CITY OF BEND MIDTOWN CROSSING - HAWTHORNE BICYCLE AND PEDESTRIAN BRIDGE

Visioning Report

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EXECUTIVE SUMMARY

The City of Bend (City) desires to improve pedestrian and bicycle connectivity through the City's Core Area. An accessible bicycle and pedestrian bridge in the Hawthorne Avenue corridor is a significant component to this vision so users can cross US97, referred to as the Bend Parkway locally, and the Burlington Northern Santa Fe Railway (BNSF) free of conflicts. The City desires a signature bridge aesthetic unique to the City and its surroundings as part of this flagship multi-modal corridor. Overall improvements included in this project will extended from NW Harriman Street to NE 3rd Street.

This Visioning Report (Report) summarizes the City's work to-date to advance this project from an idea in the 2004 Central Area Plan to the preferred bridge type and on-street connections identified in this Report, while setting the stage for the final design phase to follow that will be administered by the Oregon Department of Transportation (ODOT).

Section 2.0 summarizes design criteria and major elements of the bridge and shared-use path (SUP), presents on-street improvement options at each end of the new bridge and retaining walls, and documents early coordination with ODOT and BNSF.

Section 3.0 discusses the bridge type initial screening phase completed in early 2024. DOWL evaluated six bridge types against a set of five considerations to inform City Council's (Council) decision of which bridge types to analyze in the concept design phase. Council selected two cable-stayed configurations, the extradosed, and the steel truss to advance.

Section 4.0 presents a more detailed concept design and evaluation of the four bridge types selected by Council and summarizes feedback received at the open house. For each type, DOWL developed renderings from multiple perspectives, refined cost estimates, prepared conceptual plan sheets, and applied a set of six considerations to provide technical details to present at the open house and to inform Council selection of a preferred bridge type.

Section 5.0 presents the single-tower cable-stayed bridge, selected by Council, as the preferred bridge type, and discusses next steps as this project advances into final design.

The aerial below shows the existing site on the left and a rendering of the preferred bridge type on the right.

Aerial view of Hawthorne Avenue looking Northwest.

1.0 INTRODUCTION

The need for increased multi-modal connectivity in Bend's Core Area has long been associated with Bend's goals for sustainable growth and livability. The Bend Parkway and the BNSF right-of-way (ROW) are a barrier to east-west travel in central Bend. A limited number of crossings exist. Existing crossings are vehicle-centric and constructed prior to the development of modern standards for bicycle and accessible pedestrian use.

The City and ODOT have completed a number of plans and studies for this new bridge over the last 20 years, including studying corridor needs, crossing alignments, and connection types. This Report summarizes the City's work to-date to advance this project, which starts at NW Harriman Street and extends to NE 3rd Street, from an idea in the 2004 Central Area Plan to the preferred bridge type and on-street connection improvements identified in this Report. Other outcomes of this Report include refined project costs, evaluation of the Bend Parkway / Hawthorne intersection, and preparing for the final design phase that will be administered by ODOT starting in early 2025.

1.1 Project Background

Hawthorne Avenue was identified as the location for a separated crossing of the Bend Parkway and the BNSF ROW in the 2004 Central Area Plan. This need was reiterated in the 2014 Bend Central District Multi-Modal Mixed-Use Area Plan and 2019 Bend Core Area Project Urban Design Framework.

Specific studies of the Hawthorne Avenue crossing location began with a 2016 technical memorandum. This memorandum addressed two alternatives to cross the Bend Parkway and the BNSF ROW: a pedestrian tunnel and a pedestrian overcrossing. The overcrossing was identified as the least-cost alternative. Further evaluation in 2020 provided suggested families of alternatives for a pedestrian crossing. Lastly, the 2022 Bend Midtown Pedestrian and Bicycle Crossings Feasibility Study evaluated three overcrossing alignment alternatives, provided planning-level cost estimates, and public outreach.

The 2022 study evaluated a straight alignment with a series of ramps and landings, a switchback alignment maintaining a 4.5% slope to meet Americans with Disabilities Act (ADA) standards, and a straight alignment with stairs and elevator bridge access. The results of this study recommended the first alignment as the preferred alternative.

This Report builds upon this previous work with the intent to create a vision for the Hawthorne Pedestrian Bridge. The desired outcome is establishing the structural configuration of the bridge, including confirming the main span bridge type and aesthetics, defining the approach spans and associated retaining walls, and refining total project costs. The design phase is anticipated to start in early 2025.

1.2 Project Status

The City has been awarded state and federal funds to supplement local funds. These funds will be used for design and construction of the Hawthorne Pedestrian Bridge and connections extending from NW Harriman Street to NE 3rd Street. ODOT will administer the design and construction phases of the project.

This Report focuses on selecting the signature bridge main span type and on-street improvements at each end that are complementary to the bridge alignment and, to the extent practical, future City plans for the Hawthorne corridor. The signature bridge main span is from the west side of the Bend Parkway to approximately NE 1st Street as that section is most visible and requires the longest set of spans to cross the Bend Parkway and BNSF ROW. On-street improvements will be from NW Harriman Street to the west bridge landing and from the east bridge landing to NE 3rd Street.

The signature bridge type selection process was completed in two steps: initial screening and concept design. The initial screening applied a high-level evaluation of the project goals to identify viable bridge types for the City's consideration. The City then selected which signature bridge types to advance into the concept design phase to further refine each one and to inform the City's selection of a preferred bridge type. The findings of this Report will be provided to ODOT to define several aspects of the design phase scope.

1.3 Next Steps

In the next phase of design, the following elements need further consideration:

- **Architectural and Aesthetic Treatments and Amenities** – Specific architectural details, such as bridge railing and bridge protective screening, lighting, concrete coloring, and patterning, still need to be determined.
- **Bridge Type, Size, and Location (TS&L)** – Advance the preferred concept design presented in this Report to TS&L level. This will refine the cost estimate and confirm span configurations, foundation types, and retaining wall type and configuration. The TS&L will also develop traffic staging, and construction sequencing and duration, most notably for the portions in and around the Bend Parkway and BNSF.
- **Additional Bridge Connection Points** – The location and footprint of the stairway access or direct connection to a future City building between BNSF ROW and NE 1st Street needs to be established. Bridge layouts have been prepared to integration the connection point.
- **ODOT Mobility Advisory Committee (MAC)** – Coordination with MAC will be required to confirm minimum vertical and horizontal highway clearance requirements.
- **BNSF Coordination** – Continue approval process to construct the bridge above their tracks and across their ROW.
- **Utility Coordination** – Utility conflicts will need to be identified, as well as optimizing the bridge layout and placemaking to minimize conflicts.
- **ROW Coordination** – It will be important to optimize the bridge layout and placemaking to minimize ROW conflicts.
- **On-Street Improvements** – Design connections at each end of the bridge to create a separated, comfortable space for people biking or walking along the corridor and through adjacent intersections.

The above is not an exhaustive list but are some of the critical design elements that will need to be addressed. These elements are relevant to the project, regardless of bridge type.

2.0 DESIGN CRITERIA AND CONSIDERATIONS

The proposed bridge will provide safe crossing of the Bend Parkway, BNSF ROW, and NE 1st Street for pedestrian and bicyclist users. An 18-foot-wide clear path between the bridge rails will be provided to accommodate two-way, SUP users.

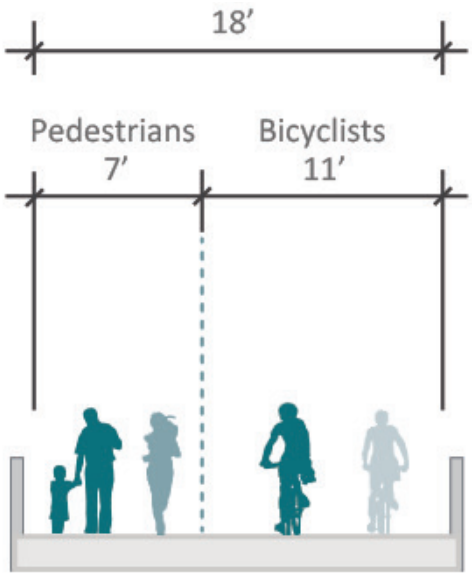


Figure 1
SUP Section View

Minimum vertical clearances, based on City, ODOT, and BNSF standards, are:

- 17.25 feet over the Bend Parkway (US97) per the ODOT Bridge Design Manual
- 23.5 feet over the BNSF ROW per BNSF standards
- 15.0 feet over NE 1st Street per the American Association of State Highway and Transportation Officials (AASHTO) standards

2.1 Bridge Design Standards

The bridge will be designed in accordance with the following:

- 2020 AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, 9th edition
- 2009 AASHTO LRFD Guide Specification for the Design of Pedestrian Bridges, 2nd edition

The design pedestrian live loading is 90 pounds per square foot. The design vehicle live loading is an H10 design truck or an inspection (boom lift) vehicle.

2.2 Shared-Use Path Design Standards

The SUP will need to comply with ADA standards and will be designed in accordance with the following:

- 2023 City of Bend Design Standards
- 2021 AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2nd edition
- 2012 AASHTO Guide for the Development of Bicycle Facilities, 4th edition
- 2011 ODOT Bicycle and Pedestrian Design Guide

The constructed maximum longitudinal slope along the path cannot exceed 5% for extended lengths, and the constructed maximum cross slope cannot exceed 2%. A maximum 8.33% longitudinal slope along the path is permitted for 30-foot-long runs if a landing is provided. Longitudinal and transverse design slopes will not be designed using the maximum allowable per the standards. Instead, the maximum allowable design slope will be 0.5% less than the standard to provide construction tolerances.

The bicycle uphill design speed is 12 miles per hour and the bicycle downhill design speed is 20 miles per hour. The vertical profile and horizonal alignment will be designed for stopping sight distance and minimum radius of curvature for both design speeds as applicable.

2.3 Shared-Use Path Elements

DOWL reviewed previous studies and evaluated the existing site conditions and constraints to confirm a preferred path alignment and vertical profile. The primary site constraints are spanning the Bend Parkway, BNSF ROW, and NE 1st Street, reconnecting to the existing grade east of NW Hill Street and west of NE 2nd Street, and maintaining driveway accesses through that corridor.

2.3.1 Horizontal Alignment

Four properties within the SUP limits have driveways connecting to Hawthorne Avenue. Two are near the NW Hill Street west terminus on the south side of Hawthorne Avenue, one is between NE 1st Street and NE 2nd Street on the north side of Hawthorne Avenue, and the other is near the 2nd Street east terminus on the south side of Hawthorne Avenue.

When these areas redevelop in the future, City standards will require alley access instead of direct access from Hawthorne. For the interim condition until then, the alignment of the bridge and approaches are set so the driveways will be maintained. To accomplish this, the alignment starts along the north side of Hawthorne Avenue from NW Hill Street across BNSF ROW, then shifts to the south side of Hawthorne Avenue near NE 1st Street using a set of reversing curves and continues along the south side of Hawthorne Avenue until reconnecting to the existing grade before the driveway on the south side near NE 2nd Street.

Appendix D Fire Apparatus Access Roads in the 2022 Oregon Fire Code and Section 503 of the 2021 International Fire Code set the minimum width for fire apparatus access roads at 20 feet. The City has incorporated this as minimum 20-foot, curb-to-curb, roadway width for Emergency Medical Services (EMS) vehicle access. The Core Area is set for redevelopment with zero lot line development of buildings up to 85 feet tall. The Fire Code require 26 feet of clear width adjacent to buildings over 30 feet tall for aerial apparatus equipment, further complicating this corridor and alignments.

The final SUP horizontal alignment needs to be coordinated closely with the final corridor modal use needs and priorities to address the minimum roadway section along Hawthorne Avenue adjacent to the bridge and approaches, sidewalk access to properties, bicycle facilities, and parking requirements. This may result in a balance of roadway width with parking and multi-modal needs. Two ways to achieve this balance are purchasing additional ROW or obtaining a design exception from the City of Bend to the Fire Code requirements.

Currently, Hawthorne Avenue is mostly constrained by an existing 60-foot ROW, although two recently redeveloped properties within the project limits have each dedicated 10 feet of ROW in preparation for an overall 80 feet of ROW width, consistent with the City's collector street classification of Hawthorne Avenue, west of the Bend Parkway. The additional ROW, or a combination of additional ROW and design exceptions, may be required to provide fire or aerial apparatus equipment access along this corridor.

2.3.2 Vertical Profile

The BNSF clearance requirement of 23.5 feet between the top of the rail and the bottom of the bridge controls the vertical profile design. Furthermore, the railway is located on an elevated embankment above the Bend Parkway and local streets. This lengthens the approaches needed to achieve the 23.5 feet of vertical clearance.

To satisfy these profile constraints, the 2022 Feasibility Study identified the need for either a 7.5% slope with 5-foot landings every 30 feet or north-south switchbacks and/or circular stacked ramps at each approach with a 4.5% grade across the Bend Parkway and BNSF. At that time, the City selected the first option.

DOWL reevaluated the profile options using ground survey, including top-of-rail survey points, to confirm clearance requirements. The City wanted to reduce or eliminate the need for the steeper slope and landings every 30 feet. This reevaluation confirmed the findings from the 2022 Feasibility Study.

2.4 Hawthorne Corridor

An important part of achieving project goals is completing on-street improvements at each end of the bridge that connect into the City's existing bicycle and pedestrian system. The Midtown Hawthorne corridor will be a flagship route for bicycles and pedestrians. This corridor needs to deemphasize vehicles; create a separate, comfortable, and intuitive space for people walking and biking; and alert all users at the intersections near the connection points.

At the west end of the project, on-street improvements have been considered between NW Harriman Street and the west terminus of the bridge immediately east of NW Hill Street (Hawthorne - West). At the east end of the project, on-street improvements have been considered between the east terminus of the bridge immediately west of NE 2nd Street and NE 3rd Street (Hawthorne - East).

Options for on-street improvements are discussed further in the following subsections. There are ongoing studies, such as the Low Car District Feasibility Study (Low Car Study), which includes this corridor between Drake Park and Juniper Park, that will result in future additional enhancements to these connections as this key east-west route is extended. Appendix 1 contains conceptual layouts for a number of options with a recommended design concept for each location.

Speed control at each end of the bridge will provide a safer, more consistent mixing of pedestrians and bicyclists. The speed treatments shown in in the conceptual layouts are illustrative in nature and provide a starting point for future design discussions and decisions. Examples of speed control that should be considered during final design range from semi-permanent installations like planters, to more permanent installation, such as raise channelizers, splitter islands, seat wall, cast-in-place planter boxes, or railings.

2.4.1 Hawthorne - West

Based on initial discussions with the City, all concepts have been developed assuming Hawthorne Avenue is closed to all vehicle access at the Bend Parkway, maintains access to the two properties at the southeast corner of NW Hill Street until future redevelopment relocates access to the alley and the water services and fire hydrant east of those driveways, and will operate one-way westbound between NW Harriman and Hill Streets for vehicles.

Three design concepts were considered but not advanced:

- Maintain the basic control and operations of all intersections and the westbound shared vehicle-bicycle lane (sharrow) on Hawthorne west of NW Hill. This is not consistent with the future vision of the corridor.
- A Woonerf concept, where the available roadway width is a single corridor shared by all modes of travel without curbs or sidewalks, between NW Harriman and Hill Streets. This is too expensive and would only be appropriate as part of a larger Woonerf corridor.
- A mini roundabout (RAB) at NW Hill Street. This is more complex for different modes, not consistent with the NE 2nd Street corridor, and is more expensive compared with the raised intersection.

Based on initial discussions with the City, the preferred on-street improvements will include constructing a raised intersection at NW Hill Street with a cycle track along the south side of Hawthorne between NW Harriman and NW Hill Streets. This will provide a connection to the City's Low Stress Network (LSN) along NW Harriman. Design considerations include:

- Sight distance between northbound traffic and westbound bicyclists
- The west leg at Harriman places bicycles between traffic lanes and is not low-stress. As an interim configuration, this might be acceptable but a low-stress configuration is needed long-term.
- Consider protecting or eliminating the westbound left-turn pocket at NW Lava Road based on the Harriman west leg configuration.
- Limits for converting Hawthorne to one-way westbound
- Creating a gateway intersection feel at NW Hill with elements, such as colored concrete, pavers, or raised features
- Speed control treatments as previously described

2.4.2 Hawthorne - East

Based on initial discussions with the City, all concepts have been developed assuming Hawthorne Avenue will operate one-way westbound between NE 1st and 3rd Streets for vehicles, the NE 2nd Street intersection will be all-way stop-controlled (AWSC), and access to the Bottle Drop is maintained from Hawthorne Avenue. Improvements between NE 2nd and 3rd Streets should be low-cost, interim elements to remain flexible based on the Low Car Study recommendations.

A mini RAB was considered but does not align with the City's vision and planning efforts for the 2nd Street corridor. Therefore, it was dismissed. Two different two-way stop-controlled (TWSC) intersections were considered. One with raised crosswalks for east/west pedestrian crossings of NE 2nd Street and full traffic movements with Hawthorne one-way westbound. The other with a westbound right turn median to make a free movement and force a northbound left turn.

The preferred concept is the first TWSC intersection with full traffic movements and a two-way cycle track from the end of the bridge to NE 3rd Street along the south side of Hawthorne. From the end of the bridge through the NE 2nd Street intersection, the cycle track and crosswalk will be raised. This provides another connection to the LSN along NE 2nd. From there to the west side of NE 3rd Street, the cycle track will be painted to provide future flexibility. Design considerations include:

- Sight distance between westbound traffic and the cycle track on their left
- The NE 2nd Street intersection will include raised crosswalks for east/west pedestrian crossings
- A fully raised intersection may be evaluated as part of the Low Car Study
- Creating a gateway intersection feel at NE 2nd with elements, such as colored concrete, pavers, or raised features, recognizing this intersection is more complex than NW Hill
- Speed control treatments as previously described

2.5 ODOT and BNSF Coordination

Construction of the bridge has the potential to impact ODOT and BNSF ROW. The west edge of BSNF ROW is near the median of the Bend Parkway (US97), meaning northbound US97 is in an easement that ODOT obtained from BNSF. In November 2023, ODOT confirmed that BNSF is unlikely to approve a bridge pier located between northbound US97 and the tracks. However, ODOT indicated locating a bridge pier in the US97 median should not be a concern from BNSF's perspective since northbound US97 is not going to move. During that same time, ODOT confirmed they did not have any other objections to a median pier as long as the design addresses constructability challenges, the pier is protected for crashworthiness, and the bridge configuration meets horizontal and vertical clearances.

As discussed previously, the railroad tracks are approximately eight feet above US97; therefore, meeting vertical clearance requirements on US97 will not be an issue. The proposed bridge layout also locates piers outside of any potential future widening of US97 to meet horizontal clearance requirements. Constructability of each bridge type is discussed later in this Report. Pier protection will be incorporated into the final design phase.

BNSF provided the City a conditional letter of support for this project. While this is nonbinding and subject to change, it is an initial positive indication as the project advances. ODOT directed the City to wait on advancing any BNSF coordination and approval processes until the next design phase.

2.6 Preliminary Geotechnical Memorandum

A preliminary geotechnical investigation of the bridge site has been completed as part of this Report. The geotechnical investigation consisted of a desktop study to summarize the existing data and subsurface conditions, preliminary seismic design parameters, potential bridge foundation and retaining wall types, and future exploration recommendations. See Appendix 2 for the complete Preliminary Geotechnical Memorandum.

Shallow spread footings bearing on rock is the anticipated bridge foundation type. Ground anchors could be considered to reduce footing sizes where space is limited. Mechanically stabilized earth (MSE) retaining walls are the anticipated retaining wall type to support the SUP approach fills. The construction costs presented in this Report are based on this preliminary understanding of subsurface conditions.

3.0 INITIAL SCREENING

After setting the preliminary alignment and vertical profile, DOWL identified six compatible bridge types described below:

Cable-Stayed: A structure that uses a deck system connected directly to tall pylons or towers by steel rods or wires. These structures accommodate long spans and a have a shallow deck system that does not require girders.

Extradosed: A hybrid structure that uses both conventional beam and cable-stayed bridge systems. Extradosed bridges are like cable-stayed bridges but use deeper girder sections to support the deck system, fewer cable stays, and shorter towers for similar span lengths.

Thrust Arch: A structure that uses a continuous circular or parabolic bent member to support the deck system. The structural arch can be located below or above the deck elements and is anchored into the ground at the foundation.

Strutted Arch: A structure like a thrust arch but uses straight inclined elements and creates a different aesthetic.

Through-Girder: A structure that uses two parallel girders that the user passes in between. The girders are connected with floor beams spaced along the length of the girder. The deck system spans between floor beams.

Steel Truss: A structure that uses vertical, horizontal, and diagonal steel members to form a truss. Steel truss bridges typically use two parallel trusses joined by floor beams spaced along the truss. The deck system spans between floor beams.

3.1 Bridge Type Consideration Categories

To help the City evaluate each signature bridge type and select which bridge types to advance into the concept design phase, DOWL developed a set of considerations to compare and rank each bridge type relative to one another.

3.1.1 Cost

Bridge costs are dependent on span arrangement, bridge type, and constructability challenges. Initial project costs for the identified six signature bridge types were developed considering the different impacts due to these factors. At this early stage of evaluation, a cost ranking of one through five was assigned to each bridge type, with one being the least cost and five being the most cost to construct.

3.1.2 Maintenance

Pedestrian bridge maintenance costs and methods are an important consideration since the City needs to identify operational needs and an annual or periodic funding source over the life cycle of the bridge for these needs. These costs include a bridge inspection every four years to identify future maintenance needs, such as bridge joint replacements, resurfacing, painting, and deck crack sealing.

Maintenance needs are higher for bridge types that are more complex, such as the cable-stayed bridge. For example, the cables on a cable-stayed bridge need “tuning” for long-term superstructure deflections, whereas a truss or through-girder bridge would not require this work.

Material types also affect maintenance needs. For example, bare structural steel components are prone to corrosion and require corrosion protection. Corrosion protection can be provided by applying a protective coating, such as paint, but require reapplication every 20 to 25 years. This maintenance effort would not be required for concrete structures.

Maintenance efforts are further increased for bridges that include elaborate lighting or protective fencing elements. In addition to bridge maintenance, the SUP will require operational maintenance, such as snow plowing, sanding, and sweeping. These costs do not appreciably vary by bridge type and are small compared with the bridge maintenance costs.

These factors and others were considered for each signature bridge type to qualitatively assign a ranking of “low”, “medium”, or “high” effort to maintain.

3.1.3 Aesthetics

Aesthetic considerations are subjective in nature but relate to the bridge’s setting, user experience, and visual impact. Given the City’s desire to invest in a signature bridge that defines this flagship multi-modal experience unique to the City, subjective evaluation was based on both the experience of the project team and public input. Aesthetic preference will be given to the bridge types that look appropriate within the site, relate to the surrounding natural and built environment, and provide the unique visual benefit the City desires from a signature bridge.

Objective measurable aspects, such as visual compatibility and a structural form and function, were also considered. Visual compatibility examines how the proposed bridge impacts, or contrasts with, the existing and future potential visual character of the landscape in terms of bridge scale, form, materials, and overall project visual character. Structural form and function relates to the structural member sizing and orientation to result in a structurally efficient system using appropriately sized members and clean visual lines.

The resulting combination of this merged analysis was the basis for assigning each signature bridge type with a ranking of “high”, “medium”, or “low” aesthetic appeal.

3.1.4 Constructability

Constructability is a major factor because of the work over the Bend Parkway and BNSF ROW and limitations on closures and/or detours. The complexity of construction varies among the bridge types. For example, a bridge pier located in the median of the Bend Parkway would be harder to construct than a pier located on the shoulder of the Bend Parkway. Also, cable-stayed bridges require multiple and precise overhead deck panel setting procedures, whereas a prefabricated truss can be assembled on the ground and set in place at one time.

These factors and others were considered for each signature bridge type to assign a ranking of “easy”, “moderate”, or “difficult” to construct.

3.1.5 Land-Use Compatibility

Land adjacent to the Bend Parkway and BNSF is zoned to accommodate new development. New buildings may be 65 to 85 feet tall. The presence of the new pedestrian crossing may encourage new development in the area. This new development should be considered when selecting a signature bridge type. Specifically, the project needs to consider how new, taller buildings might enhance or detract from each signature bridge type.

The City has identified a potential future need for a bridge connection between BNSF ROW and NE 1st Street. This access is anticipated to be a stairway to the street level and possibly a second story connection from a future City building to serve people cycling or using a wheelchair. The ability to accommodate this future access point should be considered when selecting a signature bridge type.

These factors and others were considered for each signature bridge type to assign a ranking of “good”, “fair”, or “poor” land-use compatibility.

3.2 Initial Screening Results

DOWL presented the six signature bridge types and their rankings to Council on February 21, 2024. Figure 2, below, summarizes the results of the initial screening process and the information that was presented to Council.

Consideration	Cable Stayed	Extradosed	Thrust Arch	Strutted Arch	Through-Girder	Steel Truss
Project Cost	$$$	$$$	$$$$$	$$$$	$$	$
Maintenance	High	Medium	Medium	Medium	Low	Low
Aesthetics	High	Medium	High	High	Low	Medium
Constructability	Difficult	Moderate	Difficult	Difficult	Easy	Easy
Land-use compatibility	Fair	Fair	Good	Good	Good	Good

Figure 2
Initial Screening Results

At the conclusion of that presentation, Council selected four alternatives to advance in the concept design phase:

- Single-Tower Cable-Stayed
- Two-Tower Cable-Stayed
- Extradosed
- Steel Truss

These four alternatives are discussed further in Section 4.0.

4.0 CONCEPT DESIGN

The concept design phase further refined the signature main spans, approach spans, and approach retaining wall layouts. This task included developing photorealistic renderings to confirm the bridge aesthetic, expanding on the bridge type considerations for each alternative, and facilitating an open house to engage the public's opinion on the four alternatives being considered.

Additionally, 10% planning-level project cost estimates and plan and elevation concept drawings were developed for each alternative.

The results of the concept design phase are presented in the following subsections.

4.1 Single-Tower Cable-Stayed

This alternative is composed of a single "A" frame tower located in the Bend Parkway median and two 170-foot-long, cable-stayed main spans to cross the Bend Parkway and BNSF ROW. The signature bridge deck system uses precast deck panels and a cast-in-place (CIP) deck topping slab. The pylons will extend approximately 78 feet above the bridge walking surface with a total height of approximately 110 feet. The pylons can be constructed of either CIP or precast reinforced concrete. Steel cables comprised of multiple interlocking steel strands will support the deck system and anchor to the pylons.

Figures 3 and 4, below and on the following page, show the proposed bridge elevation view looking south along the Bend Parkway and a user's perspective view looking east with Pilot Butte in the background, respectively. Both renderings include buildings representing potential future development in the area.

Figure 3
Single-Tower Cable-Stayed Alternative, Rendering Looking South Along the Bend Parkway

Figure 4
Single-Tower Cable-Stayed, User's Perspective Rendering

The bridge approaches, on either side of the signature main spans, will use multiple shorter CIP reinforced concrete approach spans and transition to MSE retaining walls as the SUP ties into the existing grade.

The minimum existing Hawthorne Avenue ROW limit is 60 feet wide and centered about the roadway. The new SUP and crossing can be constructed within existing ROW limits. A permanent construction easement for the tower located in the median of the Bend Parkway is needed. No other temporary construction easements or permanent ROW needs are anticipated.

See Appendix 3 for renderings, concept drawings, and cost estimate.

4.1.1 Cost

10%-level concept design cost estimates include construction improvement costs from the NW Harriman Street to NE 3rd Street, ROW, railroad flagging, preliminary engineering, and construction engineering costs.

The construction cost estimate's unit prices are based on previous pedestrian bridge projects completed by DOWL and historical unit cost data summarized by ODOT for bridge projects and increased for inflation and unique challenges for this site. The cost of the signature bridge, approach spans, retaining walls, SUP, and on-street improvements were estimated using assumed component sizes and weights based on previous bridge designs and preliminary analysis. The quantities used in the cost estimates are based on preliminary design assumptions. All cost estimates included a 40% contingency for each bid item and are presented as a total project cost range of -10% to +10% to account for uncertainty in this early stage of the project. Bid item unit prices were inflated assuming a 2026 bid opening.

The total project cost estimate is $29 million (M) to $35M. The single-tower cable-stayed arrangement provides an efficient structural system spanning the Bend Parkway and BSNF ROW. This structural efficiency is reflected in the total project cost.

This alternative is expected to be the second least expensive to construct.

4.1.2 Maintenance

Cable-stayed bridge maintenance efforts are inherently more than most other bridge types. This is primarily due the slender nature of the deck system, which results in a flexible system. This more flexible system has more in-service movement and can create added maintenance for the deck, railing, and protective fencing systems. The most significant maintenance activity will be the stay cables. They will require tuning after the long-term deck concrete shrinkage and creep effects have occurred. Tuning requires specialty equipment to access the stay connections along the pylons and laborers with a unique skill set. Tuning should only be needed once after initial construction but may be required again if there is a significant change to in-service loading, such as a deck overlay. The protective coating on the stay cables will also require recoating every 20 to 25 years. Like the tuning maintenance, this work requires specialty equipment and labor to complete.

Minor annual maintenance activities would include walking surface and lighting maintenance, at a relatively low cost, and regular bridge inspections every four years. The major (stay cables, deck overlay, etc.) maintenance expenses should be expected to occur every 20 to 40 years. The City should expect to budget $58 thousand (K) to $64K each year to fund future minor and major maintenance activities. The estimated annual maintenance budget is representative of the total maintenance construction costs activities, not performed by City forces, for a 75-year bridge design life.

For these reasons, this alternative was given a “high” effort to maintain ranking in this category.

4.1.3 Aesthetics

This bridge alternative has a modern aesthetic with a substantial vertical element above the bridge deck. The cable-stayed structural system uses a shallow deck system to span large distances. This results in a slender structural system. The deck spans from a single “A” frame tower in the Bend Parkway median between the southbound and northbound travel lanes. The central 110-foot-tall tower is a substantial vertical visual element in the surrounding landscape, and the triangle silhouette of the stay cables from the deck to the tower evoke a mountain peak feel.

For these reasons, this alternative was given a “high” aesthetic appeal ranking in this category.

4.1.4 Constructability

The cable-stayed bridge construction has two major elements to consider: construction of the pylons and the placement of the precast deck panels.

The main tower will be constructed in the median of the Bend Parkway. The existing median is approximately 16 feet wide. This is not wide enough for the foundation and pylon construction; therefore, the inside travel lanes for northbound and southbound traffic are anticipated to be closed for some number of months to complete this construction.

Precast concrete deck panel placement will start at the tower and move outward. As a deck panel is placed on one side, the similar panel on the opposite side of the tower would be placed to balance the tower loading. This sequence will require nighttime lane closures in both directions on the Bend Parkway and coordination with BNSF when placing deck panels over the railroad ROW. A significant temporary support structure would be required around the tower in the median to stabilize the tower and cantilevered deck panels during placement. The existing median is anticipated to be large enough to accommodate this temporary support without lane closures on the Bend Parkway.

For these reasons, this alternative was given a “difficult” to construct ranking in this category.

It should be noted that Hawthorne Avenue west of the Bend Parkway and east of the BNSF tracks will be closed during construction of the SUP and new crossing. Temporary access during construction to the impacted properties is needed and was not a focus of this study. These construction impacts are the same for all the concept design alternatives.

4.1.5 Land-Use Compatibility

The tower and silhouette of the stay cables are the two signature structural features of this alternative. The single-tower arrangement allows for both features to be highlighted in the current and future developed landscape. Future development will not negatively impact the tower's visual appeal since it is located between the highway and railway. The same is true for the east span stay cables, as this span extends minimally past BNSF ROW. Approximately one-third of the west span stay cables are west of the Bend Parkway ROW and could be obstructed by future development. While future development may obstruct some of the stay cables, the addition of 65- to 85-foot-tall buildings may soften and enhance the 110-foot-tall tower's appearance within the adjacent landscape.

The east limits of the cable-stayed span ends just past BNSF ROW, leaving space for a future at-grade stairway access to the pedestrian bridge near NE 1st Street.

Overall, this alternative is very compatible with the present and future landscape and was given a "good" land-use compatibility ranking in this category.

4.1.6 Bend Parkway - Southbound Access at Hawthorne Avenue

The access between the Bend Parkway and Hawthorne Avenue is currently right-in and right-out only. Initially, the City planned to close the right-out and maintain the right-in as outlined in the Parkway Plan at the time of this Report. However, as the bridge type evaluation progressed, the City decided to consider fully closing the access between the Bend Parkway and Hawthorne Avenue. Closing this access would provide more designated space for people using the SUP, create a more comfortable experience for them, improve intersection function for all modes, and reduce the number of vehicle using the Hawthorne Avenue corridor.

When this concept design started, a decision to fully close or just maintain right-in access to Hawthorne Avenue from the Bend Parkway was pending and expected to take several months. In August 2024, Council directed City staff to work with ODOT to fully close the Bend Parkway / Hawthorne intersection. While the current concept design phase assumes the Bend Parkway right-in access will be maintained, the bridge alignment can be refined in final design to take advantage of closing the Bend Parkway access. While this consideration is now moot, it is retained as part of the evaluation for consistency with the August 2024 open house and Council work session presentation.

Some of the bridge types will affect turning movements and restrict the size of vehicles that can make the turn from southbound off of the Bend Parkway onto westbound Hawthorne Avenue. Impacts to the transportation network for restricted vehicle movements was not analyzed as part of this Report. Therefore, no ranking is assigned for this category. Instead, if a bridge type would introduce a vehicle restriction, it has been identified for the City's consideration.

The location and footprint of the pier supporting the west end of the cable-stayed spans will not restrict vehicle turning movements.

4.2 Two-Tower Cable-Stayed

This alternative is like the Single-Tower Cable-Stayed alternative, except it will use two "A" frame towers instead of one. The towers will be located west of the Bend Parkway and east of BNSF ROW to create a single 280-foot-long span crossing the Bend Parkway and BNSF. The shorter cable-stayed back-spans deck system uses a CIP reinforced concrete slab, and the main span deck system uses precast deck panels and a CIP deck topping slab. The pylons will extend approximately 75 feet above the bridge walking surface with a total height of approximately 100 to 110 feet, depending on the location. The towers can be constructed of either CIP or precast reinforced concrete. Steel cables comprised of multiple interlocking steel strands will support the deck system and anchor to the pylons. An asymmetric cable-stayed arrangement was chosen to better frame the main 280-foot-long span and evoke a mountain range feel.

Figures 5 and 6, below, show the proposed bridge elevation view looking south along the Bend Parkway and a user's perspective view looking east with Pilot Butte in the background, respectively. Both renderings include buildings representing potential future development in the area.

Figure 5
Two-Tower Cable-Stayed, Rendering Looking South Along the Bend Parkway

Figure 6
Two-Tower Cable-Stayed, User's Perspective Rendering

The bridge approaches, on either side of the signature bridge main spans, will use multiple shorter CIP reinforced concrete approach spans and transition to MSE retaining walls as the SUP ties into the existing grade.

This alternative will require additional ROW along Hawthorne Avenue to construct. The west tower footprint is approximately 37 feet wide, and the adjacent barrier, roadway, and sidewalk section is 28.5 feet wide. The total new construction width exceeds the available 60-foot-wide ROW and will require additional permanent ROW and temporary construction easements along the north and south sides of Hawthorne Avenue.

See Appendix 4 for renderings, concept drawings, and cost estimate.

4.2.1 Cost

A 10%-level concept design cost for this alternative was developed using the same methodology as the Single-Tower, Cable-Stayed alternative. See Section 4.1.1 for further details.

The total project cost estimate is $31M to $38M. The two-tower cable-stayed arrangement provides a unique visual appeal to the site, but it is not the most efficient use of this type of structural system. The tower locations are in a more favorable location for construction, but the added cost of a second tower and additional stay cables increases the overall project cost for this alternative.

This alternative is expected to be the second most expensive to construct.

4.2.2 Maintenance

The type of bridge maintenance effort for this alternative is the same as the Single-Tower, Cable-Stayed alternative. The biggest difference is this alternative has 60% more stay cables and therefore a higher cost to maintain. The City should expect to budget $87K to $96K each year to fund future minor and major maintenance activities. The estimated annual maintenance budget is representative of the maintenance construction costs activities, not performed by City forces, for a 75-year bridge design life.

For these reasons this alternative was given a “high” effort to maintain ranking in this category.

4.2.3 Aesthetics

This bridge alternative has a modern aesthetic with substantial vertical elements above the bridge deck and evokes a similar aesthetic as the Single-Tower, Cable-Stayed alternative. In this alternative, the deck spans between two “A” frame towers, one on the west side of the Bend Parkway and the other on the east side of the BNSF ROW. This results in a slender, single, 280-foot-long main span. The towers at each end of the bridge span places the visual weight at the ends of the deck, rather than the center. This feel is compounded by the asymmetric stay cable spacing. The back-span stay cable spacing is smaller than the main span spacing, and they are anchored into deeper CIP deck sections than the main span. The combination of the tower location, denser back-span stay cable spacing, and thicker approach spans provides an anchoring feel for the suspended 280-foot-long main span. The two-tower and asymmetric stay cable arrangement evoke a mountain range feel and a slightly different aesthetic than the single-tower alternative.

For these reasons, this alternative was given a “high” aesthetic appeal ranking in this category.

4.2.4 Constructability

The cable-stayed bridge construction has two major elements to consider: construction of the pylons and the placement of the precast deck panels.

The towers will be constructed outside of the Bend Parkway and BNSF ROW limits. These are favorable locations. The construction of the towers and temporary shoring towers to stabilize the towers during cantilever deck panel placement will not impact normal operations of these facilities.

Precast concrete deck panel placement will start after the adjacent CIP reinforced concrete back-span construction. The back-spans are needed to anchor the tower as the deck panels are installed. Deck panel installation will start at each tower and move outward toward the midspan of the main span. The deck panels will be cantilevering outward from each tower until the final midspan panel is installed. This sequence will require nighttime lane closures in both directions on the Bend Parkway and coordination with BNSF when placing deck panels over the railroad ROW.

For these reasons, this alternative was given a “difficult” to construct ranking in this category.

4.2.5 Land-Use Compatibility

The towers and silhouette of the stay cables are the two signature structural features of this alternative. The towers and back-span stay cables are both located outside of the Bend Parkway and BNSF ROW and could be partially obstructed by future development. The prominent “V” shape of the main span stay cables will not be obstructed by future development. The towers are quite tall, greater than 100 feet. The potential for future buildings, 65 to 85 feet tall, may soften and reduce the tower’s appearance within the adjacent landscape.

The east limits of the cable-stayed back-span ends before NE 1st Street, leaving space for a future at-grade stairway access to the pedestrian bridge near NE 1st Street.

Overall, this alternative is compatible with the present and future landscape and was given a “fair” land-use compatibility ranking in this category.

4.2.6 Bend Parkway - Southbound Access at Hawthorne Avenue

The bridge pier supporting the west end of the cable-stayed spans is approximately 60 feet west of the Bend Parkway southbound shoulder. The out-to-out tower width is approximately 37 feet. The location and footprint of the pier would at least restrict vehicle turning movements to only passenger vehicles and smaller delivery trucks. Given the City’s vision for the Hawthorne corridor, it is assumed access to the Bend Parkway would be closed for this bridge type.

See Section 4.1.6 for further details.

4.3 Extradosed

This alternative uses the same span and tower arrangement as the Cable-Stayed, Two Towers alternative. The biggest difference is the tower and deck system geometry. The towers use a “V” frame shape instead of the “A” frame shape and will be significantly shorter than the cable-stayed alternatives. The shorter nature is better accommodated using a “V” frame shape. The pylons will extend approximately 44 feet above the bridge walking surface with a total height of approximately 70 to 80 feet, depending on the location. The towers can be constructed of either CIP or precast reinforced concrete.

The deck system will be supported by two welded steel plate through-girders. The girders will be roughly four feet deep, and the top of the walking surface will be roughly 2.5 feet below the top of the girder. A through-girder system was chosen to minimize the depth of the girder system below the walking surface and to provide a structural connection for the stay cables directly to the girder system. The deck can be constructed of either precast deck panels with a CIP topping slab or CIP reinforced concrete. The stay cables will use a similar asymmetric arrangement as the Cable-Stayed, Two Towers alternative but requires 25% fewer stay cables to construct.

Figures 7 and 8, below and on the following page, show the proposed bridge elevation view looking south along the Bend Parkway and a user's perspective view looking east with Pilot Butte in the background, respectively. Both renderings include buildings representing potential future development in the area.

Figure 7
Extradosed, Rendering Looking South Along the Bend Parkway

Figure 8
Extradosed, User's Perspective Rendering

The bridge approach spans, on either side of the signature main spans, can use the same steel through-girder system as the main span or CIP reinforced concrete slabs like the cable-stayed alternatives. Note, the above renderings show the steel through-girder aesthetic. The bridge approach spans will then transition to MSE retaining walls as the SUP ties into the existing grade.

This alternative will require additional ROW along Hawthorne Avenue to construct. The out-to-out width of the "V" frame is approximately 48 feet. The west tower will extend approximately 24 feet past the north side Hawthorne Avenue ROW limit near the Bend Parkway intersection. Additional permanent ROW and temporary construction easements are needed to construct the west tower. The "V" frame tower shape footprint uses less room at the roadway level than the "A" frame tower shape. This smaller footprint will accommodate a 28.5-foot-wide roadway section south of the west tower within the available ROW limit.

See Appendix 5 for renderings, concept drawings, and cost estimate.

4.3.1 Cost

A 10%-level concept design cost for this alternative was developed using the same methodology as the Single-Tower, Cable-Stayed alternative. See Section 4.1.1 for further details.

The total project cost for this alternative depends on which approach span system is used. The total project cost estimate is $30M to $37M for the CIP reinforced concrete slab approach span system. The total project cost estimate is $34M to $42M for the steel through-girder approach span system. For a two-tower arrangement, the extradosed bridge type is the most efficient structural system. This is reflected in the total project cost being less than the Two-Tower, Cable-Stayed alternative when the same approach span systems are used. If the steel through-girder approach span system is chosen, this option becomes the most expensive to construct.

4.3.2 Maintenance

Extradosed bridge maintenance efforts are like cable-stayed bridges, but less. Like the cable-stayed bridges, the bulk of the maintenance efforts are the stay cables. However, extradosed bridges use fewer cables. For example, the extradosed bridge alternative uses 25% fewer stay cables than the Two-Tower, Cable-Stayed alternative. Fewer stay cables means less maintenance effort. The other difference is that extradosed bridges use deeper, stiffer deck systems than cable-stayed bridges. This stiffer system sees less in-service movements and results in less added maintenance activities for the deck, railing, and protective fencing systems.

The steel through-girders will be fabricated out of weathering steel. Weathering steel forms a natural patina on the surface when exposed to the elements. This patina hardens and has a rusty appearance and protects the steel member from further corrosion. This protective coating does not require maintenance to maintain, unlike galvanizing or painting corrosion protection methods.

Minor annual maintenance activities would include walking surface and lighting maintenance, at a relatively low cost, and regular bridge inspections every four years. The major (stay cables, deck overlay, etc.) maintenance expenses should be expected to occur every 20 to 40 years. The City should expect to budget $40K to $44K each year to fund future minor and major maintenance activities. The estimated annual maintenance budget is representative of the maintenance construction costs activities, not performed by City forces, for a 75-year bridge design life.

For these reasons, this alternative was given a "medium" effort to maintain ranking in this category.

4.3.3 Aesthetics

This bridge alternative has a modern aesthetic and is like the Two-Tower, Cable-Stayed alternative. However, this alternative uses deeper girder sections to support the deck system with fewer cable stays, and shorter "V" frame towers for the same span lengths. The combination of deeper girder sections and shorter towers results in a stockier, but balanced, visual structural system. The towers are still a vertical element in context and have a higher vertical visual impact than the Steel Truss alternative. The towers at each end of the bridge span still places the visual weight at the ends of the deck, rather than the center. The towers are in context with existing visual elements that are also vertical, thereby visually transitioning the towers to existing vertical elements. This potentially allows the towers to blend into the adjacent landscape more than the cable-stayed alternatives. The relatively slender, 280-foot-long main span will still produce a visual statement to users.

For these reasons, this alternative was given a "high" aesthetic appeal ranking in this category.

4.3.4 Constructability

The extradosed bridge construction has two major elements to consider: construction of the pylons and the placement of the steel through-girders and deck system.

The towers will be constructed outside of the Bend Parkway and BNSF ROW limits. These are favorable locations. The construction of the towers and temporary shoring towers to stabilize the towers during steel though-girder placement will not impact normal operations of these facilities.

Steel through-girders offer more flexibility in erection sequence than traditional precast deck panel cable-stayed structures. The steel elements can be fabricated, shipped, and assembled on-site in larger sections than the precast deck panels. This allows the girder system to be installed from tower to tower faster than the cable-stayed alternatives. Girder installation will require nighttime lane closures in both directions on the Bend Parkway and coordination with BNSF when working over the railroad ROW.

Once the steel through-girders are installed, the deck placement using precast deck panels or CIP concrete can begin. Either option requires nighttime lane closures in both direction on the Bend Parkway and coordination with BNSF when working over the railroad ROW.

For these reasons, this alternative was given a "moderate" to construct ranking in this category.

4.3.5 Land-Use Compatibility

Like the Two-Tower, Cable-Stayed bridge, the extradosed has the same signature features and is compatible with the adjacent present and future landscape. The extradosed towers are 70 to 80 feet tall and reasonably proportioned for both the existing and potential future developed landscape.

Overall, this alternative is compatible with the present and future landscape and was given a "fair" land-use compatibility ranking in this category.

4.3.6 Bend Parkway - Southbound Access at Hawthorne Avenue

The bridge pier supporting the west end of the extradosed spans is approximately 60 feet west of the Bend Parkway southbound shoulder. The out-to-out tower width is approximately 48 feet. The location and footprint of the pier would at least restrict vehicle turning movements to only passenger vehicles and a smaller delivery trucks. Given the City's vision for the Hawthorne corridor, it is assumed access to the Bend Parkway would be closed for this bridge type.

See Section 4.1.6 for further details.

4.4 Steel Truss

This alternative is composed of three steel pony truss spans to cross the Bend Parkway and BNSF ROW. Pony trusses are through-trusses that do not use top chord transverse bracing. The steel truss span arrangement will use two 90-foot approach spans and one 150-foot main span. The shorter approach spans will use a constant 7-foot-deep truss section and the main span will use a variable 7- to 16-foot-deep truss section. The variable truss section will create an arching "bowstring" aesthetic. The approach span truss height will match the minimum main span truss height and create an entering and exiting user experience. The three-span layout requires four piers to support the steel truss spans, including a pier in the median of the Bend Parkway. The piers use conventional CIP reinforced concrete crossbeams supported by a single column. The deck system is supported by the steel floor beams and can be constructed of either precast deck panels with a CIP topping slab or CIP reinforced concrete.

Figures 9 and 10, below, show the proposed bridge elevation view looking south along the Bend Parkway and a user's perspective view looking east with Pilot Butte in the background, respectively. Both renderings include buildings representing potential future development in the area.

Figure 9
Steel Truss, Rendering Looking South Along the Bend Parkway

Figure 10
Steel Truss, User's Perspective Rendering

The bridge approaches, on either side of the signature main spans, will use multiple shorter CIP reinforced concrete approach spans and transition to MSE retaining walls as the SUP ties into the existing grade.

The minimum existing Hawthorne Avenue ROW limit is 60 feet wide and centered about the roadway. The new SUP and crossing can be constructed within existing ROW limits. A permanent construction easement for the pier located in the Bend Parkway median is needed and will need to be coordinated with ODOT. No other temporary construction easements or permanent ROW needs are anticipated.

See Appendix 6 for renderings, concept drawings, and cost estimate.

4.4.1 Cost

A 10%-level concept design cost for this alternative was developed using the same methodology as the Single-Tower, Cable-Stayed alternative. See Section 4.1.1 for further details.

The total project cost estimate is $27M to $33M. Prefabricated steel trusses are economical to construct, which is reflected in the total project cost.

This alternative is expected to be the least expensive to construct.

4.4.2 Maintenance

Prefabricated truss bridges are relatively easy to maintain. The trusses will use weathering steel to protect the steel from corrosion, which, as discussed earlier, is a relatively low-maintenance corrosion protection system. The truss is also a stiffer system than the other alternatives, which results in less periodic maintenance for the deck, railings, and protective fencing systems. The truss does require more expansion joints than the other alternatives. However, the expected range of movements are small enough to be accommodated by conventional preformed compression joint seals. This joint type requires little in-service maintenance and is straightforward to replace.

Minor annual maintenance activities would include walking surface and lighting maintenance, at a relatively low cost, and regular bridge inspections every four years. Major (deck overlay, joint replacements, etc.) maintenance expenses should be expected to occur every 30 to 40 years. The City should expect to budget $12K to $13K each year to fund future minor and major maintenance activities. The estimated annual maintenance budget is representative of the maintenance construction costs activities, not performed by City forces, for a 75-year bridge design life.

For these reasons, this alternative was given a “low” effort to maintain ranking in this category.

4.4.3 Aesthetics

This bridge alternative has a historic bridge aesthetic with lower vertical elements above the bridge deck. While the vertical scale and form of the steel truss are less than the other bridge alternatives, the materials are visually heavier than either the cable-stayed or extradosed alternatives. The visual weight is evenly distributed across the span and does not differentiate from center to end. While this design alternative still contrasts with the existing visual character, the materials are consistent in color and warmth of the surrounding context. This alternative provides the lowest vertical profile, a uniform appearance, and is visually heavier than the other alternatives.

For these reasons, this alternative was given a “medium” aesthetic appeal ranking in this category.

4.4.4 Constructability

The truss bridge construction has two major elements to consider: construction of the piers and the assembly and placement of the truss and deck system.

The truss piers use conventional, single-column and crossbeam CIP reinforced concrete elements. A total of four piers are required, one of which will be constructed in the median of the Bend Parkway. This poses similar constructability challenges as the Single-Tower, Cable-Stayed alternative. However, the truss pier is smaller and will not require temporary shoring towers for the truss placement. The southbound and northbound inside lanes on the Bend Parkway will need to be closed to construct the pier, but for a shorter duration than the Single-Tower, Cable-Stayed alternative. The other three piers are located outside of the Bend Parkway and BNSF ROW and will not impact normal operations of these facilities.

The steel trusses will be fabricated off-site and shipped in segments to the jobsite. The out-to-out width of the truss system is too large to be shipped in full-width segments. Therefore, the truss segments and floor beams will need to be assembled on-site. Truss assembly can take place within the Hawthorne Avenue ROW limits. The truss installation requires nighttime lane closures in both directions on the Bend Parkway and coordination with BNSF when working over the railroad ROW. Unlike the cable-stayed alternatives, which require multiple nighttime shifts, a single truss span can be installed within one nightshift.

Once the trusses are installed, the deck placement using precast deck panels or CIP concrete can begin. Either option requires nighttime lane closures in both directions on the Bend Parkway and coordination with BNSF when working over the railroad ROW.

For these reasons, this alternative was given an “easy” to construct ranking in this category.

4.4.5 Land-Use Compatibility

The truss is the main signature structural feature for this alternative. The truss blends in naturally with the adjacent railway and landscape. Of all the alternatives, the truss uses pier elements that do not extend above the truss itself. This leaves the truss as the highest element at approximately 30 feet above the existing grade. The shorter stature of the truss system is compatible with the current and potential future developed landscape. In the current landscape, the truss is the most prominent feature, but not overbearing.

The east approach truss span is located completely outside of the Bend Parkway and BNSF ROW. This leaves the potential for a portion of the symmetric three-span arrangement to be obstructed from north-south pedestrian vehicle users by future development. While the future development may obstruct portions of the truss, the addition of 65- to 85-foot-tall buildings will not overpower the presence of the truss.

The east limit of the truss ends before NE 1st Street, leaving space for a future at-grade stairway access to the pedestrian bridge near NE 1st Street.

Overall, this alternative is very compatible with the present and future landscape and was given a “good” land-use compatibility ranking in this category.

4.4.6 Bend Parkway - Southbound Access at Hawthorne Avenue

The location and footprint of the pier supporting the west end of the truss spans will not restrict vehicle turning movements.

See Section 4.1.6 for further details.

4.5 Bridge Type Considerations Comparison

All the concept design alternatives address the design constraints and provide a new signature crossing at Hawthorne Avenue. Each alternative has its strengths and weaknesses and offers something unique to the site. The following figure shows the results of the bridge type consideration category rankings for each alternative.

Consideration	Cable Stayed Single Tower	Cable Stayed Two Tower	Extradosed	Steel Truss
Project Cost	$29M - $35M	$31M - $38M	$30M - $42M	$27M - $ 33M
Maintenance	High (5x)	High (7x)	Medium (3x)	Low (1x)
Aesthetics	High	High	High	Medium
Constructability	Difficult	Difficult	Moderate	Easy
Land-use compatibility	Good	Fair	Fair	Good
US97 SB Access at Hawthorne oversize vehicle restrictions	No	Yes	Yes	No

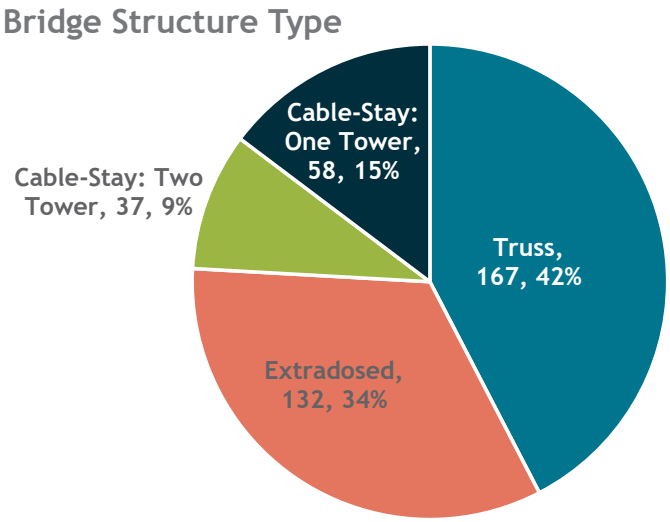
Figure 11
Bridge Type Consideration Summary

4.6 Public Outreach

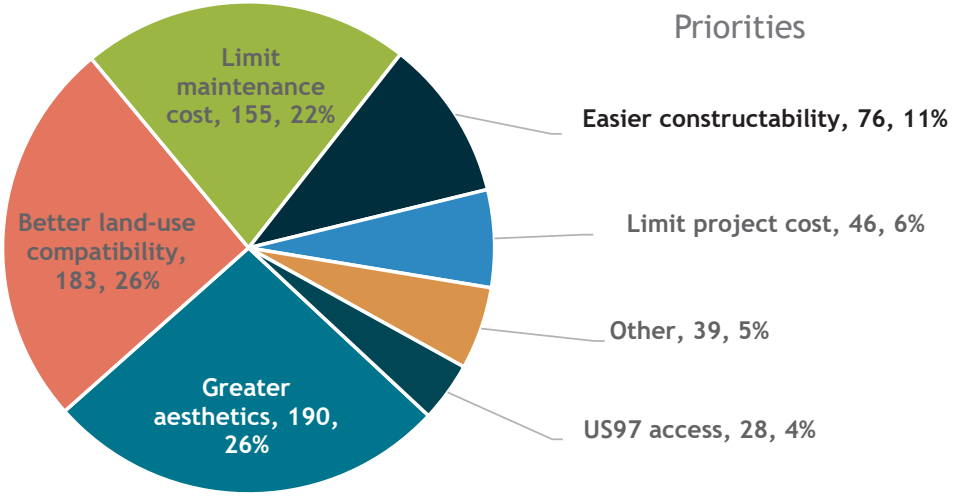
JLA Public Involvement coordinated and administered a public outreach campaign to give community members a chance to provide input on the four concept design alternatives. The public outreach campaign consisted of an online open house and an in-person open house. The online open house was held from July 3 through July 17, 2024, and the in-person open house was held on July 10, 2024, at the Campfire Hotel's meeting room in Bend. Approximately 435 people participated in the open houses, with 398 submitting responses.

The open houses presented the four concept design alternative renderings and bridge type considerations and rankings to the public. The goal of the open houses was to solicit feedback on the bridge types and confirm which priorities they considered most important to the decision. Additionally, the public was asked if they would support fully closing the intersection of the Bend Parkway and Hawthorne Avenue and what other design elements they would like to see considered in next phase of design. The results of the open houses are summarized on the following pages. See Appendix 7 for the complete open house summary.

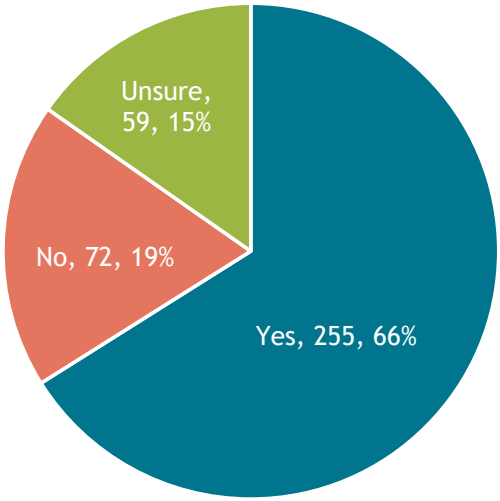
1. Which of the four bridge structure types would you like to see advanced into the design phase?



2. What are your priorities for the selection of the bridge?



3. The current Bend Parkway Plan includes a closure of the entrance to the Parkway at Hawthorne Avenue and maintains the exit for vehicles to go westbound on Hawthorne. Based on the safety considerations you've seen presented, would you support the team pursuing an amendment to the Parkway to fully close the Hawthorne exit and entrance to the Parkway?



4. What other design elements (e.g. lighting, wayfinding, connectivity, safety, aesthetics, stairs) would you like to see considered as design proceeds for the bridge overcrossing?

- Design elements repeatedly mentioned by participants were lighting, safety and accessibility, and connectivity to the surrounding transportation network.

The key takeaway from the public outreach effort is that the community values an aesthetic structure that connects to the surrounded network, is compatible with the present and future landscape, and is easier to maintain. The public is also open to the idea of closing the Hawthorne Avenue access to the Bend Parkway.

A complete summary of the open house results can be found in the "Midtown Crossings Project Hawthorne Overcrossing Open House Public Feedback Summary July 2024" report under separate cover.

5.0 PREFERRED BRIDGE ALTERNATIVE

The concept design renderings, bridge type consideration rankings, total construction costs, and public outreach results were presented to Council on August 7, 2024. The preferred signature bridge type selected by Council was the Single-Tower, Cable-Stayed alternative.

This alternative provides the desired aesthetic and unique visual benefit the City is looking for in a signature bridge crossing. Additionally, this alternative is compatible with the present and future developed landscape and is cost-effective to construct. Council saw added value in the main tower being in the Bend Parkway median versus the Hawthorne Avenue corridor limits. By using the Bend Parkway median, the City has more placemaking area opportunities.

Council also directed City staff to pursue amending the Bend Parkway Plan to fully close Hawthorne Avenue vehicle access from the Bend Parkway.

5.1 Future Placemaking Opportunities

This project is going to transform the way residents use this corridor and how they travel east-west through Bend's Midtown. Beyond the signature bridge being a new landmark in the City, the project presents opportunities to make this a destination for the community. Closing access between Hawthorne Avenue and the Bend Parkway, and making Hawthorne Avenue one-way between NE 1st Street and NE 3rd Street amplify these placemaking opportunities such as:

- A wider plaza area east of NW Hill Street as part of the intersection reconfiguration
- A linear park under the bridge west of the Bend Parkway and/or east of BNSF
- More direct connections to at-grade areas, like the potential staircase at NE 1st Street mentioned earlier
- Architectural lighting that accentuates the tower and/or stay cables
- Treatments for the protective screening such as a low-profile mesh, more artistic perforated metal design or something that incorporates illumination beyond that required for safety.

The project cost range includes allowances for incorporating some of these opportunities. Some of these opportunities could be completed as separate, follow-on projects. Many are scalable up or down to balance needs, desires, and budget. Other considerations include safety, future development, ROW needs, and the ultimate vision for this low car corridor.

5.2 Next Steps

This Report focused on main span bridge type selection, refining the SUP alignment, and developing initial recommendations for on-street improvements at each end of the bridge to create a separate, comfortable space that connects with the City's LSN and is forward compatible with other ongoing City projects and studies. As the project transitions into the final design under the contract to be administered by ODOT, there are a number of future considerations specific to the preferred bridge type and on-street improvements, including:

- **Maintain Forward Compatibility** - Continue coordinating with the ongoing, separate projects including the Low Car Study, and the planned redevelopment in the NE 1st Street area. Key City objectives across all projects to create this flagship corridor are to establish a prioritized bicycle and pedestrian link between Drake Park and Juniper Park, provide direct access onto the bridge in the vicinity of NE 1st Street, connect to the Bend Bikeways Project, and develop an enhanced crossing of NE 3rd Street.

- **Additional Bridge Connection Points** - Expanding on one aspect of forward compatibility, the location and footprint of the stairway access or direct connection to a future City building between BNSF ROW and NE 1st Street needs to be established. The Single-Tower Cable-Stayed layout accommodates this connection point once its location and type are further developed.
- **Bridge TS&L** – Advance the Single-Tower Cable-Stayed to TS&L level. This will refine the cost estimate and confirm approach span configurations, foundation types, and retaining wall type and configuration. The TS&L will also develop traffic staging, and construction sequencing and duration, most notably for erecting the tower and placing deck panels over and adjacent to the Bend Parkway and BNSF.
- **Finalize Alignments** - During completion of the bridge TS&L in the next phase , there is an opportunity to potentially lower the vertical profile slightly as the cable-stayed deck cross-section depth is confirmed. This refinement could reduce the number of landings and runs, or shorten the SUP and retaining wall limits. There is also a need to confirm the horizontal alignment at each end of the SUP to maximize the separation and level of comfort for people using the SUP. This could include shifting the west end of the alignment slightly south and the east end of the alignment slightly north.
- **Architectural and Aesthetic Treatments and Amenities** - Selecting the Single-Tower Cable-Stayed bridge has defined the overall aesthetic and how the structure generally fits into the landscape. In the next phase, additional refinements and details to evaluate include bridge rail and protective screening , SUP safety and/or enhanced lighting, concrete coloring and patterning, and plaza or placemaking opportunities near the bridge ends and connecting intersections. Examples of potential enhancements for the City to consider during the next phase of design has been included in Appendix 8.
- **On-Street Improvements** - Preferred design concepts at the closest intersections off each end of the bridge have been developed with the objective of creating a separated, comfortable space for people biking or walking along the corridor and through adjacent intersections. There are a number of opportunities to refine these designs, including: consistency in the user experience at each end, such as considering a fully raised intersection at NE 2nd Street to match NW Hill, speed control treatments, visual cues for increased awareness, and limits for changing Hawthorne to one-way westbound.
- **ODOT MAC** – Coordination with MAC will be required to confirm minimum vertical and horizontal highway clearance requirements.
- **BNSF Coordination** – Continue approval process to construct the bridge above their tracks and across their ROW.
- **Utility Coordination** – Utility conflicts will need to be identified, as well as optimizing the bridge layout and placemaking to minimize conflicts.
- **ROW Coordination** – It will be important to optimize the bridge layout and placemaking to minimize ROW conflicts.

APPENDIX 1

Hawthorne Corridor On-Street Design Concept

Hawthorne Avenue - West

On-Street Concepts

Concept Layout - Hawthorne South Cycle Track

Preliminary Design Subject to Change
Date: September 2024

HARRIMAN ST

HILL ST

HAWTHORNE AVE

PLANTER

RAISED AREA

APPROXIMATE PEDESTRIAN BRIDGE FOOTPRINT

KITTELSON & ASSOCIATES
PHONE: 541-639-8611 CONTACT: Scott Beaird

Scale: 1" = 50'
50 25 0 50

Preferred Concept

Midtown Crossing
Hawthorne Ave West

H:\29\29385 - Bend Midtown Crossings PDB\design\Exhibits\Hawthorne Concepts\29385-Hawthorne_West-Concepts.dwg Sep 25, 2024 - 1:51pm cthompson Layout Tab: Cycle Track-South

Concept Layout - Hawthorne Sharrows

Preliminary Design Subject to Change
Date: September 2024

HARRIMAN ST

HILL ST

HAWTHORNE AVE

PLANTER

APPROXIMATE PEDESTRIAN BRIDGE FOOTPRINT

KITTELSON & ASSOCIATES
PHONE: 541-639-8611 CONTACT: Scott Beaird

Scale: 1" = 50'

50 25 0 50

Midtown Crossing
Hawthorne Ave West

Concept Layout - Hawthorne Woonerf Style Street

Preliminary Design Subject to Change
Date: September 2024

HARRIMAN ST

HILL ST

HAWTHORNE AVE

WOONERF STYLE STREET

PLANTER

APPROXIMATE PEDESTRIAN BRIDGE FOOTPRINT

KITTELSON & ASSOCIATES
PHONE: 541-639-8611 CONTACT: Scott Beaird

Scale: 1" = 50'

50 25 0 50

Midtown Crossing
Hawthorne Ave West

Concept Layout - Hawthorne North Cycle Track - Mini Roundabout

Preliminary Design Subject to Change
Date: September 2024

HARRIMAN ST

HILL ST

HAWTHORNE AVE

PLANTER

APPROXIMATE PEDESTRIAN BRIDGE FOOTPRINT

KITTELSON & ASSOCIATES
PHONE: 541-639-8611 CONTACT: Scott Beaird

Scale: 1" = 50'

50 25 0 50

Midtown Crossing
Hawthorne Ave West

Hawthorne Avenue - East

On-Street Concepts

Concept Layout - Two Way Stop Control w/ Raise Crosswalks & Raised Cycle Track

Preliminary Design Subject to Change
Date: September 2024

2ND ST

Raised Crosswalk

Mountable Raised Bike Lane

Mountable Raised Bike Lane

HAWTHORNE AVE

Raised Crosswalk

PLANTER

APPROXIMATE PEDESTRIAN BRIDGE FOOTPRINT

KITTELSON & ASSOCIATES
PHONE: 541-639-8611 CONTACT: Scott Beaird

Scale: 1" = 50'

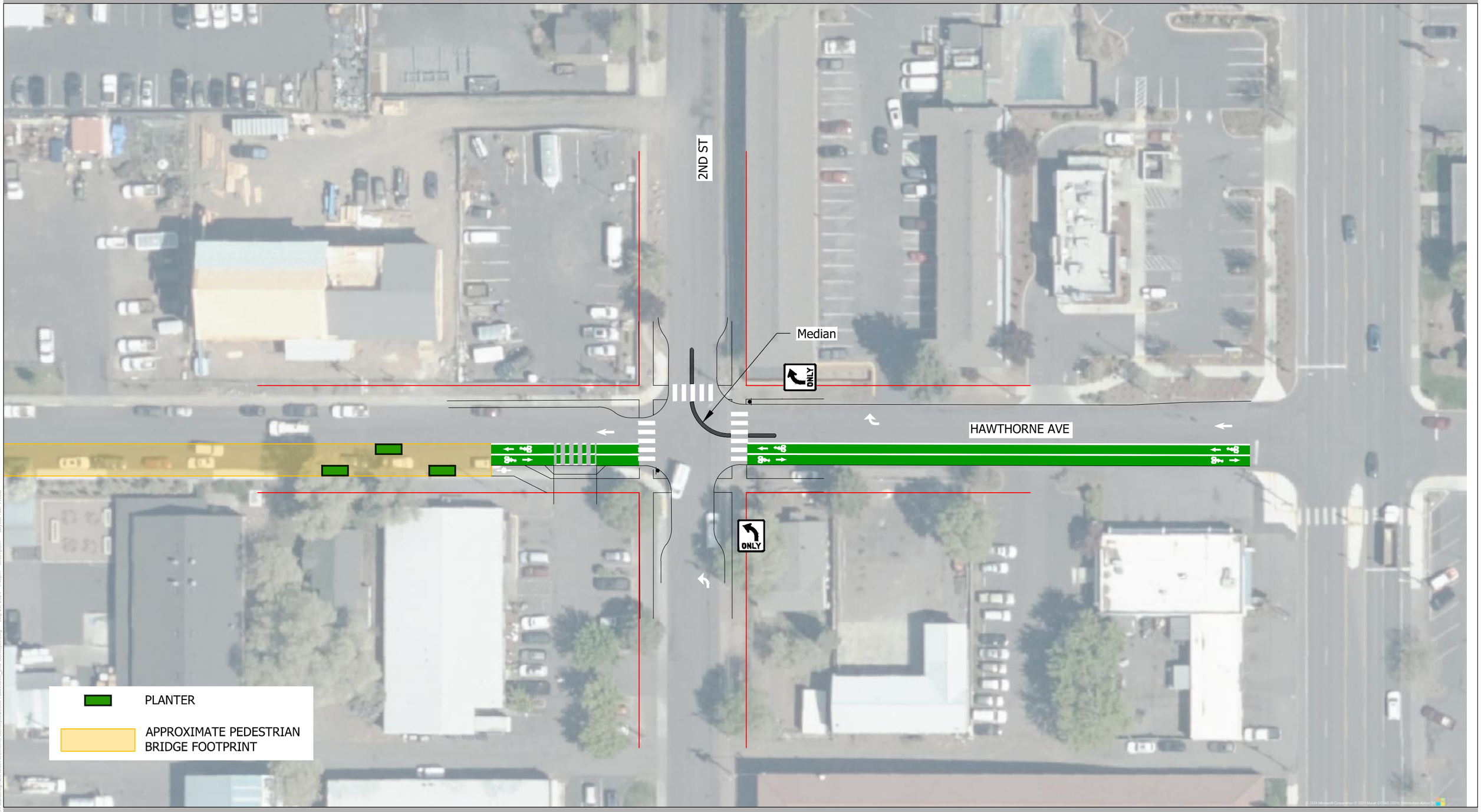
50 25 0 50

Preferred Concept

Midtown Crossing
Hawthorne Ave East

Concept Layout - Two Way Stop Control w/ WB Right Turn Median

Preliminary Design Subject to Change
Date: September 2024



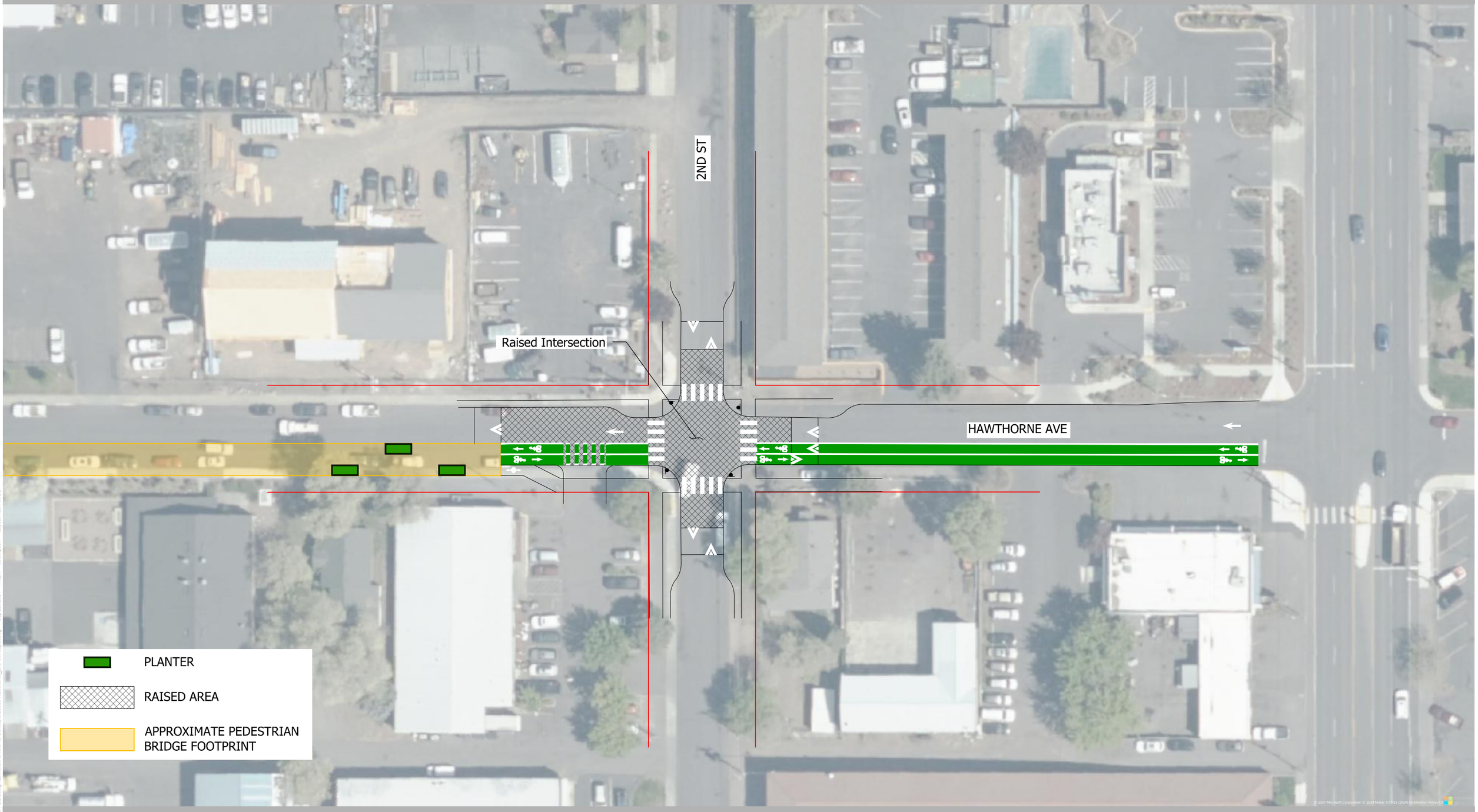
KITTELSON & ASSOCIATES
PHONE: 541-639-8611 CONTACT: Scott Beaird

Scale: 1" = 50'
50 25 0 50

Midtown Crossing
Hawthorne Ave East

Concept Layout - All Way Stop Control w/ Raised Intersection

Preliminary Design Subject to Change
Date: September 2024



KITTELSON & ASSOCIATES
PHONE: 541-639-8611 CONTACT: Scott Beaird

Scale: 1" = 50'
50 25 0 50

Midtown Crossing
Hawthorne Ave East

APPENDIX 2

Preliminary Geotechnical Memorandum

SHANNON & WILSON
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

September 26, 2024

Bob Goodrich, PE
DOWL
4275 Commercial St, Suite 100
Salem, Oregon 97302

RE: GEOTECHNICAL ENGINEERING MEMORANDUM
MIDTOWN MULTIMODAL CONNECTIONS – HAWTHORNE OVERCROSSING
BEND, OREGON

Dear Mr. Goodrich:

This memorandum presents the results of our geologic and geotechnical desktop study to support the alternative selection for Hawthorne Pedestrian Bridge in Bend, Oregon as part of the Midtown Multimodal Connections and Streetscaping project.

Shannon & Wilson, Inc. (Shannon & Wilson) prepared this memorandum and participated in this project through our subconsultant agreement with DOWL, fully executed on February 7, 2024.

The City of Bend (the City) is looking to construct a new bicycle and pedestrian bridge connecting Hawthorne Avenue over the Bend Parkway (US97) and BNSF railroad. The location of the project site is shown on the Vicinity Map, Figure 1.

This memorandum provides geotechnical input to address the feasibility of the selected alternative for high-level cost estimating (performed by others).

PROJECT UNDERSTANDING

We understand that the design team has selected a cable-stayed bridge type with a single support tower. We understand the pedestrian bridge will consist of 10 spans and 11 bents. Bents 1 and 11 are located at the end of the approach retaining walls. Bents 2, 3, and 5 through 10 support shorter approach spans ranging from 47 to 73 feet. Bent 4 will be the main cable-stayed bridge support tower located at the center median of US97. The conceptual profile of the bridge is provided in Exhibit 1 and the location of the proposed bridge is shown in the Site Plan, Figure 2.

3990 Collins Way ▪ Suite 100 ▪ Lake Oswego, Oregon 97035-3437 ▪ 503 210-4750
▪ www.shannonwilson.com ▪

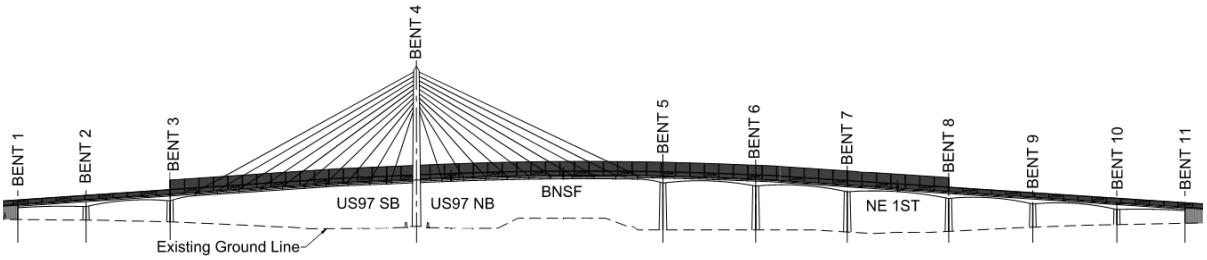


Exhibit 1: Profile of proposed cable-stayed bridge.

Scope of Services

Shannon & Wilson's services were conducted in general accordance with the Professional Services Subconsultant Agreement between DOWL and Shannon & Wilson. The completed geotechnical design services for the project included the following tasks:

- Review available existing information and determine the geological impacts to the proposed project with respect to the performance of the proposed structures and earthwork, based on the existing information;
- Visit the site to observe existing geologic conditions, observe bedrock outcrops, explore the site for geologic hazards and related impacts to the proposed project, and evaluate potential site constraints and construction staging issues;
- Develop seismic design criteria and evaluate seismic hazards;
- Develop conceptual foundation alternatives for up to three alternatives; and
- Prepare this memorandum summarizing our preliminary geotechnical recommendations.

Site Description

A site reconnaissance was performed on September 11, 2024, to observe site conditions and site constraints for geotechnical explorations and construction. The proposed bridge alignment is located along Hawthorne Avenue at US97. Hawthorne Avenue runs east and west and has a right-in/right-out connection to US97 southbound and no connection to US97 northbound. The west extent of the project is at NW Hill Street. Between NW Hill Street and US97, eastbound and westbound lanes of Hawthorne Avenue are separated by a concrete mountable median. Between US97 and NE 1st Street, Hawthorne Avenue has an approximate 400-foot gap which includes approximately 100 feet of BNSF right of way and a 200-foot-wide gravel lot off of NE 1st Street. Hawthorne Avenue continues east of NE 1st Street to the east extent of the project at NE 2nd Street.

The site is generally flat with approximately 12 feet of variation in the existing ground surface across the proposed alignment. The low point of the existing ground surface along the alignment is at NE 1st Street and the high point is at NW Hill Street at elevations of 3624 feet and 3636 feet, respectively. The BNSF railroad is supported on an embankment approximately 7 feet above the adjacent US97 roadway. Photos of the site are provided in Exhibits 2 through 4.

Exhibit 2: NW Hawthorne Avenue looking east with concrete median shown.

Exhibit 3: US97 at Hawthorne Ave looking north-northeast with BNSF railroad in background.

Exhibit 4: NE Hawthorne Ave looking west toward NE 1st Street.

Geotechnical explorations east of the BNSF railroad (Bents 5 through 10) will be relatively straightforward requiring minimal traffic control and only a few overhead obstructions. Explorations in the US97 median and on Hawthorne Avenue west of US97 will require lane

closures and will likely need to be completed during nighttime work hours to minimize traffic impacts.

EXISTING INFORMATION

Existing information from the project area includes as-constructed plans provided by the Oregon Department of Transportation (ODOT) and water well logs acquired from the Oregon Water Resources Department. We reviewed the existing geotechnical data from the following sources:

- 1982 Greenwood Avenue Undercrossing @ Division Street (ODOT Plan sheets)
- 1998 Greenwood Avenue Overcrossing Widening (ODOT Plan sheets)
- 1998 Franklin Avenue Overcrossing Widening (ODOT Plan sheets)
- 2007 44 NW Irving Avenue – 5 geotechnical borings (Oregon Well Reports)
- 2022 755 NE 1st Street – 12 push probes (Oregon Well Reports)

Relevant existing geotechnical explorations are shown on the Site Plan, Figure 2. Discussion of existing geotechnical explorations is provided later in this report.

SITE GEOLOGY

Based on geologic mapping by Sherrod and others (2004), the project site is underlain by a Pleistocene-age undifferentiated basalt flow of the Newberry Volcanics. The majority of these flows originated from vents on the north side of Newberry Volcano and flowed north of Redmond into the Deschutes and Crooked River Canyon. Based on existing boring logs nearby, small amounts of fill or overburden are overlying the basalt surface at the project site.

ANTICIPATED SUBSURFACE CONDITIONS

Based on our site reconnaissance, previous geotechnical explorations by others, and as-constructed plans, the general stratigraphy at the site consists of Fill over Residual Soil over Newberry Volcanics (basalt). We expect the basalt at the proposed bridge site to be less than 10 feet below ground surface (bgs) and the overburden soil to be non-cohesive silty sand and gravel. Variability in depth to basalt is discussed in the Conceptual Geotechnical Opinions section of this report. Based on the borings drilled for the Greenwood and Franklin Overcrossings, the basalt is expected to be weak to very strong (R2 to R5) with rock quality designations (RQDs) ranging from 25 to 100 percent. Uniaxial compressive

strengths reported for TH 3-98 and TH 4-98 (for the Greenwood Overcrossing Widening) ranged from 5,400 to 12,900 pounds per square inch.

Groundwater

A well log from the Oregon Water Resources Department Well Report Mapping tool (OWRD, 2024) indicates groundwater at a depth >500 feet at a well approximately 1 mile east of the project site. The Deschutes River is approximately 0.4 miles west of the project site and approximately 30 feet lower in elevation. Groundwater levels throughout the site should be expected to vary seasonally and with changes in precipitation. Zones of perched water may be encountered at a shallow depth after periods of extended precipitation, nearby irrigation, or snowmelt. Generally, groundwater highs occur in the spring, late fall, and winter; groundwater lows typically occur in the late summer and early fall.

SEISMIC GROUND MOTIONS AND HAZARD EVALUATION

Recommended Ground Motion Parameters

We understand the project will use the ODOT seismic design criteria for the bridge and retaining walls. The ODOT Geotechnical Design Manual (GDM) requires that all bridge structures, bridge retaining walls, and highway retaining walls be designed for 1,000-year return period ground motions under Life Safety criteria. Under this level of shaking, bridges and bridge retaining walls, defined in the ODOT GDM as walls located within 100 feet of a bridge abutment, must be designed for overall stability under seismic loading conditions. They also must be able to withstand seismic forces and displacements without failure of any part of the structure or collapse of any part of the bridge supported by a retaining wall. Similarly, highway retaining walls (i.e., retaining walls located beyond 100 feet of bridge abutments) must be designed to withstand seismic forces and displacements without failure of any part of the wall.

The seismic site class for the "Life Safety" seismic design criteria was determined based on the recommended procedure in the AASHTO Load and Resistance Factor Design Specifications (AASHTO LRFD) and the ODOT GDM. Based on the subsurface conditions encountered in the project borings, we recommend Site Class B for the bridge and retaining walls which corresponds to rock with a shear wave velocity between 2,500 and 5,000 feet per second. Table 2 presents the recommended "life-safety" ground motion parameters corresponding to a 1,000-year return period. These parameters were obtained from the ODOT Seismic web page.

Exhibit 5: Life Safety Criteria Seismic Parameters

Seismic Parameter	1,000-year return period "Life Safety" Criteria
Site Class	B
Rock Peak Ground Acceleration, PGA Rock	0.11g
Short Period Acceleration, Ss	0.24g
Long-Period Acceleration, S1	0.099g
Zero-Period Site Factor, Fpga	0.90
Short-Period Site Factor, Fa	0.90
Long-Period Site Factor, Fv	0.80
Peak Design Acceleration Coefficient, As	0.10g
Short Period Design Acceleration, SDS	0.22g
Long Period Design Acceleration, SD1	0.08g

NOTES:
1 g = gravity acceleration.
2 Spectral values calculated assuming 5% structural damping.

Seismic Hazards Evaluation

Seismic hazards generally include ground shaking, liquefaction and associated effects (e.g., flow failure, lateral spreading, and settlement), soil compaction, slope instability, ground surface fault rupture, and earthquake-induced flooding (i.e., tsunami and seiche). The primary hazard at this site is strong ground shaking and associated effects on the wall and retained structures and utilities.

Due to the shallow bedrock and deep groundwater table at the site, liquefaction is a non-risk. The Sisters Fault Zone has the closest faults to the site at approximately one half of a mile to the east. Due to low activity of nearby faults and the distance between the faults and the site, we anticipate the risk of fault rupture at the site to be low. The potential for seismically induced slope instability and landslides is also low. Seismically induced tsunami and seiche are also non-hazards at this site.

CONCEPTUAL GEOTECHNICAL OPINIONS

Depth of Basalt

The bearing layer for bridge foundations will be Basalt. The depth and variability of the basalt surface will significantly influence the foundation alternative selection and construction considerations. Based on our review of existing data and our site reconnaissance, we expect the basalt to be encountered at depths between 1 and 10 feet below ground surface (bgs). Exhibits 6 and 7 provide the depths to top of basalt reported in the well logs and geotechnical data sheets. Top of basalt elevation was reported in the geotechnical data sheets provided by ODOT and corrected to NAVD88 datum by adding 3.83 feet. The top of basalt elevations for the well logs were approximated by estimating ground surface elevation using lidar data available from DOGAMI and subtracting the reported depth to basalt.

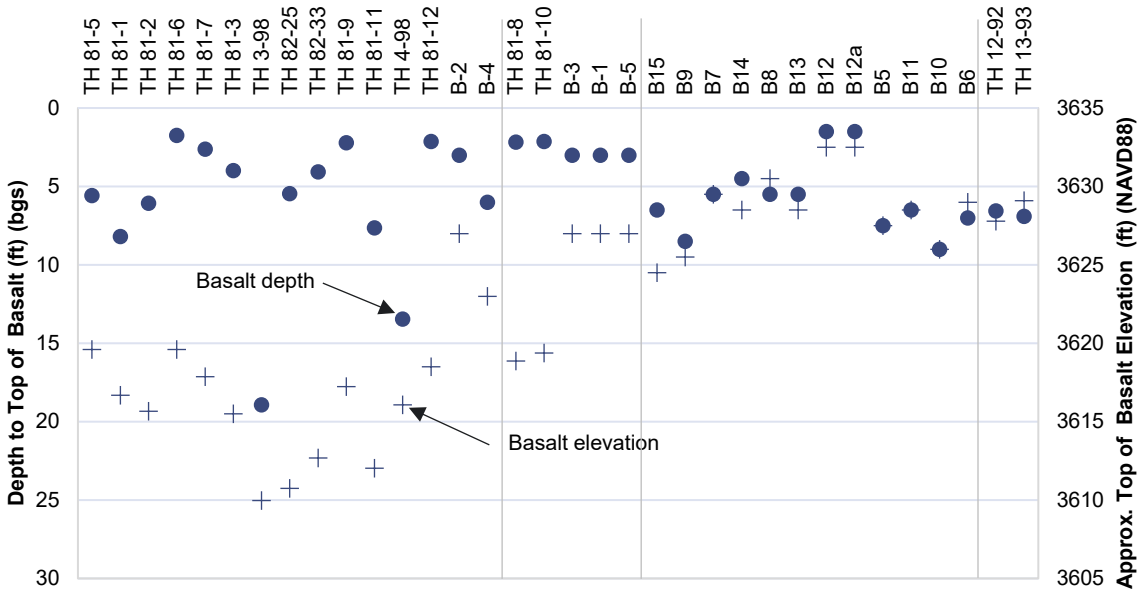


Exhibit 6: Top of basalt depth bgs and elevation for each boring (Note: ground surface elevation for well logs was estimated from lidar surface).

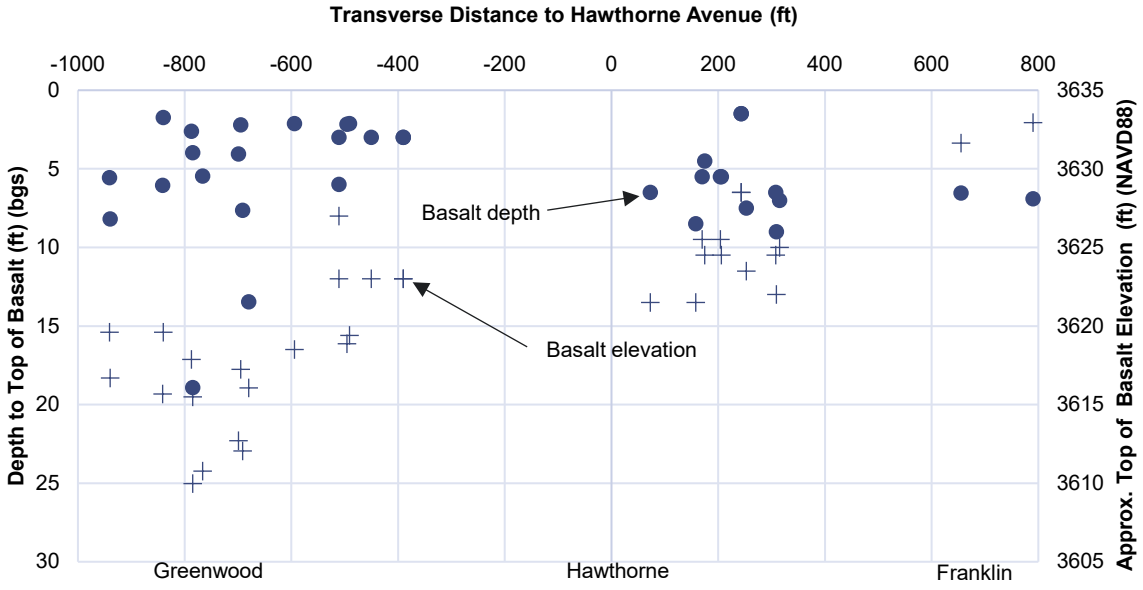


Exhibit 7: Top of basalt depth bgs and elevation verses transverse distance from Hathorn Avenue. (Note: ground surface elevation for well logs was estimated from lidar surface).

Basalt was encountered at depths bgs of 1.5 to 19 feet with an average 5.5 feet. However, two borings were drilled through a fill embankment. Borings not drilled through an embankment encountered basalt at depths shallower than 9 feet. At the bridge site we estimate the top of rock may be encountered at depths of 10 feet or less below existing grade, however, due to significant variation in the basalt surface over relatively short horizontal distances, we recommend conducting a geotechnical exploration program consisting of borings and ground penetrating radar to assess the variability of the basalt along the alignment.

Bridge Foundation Alternatives

Due to the likely presence of shallow basalt, driven piles are not a feasible bridge foundation alternative. Feasible foundation alternatives include drilled shafts, spread footings, or spread footings with tie-down anchors. We understand that spread footings founded on basalt are the preferred foundation alternative, however, spread footings may require more right of way than is available in some areas. If spread footing dimensions need to be reduced, then tiedown anchors can be installed and tensioned to prevent footing rocking at smaller dimensions. We understand 20 to 30 tie-down anchors are anticipated for the cable-stayed bridge support tower (Bent 4).

Alternatively, large diameter drilled shafts, 6- to 8-foot diameter, could be used to reduce right of way conflicts. Additionally, if the depth to bedrock is greater than 10 feet then drilled shafts may be more feasible to spread footings. Shaft excavation may be cost prohibitive if lengths greater than 30 to 40 feet are required.

For preliminary cost estimating, we recommend assuming a nominal bearing resistance of the basalt of 20 kips per square foot. Tie-down anchors will likely consist of either strand or threaded bar anchors that extend a minimum of 20 feet into basalt with 10-foot bonded zone resulting in an estimated total length of 21 to 30 feet.

Approach Retaining Wall Alternatives

Feasible wall alternatives for the bridge approaches will depend on the depth to bedrock. We expect back-to-back mechanically stabilized earth (MSE) walls, modular block walls, or cantilever cast-in-place (CIP) walls will be the most feasible options at this site, however, we expect the MSE wall to be more cost effective at heights greater than 10 feet. A combination of CIP or modular block walls for shorter heights and MSE walls near the abutments may be the most cost effective solution.

The walls should be embedded a minimum of two feet below finished grade except at the bridge abutment. If the bridge abutments are supported by the MSE wall backfill, within 20 feet of the bridge abutment the MSE wall and reinforcement should extend down to the top of basalt. If CIP walls are selected, the CIP wall at the abutment will be designed to support the superstructure and should extend to the top of basalt.

Lava Tubes and Voids

Although not reported in the explorations reviewed, lava tubes or voids may be encountered in the footing or wall subgrade excavations. If encountered, these voids will need to be backfilled with Controlled Low Strength Material (CLSM). The volume of a void can range from 10 cubic yards to over 300 cubic yards. We recommend conducting a ground penetrating radar survey, along the bridge and wall alignments, to identify potential lava tubes and voids.

Recommended Geotechnical Exploration Program

To meet ODOT GDM requirements, a boring should be drilled at the location of each Bent and extend a minimum of 20 feet into rock, however, we recommend extending the borings to 25 feet below top of rock in case anchors are needed to reduce footing size during final

design. At the main cable stay support tower (Bent 4), where the highest loads are anticipated, we recommend extending two borings a minimum of 35 feet into the basalt to provide flexibility in foundation type and length during final design. Three additional borings should be drilled for the approach retaining walls, one boring for the west approach and two for the east approach. The drilling program should include a total of 15 borings. In addition to the geotechnical borings, we recommend performing ground penetrating radar to detect potential voids and lava tubes in the basalt layer.

LIMITATIONS

The analyses, conclusions, and recommendations contained in this report are based on site conditions as they presently exist.

This report was prepared for the exclusive use of DOWL and their design team for the conceptual design of the Hawthorne Pedestrian Bridge. The findings in this report must be updated and revisited as the design for this project is refined. Please read the Important Information Section at the back of this report to reduce project risks.

Sincerely,

SHANNON & WILSON

James Walters, PE
Senior Engineer

Risheng "Park" Piao, PE, GE
Vice President

JJW | RPP:myw

Enc.
Figure 1 – Vicinity Map
Figure 2 – Site Plan
Attachment A – Existing Information
Important Information About Your Geotechnical/Environmental Report

SHANNON & WILSON

REFERENCES

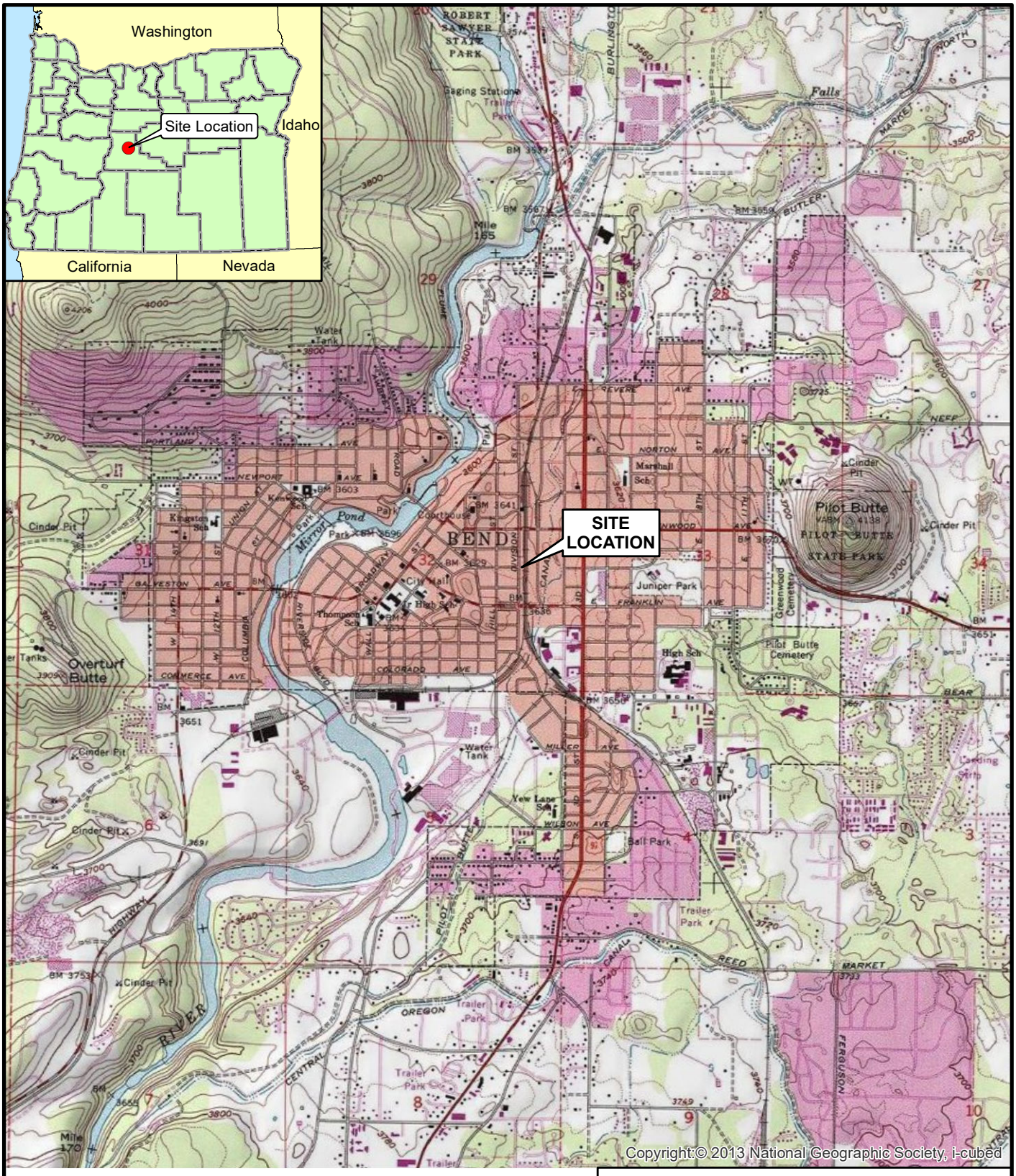
American Association of State Highway and Transportation Officials (AASHTO), 2020, AASHTO LRFD bridge design specifications (9th ed., with 2021 Errata): Washington, D. C., AASHTO, 2 v.

ODOT, 2024, Geotechnical Design Manual: Salem, Oregon, available: https://www.oregon.gov/ODOT/GeoEnvironmental/Pages/Geotech-Manual.aspx.

Oregon Water Resources Department (OWRD), 2024, Oregon Water Resources Department Well Report Mapping Tool website, https://apps.wrd.state.or.us/apps/gw/wl_well_report_map/Default.aspx.

Sherrod, D.R.; Taylor, E.M.; Ferns, M.L.; and others, 2004, Geologic map of the Bend 30- x 60-minute quadrangle, central Oregon: U.S. Geological Survey Geologic Investigations Series I-2683, scale 1:100,000.

United States Geological Survey, 2017, Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquake.usgs.gov/hazards/qfaults/map/#qfaults, accessed 01/24/2017.



0 0.25 0.5 1

Scale in Miles

N

Midtown Multimodal Connections
Hawthorne Overcrossing
Bend, Oregon

VICINITY MAP

September 2024 112420

SHANNON & WILSON | **FIG. 1**

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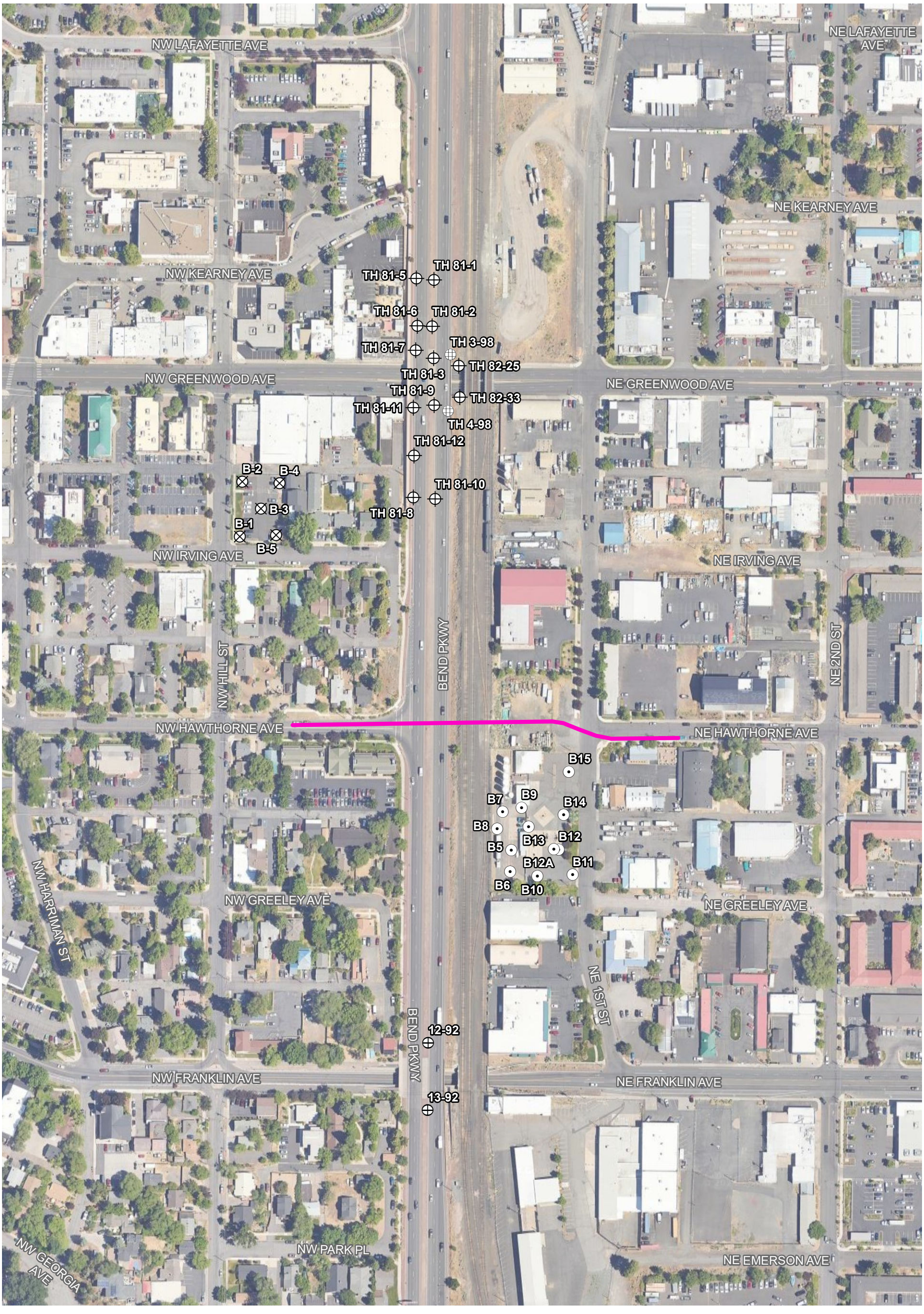


LEGEND

- Approximate Location of Push Probe (Well Log, 2022)
- Approximate Location of Boring (Well Log, 2007)
- Approximate Location of Boring (ODOT, 1998)
- Approximate Location of Boring (ODOT, 1992)
- Approximate Location of Boring (ODOT, 1981-82)
- Approximate Proposed Overcrossing

0 100 200 400

Scale in Feet

NOTES

1. Aerial imagery obtained through Google Maps Satellite.
2. Proposed overcrossing based on file Midtown Hawthorne Progress Set.pdf, provided by DOWL on August 22, 2024.

Midtown Multimodal Connections
Hawthorne Overcrossing
Bend, Oregon

SITE PLAN

September 2024 112420

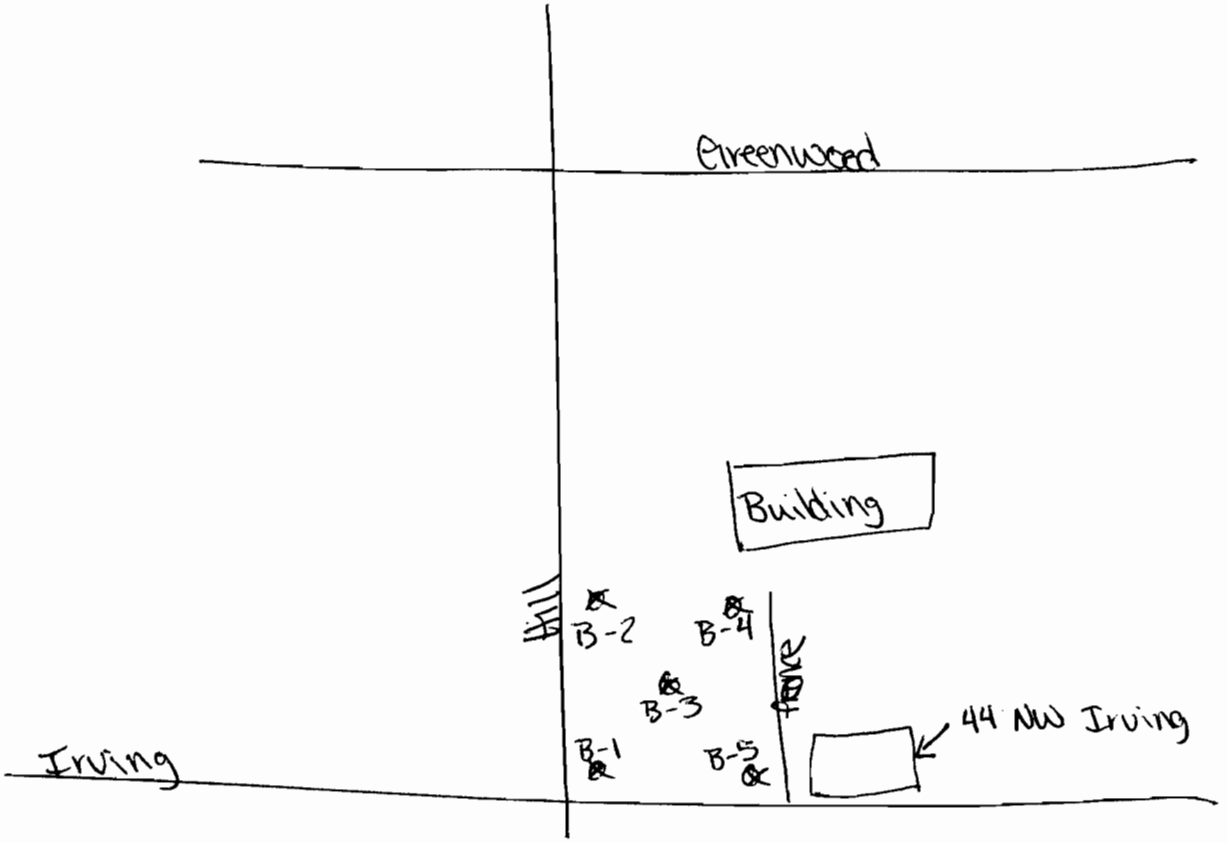
SHANNON & WILSON

FIG. 2

FIG. 2

ATTACHEMENT A
EXISTING INFORMATION

DESC 57940



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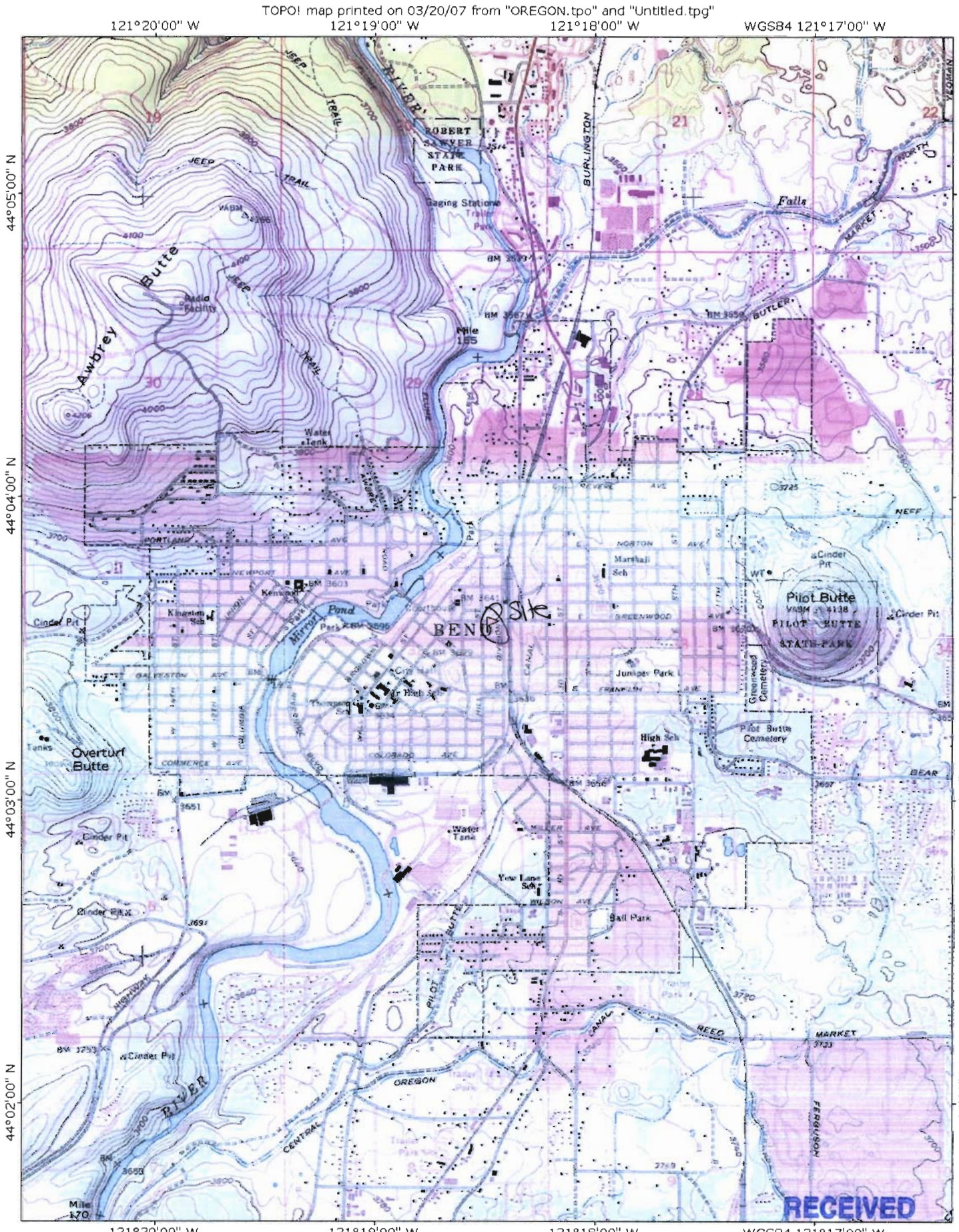

DESC 57940

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-035)

DESC 57940

(1) OWNER/PROJECT: Hole Number **B-1**
Name **ANTHONY ALBERTAZZI**
Address **1070 NW BOND STREET SUITE 202**
City **BEND** State **OREGON** Zip **97701**

(2) TYPE OF WORK
☑ New ☐ Deepening ☐ Alteration (repair/recondition) ☑ Abandonment

(3) CONSTRUCTION:
☐ Rotary Air ☐ Hand Auger ☑ Hollow Stem Auger
☐ Rotary Mud ☐ Cable Tool ☐ Push Probe ☑ Other **ROCK CORING**

(4) TYPE OF HOLE:
☑ Uncased Temporary ☐ Cased Permanent
☐ Uncased Permanent ☐ Slope Stability ☐ Other

(5) USE OF HOLE: **GEOTECHNICAL**

(6) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☑ No Depth of Completed Hole **20** ft.

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
8	0	20	BENT CHIPS	20	0	10 SKS

Backfill placed from ____ ft. to ____ ft. Material ____
Filter Pack placed from ____ ft. to ____ ft. Size of pack ____

(7) CASING/SCREEN:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	N/A				☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Screen:					☐	☐	☐	☐
					☐	☐	☐	☐

Slot size ____

(8) WELL TEST:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
Permeability ____ Yield ____ GPM ____
Conductivity ____ PH ____
Temperature of water **N/A** °F Depth artesian flow found ____ ft.
Was water analysis done? ☐ Yes ☑ No
By whom? ____
Depth of strata analyzed. From ____ ft. to ____ ft.
Remarks: ____

(9) LOCATION OF HOLE by legal description:
County **DESCHUTES** Latitude ____ Longitude ____
Township **17** S Range **12** E WM.
Section **32** **NE** 1/4 **SE** 1/4
Tax Lot **4900** Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) **44 NW IRVING AVENUE**
BEND, OR

Map with location indentified must be attached

(10) STATIC WATER LEVEL:
N/A ft. below land surface. Date **3/12/07**
Artesian pressure ____ lb. per square inch. Date ____

(11) SUBSURFACE LOG:
Ground Elevation ____

Material Description	From	To	SWL
BROWN SILT WITH GRAVELS	0	3	
BASALT/ CORED	3	20	

Date Started **3/12/07** Date Completed **3/12/07**

(12) ABANDONMENT LOG:

Material Description	From	To	Sacks or Pounds
BENT CHIPS	20	0	10 SKS

RECEIVED
MAR 28 2007
WATER RESOURCES DEPT
SALEM, OREGON

Date started **3/12/07** Date Completed **3/12/07**

Professional Certification
(to be signed by a licensed water supply or monitoring well constructor, or registered geologist or civil engineer).

I accept responsibility for the construction, alteration, or abandonment work performed on during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License or Registration Number **10554**
Signed ____ Date **3/21/07**
ALEX MCCANN
Affiliation **SUBSURFACE TECHNOLOGIES**

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

DESC 57941

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-035)

(1) OWNER/PROJECT: Hole Number **B-2**
Name **ANTHONY ALBERTAZZI**
Address **1070 NW BOND STREET SUITE 202**
City **BEND** State **OREGON** Zip **97701**

(2) TYPE OF WORK
☑ New ☐ Deepening ☐ Alteration (repair/recondition) ☑ Abandonment

(3) CONSTRUCTION:
☐ Rotary Air ☐ Hand Auger ☑ Hollow Stem Auger
☐ Rotary Mud ☐ Cable Tool ☐ Push Probe ☑ Other **ROCK CORING**

(4) TYPE OF HOLE:
☑ Uncased Temporary ☐ Cased Permanent
☐ Uncased Permanent ☐ Slope Stability ☐ Other

(5) USE OF HOLE: **GEOTECHNICAL**

(6) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☑ No Depth of Completed Hole **20** ft.

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
8	0	20	BENT CHIPS	20	0	10 SKS

Backfill placed from ____ ft. to ____ ft. Material ____
Filter Pack placed from ____ ft. to ____ ft. Size of pack ____

(7) CASING/SCREEN:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	N/A				☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Screen:					☐	☐	☐	☐
					☐	☐	☐	☐

Slot size ____

(8) WELL TEST:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
Permeability ____ Yield ____ GPM ____
Conductivity ____ PH ____
Temperature of water **N/A** °F Depth artesian flow found ____ ft.
Was water analysis done? ☐ Yes ☑ No
By whom? ____
Depth of strata analyzed. From ____ ft. to ____ ft.
Remarks: ____

(9) LOCATION OF HOLE by legal description:
County **DESCHUTES** Latitude ____ Longitude ____
Township **17** S Range **12** E WM.
Section **32** **NE** 1/4 **SE** 1/4
Tax Lot **4900** Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) **44 NW IRVING AVENUE**
BEND, OR

Map with location indentified must be attached

(10) STATIC WATER LEVEL:
N/A ft. below land surface. Date **3/12/07**
Artesian pressure ____ lb. per square inch. Date ____

(11) SUBSURFACE LOG:
Ground Elevation ____

Material Description	From	To	SWL
BROWN SILT WITH GRAVELS	0	3	
BASALT/ CORED	3	20	

Date Started **3/12/07** Date Completed **3/12/07**

(12) ABANDONMENT LOG:

Material Description	From	To	Sacks or Pounds
BENT CHIPS	20	0	10 SKS

RECEIVED
MAR 28 2007
WATER RESOURCES DEPT
SALEM, OREGON

Date started **3/12/07** Date Completed **3/12/07**

Professional Certification
(to be signed by a licensed water supply or monitoring well constructor, or registered geologist or civil engineer).

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License or Registration Number **10554**
Signed ____ Date **3/21/07**
ALEX MCCANN
Affiliation **SUBSURFACE TECHNOLOGIES**

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

DESC 57942

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-035)

(1) OWNER/PROJECT: Hole Number B-3
Name ANTHONY ALBERTAZZI
Address 1070 NW BOND STREET SUITE 202
City BEND State OREGON Zip 97701

(2) TYPE OF WORK
☑ New ☐ Deepening ☐ Alteration (repair/recondition) ☑ Abandonment

(3) CONSTRUCTION:
☐ Rotary Air ☐ Hand Auger ☑ Hollow Stem Auger
☐ Rotary Mud ☐ Cable Tool ☐ Push Probe ☑ Other ROCK CORING

(4) TYPE OF HOLE:
☑ Uncased Temporary ☐ Cased Permanent
☐ Uncased Permanent ☐ Slope Stability ☐ Other

(5) USE OF HOLE: GEOTECHNICAL

(6) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☑ No Depth of Completed Hole 30 ft.

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
8	0	30	BENT CHIPS	30	0	15 SKS

Backfill placed from ____ ft. to ____ ft. Material ____
Filter Pack placed from ____ ft. to ____ ft. Size of pack ____

(7) CASING/SCREEN:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	N/A				☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Screen:					☐	☐	☐	☐
					☐	☐	☐	☐

Slot size ____

(8) WELL TEST:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
Permeability ____ Yield ____ GPM ____
Conductivity ____ PH ____
Temperature of water N/A °F Depth artesian flow found ____ ft.
Was water analysis done? ☐ Yes ☑ No
By whom? ____
Depth of strata analyzed. From ____ ft. to ____ ft.
Remarks: ____

(9) LOCATION OF HOLE by legal description:
County DESCHUTES Latitude ____ Longitude ____
Township 17 S Range 12 E WM.
Section 32 NE 1/4 SE 1/4
Tax Lot 4900 Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) 44 NW IRVING AVENUE
BEND, OR

Map with location indentified must be attached

(10) STATIC WATER LEVEL:
N/A ft. below land surface. Date 3/13/07
Artesian pressure ____ lb. per square inch. Date ____

(11) SUBSURFACE LOG:
Ground Elevation ____

Material Description	From	To	SWL
BROWN SILT WITH GRAVELS	0	3	
BASALT/ CORED	3	30	

Date Started 3/13/07 Date Completed 3/13/07

(12) ABANDONMENT LOG:

Material Description	From	To	Sacks or Pounds
BENT CHIPS	30	0	

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MAR 28 2007
WATER RESOURCES DEPT
SALEM, OREGON

Date started 3/13/07 Date Completed 3/13/07

Professional Certification
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License or Registration Number 10554

Signed Alex McCann Date 3/21/07
ALEX MCCANN
Affiliation SUBSURFACE TECHNOLOGIES

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

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DESC 57943

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-035)

(1) OWNER/PROJECT: Hole Number **B-4**
Name **ANTHONY ALBERTAZZI**
Address **1070 NW BOND STREET SUITE 202**
City **BEND** State **OREGON** Zip **97701**

(2) TYPE OF WORK
☑ New ☐ Deepening ☐ Alteration (repair/recondition) ☑ Abandonment

(3) CONSTRUCTION:
☐ Rotary Air ☐ Hand Auger ☑ Hollow Stem Auger
☐ Rotary Mud ☐ Cable Tool ☐ Push Probe ☑ Other **ROCK CORING**

(4) TYPE OF HOLE:
☑ Uncased Temporary ☐ Cased Permanent
☐ Uncased Permanent ☐ Slope Stability ☐ Other

(5) USE OF HOLE: **GEOTECHNICAL**

(6) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☑ No Depth of Completed Hole **25** ft.

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
8	0	25	BENT CHIPS	25	0	13 SKS

Backfill placed from ____ ft. to ____ ft. Material ____
Filter Pack placed from ____ ft. to ____ ft. Size of pack ____

(7) CASING/SCREEN:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	N/A				☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Screen:					☐	☐	☐	☐
					☐	☐	☐	☐

Slot size ____

(8) WELL TEST:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
Permeability ____ Yield ____ GPM ____
Conductivity ____ PH ____
Temperature of water **N/A** °F Depth artesian flow found ____ ft.
Was water analysis done? ☐ Yes ☑ No
By whom? ____
Depth of strata analyzed. From ____ ft. to ____ ft.
Remarks: ____

(9) LOCATION OF HOLE by legal description:
County **DESCHUTES** Latitude ____ Longitude ____
Township **17** S Range **12** E WM.
Section **32** **NE** 1/4 **SE** 1/4
Tax Lot **4900** Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) **44 NW IRVING AVENUE**
BEND, OR

Map with location indentified must be attached

(10) STATIC WATER LEVEL:
N/A ft. below land surface. Date **3/13/07**
Artesian pressure ____ lb. per square inch. Date ____

(11) SUBSURFACE LOG:
Ground Elevation ____

Material Description	From	To	SWL
BROWN SILT WITH GRAVELS	0	6	
BASALT/ CORED	6	25	

Date Started **3/13/07** Date Completed **3/13/07**

(12) ABANDONMENT LOG:

Material Description	From	To	Sacks or Pounds
BENT CHIPS	25	0	13 SKS

RECEIVED
MAR 28 2007
WATER RESOURCES DEPT
SALEM, OREGON

Date started **3/13/07** Date Completed **3/13/07**

Professional Certification
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License or Registration Number **10554**
Signed ____ Date **3/21/07**
ALEX MCCANN
Affiliation **SUBSURFACE TECHNOLOGIES**

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DESC 57944

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-035)

DESC 57944

(1) OWNER/PROJECT: Hole Number **B-5**
Name **ANTHONY ALBERTAZZI**
Address **1070 NW BOND STREET SUITE 202**
City **BEND** State **OREGON** Zip **97701**

(2) TYPE OF WORK
☑ New ☐ Deepening ☐ Alteration (repair/recondition) ☑ Abandonment

(3) CONSTRUCTION:
☐ Rotary Air ☐ Hand Auger ☑ Hollow Stem Auger
☐ Rotary Mud ☐ Cable Tool ☐ Push Probe ☑ Other **ROCK CORING**

(4) TYPE OF HOLE:
☑ Uncased Temporary ☐ Cased Permanent
☐ Uncased Permanent ☐ Slope Stability ☐ Other

(5) USE OF HOLE: **GEOTECHNICAL**

(6) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☑ No Depth of Completed Hole **25** ft.

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
8	0	25	BENT CHIPS	25	0	13 SKS

Backfill placed from ____ ft. to ____ ft. Material ____
Filter Pack placed from ____ ft. to ____ ft. Size of pack ____

(7) CASING/SCREEN:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	N/A				☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Screen:					☐	☐	☐	☐
					☐	☐	☐	☐

Slot size ____

(8) WELL TEST:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
Permeability ____ Yield ____ GPM ____
Conductivity ____ PH ____
Temperature of water **N/A** °F Depth artesian flow found ____ ft.
Was water analysis done? ☐ Yes ☑ No
By whom? ____
Depth of strata analyzed. From ____ ft. to ____ ft.
Remarks: ____

(9) LOCATION OF HOLE by legal description:
County **DESCHUTES** Latitude ____ Longitude ____
Township **17** S Range **12** E WM.
Section **32** **NE** 1/4 **SE** 1/4
Tax Lot **4900** Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) **44 NW IRVING AVENUE**
BEND, OR

Map with location indentified must be attached

(10) STATIC WATER LEVEL:
N/A ft. below land surface. Date **3/13/07**
Artesian pressure ____ lb. per square inch. Date ____

(11) SUBSURFACE LOG:
Ground Elevation ____

Material Description	From	To	SWL
BROWN SILT WITH GRAVELS	0	3	
BASALT/ CORED	3	25	

Date Started **3/13/07** Date Completed **3/13/07**

(12) ABANDONMENT LOG:

Material Description	From	To	Sacks or Pounds
BENT CHIPS	25	0	13 SKS

RECEIVED
MAR 28 2007
WATER RESOURCES DEPT
SALEM, OREGON

Date started **3/13/07** Date Completed **3/13/07**

Professional Certification
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License or Registration Number **10554**
Signed ____ Date **3/21/07**
ALEX MCCANN
Affiliation **SUBSURFACE TECHNOLOGIES**

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ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

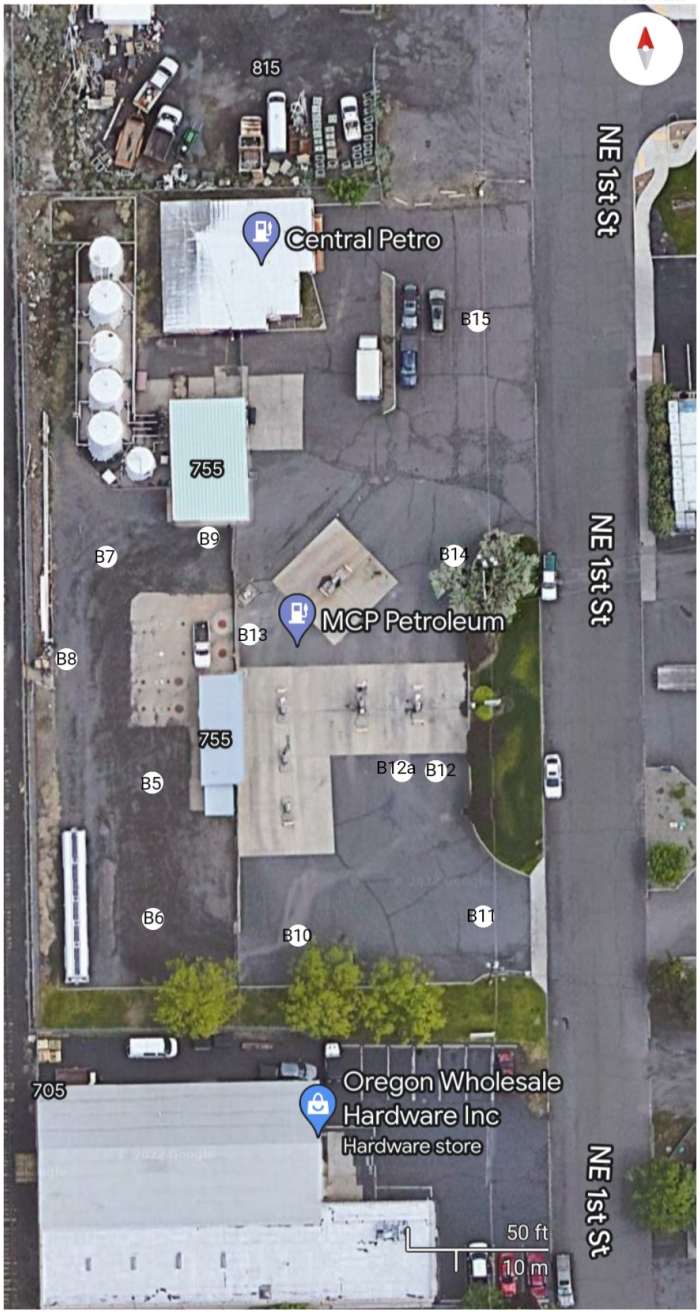
GEOTECHNICAL HOLE REPORT - Map with location identified must be attached and shall include an approximate scale and north arrow

DESC 63897

12/20/2022

Map of Hole

0983.20.22



755 NE 1st St.
Bend, OR, 97701

DESC 63897

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B5

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 8.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	8					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Gravel	0	1
Silts with sands	1	7.5
basalt	7.5	8

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	8	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63898

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B6

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

[X] New [ ] Deepening [X] Abandonment
[ ] Alteration (repair/recondition)

(3) CONSTRUCTION

[ ] Rotary Air [ ] Hand Auger [ ] Hollow stem auger
[ ] Rotary Mud [ ] Cable [X] Push Probe
[ ] Other _____

(4) TYPE OF HOLE:

(•) Uncased Temporary ( ) Cased Permanent
( ) Uncased Permanent ( ) Slope Stablity
( ) Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard [ ] (Attach copy)
Depth of Completed Hole 7.50 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	7.5					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
( )	( )						( )	( )		
( )	( )						( )	( )		
( )	( )						( )	( )		
( )	( )						( )	( )		
( )	( )						( )	( )		

(8) WELL TESTS

( ) Pump ( ) Bailer ( ) Air ( ) Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis [ ] Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? [ ] Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
(•) Street address of hole ( ) Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			[ ]	
Completed Well			[ ]	

Flowing Artesian? [ ]
WATER BEARING ZONES
Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					[ ]	
					[ ]	
					[ ]	
					[ ]	
					[ ]	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Gravel	0	1
Silts with sands	1	7
basalt	7	7.5

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	7.5	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

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License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63899

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B7

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 6.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	6					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Gravel	0	1
Silts with sands	1	5.5
basalt	5.5	6

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	6	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63900

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B8

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 6.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	6					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Gravel	0	1
Silts with sands	1	5.5
basalt	5.5	6

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	6	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63901

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B9

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 9.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	9					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Gravel	0	1
Silts with sands	1	8.5
basalt	8.5	9

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	9	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63902

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B10

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

[X] New [ ] Deepening [X] Abandonment
[ ] Alteration (repair/recondition)

(3) CONSTRUCTION

[ ] Rotary Air [ ] Hand Auger [ ] Hollow stem auger
[ ] Rotary Mud [ ] Cable [X] Push Probe
[ ] Other _____

(4) TYPE OF HOLE:

(•) Uncased Temporary ( ) Cased Permanent
( ) Uncased Permanent ( ) Slope Stablity
( ) Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard [ ] (Attach copy)
Depth of Completed Hole 9.50 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	9.5					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
( )	( )						( )	( )		
( )	( )						( )	( )		
( )	( )						( )	( )		
( )	( )						( )	( )		
( )	( )						( )	( )		

(8) WELL TESTS

( ) Pump ( ) Bailer ( ) Air ( ) Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis [ ] Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? [ ] Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
(•) Street address of hole ( ) Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			[ ]	
Completed Well			[ ]	

Flowing Artesian? [ ]
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					[ ]	
					[ ]	
					[ ]	
					[ ]	
					[ ]	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Asphalt	0	1
Silts with sands	1	9
basalt	9	9.5

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	9.5	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63903

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B11

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 7.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	7					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Asphalt	0	0.5
Silts with sands	0.5	6.5
basalt	6.5	7

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	7	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63904

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B12

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 2.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	2					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Asphalt	0	0.5
Silts with sands	0.5	1.5
basalt	1.5	2

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	2	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63905

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B12A

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 2.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	2					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Asphalt	0	0.5
Silts with sands	0.5	1.5
basalt	1.5	2

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	2	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63906

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B13

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 6.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	6					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Asphalt	0	1
Silts with sands	1	5.5
basalt	5.5	6

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	6	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63907

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B14

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 5.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	5					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Asphalt	0	1
Silts with sands	1	4.5
basalt	4.5	5

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	5	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

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License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

DESC 63908

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

12/20/2022

(1) OWNER/PROJECT

Hole Number B15

PROJECT NAME/NBR: 0983.20.22

First Name _____ Last Name _____
Company COWAN LAND COMPANY
Address 60978 WOODS VALLEY PL
City BEND State OR Zip 97702

(2) TYPE OF WORK

☒ New ☐ Deepening ☒ Abandonment
☐ Alteration (repair/recondition)

(3) CONSTRUCTION

☐ Rotary Air ☐ Hand Auger ☐ Hollow stem auger
☐ Rotary Mud ☐ Cable ☒ Push Probe
☐ Other _____

(4) TYPE OF HOLE:

◉ Uncased Temporary ○ Cased Permanent
○ Uncased Permanent ○ Slope Stablity
○ Other
Other: _____

(5) USE OF HOLE

SOIL SAMPLE

(6) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)
Depth of Completed Hole 7.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
2.25	0	7					

Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

(8) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Supervising Geologist/Engineer _____
Water quality concerns? ☐ Yes (describe below) TDS amount _____ _____

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)

County DESCHUTES Twp 17.00 S N/S Range 12.00 E E/W WM
Sec 32 NE 1/4 of the SE 1/4 Tax Lot 8500
Tax Map Number _____ Lot _____
Lat ° ' " or 44.05732514 DMS or DD
Long ° ' " or -121.30633511 DMS or DD
◉ Street address of hole ○ Nearest address
755 NE 1ST ST, BEND, OR 97701

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			☐	
Completed Well			☐	

Flowing Artesian? ☐
Depth water was first found _____

WATER BEARING ZONES

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
					☐	
					☐	
					☐	
					☐	
					☐	

(11) SUBSURFACE LOG

Ground Elevation _____

Material	From	To
Asphalt	0	0.5
Silts with sands	0.5	6.5
basalt	6.5	7

Date Started 12/19/2022 Completed 12/19/2022

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs
Other	0	1	0.25	S
Bentonite Chips	1	7	0.5	S

Date Started 12/19/2022 Completed 12/19/2022

Professional Certification

(to be signed by an Oregon licensed water or monitoring well constructor, Oregon registered geologist or professional engineer).

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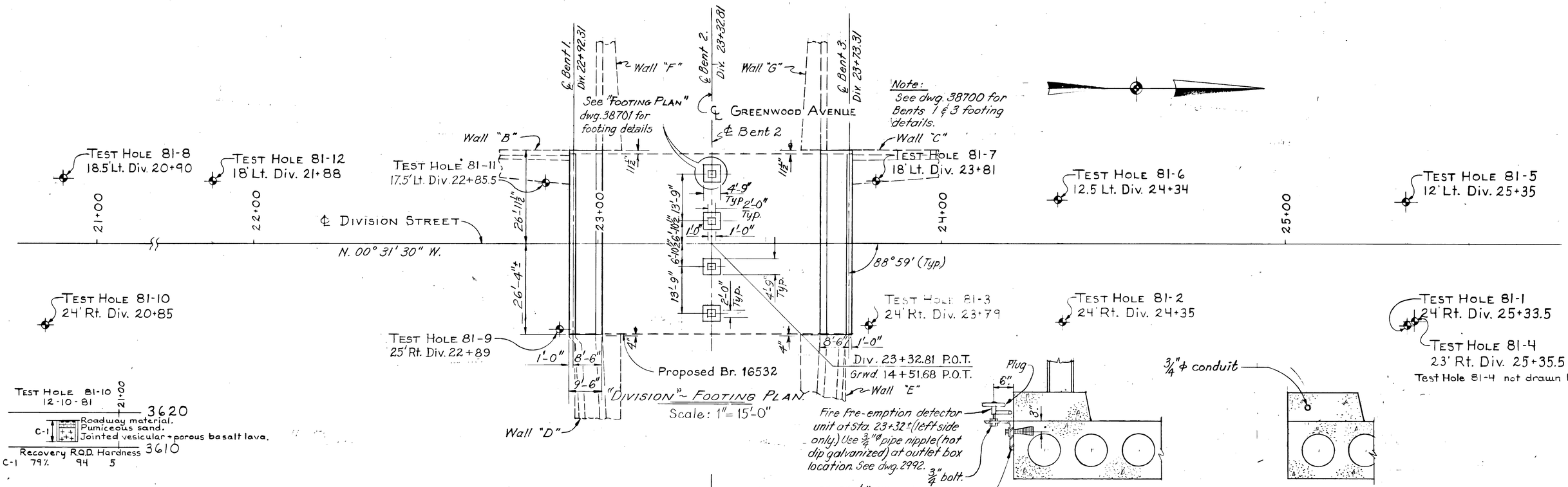
License/Registration Number 10670 Date 12/20/2022
First Name STEVEN Last Name EDDINS
Affiliation STEVENEDDINS

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK



FOUNDATION DATA

scale: 1"=15'

LEGEND OF MATERIALS

- Gravels, cobbles and boulders.
- Silts.
- Silty gravels, gravel-silt mixture.
- Clayey gravel, gravel-clay mixture.
- Silty clay.
- Shale.
- Basalt rock, broken, solid, weathered, lava.
- Sand.
- Clays.
- Silty sand, sand-silt mixture.
- Clayey sand, sand-clay mixture.
- Sand-silt-clay mixture, near equal proportions.
- Sandstone.

▽ Elevation ground water encountered.
✱ Standard Penetration test.
✱✱ Oregon Miniature Pile test.
RQD = Rock Quality Designation
U = Undisturbed Sample
C = Core Sample

Foundation data shown on this drawing, in some instances, is a consolidation of and a revision in terminology from the original field drilling logs. The original field drilling logs are available for review through the office of the Structural Design Engineer in Salem.

REGISTERED PROFESSIONAL ENGINEER 9687 John R. Marks OREGON JULY 14, 1978 JOHN R. MARKS

APPROVED: Walter Hart
STRUCTURAL DESIGN ENGINEER
DESIGNED
DRAWN G.R. Thommen
CHECKED J.R.M.
REVIEWED
REVIEWED
CALC. BOOK

DATE	REVISION

OREGON DEPARTMENT OF TRANSPORTATION
STRUCTURAL DESIGN SECTION

GREENWOOD AVE. U'XING @ DIVISION ST.
BEND SECTION
CENTRAL OREGON HWY ~ DESCHUTES COUNTY

FOUNDATION DATA

DATE June 1982
BRIDGE NO. 16532 & 16546
SHEET 3 OF 28
DRAWING NO. 38699

Test Hole 81-3*

Core	% Rec.	Hardness	R.Q.D.
C-1	36	-	-
C-2	90	R5	52
C-3	100	R5	95
C-4	100	R5	100

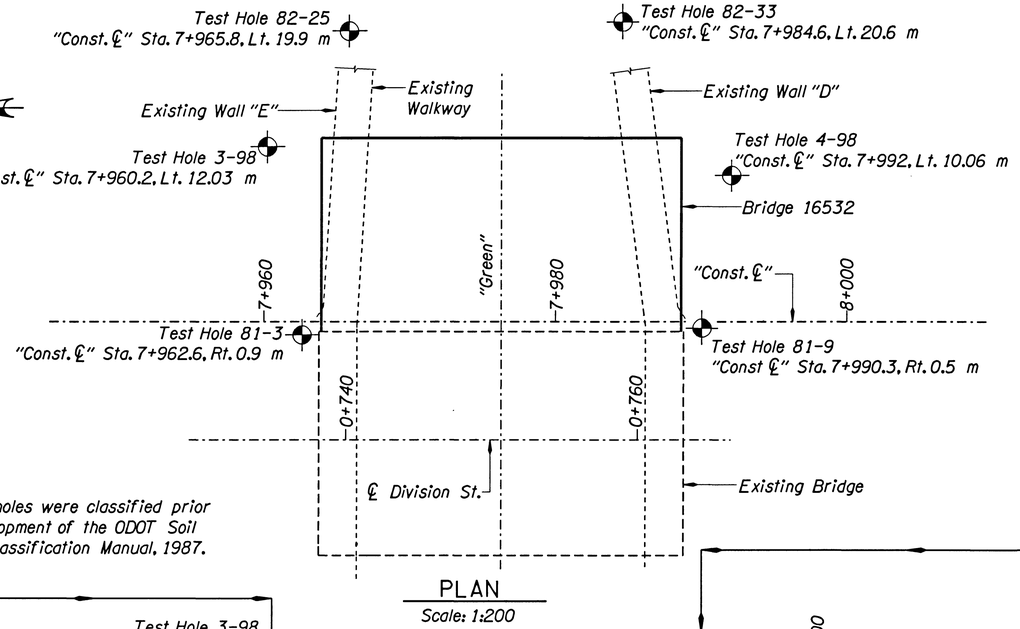
Test Hole 3-98

Core	% Rec.	Hardness	R.Q.D.	Unconfined Compressive Strength
C-1	0	-	-	
C-2	30	-	-	
C-3	58	-	-	
C-4	66	R3	38	41.92mPa
C-5	100	R3	80	37.50mPa
C-6	100	R3-R4	70	67.85mPa

Test Hole 81-9*

Core	% Rec.	Hardness	R.Q.D.
C-1	73	-	-
C-2	100	R5	100
C-3	100	R5	86
C-4	100	R5	78

*NOTE:
These test holes were classified prior to the development of the ODOT Soil and Rock Classification Manual, 1987.



PLAN
Scale: 1:200

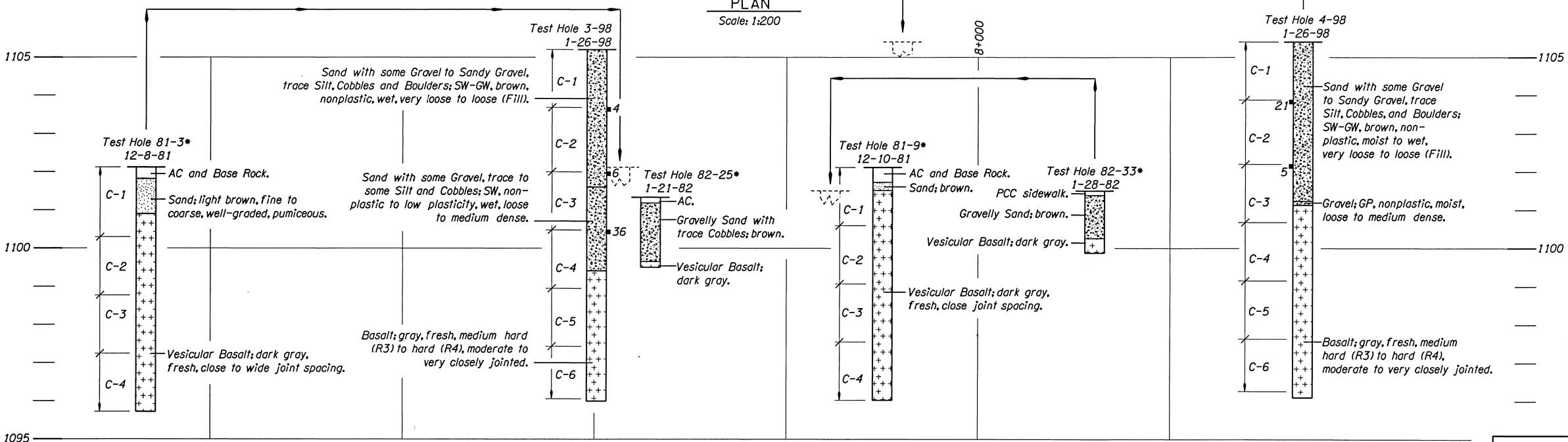
LEGEND OF MATERIALS

Gravel Sand Basalt

Foundation data shown on this drawing is a consolidation of information and/or revision in terminology from the Exploration Logs. The Exploration Logs used in compiling this drawing are available upon request.

Test Hole 4-98

Core	% Rec.	Hardness	R.Q.D.	Unconfined Compressive Strength
C-1	27	-	-	
C-2	30	-	-	
C-3	50	R3	100	50.19mPa
C-4	100	R4	92	57.23mPa
C-5	100	R4	64	88.95mPa
C-6	96	R3	66	43.09mPa



FOUNDATION DATA
Scale: 1:200 (Horiz.)
1:50 (Vert.)

24 ■ Standard Penetration Test.
└ N value.

C = Core Sample.
U = Undisturbed Sample.
RQD = Rock Quality Designation.
▽ = Elevation of groundwater measured in the test hole on the date shown.

DRAFTED: Ann Durley
CHECKED: Jan Six

DESIGNER
REGISTERED PROFESSIONAL ENGINEER 15046 OREGON JULY 25, 1990 RICHARD F. WATANABE
EXPIRES: 6-30-00

OREGON DEPARTMENT OF TRANSPORTATION
GEO/HYDRO SECTION

BRIDGE NO. 16532
DATE 22-DEC-1998

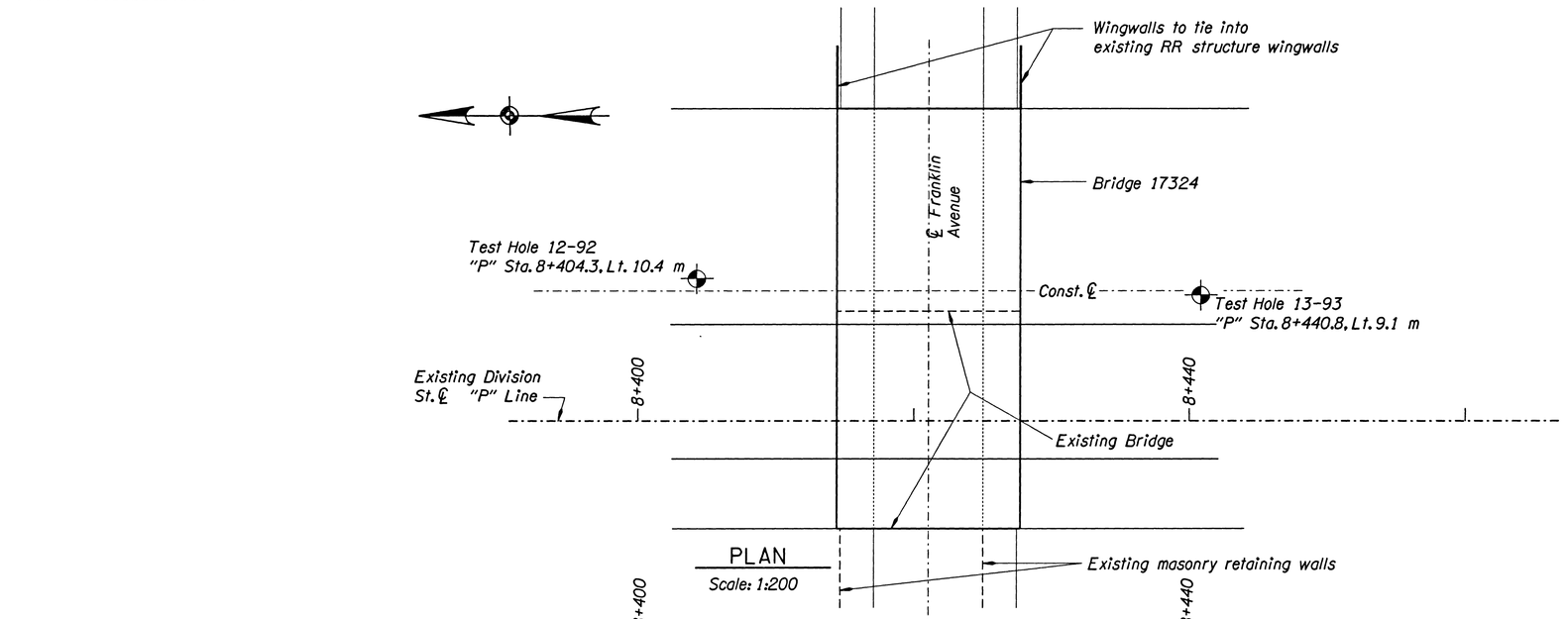
GREENWOOD AVENUE O'XING WIDENING
BEND PARKWAY (PHASE 1)
THE DALLES - CALIFORNIA HIGHWAY
DESCHUTES COUNTY

FOUNDATION DATA

METRIC

SHEET 2 OF 15
DRAWING NO. 56917

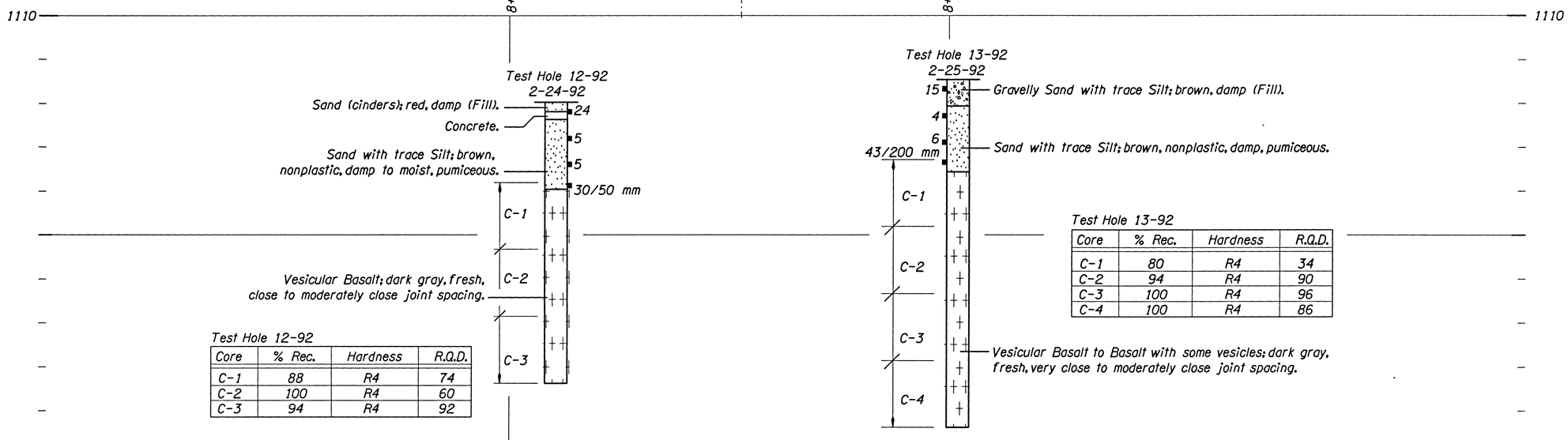
22-DEC-1998 [VIEW=C1] [PGRID=C1] N7747\3(dd):c:\usr\br\projects\temp\green.dgn



Foundation data shown on this drawing is a consolidation of information and/or revision in terminology from the Soils and Geological Exploration Logs. The Soils and Geological Exploration Logs used in compiling this drawing are available upon request.

LEGEND OF MATERIALS

Gravel | Sand | Basalt



Test Hole 12-92

Core	% Rec.	Hardness	R.Q.D.
C-1	88	R4	74
C-2	100	R4	60
C-3	94	R4	92

Test Hole 13-92

Core	% Rec.	Hardness	R.Q.D.
C-1	80	R4	34
C-2	94	R4	90
C-3	100	R4	96
C-4	100	R4	86

FOUNDATION DATA
Scale: 1:200 (Horiz.)
1:50 (Vert.)

24 ┤ Standard Penetration Test.
└ N value.

C = Core Sample.
U = Undisturbed Sample.
RQD = Rock Quality Designation.
▽ = Elevation of groundwater measured in the test hole on the date shown.

DRAFTED: Ann Durley
CHECKED: John Gent

DESIGNER
REGISTERED PROFESSIONAL ENGINEER 13249 Robert William Burns OREGON MAY 17, 1991 ROBERT WILLIAM BURNS
EXPIRES: 12-31-99

OREGON DEPARTMENT OF TRANSPORTATION
GEO/HYDRO SECTION

BRIDGE NO. 17324
DATE 22-DEC-1998

FRANKLIN AVENUE OVERCROSSING WIDENING
BEND PARKWAY (PHASE 1)
THE DALLES - CALIFORNIA HIGHWAY
DESCHUTES COUNTY

FOUNDATION DATA

METRIC

SHEET 2 OF 15
DRAWING NO. 56926

NT1473a\dd:c:\usr\br\projects\10287\wall10.dgn [VIEW=NULL] [PGRID=C1] 22-DEC-1998

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

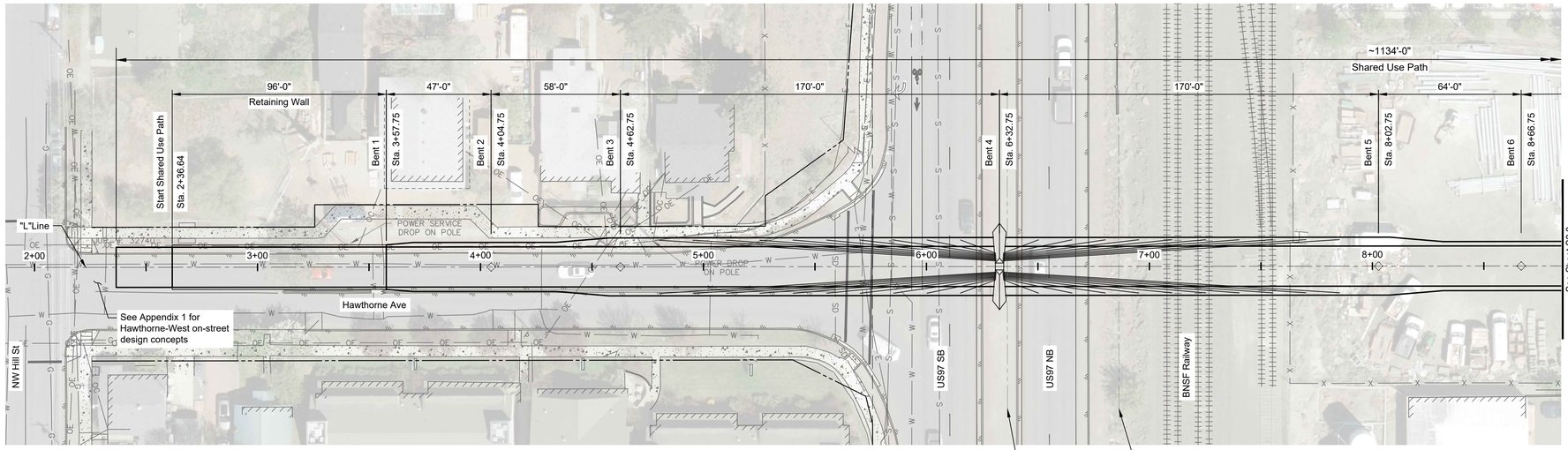
The preceding paragraphs are based on information provided by the Geoprofessional Business Association (https://www.geoprofessional.org)

APPENDIX 3

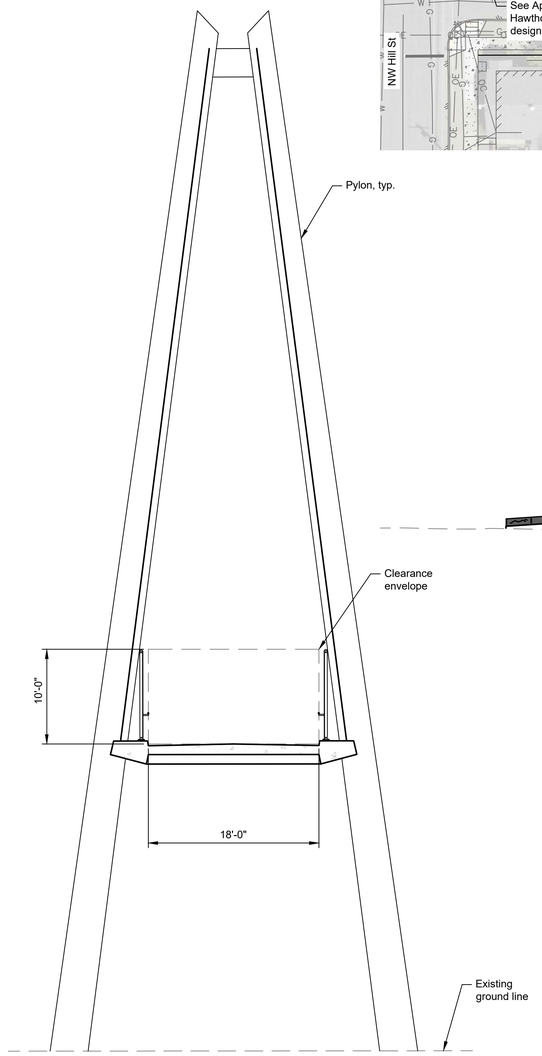
Single-Tower Cable-Stayed

Single-Tower Cable-Stayed Alternative, Rendering Looking South Along the Bend Parkway

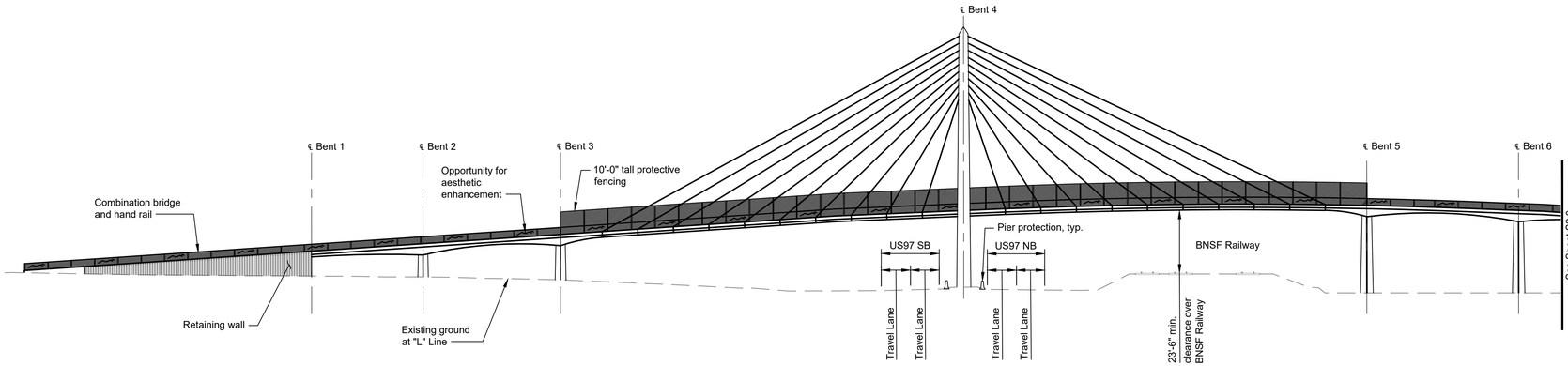
Single-Tower Cable-Stayed, User's Perspective Rendering



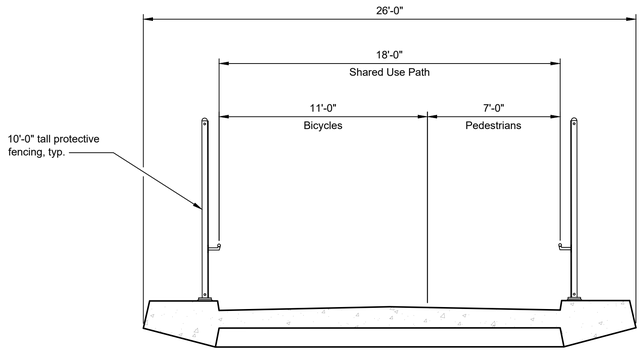
PLAN
SCALE: 1" = 30"



TOWER TYPICAL SECTION
SCALE: 1/8" = 1'-0"



ELEVATION
SCALE: 1" = 30"



CABLE-STAYED DECK SECTION
SCALE: 1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER
OREGON
NOVEMBER 21, 2001
RAEL G. McNULTY
EXPIRES: 12/31/

CONCEPT PLANS NOT FOR CONSTRUCTION

MIDTOWN CONNECTION 3: HAWTHORNE OVERCROSSING

SINGLE-TOWER CABLE-STAYED ALTERNATIVE

DESCHUTES COUNTY, OREGON

CITY OF BEND

REVISIONS:

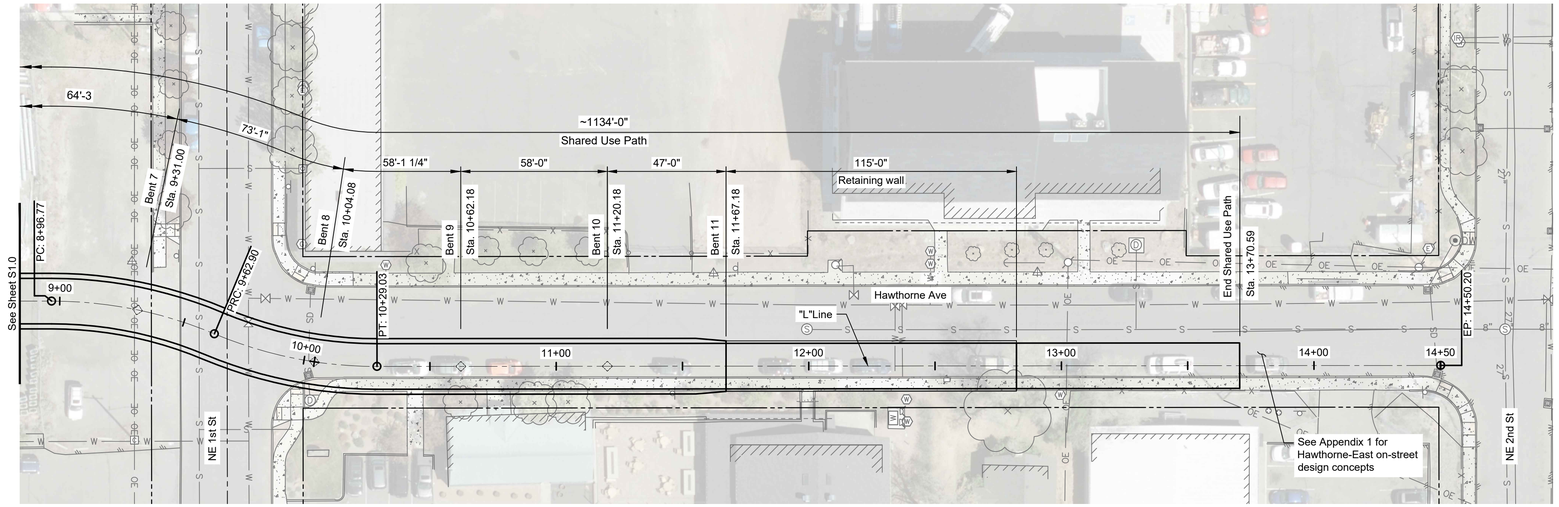
DOWL
WWW.DOWL.COM
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772

DESIGNED BY: MGM
DRAWN BY: CJW
SCALE: VARIES
FILE: SA-ST-PL-14953_01
DATE: 08/30/2024

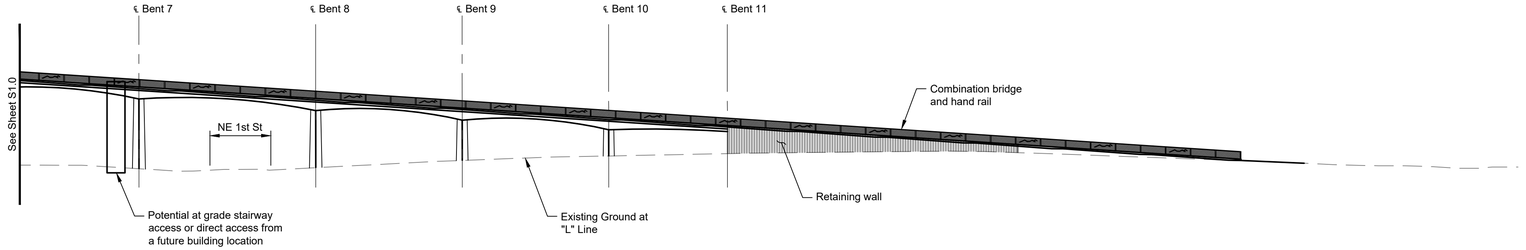
VERIFY SCALES
0 1"
BAR EQUALS ONE INCH ON ORIGINAL DRAWING

SHEET:
S1.0

COB #
XXXX



PLAN
SCALE: 1" = 30'



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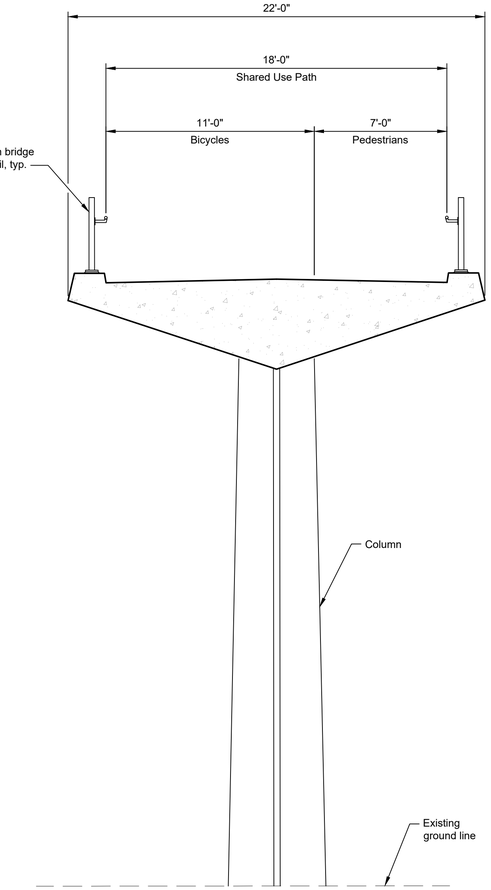
SCALE: 1" = 30'



TYPICAL APPROACH SPAN SECTION
SCALE: 1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER
OREGON
DECEMBER 21, 2001
RAEL G. McNULTY
EXPIRES: 12/31/
CONCEPT PLANS NOT FOR CONSTRUCTION

MIDTOWN CONNECTION 3:
HAWTHORNE OVERCROSSING

SINGLE-TOWER CABLE-STAYED ALTERNATIVE
DESCHUTES COUNTY, OREGON

CITY OF BEND

REVISIONS:

DOWL
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772
WWW.DOWL.COM

DESIGNED BY: MGM
DRAWN BY: CJW
SCALE: VARIES
FILE:SA-ST-PL-14953_02
DATE: 08/30/2024

VERIFY SCALES
0 1"
BAR EQUALS ONE INCH ON ORIGINAL DRAWING

SHEET:
S2.0

COB #
XXXX

Single-Tower Cable-Stayed Bridge Engineer's Cost Estimate (Concept)
September 2024

Spec. No.	Item No.	Item	Bid Unit	Est. Unit	Quantity	Unit Price	Total Price
		TEMPORARY FEATURES AND APPURTENANCES					
00210	10	MOBILIZATION	Lump Sum	Lump Sum	1	$ 1,542,750.87	$ 1,542,750.87
00XXX	20	RAILROAD FLAGGING	Lump Sum	Work Shift	180	$ 1,500.00	$ 270,000.00
00221	30	TEMPORARY WORKS	Lump Sum	Lump Sum	1	$ 648,321.80	$ 648,321.80
		BRIDGE - APPROACH SPANS (CIP CONCRETE)					
00510	40	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	724	$ 100.00	$ 72,400.00
00510	50	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	394	$ 75.00	$ 29,550.00
00510	60	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	462	$ 900.00	$ 415,800.00
00530	70	REINFORCEMENT	Lump Sum	Lb	442,500	$ 2.50	$ 1,106,250.00
00540	80	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	330	$ 1,000.00	$ 330,000.00
00540	90	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	1,360	$ 2,000.00	$ 2,720,000.00
00555	100	POST-TENSIONING	Lump Sum	Lb	27,960	$ 10.00	$ 279,600.00
00585	110	EXPANSION JOINTS	Lump Sum	Foot	104	$ 500.00	$ 52,000.00
00587	120	HANDRAIL	Lump Sum	Foot	1,166	$ 200.00	$ 233,200.00
		BRIDGE - SIGNATURE SPANS					
00510	130	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	837	$ 100.00	$ 83,700.00
00510	140	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	364	$ 75.00	$ 27,300.00
00510	150	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	309	$ 900.00	$ 278,100.00
00515	150	GROUND ANCHORS	Each	Each	26	$ 7,500.00	$ 195,000.00
00530	160	REINFORCEMENT	Lump Sum	Lb	179,000	$ 2.50	$ 447,500.00
00540	160	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	473	$ 1,000.00	$ 473,000.00
00540	170	DECK CONCRETE, CLASS HPC4500	Lump Sum	Cu Yd	120	$ 1,700.00	$ 204,000.00
00540	170	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	123	$ 2,000.00	$ 246,000.00
00550	180	PRECAST CONCRETE PYLONS	Lump Sum	Foot	230	$ 1,100.00	$ 253,000.00
00550	180	PRECAST CONCRETE DECK PANELS	Lump Sum	Sq Ft	7,800	$ 150.00	$ 1,170,000.00
00555	190	DECK POST-TENSIONING	Lump Sum	Lb	12,400	$ 10.00	$ 124,000.00
00560	190	CABLE STAYS	Lump Sum	Lb	23,950	$ 20.00	$ 479,000.00
00587	200	HANDRAIL	Lump Sum	Foot	680	$ 200.00	$ 136,000.00
00587	200	PROTECTIVE FENCING	Lump Sum	Foot	680	$ 400.00	$ 272,000.00
		RETAINING WALLS - APPROACH					
00596A	210	WALL COPING WITH HANDRAIL	Foot	Foot	422	$ 600.00	$ 253,200.00
00596A	220	RETAINING WALL, MSE	Lump Sum	Sq Ft	3,472	$ 160.00	$ 555,520.00
		BASES					
00640	230	AGGREGATE BASE	Ton	Ton	220	$ 45.00	$ 9,900.00
		WEARING SURFACES					
00759	240	6 INCH CONCRETE SURFACING	Sq Ft	Sq Ft	5,868	$ 12.00	$ 70,416.00
		ALLOWANCES FOR ADDITIONAL IMPROVEMENTS					
00XXX	250	HAWTHORNE CORRIDOR IMPROVEMENTS - WEST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00XXX	260	HAWTHORNE CORRIDOR IMPROVEMENTS - EAST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00970	270	BRIDGE LIGHTING	Lump Sum	Lump Sum	1	$ 700,000.00	$ 700,000.00
10XXX	280	SITE RESTORATION	Lump Sum	Lump Sum	1	$ 250,000.00	$ 250,000.00
10XXX	290	HARDSCAPE IMPROVEMENTS	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00

SUB-TOTAL OF ITEMS	$ 15,427,508.67
Contingency (40%)	$ 6,171,003.47
Inflation (2026 Dollars)*	$ 1,098,824.30
Construction Engineering (13.5%)	$ 2,915,799.14
ODOT STIP Preliminary Engineering Funding	$ 5,072,229.21
ODOT STIP ROW Funding	$ 1,068,783.07

Total Construction Cost (Year 2026):	$ 31,754,147.86
AACE Class 3 Estimate (Low -10%):	**$ 28,578,733.07**
AACE Class 3 Estimate (High +10%):	**$ 34,929,562.64**

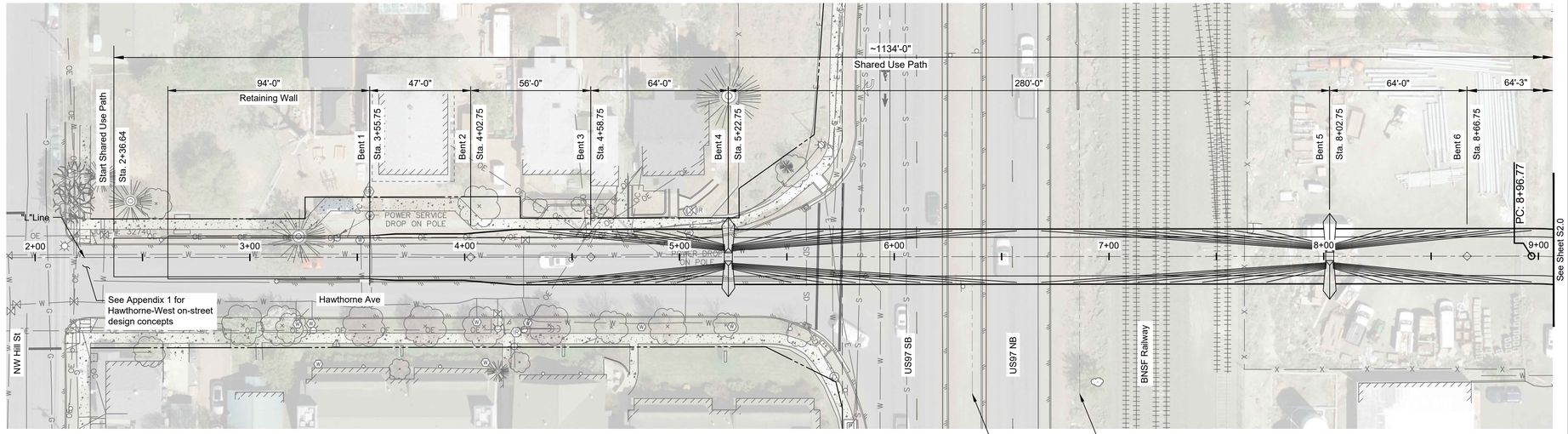
*Inflation is 3.5% per year. Unit costs are 2024 dollars.

APPENDIX 4

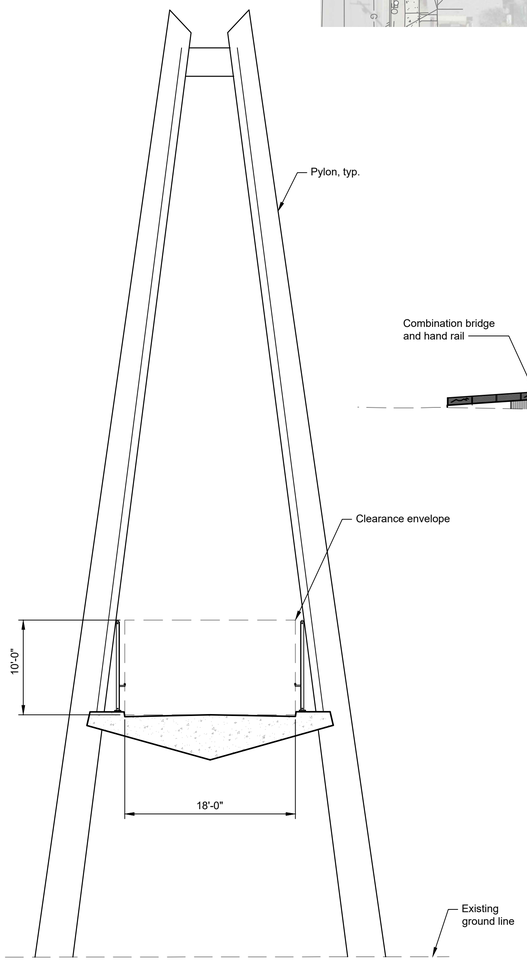
Two-Tower Cable-Stayed

Two-Tower Cable-Stayed Alternative, Rendering Looking South Along the Bend Parkway

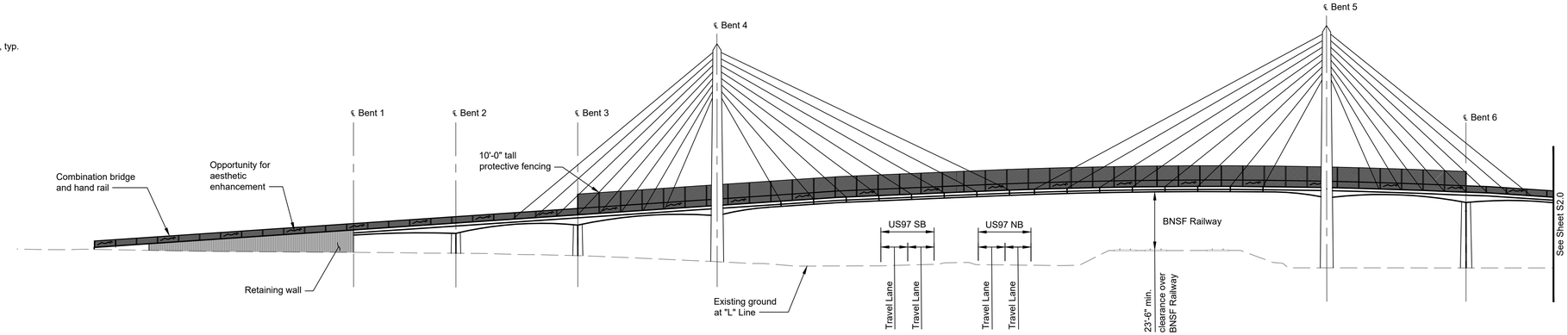
Two-Tower Cable-Stayed, User's Perspective Rendering



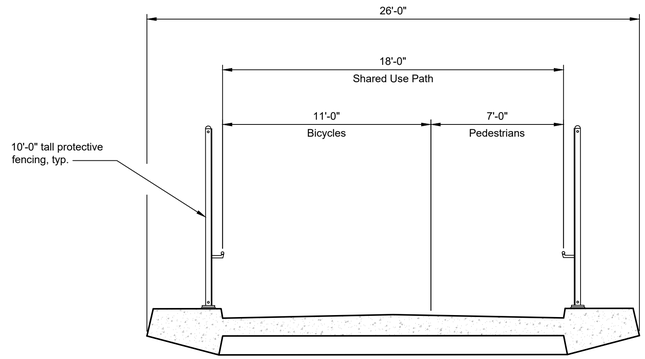
PLAN
SCALE: 1" = 30'



TOWER TYPICAL SECTION
SCALE: 1/8" = 1'-0"



ELEVATION
SCALE: 1" = 30'



CABLE-STAYED DECK SECTION
SCALE: 1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER
OREGON
DECEMBER 21, 2001
RAEL G. McNULTY
EXPIRES: 12/31/

CONCEPT PLANS NOT FOR CONSTRUCTION

MIDTOWN CONNECTION 3: HAWTHORNE OVERCROSSING

TWO-TOWER CABLE-STAYED ALTERNATIVE

DESCHUTES COUNTY, OREGON

CITY OF BEND

REVISIONS:

DOWL
WWW.DOWL.COM
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772

DESIGNED BY: MGM
DRAWN BY: CJW
SCALE: VARIES
FILE: SA-ST-PL-14953_03
DATE: 08/30/2024

VERIFY SCALES
0 1"
BAR EQUALS ONE INCH ON ORIGINAL DRAWING

SHEET:
S1.0

COB #
XXXX

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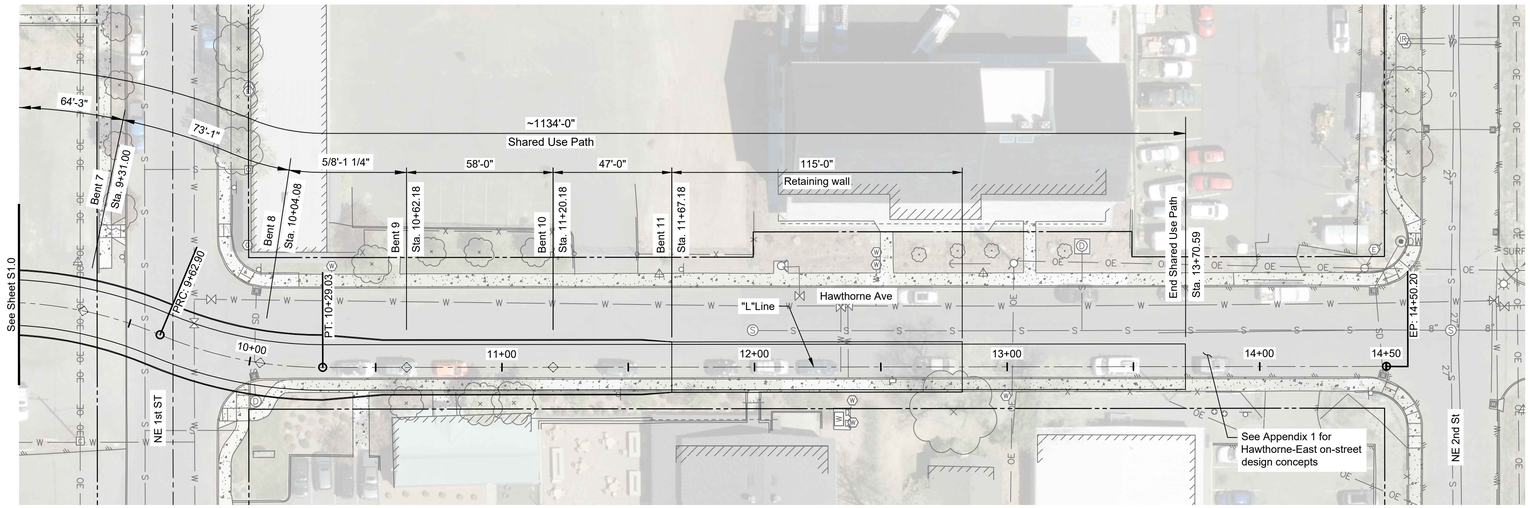


PLAN
SCALE: 1" = 30'

ELEVATION
SCALE: 1" = 30'

TYPICAL APPROACH SPAN SECTION
SCALE: 1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER
OREGON
NOVEMBER 21, 2001
RAEL G. McNULTY
EXPIRES: 12/31/
CONCEPT PLANS NOT FOR CONSTRUCTION

MIDTOWN CONNECTION 3:
HAWTHORNE OVERCROSSING

TWO-TOWER CABLE-STAYED ALTERNATIVE

DESCHUTES COUNTY, OREGON

CITY OF BEND

REVISIONS:

DOWL
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772
WWW.DOWL.COM

DESIGNED BY: MGM
DRAWN BY: CJW
SCALE: VARIES
FILE:SA-ST-PL-14953_04
DATE: 08/30/2024

VERIFY SCALES
0 1"
BAR EQUALS ONE INCH ON ORIGINAL DRAWING

SHEET:
S2.0

COB #
XXXX

Two-Tower Cable-Stayed Bridge Engineer's Cost Estimate (Concept)
September 2024

Spec. No.	Item No.	Item	Bid Unit	Est. Unit	Quantity	Unit Price	Total Price
		TEMPORARY FEATURES AND APPURTENANCES					
00210	10	MOBILIZATION	Lump Sum	Lump Sum	1	$ 1,700,257.98	$ 1,700,257.98
00XXX	20	RAILROAD FLAGGING	Lump Sum	Work Shift	180	$ 1,500.00	$ 270,000.00
00221	30	TEMPORARY WORKS	Lump Sum	Lump Sum	1	$ 715,824.85	$ 715,824.85
		BRIDGE - APPROACH SPANS (CIP CONCRETE)					
00510	40	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	384	$ 100.00	$ 38,400.00
00510	50	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	214	$ 75.00	$ 16,050.00
00510	60	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	274	$ 900.00	$ 246,600.00
00530	70	REINFORCEMENT	Lump Sum	Lb	253,100	$ 2.50	$ 632,750.00
00540	80	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	170	$ 1,000.00	$ 170,000.00
00540	90	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	842	$ 2,000.00	$ 1,684,000.00
00555	100	POST-TENSIONING	Lump Sum	Lb	16,800	$ 10.00	$ 168,000.00
00585	110	EXPANSION JOINTS	Lump Sum	Foot	104	$ 500.00	$ 52,000.00
00587	120	HANDRAIL	Lump Sum	Foot	790	$ 200.00	$ 158,000.00
		BRIDGE - SIGNATURE SPANS					
00510	130	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	1,599	$ 100.00	$ 159,900.00
00510	140	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	691	$ 75.00	$ 51,825.00
00510	150	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	595	$ 900.00	$ 535,500.00
00515	150	GROUND ANCHORS	Each	Each	76	$ 7,500.00	$ 570,000.00
00530	160	REINFORCEMENT	Lump Sum	Lb	442,600	$ 2.50	$ 1,106,500.00
00540	160	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	907	$ 1,000.00	$ 907,000.00
00540	170	DECK CONCRETE, CLASS HPC4500	Lump Sum	Cu Yd	93	$ 1,700.00	$ 158,100.00
00540	170	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	810	$ 2,000.00	$ 1,620,000.00
00550	180	PRECAST CONCRETE PYLONS	Lump Sum	Foot	458	$ 1,100.00	$ 503,800.00
00550	180	PRECAST CONCRETE DECK PANELS	Lump Sum	Sq Ft	6,045	$ 150.00	$ 906,750.00
00555	190	DECK POST-TENSIONING	Lump Sum	Lb	19,250	$ 10.00	$ 192,500.00
00555	190	COLUMN POST-TESNIONING	Lump Sum	Lb	324	$ 10.00	$ 3,240.00
00560	200	CABLE STAYS	Lump Sum	Lb	29,142	$ 20.00	$ 582,840.00
00587	200	HANDRAIL	Lump Sum	Foot	1,057	$ 200.00	$ 211,300.00
00587	210	PROTECTIVE FENCING	Lump Sum	Foot	816	$ 400.00	$ 326,400.00
		RETAINING WALLS - APPROACH					
00596A	220	WALL COPING WITH HANDRAIL	Foot	Foot	414	$ 600.00	$ 248,400.00
00596A	230	RETAINING WALL, MSE	Lump Sum	Sq Ft	3,358	$ 160.00	$ 537,280.00
		BASES					
00640	240	AGGREGATE BASE	Ton	Ton	218	$ 45.00	$ 9,810.00
		WEARING SURFACES					
00759	250	6 INCH CONCRETE SURFACING	Sq Ft	Sq Ft	5,796	$ 12.00	$ 69,552.00
		ALLOWANCES FOR ADDITIONAL IMPROVEMENTS					
00XXX	260	HAWTHORNE CORRIDOR IMPROVEMENTS - WEST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00XXX	270	HAWTHORNE CORRIDOR IMPROVEMENTS - EAST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00970	280	BRIDGE LIGHTING	Lump Sum	Lump Sum	1	$ 700,000.00	$ 700,000.00
10XXX	290	SITE RESTORATION	Lump Sum	Lump Sum	1	$ 250,000.00	$ 250,000.00
10XXX	300	HARDSCAPE IMPROVEMENTS	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00

SUB-TOTAL OF ITEMS	$ 17,002,579.83
Contingency (40%)	$ 6,801,031.93
Inflation (2026 Dollars)*	$ 1,211,008.75
Construction Engineering (13.5%)	$ 3,213,487.59
ODOT STIP Preliminary Engineering Funding	$ 5,072,229.21
ODOT STIP ROW Funding	$ 1,068,783.07

Total Construction Cost (Year 2026):	$ 34,369,120.38
AACE Class 3 Estimate (Low -10%):	**$ 30,932,208.35**
AACE Class 3 Estimate (High +10%):	**$ 37,806,032.42**

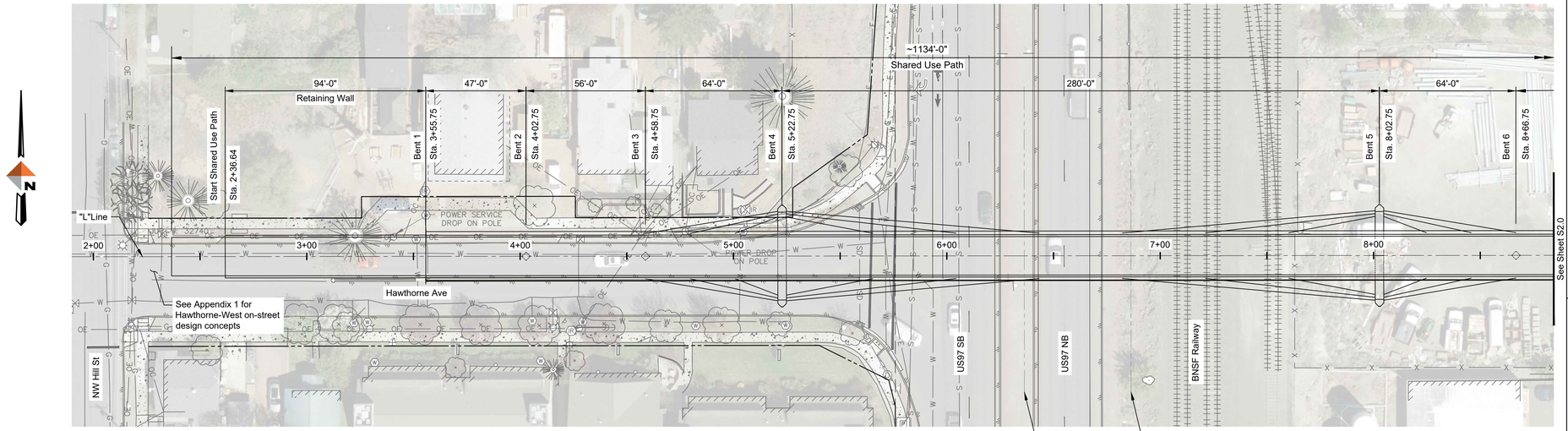
*Inflation is 3.5% per year. Unit costs are 2024 dollars.

APPENDIX 5

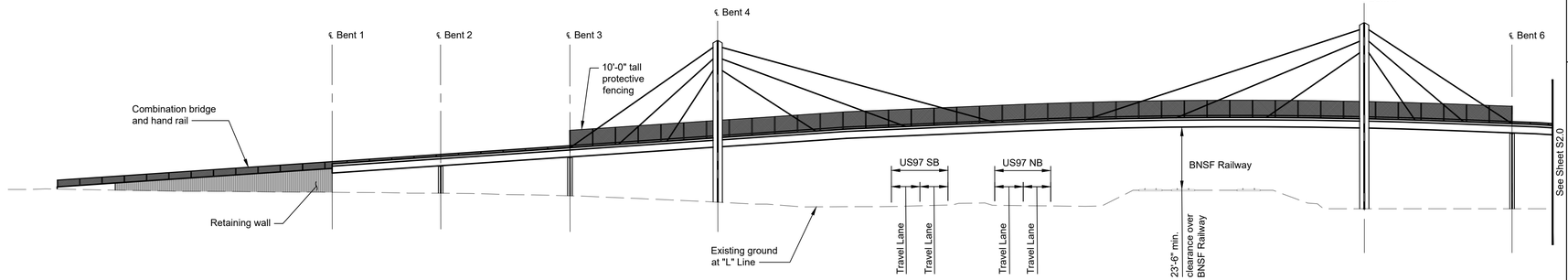
Extradosed

Extradosed Alternative, Rendering Looking South Along the Bend Parkway

Extradosed, User's Perspective Rendering



PLAN
SCALE: 1" = 30'



ELEVATION
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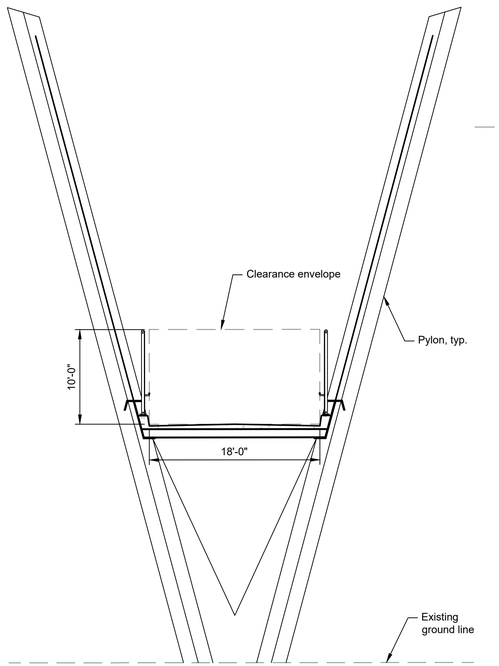
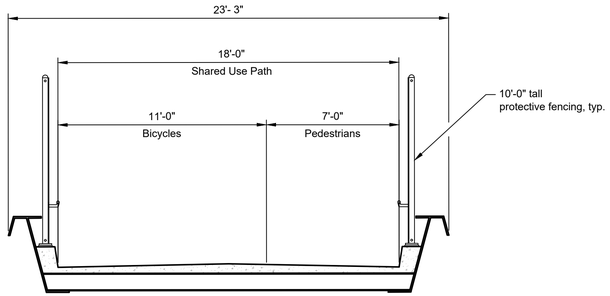


TOWER TYPICAL SECTION
SCALE: 1/8" = 1'-0"



DECK SECTION
SCALE: 1/4" = 1'-0"

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REGISTERED PROFESSIONAL ENGINEER
OREGON
NOVEMBER 21, 2001
RACHAEL G. McNULTY
EXPIRES: 12/31/

CONCEPT PLANS NOT FOR CONSTRUCTION

MIDTOWN CONNECTION 3: HAWTHORNE OVERCROSSING

EXTRADOSED ALTERNATIVE

DESCHUTES COUNTY, OREGON

CITY OF BEND

REVISIONS:

DOWL
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772
WWW.DOWL.COM

DESIGNED BY: MGM
DRAWN BY: CJW
SCALE: VARIES
FILE: SA-ST-PL-14953_05
DATE: 08/30/2024

VERIFY SCALES
0 1"
BAR EQUALS ONE INCH ON ORIGINAL DRAWING

SHEET:
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COB #
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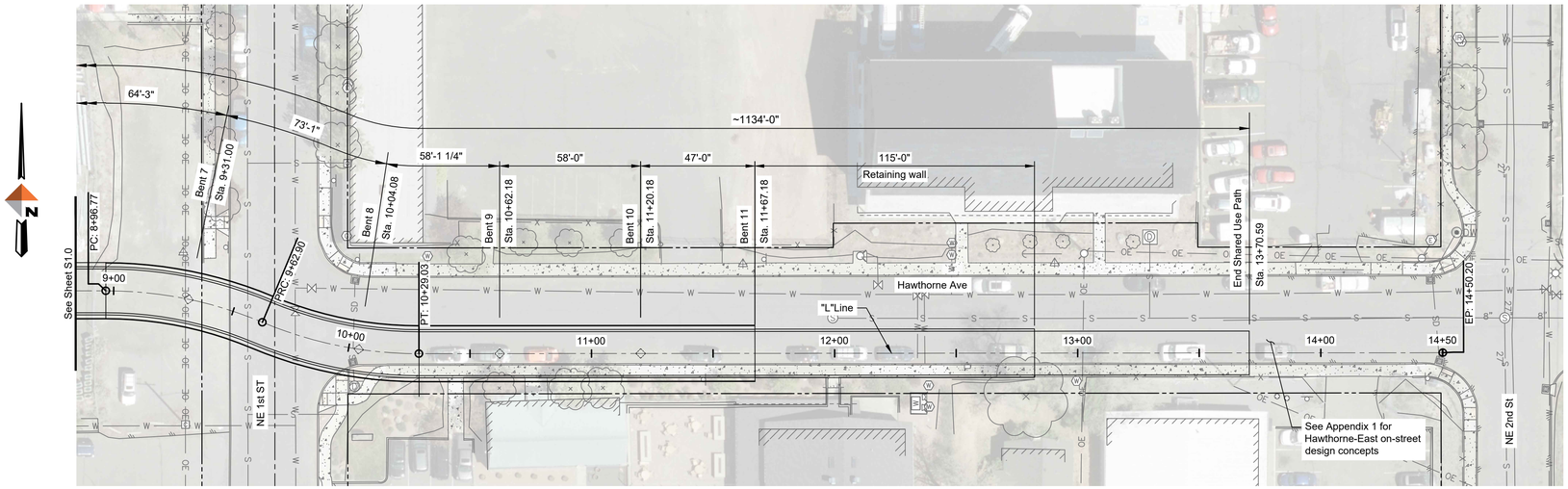

PLAN
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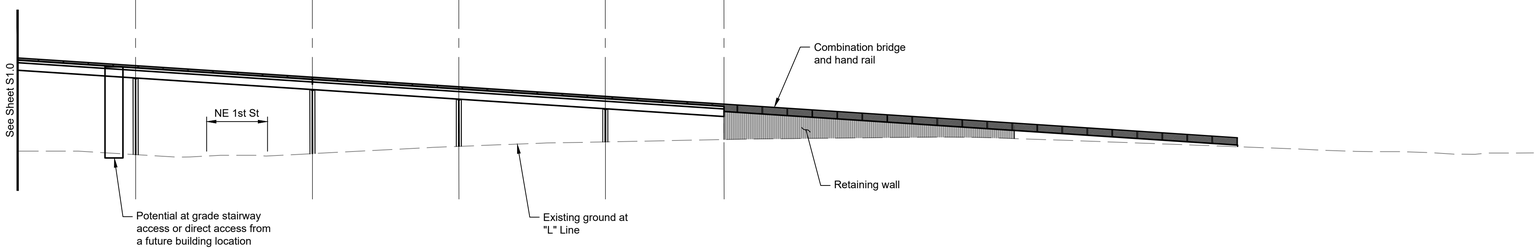


ELEVATION
SCALE: 1" = 30'

TYPICAL APPROACH SPAN SECTION
SCALE: 1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER
OREGON
NOVEMBER 21, 2001
RACHAEL G. McNULTY
EXPIRES: 12/31/

CONCEPT PLANS NOT FOR CONSTRUCTION

MIDTOWN CONNECTION 3: HAWTHORNE OVERCROSSING

EXTRADOSED ALTERNATIVE

DESCHUTES COUNTY, OREGON

CITY OF BEND

REVISIONS:

DOWL
WWW.DOWL.COM
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772

DESIGNED BY: MGM
DRAWN BY: CJW
SCALE: VARIES
FILE: SA-ST-PL-14953_06
DATE: 08/30/2024

VERIFY SCALES
0 1"
BAR EQUALS ONE INCH ON ORIGINAL DRAWING

SHEET: S2.0

COB # XXXX

Extradosed Bridge - Steel Approach Spans Engineer's Cost Estimate (Concept)
September 2024

Spec. No.	Item No.	Item	Bid Unit	Est. Unit	Quantity	Unit Price	Total Price
		TEMPORARY FEATURES AND APPURTENANCES					
00210	10	MOBILIZATION	Lump Sum	Lump Sum	1	$ 1,910,619.94	$ 1,910,619.94
00XXX	20	RAILROAD FLAGGING	Lump Sum	Work Shift	180	$ 1,500.00	$ 270,000.00
00221	30	TEMPORARY WORKS	Lump Sum	Lump Sum	1	$ 805,979.98	$ 805,979.98
		BRIDGE - APPROACH SPANS (STEEL)					
00510	40	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	568	$ 100.00	$ 56,800.00
00510	50	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	313	$ 75.00	$ 23,475.00
00510	60	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	386	$ 900.00	$ 347,400.00
00530	70	REINFORCEMENT	Lump Sum	Lb	139,250	$ 2.50	$ 348,125.00
00540	80	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	255	$ 1,000.00	$ 255,000.00
00540	90	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	118	$ 2,000.00	$ 236,000.00
00540	100	DECK CONCRETE, CLASS HPC4500	Lump Sum	Cu Yd	181	$ 1,700.00	$ 307,700.00
00555	110	DECK POST-TENSIONING	Lump Sum	Lb	14,600	$ 10.00	$ 146,000.00
00560	120	STRUCTURAL STEEL	Lump Sum	Lb	561,200	$ 6.50	$ 3,647,800.00
00585	130	EXPANSION JOINTS	Lump Sum	Foot	72	$ 500.00	$ 36,000.00
00587	140	HANDRAIL	Lump Sum	Foot	1,034	$ 200.00	$ 206,800.00
		BRIDGE - SIGNATURE SPANS					
00510	150	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	622	$ 100.00	$ 62,200.00
00510	160	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	293	$ 75.00	$ 21,975.00
00510	170	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	322	$ 900.00	$ 289,800.00
00515	180	GROUND ANCHORS	Each	Each	40	$ 7,500.00	$ 300,000.00
00530	190	REINFORCEMENT	Lump Sum	Lb	155,825	$ 2.50	$ 389,562.50
00540	200	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	329	$ 1,000.00	$ 329,000.00
00540	210	DECK CONCRETE, CLASS HPC4500	Lump Sum	Cu Yd	279	$ 1,700.00	$ 474,300.00
00540	220	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	14	$ 2,000.00	$ 28,000.00
00550	230	PRECAST CONCRETE PYLONS	Lump Sum	Foot	342	$ 1,100.00	$ 376,200.00
00555	240	DECK POST-TENSIONING	Lump Sum	Lb	14,800	$ 10.00	$ 148,000.00
00555	250	COLUMN POST-TESNIONING	Lump Sum	Lb	1,625	$ 10.00	$ 16,250.00
CON	260	STRUCTURAL STEEL	Lump Sum	Lb	569,500	$ 6.50	$ 3,701,750.00
00560	270	CABLE STAYS	Lump Sum	Lb	28,341	$ 20.00	$ 566,820.00
00587	280	HANDRAIL	Lump Sum	Foot	816	$ 200.00	$ 163,200.00
00587	290	PROTECTIVE FENCING	Lump Sum	Foot	816	$ 400.00	$ 326,400.00
		RETAINING WALLS - APPROACH					
00596A	300	WALL COPING WITH HANDRAIL	Foot	Foot	414	$ 600.00	$ 248,400.00
00596A	310	RETAINING WALL, MSE	Lump Sum	Sq Ft	3,358	$ 160.00	$ 537,280.00
		BASES					
00640	320	AGGREGATE BASE	Ton	Ton	218	$ 45.00	$ 9,810.00
		WEARING SURFACES					
00759	330	6 INCH CONCRETE SURFACING	Sq Ft	Sq Ft	5,796	$ 12.00	$ 69,552.00
		ALLOWANCES FOR ADDITIONAL IMPROVEMENTS					
00XXX	340	HAWTHORNE CORRIDOR IMPROVEMENTS - WEST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00XXX	350	HAWTHORNE CORRIDOR IMPROVEMENTS - EAST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00970	360	BRIDGE LIGHTING	Lump Sum	Lump Sum	1	$ 700,000.00	$ 700,000.00
10XXX	370	SITE RESTORATION	Lump Sum	Lump Sum	1	$ 250,000.00	$ 250,000.00
10XXX	380	HARDSCAPE IMPROVEMENTS	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00

SUB-TOTAL OF ITEMS	$ 19,106,199.42
Contingency (40%)	$ 7,642,479.77
Inflation (2026 Dollars)*	$ 1,360,839.05
Construction Engineering (13.5%)	$ 3,611,071.69
ODOT STIP Preliminary Engineering Funding	$ 5,072,229.21
ODOT STIP ROW Funding	$ 1,068,783.07

Total Construction Cost (Year 2026)	$ 37,861,602.21
AACE Class 3 Estimate (Low -10%):	**$ 34,075,441.99**
AACE Class 3 Estimate (High +10%):	**$ 41,647,762.43**

*Inflation is 3.5% per year. Unit costs are 2024 dollars.

Extradosed Bridge - Concrete Approach Spans Engineer's Cost Estimate (Concept)
September 2024

Spec. No.	Item No.	Item	Bid Unit	Est. Unit	Quantity	Unit Price	Total Price
		TEMPORARY FEATURES AND APPURTENANCES					
00210	10	MOBILIZATION	Lump Sum	Lump Sum	1	$ 1,631,028.28	$ 1,631,028.28
00XXX	20	RAILROAD FLAGGING	Lump Sum	Work Shift	180	$ 1,500.00	$ 270,000.00
00221	30	TEMPORARY WORKS	Lump Sum	Lump Sum	1	$ 686,154.98	$ 686,154.98
		BRIDGE - APPROACH SPANS (CIP CONCRETE)					
00510	40	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	384	$ 100.00	$ 38,400.00
00510	50	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	214	$ 75.00	$ 16,050.00
00510	60	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	274	$ 900.00	$ 246,600.00
00530	70	REINFORCEMENT	Lump Sum	Lb	253,100	$ 2.50	$ 632,750.00
00540	80	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	170	$ 1,000.00	$ 170,000.00
00540	90	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	842	$ 2,000.00	$ 1,684,000.00
00555	100	POST-TENSIONING	Lump Sum	Lb	16,800	$ 10.00	$ 168,000.00
00585	110	EXPANSION JOINTS	Lump Sum	Foot	104	$ 500.00	$ 52,000.00
00587	120	HANDRAIL	Lump Sum	Foot	1,034	$ 200.00	$ 206,800.00
		BRIDGE - SIGNATURE SPANS					
00510	130	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	622	$ 100.00	$ 62,200.00
00510	140	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	293	$ 75.00	$ 21,975.00
00510	150	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	322	$ 900.00	$ 289,800.00
00515	160	GROUND ANCHORS	Each	Each	40	$ 7,500.00	$ 300,000.00
00530	170	REINFORCEMENT	Lump Sum	Lb	155,825	$ 2.50	$ 389,562.50
00540	180	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	329	$ 1,000.00	$ 329,000.00
00540	190	DECK CONCRETE, CLASS HPC4500	Lump Sum	Cu Yd	279	$ 1,700.00	$ 474,300.00
00540	200	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	14	$ 2,000.00	$ 28,000.00
00550	210	PRECAST CONCRETE PYLONS	Lump Sum	Foot	342	$ 1,100.00	$ 376,200.00
00555	220	DECK POST-TENSIONING	Lump Sum	Lb	14,800	$ 10.00	$ 148,000.00
00555	230	COLUMN POST-TESNIONING	Lump Sum	Lb	1,625	$ 10.00	$ 16,250.00
CON	240	STRUCTURAL STEEL	Lump Sum	Lb	569,500	$ 6.50	$ 3,701,750.00
00560	250	CABLE STAYS	Lump Sum	Lb	28,341	$ 20.00	$ 566,820.00
00587	260	HANDRAIL	Lump Sum	Foot	816	$ 200.00	$ 163,200.00
00587	270	PROTECTIVE FENCING	Lump Sum	Foot	816	$ 400.00	$ 326,400.00
		RETAINING WALLS - APPROACH					
00596A	280	WALL COPING WITH HANDRAIL	Foot	Foot	414	$ 600.00	$ 248,400.00
00596A	290	RETAINING WALL, MSE	Lump Sum	Sq Ft	3,358	$ 160.00	$ 537,280.00
		BASES					
00640	300	AGGREGATE BASE	Ton	Ton	218	$ 45.00	$ 9,810.00
		WEARING SURFACES					
00759	310	6 INCH CONCRETE SURFACING	Sq Ft	Sq Ft	5,796	$ 12.00	$ 69,552.00
		ALLOWANCES FOR ADDITIONAL IMPROVEMENTS					
00XXX	320	HAWTHORNE CORRIDOR IMPROVEMENTS - WEST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00XXX	330	HAWTHORNE CORRIDOR IMPROVEMENTS - EAST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00970	340	BRIDGE LIGHTING	Lump Sum	Lump Sum	1	$ 700,000.00	$ 700,000.00
10XXX	350	SITE RESTORATION	Lump Sum	Lump Sum	1	$ 250,000.00	$ 250,000.00
10XXX	360	HARDSCAPE IMPROVEMENTS	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00

SUB-TOTAL OF ITEMS	$ 16,310,282.75
Contingency (40%)	$ 6,524,113.10
Inflation (2026 Dollars)*	$ 1,161,699.89
Construction Engineering (13.5%)	$ 3,082,643.44
ODOT STIP Preliminary Engineering Funding	$ 5,072,229.21
ODOT STIP ROW Funding	$ 1,068,783.07

Total Construction Cost (Year 2026): $ 33,219,751.46

AACE Class 3 Estimate (Low -10%): $ 29,897,776.31

AACE Class 3 Estimate (High +10%): $ 36,541,726.60

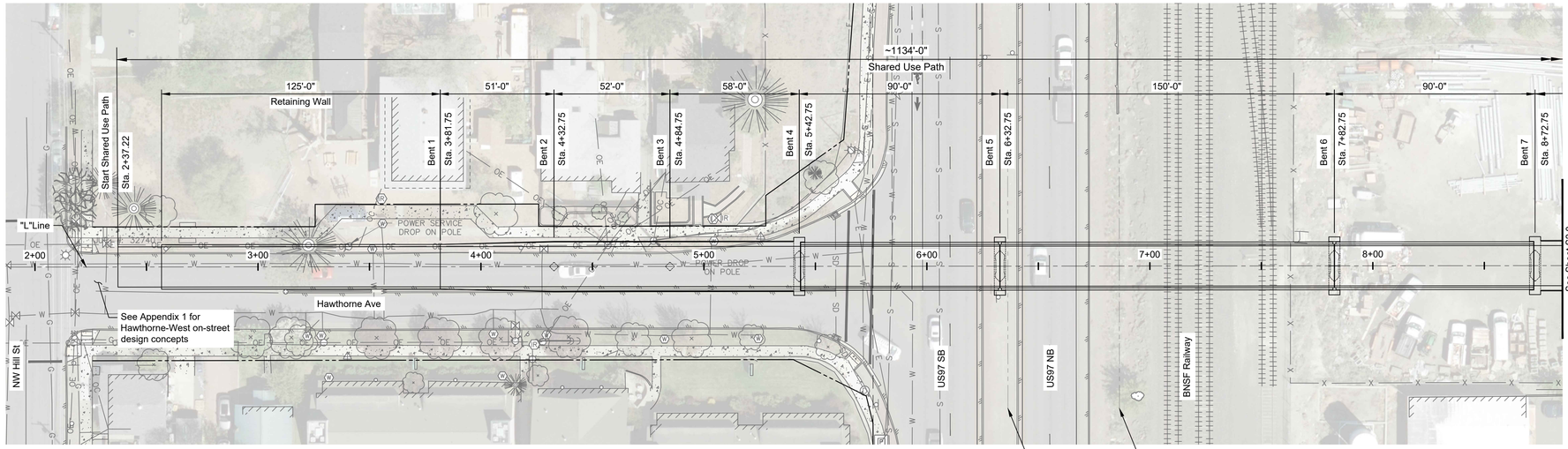
*Inflation is 3.5% per year. Unit costs are 2024 dollars.

APPENDIX 6

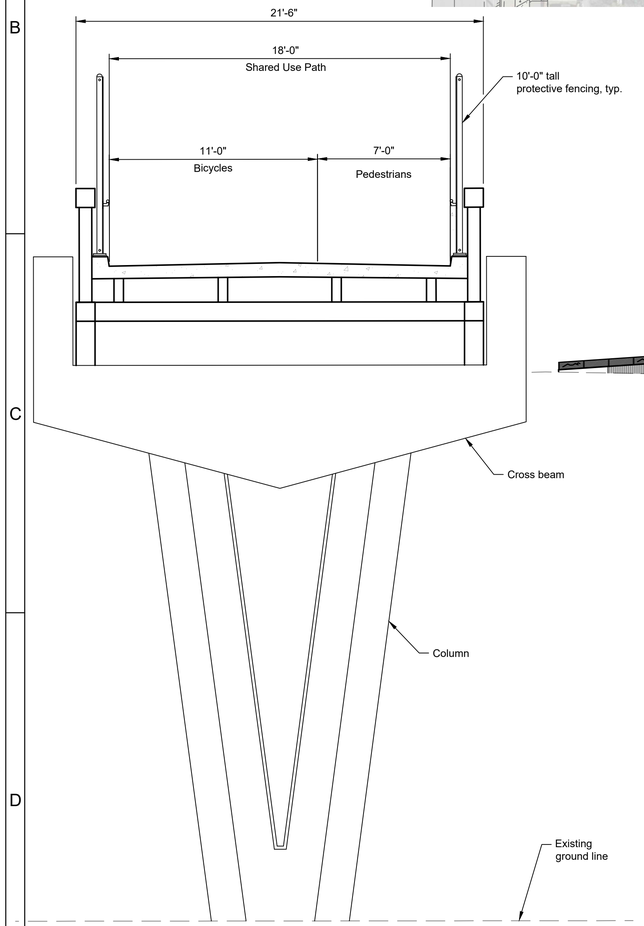
Steel Truss

Steel Truss Alternative, Rendering Looking South Along the Bend Parkway

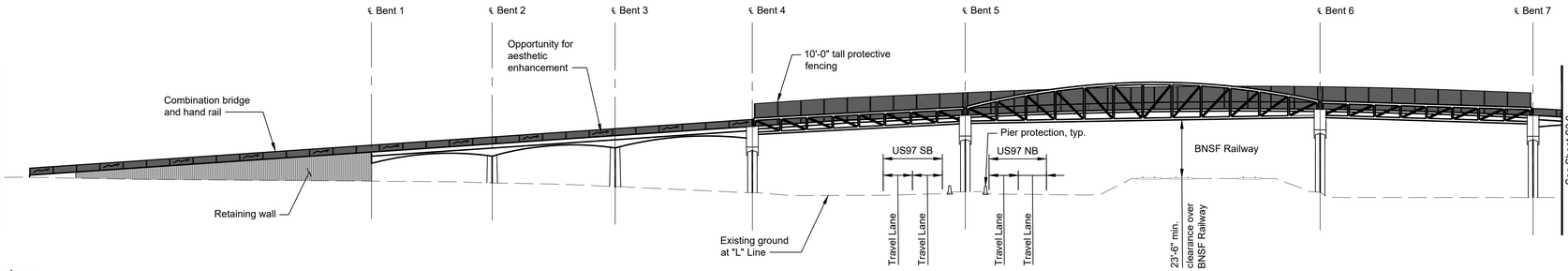
Steel Truss, User's Perspective Rendering



PLAN
SCALE: 1" = 30'



TRUSS TYPICAL SECTION
SCALE: 1/4" = 1'-0"



ELEVATION
SCALE: 1" = 30'

REGISTERED PROFESSIONAL ENGINEER
OREGON
JANUARY 21, 2001
RAEL G. McNULTY
EXPIRES: 12/31/

CONCEPT PLANS NOT FOR CONSTRUCTION

MIDTOWN CONNECTION 3: HAWTHORNE OVERCROSSING

STEEL TRUSS ALTERNATIVE

DESCHUTES COUNTY, OREGON

CITY OF BEND

REVISIONS:

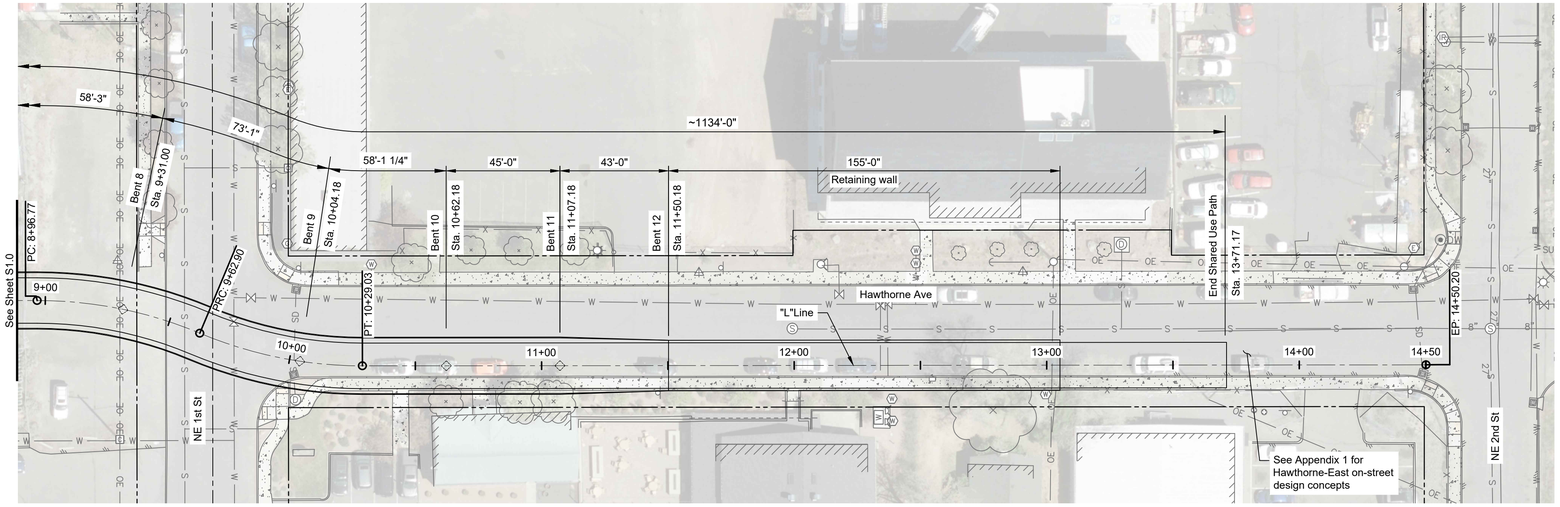
DOWL
WWW.DOWL.COM
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772

DESIGNED BY: MGM
DRAWN BY: CJW
SCALE: VARIES
FILE: MC20-VP-RW-1495301
DATE: 08/30/2024

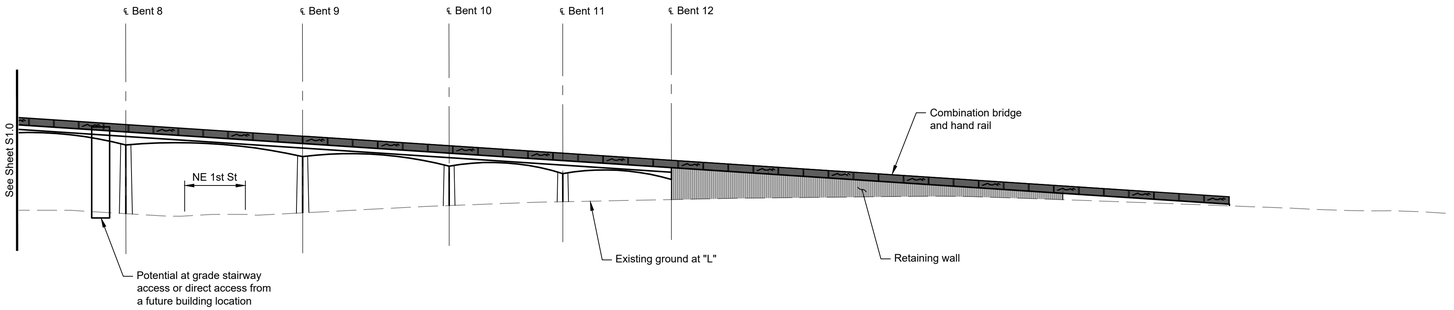
VERIFY SCALES
0 1"
BAR EQUALS ONE INCH ON ORIGINAL DRAWING

SHEET: S1.0

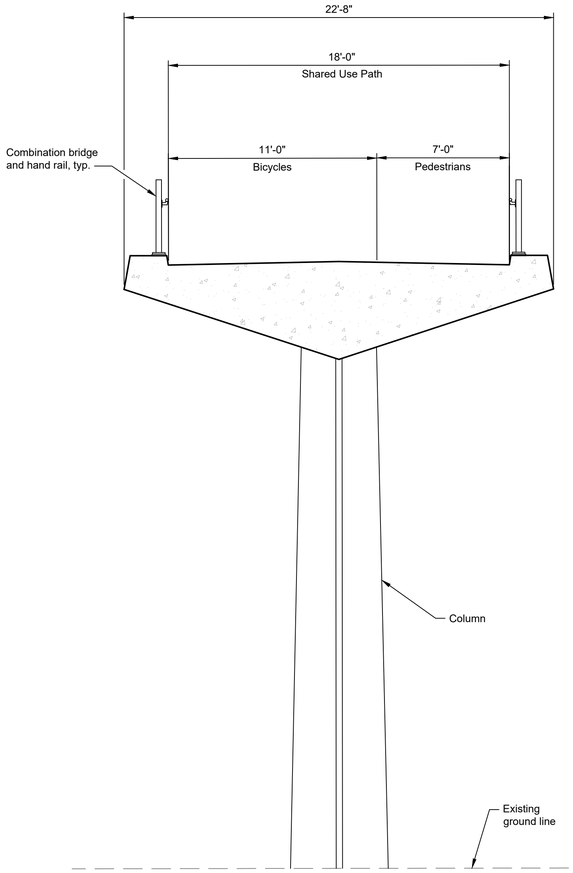
COB # XXXX



PLAN
SCALE: 1" = 30'



ELEVATION
SCALE: 1" = 30'



TYPICAL APPROACH SPAN SECTION
SCALE: 1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER
OREGON
NOVEMBER 21, 2001
RAEL G. McNULTY
EXPIRES: 12/31/
NOT FOR CONSTRUCTION
CONCEPT PLANS

MIDTOWN CONNECTION 3:
HAWTHORNE OVERCROSSING

STEEL TRUSS ALTERNATIVE
DESCHUTES COUNTY, OREGON

CITY OF BEND

REVISIONS:

DOWL
WWW.DOWL.COM
963 SW Simpson, #200
Bend, Oregon 97702
541-385-4772

DESIGNED BY: MGM
DRAWN BY: CJW
SCALE: VARIES
FILE: SA-ST-PL-14953_08
DATE: 08/30/2024

VERIFY SCALES
0 1"
BAR EQUALS ONE INCH ON ORIGINAL DRAWING

SHEET:
S2.0

COB #
XXXX

Steel Truss Bridge Engineer's Cost Estimate (Concept)
September 2024

Spec. No.	Item No.	Item	Bid Unit	Est. Unit	Quantity	Unit Price	Total Price
		TEMPORARY FEATURES AND APPURTENANCES					
00210	10	MOBILIZATION	Lump Sum	Lump Sum	1	$ 1,410,813.50	$ 1,410,813.50
00XXX	20	RAILROAD FLAGGING	Lump Sum	Work Shift	100	$ 1,500.00	$ 150,000.00
00221	30	TEMPORARY WORKS	Lump Sum	Lump Sum	1	$ 597,491.50	$ 597,491.50
		BRIDGE - APPROACH SPANS (CIP CONCRETE)					
00510	40	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	639	$ 100.00	$ 63,900.00
00510	50	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	353	$ 75.00	$ 26,475.00
00510	60	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	439	$ 900.00	$ 395,100.00
00530	70	REINFORCEMENT	Lump Sum	Lb	391,000	$ 2.50	$ 977,500.00
00540	80	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	286	$ 1,000.00	$ 286,000.00
00540	90	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	1,276	$ 2,000.00	$ 2,552,000.00
00555	100	POST-TENSIONING	Lump Sum	Lb	26,100	$ 10.00	$ 261,000.00
00587	110	HANDRAIL	Lump Sum	Foot	1,100	$ 200.00	$ 220,000.00
		BRIDGE - SIGNATURE SPANS					
00510	120	STRUCTURE EXCAVATION	Lump Sum	Cu Yd	567	$ 100.00	$ 56,700.00
00510	130	GRANULAR STRUCTURE BACKFILL	Lump Sum	Cu Yd	296	$ 75.00	$ 22,200.00
00510	140	SHORING, CRIBBING, AND COFFERDAMS	Lump Sum	Sq Yd	290	$ 900.00	$ 261,000.00
00530	150	REINFORCEMENT	Lump Sum	Lb	157,400	$ 2.50	$ 393,500.00
00540	160	FOUNDATION CONCRETE, CLASS 4000	Lump Sum	Cu Yd	271	$ 1,000.00	$ 271,000.00
00540	170	DECK CONCRETE, CLASS HPC4500	Lump Sum	Cu Yd	128	$ 1,700.00	$ 217,600.00
00540	180	GENERAL STRUCTURAL CONCRETE, CLASS 4000	Lump Sum	Cu Yd	230	$ 2,000.00	$ 460,000.00
00560	190	TRUSS SUPERSTRUCTURE MAIN	Lump Sum	Sq Ft	2,700	$ 250.00	$ 675,000.00
00560	200	TRUSS SUPERSTRUCTURE APPROACH	Lump Sum	Sq Ft	3,240	$ 190.00	$ 615,600.00
00582	210	BEARINGS	Each	Each	12	$ 2,500.00	$ 30,000.00
00585	220	EXPANSION JOINTS	Lump Sum	Foot	72	$ 500.00	$ 36,000.00
00587	230	HANDRAIL	Lump Sum	Foot	660	$ 200.00	$ 132,000.00
00587	240	PROTECTIVE FENCING	Lump Sum	Foot	660	$ 400.00	$ 264,000.00
		RETAINING WALLS - APPROACH					
00596A	250	WALL COPING WITH HANDRAIL	Foot	Foot	560	$ 600.00	$ 336,000.00
00596A	260	RETAINING WALL, MSE	Lump Sum	Sq Ft	5,312	$ 160.00	$ 849,920.00
		BASES					
00640	270	AGGREGATE BASE	Ton	Ton	267	$ 45.00	$ 12,015.00
		WEARING SURFACES					
00759	280	6 INCH CONCRETE SURFACING	Sq Ft	Sq Ft	7,110	$ 12.00	$ 85,320.00
		ALLOWANCES FOR ADDITIONAL IMPROVEMENTS					
00XXX	290	HAWTHORNE CORRIDOR IMPROVEMENTS - WEST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00XXX	300	HAWTHORNE CORRIDOR IMPROVEMENTS - EAST	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00
00970	310	BRIDGE LIGHTING	Lump Sum	Lump Sum	1	$ 700,000.00	$ 700,000.00
10XXX	320	SITE RESTORATION	Lump Sum	Lump Sum	1	$ 250,000.00	$ 250,000.00
10XXX	330	HARDSCAPE IMPROVEMENTS	Lump Sum	Lump Sum	1	$ 500,000.00	$ 500,000.00

SUB-TOTAL OF ITEMS	$ 14,108,135.00
Contingency (40%)	$ 5,643,254.00
Inflation (2026 Dollars)*	$ 1,004,851.92
Construction Engineering (13.5%)	$ 2,666,437.52
ODOT STIP Preliminary Engineering Funding	$ 5,072,229.21
ODOT STIP ROW Funding	$ 1,068,783.07

Total Construction Cost (Year 2026): $ 29,563,690.71

AACE Class 3 Estimate (Low -10%): **$ 26,607,321.64**

AACE Class 3 Estimate (High +10%): **$ 32,520,059.78**

*Inflation is 3.5% per year. Unit costs are 2024 dollars.

APPENDIX 7

Public Involvement - Open House Results

MIDTOWN CROSSINGS PROJECT

HAWTHORNE OVERCROSSING OPEN HOUSE

Public Feedback Summary July 2024

Prepared for:

City of Bend

CITY OF BEND

Prepared by:

JLA Public Involvement

jla Public Involvement

Completed:

August 6, 2024

TABLE OF CONTENTS

OVERVIEW

The Hawthorne Overcrossing open house offered the community a chance to provide input on plans for a brand-new bridge for people walking and biking on Hawthorne Avenue. The project team shared four bridge structure types with the public: Cable Stayed-Two Tower, Cable Stayed-One Tower, Extradosed and Truss. Attendees were asked to share their preferred bridge type, and which priorities they considered most important to the decision. Factors like cost, aesthetics, and construction impact were presented. Additionally, community members weighed in on the potential closure of the Parkway exit at Hawthorne Ave based on safety considerations.

The Hawthorne Overcrossing open house is part of the Midtown Crossings Project, which is focused on developing safer travel for all users on four key corridors in the city of Bend: Greenwood Avenue, Franklin Avenue, Hawthorne Avenue and Second Street.

Outreach Activities and Participation

Outreach activities for this phase of the project included:

- **July 3 through July 17** – Online open house
  - **351 people** submitted the survey form
- **July 10** – In-person open house at Campfire Hotel's meeting room
  - Approximately **80 people attended**, 45 submitted comment forms

All information and questions provided at the in-person event were replicated in the online event. Two people submitted responses via email. The Hawthorne Overcrossing open houses had approximately 435 people participate with 398 submitting responses.

The online and in-person open houses were available in English and Spanish. No responses were received online in Spanish. One person at the event provided comments in Spanish.

Promotion

To promote the project and the open house, the following communications were completed:

- **Postcard:** mailed to the project area of 4,785 addresses
- **Email:** sent to the project mailing list of 1,193 subscribers with a 45% open rate
- **Website update**
- **Press release:** submitted on July 2, 2024
- **Social media posts:** on July 8
  - Facebook: 1k reached, 12 reactions, 0 comments and 1 share
  - Instagram 1.3k reached, 18 likes, 0 comments and 4 shares

Key Takeaways

The Hawthorne Overcrossing Open Houses engaged over 400 community members and received 398 responses through an in-person event and online survey. We found the main takeaways from community participants were:

The **Truss bridge type received the most support** from the public (167), with the **Extradosed bridge type a close second** (132).

- Participants who supported the Truss type shared that this option retains Bend's historical character and is more cost-friendly for the project, including ongoing maintenance. Other participants shared that the Truss type would look outdated (reminiscent of a 1930s railroad bridge) and is not unique enough for Bend.
- Participants who supported the Extradosed type shared that this option fits with Bend as a growing, vibrant city. This option was seen as more pleasant to look at.

TWO TOWER CABLE-STAY

SINGLE TOWER CABLE-STAY

EXTRADOSED

STEEL TRUSS

Design elements repeatedly mentioned by participants were lighting, safety and accessibility, and connectivity to the surrounding transportation network.

- **Lighting:** nearly half of the participants care about lighting including safety concerns, maintenance, and wildlife considerations.
- **Safety and accessibility**: participants mentioned clear signage, safe landings, and special attention to making the entrances accessible for all users, including stairs, elevators, and/or ramps.
- **Connectivity**: participants want to ensure the bridge is connected to Bend's key corridors, bike network, and walking trails.

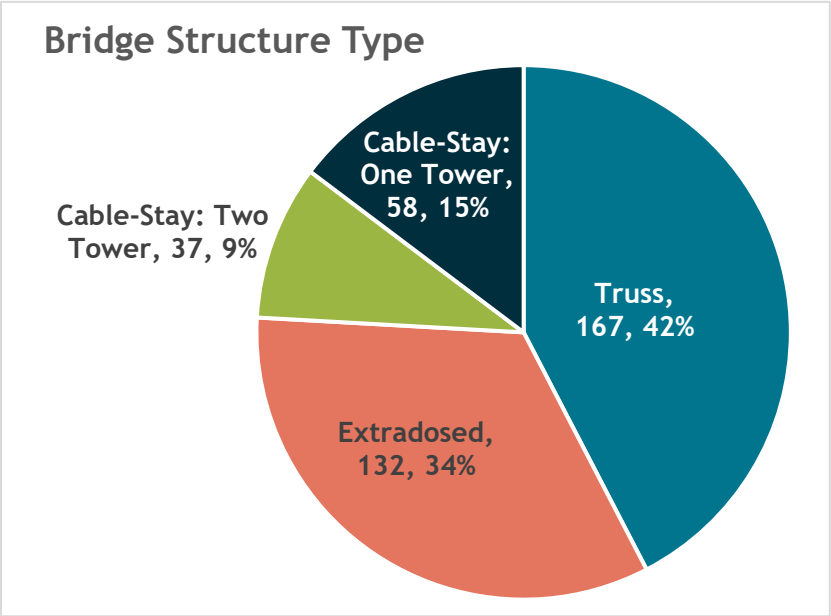
Greater aesthetics, **better land-use compatibility**, and **limited maintenance cost** were the most selected priorities in our participants' selection process.

Regarding the **Bend Parkway Plan**, **participants showed a majority support, with 67% saying "Yes" and 15% saying "Unsure," citing safety as a key consideration.** From observations, many shared that vehicles and drivers leaving the Parkway are often continuing to travel at near highway speeds. Participants saying "No" (18%) shared reasons including increased traffic at other exits and losing a vital access point to downtown.

FEEDBACK SUMMARY

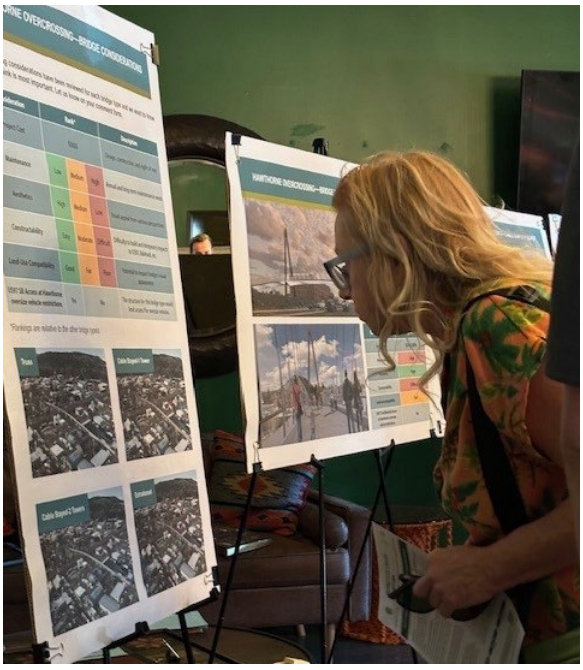
We received 45 in-person, 351 online, and two (2) email responses. The following feedback themes emerged from the 398 surveys submitted.

1. **Which of the four bridge structure types would you like to see advanced into the design phase**? *(381 responses)*



Through this outreach activity, the **Truss bridge type received the most support from the community** at 42%. Support was **followed closely by the Extradosed bridge type** at 34%. The Extradosed type received slightly more support at the in-person open house. In the comments, some participants mentioned that the Truss type feels more rustic or suitable for a "mountain town" with a historical character. Participants shared that the Truss type is functional and streamlined without being too showy. Participants liked that it was less expensive and had lower maintenance costs than the other options. However, some participants shared that the Truss type would quickly feel outdated without some extra effort to make it more modern. Some supporters of the Extradosed type shared that they want a modern bridge that is still attractive and welcoming and retains lower maintenance costs. One participant did not select a type and wrote in "none."

2. **What other design elements (e.g. lighting, wayfinding, connectivity, safety, aesthetics, stairs) would you like to see considered as design proceeds for the bridge overcrossing?** *(212 responses)*
   - (97) Nearly half of those who left comments in this section mentioned **lighting** as key to a successful bridge design. A few even brought up the need for lighting under the bridge for safety and activation. Other participants see lighting opportunities for seasonal and holiday events.
     - (13) Some mentioned the need for **dark sky compliance** and limiting environmental impacts at night.
   - (50) **Safety and accessibility** were significant considerations for participants. Getting on and off the bridge easily and feeling comfortable doing so is very important.
   - (41) The bridge's **connectivity to the surrounding transportation network** is critical to many participants. This includes safety in making connections to nearby locations (bike network, downtown businesses, integration with Drake and Juniper parks and other key routes) without stress.

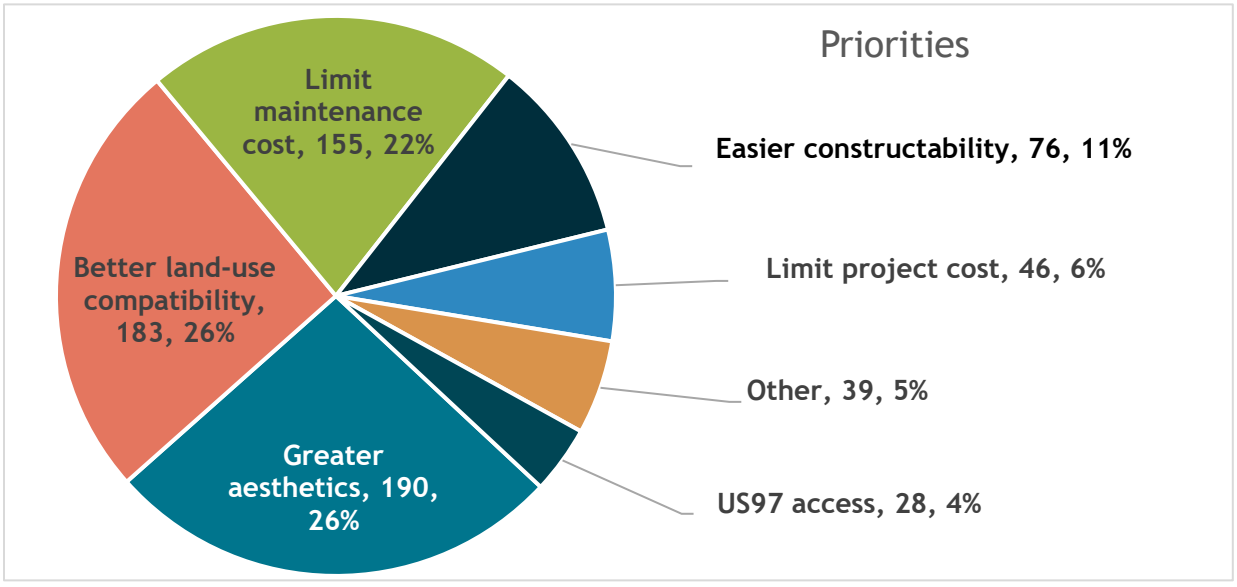


- (35) **Aesthetics** is an overall high priority for those participating. Some participants mentioned “iconic” in their preferred classification. i.e., an iconic part of the skyline or pedestrian landmark for Bend.
- (26) Several participants mentioned **stairs or elevator access** as being important, specifically at the First Street landing. Participants shared that the stairs would allow for a shorter crossing for those not traveling on bikes or stairs with a bike rail so cyclists can access the stairs, too.
- (26) **Wayfinding** was equally as important. Maps or signage to businesses and parks at both landings
- (21) Some participants mentioned the need for **separate and marked lanes** for biking and walking to increase safety and reduce conflicts between pedestrians and cyclists. They would like lanes that are wide and spacious, so users don’t experience the bridge as a “funnel.”
- (15) Several people suggested convenience measures, such as **noise reduction barriers** to reduce highway noise or **weather protection** (shade, heat strips for de-icing, or anti-slip surfaces).
- (11) Some brought up an interest in activating the **landing areas** at the ends of the bridge or the space under the bridge landings. Ideas include food trucks, parks, tree landscaping, public art, and a plaza space.
- (8) A few people desired a more casual experience on the bridge, somewhere to stop and rest or take in the views of the mountains. (7) Some also mentioned adding landscaping on the bridge itself or on the landings for aesthetic, environmental, and climate resilience reasons.

3. **What are your priorities for the selection of the bridge?** *(688 selections - Participants could select up to two options.*)

We asked participants for their top two priorities in deciding which bridge to build. The options were:

- **Better land-use compatibility** – I want the bridge to fit well with the planned surrounding development.
- **Greater aesthetics** – I want a more visually appealing bridge.
- **Limiting maintenance cost** – I want lower annual and long-term costs.
- **Easier constructability** – I want the bridge to be constructed quickly and with less impact on the surroundings.
- **Limiting project cost** – I want the bridge to cost less to design, construct, and purchase the right of way.
- **Maintaining US97 Southbound access at Hawthorne exit** – I don't want the Parkway exit to close or limit vehicle size.
- **Other priority?**



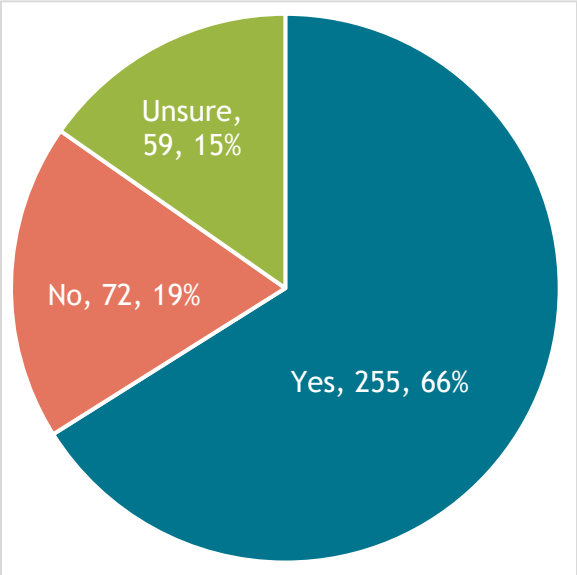
Greater aesthetics and land-use compatibility were the top two choices of participants, with 26% each of the selections. Limiting on-going maintenance was the third most selected option with 22%. 39 people added in an additional priority, with the following themes emerging.

Please provide the other priority not listed above. *(39 responses)*

- (20) **Ease of use for bikes and pedestrians** emerged as the primary priority in comments. This includes considering the grade of the ramps, separation of uses, and accessibility. These participants expressed concern about ensuring that most users can access the bridge and begin to use it regularly.
- (12) **Safety** emerged as a significant follow-up to accessibility as a priority.
- (7) **Connecting existing and new infrastructure** for bikes to ensure the bridge functions well within the transportation network was listed as key to the future success of the bridge. This includes better intersection treatments and crosswalks. Some mentioned the closure of the Parkway exit would be critical to this end.
- A few items that were mentioned just once or twice include:
  - Weather protection
  - Wildlife or environmental impacts
  - Traffic/noise reduction
  - Protecting views
  - Suicide prevention measures
- Two participants indicated they think the bridge is a waste of money.

4. **The current Bend Parkway Plan includes a closure of the entrance to the Parkway at Hawthorne Avenue and maintains the exit for vehicles to go westbound on Hawthorne. Based on the safety considerations you've seen presented, would you support the team pursuing an amendment to the Parkway Plan to fully close the Hawthorne exit and entrance to the Parkway?** *(385 responses)*

The majority (67%) of participants are in favor of pursuing closure of the Hawthorne exit and entrance for the Parkway.



Additional reasoning? *(165 responses)*

- (61) The overwhelming reason for supporting the closure was that it feels **unsafe**. Many said the current corridor already feels unsafe without a bridge and bike lane. Participants said it would feel very dangerous when additional travel modes are added at this location. Several participants said they would support the exit closure even if the bridge were not built.
  - (13) Other participants supporting the full closure cite the current **traffic** in this location, with many drivers exceeding the **speed limit**.

- (32) Several mentioned that the new bridge on Hawthorne Avenue is meant to prioritize multi-modal travel, especially for biking and walking. Closure would be needed to achieve this goal.
- (31) Many participants mentioned that this intersection **often impedes traffic on US97**. Since there are no on or off-ramps, it can be difficult to use, and they avoid this exit/entrance whenever they can. (6) Some participants mentioned that if the Parkway exit/entrance is left open, a deceleration/acceleration lane should be added.
- (17) Participants across all responses share concern about how the closure would affect **other intersections and Parkway exits**. A complete traffic analysis and corresponding improvements will be needed to ensure consistent travel times.
- (14) Some suggested just **closing the onramp but keeping the exit** would be a better option.
- (13) Even among participants who do not support the closure, many said the **speeds on the Parkway are too fast** and need better speed control measures.
- (11) The use of Hawthorne for downtown access was mentioned, whether for getting folks out of downtown after an event or helping them find businesses in the area. Some participants also mentioned that the closure could cause more cut-through traffic on the neighborhood streets.

5. **Do you have any other comments or questions? Is there anything else you want to share with us?** *(95 responses)*

- (25) General support for the project
- (14) Support for biking access and multi-modal transportation system
- (14) Requests to consider additional connectivity and traffic issues
- (8) Opposition to the project
- (5) Concerns that project cost is not worth the benefit

Participants shared concern for the environmental impacts and a desire for artwork to be considered as part of the project.

Some see this bridge and other Midtown improvements as increasing vehicle congestion. A participant cites the 2019 City surveys which showed traffic congestion as a high concern for the community.

A few people talked about their appreciation for the Truss bridge type:

"The non-truss designs are too flashy and overreach for Bend. I'd like to see something that doesn't detract from the mountains and that blends into the small-city vibe we still have and preserves local dollars for connectivity."

PARTICIPANT INFORMATION

Primary neighborhoods that participants indicated as having an association with:

- Larkspur 20
- Orchard District 20
- River West 14
- Old Farm District 14
- Old Bend 11
- Mountain View 11
- Midtown 10
- Summit West 10
- Southern Crossing 6

Neighborhoods with less than 5 responses were not included in this list.

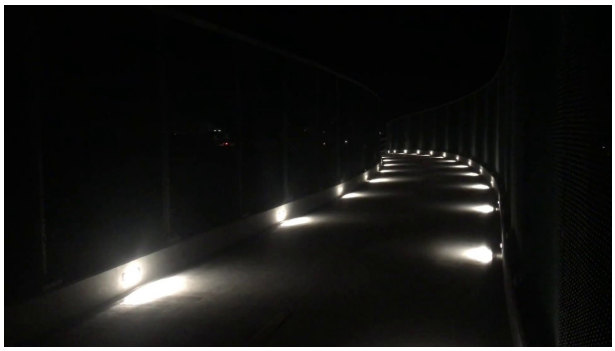
APPENDIX 8

Aesthetics Package

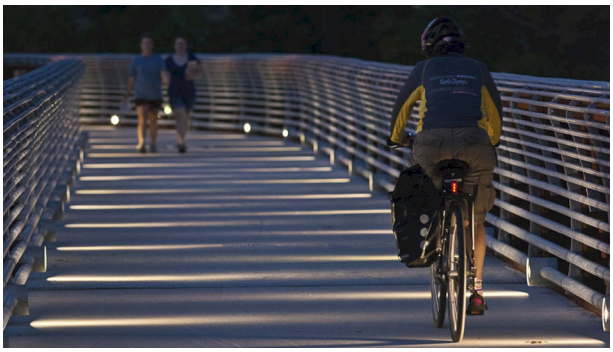
Bridge Path Lighting

Two forms of the bridge path lighting are available. The first option is to use conventional illumination pole and light fixtures. This option would require bulb outs on the bridge deck to support the poles and may deter from the aesthetic lines of the stay cables.

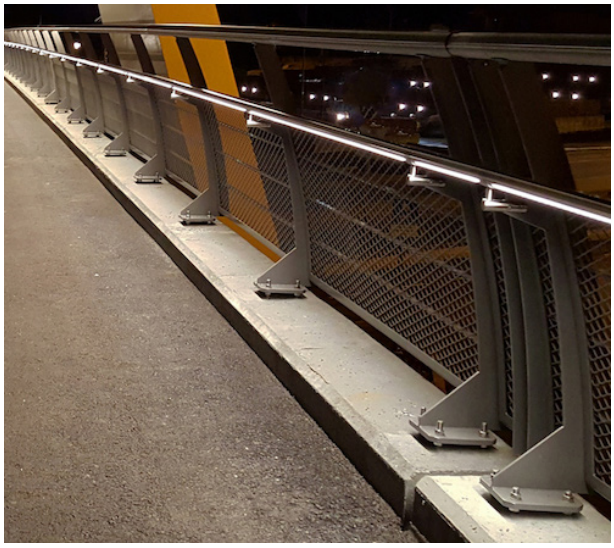
The second, and preferred, option is to provide handrail lighting. This would integrate the lighting element into the bridge rail. Examples of hand rail lighting are presented below.



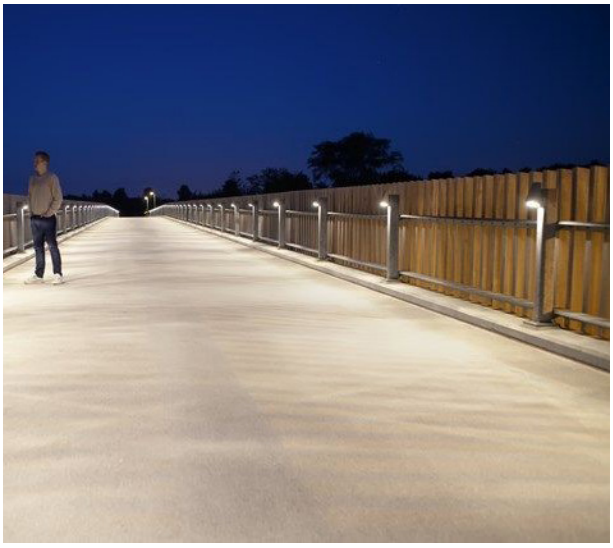
Lighting in Concrete



Curb Lighting in Rail



Continuous Handrail Lighting



Intermittent Handrail Lighting

Tower and Stay Cable Lighting

Lighting elements can be used to outline and draw the user's eye to the tower and stay cable elements. This can be achieved by using a variety of lighting options, such as light strips and projection lights, to achieve the desired aesthetic. Lighting can be a variety of colors and programmable to change the color for different seasons or occasions. This option could create glare for drivers on the Bend Parkway (US97) and trains on the BNSF railway. Tower and stay cable lighting concepts would need to be vetted with ODOT and BNSF.

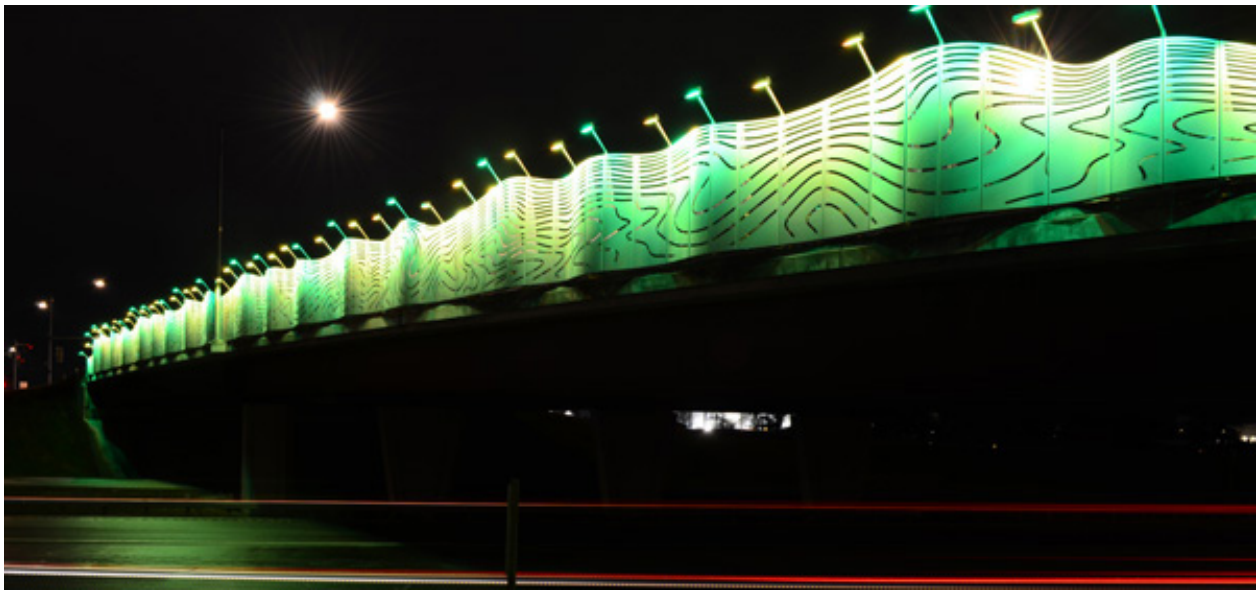
Delta Ponds Pedestrian Bridge, Eugene, Oregon

Hebei Yanchao Bridge, Beijing, China

Main Span Projection Lighting

Main span projection lighting can be mounted at the deck level and projected upwards or above the deck level and projected downwards onto the bridge structure. The lighting would highlight the architectural elements of the protective screening while also providing light to the SUP.

I-5 Bridge, Woodburn, Oregon



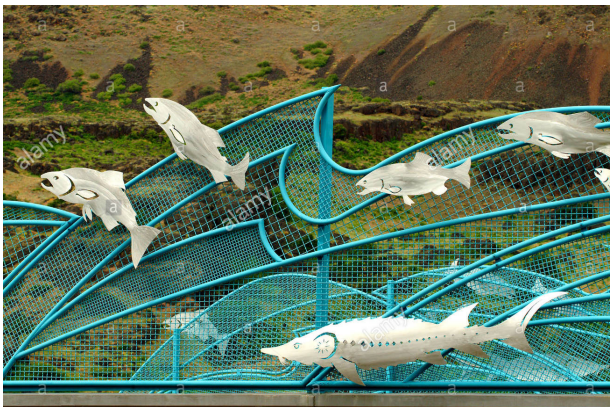
NW Brookwood Parkway Overpass over Highway 26, Hillsboro, Oregon

Protective Screening

ODOT and BNSF require pedestrian bridges crossing their facilities to have protective screening. Protective screening will be required from the west shoulder of the Bend Parkway (US97) to the east side of the BNSF ROW limits. There are endless opportunities to customize protective screening, including using various shapes to the top of the fencing, varying the density of the mesh to silhouette a custom image, attaching metal shapes, and providing color.

Example 1

Example 2



Example 3

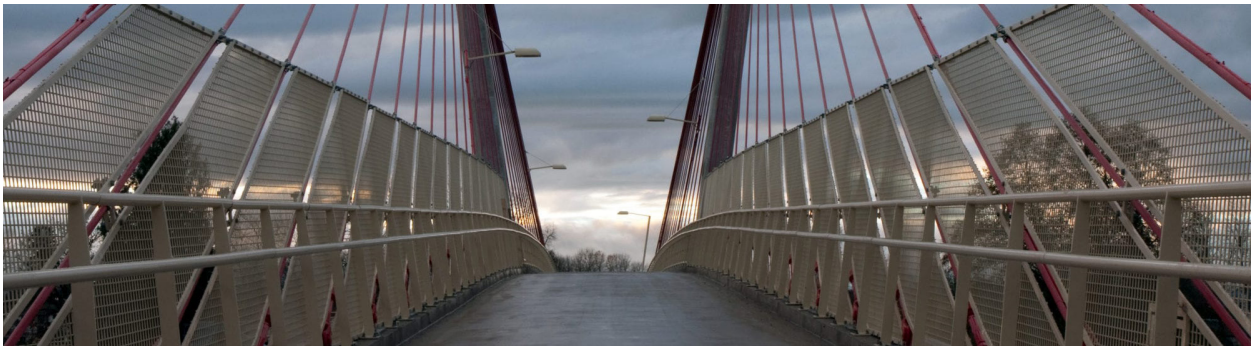
Example 4

Bridge Rail

A bridge rail will be required along the length of the bridge and SUP. The bridge rail will be a stand alone element outside of the protective fencing limits and can either remain so or be blended into the protective fencing system.

Some options shown include the Gibbs Street bridge, which uses a more heavy-duty steel bridge rail that blends into the protective screen system and the Delta Ponds bridge, which used a steel rail system that is separate from the protective screening system. The Minto Island bridge provides a minimal bridge rail across the bridge to provide a straight line across the bridge and not diminish the unique arches.

Gibbs Street Bridge, Portland, Oregon

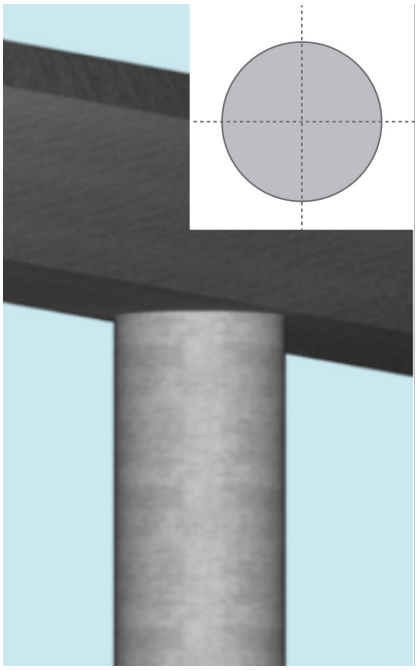


Delta Ponds Bridge, Eugene, Oregon

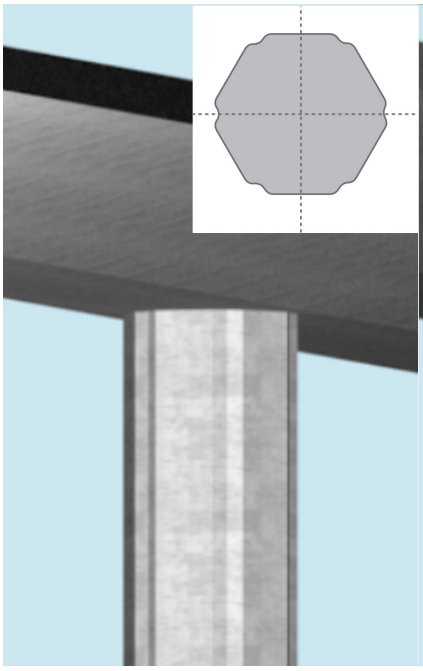
Minto Island Bridge, Salem, Oregon

Approach Column Shapes

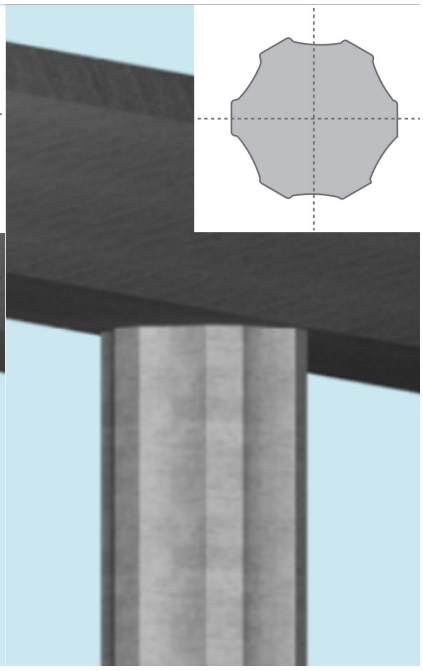
The concrete approach columns can use simple to complex geometries depending on the desired place making aesthetic.



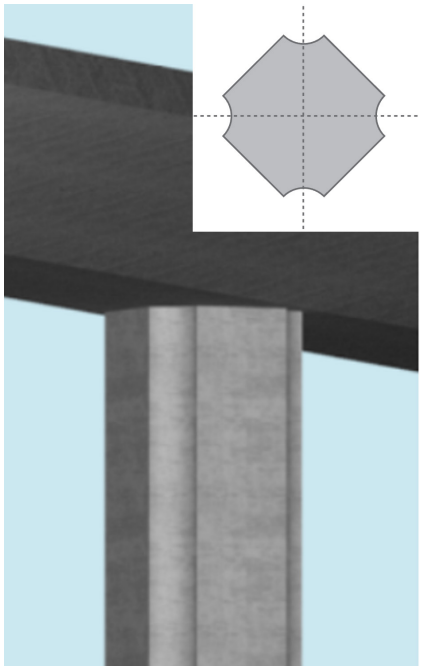
Round Alternative



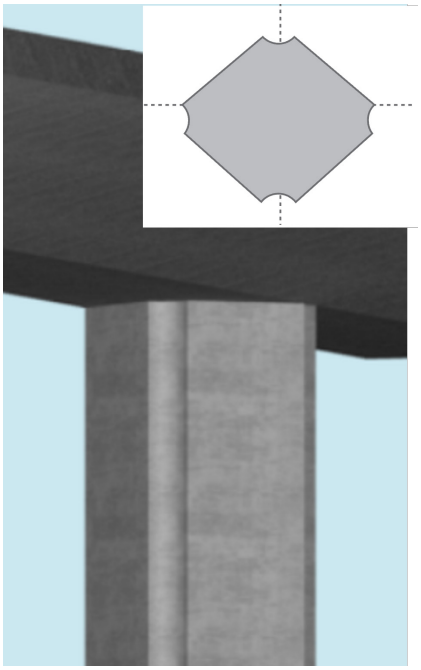
Alternative A



Alternative B



Alternative C



Alternative D

Tower Color

The concrete tower can be constructed with and without a color component. Rendering examples of the selected Single-Tower Cable Stayed alternative using a natural concrete and a cinder red colored tower aesthetic are presented below.

Natural Concrete Tower Color

Cinder Red Tower Color

Wall Formliner Examples

The SUP retaining walls also provide a canvas to add more place making aesthetic if the City desires, by using wall formliners. Formliners come in standard textures or can be custom ordered with unique textures and images.

South Medford Bridge, Medford, Oregon

Del Rio Road Interchange, Winchester, Oregon

Goshen Interchange, Goshen, Oregon

Willamette River Bridge, Eugene, Oregon

Wall Formliner Examples (Cont.)

Salem Sound Wall, Salem, Oregon

Wilsonville Road Interchange, Wilsonville, Oregon

Chenowith Interchange, The Dalles, Oregon

Biggs Junction Interchange, Biggs Junction, Oregon