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TUALATIN

CE 484: CIVIL & ENVIRONMENTAL ENGINEERING CAPSTONE
PORTLAND STATE UNIVERSITY

Boones Ferry Road Walkability Exploration

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UNIVERSITY OF OREGON · Portland State UNIVERSITY · CITY of TUALATIN · SCI Sustainable Cities Institute · SCYP Sustainable City Year Program

About SCI

The Sustainable Cities Institute (SCI) is an applied think tank focusing on sustainability and cities through applied research, teaching, and community partnerships. We work across disciplines that match the complexity of cities to address sustainability challenges, from regional planning to building design and from enhancing engagement of diverse communities to understanding the impacts on municipal budgets from disruptive technologies and many issues in between.

SCI focuses on sustainability-based research and teaching opportunities through two primary efforts:

1. Our Sustainable City Year Program (SCYP), a massively scaled university-community partnership program that matches the resources of the University with one Oregon community each year to help advance that community's sustainability goals; and
2. Our Urbanism Next Center, which focuses on how autonomous vehicles, e-commerce, and the sharing economy will impact the form and function of cities.

In all cases, we share our expertise and experiences with scholars, policymakers, community leaders, and project partners. We further extend our impact via an annual Expert-in-Residence Program, SCI China visiting scholars program, study abroad course on redesigning cities for people on bicycle, and through our co-leadership of the Educational Partnerships for Innovation in Communities Network (EPIC-N), which is transferring SCYP to universities and communities across the globe. Our work connects student passion, faculty experience, and community needs to produce innovative, tangible solutions for the creation of a sustainable society.

About SCYP

The Sustainable City Year Program (SCYP) is a yearlong partnership between SCI and a partner in Oregon, in which students and faculty in courses from across the university collaborate with a public entity on sustainability and livability projects. SCYP faculty and students work in collaboration with staff from the partner agency through a variety of studio projects and service- learning courses to provide students with real-world projects to investigate. Students bring energy, enthusiasm, and innovative approaches to difficult, persistent problems. SCYP's primary value derives from collaborations that result in on-the-ground impact and expanded conversations for a community ready to transition to a more sustainable and livable future.

Community partnerships are possible in part due to support from U.S. Senators Ron Wyden and Jeff Merkley, as well as former Congressman Peter DeFazio, who secured federal funding for SCYP through Congressionally Directed Spending.

About City of Tualatin

The City of Tualatin is a thriving, welcoming community of nearly 28,000 residents known for its exceptional quality of life, strong community involvement, and attractive location. Tualatin offers a balance of small-town charm and big-city access. Its strategic location 12 miles south of Portland and 30 miles north of Salem, at the crossroads of Interstates 5 and 205, combined with commuter rail access via the Westside Express Service (WES), makes Tualatin a vital hub for both residents and businesses in the Portland metropolitan area.



The city's history dates back to the mid-1800s and is rooted in entrepreneurship and transportation. From its early days as a ferry crossing and rail depot, Tualatin has grown into a forward-thinking city with a strong economic base. Today, its economy is anchored by key industry clusters in advanced manufacturing, software and technology, health and wellness, transportation and logistics, and corporate services.

Tualatin's residents enjoy over 200 acres of public parks and riverfront spaces, top-rated schools through the Tigard-Tualatin School District, and one of Oregon's premier shopping destinations—Bridgeport Village. The city is also rich in recreational and cultural offerings, including the famed Giant Pumpkin Regatta.

Downtown Tualatin, anchored by the Lake at the Commons, serves as a central gathering place for residents and visitors alike. With its blend of residential, retail, and office space surrounding a small manmade lake and public plaza, the Commons exemplifies the city's emphasis on livability and smart design.

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Course Description

PORTLAND STATE UNIVERSITY CIVIL & ENVIRONMENTAL ENGINEERING (PSU CE 484):

Portland State University Civil & Environmental Engineering (PSU CE 484) is a capstone course covering engineering design processes, including owner design, professional constructor relationships, procurement procedures, project evolution; contracts, dispute resolution, bonds, warranties; construction documents, including specifications; cost estimating, planning, and scheduling; construction administration; group process, diversity, and leadership.

Tualatin Boones Ferry Road Walkability Study
Final Design Report



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Civil & Environmental Engineering Capstone

Portland State UNIVERSITY

CITY of TUALATIN

PROJECT DISCLAIMER

This report was prepared as part of a class project for the Civil and Environmental Engineering Project Management and Design course at Portland State University. The contents of this report were developed by the student authors and do not necessarily reflect the views of Portland State University. The analyses, conclusions, and recommendations contained in the report should not be construed as an engineering report or used as a substitute for professional engineering services.

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Executive Summary

The Tualatin Boones Ferry Road Walkability Study aims at making part of SW Boones Ferry Road (simplified to BFR later in the report) more accessible in downtown Tualatin, Oregon. It will ensure that the road that goes through the revitalized downtown of Tualatin increases its walkability by making it more safe and connected along with its vision. The area of the study is focused on SW Boones Ferry Road, which goes through various destinations including but not limited to the commercial and residential areas and the upcoming Tualatin River waterfront park.

The study area is along an existing road that is currently outfitted with sidewalks, bike lanes, and many marked pedestrian crossings. Despite road and facility implementations, the study area suffers from poor road and path connectivity with a lack of provisions and amenities for pedestrians. The Tualatin River Greenway Trail currently ends in the study area and connects to neither downtown nor the park, leaving users without an outlet. The study area is also particularly sensitive to environmental disruption due to its proximity to Hedges Creek and a floodplain.

To mitigate these concerns, various design alternatives were identified. Collectively, these opened a dialogue for a downtown pedestrian route, improved pedestrian crossings, a tunnel under Boones Ferry Road, a boardwalk and underpass, and a no-build option. Tunnel E was selected for the underpass due to the offered positive impacts regarding road user experience within the study area and ease-of-use for trail users with an increased and uninterrupted trail connection to Tualatin River's planned park from the Greenway River Trail.

While the existing designs requested in the lower Boones Ferry Road area avoid the need for people to cross a busy road, there is a need for cyclists and pedestrians that walk along Boones Ferry Road in a east-west direction to cross at the road to access the path those designs create. The proposed path designed for cyclists and pedestrians is designed to divert from above Boones Ferry Road and cross below it. This design offers a clearer path in terms of user experience satisfaction and greatly improves safety concerns. The tradeoffs with a below-surface path at floodplain crossings, water crossings, and subsurface utilities, are limitations that are still reversible as concerns to the design plan in request for the most feasible user experience.

The design plan prioritizes user experience, safety, and connectivity. Key considerations include ensuring the safety of all users of this busy corridor. Also, to enhance the pedestrian experience within the project area and its surroundings. Improved connections on Boones Ferry Road, the Greenway Trail, and the planned waterfront park will encourage and allow for new access points and easier navigation throughout the area. These connections will help support the vision of a vibrant, accessible, and livable downtown.

Introduction

This design report covers a section of Boones Ferry Road in Downtown Tualatin. The two main goals are to make the corridor more walkable and to connect the end of the Tualatin River Greenway Trail to a future park location. The client for this project is the City of Tualatin Community Development Department and all work below was completed by Group 3 of the 2026 Portland State University CEE Capstone course. This report includes sections of Project Background, Alternatives Analysis, Design Development, and Regulatory Compliance and Permitting.

The following Design Report was prepared for the City of Tualatin, Oregon by Group 3. This document provides project understanding and an alternative analysis of possible design solutions for the Tualatin Boones Ferry Rd Walkability Study.

1.0 Project Understanding

The Project Understanding section describes an overview and background of the project.

1.1 Project Overview

The Tualatin Boones Ferry Road Walkability Study site is located at the central part of downtown Tualatin, Oregon. The study spans from the intersection of SW Boones Ferry Road and SW Tualatin road to the end of the SW Boones Ferry Road bridge (Figure 1.1). The purpose of this project is to study the accessibility and pedestrian features of SW Boones Ferry Road. The city of Tualatin plans on revitalizing its downtown area which requires a pedestrian friendly roadway that allows access to key areas of downtown. These areas include access to a planned waterfront park along the Tualatin River near Hedges Creek, shopping centers, living and communal areas. Another component of this to connect the Tualatin River Greenway Trail to and across SW Boones Ferry Rd (Figure 1.2).

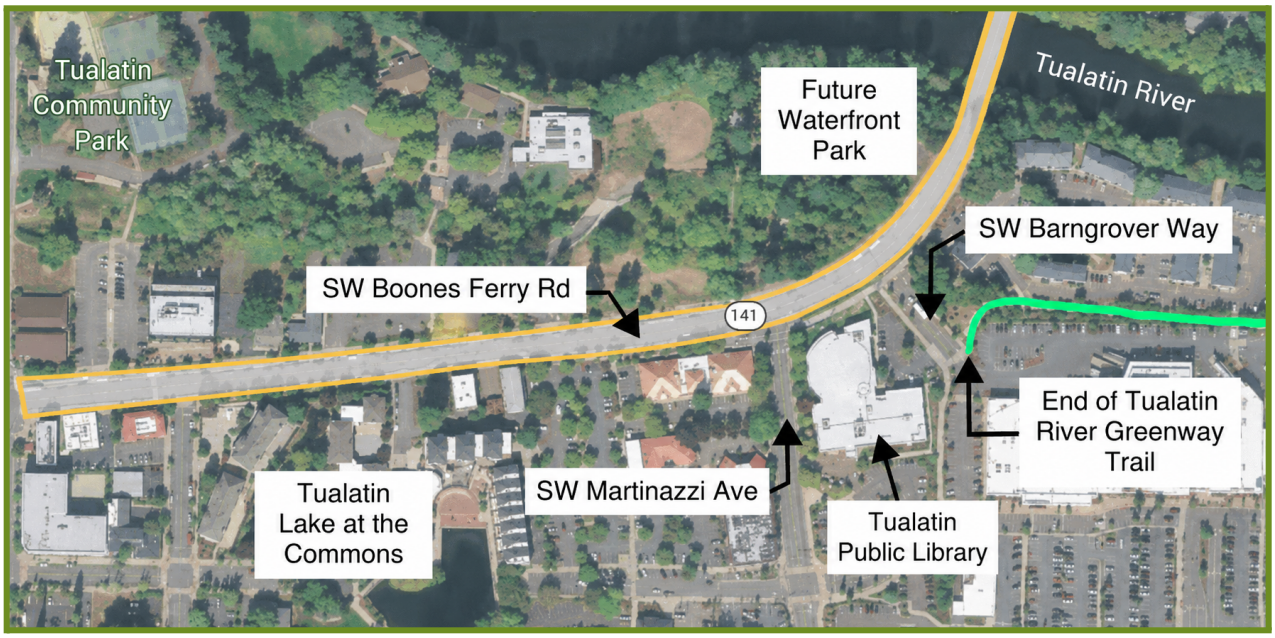

Figure 1.1 Aerial view of SW Boones Ferry Road Located in Tualatin, Oregon (Google Earth)



Figure 1.2 Aerial view of the Tualatin River Greenway Trail *(Google Maps)*

1.2 Existing Site Conditions

The project site is located near the Tualatin River and Hedges Creek at the northern part of Tualatin. SW Boones Ferry Road is located on a flood plain, where Hedges Creek often floods as the result of high rainfall. SW Boones Ferry Road currently employs single lanes in each direction with turn lanes at each intersection. Both lanes include bicycle travel lanes that span across the SW Boones Ferry Road bridge. Marked pedestrian crossings over Boones Ferry Road can also be found at the site, 6 total shown in Figure 1.3a. These crosswalks all follow ADA compliance. Three of those crosswalks are at signalized intersections (1, 5, and 6 below) and three are not, but have push button flashing pedestrian crossing signage and refuge islands, (2, 3, and 4 below) shown in Figure 1.3b. The current conditions of the Tualatin River Greenway trail include concrete walkways near the residential area and along the Tualatin River. The trail also has a decorative painted median separating pedestrians and cyclists (Figure 1.3c). It also has viewpoint locations with benches. Additional images of current site conditions can be found in Appendix A with their respective details.



Figure 1.3a Pedestrian Crossings over Boones Ferry Road



Figure 1.3b Flashing Pedestrian crossing sign (left), ADA Ramp at a crosswalk (right)



Figure 1.3c Tualatin River Greenway Trail *(Google maps)*

1.3 Stakeholders

Seven stakeholders have been identified who have an interest in the project. These stakeholders are involved in the use, development, and maintenance of the final product.

The Client

The client for this project is the local government of the City of Tualatin, specifically the city community development department. The City of Tualatin Engineering Division of the Community Development Department is a team of seven, focused on upkeep and improvement of the city's built environment. The primary points of contact are Mike McCarthy, the city engineer and Abby Mcfetridge, an engineering associate.

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Tualatin River Greenway Trail Users (Pedestrians and Cyclists)

Pedestrians, recreational walkers, cyclists, and commuters using the Tualatin River Greenway Trail are primary stakeholders. Their stake lies in maintaining safe, continuous, and accessible pathways. These users will be most concerned with project aspects related to path continuity, user safety, separation from vehicular traffic, signage, lighting, and potential disruptions during construction.

Daily Commuters and Motor Vehicle Users

Drivers who rely on the Boones Ferry road are stakeholders because the project may affect traffic flow, travel time, and roadway safety. Their opinions are most relevant to decisions involving road design, intersection design, signal timing, construction phasing, and any changes that could influence congestion or access during peak commuting hours.

Public Transit Users and TriMet

Bus riders and TriMet have a direct stake in the project. Transit users depend on reliable service, safe pedestrian access to stops, and clear wayfinding. The transit authority's input is especially relevant to bus stop placement, curb access and schedule reliability.

Local Businesses and Business Owners

Businesses within the affected district are stakeholders due to potential impacts on customer

access, visibility, deliveries, and overall economic activity. Their primary concerns relate to parking availability, pedestrian and bicycle access, signage, construction duration, and long-term changes in foot traffic patterns that could either support or hinder commercial vitality.

Nearby Residents

Residents living near the project area are stakeholders because the project may influence neighborhood connectivity, noise levels, safety, and property values. Their perspectives are particularly relevant to design elements affecting livability, such as traffic calming, lighting, landscaping, and measures to minimize construction-related disturbances.

Municipal Agencies and City Departments

City departments responsible for transportation, planning, parks, and public works are stakeholders due to their role in project delivery, long-term maintenance, and policy alignment. Their input is most relevant to regulatory compliance, design standards, multimodal integration, environmental considerations, and lifecycle costs. This includes the Downtown Revitalization Project Community Advisory Committee.

Maintenance Workers

Any development will need to be maintained by the appropriate workers. They would have a stake in the project as they would be responsible for its upkeep and longevity.

2.0 Alternatives Analysis

Although the scope of this project includes pedestrian improvements and the Greenway Trail expansion, an alternative analysis has been performed for just the greenway trail. This section describes five different design ideas for addressing the continuation of the Greenway Trail. It also describes the ranking criteria, how each alternative was ranked, and the final decision that was recommended for further design.

2.1 Alternatives Considered

Multiple alternative designs were proposed to connect the end of the Tualatin River Greenway Trail to the park. The five design considerations were: A) An underpass and boardwalk, B) Improved pedestrian crossing, C) A downtown route, D) No build, and E) a tunnel under Boones Ferry Rd. These options were analyzed based on a list of criteria including cost, feasibility, design/construction time, environmental impacts, local business impacts, and others. The most effective alternative was then chosen for further design.

2.1.1 Alternative A: Underpass & Boardwalk

For the first alternative, an underpass and boardwalk are considered along and under the Tualatin River bridge. The underpass would be sloped towards the river to reduce the accumulation of water, as the area is located on a floodplain. An example of what the underpass would look like can be seen on Figure 2.1.1.b. The addition of a boardwalk would allow pedestrians more room to use the area to travel between places, and would provide pedestrians with a scenic route and view of the river. A ramp would be included to allow ADA accessibility, allowing those to access the underpass and boardwalk from the line of sidewalk along the top of the bridge. The boardwalk would span approximately 775 feet along the Tualatin River and be composed of an elevated wooden walkway. Figure 2.1.1.a displays the section of the boardwalk that would run along the River Lofts Apartments, who own the right of way. There could be issues with getting access to this private property. Also, on the park side of the bridge, more information would be needed to plan how the boardwalk would end or cross the end of Hedges Creek.

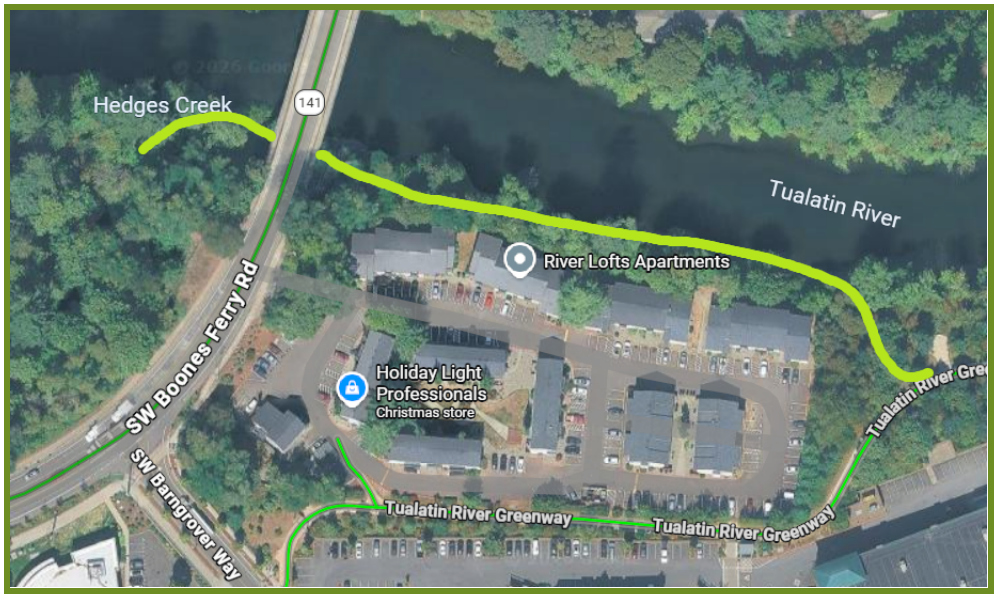

Figure 2.1.1.a Alternative A *(Google Maps)*



Figure 2.1.1.b Greenway Trail I5 underpass example *(Google Maps)*

2.1.2 Alternative B: Improved Pedestrian Crossing

The second alternative for a Tualatin River Greenway Trail extension would be to create a continuous path from the end of the current trail to the entrance of the future or current park. Currently the greenway trail ends across an intersection from the library with no fanfare and does not “lead” anywhere or have a definitive end. Adding a built, intentional path from the end of the current trail and extending it to the park will give a stronger sense of place, encourage park use, connect people visiting the park to the downtown area and businesses and give the Tualatin River Greenway Trail a fitting end. To accomplish this the alternative would create a shared pedestrian

and bike lane along SW Barngrover Way and connect to SW Boones Ferry Rd and include a design theme that speaks to the identity of the community. The shared lane would then cross at the intersection of SW Boones Ferry Rd and SW Martinazzi Ave using an existing signalized crossing to lead people into the future park entrance as well as the current entrance. Figure 2.1.2 highlights the path this alternative would implement.



Figure 2.1.2 Alternative B *(Google Earth)*

2.1.3 Alternative C: Downtown Pedestrian Route

The third alternative involves routing the Tualatin River Greenway Trail to the downtown area. This would give a route to more business events held at the Tualatin Lake of the Commons area. An initial route could cross Barngrover Way at the end of the trail with an existing crosswalk and ramps, unlighted but with a stop for pedestrians sign. The trail could follow the sidewalk around the library and library parking lot and along Seneca St (Figure 2.1.3.b) and crossing next at Martinazzi Ave, this is a signalized intersection. This trail would be shared with pedestrians and cyclists which could require an extension of the sidewalk. Due to the area consisting mostly of parking lots, the alternative is not expected to impact traffic along the Downtown Pedestrian Route. Finally the route would end at the plaza and lake. This area has possibilities for bike racks for people to leave their bikes while they enjoy the downtown area. This alternative has the option of being combined with alternative B as itself doesn't connect to the park area.

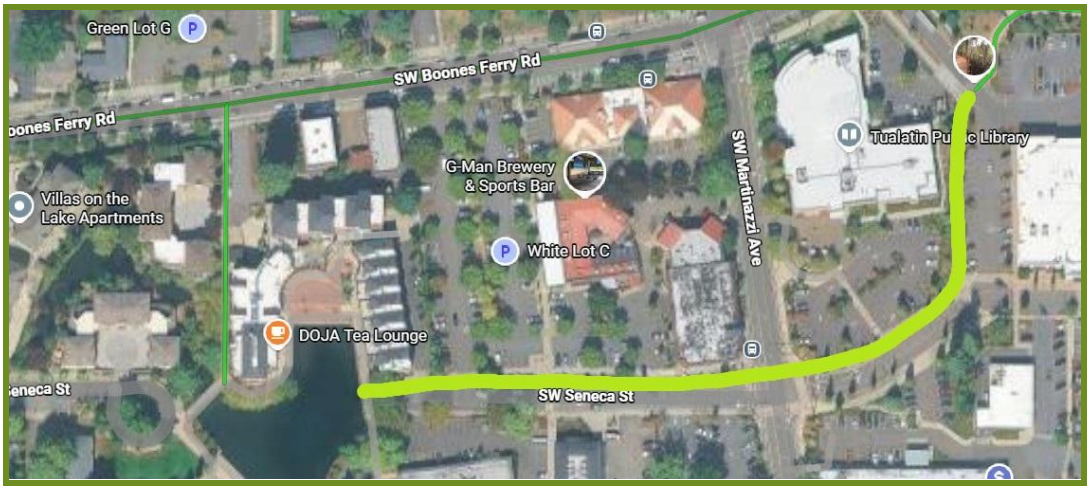

Figure 2.1.3.a Alternative C *(Google Maps)*

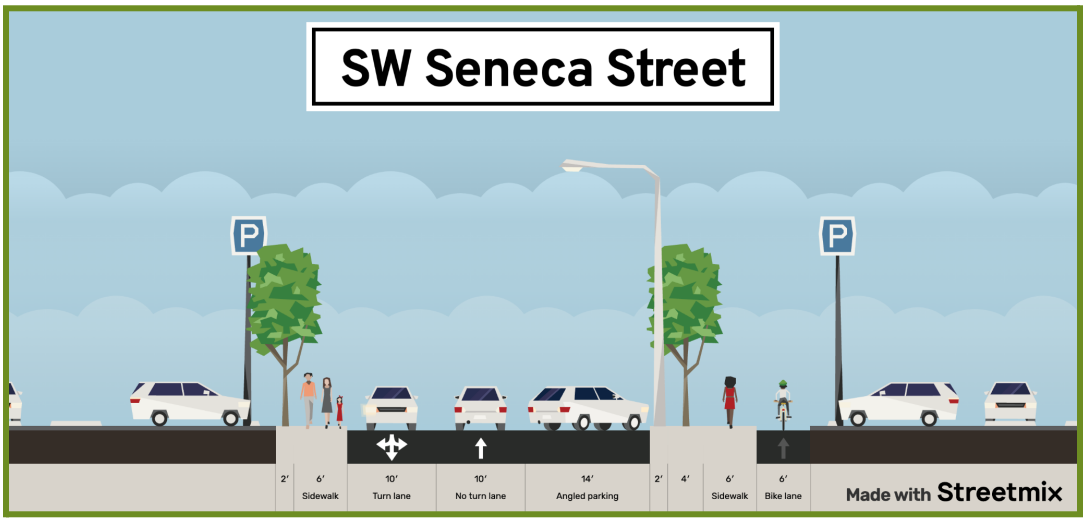

Figure 2.1.3.b Cross-section of Proposed Alternative C Along SW Seneca Street *(Streetmix)*

2.1.4 Alternative D: No Build

The fourth alternative, Alternative D, encompasses no alterations to the current Tualatin River Greenway Trail. This includes the abrupt ending of the trail on SW Barngrover Way as it meets a cross-walk and a bicycle lane. The bicycle lane in this case, travels towards SW Boones Ferry Road and as it meets SW Boones Ferry Rd, it continues across the SW Boones Ferry Rd Bridge (Figure 1.1.4). At this specific road intersection, a bicycle lane does not exist to cross SW Boones Ferry Rd from SW Barngrover Way. Alternative D still considers the upkeep and service costs for the current conditions and infrastructure. The sidewalk continues along Barngrover and Boones Ferry to a lighted intersection and cross walk to the park area. This alternative is included in the alternative analysis for the purpose of providing a baseline to compare existing and proposed alternative designs.



Figure 2.1.4 Alternative D, Existing Conditions (*Google Maps*)

2.1.5 Alternative E: Tunnel under Boones Ferry Rd

The final alternative is a tunnel under Boones Ferry Road. This would likely start along Barngrover Way near where the Tualatin River Greenway Trail ends. It could possibly begin on the north east corner of Barngrover Way and run perpendicular to Boones Ferry Rd under the street. It would exit where the future park is planned to be. Ideally the difference in elevation from the park side and the Barngrover road side would allow for a sufficient slope and clearance from Boones Ferry road to avoid steep ramps. This idea could take pedestrians away from crossing over the busy road and would allow a direct path to the park. However with this area being within a floodplain there are concerns of the tunnel flooding causing design complexities. Also, this idea involves going underground, there could be interactions or rerouting of utilities involved.

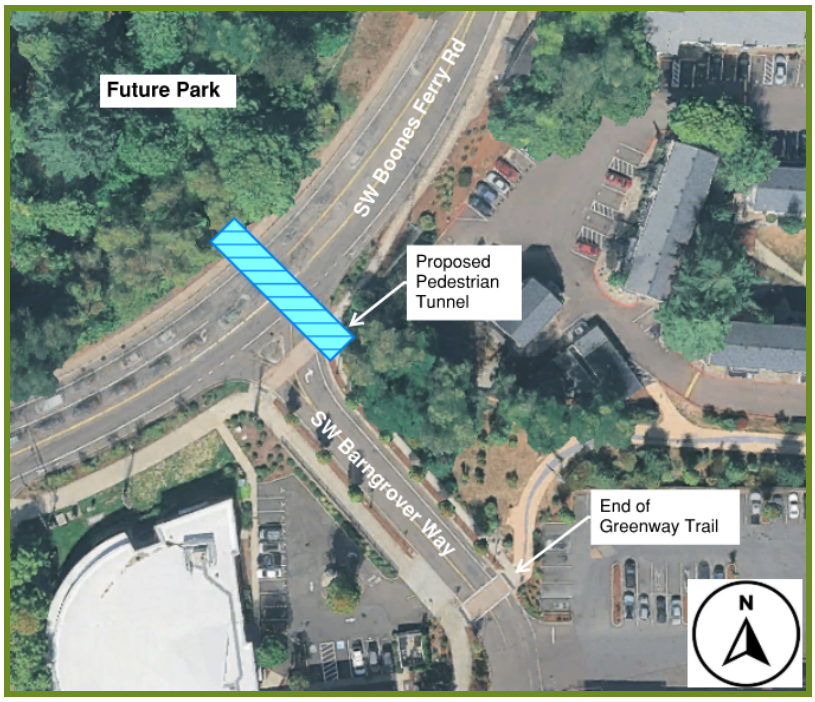

Figure 2.1.5a Alternative E, potential location for pedestrian tunnel



Figure 2.1.5b Sunriver pedestrian tunnel example (*Cascade Business News*)

2.2 Selection Criteria For Evaluation

Each alternative for the project will be assessed using a qualitative comparative method focusing on the project goals for enhancing pedestrian/user experience, accessibility, connectivity, and safety for the users along SW Boones Ferry Road and the Tualatin River Greenway Trail. In evaluating the alternatives, the criteria will also include the design's operational and transportation efficiency, construction and environmental responsibility, and design's impact/perceived impact on the community. The goal for each alternative is to create a qualitative range or ordering for each criterion, using a 1-5 scoring system for comparison across alternatives. The preferred alternative will be the option that optimally achieves and balances safety, feasibility, cost, and community value and still meets the overall goals of the Boones Ferry Road Walkability Study.

2.2.1 Cost

This criterion solely relates to estimating the construction capital costs and the subsequent maintenance costs and the duration associated with each of the alternatives. This includes, but is not limited to, the cost of materials, labor, permits, drainage improvements, and any required structural components or the relocation of utilities. Therefore, alternatives that will cost less to construct and that will still achieve the goals of the project will be scored higher. Any alternatives that will involve substantial and/or major structural components will be expected to incur higher construction capital costs and therefore score lower in this aspect. This would also include design and engineering cost as some projects will be more design intensive than others.

2.2.2 Feasibility

Feasibility assesses practicality of each alternative in regards to site-specific constraints including right of way, floodplain, ADA, construction challenges. This criterion also evaluates the nature of permits, coordination with local jurisdictions, and utility issues. Alternatives that present the least in the way of regulations and construction obstacles are ranked the highest.

2.2.3 Construction Time

Construction time estimates the time needed to implement the alternative. This includes the time needed for staging, traffic management, and environmental controls, including in-water work, and seasons when construction can’t occur. Alternatives that include substantial structural work, or work near or within a river, are likely to take a long time and will score poorly. Projects that are shorter in duration and focus on minimal disruption will score highly.

2.2.4 Design Time

Design time estimates the amount of effort needed for engineering design, environmental documentation,structural calculations, and for obtaining the necessary permits.The design time for options that need detailed geotechnical studies, floodplain studies, or structural design will be

more significant. Roadway or crossing improvements of lower complexity will perform better in this category.

2.2.5 Pedestrian & Cyclist Connectivity Experience

The criterion of the pedestrian experience assesses the safety, comfort, and accessibility, and level of pedestrian and cyclist connectivity for each alternative, as well as separation distance from motorized vehicles, ADA compliancy, clearly defined pathways, overall aesthetics, and feelings of safety, among others. Providing separated pedestrian facilities, reducing vehicle conflict points, and improving comfort infrastructure and aesthetics will score alternatives better. In this respect, improving safety and accessibility will score alternatives better as part of the overall pedestrian experience, and alternatives that improve pedestrian and cyclist connectivity along the corridor. In this category the higher score will go to alternatives that close the connectivity gaps between pedestrian and bicycle facilities along the corridor.

2.2.6 Motor Vehicle Experience

This criterion considers the effects each alternative has on vehicle traffic, road use, delays, and the safety of road users. While maintaining the project's primary goal of improving walkability and pedestrian safety, Boones Ferry carries many vehicles throughout the day and negative impacts on the traffic is not acceptable. Options that cause traffic disruptions and delays will score lower. Options that are likely to cause traffic jams, reduce the number of lanes that traffic can use, or operational difficulties are not acceptable for this corridor.

2.2.7 Environmental Impact

The criterion for environmental impacts assesses how each alternative affects the natural environment, including the Tualatin River, the floodplain, vegetation and the pattern of stormwater runoff, and potential effects on water quality, as well as the tributaries. This considers how the alternatives may disturb habitats and cause erosion as well as construction impacts when the construction is above or below water and make surfaces less permeable. Alternatives that cause less damage to the environment by sedimentation and those that help to preserve vegetation get more credit and help protect water quality in the river and tributaries. Alternatives that need a lot of excavation and new construction of structures near a water body or vegetation loss are likely to gain less credit. Also, any additional impervious surfaces constructed will have stormwater runoff impacts. Alternatives with heavier environmental impacts and the need for more environmental permits will score lower.

2.2.8 Business Impact

The business impact criterion assesses how each alternative affects neighboring commercial zones both during and post construction. This includes possible access restrictions, parking, construction disruptions, and pedestrian circulation. Alternatives that improve accessibility to

local businesses and improve pedestrian access to commercial zones will score higher. Alternatives that will be disruptive for a longer construction period, have worse accessibility and cause the flow of customers will be negatively affected, will score low.

2.3 Evaluation of Alternatives

In order to determine the best alternative to implement, a Pugh scoring matrix system was used. This scoring system provides a qualitative way to rate each alternative based on various criteria described in Section 2. Figure 2.3 shows the scoring matrix with results for each alternative. The ratings and reasoning behind the score for each alternative's criteria are described below.

	Alternatives				
Criteria	A: Underpass & Boardwalk	B: Improved Pedestrian Crossing	C: Downtown Pedestrian Route	D: No Build	E: Tunnel
Cost	1	3	3	3	2
Feasibility	2	4	4	3	3
Construction Time	1	2	3	3	2
Design Time	2	3	3	3	3
Pedestrian Experience	5	4	4	1	4
Motor Vehicle Experience	4	2	3	2	4
Environmental Impact	2	4	4	3	3
Business Impact	4	4	5	3	4
Average	2.6	3.3	3.6	2.6	3.1

Ratings	
Bad	1
Not good	2
Neutral	3
Good	4
Great	5

Figure 2.3 Alternative Analysis Scoring Matrix

2.3.1 Alternative A: Underpass & Boardwalk

- **Cost:** The cost is estimated to be relatively high compared to the other options giving it a low score. To install an underpass and boardwalk would need extensive labor and materials such as concrete and lumber. **- 1/5**
- **Feasibility:** This alternative scores lower than other options with feasibility. It shouldn't get in the way of any existing traffic, but other design constraints and challenges are likely. The site would have to be examined and level for the underpass, but challenges will occur in designing an underpass along a river and in a floodplain. The boardwalk would need

adequate equipment to begin constructing and establishing a foundation for the boardwalk to rest upon above the water near the top of the banks elevation. **- 2/5**

- **Construction Time:** Construction time would be longer than other options. With a rough estimation of 2-4 weeks per 500 square feet of boardwalk. The underpass should be constructed first, with an estimated construction time of 4 or more weeks depending on the square footage of material being used to construct it. This could take around a year to complete **- 1/5**
- **Design Time:** Design time should be more than other options, with probable challenges from the flood plain and getting any necessary permits. **- 2/5**
- **Pedestrian Experience:** Alternative A should score high when it comes to pedestrian experience. It offers pedestrians and cyclists a scenic route away from motor vehicles while also providing a level of safety. Concerns for pedestrian safety exist, the design would require safety rails. **- 5/5**
- **Motor Vehicle Experience:** Given that the road would be located directly above the underpass and boardwalk, the motor vehicles should experience little to no complications from Alternative A. Alternative A scores higher in terms of Motor Vehicle experience. **- 4/5**
- **Environmental Impact:** Alternative A should score lower with environmental impact. Depending on materials used for construction, there could be some erosion that seeps into the river. There is also the possibility and concern of any litter from pedestrians. **- 2/5**
- **Business Impact:** This section scores higher in terms of business impact. An underpass and boardwalk should not affect local businesses in a negative way. The addition of a boardwalk could bring increased customers to local businesses for food, as pedestrians could enjoy their meals or treats on the boardwalk enjoying a nice view of the river. **- 4/5**

2.3.2 Alternative B: Improved Pedestrian Crossing

- **Cost:** This alternative would primarily require pathway construction, pavement improvements, signage, striping, and possible ADA ramp upgrades. It does not require structural bridge modifications, excavation in a floodplain, or major utility relocation. Because the improvements build on existing infrastructure, overall project costs would likely remain moderate. Compared to structural or grade-separated options, this alternative represents a cost-effective solution. - **3/5**
- **Feasibility:** The project relies largely on existing sidewalks, intersections, and public right-of-way, making implementation straightforward. It does not introduce complex engineering challenges or significant environmental permitting requirements. The scope is small and projects like this are done often. As a result, it is highly feasible from a cost, technical, and practical standpoint. **- 4/5**
- **Construction Time:** Construction activities would likely consist of paving, striping, signage installation, and minor concrete work. These tasks are relatively simple and can typically

be completed within a short to moderate timeframe. Construction could be delayed as it would involve working over and next to a busy road. No extensive excavation, bridge work, or phased traffic reconstruction would be required. Therefore, construction duration could likely be limited compared to more infrastructure-intensive alternatives like Alternative A. **- 2/5**

- **Design Time:** Design efforts would focus on ADA compliance, pedestrian circulation, signage placement, and intersection safety treatments. While coordination with traffic engineering may be necessary, the design complexity remains manageable. Overall, the design phase would be easier than other alternatives and predictable. **- 3/5**
- **Pedestrian Experience:** This alternative design creates a clearer, more intentional ending to the existing greenway. By directly connecting the trail to the park and downtown area, it strengthens wayfind and sense of place. It encourages park use and improves accessibility to nearby businesses. The crossing would still be an at-grade solution through a major intersection. **- 4/5**
- **Motor Vehicle Experience:** Improving pedestrian connectivity activity at nearby intersections. Drivers may experience minor delays due to increased pedestrian usage. This is a busier intersection for vehicles and pedestrians than Alternative C making it slower for vehicles. In the pedestrian study from 2025 this intersection had 69 crossings over 2 hours at the Martinazzi and Boones Ferry crossing and 52 at the Martinazzi and Seneca intersection. However roadway lanes and traffic flow would remain largely unchanged. Overall, impacts to motorists would be manageable and relatively minor. **- 2/5**
- **Environmental Impact:** The improvements would occur within already developed areas and existing right-of-way. There would be minimal land disturbance and no encroachment into the floodplain. The project would likely avoid significant environmental permitting requirements. As a result, environmental impacts would be very low. **- 4/5**
- **Business Impact:** By directly connecting the Tualatin River Greenway Trail to the park and downtown, this alternative increases pedestrian circulation near local businesses. Improved access encourages visitors to spend time in commercial areas and attend downtown events. Increased foot traffic can positively influence retail activity and community engagement. This alternative strongly supports local economic development. **- 4/5**

2.3.3 Alternative C: Downtown Pedestrian Route

- **Cost:** Depending on the final design this alternative would not involve much redevelopment as most of the infrastructure is already in place. This could involve new pavement in widening sidewalks or improved ADA accessibility and possibly adding bike rack stations. The overall cost would be moderate to low compared to some other alternatives. - **3/5**

- **Feasibility:** This option seems very feasible as it relies on existing conditions and doesn't involve a large project area. There should not be complex engineering challenges or permitting requirements. The scope is small and is very feasible from a cost, technical, and practical standpoint. - **4/5**
- **Construction Time:** Construction time could depend on when work could be done as construction could involve shutting down roads or interfering with businesses. This could be moderate as there would be paving, striping, signage installation involved. This should be quicker than Alternative B as it doesn't involve shutting down parts of Boones Ferry Road which is typically busier. - **3/5**
- **Design Time:** Design time should be simpler than some other alternatives. Design efforts would focus on ADA compliance, pedestrian circulation, signage placement, and intersection safety treatments. While coordination with traffic engineering may be necessary, the design complexity remains manageable. Overall, the design phase would be easier than other alternatives and predictables. - **3/5**
- **Pedestrian Experience:** This option should have a positive impact on the pedestrian experience by extending the trail to a more popular destination. By connecting the trail to the downtown plaza it encourages business interactions and event participation. - **4/5**
- **Motor Vehicle Experience:** Improving pedestrian connectivity activity at nearby intersections drivers may experience minor delays due to increased pedestrian usage. However roadway lanes and traffic flow would remain largely unchanged. Overall, impacts to motorists would be manageable and relatively minor. As the downtown crossings should be less busy then the Boones Ferry crossing this would be less of a problem than Alternative B **- 3/5**
- **Environmental Impact:** This option should not have a negative impact on the environment, but wouldn't be positive. This option wouldn't involve new street trees or landscaping upgrades. It will be within current developed areas. It would have minimal changes to the floodplain problem. **- 4/5**
- **Business Impact:** Connecting the trail to the downtown area would improve accessibility and bring people directly to the businesses. This would give businesses more customers making it a beneficial implementation, even more so than Alternative B. - **5/5**

2.3.4 Alternative D: Do Nothing

- **Cost:** The cost for this alternative is considered to be low or not applicable giving this category a neutral score. This is due to the fact that only the current maintenance of existing roadway signage for the bicycle lanes and the shared roadway markings including the bike lanes and the crosswalks are being considered. **- 3/5**

- **Feasibility:** This alternative would score neutral on the feasibility scale because not altering the current conditions would make it easy to implement the "No Build" alternative. **- 3/5**
- **Construction Time:** Implementation of the "No Build" alternative would require no construction time making this criteria not applicable. **- 3/5**
- **Design Time:** Design time is considered to be neutral because there is no design to be completed for a "No Build" alternative making this criteria not applicable. **- 3/5**
- **Pedestrian Experience:** Pedestrian experience can be scored low because the current infrastructure (bicycle lanes and crosswalks) exist near the end of the trail which provide a safe connection across and along SW Barngrover Way. However, there is no way to cross over SW Boones Ferry Road for both cyclists or pedestrians at the intersection of SW Boones Ferry Road and SW Barngrover Way. Pedestrians would need to travel to the next intersection which is SW Boones Ferry Road and SW Martinazzi Avenue to cross SW Boones Ferry Road. **- 1/5**
- **Motor Vehicle Experience:** The motor vehicle experience would score low because not implementing any changes to the current roadway design would not affect the current experiences vehicle drivers experience. If current vehicle experience is considered "bad" implementing Alternative D, would continue a low or "bad" motor vehicle experience. **- 2/5**
- **Environmental Impact:** The environment would not be positively or negatively impacted in this no change scenario. For this reason, the environmental impact would get a neutral score. **- 3/5**
- **Business Impact:** Alternative D might deter pedestrians from reaching the downtown area as the trail would not be directly connected to downtown. This would negatively impact the businesses in the area, so business impact can be considered medium. No change would not have an impact on business **- 3/5**

2.3.5 Alternative E: Tunnel Under Boone Ferry Rd

- **Cost:** The cost for this alternative is estimated to be higher than Alternatives B or C but less than A. Excavation and structural costs would be significant. **- 2/5**
- **Feasibility:** This alternative would score higher than Alternative A but slightly lower than Alternatives B and C. The idea is reasonable, but could be difficult to design with the flood plain complexities. **- 3/5**
- **Construction Time:** Implementation of the tunnel could have slightly higher construction time due to the excavation and structural components. It is also likely that Boones Ferry will be partially shut down at different times which could draw out the completion of the project. **- 2/5**

- **Design Time:** Design time is considered to be neutral. It could be comparable to Alternatives B and C. It is a more concentrated area so it would interfere with less components that could involve permitting. **- 3/5**
- **Pedestrian Experience:** Pedestrian experience can be scored high. This idea would benefit pedestrians and bikers by giving them a fun and safe route to the future park and allowing them to skip crossing the busy road. **- 4/5**
- **Motor Vehicle Experience:** The motor vehicle experience would score high and comparable to Alternative A. It should take more people off of the main roads and allow for less crossings which slow down vehicle traffic. This lessens vehicle and pedestrian interactions which improves safety. **- 4/5**
- **Environmental Impact:** The environment could be impacted more than Alternatives B and C as it involves excavation. However, it is a smaller area and is mostly within current paved areas. **- 3/5**
- **Business Impact:** Similarly to Alternative B this idea should be beneficial to businesses. This would give a safe route for people to move from the park and downtown area allowing more customer interactions with businesses. **- 4/5**

2.4 Selection of the Preferred Alternative

After evaluating our alternatives with the established criteria, recommending both Alternative B and C proves to address the most issues and aligns with the client's desires. The clients plan to build a park nearby and have expressed wanting to have some sort of improvement for pedestrian experience for those walking to and from the park, Alternative B addresses this. Alternative C also addresses the main issue of improving walkability and the overall pedestrian experience for the Tualatin Boones Ferry Rd area. Selecting both B and C for solutions improves already existing public infrastructure with improved pedestrian experience and safety and paves the way for more accessibility, creating an overall more friendly area. Both solutions have a moderate scoring when it comes to cost and overall time to design and construct, however it is believed by our team that the benefits would outweigh the investment in cost and time that Alternative B and C would bring. By selecting both Alternative B and C, the combined solution would provide the community with a reliable and safe pedestrian experience, whilst bringing little to no impact to the surrounding environment and motor vehicle experience which in turn would also bring a positive impact to nearby businesses in the area.

However, although the decision matrix recommends Alternatives B and C the proposed design for Alternative E will be documented in this report. Alternative E is an option that the clients would like to see more ideas for and that the group was most interested in. The group knows that this alternative could have scored higher if the grading criteria better reflected the clients priorities.

Some categories could have been weighted more, like pedestrian experience and some could have been weighted less like motor vehicle experience since the priority is pedestrians.

3.0 Design Development

The following section provides a detailed description of the proposed design elements intended to enhance safety, accessibility, connectivity and streetscape of Tualatin Boones Ferry Road and Downtown Tualatin. The designs provide the extension of the Tualatin River Greenway Trail, improvements to the existing pedestrian facilities along SW Boones Ferry Rd and improvements to the streetscape along SW Boones Ferry Rd. Each design includes a summary, dimensions and considerations section which includes applicable design standards. Finally, a construction cost estimate and construction schedule section are provided summarizing the cost and construction time of the whole project.

3.1 Wider Sidewalks

Widening the sidewalks of the proposed route along SW Boones Ferry Road (SW BFR) provides ample room for shared pedestrian and bike mobility while providing more space for separation. Existing sidewalk sections along SW BFR have a width of 5 feet which after implementation would change to 6 feet. This implementation was selected based on keeping enough space for pedestrians to travel through the sidewalk while adding additional space to provide a separation between either tree wells or bike lanes (see Drawing sheet A4).

3.1.1 Design Criteria

In order to widen the sidewalks, the City of Tualatin Development & Public Works Construction codes must be followed to correctly size pedestrian paths. The minimum width of sidewalk according to the Tualatin Development Code (TDC) Section 203.2.14 on sidewalks, requires a minimum width of 10 feet. This width provides pedestrians with enough clearance for mobility while ensuring the existing tree wells fit within the 10 feet of sidewalk. The design includes ADA ramps at entrances and exits of the pathway which must meet the guidelines from the Public Right-of-Way Accessibility Guidelines (PROWAG). This design ensures that pedestrians will have access to safe and accessible walkways

3.1.2 Geometry

The sidewalks will be widened to a total of 10 feet, four of those ten feet will provide enough clearance for new planter dividers and existing tree wells which require a minimum area of 4 feet by 4 feet. Figure 3.1.2a below shows a mock up design of what the sidewalk will look like along the south side of SW BFR (see Figure 3.1.2b). This design

would span the whole length of SW BFR from the intersection at SW Tualatin Road to SW Barngrover Way. The length the sidewalks will span is 1,800 feet for each side of the road, which in total would be 3600 feet. The spacing required in between each tree well is 30 feet on-center. Figure 3.1.2b shows a typical BFR cross-section with existing and proposed widths of sidewalks, tree wells, planter strips, bike lanes and vehicle lanes. The figure also displays how the south side and north side of BFR differ in terms of new improvements. It is important to note that the other sections of SW BFR have slight differences in geometry, which can be seen on Drawing Sheet A5.



Figure 3.1.2a Example of tree wells on sidewalk *(Source: EVStudio)*

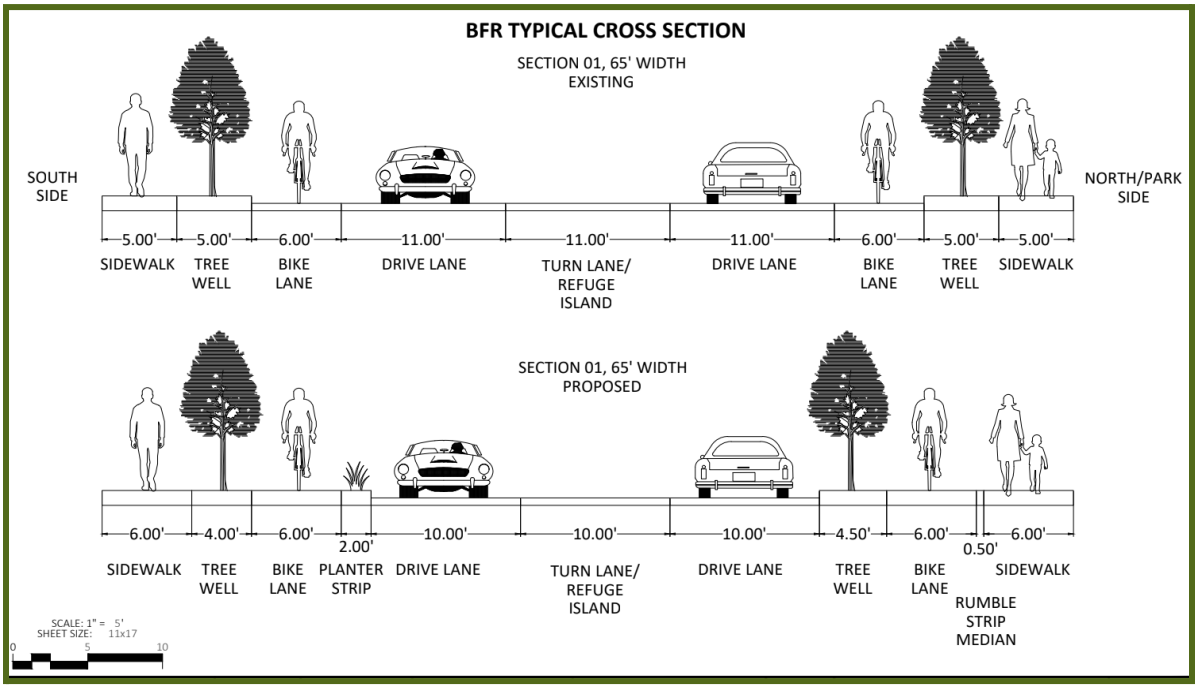

Figure 3.1.2b Existing and Proposed Boones Ferry Road Cross-section

3.1.3 Considerations

The width of the sidewalk considered was chosen based on the TDC section 74.090 for pedestrian walkways, which require a minimum width of 10 feet for the sidewalk. Curb ramps at the start and end of sidewalks are also included in the widening of the sidewalks. The curb ramp design elements must follow standards from the Public Right-of-Way Accessibility Guidelines (PROWAG) for curb ramp transitions.

Note: The cross section design in figure 3.1.2b is a typical section of BFR which has a typical cross section of 65 ft. This is shown in Appendix A (Drawing Sheet A4) along with a section modeling BFR at intersections which is 87 ft in width (Sheet A5). The north and south sides look different as part of the design idea was to keep some of the existing infrastructure the same. So, the refuge islands in the turn lanes and the concrete median shown in Sheet A5 can remain in place. Also, no new asphalt would be needed, only expanded sidewalks and new road striping. The south side has more division between bikers and walkers since this is the side with more shops and restaurants, this gives more of a downtown feel and makes pedestrians feel safer as they enjoy the downtown area. The north side has more space for pedestrians, especially when no bikes are going through, there is lots of space for people walking.

3.2 Raised Bicycle Lanes

The raised bicycle lanes replace the on-road bicycle lanes which provide a safer travel lane for cyclists while physically separating cyclists from vehicle lanes where applicable. The existing bike lanes are on-road painted lanes on both sides along BFR which only provides a basic line separation between bicycles and vehicles. This design was selected after the group noticed people biking on the sidewalk. This makes sense for people to choose the safer option, but this can also lead to dangerous interactions between bikers and walkers. This design would create physical barriers between vehicles and cyclists and walkers to reduce these interactions creating a better sense of safety for all modes of transportation.

3.2.1 Design Criteria

According to the TDC Section 203.2.11B, bike lanes must be separated from motor vehicle travel lanes and must be marked and signed to separate both lanes. To meet these requirements, the bike lanes will be raised 6 inches above road level and meet with the sidewalk. This will create a physical separation between cyclists and motor vehicles enhancing the safety of cyclists.

3.2.2 Geometry

The raised bike lanes will run along the whole length of SW BFR from the intersection at SW Tualatin Road to SW Barngrover Way except at exclusive turn lanes. The image below shows the locations where the raised bike lanes will be excluded from the design. The design raises the existing bike lanes 6 inches which meets the height level of the sidewalks and has a lane width of 6 feet. The total raised bike lane length per side of the road is estimated to be 1,040 feet. Due to having the same elevation as the sidewalk, the bike lane will be separated from the sidewalk by the addition of lane markings that follow Section 9E.07 from the Manual on Uniform Traffic Control Devices (MUTCD) and the physical barriers provided by the tree wells on the sidewalk.



Figure 3.2.2 SW Boones Ferry Road bike lane sections excluded from being raised

3.2.3 Considerations

Final design considerations include the addition of traffic delineators to provide a physical barrier between the raised bike lanes and the motor vehicle lanes. This consideration also follows Section 9E.07 and Chapter 3G from the MUTCD for separated bicycle lanes and traffic delineators. The other final design consideration consists of repainting the existing bike lanes that will not be raised due to their proximity to exclusive turn lanes at intersections. This consideration should follow Section 9E.02 for bicycle lanes at intersection approaches for required road markings.

3.3 Raised Crosswalks

Existing crosswalks along SW BFR are on-level with the road elevation and are marked. It was decided that by raising the existing crosswalks along SW BFR, it should slow down motor vehicle traffic providing pedestrians a safer passage while crossing the road. There are also pedestrian refuge islands which are currently implemented at some sections of SW BFR which provide safer crossings. With the additional raised crosswalks, SW BFR can be considered safer by pedestrians and visitors to Downtown Tualatin.

3.3.1 Design Criteria

Each raised sidewalk follows the guidance from the ODOT Highway Design Manual section for 821.1.5 for raised crosswalks and section 830.4 for marked crosswalks. The design also includes detectable warning surfaces that meet ADA standards and follows Chapter 3C from the MUTCD for crosswalk markings to provide accessibility features for pedestrians.

3.3.2 Geometry

Raised crosswalks will be implemented across all major existing crosswalks along SW BFR. The locations that will include raised sidewalks can be found as call outs on Drawing Sheet A1. The crosswalks will be raised appropriately depending on the elevation of roadway at each crosswalk but on average they will be raised 4 inches and will be 10 feet wide. The average cross length of SW BFR is approximately 60 feet and the total number of raised crosswalks that will be implemented is 3. Figure 3.3.2 shows an example from another location of what a raised crosswalk would look like.



Figure 3.3.2 Example of raised crosswalk
(U.S. DOT Federal Highway Administration)

3.3.3 Considerations

An additional design consideration for the raised crosswalks is to combine the raised crosswalk with flashing push button crossing signage. This additional consideration alongside reflective crosswalk markings will provide more visibility to incoming traffic improving the safety of pedestrians. Three of those crosswalks already implement push button crossing signage. The given dimensions are recommended for the current speed limit of 25mph, so this would not have to change. This addition would give This consideration will follow guidelines from PROWAG section R307.3 and from Chapter 4 in the MUTCD.

3.4 Art, Bench, Fountain, & Parklet Installation

There is currently one existing art installation, two bench locations and no existing water fountains or parklets along BFR. Providing areas where art, benches and water fountain installations can be placed will promote visits to the City of Tualatin by enhancing the streetscape. This is also an opportunity to promote the city and its local artists and to visitors to the community.

3.4.1 Design Criteria

The installation of the parklets locations must follow guidance from the TDC and receive approval from the City of Tualatin. Art installations must not interfere with the traffic of pedestrians and cyclists additionally they must be located in areas with ample space. This also applies to the installation of benches and water fountains. Likely locations for these design elements are near the future park entrance, near existing bus stops and outside the Tualatin Public Library. See Drawing sheet A1 in Appendix A for the location of these improvements, some options are shown in Figure 3.4.3.

3.4.2 Geometry

There are two existing bus stop locations along SW BFR which will have a prefabricated bench installed beside the stop. The art installation concrete pads provide flexibility from changing or choosing art to install at a later date by simply mounting the installation to the concrete pad. The pad has set dimensions of 6 feet by 6 feet and 6 inch depth with pre-installed bolt holes to mount the art. The water fountains will also be prefabricated which comply with Chapter 6 of the ADA standards and Section 74.110 from the TDC. An example of an installation from a different location is shown in Figure 3.4.2.



Figure 3.4.2 Example of a bench station *(Colin Selig: Sculptures + Sustainable Design)*

3.4.3 Considerations

The location to install concrete pads for art was chosen based on estimated high foot traffic areas, which include the park entrance that is near the BFR bridge and the Tualatin Public Library. The park is also estimated to have high foot traffic and therefore having a water fountain near the entrance will provide the visitors and community with another amenity. While this design does not include multiple water fountain installations throughout the future park area it serves as a first step into future park improvements.



Figure 3.4.3 Possible Parklet installation locations along Boones Ferry Rd

3.5 Street Lighting

SW Boones Ferry Road currently utilizes decorative overhead street lighting which is spaced every 60 feet on-center and no existing decorative tree lighting. Current lights focus on illuminating the road. Updating the street lighting and implementing decorative tree lighting along the proposed pedestrian and cyclist routes on SW BFR was selected to enhance the safety by improving visibility which can prevent accidents and crime rates as well as enhance the streetscape of SW BFR.

3.5.1 Design Criteria

Street lighting will follow the Tualatin Public Works Construction code guidance along with the ODOT Lighting Design Manual. Street lighting will provide increased visibility at all crosswalks and intersections along SW BFR, which should include the implementation of light posts on both sides of BFR with energy efficient LED lamps. The implementation of decorative permanent lighting on trees along the SW BFR sidewalks will turn on during dusk to enhance the pedestrian walkways. Decorative lights used are required to be weather resistant to promote long term usage. Drawing sheet A1 in Appendix A shows the placement and locations of street lighting improvements made along BFR.

3.5.2 Geometry

Light poles are installed at the start of each major crosswalk and intersections along SW BFR on both sides of the road. This will provide sufficient visibility for pedestrians on the sidewalk and crosswalks as well as motor vehicle drivers to safely traverse through BFR at critical intersections. Each tree along the SW BFR sidewalk will implement weather resistant decorative lights.

3.5.3 Considerations

Due to the increased nature of accidents occurring near intersections and road crossings, increased street lighting would help prevent these types of accidents. The shareholders would also like to enhance the streetscape of BFR which is why the addition of decorative lights on the trees was selected. While there are no standards for the decorative street lighting, the implementation would still require permission from the City of Tualatin.

3.6 Plants and Trees

SW Boones Ferry Road currently implements tree wells along the sidewalks on both sides of the road. Some of those tree wells are currently overgrown with tree roots which have lifted the tree well grates that could be a hazard for pedestrians. The addition of plants and trees were selected to enhance the image of the city while also acting as a physical barrier between the roadway, cyclists and the community and its visitors.

3.6.1 Design Criteria

The addition of plants and trees must follow TDC Chapter 73B. Location of new landscaping will take place along the SW BFR sidewalk where 4 foot wide tree wells have been designated for the placement of trees. The lengths can vary based on the allowed space. The type of trees used need to be selected based on the Eligible Street Tree List from the City of Tualatin. These trees provide a physical barrier between the sidewalk and the raised bike lane and enhance the streetscape by promoting a natural environment.

The tree wells must also include the installation of new cast iron tree grates which will protect the trees and provide a safe flat surface for pedestrians to walk on. The location of these implementations can be seen in Appendix A, sheet A1. Smaller 2 foot planters will also be used on the south side of the road to provide separation between bikers and the drive lane. These planters and tree wells also give opportunities for stormwater management infrastructure. An example of tree wells with runoff inlets is shown in Figure 3.1.2.

3.6.2 Geometry

The trees are separated by 30 feet measured on-center and will be placed all along SW BFR. Sections within the sidewalk that have bus stop signage, benches, and utility poles will require trees to be placed further apart if the total length where signs, benches, and utility poles exist exceed the 30 foot separation length. The plan sheet found in Appendix A shows the placement of each tree along SW BFR.

3.6.3 Considerations

Using the Eligible Street Tree List provided by the City of Tualatin, the type of tree selected for implementation was the Golden Desert Ash. This tree meets the 4 foot width requirement for the tree well, is compatible with powerlines, and grows relatively small which will not affect the mobility of the sidewalk and bike lane. Final design also considers appropriate irrigation systems to each tree that will follow guidelines from Table 73B-2 found on Section 73B.060 of the TDC. Cast iron tree well covers are also considered for the design to promote the streetscape along SW BFR.

3.7 Tunnel Element

The proposed tunnel element will provide an exclusive path across SW BFR from SW Barngrover Way to the future park entrance. The tunnel was selected because it introduces a safe passageway for pedestrians and cyclists to reach across SW BFR. It also connects the existing Tualatin River Greenway trail to the future park increasing pedestrian and cyclist mobility along Downtown Tualatin.

3.7.1 Design Criteria

It is important to note that for the scope of this project, developing a complete design for the tunnel element along with the other proposed improvements is beyond the scope of the project. Therefore, a preliminary conceptual design for the tunnel element is being proposed. The tunnel must be constructed with the use of appropriately designed retaining walls to prevent the road and tunnel from collapsing. The top section of the

tunnel must also be structurally designed to safely carry the load of vehicles and pedestrians as well as provide a structurally safe passage underground.

3.7.2 Geometry

The retaining walls must span the cross-section length of BFR (see sheet B2) ; this will also include a portion outside the cross-section length of BFR to safely prevent any land from collapsing on the tunnel segment. The depth of the retaining walls must span at least 20 feet or more depending on an appropriate design approach for the retaining wall. The top/road section of the tunnel should span at least 80 feet, providing ample room for two way single lanes with additional room for sidewalks and bike lanes on both sides of the road. The sidewalks and bike lanes should follow the new improved widths and implementations of proposed designs for sidewalks and bike lanes.

3.7.3 Considerations

After appropriate engineering design for retaining walls and road/top section of the tunnel, pre-fabricated retaining walls and road sections are to be considered for the design. Using pre-fabricated sections shall provide a cost and time effective implementation of the design while also ensuring that the safety of drivers, pedestrians and cyclists is kept as a priority. The final design also considers appropriate lighting within the tunnel segment, a suitable water drainage system, and a pre-fabricated guard rail system that prevents vehicles and pedestrians from leaving the roadway on top of the tunnel. After crossing under BFR, pedestrians would still be separated from the park, as Hedges Creek goes through this area. There is the option to follow west along BFR to get to the vehicle entrance. Otherwise, a bridge crossing over Hedges Creek would be required.

3.8 Construction Cost Estimate

The total expected cost for the Boones Ferry Road Walkability Project is estimated to be $__. The preliminary cost estimate tables for the preferred project implementations can be seen in Appendix B Tables 1 through 4. These tables include over 30 items and cover the cost of material, existing material removal, and mobilization and traffic control costs. It is important to emphasize that these cost estimates do not account for inflation, permit fees, or maintenance costs after implementation.

3.8.1 Cost Estimate Calculations

Tables in Appendix B highlight the quantities, cost per unit as well as the total cost per design implemented. The costs per unit that were used were estimated using the ODOT Average Item Price Report to provide a close approximation of costs for the project. The

quantities for existing material were estimated using the measurement tool on Google Earth and the quantities for the material of designs implemented were estimated using Google Earth measurements along with measurements taken from the project's plan sheets.

3.9 Construction Schedule

The duration of the construction schedule has been divided into 5 sections. This schedule can be seen in Appendix D. This schedule includes the start and finish dates, establishes deadlines for project progress, and lists the order of the tasks as they should be completed.

4.0 Design Requirements, Regulatory Compliance, and Permitting

The implementation of the proposed solutions along SW Boones Ferry Rd must comply with federal, state, and local regulations and laws. Meeting these regulations and requirements will ensure the project meets the proper safety, accessibility, environmental, and construction standards. The project will primarily be regulated by the City of Tualatin Development Codes, the City of Tualatin Public Works Construction Codes, federal PROWAG accessibility standards, and transportation design guidelines such as the MUTCD (Manual on Uniform Control Devices). Additional environmental regulations and permits are to be considered due to the project's proximity to the Tualatin River and Hedges Creek Floodplain.

4.1 City of Tualatin Development Codes

- **74.030 - Street Standards:** Establishes the maximum block length and connectivity requirements to improve pedestrian and bicycles access throughout the traffic and transportation system.
- **74.090 - Bikeways and Pedestrian Paths:** Requires the construction of bicycle and pedestrian paths to connect to existing or planned multi-use trails or bikeways. This code also requires adequate striping, signage, and easements where necessary for connections to public right-of-way.

4.2 City of Tualatin Public Works Construction Codes

- **203.2.14 - Sidewalks:** Sidewalks must be constructed according to the Public Right-of-Way Accessibility Guidelines (PROWAG). Sidewalk widths must also comply with the City Transportation System Plan standards.
- **203.2.15 - Curb Ramps:** Curb ramps must meet PROWAG accessibility standards and follow City standard drawings.
- **312 - Concrete Sidewalks and Pathways:** Specifies construction materials and thickness for sidewalk infrastructure.
- **317 - Pavement Marking:** Provides requirements for roadway striping and bike lane markings.

4.3 PROWAG and Accessibility Requirements for Curbs

All pedestrian infrastructure and curbs must comply with the ADA (American with Disabilities Act) and PROWAG (Public Right-of-Way Accessibility Guidelines). Key drawings that must be followed

include ADA Curb Ramp codes 460 through 464 (PROWAG, 2023). Relevant codes for PROWAG include:

- **R209 - Street Furniture:** Ensures the proper design and spacing when placing street furniture on public infrastructure, such as benches at transit stops.
- **R302 - Pedestrian Access Routes:** Ensures that pedestrian routes are accessible, and navigable for those with mobility impairments.
- **R304 - Curb Ramps and Blended Transitions:** Ensures curb ramps are traversable even to those with mobility impairments.
- **R305 - Detectable Warning Surfaces:** Detectable warning surfaces shall be placed accordingly and sized accordingly.
- **R306 - Crosswalks:** Ensures proper timing for pedestrian signals on traffic control devices and proper design when connecting pedestrian passage to crosswalks

4.4 Traffic Control and Transportation Standards

Traffic control devices, pavement markings, and pedestrian crossing treatments must comply with the MUTCD (Manual on Uniform Traffic Control Devices) published by the Federal Highway Administration (MUTCD, 11th Edition).

- **Section 2B - Regulatory Signs:** Specifies design and placement standards for regulatory signage, including pedestrian crossing signs and bicycle related roadway signage.
- **Section 3B - Pavement Markings:** Establishes standards for roadway striping, bicycle lane markings, and pedestrian crosswalk markings. The sub-sections list and ensure that pedestrian crossings and bicycle facilities are clearly visible and consistent with national design standards and practices.
- **Section 4E - Pedestrian Signals:** Defines requirements for pedestrian signal heads, countdown timers, and accessible pedestrian signals at signalized intersections. These features improve safety and accessibility for pedestrians crossing major roadways.

Additionally the project must comply with the Oregon Department of Transportation's codes for pedestrian needs to ensure pedestrian safety and to meet guidelines provided by the ADA (ODOT, Highway Design Manual). These codes are primarily located in Section 800, with notable ones being:

- **Section 805 - Pedestrian Needs:** Specifies that the design of sidewalks and crossings will take the ADA into account and ensure that all pedestrian infrastructure is accessible to people with disabilities.
- **Section 815 - Curb Ramps:** Specifies that curb ramps will use proper design and ensure that pedestrians with varying abilities can access these components.
- **Section 821 - Tactile Walking Surface Indicators:** Provides a means of delivering effective communication to those of low vision or are blind whilst also assisting other pedestrians.

- **Section 830 - Crosswalks and Crossings:** Ensures the design and construction of crosswalks use a raised median, and provide adequate high-visual striping to crosswalks.
- **Section 835 - Bicycle Crossings:** Specifies that cyclists may use pedestrian crossings, and that island crossings must have openings of 6 to 8 ft in width for bicycles to use adequately.
- **Section 845 - Shared Use Paths:** States that the AASHTO Bike guide should be consulted for geometric design guidelines if a path of sidewalk is shared by cyclists and pedestrians. Appropriate signage is necessary to inform pedestrians and cyclists of the shared path.

4.5 NACTO Guidelines

NACTO (National Association of City Transportation Officials) provides some excellent guidelines that can be followed or used as a rule-of-thumb when it comes to the design of public infrastructure along the SW Boones Ferry Rd area (NACTO, 2026). Some guidelines include:

- **Sidewalks:** Design guidelines recommend a minimum sidewalk cross-section of 5ft, that is exclusive of other amenities. This recommended cross-section is large enough for at least 2 people to be walking side by side. Sidewalk standards should accommodate higher than anticipated pedestrian volumes.
- **Crosswalks and Crossings:** Crosswalks should be applied where pedestrian traffic is anticipated or encouraged. Crosswalks should have visible markings to guide pedestrians and reinforce right-of-way at intersections
- **Curb Extensions:** Curb extensions serve as a visual cue to drivers that they are approaching a pedestrian crossing or even a neighborhood area whilst increasing overall visibility of pedestrians. Curb extensions may be designed as edge islands with a 1-2 ft gap from the curb or a trench drain.

4.6 Environmental and Floodplain Considerations

This project is located near the Tualatin River and Hedges Creek floodplain, which requires consideration of environmental impacts during construction. If construction occurs near regulated waterways, permits will be required from agencies such as:

- DSL (Oregon Department of State Lands)
- U.S. Army Corps of Engineers

Required considerations of environmental impacts during construction include:

- Stormwater management and erosion
- Sediment control
- Avoidance of disturbance to riverbanks and vegetation

4.7 Permitting Requirements

Construction within public right-of-way will require permits and approvals from the City of Tualatin, which will likely include:

- Right-of-Way Construction Permit
- Traffic Control Plan Approval
- Erosion and Sediment Control (if land disturbance thresholds are succeeded and construction occurs near regulated waterways.)
- Engineering Plan Approval

5.0 Conclusion

For the Tualatin Boones Ferry Road Walkability Study, existing conditions were analyzed to come up with design strategies to enhance walkability for people on foot and bike specifically in the downtown area of Tualatin. After considering safety and balancing design constraints related to cost, environmental impact, overall traveler experience, and other project considerations, Alternative E, the tunnel beneath SW Boones Ferry Road, was made the preferred design option.

A direct, non-interrupted route from the Tualatin River Greenway Trail to the new waterfront park will be made by the suggested tunnel design. Because of the tunnel option, there will be no user-traffic conflict, where safety is invariably increased when walkways are compared to on-ground roadway crossings. The tunnel improves access and connection and increases user walkability and integration in the city of Tualatin's downtown area.

The general improvements create an enjoyable space for pedestrians. Widening sidewalks and slowing down cars with narrower drive lanes would improve safety. This can also be improved with more lighting, raised sidewalks and by separating bike lanes from vehicle traffic. The addition of mini parks and art installations draw people to the downtown and create a community feel.

Even when there are challenges brought on with this tunnel option due to conditions of the floodplain, as well as the design of drainage and conflicts with existing utilities, the frame of solving these challenges with engineering design and coordination design with associated agencies is positively considered. Safety, user experience, and improved connection pose high relative benefits and will sustain this project.

The safety, convenience and walkability of the tunnel design for pedestrians and cyclists will not be at the cost of roadway operations for vehicles; this is another positive to the design of the tunnel. For this reason, the City of Tualatin's adoption of Alternative E is encouraged.

To make progress on the project, the following steps should be taken. First, project team members should enter the detailed engineering design phase, which should include, geotechnical investigations, hydraulic and floodplain analysis, and the structural designs. Next, connecting local and regional agencies and utility providers will be essential to identify conflicts and determine permitting. Next, the environmental permitting must be completed, especially in light of the project's proximity to the Tualatin River and Hedges Creek. A construction plan supported by detailed cost and phasing estimates will be critical to project planning and securing funding.

These changes would support a wider range of transportation options, improve safety, and contribute to a dynamic and secure downtown Tualatin. The new construction of the design is a

commitment to the community and will be an asset of a community's infrastructure that meets both current and future needs.

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APPENDICES

The following appendices are attached.

A. Drawings

B. Construction Cost Estimate

C. Construction Schedule

D. Specifications

E. QC Checklist

Appendix A

DRAWINGS

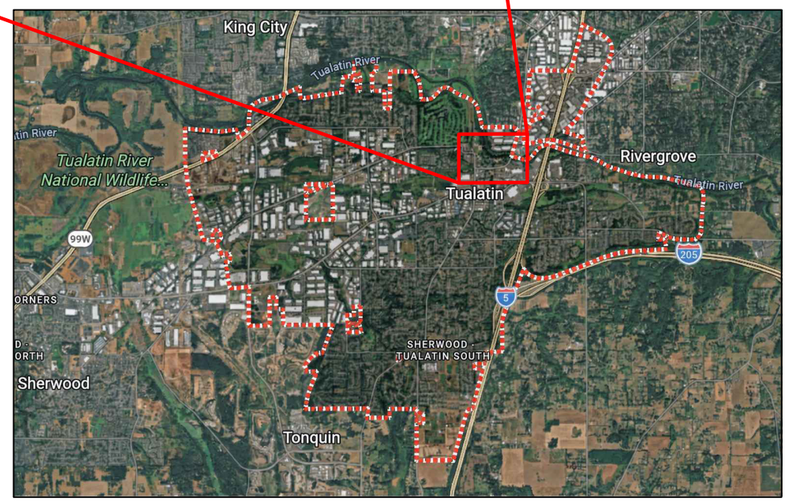
SHEET LIST	
SHEET NAME	SHEET NUMBER
COVER	A1
GENERAL CHANGES	A2
CROSS SECTION LAYOUT	A3
CROSS SECTION 01	A4
CROSS SECTION 02	A5
TUNNEL TOPOGRAPHY	B1
TUNNEL SIDE VIEW	B2

GENERAL NOTES:

1. ALL EXISTING CONDITIONS SHOULD BE VERIFIED PRIOR TO PROCEEDING WITH WORK.
2. ALL CONSTRUCTION SHALL ADHERE TO OREGON DEPARTMENT OF TRANDPORTATION.



BOONES FERRY ROAD



DATE	REVISION
3/2/2026	DRAFT 1
3/15/2026	DRAFT 2
5/3/2026	DRAFT 3
6/7/2026	DRAFT 4

CITY of TUALATIN

PREPARED BY:
GROUP 3
NATALIE SMITH
AFNAN AJINA
KYLE PETCHEY
ETHAN FREDERICK
EMMANUEL CASTANEDA

ROLE	CHECK DONE
GROUP NUMBER: 3	
CE 484	
PROJECT MANAGER: NATALIE SMITH	6/7/2026
DRAWN BY: ETHAN FREDERICK	6/7/2026

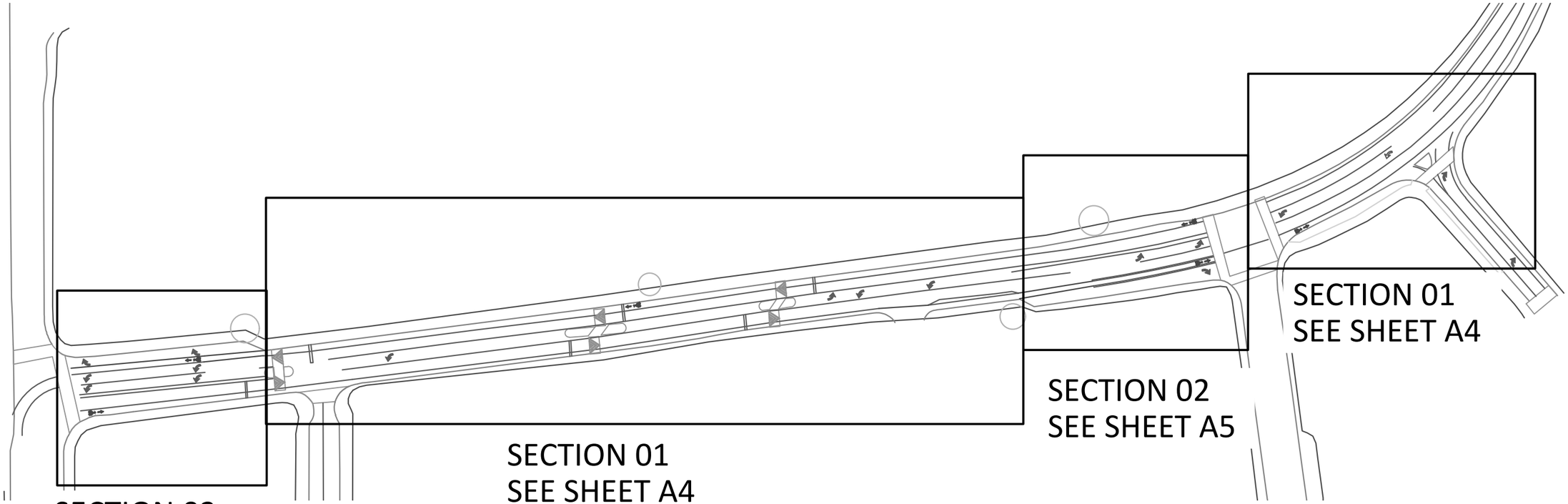
Tualatin Boones Ferry Road Walkability Study

DRAWING NO.:

A1



3/2/2026	DRAFT 1	CITY of TUALATIN		PREPARED BY: GROUP 3 NATALIE SMITH AFNAN AJINA KYLE PETCHEY ETHAN FREDERICK EMMANUEL CASTANEDA	GROUP NUMBER: 3		Changes Overlaid in Green	DRAWING NO.: A 6
					CE 484			
					PROJECT MANAGER: NATALIE SMITH	3/2/2026		
					DRAWN BY: ETHAN FREDERICK	3/2/2026		
DATE	REVISION				ROLE	CHECK DONE		



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SHEET SIZE: 11x17

0 120 240

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DATE	REVISION
3/2/2026	DRAFT 1
3/15/2026	DRAFT 2
5/3/2026	DRAFT 3
6/7/2026	DRAFT 4

CITY of TUALATIN

PREPARED BY:
GROUP 3
NATALIE SMITH
AFNAN AJINA
KYLE PETCHEY
ETHAN FREDERICK
EMMANUEL CASTANEDA

GROUP NUMBER: 3	
CE 484	
PROJECT MANAGER: NATALIE SMITH	6/7/2026
DRAWN BY: ETHAN FREDERICK	6/7/2026
ROLE	CHECK DONE

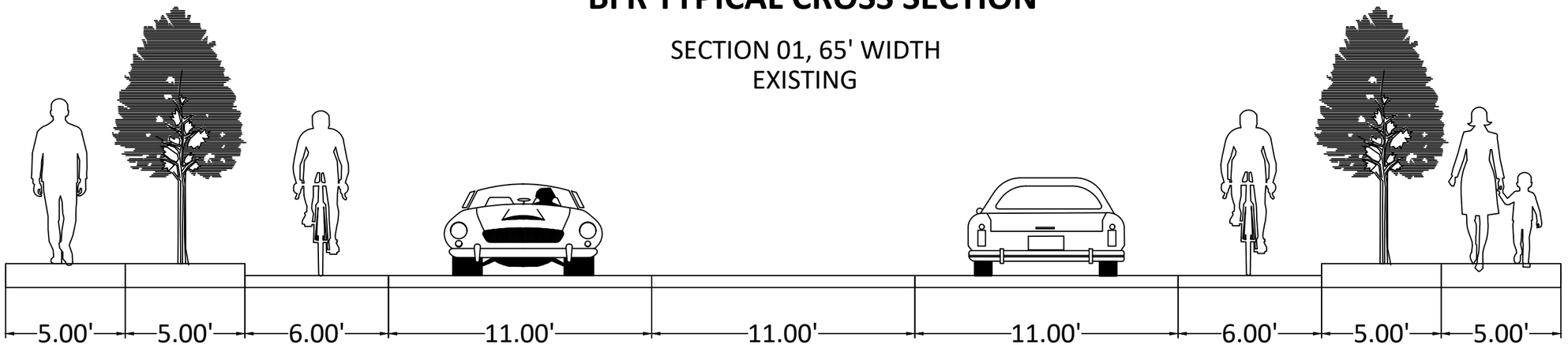
Cross Section Layout

DRAWING NO.:

A3

BFR TYPICAL CROSS SECTION

SECTION 01, 65' WIDTH
EXISTING



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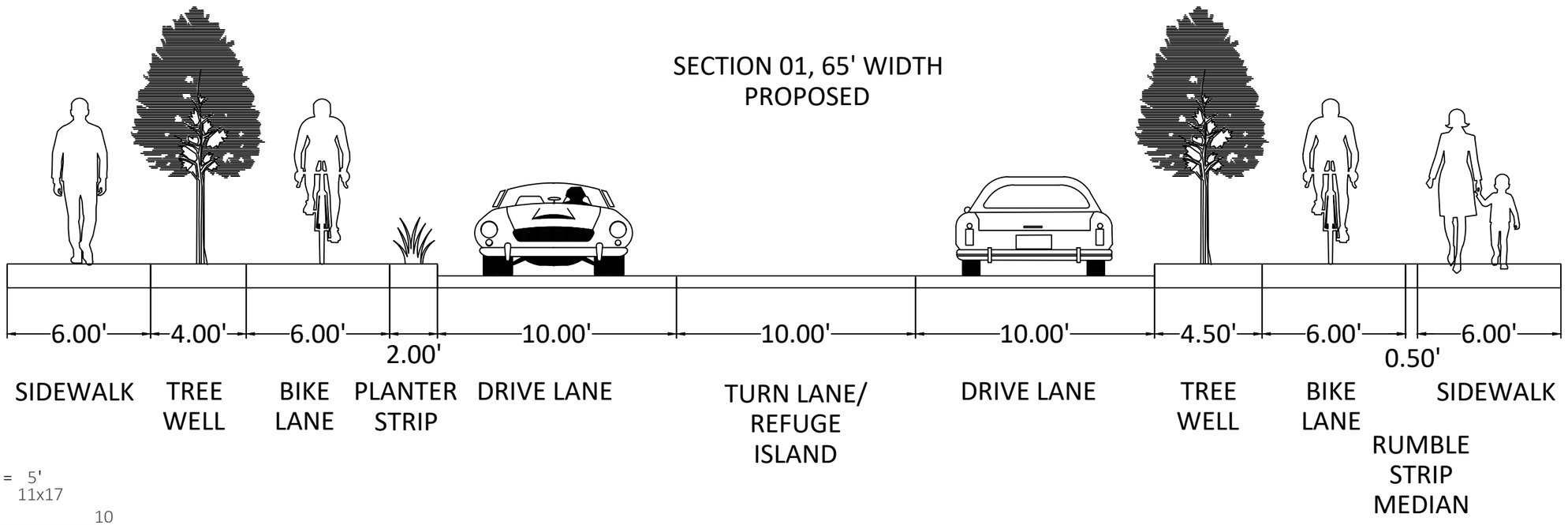
PROPOSED



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DATE	REVISION
3/2/2026	DRAFT 1
3/15/2026	DRAFT 2
5/3/2026	DRAFT 3
6/7/2026	DRAFT 4

CITY of TUALATIN

PREPARED BY:
GROUP 3
NATALIE SMITH
AFNAN AJINA
KYLE PETCHEY
ETHAN FREDERICK
EMMANUEL CASTANEDA

ROLE	CHECK DONE
GROUP NUMBER: 3	
CE 484	
PROJECT MANAGER: NATALIE SMITH	6/7/2026
DRAWN BY: ETHAN FREDERICK	6/7/2026

Cross Section 01

DRAWING NO.: A4

BFR AT INTERSECTIONS

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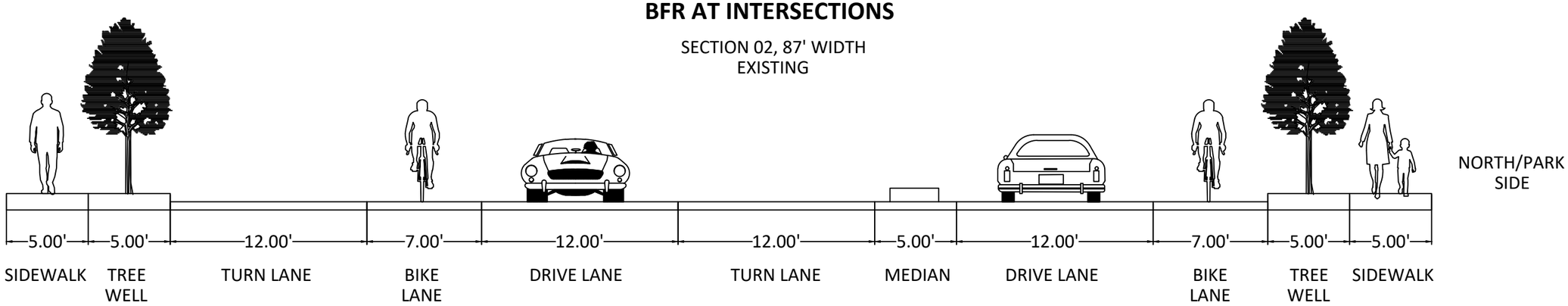

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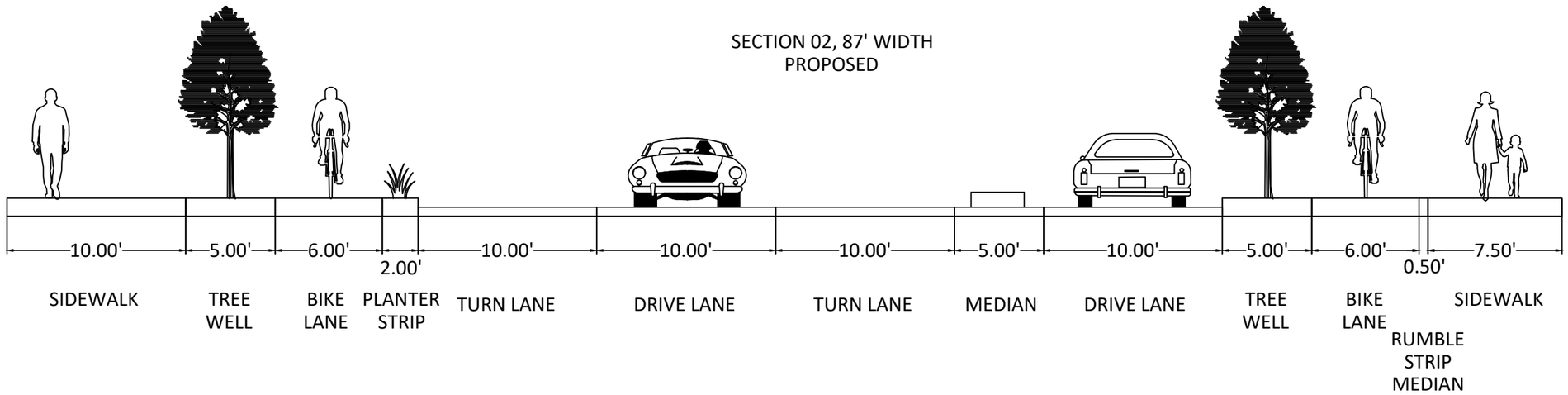

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SHEET SIZE: 11x17

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DATE	REVISION
3/2/2026	DRAFT 1
3/15/2026	DRAFT 2
5/3/2026	DRAFT 3
6/7/2026	DRAFT 4

CITY of TUALATIN

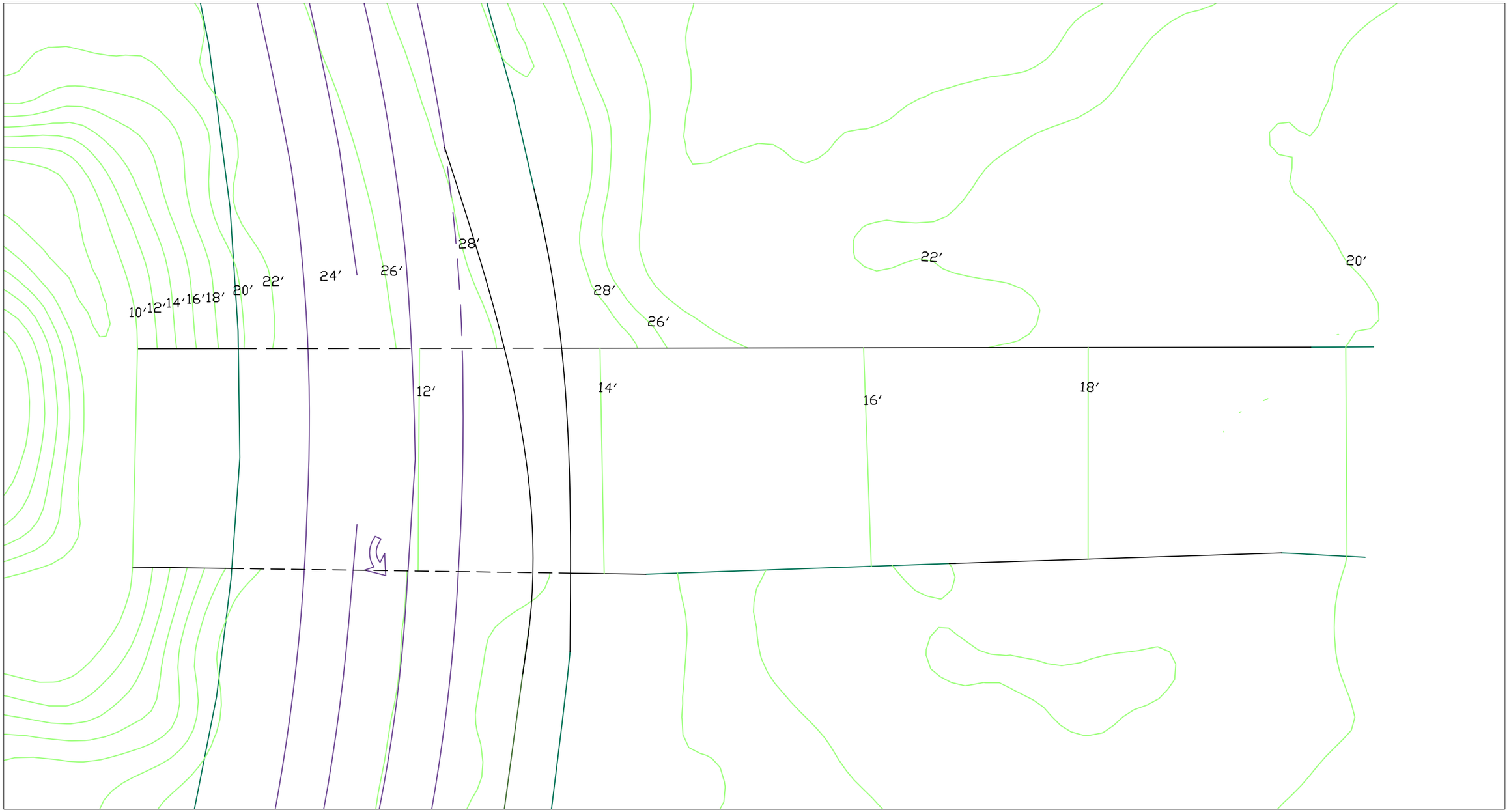
PREPARED BY:
GROUP 3
NATALIE SMITH
AFNAN AJINA
KYLE PETCHEY
ETHAN FREDERICK
EMMANUEL CASTANEDA

GROUP NUMBER: 3	
CE 484	
PROJECT MANAGER: NATALIE SMITH	6/7/2026
DRAWN BY: ETHAN FREDERICK	6/7/2026
ROLE	CHECK DONE

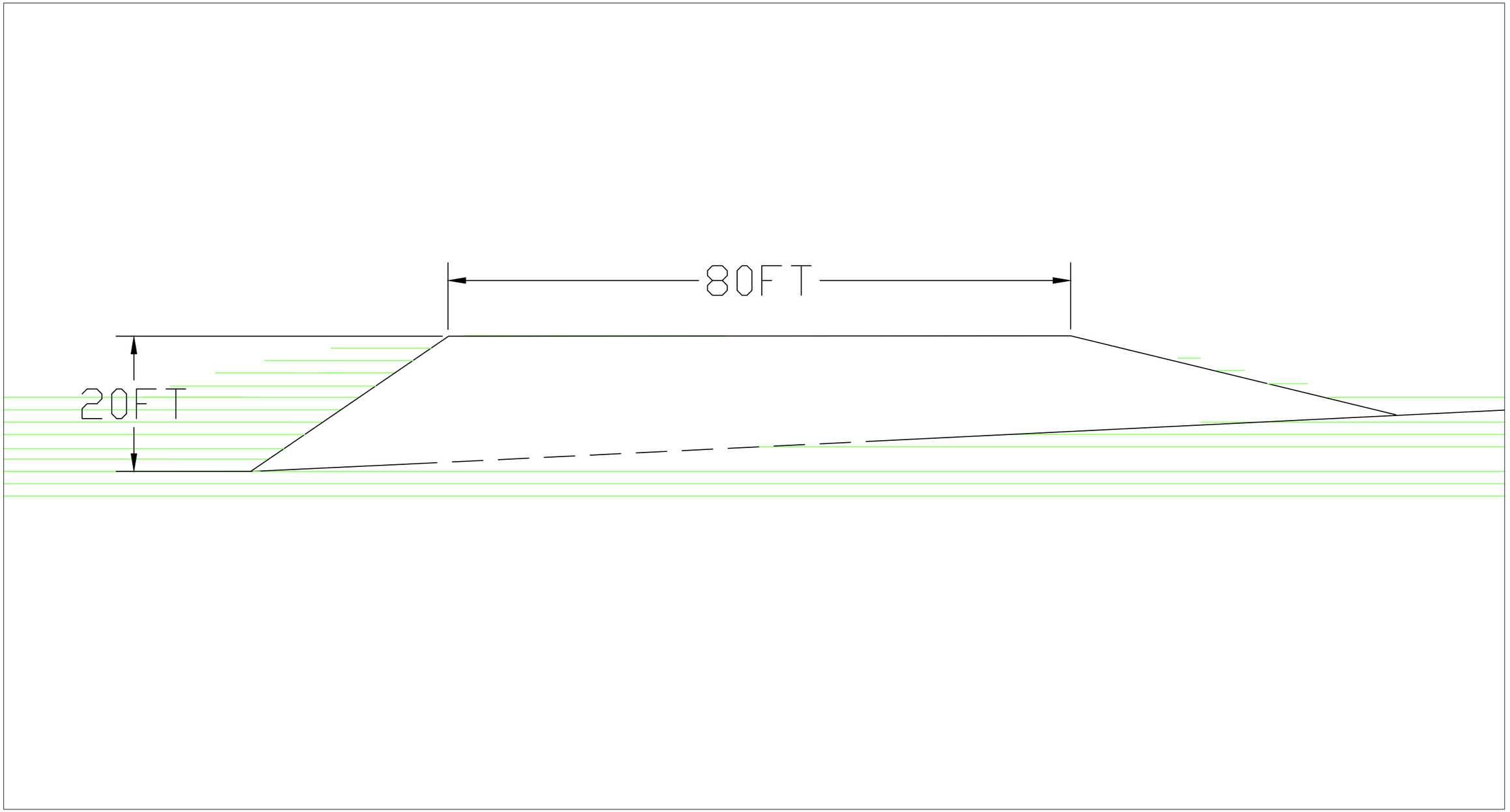
Cross Section 02

DRAWING NO.:

A5



5/2/2026	DRAFT 1	CITY of TUALATIN		PREPARED BY: GROUP 3 NATALIE SMITH AFNAN AJINA KYLE PETCHEY ETHAN FREDERICK EMMANUEL CASTANEDA	GROUP NUMBER: 3		Tunnel Topography	DRAWING NO.:
					CE 484			B 1
					PROJECT MANAGER: NATALIE SMITH	5/2/2026		
					DRAWN BY: ETHAN FREDERICK	5/2/2026		
DATE	REVISION				ROLE	CHECK DONE		



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					PROJECT MANAGER: NATALIE SMITH	5/2/2026		
					DRAWN BY: ETHAN FREDERICK	5/2/2026		
DATE	REVISION				ROLE	CHECK DONE		

Appendix B

Construction Cost Estimate

Unit costs rely on weighted average unit prices (2022) provided by ODOT. Quantities presented are planning-level estimates which consider the proposed design along with preliminary engineering assumptions. Costs presented will not represent the actual costs once final design, permitting, utility coordination, site conditions and the applicable market at the time of construction are considered. The calculations are based on the total length of the study area along BFR = 1,800 ft.

Section	Unit	Quantity	Unit Cost ($)	Total Cost ($)
Temporary Signs	ft^2	100	24.14	2414
Portable Changeable Message Sign	EA	2	7,903.74	15807.48
Flaggers	hr	160	65.60	10.496
Traffic Control Supervisor	EA	1	741.68	741.68
Subtotal				**18,974**

Table 1: Estimate Cost for Mobilization and Traffic Control During Construction Period

Section	Unit	Quantity	Unit Cost ($)	Total Cost ($)
Concrete Sidewalk	ft^2	26,550	17.37	461,174
Speed Table	EA	3	2,000	6,000
ADA Curb Ramp	EA	8	2,180.94	17448
Subtotal				**484,622**

Table 2: Estimate Cost for Pedestrian Infrastructure

Section	Unit	Quantity	Unit Cost ($)	Total Cost ($)
Green bike lane marking	ft	3,600	10.47	37,692
Concrete bike lane	ft	3600	55.88	201,168
Pavement repair	yd^2	436	20.66	9007.76
Removal of curb and gutter	ft^2	3600	17.76	63,936
Subtotal				**311,804**

Table 3: Estimate Cost for Roadway Work

Section	Unit	Quantity	Unit Cost ($)	Total Cost ($)	Notes
1. Tunnel Structure					
Precast box culvert (12ft x 10ft)	LF	80	$4,500.00	$360,000	RS Means Heavy Construction 2024; PNW labor premium applied
Portal headwalls — concrete (both ends)	EA	2	$22,000.00	$44,000	Retaining structure where culvert meets embankment
Waterproofing & joint sealing	LF	80	$85.00	$6,800	Elastomeric sealant at culvert joints
Section 1 Subtotal				$410,800	
2. Earthwork & Site Preparation					
Excavation & embankment removal	CY	1850	$38.00	$70,300	Includes dewatering allowance for Tualatin Valley clay soils
Subgrade stabilization / geotextile	SY	600	$18.00	$10,800	Likely needed given silty clay conditions
Backfill & compaction	CY	1200	$28.00	$33,600	Granular backfill, compacted lifts
Section 2 Subtotal				$114,700	

3. Approach Ramps (both ends)					
Ramp grading & earthwork	CY	2200	$32.00	$70,400	20ft rise; ADA 1:12 slope = ~240ft overall
Concrete ramp paving (6in)	SY	1400	$95.00	$133,000	Both ramp runs + landing areas
Retaining walls at ramp cuts	SF	1800	$45.00	$81,000	Segmental retaining wall to hold embankment at ramps
Handrails & guardrails	LF	500	$65.00	$32,500	Both sides of both ramps, galvanized steel
Section 3 Subtotal				$316,900	
4. Utility Relocation (allowance)					
Utility potholing & investigation	LS	1	$12,000.00	$12,000	Locate existing stormwater, gas, telecom before excavation
Utility relocation allowance	LS	1	$85,000.00	$85,000	Tualatin infrastructure; actual cost TBD by utility survey
Section 4 Subtotal				$97,000	
5. Tunnel Finishes & Safety					
Tunnel lighting (LED, weatherproof)	EA	12	$950.00	$11,400	Vandal-resistant, conduit & wiring included
Striping & wayfinding signage	LF	160	$8.50	$1,360	Matches surface bike lane unit cost
Security camera rough-in (conduit only)	LS	1	$4,500.00	$4,500	Conduit stub-outs for future cameras
Section 5 Subtotal				$17,260	
6. Soft Costs					
Traffic control (3 weekend closures)	LS	3	$18,000.00	$54,000	Significant savings vs live-road work
Erosion control & SWPPP compliance	LS	1	$15,000.00	$15,000	Oregon DSL and CWA Section 404 likely triggered
Structural engineering & design fees	LS	1	$95,000.00	$95,000	~10% of construction; required for road crossing permit
Construction inspection & testing	LS	1	$45,000.00	$45,000	Special inspection, compaction testing, materials

Section 6 Subtotal	$209,000	
Construction Subtotal	$1,165,660	
Contingency (15%)	$174,849	
TOTAL ESTIMATE	$1,340,509	

Table 4: Estimate Cost for Tunnel Work

Appendix C

Construction Schedule

Capstone Group 3 Project Schedule

Portland State University

Project Start Date: 3/15/2026

Project Manager: Natalie

Display Week: All

Scope [1]	Task [2]	Lead [3]	Start [4]	End [5]	Days [6]	% Done [7]
1	**Brainstorm**	[Name]	Sun 3/15/26	Sat 3/14/26	0	25%
1.1			Sun 3/15/26	Sat 3/14/26		100%
1.1.1			Sun 3/15/26	Sat 3/14/26		100%
1	**Design**		Sun 3/15/26	Sat 3/14/26	0	23%
1.1			Sun 3/15/26	Sat 3/14/26		100%
2.1.1			Sun 3/15/26	Sat 3/14/26		100%
3	**Planning**		Tue 9/09/25	Wed 10/22/25	44	
3.1			Tue 9/09/25	Tue 9/30/25		100%
3.1.1			Wed 10/01/25	Wed 10/22/25		100%
4	**Design II**		Tue 9/09/25	Wed 9/10/25	2	25%
4.1			Tue 9/09/25	Tue 9/09/25		100%
4.1.1			Wed 9/10/25	Wed 9/10/25		100%
5	**Construction**		Tue 6/30/26	Wed 6/30/27	366	
5.1	Planning & Initiation		Tue 6/30/26	Fri 7/31/26	32	0%
5.1.1	Obtain and Hire Contractors		Tue 6/30/26	Fri 7/31/26	32	0%
5.1.2	Finalizing Design		Wed 7/01/26	Fri 7/31/26	31	0%
5.2	Mobilization		Fri 7/31/26	Sat 8/15/26	16	0%
5.2.1	Traffic Control Setup		Fri 7/31/26	Sat 8/15/26	16	0%
5.3	Demolition & Removal		Sun 8/16/26	Wed 9/30/26	46	0%
5.3.1	Tunnel Excavation		Sun 8/16/26	Mon 8/31/26	16	0%
5.3.2	Adjustments to Utilities		Sun 8/16/26	Wed 9/30/26	46	0%
5.3.3	Concrete and Sidewalk work		Sun 8/16/26	Mon 8/31/26	16	0%
5.4	Construction		Wed 9/30/26	Tue 6/1/27	245	0%
5.4.1	Tunnel Construction		Wed 9/30/26	Sat 5/1/27	214	0%
5.4.2	Sidewalk Improvements		Sat 5/01/27	Tue 6/1/27	32	0%
5.4.3	Bike Lane Striping		Sat 5/01/27	Tue 6/1/27	32	0%
5.4.4	Crosswalk Markings		Sat 5/01/27	Tue 6/1/27	32	0%
5.5	Project Completion		Tue 6/01/27	Wed 6/30/27	30	0%
5.5.1	Final Check-off of Site		Wed 6/02/27	Sat 7/17/27	46	0%
5.5.2	Project Finish		Thu 6/17/27	Wed 6/30/27	14	0%

Week 1 16 Mar 2026 — Week 2 23 Mar 2026 — Week 3 30 Mar 2026 — Week 4 6 Apr 2026 — Week 5 13 Apr 2026 — Week 6 20 Apr 202

16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

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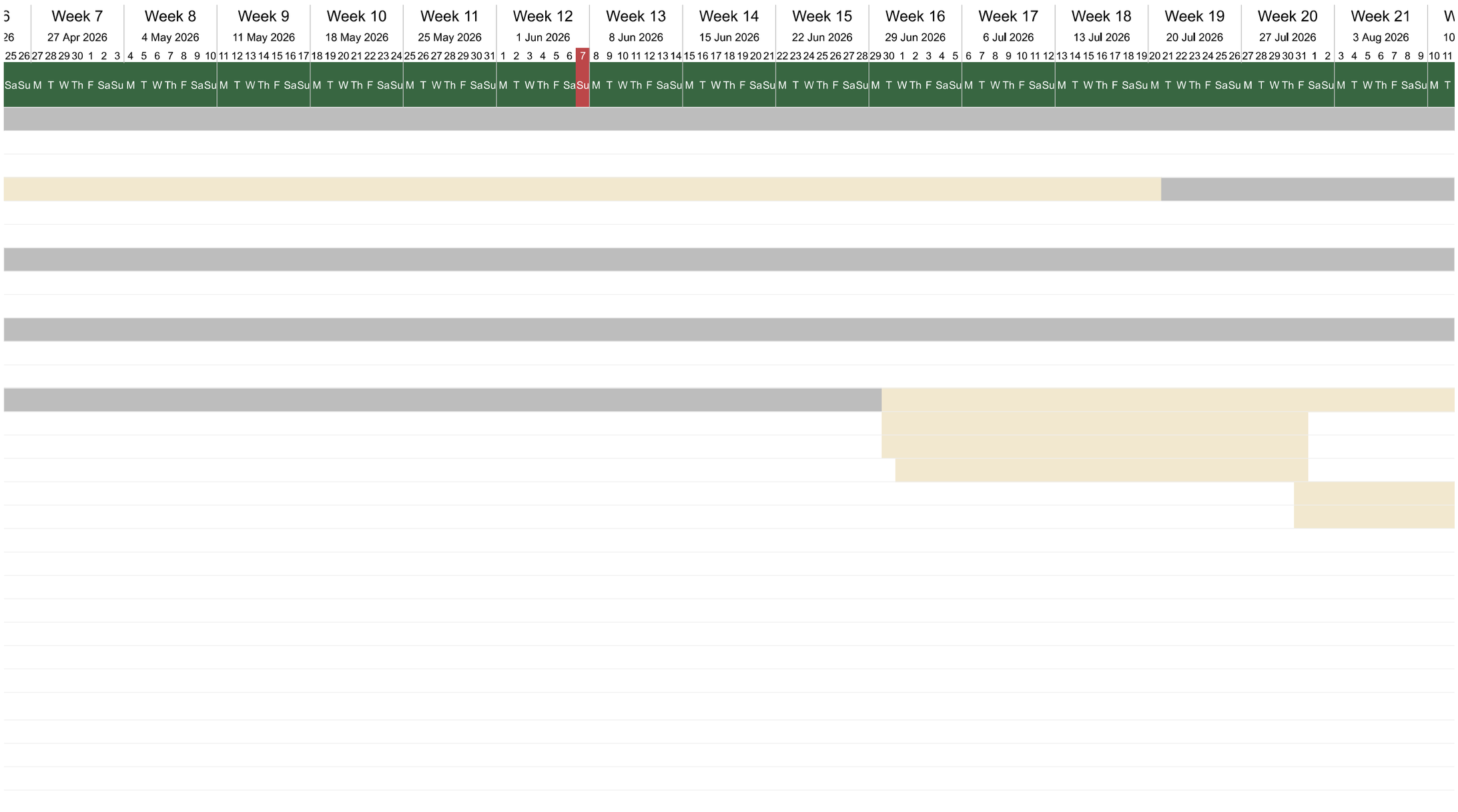
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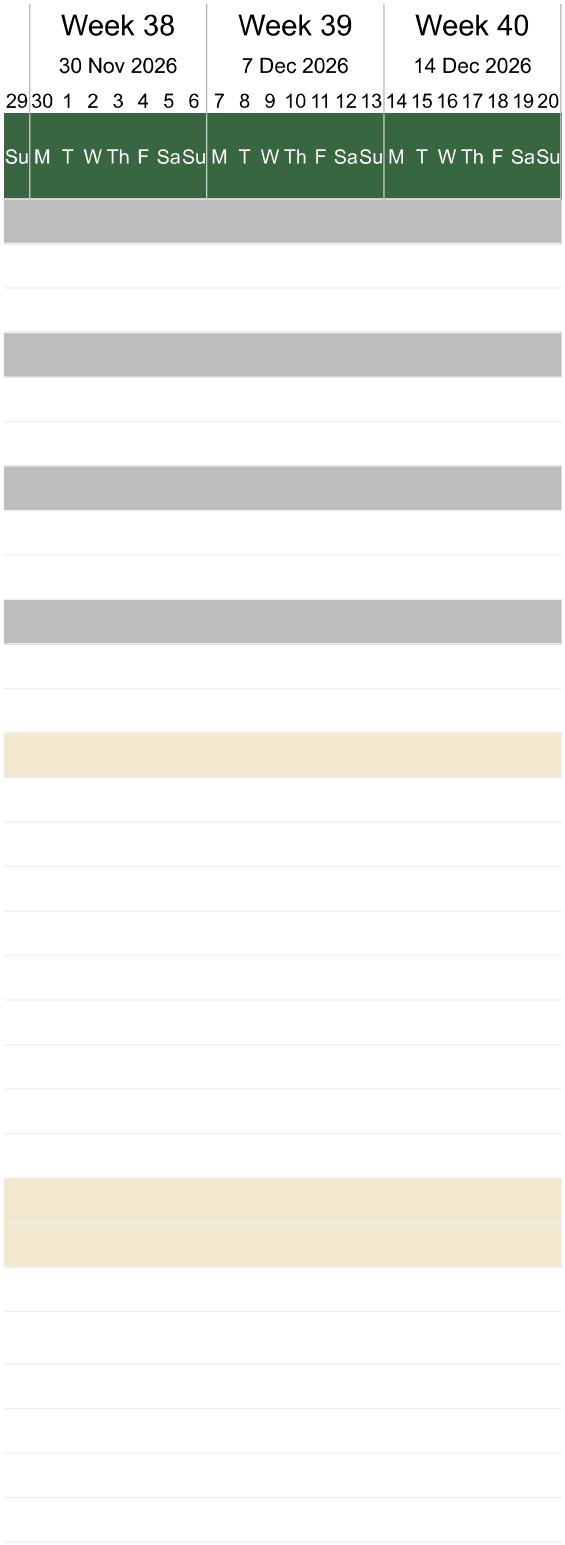
27 Apr 2026
Week 8
4 May 2026
Week 9
11 May 2026
Week 10
18 May 2026
Week 11
25 May 2026
Week 12
1 Jun 2026
Week 13
8 Jun 2026
Week 14
15 Jun 2026
Week 15
22 Jun 2026
Week 16
29 Jun 2026
Week 17
6 Jul 2026
Week 18
13 Jul 2026
Week 19
20 Jul 2026
Week 20
27 Jul 2026
Week 21
3 Aug 2026

Week 22	Week 23	Week 24	Week 25	Week 26	Week 27	Week 28	Week 29	Week 30	Week 31	Week 32	Week 33	Week 34	Week 35	Week 36	Week 37
Aug 2026	17 Aug 2026	24 Aug 2026	31 Aug 2026	7 Sep 2026	14 Sep 2026	21 Sep 2026	28 Sep 2026	5 Oct 2026	12 Oct 2026	19 Oct 2026	26 Oct 2026	2 Nov 2026	9 Nov 2026	16 Nov 2026	23 Nov 2026
12 13 14 15 16	17 18 19 20 21 22 23	24 25 26 27 28 29 30	31 1 2 3 4 5 6	7 8 9 10 11 12 13	14 15 16 17 18 19 20	21 22 23 24 25 26 27	28 29 30 1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18	19 20 21 22 23 24 25	26 27 28 29 30 31 1	2 3 4 5 6 7 8	9 10 11 12 13 14 15	16 17 18 19 20 21 22	23 24 25 26 27 28
W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa Su	M T W Th F Sa


Week 38
30 Nov 2026
Week 39
7 Dec 2026
Week 40
14 Dec 2026
29 30 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Su M T W Th F Sa Su M T W Th F Sa Su M T W Th F Sa Su

Appendix D

SPECIFICATIONS

Posted or 85th-Percentile Speed	Advance Placement Distance[1]									
	Condition A: Speed reduction and lane changing in heavy traffic[2]	Condition B: Deceleration to the listed advisory speed (mph) for the condition								
		0[3]	10[4]	20[4]	30[4]	40[4]	50[4]	60[4]	70[4]	80[4]
20 mph	225 ft	115 ft	N/A[5]	–	–	–	–	–	–	–
25 mph	325 ft	155 ft	N/A[5]	N/A[5]	–	–	–	–	–	–
30 mph	460 ft	200 ft	N/A[5]	N/A[5]	–	–	–	–	–	–
35 mph	565 ft	250 ft	N/A[5]	N/A[5]	N/A[5]	–	–	–	–	–
40 mph	670 ft	305 ft	100 ft[6]	100 ft[6]	N/A[5]	–	–	–	–	–
45 mph	775 ft	360 ft	125 ft	100 ft[6]	100 ft[6]	N/A[5]	–	–	–	–
50 mph	885 ft	425 ft	200 ft	175 ft	125 ft	100 ft[6]	–	–	–	–
55 mph	990 ft	495 ft	275 ft	225 ft	200 ft	125 ft	N/A5	–	–	–
60 mph	1,100 ft	570 ft	350 ft	325 ft	275 ft	200 ft	100 ft[6]	–	–	–
65 mph	1,200 ft	645 ft	450 ft	400 ft	350 ft	275 ft	200 ft	100 ft[6]	–	–
70 mph	1,250 ft	730 ft	525 ft	500 ft	450 ft	375 ft	275 ft	150 ft	–	–
75 mph	1,350 ft	820 ft	625 ft	600 ft	550 ft	475 ft	375 ft	250 ft	100 ft[6]	–
80 mph	1,475 ft	910 ft	725 ft	700 ft	625 ft	550 ft	450 ft	350 ft	200 ft	–
85 mph	1,600 ft	1,010 ft	825 ft	800 ft	750 ft	675 ft	575 ft	450 ft	300 ft	150 ft

Table E-1: Guidelines for Advance Placement of Warning Signs, *MUTCD*.

Context	Arterial	Collector	Local
Urban Core	20-25 mph	20-25 mph	20-25 mph
Urban Mix	25-30 mph	25-30 mph	20-25 mph
Suburban Commercial or Residential	30-35 mph	25-35 mph	25-35 mph
Suburban Fringe	35-45 mph	30-40 mph	25-35 mph

Table E-2: Allowable Speed by Functional Class and Context, *ODOT.*

Element	Requirement	Source Code
Sidewalk	Min. Width of 60 in.	R302.2
Ramp Slope	Max. Slope of 8.3%	R304.2
Transitions	Min. Width of 48 in.	R304.5
Crossing Time	Min. Time of 7 sec.	R306.2

Table E-3: Relevant Specifications for Pedestrian Design, *PROWAG.*

Oregon Highway Plan Designation [9]	Minimum Pedestrian Realm Width (B+P+F)	Buffer Zone or Frontage Zone Treatment
Special Transportation Area (STA), Central Business District (CBD) or Traditional Downtown	10 feet	1 foot paved Frontage Zone
Special Transportation Area (STA), Central Business District (CBD) or Traditional Downtown	12 feet	4 feet softscaped buffer strip
Urban Business Area (UBA), commercial centers and other developed areas	6 feet	Curbside, 1 foot paved Frontage Zone
Urban Business Area (UBA), commercial centers and other developed areas	10 feet	4 feet softscaped buffer strip
Urban Fringe: 35-45 mph Target Speed	8 feet	Curbside, 1 foot paved Frontage Zone
Urban Fringe: 35-55 mph Target Speed	10 feet	4 feet softscaped buffer strip
Expressway: 45 mph Target Speed	8 feet	Curbside, 1 foot paved Frontage Zone[10]
Expressway: 45 mph Target Speed	14 feet	8 feet softscaped buffer strip
Expressway: 50-55 mph Target Speed	14 feet	8 feet softscaped buffer strip
Bridge Sidewalk and Sidewalk separated by Traffic Barrier	7 feet	Not applicable
Roundabouts	14 feet	3-foot detectable Buffer Zone

Table E-4: Minimum Pedestrian Sidewalk Width, *ODOT Highway Design Manual*

<table>
<tr><th colspan="5">DESIGN SPEED</th></tr>
<tr><th>FUNCTIONAL CLASSIFICATION/CONTEXT</th><th colspan="4">Terrain or Characteristic</th></tr>
<tr><th></th><th>Flat</th><th>Rolling</th><th>Mountainous</th><th>Urban</th></tr>
<tr><td>Interstate/Freeway</td><td>70</td><td>70</td><td>50-70</td><td>50-70</td></tr>
<tr><td>Urban Expressway</td><td colspan="4">45-70</td></tr>
<tr><td>Rural Expressway</td><td colspan="4">50-70</td></tr>
<tr><td>Rural Arterial</td><td colspan="4">45-70</td></tr>
<tr><td>Rural Collector</td><td colspan="4">45-70</td></tr>
<tr><td>Rural Local Route</td><td colspan="4">45-50</td></tr>
<tr><th>ODOT URBAN CONTEXTS</th><th colspan="4">DESIGN SPEED/TARGET SPEED</th></tr>
<tr><td>Traditional Downtown/CBD</td><td>20-25</td><td rowspan="6" colspan="3">Speeds shown for Urban Contexts are considered aspirational “target speeds” anticipated for each context. Actual selected project design speed shall not be less than posted speeds.

In cases where desired target speed is less than posted speed, design speed is set at posted speed and design treatments are employed to reduce operating speed.</td></tr>
<tr><td>Urban Mix</td><td>25-30</td></tr>
<tr><td>Commercial Corridor</td><td>30-35</td></tr>
<tr><td>Residential Corridor</td><td>30-35</td></tr>
<tr><td>Suburban Fringe</td><td>35-40</td></tr>
<tr><td>Rural Community</td><td>25-35</td></tr>
</table>

Table E-5: Design Speed Specifications

Appendix E

QC CHECKLIST

Project Requirements

- Draft 4 follows the provided template
- Alternatives (100%)
- References (100%)
- Drawing/plan sheet (100%)
- Acknowledgements (100%)
- Design Req and Reg Compliance and Permitting (100%)
- Design Development (100%)
- Calculations (100%)
- Construction Cost Estimate (100%)
- Construction Schedule (100%)
- qc checklist (100%)
- conclusion (100%)
- specifications (100%)
- Executive Summary (100%)

- All required sections are included and clearly labeled
- Content responds directly to the project prompt and requirements
- Scope, objectives, tasks, and deliverables are clearly defined

Quality & Clarity

- Writing is clear, professional, and free of grammar or spelling errors
- Assumptions and responsibilities are clearly stated
- Figures, tables, and schedules are properly labeled and referenced

Review

- Internal review completed prior to submission
- QA/QC checklist fully completed
- All reviewer comments addressed

Additional Files to Include in Merge

- GANTT chart (construction schedule)
- Drawing set (6 pages)

Sign-Off

- Reviewer Name & Signature: Natalie Smith Date: 06/07/2026

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