDER CABLES 1 3/4" DIAMETER	550	FOOT	$106.00	$58,300
18	ANCHORS	8	EACH	$5,000.00	$40,000
19	SUSPENDER GRIPPERS	24	EACH	$460.00	$11,040
20	LIGHTING ON BRIDGE	700	FOOT	$200.00	$140,000
21	RR CRASH WALL	1	LS	$12,000.00	$12,000
22	STEEL STRUCTURE PAINTING	1	LS	$86,000.00	$86,000
				Subtotal	$4,011,840
	PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES				
23	STREET IMPROVEMENTS - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$250,000.00	$250,000
24	STREET IMPROVEMENTS - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$250,000.00	$250,000
				Subtotal	$500,000
	RIGHT OF WAY DEVELOPMENT AND CONTROL				
25	RIGHT-OF-WAY ACQUISITION	0	ALLOWANCE	$0.00	$0
				Subtotal	$0
	MISCELLANEOUS ITEMS				
26	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$50,000.00	$50,000
27	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$50,000.00	$50,000
28	CONTAMINATED SOIL HANDLING AND TREATMENT	1	ALLOWANCE	$150,000.00	$150,000
				Subtotal	$250,000

		CONSTRUCTION SUBTOTAL	$5,719,375
		CONTINGENCY (30.%)	$1,715,813
	TOTAL CONSTRUCTION COSTS	CONSTRUCTION TOTAL	$7,435,188
		PRELIMINARY ENGINEERING (25.%)	$1,858,797
		CONSTRUCTION ENGINEERING (20.%)	$1,487,038
		INFLATION 3 YEARS @ 2% (6.1%)	$657,642
	TOTAL OVERALL COST	**TOTAL**	**$11,439,000**

SULLIVAN'S CROSSING BIKE & PEDESTRIAN BRIDGE
CITY OF PORTLAND - BUREAU OF TRANSPORTATION

BRIDGE OPTION 4
STEEL TIED ARCH WITH DROP-IN SPAN (ALONG ALIGNMENT 1)
PRELIMINARY COST ESTIMATE

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
	TEMPORARY FEATURES AND APPURTENANCES				
1	MOBILIZATION	1	LS	10%	$386,495
2	TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC	1	LS	5%	$184,045
3	RAILROAD FLAGGERS	30	DAY	$ 2,000.00	$60,000
				Subtotal	$630,540
	DRAINAGE AND SEWERS				
4	BRIDGE DRAINAGE DEVICES	1	LS	$30,000.00	$30,000
				Subtotal	$30,000
	STRUCTURE				
5	STRUCTURE EXCAVATION	150	CUYD	$100.00	$15,000
6	SHORING, CRIBBING AND COFFERDAMS	1	ALLOWANCE	$50,000.00	$50,000
7	RETAINING WALLS	1	ALLOWANCE	$25,000.00	$25,000
8	DRILLED SHAFT COMPLETE - 24" DIAMETER	470	LF	$600.00	$282,000
9	REINFORCEMENT	64,000	LB	$1.50	$96,000
10	FOUNDATION CONCRETE, CLASS 4000	140	CUYD	$500.00	$70,000
11	DECK CONCRETE, CLASS HPC 4000	180	CUYD	$750.00	$135,000
12	STRUCTURAL STEEL	350,000	LB	$3.85	$1,347,500
13	STEEL ERECTION	1	ALLOWANCE	$400,000.00	$400,000
14	BRIDGE RAILING	688	FOOT	$350.00	$240,800
15	LIGHTING ON BRIDGE	688	FOOT	$200.00	$137,600
16	STEEL STRUCTURE PAINTING	1	LS	$42,000.00	$42,000
				Subtotal	$2,840,900
	PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES				
17	STREET IMPROVEMENTS - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$250,000.00	$250,000
18	STREET IMPROVEMENTS - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$250,000.00	$250,000
				Subtotal	$500,000
	RIGHT OF WAY DEVELOPMENT AND CONTROL				
19	RIGHT-OF-WAY ACQUISITION	0	ALLOWANCE	$0.00	$0
				Subtotal	$0
	MISCELLANEOUS ITEMS				
20	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$50,000.00	$50,000
21	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$50,000.00	$50,000
22	CONTAMINATED SOIL HANDLING AND TREATMENT	1	ALLOWANCE	$150,000.00	$150,000
				Subtotal	$250,000

		CONSTRUCTION SUBTOTAL	$4,251,440
		CONTINGENCY (30.%)	$1,275,432
	TOTAL CONSTRUCTION COSTS	CONSTRUCTION TOTAL	$5,526,871
		PRELIMINARY ENGINEERING (25.%)	$1,381,718
		CONSTRUCTION ENGINEERING (20.%)	$1,105,374
		INFLATION 3 YEARS @ 2% (6.1%)	$488,852
	TOTAL OVERALL COST	**TOTAL**	**$8,503,000**

SULLIVAN'S CROSSING BIKE & PEDESTRIAN BRIDGE
CITY OF PORTLAND - BUREAU OF TRANSPORTATION

BRIDGE OPTION 5
STEEL TIED ARCH WITH DROP-IN SPAN (ALONG ALIGNMENT 2)
PRELIMINARY COST ESTIMATE

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	ITEM COST
	TEMPORARY FEATURES AND APPURTENANCES				
1	MOBILIZATION	1	LS	10%	$590,747
2	TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC	1	LS	5%	$281,308
3	RAILROAD FLAGGERS	38	DAY	$ 2,000.00	$76,000
				Subtotal	$948,055
	DRAINAGE AND SEWERS				
4	BRIDGE DRAINAGE DEVICES	1	LS	$38,000.00	$38,000
				Subtotal	$38,000
	STRUCTURE				
5	STRUCTURE EXCAVATION	150	CUYD	$100.00	$15,000
6	SHORING, CRIBBING AND COFFERDAMS	1	ALLOWANCE	$50,000.00	$50,000
7	RETAINING WALLS	1	ALLOWANCE	$25,000.00	$25,000
8	DRILLED SHAFT COMPLETE - 36" DIAMETER	520	LF	$788.00	$409,760
9	REINFORCEMENT	77,500	LB	$1.50	$116,250
10	FOUNDATION CONCRETE, CLASS 4000	140	CUYD	$500.00	$70,000
11	DECK CONCRETE, CLASS HPC 4000	230	CUYD	$750.00	$172,500
12	STRUCTURAL STEEL	815,000	LB	$3.25	$2,648,750
13	STEEL ERECTION	1	ALLOWANCE	$650,000.00	$650,000
14	BRIDGE RAILING	922	FOOT	$350.00	$322,700
15	LIGHTING ON BRIDGE	922	FOOT	$200.00	$184,400
16	STEEL STRUCTURE PAINTING	1	LS	$97,800.00	$97,800
				Subtotal	$4,762,160
	PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES				
17	STREET IMPROVEMENTS - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$250,000.00	$250,000
18	STREET IMPROVEMENTS - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$250,000.00	$250,000
				Subtotal	$500,000
	RIGHT OF WAY DEVELOPMENT AND CONTROL				
19	RIGHT-OF-WAY ACQUISITION	0	ALLOWANCE	$0.00	$0
				Subtotal	$0
	MISCELLANEOUS ITEMS				
20	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 7TH AVE / NE LLOYD BLVD	1	ALLOWANCE	$50,000.00	$50,000
21	LANDSCAPE IMPROVEMENTS AND LIGHTING - NE 8TH AVE / NE GLISAN ST	1	ALLOWANCE	$50,000.00	$50,000
22	CONTAMINATED SOIL HANDLING AND TREATMENT	1	ALLOWANCE	$150,000.00	$150,000
				Subtotal	$250,000
23				**CONSTRUCTION SUBTOTAL**	$6,498,215
24				**CONTINGENCY (30.%)**	$1,949,464
25	**TOTAL CONSTRUCTION COSTS**			**CONSTRUCTION TOTAL**	**$8,447,679**
26				**PRELIMINARY ENGINEERING (20.%)**	$1,689,536
27				**CONSTRUCTION ENGINEERING (20.%)**	$1,689,536
28				**INFLATION 3 YEARS @ 2% (6.1%)**	$721,432
29	**TOTAL OVERALL COST**			**TOTAL**	**$12,548,000**

Appendix C
PBOT Street Re-Design Options

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APPENDIX C – PBOT ROADWAY ALTERATION STUDIES

PBOT – NE Lloyd Boulevard & NE 7th Avenue- Study for a Protected Intersection

PBOT – NE Lloyd Boulevard & NE 7th Avenue- Study for a Protected Roundabout

PBOT – NE Lloyd Boulevard & NE 7th Avenue- Study for the south bridgehead

Appendix D
Preliminary Foundation Design Memorandum

kpff

GRI
9750 SW Nimbus Avenue
Beaverton, OR 97008-7172
p | 503-641-3478 f | 503-644-8034

MEMORANDUM

To: Craig Totten / KPFF Consulting Engineers

Date: December 2, 2015
(REVISED)

GRI Project No.: 5796

From: Mike Reed, PE, GE, and Jack Gordon, PE

Re: Preliminary Foundation Design Recommendations
Lloyd-Central Eastside Pedestrian Bridge over I-84
Portland, Oregon

DRAFT

The purpose of this memorandum is to provide preliminary foundation design recommendations to support conceptual (15% level) design of the proposed Lloyd-Central Eastside pedestrian bridge that will connect NE 7th and 8th Avenues over I-84 in Portland, Oregon. As part of our consultation, GRI reviewed available subsurface information for the project area. This information indicates the ground surface in the project area is typically mantled with sand and silt that is underlain by relatively dense gravel. The depth to gravel in the project area is highly variable, and we anticipate additional geotechnical explorations will be completed to further evaluate subsurface conditions prior to final design. For the purpose of this preliminary evaluation, we have attached an image (Figure 1) showing the depth at which gravel was encountered in several subsurface explorations completed by GRI and others in the site vicinity. Based on the information shown on the attached Figure 1, we anticipate gravel could be encountered at depths ranging from about 40 to 100 ft below the existing ground surface in the vicinity of the proposed alignment. For preliminary planning purposes, we recommend assuming that gravel will be encountered at depths of about 50 ft below existing grades in the northern and southern limits of the bridge alignment and about 90 ft near the central portion of the alignment.

At this time, we understand several bridge design alternatives are currently being considered. Based on preliminary information you provided, we understand foundation loads could range from about 400 to 1,900 kips in compression and 400 to 1,500 kips in uplift. Considering these loads, it is our opinion that foundation support for the new bridge can be provided by deep foundations extending into the underlying gravel. Based on our experience with similar projects in the site vicinity, we anticipate drilled foundations such as continuous flight auger (CFA) piles, augercast piles, or drilled shafts will be the preferred alternative for deep foundation support at the site. Considering this, we have estimated the axial capacity of several sizes of drilled piles with varying embedment depths in the underlying gravel. The tables below summarize the estimated nominal geotechnical axial resistance of 24- and 36-in.-diameter drilled piles/shafts with 10, 20, and 30 ft embedment depths in the underlying gravel. Different pile types, sizes, and lengths can be evaluated as requested during final design. Although seismic design criteria for the bridge are not currently known, we anticipate the risk of seismically induced liquefaction having a significant impact on the geotechnical design of the foundations is low.

ESTIMATED NOMINAL AXIAL RESISTANCES FOR DRILLED PILES/SHAFTS AT BENTS NEAR TOP OF SLOPE

Embedment Depth in Gravel, ft	Compression/Uplift Resistance, kips (24 in. diameter)	Compression/Uplift Resistance, kips (36 in. diameter)
10	950 / 380	1,760 / 560
20	1,130 / 560	2,050 / 850
30	1,320 / 750	2,330 / 1,130

ESTIMATED NOMINAL AXIAL RESISTANCES FOR DRILLED PILES/SHAFTS AT BENTS NEAR HIGHWAY GRADE

Embedment Depth in Gravel, ft	Compression/Uplift Resistance, kips (24 in. diameter)	Compression/Uplift Resistance, kips (36 in. diameter)
10	1,510 / 750	2,610 / 1,130
20	1,690 / 940	2,900 / 1,410
30	1,880 / 1,130	3,180 / 1,690

We anticipate the bridge will be designed in accordance with the 2014 American Association of State Highway and Transportation Officials (AASHTO) *LRFD Bridge Design Specifications* (BDS). Based on our review of Section 10.5.5.2.4 of the AASHTO BDS, resistance factors of 0.55 and 0.45 are appropriate for evaluating the factored axial resistance of single drilled piles/shafts in compression and uplift, respectively, for the Strength Limit State. For the Extreme Limit State, resistance factors of 1.0 and 0.8 can be used to evaluate the factored axial resistance in compression and uplift, respectively. Service Limit State capacities can be evaluated during final design.

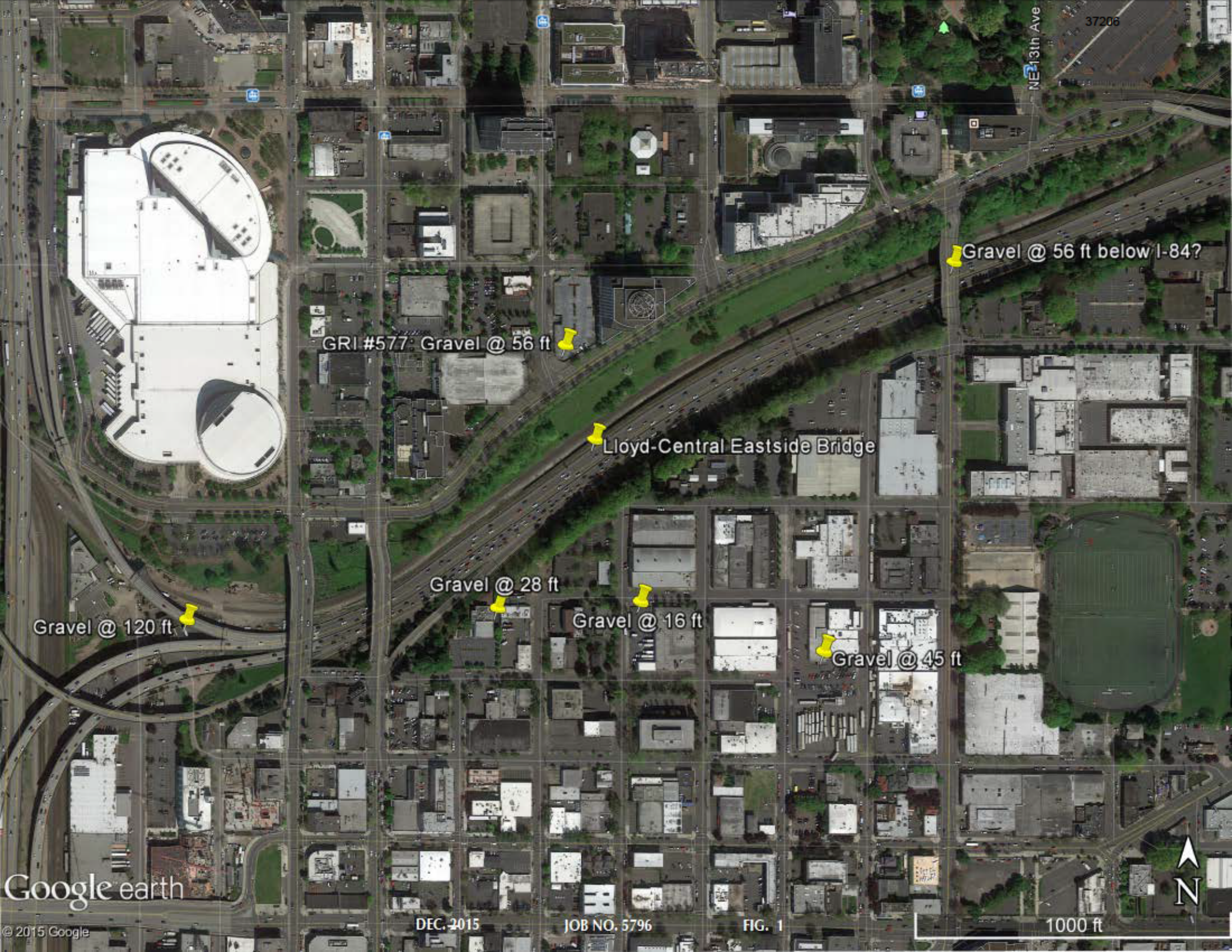
This memorandum has been prepared to aid the engineer in the preliminary design of the proposed bridge structure. The preliminary scope of work is limited to the specific project and location described herein, and our description of the project represents our understanding of the significant aspects of the project relevant to design of pile foundations. It should be noted that additional engineering analyses will be completed for this project, which may provide information that results in changes to the preliminary conclusions and recommendations provided in this memorandum, particularly with regard to seismic loading of foundation piles.

Please contact the undersigned if you have any questions regarding this memorandum.

Submitted for GRI,

Michael W. Reed, PE, GE
Principal

John K. (Jack) Gordon, PE
Project Engineer



DEC. 2015 JOB NO. 5796 FIG. 1

Appendix E
Hazardous Materials Memorandum

kpff

GRI
9750 SW Nimbus Avenue
Beaverton, OR 97008-7172
p | 503-641-3478 f | 503-644-8034

MEMORANDUM

To: Craig Totten, PE / KPFF

Date: December 2, 2015
GRI Project No.: 5728

From: George Freitag, CEG; Mike Reed, PE

Re: Preliminary Hazardous Materials Assessment
Lloyd-Central Eastside Bicycle and Pedestrian Bridge
Portland, Oregon

DRAFT

This memorandum summarizes our preliminary hazardous materials assessment for the Lloyd-Central Eastside Bicycle and Pedestrian Bridge project in Portland, Oregon. We understand KPFF is assisting the City of Portland with this project. The proposed bridge will connect NE 7th and 8th Avenues over Interstate I-84. The purpose of this assessment was to evaluate if recognized environmental conditions (e.g. potential hazardous waste/contaminated sites) are present in the project area.

RECORDS REVIEW

Standard Environmental Record Sources

A desktop records review of Federal, State, and Tribal Environmental Records Sources within the general framework of Section 7 of ASTM E 1527-13 Standard was completed. The review was conducted to evaluate and identify recognized environmental conditions (e.g., potential hazardous waste/contaminated facilities) in connection with properties on or adjacent to the proposed project. GRI subcontracted with EDR, Inc., to compile government agency database information for listings of facilities or locations with recognized environmental conditions near the project site.

The database search shows two historic gasoline stations were located near the north and south landings for the proposed bridge. In 1935 a gasoline station was located near the north (NE 7th Avenue) landing. In 1955 a gasoline station was located near the south (NE 8th Avenue) landing. In our opinion, given the operational timeframe of these gasoline stations, the potential exists for undocumented release of petroleum products to area soils from these facilities. A copy of the database summary and area map is included in Attachment A.

Historical Aerial Photographs

GRI reviewed historical aerial photographs dated 1936, 1948, 1956, 1964, 1970, 1980, 1990, and 2009 obtained from the University of Oregon. A copy of the photographs is included in Attachment B. Land use based on interpretation of the photographs is described below.

Date	Comments
1936	The intersection of NE 7th Avenue and NE Hoyt Street (north landing of proposed bridge) is undeveloped land along the north slope of Sullivan Gulch. The present-day Union Pacific Railroad is present at the base of the gulch. Rough graded areas and possible fill materials are visible along the north slope. The intersection of NE 8th Avenueand NE Glisan Street (south landing of proposed bridge) is undeveloped land. Rough graded areas and paths are present near the proposed bridge landing.
1948	Fill material are rough graded areas are visible along the slope near the north landing. The present-day warehouse building on the southeast corner of NE 8th Avenue and NE Glisan Street has been constructed.
1956	Air emissions are visible in a building north of the north landing. Light-colored fill material appears visible on the property to the west of the south landing.
1964	Interstate I-84 appears constructed. The location of NE Lloyd Boulevard has been shifted to the south, towards I-84, which indicates that fill material was placed near the north landing area.
1970	A building adjacent to the north landing on the north side of NE Lloyd Boulevard has been removed and replaced with a parking lot. Light-colored fill material appears visible on the property to the west of the south landing.
1980	Little appreciable change is noted in the area of the north landing. Small structures are visible on the property to the west of the south landing.
1990	The parking lot near the north landing is rough graded. Little appreciable change is noted in the area of the south landing.
2009	Redevelopment buildings are visible north and east of the north landing. Little appreciable change is noted in the area of the south landing.

In our opinion, given the historic placement of fill soils in the north and south landing areas, the potential exists for chemicals or petroleum products to be present in soils that may be generated as part of bridge construction.

Historical Sanborn Maps

GRI reviewed historical Sanborn fire insurance maps dated 1909, 1948, and 1950. A copy of the maps is included in Attachment C. Land use based on interpretation of the maps is described below.

Date	Comments
1909	The intersection of NE 7th Avenue and NE Hoyt Street (north landing of proposed bridge) is undeveloped land along the north slope of Sullivan Gulch. The area is labeled "Deep Gulch". The present-day Union Pacific Railroad is present at the base of the gulch. The intersection of NE 8th Avenue and NE Glisan Street (south landing of proposed bridge) is undeveloped land with variable topography. The area is labeled "Top of Gulch." A southeast- to northeast-trending lowland area extends through the south landing of the proposed bridge. Several residences are present in the area along the top of the lowland.
1924-28	Little appreciable change is noted in the north and south landing areas. The north landing is noted as "Deep Gulch & Swampland...All Streets Impassable." The south landing area is noted as "Deep Gulch."
1950	Little appreciable change is noted in the north landing area. The north landing is noted as "Deep Gulch & Swampland...All Streets Impassable." The present-day warehouse building on the southeast corner of NE 8th Avenue and NE Glisan Street has been constructed. This building is noted as the American Steel Warehouse Company.

In our opinion, given the historic placement of fill soils in the north and south landing areas, the potential exists for chemicals or petroleum products to be present in soils that may be generated as part of bridge construction.

ROADWAY SHOULDER SOIL

The proposed project footprint includes, and is adjacent to, the I-84 corridor. It is likely that excavations will be required in existing cut slopes that front I-84 for bridge landing areas. The historical use of lead-based automotive products, notably leaded gasoline, and lead-based paint for road striping has introduced elevated concentrations of lead to surface soils near US roads and highways (Barrett, et al. 1998). Some near-highway surface soils, termed *shoulder soils*, may contain lead at sufficient concentrations to represent potential risk to public health and the environment and can exceed regulatory levels for 'clean fill soils'. The proposed project will likely include some excavation of soil adjacent to the I-84 corridor for project alternatives. The Oregon Department of Transportation (ODOT) has guidelines for policy regarding management and reuse of lead-impacted shoulder soil in the upper 18 in. of their rights-of-way (ODOT, 2014). The guidelines are also intended to apply for Local Agency projects that are funded by ODOT.

In our opinion, elevated lead concentrations may be present in surficial roadway shoulder soil and cut slope soils in the project footprint.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

GRI performed a Preliminary Hazardous Materials Assessment for the Lloyd-Central Eastside Bicycle and Pedestrian Bridge project. The following preliminary conclusions are derived from the assessment:

- In 1935 a gasoline station was located near the north (NE 7th Avenue) landing. In 1955 a gasoline station was located near the south (NE 8th Avenue) landing. In our opinion, given the operational timeframe of these gasoline stations, the potential exists for undocumented release of petroleum products to area soils from these facilities.

- In our opinion, given the historic placement of fill soils in the north and south landing areas, the potential exists for chemicals or petroleum products to be present in soils that may be generated as part of bridge construction.

- In our opinion, lead contamination from vehicle and highway use and may have affected roadway shoulder soil and cut slope soils in the project footprint.

We recommend the project team evaluate the need for additional environmental characterization of fill soils in the landing areas, and roadway shoulder and cut slope soils that may be impacted by project construction. A *Contaminated Media Management Plan* should be prepared prior to construction that summarizes hazardous materials and/or non-clean fill management options. Pre-construction evaluation and management of these issues can likely improve project schedule and reduce unanticipated costs related to hazardous materials conditions and management of non-clean fill soils.

LIMITATIONS

This preliminary assessment has been prepared to assist KPFF and the City of Portland in evaluating the potential for recognized environmental conditions (e.g. potential hazardous waste/contaminated sites) in the project area. More extensive assessment, including additional historical review, site exploration, soil and groundwater sampling, and chemical analyses, may be used to supplement the information presented by this assessment and reduce uncertainty beyond the level associated with this assessment.

The conclusions and recommendations presented in this preliminary report are based on our interpretation of the information obtained through the assessment procedures described in this report. No other warranty or representation, either expressed or implied, is included or intended.

Please contact the undersigned if you have any questions regarding this memorandum.

Submitted for GRI,

George A. Freitag, CEG
Associate

Michael W. Reed, PE
Principal

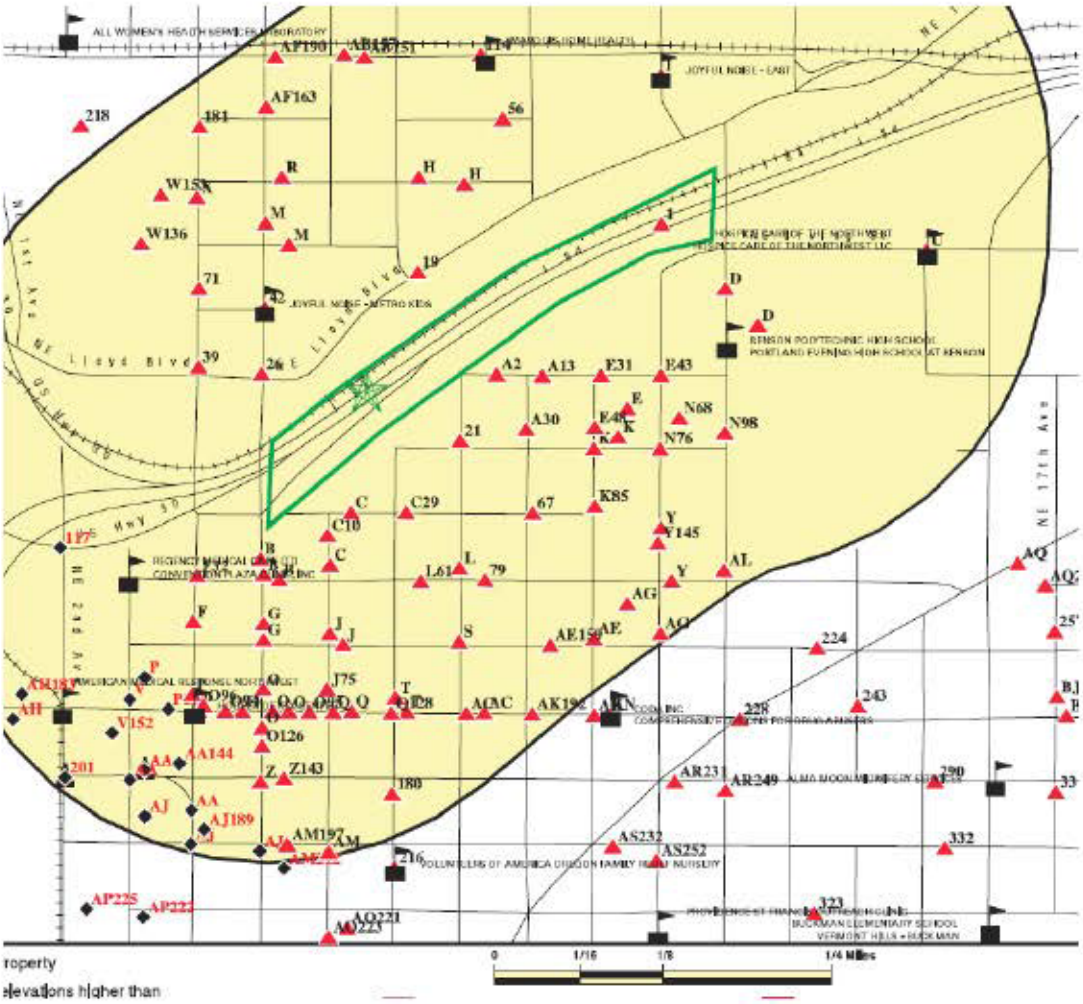
References:

Barrett, M.E., Irish, Jr., L.B., Malina, Jr., J.F., Charbeneau, R.J., 1998, "Characterization of Highway Runoff in Austin, Texas Area," Journal of Environmental Engineering, 124: (No. 2), pp 131-137.

Oregon Department of Transportation, September 14, 2014, Geo-Environmental Section Directive, GE 14-01(D), Management of surface soils removed within operational right-of-way, (http://www.oregon.gov/ODOT/HWY/TECHSERV/docs/tech_bulletins/GE14-01d.pdf)

ATTACHMENT A

Database Summary



A2 MORRIS DEMONT L EDR US Hist Auto Stat 1009494474
East 708 NE GLISAN N/A
< 1/8 PORTLAND, OR
0.016 mi.
85 ft. Site 1 of 3 in cluster A

Relative: EDR Historical Auto Stations:
Higher Name: MORRIS DEMONT L
Year: 1935
Actual: Type: GASOLINE AND OIL SERVICE STATIONS
106 ft.

---

19 WEATHERFORD MAC SERVICE EDR US Hist Auto Stat 1009494502
NNE 711 NE LLOYD BLVD N/A
< 1/8 PORTLAND, OR
0.038 mi.
201 ft.

Relative: EDR Historical Auto Stations:
Higher Name: WEATHERFORD MAC SERVICE
Year: 1955
Actual: Type: GASOLINE STATIONS
104 ft.

Name: HEUVEL KEN SERVICE
Year: 1960
Type: GASOLINE STATIONS

Database search shows two historic gasoline stations at locations 19 and A2 near the north and south approaches for the new bridge.

ATTACHMENT B

Historical Aerial Photographs

1936

1948

1956

1964

1970

1980

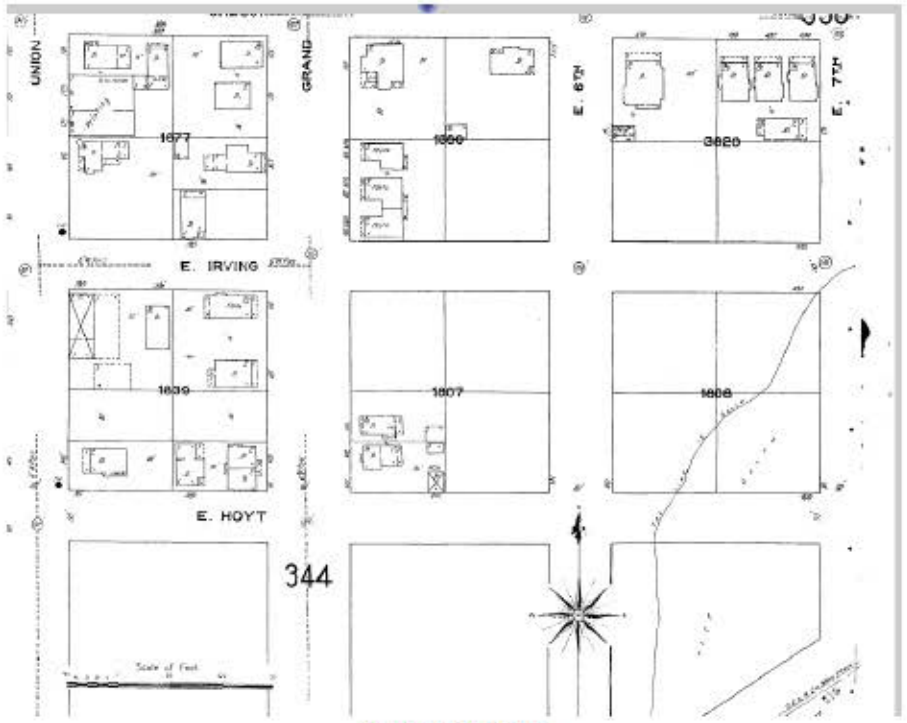
1990

2009

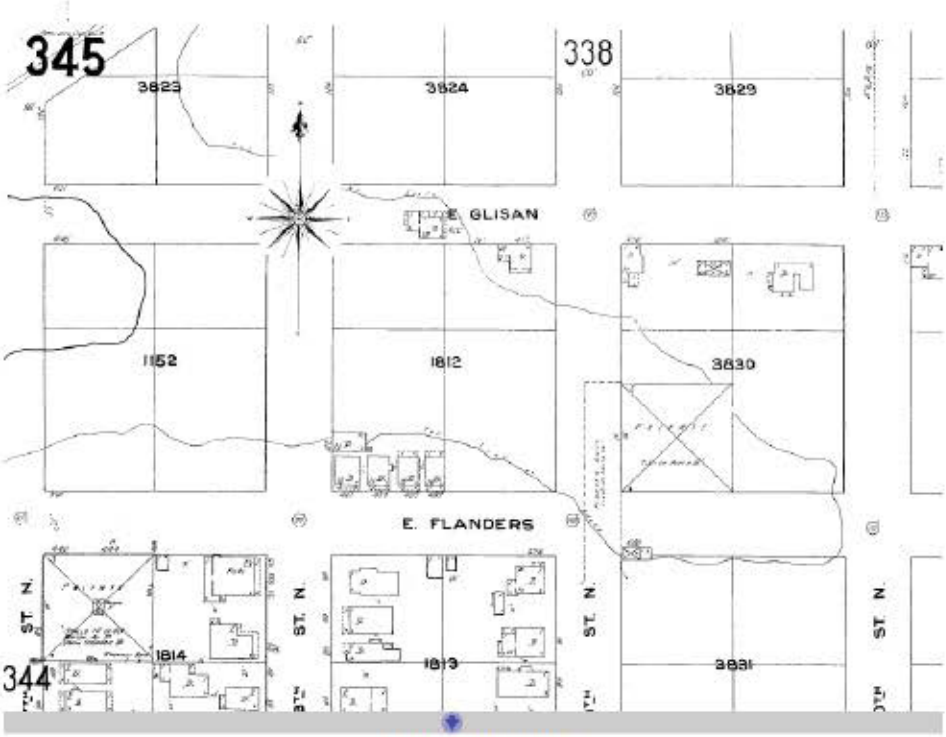
ATTACHMENT C

Sanborn Maps

1909

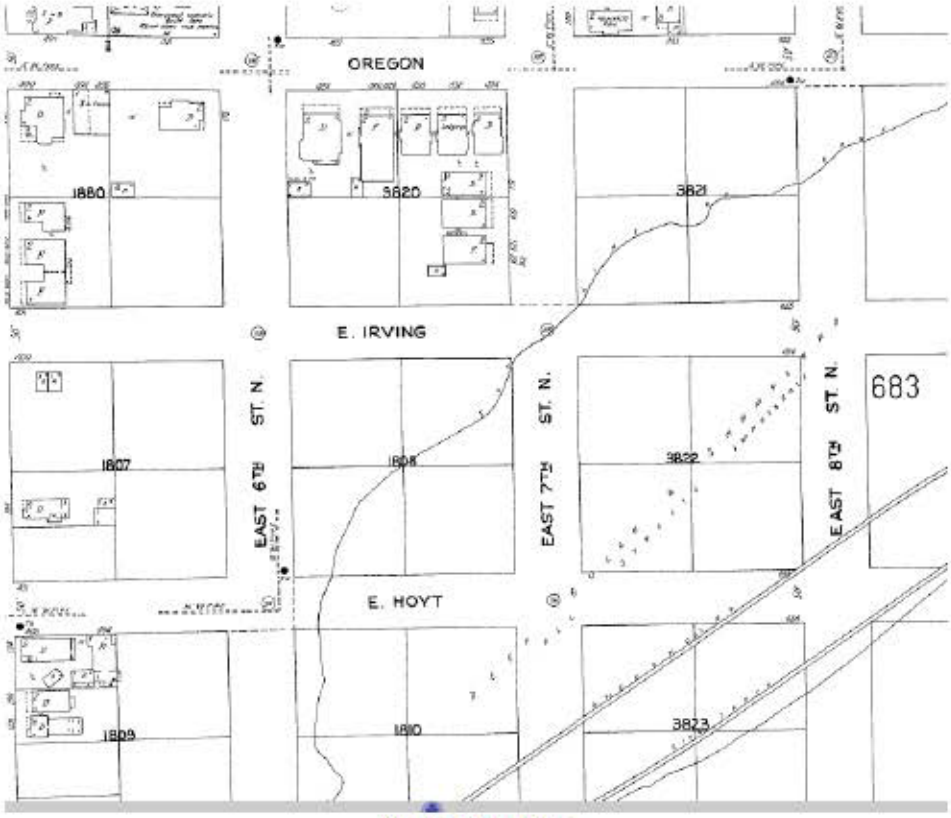


North Landing



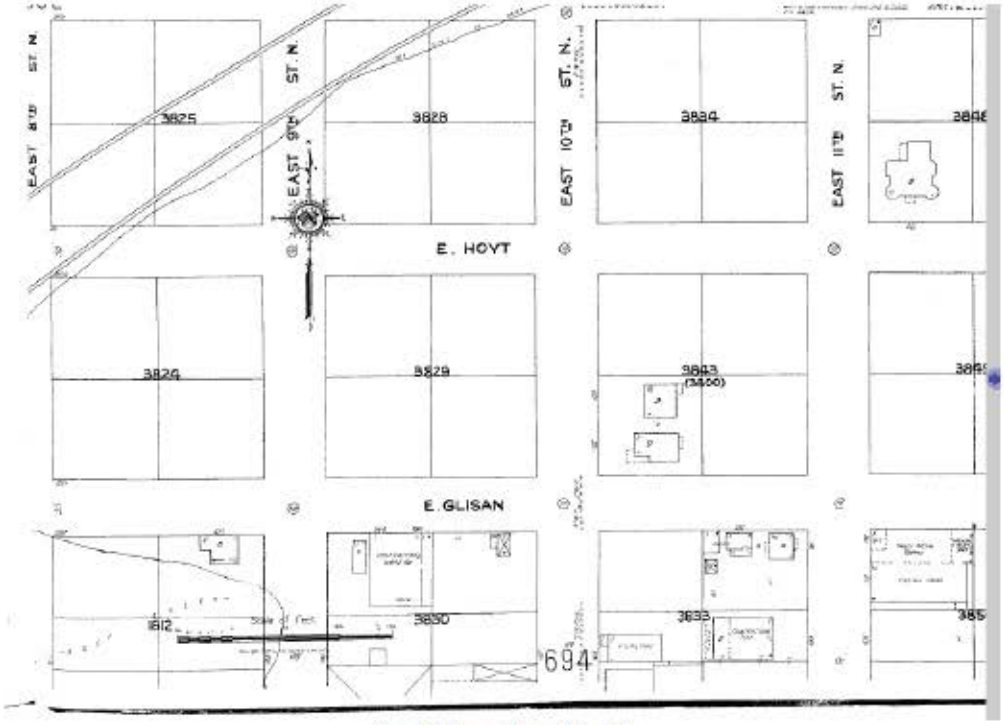
South Landing

1924-1928

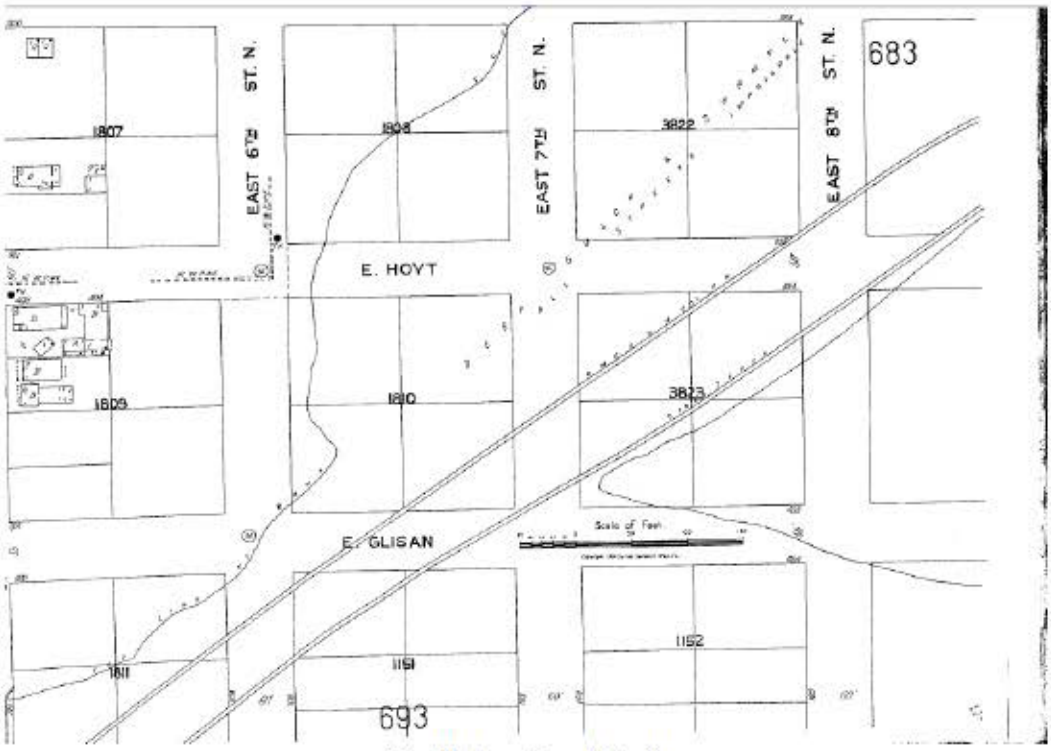


North Landing

1924-1928

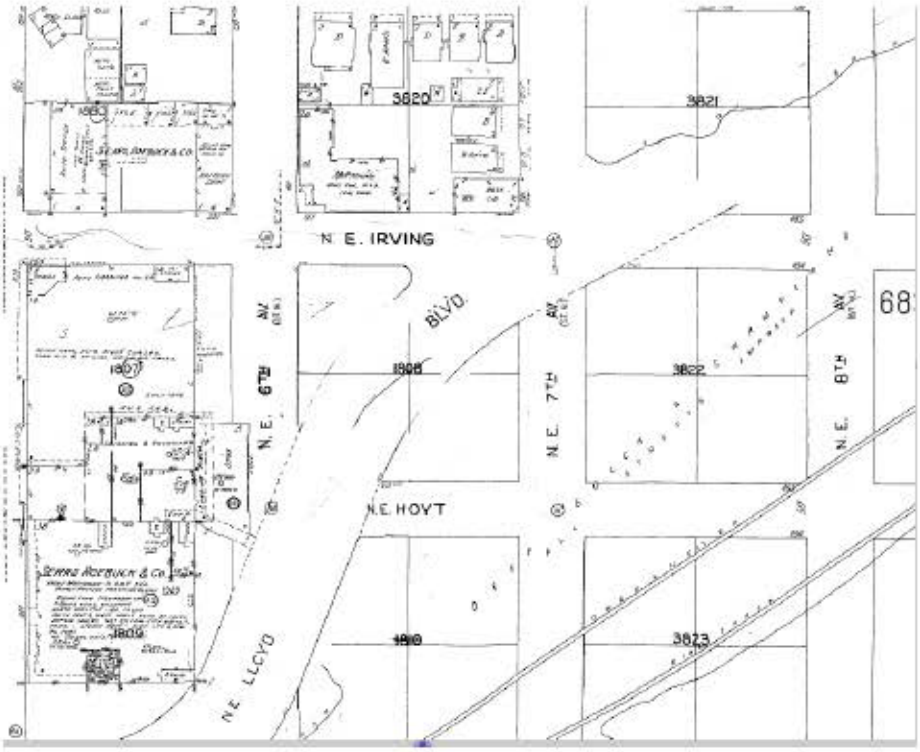


South Landing (East)



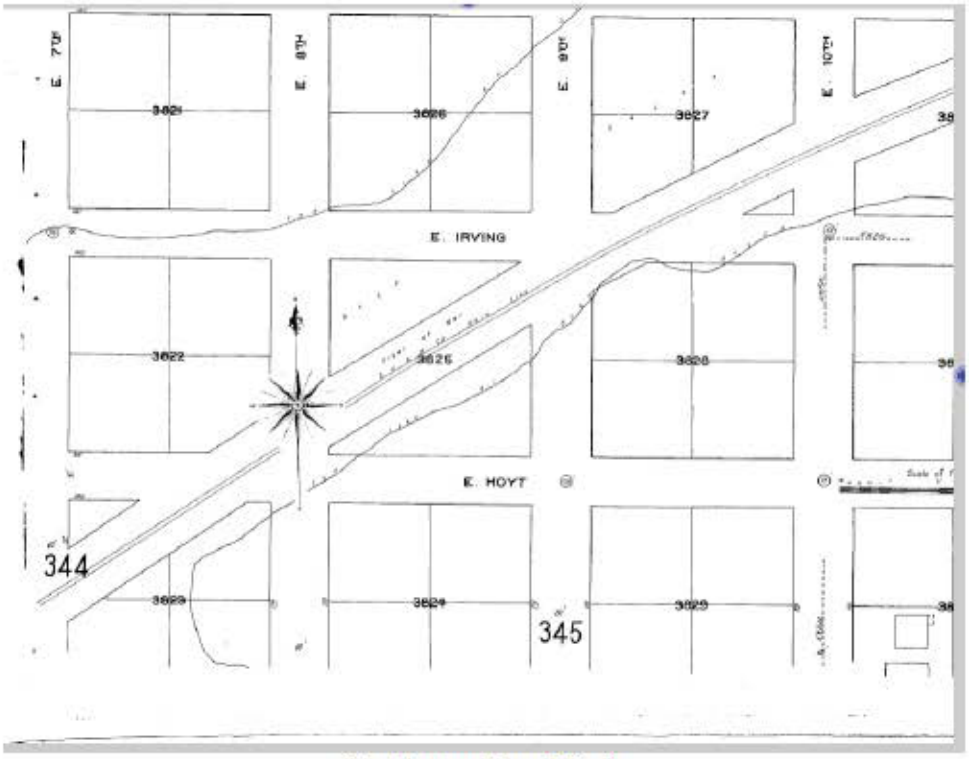
South Landing (West)

1950

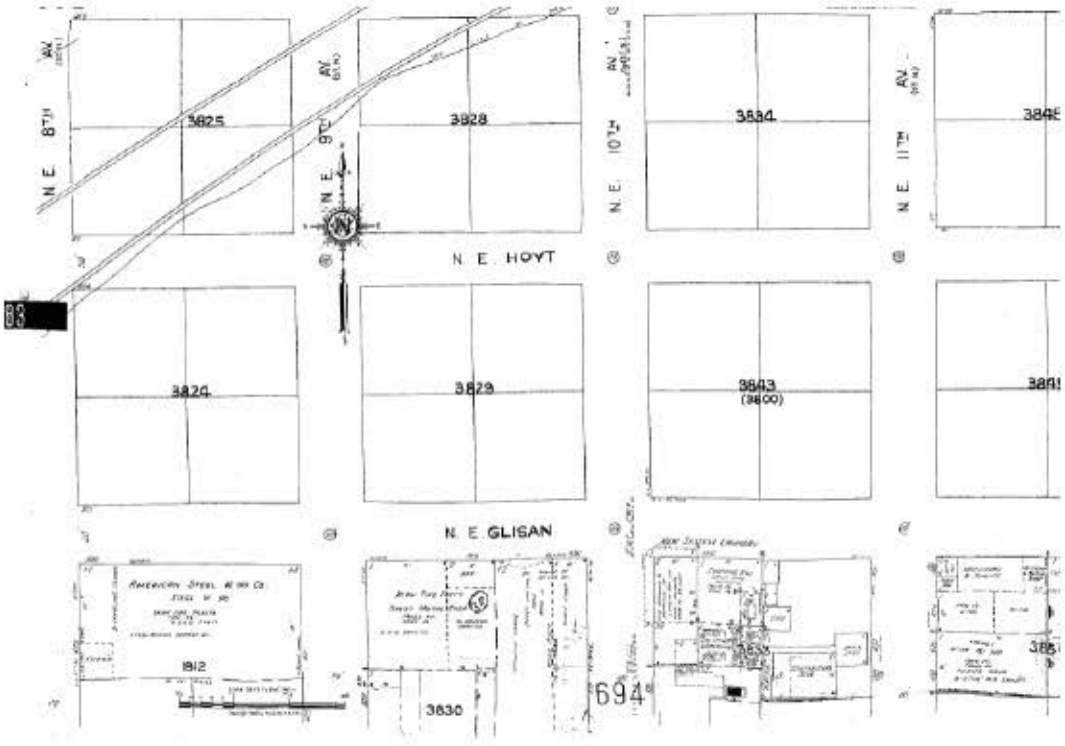


North Landing

1950



South Landing (West)



South Landing (East)

Appendix F
Meeting Minutes from PBOT/ODOT Review Meeting

kpff

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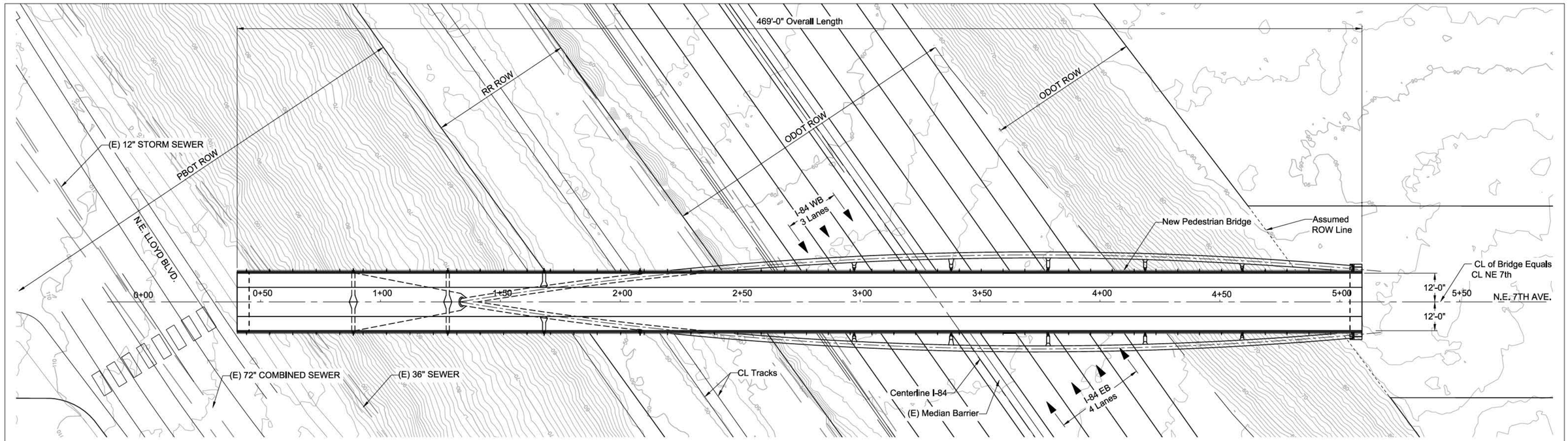
Meeting Notes

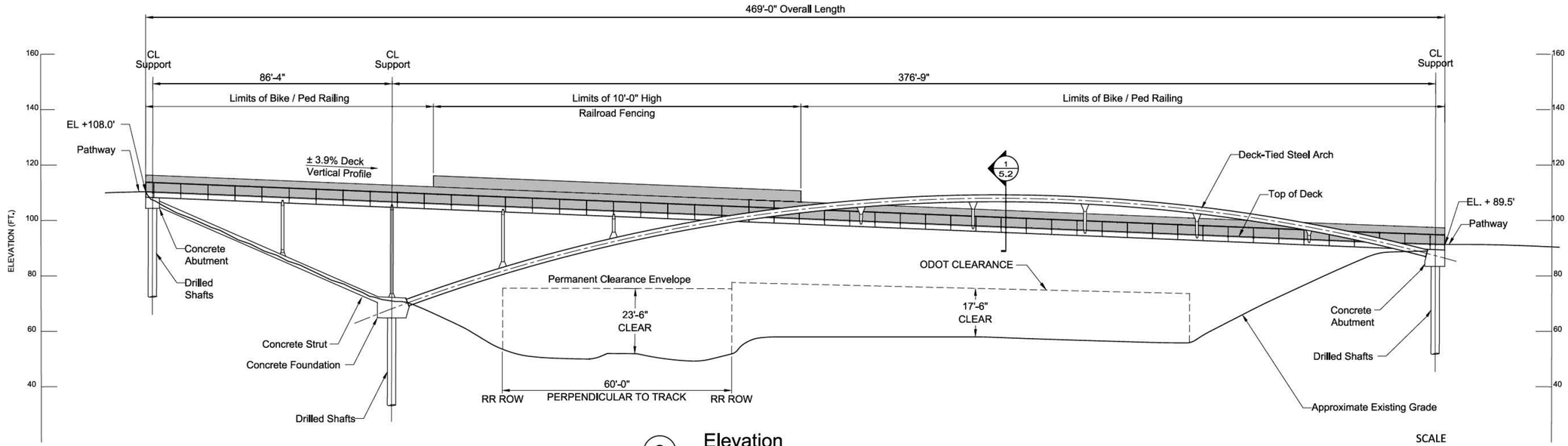
KPFF Project No.: 214268.10	By: Stephen Whittington	Date: November 13, 2015
Project: Lloyd Central Eastside Bike and Pedestrian Crossing		
Meeting Location: ODOT Region 1		
Those Present:	David O'Longaigh – PBOT Zef Wagner – PBOT Andrew Sullivan – PBOT Katherine Burns – ODOT Jessica Horning – ODOT Joseph Auth – ODOT	Tony Stratis – ODOT Craig Totten – KPFF Stephen Whittington – KPFF
Purpose Of The Meeting: Introduce project to ODOT; present several conceptual bridge designs; discuss ODOT's future plans near the planned crossing; Discuss use of ODOT Right-of-Way		

	DISCUSSION ITEMS	Action By
1.	Attendee introductions	None
2.	Craig gave a brief overview of the planned bridge location and where ODOT, PBOT and UPRR right-of-ways were located. Craig explained that PBOT was seeking permission from ODOT to possibly construct temporary or permanent bridge piers within ODOT R/W. Handout distributed showing 4 bridge types being considered.	None
3.	A general discussion ensued about bridge location and right-of-way: ▪ Joseph: ODOT R/W between I-84 WB and UPRR is an acceptable location for a bridge pier. Pier would need to be setback proper distance behind permanent barrier to allow for deflections from vehicle impacts to barrier. ▪ Joseph: There are future plans to re-align the I-5 ramp to I-84 EB. This re-alignment would occur south of the existing I-84 EB edgeline and cut significantly into the existing slope. ▪ KPFF: Asked for a copy of the future alignment plans. Joseph recommended speaking with Mark Johnson (ODOT). Stephen will contact Mark Johnson. ▪ Jessica: Check how sitelines for I-84 WB guide signs mounted on NE Grand Ave bridge crossing may be impacted by proposed new bridge.	Stephen: Contact M. Johnson

	DISCUSSION ITEMS	Action By
	▪ Katherine: ODOT has ITS plans for this portion of I-84. Will need to coordinate bridge location with these ITS structures. Katherine will send Craig ITS information. ▪ Tony: Asked about vertical clearance at new proposed bridge. Craig replied clearance will be well above 17'-6". Handout shows vertical profile for bridge and I-84 cross section. ▪ Tony: Asked if PBOT was considering relocating existing utilities that cross over I-84 on non-seismic resilient bridges over to this new bridge. David thought that was a good idea and would consider. ▪ Katherine: Asked how bridge would be constructed with traffic below. Craig responded that work over I-84 would be performed during night closures. Katherine will send KPFF a list of hours I-84 can be closed and during what days.	Katherine: send ITS plans or contact person to Craig Katherine: send KPFF allowable I-84 closure schedules
4.	Meeting adjourned	



1 **Plan**
1"=20'-0"



2 **Elevation**
1"=20'-0"

SCALE
20 0 10 20 40
1 INCH = 20 FEET

Note: All dimensions are in feet (ft) except as noted.

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

DESIGNED BY	–
DATE APPROVED	-
CAD BY	JB
	Apr. 2016
CHECKED BY	CT
	Apr. 2016

APPROVALS:

DIVISION ENGINEER — REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER — REG. PROF. ENGR. NO. 51538PE

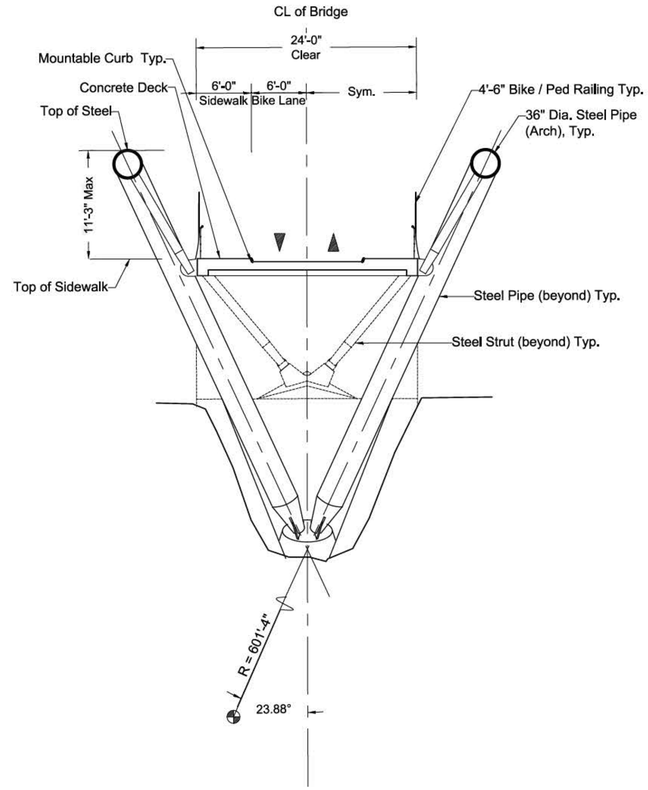
PBOT
PORTLAND BUREAU OF TRANSPORTATION
STEVE NOVICK — COMMISSIONER
STEVE TOWNSEN, P.E. — CITY ENGINEER

SULLIVAN'S CROSSING
BICYCLE AND PEDESTRIAN BRIDGE
OVER I-84
OPTION 5 - DECK-TIED STEEL ARCH
WITH DROP-IN SPAN
ALONG ALIGNMENT 2

1/4 SECTION
PROJECT NO.
SHEET NO. 5.1

15% DESIGN
APRIL 12, 2016

architectural applications a2
kpff
111 SW Fifth Ave., Suite 2500
Portland, OR 97204
O: 503.227.3251
F: 503.227.7980
www.kpff.com



1 BRIDGE SECTION
1/8" = 1'-0"

15% DESIGN
APRIL 12, 2016

SCALE
1 .5 0 .5 1 2
1/8 INCH = 1 FOOT

Note: All dimensions are in feet (ft) except as noted.

architectural applications
a2
kpff
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Portland, OR 97204
O: 503.227.3251
F: 503.227.7980
www.kpff.com

NO.	DATE	DESCRIPTION	APPD.
		REVISION	

DESIGNED BY	DATE APPROVED
–	-
CAD BY	
JB	Apr. 2016
CHECKED BY	
CT	Apr. 2016

APPROVALS:

DIVISION ENGINEER REG. PROF. ENGR. NO. 55504PE

CITY ENGINEER REG. PROF. ENGR. NO. 51538PE

PBOT
PORTLAND BUREAU OF TRANSPORTATION
STEVE NOVICK COMMISSIONER
STEVE TOWNSEN, P.E. CITY ENGINEER

CITY OF PORTLAND OREGON 1851

SULLIVAN'S CROSSING
BICYCLE AND PEDESTRIAN BRIDGE
OVER I-84
OPTION 5 - DECK-TIED STEEL ARCH
ALIGNED WITH NE 7TH AVE.
WITH DROP-IN SPAN

1/4 SECTION

PROJECT NO.

SHEET NO.
5.2

File: G:\e\p\2014\214268.10-Pedestrian_Bridge_Over_I-84\NE 7th to 8th Bike Bridge over UPRR I-84_SCHEME 4.dwg TAB:Layout1 (2)
Plotted: 4/14/16 at 12:01pm By: jwilkes
XREFs:

Appendix B
Bridge Cost Estimate Breakdowns

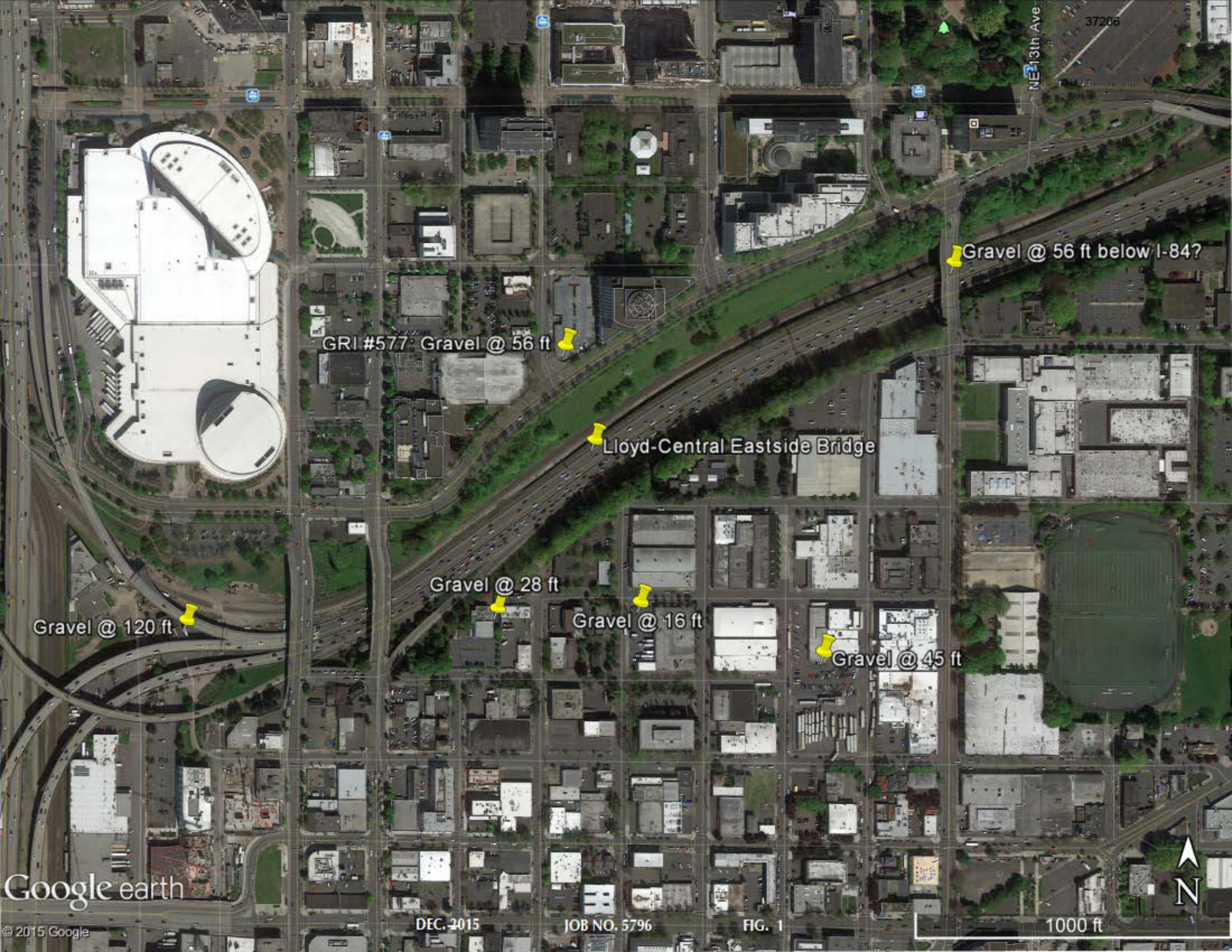
kpff

Appendix C
PBOT Street Re-Design Options

kpff

Appendix D
Preliminary Foundation Design Memorandum

kpff



DEC. 2015 JOB NO. 5796 FIG. 1

Appendix E
Hazardous Materials Memorandum

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