

# Technical Memorandum

January 29, 2024

Project# 19531.016

To: Dayna Webb, PE. City of Oregon City

From: Marc Butorac, PE, PTOE, PMP; Amy Griffiths; Nicholas Gross; Sophia Semensky

CC: Mahasti Hastings, Oregon Department of Transportation (ODOT)

RE: Draft TM#5: Existing Safety and Active Transportation Conditions  
McLoughlin Boulevard Enhancements - 10th Street to tumwata village

## EXISTING SAFETY & ACTIVE TRANSPORTATION CONDITIONS

This memorandum provides technical analyses and summarizes key considerations for integrating the design alternatives developed in Technical Memorandum (TM) #4: Alternative Concepts (Reference 1) into adjacent active transportation networks for the McLoughlin Boulevard Enhancements - 10th Street to tumwata village Project (Project).

This memorandum identifies existing, planned, funded, and designed active transportation facilities in the Project area, details user experience considerations for the identified alternatives, performs a pedestrian and bicycle level of traffic stress (LTS) analysis, presents a qualitative travel demand estimation, explores placemaking opportunities, analyses pedestrian crossings on McLoughlin Boulevard, conducts a safety analysis, and presents a preliminary screening of active transportation considerations for the design alternatives based on the relevant evaluation criteria developed in TM#2: Evaluation Criteria (Reference 2).

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## Executive Summary

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### Active Transportation Connectivity

- The proposed shared-use path on McLoughlin Boulevard will connect to:
  - The existing shared-use path that current terminates at 10<sup>th</sup> Street/McLoughlin Boulevard.
  - The potential connections for the Oregon City-West Linn Pedestrian-Bicycle Bridge.
  - The future open space and tumwata village development, which would include a promenade, trails, public plaza, gathering space, habitat restoration and redevelopment of industrial uses along the Oregon City waterfront.
  - Downtown Oregon City, with low-stress, comfortable crossings of McLoughlin Boulevard.

### Shared-Use Path Design Guidance

- Based on anticipated increases of walking and biking activity, the shared-use path is planned to be designed to a width of 14 feet, consistent with the recommendations from American Association of State Highway Officials (AASHTO) Bike Guide (Reference 3) and ODOT Highway Design Manual (Reference 4). The minimum vertical clearance for all alternatives is 10 feet.

## User Experience

**Table 1. User Experience Summary**

Design Alternative	Vertical and Horizontal Separation	Shared-Use Path Facility Width	Shared-Use Path Grade	Directness of Route	Personal Security
Alternative 1A: Low Route	Very high horizontal and vertical separation	Wide	High (5 to 7.4% at ramps)	High out-of-direction travel	Low personal security
Alternative 1B: High Route	High horizontal and vertical separation	Wide (14' pinch point through arch bridge)	Low (less than 2%)	Moderate out-of-direction travel	Moderate personal security
Alternative 1C: Hybrid Route (At-Grade)	Moderate horizontal and vertical separation	Wide (14' pinch point through arch bridge)	Low (less than 2%)	Moderate out-of-direction travel	Moderate personal security
Alternative 1C: Hybrid Route (Below-Grade)	Moderate horizontal and vertical separation	Wide (13' pinch point through utility structure and 13'9" pinch point through arch bridge pier)	High (5 to 7.4% at tunnel)	Moderate out-of-direction travel	Moderate to low personal security
Alternative 2A: McLoughlin Boulevard Reorganization	High horizontal and vertical separation	N/A	N/A	N/A	N/A
Alternative 2B: Viaduct Augmentation	Moderate horizontal and vertical separation	Moderate (10' pinch point at viaduct; same as 1C after the viaduct)	Low (less than 2%) at viaduct; same as 1C after the viaduct	Low out-of-direction travel	High personal security at viaduct; same as 1C after the viaduct
Alternative 2C: Viaduct Rebuild	Moderate horizontal and vertical separation	Wide (no pinch point at viaduct; same as 1C after the viaduct)	Low (less than 2%) at viaduct; same as 1C after the viaduct	Low out-of-direction travel	High personal security at viaduct; same as 1C after the viaduct
Alternative 3: Reroute	Low horizontal and vertical separation	N/A	Low (less than 2%)	Very high out-of-direction travel	High personal security

## Level of Traffic Stress

- The BLTS for McLoughlin Boulevard would decrease from a BLTS 4 to a BLTS 1 for the Realign and Retrofit alternatives.
- The PLTS for McLoughlin Boulevard would decrease from a PLTS 3 to a PLTS 1 for the Realign and Retrofit alternatives.

## Travel Demand

- The shared-use path connection could generate approximately 96 walking and biking trips in the peak hour by 2045.
- Within the Project area, there is a direct correlation between walking and biking activity levels and lack of comfortable walking and biking facilities present. Based on field observations. Relatively low levels of walking and biking have been observed along McLoughlin Boulevard within the Project area.
- A wide, comfortable, and accessible shared-use path is located northeast of the Project area which receives relatively high levels of walking and biking activity. This shared-use path was built as part of the McLoughlin Boulevard Improvement Project – Phase 2.
- A continuous shared-use path connection from points northeast (downtown Oregon City, Clackamas River Trail, Gladstone, Milwaukie, Portland) to tumwata village will provide the option for people to walk and bike to the future tumwata village site.
- Constructing a shared-use path to fill the existing gap between the terminus of the McLoughlin Boulevard shared-use path (northeast of Project area) and the tumwata village development and future open space will increase walking and biking activity levels along McLoughlin Boulevard.

## McLoughlin Boulevard Crossings

- A crossing at McLoughlin Boulevard/8<sup>th</sup> Street or McLoughlin Boulevard/9<sup>th</sup> Street will achieve the recommended target crossing spacing.
- Due to sight distance challenges, a crossing is not recommended between 6<sup>th</sup> Street and Main Street.
- Recommended crossing treatments include:
  - Wide advance stop bar and STOP HERE FOR Pedestrians sign.
  - Rectangular Rapid Flashing Beacon (RRFB).
  - Continental-style crosswalk markings, parking restrictions on crosswalk approach (see Table 310.3-B) lighting according to ODOT Traffic Lighting Design Manual. Crossing warning sign(s) for school crosswalks, midblock crosswalks, or speed  $\geq 30\text{mph}$ .
- Due to the inability to install a pedestrian refuge island while maintaining the four-lane roadway cross section, the recommendation of a RRFB may not be a feasible treatment. With this consideration, a traffic signal, pedestrian hybrid beacon (PHB), or grade separated crossing could be implemented.

## Placemaking Opportunities

- **Alternative 1A: Low Route** has the most opportunities for placemaking due to its floating design. It would also lead to the least amount of noise pollution for path users.
- Alternatives that include horizontal separation from the roadway for some portions of the path (**Alternatives 1B and 1C**) would also have lower noise pollution for those portions.
- Alternatives with pinch points may have limited space for placemaking. Alternatives with cantilevered structures need to weigh the tradeoffs between path material, placemaking elements, and cost.
  - **Alternative 1B and 1C (At-Grade)**, as well as the at-grade versions of **2B** and **2C**, have a pinch point at the Arch Bridge.
  - **Alternative 1C (Below-Grade)** has a pinch point at the Arch Bridge.
  - **Alternative 2B** has to be 10 feet wide or less at the viaduct.

## Safety

- There was one reported crash involving a pedestrian on McLoughlin Boulevard between 2017 and 2021, at the intersection of 10<sup>th</sup> Street. It resulted in a minor injury.
- McLoughlin Boulevard is a high pedestrian and bicycle priority segment according to the ODOT Active Transportation Needs Inventory.
- McLoughlin Boulevard is a high-risk location for pedestrian and bicycle access according to the ODOT Statewide Bicycle and Pedestrian Safety Action Plan.

## Active Transportation Conditions

The following section summarizes the existing, planned, and funded active transportation facilities in the Project area. The facility inventory is based on a review of existing conditions and projects identified in TM #3: Plans and Policies Review (Reference 5).

The purpose of evaluating the active transportation conditions is to understand the integration and connectivity of the shared-use path alternatives, summarized in the next section, into the existing and planned active transportation system.

The shared-use path should be well connected to the existing and planned street network. It should be coordinated with planned improvements to McLoughlin Boulevard, future open space and tumwata village development, and the potential Oregon City-West Linn Pedestrian-Bicycle Bridge alignments<sup>1</sup>.

Figure 1 and Figure 2 illustrate the existing and planned active transportation facilities. Crossings of McLoughlin Boulevard and connections to existing and planned active transportation facilities and destinations are considered as part of the safety and active transportation analysis.

<sup>1</sup> Streetscape elements for McLoughlin Boulevard will be developed following the identification of a shared-use path design alternative.



Figure 1

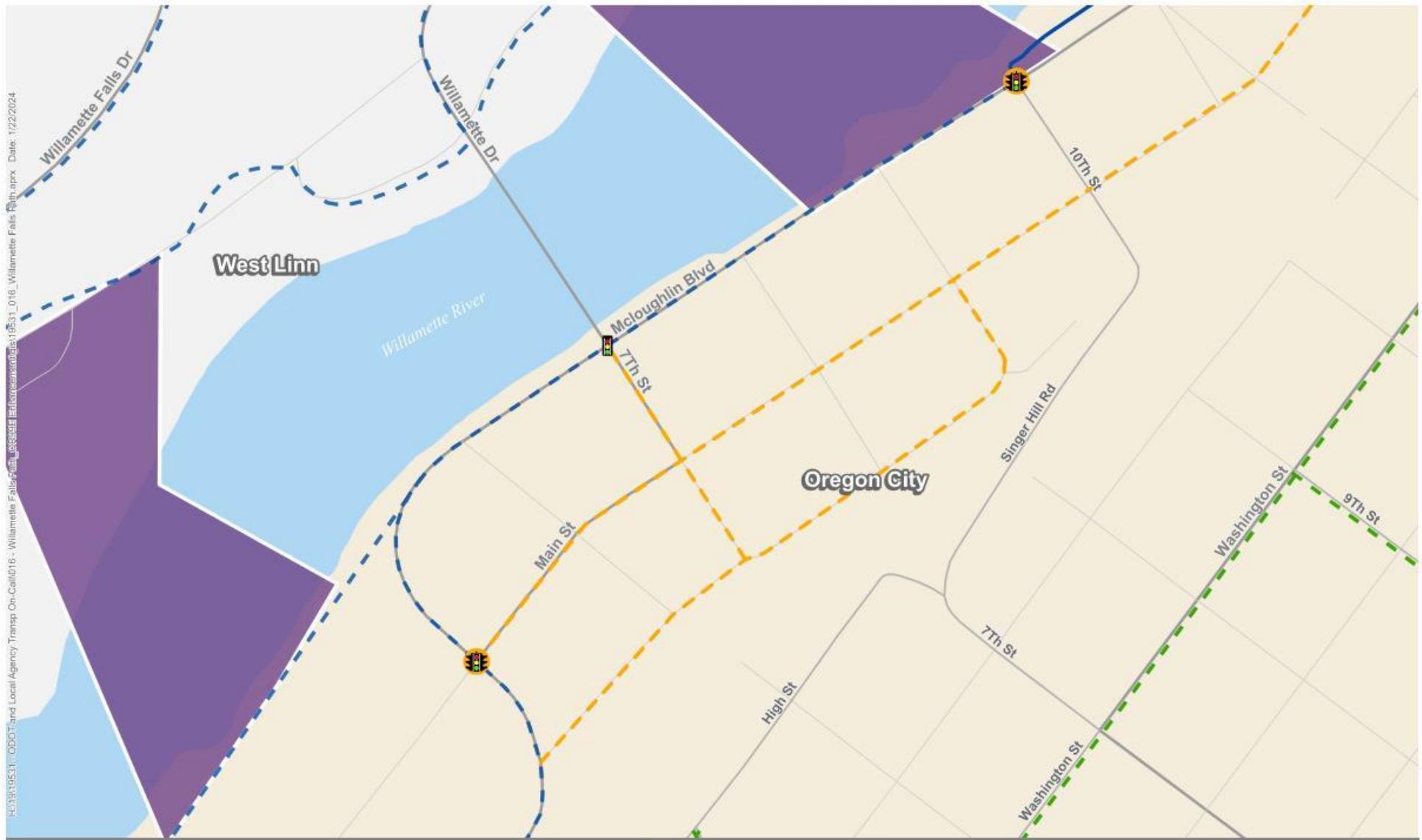


Figure 2

Existing and Planned Bicycle Facilities  
Oregon City, Oregon

## McLoughlin Boulevard

### Existing Active Transportation Facilities

Northeast of 10<sup>th</sup> Street, there is an existing shared-use path on the north side of McLoughlin Boulevard. The path varies in width from about 8 – 30 feet and continues through to the 82<sup>nd</sup> Drive pedestrian bridge over the Clackamas River, where it connects to bicycle facilities on Clackamas Boulevard and 82<sup>nd</sup> Drive. The shared-use path closest to downtown includes boardwalk material, seating, lighting, and art installations.



Figure 3. Existing Shared-Use Path Northeast of 12<sup>th</sup> Street

Between 10<sup>th</sup> Street and 6<sup>th</sup> Street, there are five-to-seven-foot sidewalks on both sides of McLoughlin Boulevard. The sidewalk has no buffer.



Figure 4. Narrow Sidewalk Southwest of 10<sup>th</sup> Street

Between 6<sup>th</sup> Street and Main Street, the sidewalk continues just on the northeast side of the roadway. Southwest of Main Street, the sidewalk continues just on the southwest side of the roadway.

## Planned Transportation Improvements

There are several projects recommended on McLoughlin Boulevard, including:

- Widen McLoughlin Boulevard to a five-lane cross-section that includes two travel lanes in each direction and add a center two-way left-turn lane and/or a median to improve access management (Oregon City Transportation System Plan, "Not Likely to Be Funded"<sup>2</sup>).
- Add parallel parking on west side of roadway (McLoughlin Boulevard Enhancement Plan).
- Extend the shared-use path on west side of the roadway (Oregon City Transportation System Plan, "Not Likely to Be Funded").
- Widen sidewalk to a typical width of 18 feet along the west-side waterfront promenade, creating a plaza atmosphere, and including strong separation between the highway and pedestrian space (McLoughlin Boulevard Enhancement Plan).

## Main Street

### Existing Active Transportation Facilities

Main Street currently has one travel lane in each direction and on-street parking from McLoughlin Boulevard to 12<sup>th</sup> Street. The lanes are marked with sharrows.

### Planned Active Transportation Facilities

There are several projects recommended on Main Street, including:

- A shared roadway from McLoughlin Boulevard to 15<sup>th</sup> Street via wayfinding and sharrows ("Likely to be Funded", Oregon City Transportation System Plan).
- A shared-use path from Clackamette Park to 17<sup>th</sup> Street on the north/east side of the roadway ("Not Likely to be Funded", Oregon City Transportation System Plan).
- Complete sidewalk gaps from McLoughlin Boulevard to 17<sup>th</sup> Street ("Not Likely to be Funded", Oregon City Transportation System Plan).

In addition, Oregon City received State Lottery Bond funding to design and construct streetscape improvements on Main Street from 10<sup>th</sup> Street to 15<sup>th</sup> Street. This will include sidewalk infill, streetlights, street trees, and other improvements. This project is likely to begin in 2025.

## Railroad Avenue

### Existing Active Transportation Facilities

Railroad Avenue has one westbound travel lane with angle parking from McLoughlin Boulevard to 6<sup>th</sup> Street; one travel lane in each direction and angle parking from 6<sup>th</sup> Street to 7<sup>th</sup> Street; and one eastbound travel lane from 7<sup>th</sup> Street to 9<sup>th</sup> Street. There are currently no bicycle facilities and there are missing sidewalk on the south side of the roadway.

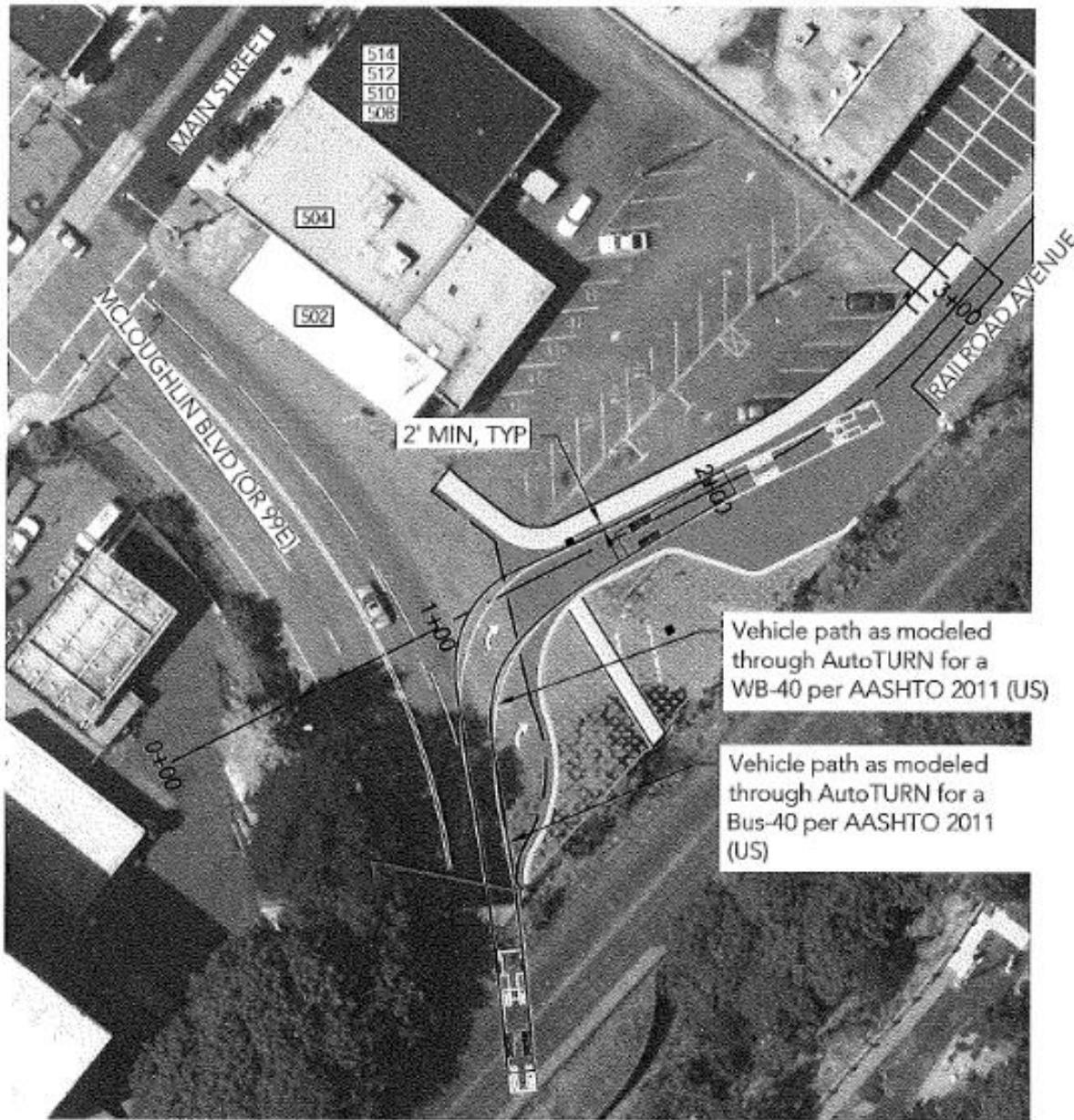
<sup>2</sup> The TSP divided transportation solutions into two categories: those reasonably expected to be funded by 2035 were included in the "Likely to be Funded Transportation System", while the projects that are not expected to be funded by 2035 were included in the "Not Likely to be Funded" Transportation System.

## Planned Active Transportation Facilities

There is one project recommended on Railroad Avenue in the Oregon City Transportation System Plan, which suggests a shared roadway from McLoughlin Boulevard to 9<sup>th</sup> Street via wayfinding and sharrows ("Likely to be Funded", Oregon City Transportation System Plan).

In addition, the tumwata village site is conditioned to create a short McLoughlin Boulevard northbound deceleration lane that creates a safer pedestrian crossing of Railroad Avenue. Figure 5 provides an exhibit of the turning movements at the intersection of McLoughlin Boulevard and Railroad Avenue with this deceleration lane.

Figure 5. McLoughlin Boulevard Deceleration Lane Concept



Source: ODOT Roadway Engineering Design Exception Review; OR99E: McLoughlin Boulevard (Oregon City); 2016

## 10<sup>th</sup> Street

### Existing Active Transportation Facilities

10<sup>th</sup> Street has two travel lanes in each direction from McLoughlin Boulevard to Railroad Avenue. There are sidewalks on both sides of the roadway, but no bicycle facilities.

### Planned Active Transportation Facilities

The Oregon City Quiet Zone will include a new ADA compliant sidewalk and railroad crossing at 10<sup>th</sup> Street, as the current pedestrian crossing is not ADA compliant. Consultant selection for this project begins in early 2024.

## 9<sup>th</sup> Street

### Existing Active Transportation Facilities

9<sup>th</sup> Street is an unmarked two-way roadway with parking from McLoughlin Boulevard to Main Street. From Main Street to Railroad Avenue, 9<sup>th</sup> Street has one northbound lane with parking. There are sidewalks on both sides of the roadway, but no bicycle facilities.

### Planned Active Transportation Facilities

There is one project recommended on 9<sup>th</sup> Street, which suggests a shared roadway from Railroad Avenue to Main Street via wayfinding and sharrows ("Likely to be Funded", Oregon City Transportation System Plan).

## 8<sup>th</sup> Street

### Existing Active Transportation Facilities

8<sup>th</sup> Street has one southbound lane and on-street parking from McLoughlin Boulevard to Railroad Avenue. There are sidewalks on both sides of the roadway, but no bicycle facilities.

### Planned Active Transportation Facilities

There are no planned projects on 8<sup>th</sup> Street.

## 7<sup>th</sup> Street

### Existing Active Transportation Facilities

7<sup>th</sup> Street has one lane in each direction from Railroad Avenue through to the arch bridge. It currently has sharrows and sidewalks on both sides. This is currently the only bridge in Oregon City that people walking or biking can take to cross the Willamette River.

## Planned Active Transportation Facilities

There is one project recommended on 7<sup>th</sup> Street, which suggests a shared roadway between the arch bridge and Railroad Avenue via wayfinding and sharrows ("Likely to be Funded", Oregon City Transportation System Plan).

## 6<sup>th</sup> Street

### Existing Active Transportation Facilities

6<sup>th</sup> Street has one northbound lane and on-street parking from McLoughlin Boulevard to Railroad Avenue. There are sidewalks on both sides of the roadway, but no bicycle facilities.

### Planned Active Transportation Facilities

There are no planned projects on 6<sup>th</sup> Street.

## Oregon City Municipal Elevator

### Existing Active Transportation Facilities

The Oregon City Municipal Elevator is located on McLoughlin Promenade just east of 6<sup>th</sup> Street, and connects to Railroad Avenue at 7<sup>th</sup> Street over a steep cliff. The elevator is one of only four municipal elevators in the world and "Elevator Street" remains the only "vertical street" in North America.

## Oregon City-West Linn Pedestrian-Bicycle Bridge Concept Plan

### Planned Active Transportation Facilities

The unadopted Oregon City-West Linn Pedestrian-Bicycle Bridge Concept Plan details potential alignments for a dedicated pedestrian-bicycle bridge across the Willamette River between Willamette Falls and the I-205 Abernethy Bridge. The plan identified two potential corridors for further study: an upstream corridor that connects at 4<sup>th</sup> Street from the planned tumwata village and a downstream corridor that connects at the signalized intersection at 10<sup>th</sup> Street. Both potential future corridors intersect the study area.

## tumwata village

### Planned Active Transportation Facilities

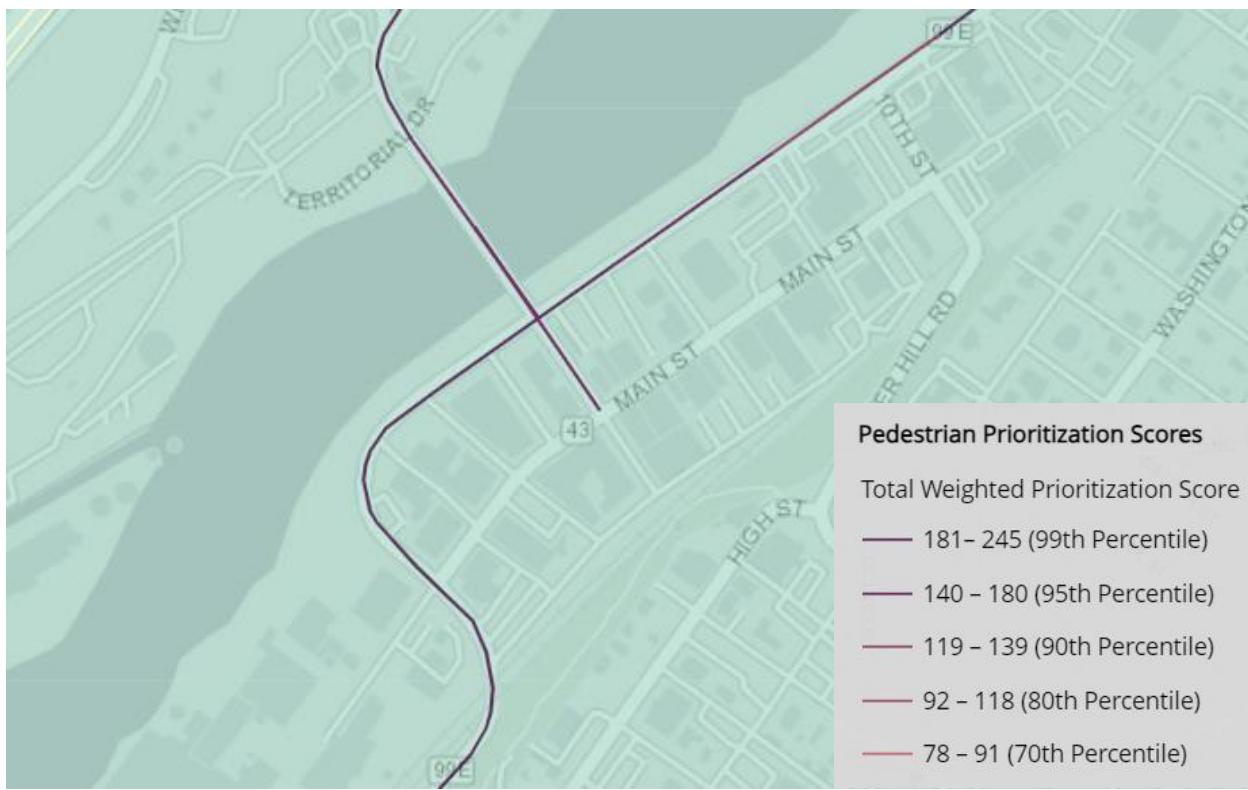
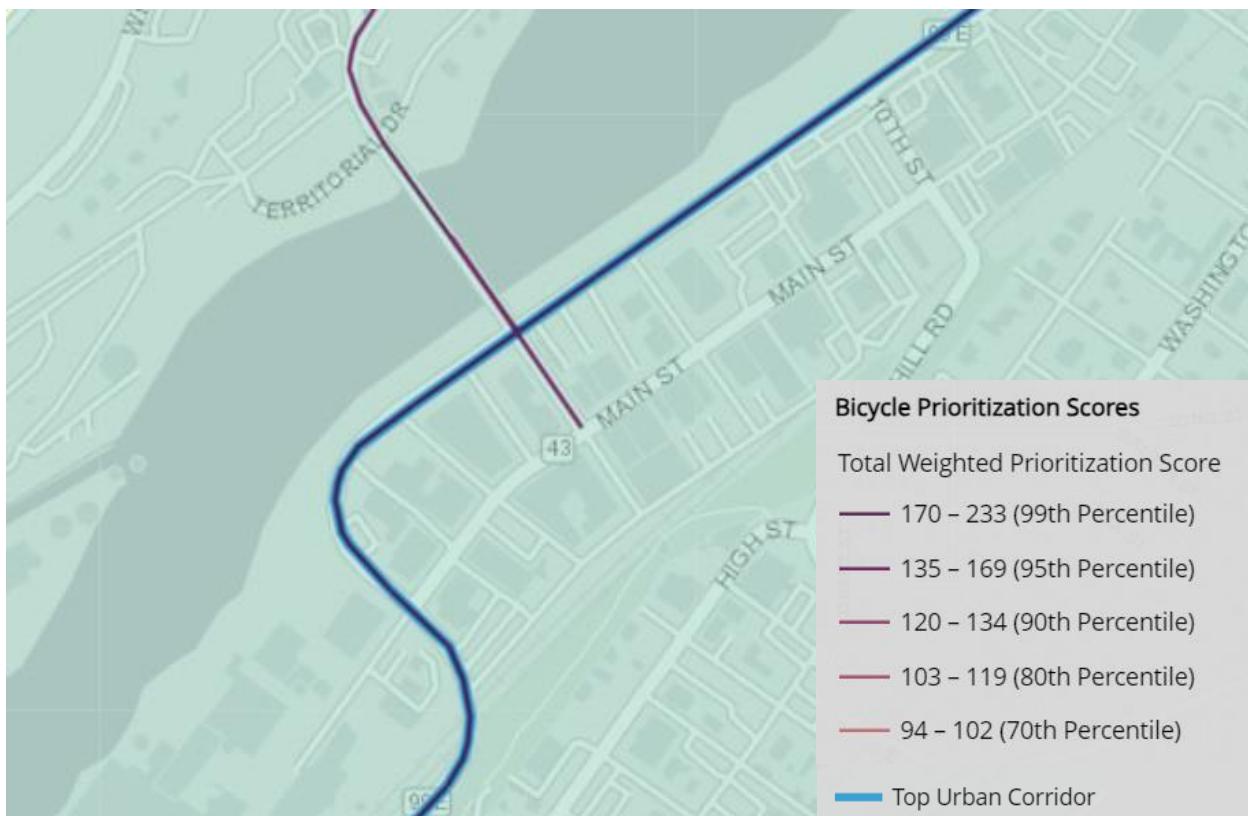
The tumwata village (described in the Willamette Falls Riverwalk Master Plan) includes a promenade, trails, public plaza, gathering space, habitat restoration and redevelopment of industrial uses along the Oregon City waterfront.

## Active Transportation Needs Inventory

The [ODOT Active Transportation Needs Inventory \(ATNI\) online map](#) includes a pedestrian and bicycle prioritization screening for ODOT roadways. This pedestrian and bicycle prioritization classifies and prioritizes the bicycle and pedestrian needs on the system based on six criteria:

- Safety (bicycle or pedestrian crash frequency and bicycle and pedestrian risk factors);
- Connectivity (Bicycle Level of Traffic Stress and gaps);
- Demand (access to essential destinations and transit; bicycle tourism routes);
- Equity (transportation disadvantaged communities and health);
- Stakeholder input; and
- Existing conditions.

Figure 6 and Figure 7 show the pedestrian and bicycle prioritization scores for McLoughlin Boulevard, respectively. McLoughlin Boulevard is in the 99<sup>th</sup> percentile for both pedestrian and bicycle priority. In addition, the project study segment is classified as a top priority bicycle urban corridor.

**Figure 6. ODOT ATNI Pedestrian Prioritization****Figure 7. ODOT ATNI Bicycle Prioritization**

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## Design Alternatives

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Three design alternatives have been developed for the Project:

- Alternative 1: Realign (a separate, standalone structure),
- Alternative 2: Retrofit (a structure connected to McLoughlin Boulevard), and
- Alternative 3: Reroute (a parallel alignment).

There are four (4) sub-alternatives under Realign and three (3) sub-alternatives under Retrofit and no sub-alternatives under Reroute.<sup>3</sup>

The near-term priority for the Project is to identify a preferred shared-use path alignment. This priority primarily focuses on the sub-alternatives identified under Alternative 1: Realign and Alternative 2: Retrofit.

Once a preferred shared-use path alternative is identified, the Project will look at traffic calming, streetscape, landscaping, and placemaking treatments along McLoughlin Boulevard to improve the conditions and experience of the corridor.

Figure 8 presents an overview of the sub-alternatives.

Appendix A presents 3D model visualizations for the shared-use path alternatives.

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<sup>3</sup> Alternative 3: Reroute will only be advanced if Alternative 1: Realign and Alternative 2: Retrofit are deemed infeasible or fatally flawed. Alternative 3: Reroute is considered a "no-build" alternative.



### Alternative 1A: Low Route

This alignment would be constructed as a floating esplanade at water level. Ramping structures would be needed to bring path users down to water level and back up to McLoughlin Blvd. The dock and ramping structures would need to be constructed to adjust to changing water levels throughout the year. This alignment would bypass the Arch Bridge underneath the arch rib.

### Alternative 1B: High Route

This alignment would be constructed approximately at-grade and adjacent to the existing viaduct. This alignment would either bypass the Arch Bridge between the arch columns or reroute through the arch pilaster.

### Alternative 2A: McLoughlin Boulevard Reorganization

This alternative reimagines the existing McLoughlin Blvd roadway cross section within the right-of-way. This alternative retains and attempts to rework the current viaduct envelope without additional structural width.

This alignment is shared by **Alternative 1C and 2B**

## Figure 8: Overview of Alternatives

### Alternative 1C: Hybrid Route (At-Grade & Below-Grade)

This alignment would be constructed as a standalone structure between 10th Street and 8th Street. Southwest of 8th Street, existing on-street parking would be removed in exchange for path space. The alignment would pass through or around the utility structure and bypass the Historic Arch Bridge through the arch pilaster, a cantilever structure, or a tunnel underneath the arch pilaster.

### Alternative 2B: Viaduct Augmentation

Alternative 2B augments the viaduct through a cantilevered structure (cantilever add on) between 10th Street and 8th Street. The alignment would pass through the utility structure via modifications and bypass the Arch Bridge through either the arch pilaster, a cantilever structure, or a structure supported from the rock. Retaining wall augmentation would also occur to provide additional width for the multiuse path near the McLoughlin Blvd “elbow”.

### Alternative 3: Reroute

Alternative 3 provides a parallel alignment through downtown Oregon City via 10th Street and Main Street. Based on a review of background material, as well as the goals and objectives of the Plan, this alternative is not preferred. Alternative 3 will only be advanced if Alternative 1 and Alternative 2 are deemed infeasible or fatally flawed.

## Active Transportation Analysis

The following section details the guidance used in developing the shared-use path alternatives; user experience elements for the concepts; a pedestrian and bicycle level of traffic stress analysis; a travel demand analysis; and a crossing analysis.

### Shared-Use Path Design Guidance

The existing shared-use path adjacent to McLoughlin Boulevard northeast of the Project area varies from 8 feet to 30 feet. The segment immediately northeast of 10<sup>th</sup> Street includes a 30-foot cross section with lighting, stairs, art, trees, interpretive signs, and a boardwalk.

#### ODOT Highway Design Manual

The shared-use path is planned to be a mixed pedestrian and bicycle space, consistent with the facility treatment, signing, and striping of the shared-use path northeast of 10<sup>th</sup> Street. The ODOT Highway Design Manual (HDM) recommends a shared-use path width of 12 feet or greater for mixed pedestrian and bicycle use in areas with high use, with a 10-foot minimum for lower use areas<sup>4</sup>.

#### AASHTO Guide for the Development of Bicycle Facilities

The AASHTO Guide for the Development of Bicycle Facilities recommends path widths of 10 to 14 feet, with 11 to 14 feet recommended to allow bicyclists to pass other users and for areas with high use and/or a wider variety of user groups.

The guide also states that grades greater than 5 percent are undesirable and recommends a vertical clearance of 10 feet.

#### Recommendation

Based on the guidance provided in the ODOT HDM, AASHTO Guide for the Development of Bicycle Facilities, and feedback received from City staff as well as City Commission, the recommended shared-use path width for all design alternatives is 14 feet of functional width (including any shoulder/shy distance needed on one or both sides of the shared-use path). In addition, the minimum vertical clearance for all alternatives is 10 feet.

### User Experience

This section details the preliminary user experience considerations for the design alternatives, including the level of vertical and horizontal separation; grade; directness of route; and personal security. Note: Shared-use path width is an element impacting user experience and is covered in the prior section.

<sup>4</sup> The standard path width is the paved portion of the path, and typically does not include shoulder/shy distance.

## Vertical and Horizontal Separation

Both the Realign and Retrofit alternatives offer full separation, but some alternatives have greater horizontal separation from the roadway than others.

- **Alternative 1A: Low Route** provides a fully separated shared-use path constructed as a floating esplanade at water level. This alternative would be offset by at least 70 feet from the center of the first pier (in order to meet a 10-foot vertical clearance from the arch of the arch bridge). It would also be located well below McLoughlin Boulevard. Therefore, this alternative has high horizontal and vertical separation.
  - This alternative joins McLoughlin Boulevard at the “elbow” or curve of the road. At this location, additional width is provided to increase the level of horizontal separation.
- **Alternative 1B: High Route** provides a fully separated shared-use path. ODOT requires a 30-foot minimum clearance from the viaduct, so the path would have a 30-foot horizontal separation from the roadway at the viaduct. The path would then horizontally shift after the viaduct ends to meet the arch bridge in the first bay. The path would likely need to ramp up through the arch bridge bay to meet the 100-year flood line, leading to the path likely being slightly above McLoughlin Boulevard at this point. Overall, this alternative has a high level of separation.
- **Alternative 1C: Hybrid Route (At-Grade)** provides a fully separated shared-use path from 10<sup>th</sup> Street to 8<sup>th</sup> Street, where it would be constructed as a standalone structure. As with Alternative 1B, the path would have a 30-foot horizontal separation from the roadway at the viaduct. After the viaduct section, the alignment would connect back to McLoughlin Boulevard at 8<sup>th</sup> Street as a fully separated path replacing existing on-street parking. At the utility structure, the path would continue as a cantilever structure or structure supported from the bedrock to both go around the utility structure and pass through the first bay of arch bridge. Again, this alternative would likely need to ramp up through the arch bridge to meet the 100-year flood line, leading to a path slightly above McLoughlin Boulevard. This alternative would thus have the highest horizontal separation at the viaduct, and then provide a structure adjacent to McLoughlin Boulevard.
- **Alternative 1C: Hybrid Route (Below-Grade)** provides a fully separated shared-use path from 10<sup>th</sup> Street to 8<sup>th</sup> Street, where it would be constructed as a standalone structure. As with Alternative 1B, the path would have a 30-foot horizontal separation from the roadway at the viaduct. After the viaduct section, the path would connect back to McLoughlin Boulevard at 8<sup>th</sup> Street. The path would ramp down starting at the beginning of the on-street parking segment, constructed as a tunnel that passes below the utility structure and through the pier. This alternative would thus have the highest horizontal separation at the viaduct, and then provide a separated tunnel structure that ramps below McLoughlin Boulevard at the arch bridge.
- **Alternative 2A: McLoughlin Boulevard Reorganization** provides traffic calming, landscaping, and roadway improvements to compliment a shared-use path alternative from Alternative 1. This alternative has the potential to add an additional level of horizontal separation from motor vehicle traffic.
- **Alternative 2B: Viaduct Augmentation** provides a fully separated shared-use path from 10<sup>th</sup> Street to 8<sup>th</sup> Street via a cantilevered structure. This structure would be adjacent to McLoughlin Boulevard with no additional horizontal separation. Southwest of 8<sup>th</sup> Street, the alignment would continue as one of the sub-options for Alternative 1C (at-grade or below-grade).
- **Alternative 2C: Viaduct Rebuild** provides the same vertical and horizontal separation as Alternative 2B.
- **Alternative 3: Reroute**, considered the “no-build”, proposes a bicycle route that crosses McLoughlin Boulevard at 10<sup>th</sup> Avenue and then continues on Main Street until the western intersection with McLoughlin Boulevard. The bicycle facilities would likely be on-street with minimal space for high vertical and horizontal separation. Therefore, this alternative would have a low degree of separation.

## Shared-Use Path Facility Width

The recommended shared-use path width is 14 feet for all alternatives. The Realign and Retrofit alternatives provide mostly fully separated structures that can be as wide as needed, but have some pinch points:

- Utility structure: The path can be 13 feet wide and 11 feet high.
- Arch bridge pier: The path can be 13 feet and 9 inches wide and 10 feet high.
- First arch bridge bay: The path can be 14 feet wide and at least 10 feet high.

Facility widths by alternative are described below:

- **Alternative 1A: Low Route** would provide a fully separated shared-use path and can accommodate a wide shared-use path through most of the alignment. The ramping structures may require wider corners to allow turning through landings.
- **Alternative 1B: High Route** would provide a standalone structure that can accommodate a wide shared-use path. The path would pass through the first column of the arch bridge, which limits the width of the shared-use path to 14 feet, but still meets the recommended width.
- **Alternative 1C: Hybrid Route (At-Grade)** would provide a standalone structure from 10<sup>th</sup> Street to 8<sup>th</sup> Street, where the shared-use path width can be wide. Southwest of 8<sup>th</sup> Street, the alignment would continue by removing the existing on-street parking and then constructing a cantilevered or rock-supported structure around the utility structure and through the arch bridge. The path could be up to 14 feet wide through the arch bridge bay.
- **Alternative 1C: Hybrid Route (Below-Grade)** would provide a standalone structure from 10<sup>th</sup> Street to 8<sup>th</sup> Street, where the shared-use path width can be wide. Southwest of 8<sup>th</sup> Street, the alignment would continue by removing the existing on-street parking and tunneling under the utility structure and arch bridge pier.
  - Through the utility structure, the path would be able to be 13-feet wide and 11 feet high, which is one foot shy of the recommended path width of 14 feet but meets vertical clearance.
  - Through the pier, the path would be able to be 13 feet and 9 inches wide and 10 feet high, which is just shy of the recommended path width of 14 feet but meets the recommended vertical clearance.
- **Alternative 2A: McLoughlin Boulevard Reorganization** would provide traffic calming elements in addition to a shared-use path from Alternative 1; therefore, this performance measure is not applicable.
- **Alternative 2B: Viaduct Augmentation** would provide a fully separated shared-use path from 10<sup>th</sup> Street to 8<sup>th</sup> Street via a cantilevered structure. To accommodate ODOT's existing maintenance machinery, the path width would be limited to 10 feet next to the viaduct.
  - Southwest of 8<sup>th</sup> Street, the alignment would continue as one of the sub-options for Alternative 1C (at-grade or below-grade). Therefore, the path could be restricted below 14 feet for a significant part of the alignment.
- **Alternative 2C: Viaduct Rebuild** be the same as Alternative 2B but would rebuild the viaduct. A maintenance access system would be incorporated into the new structure, so there would be no width restriction on the path.
  - Southwest of 8<sup>th</sup> Street, the alignment would continue as one of the sub-options for Alternative 1C (at-grade or below-grade). Therefore, the path would be restricted below 14 feet for a portion of the alignment.
- **Alternative 3: Reroute** would not provide a shared-use path and the cross section has not been determined, so this measure cannot be scored at this time.

## Shared-Use Path Grade

The Realign and Retrofit alternatives provide alignments with grades varying by segment:

- **Alternative 1A: Low Route** would ramp the shared-use path down to water-level and back up, so would provide ramping structures with a grade between 5 and 7.4 percent.
  - A 5 percent grade would mean a ramping length of approximately 50 percent longer than the 7.4 percent option.
  - The 7.4 percent grade is accomplished via the provision of handrails and ramps not exceeding 8.33 percent with 5-foot-long landings placed for every 30 inches of ramp rise. The result is a 7.4 percent blended ramps and landings average grade. This option would allow a shorter ramping structure.
- **Alternative 1B: High Route** would provide a shared-path at road-level, so would provide facilities with a minimal grade between 10<sup>th</sup> Street and 8<sup>th</sup> Street. Southwest of 8<sup>th</sup> Street, the path would need to ramp up (3 to 5 percent) to meet the 100-year flood line through the arch bridge.
- **Alternative 1C: Hybrid Route (At-Grade)** would provide a shared-use path at road-level. This would provide facilities with a minimal grade (less than 2 percent) between 10<sup>th</sup> Street and 8<sup>th</sup> Street. Southwest of 8<sup>th</sup> Street the path would need to ramp up (3 to 5 percent) to meet the 100-year flood line through the arch bridge.
- **Alternative 1C: Hybrid Route (Below-Grade)** would provide a shared-use path at road-level, so would provide facilities with a minimal grade (less than 2 percent) grade between 10<sup>th</sup> Street and 8<sup>th</sup> Street. Southwest of 8<sup>th</sup> Street, the alignment would continue by removing the existing on-street parking and tunneling under the utility structure and arch bridge pier. This would require a 5 to 7.4 percent grade, with the 5 percent grade necessitating a longer tunnel and the 7.4 percent grade necessitating ramps and landings.
- **Alternative 2A: McLoughlin Boulevard Reorganization** would include a shared-use path from Alternative 1, so the scoring for this alternative would align with the scores above.
- **Alternative 2B: Viaduct Augmentation** and **Alternative 2C: Viaduct Rebuild** would provide a shared-path at road-level from 10<sup>th</sup> Street to 8<sup>th</sup> Street. This would provide facilities with a minimal grade (less than 2 percent) at this segment.
  - Southwest of 8<sup>th</sup> Street, the alignment would continue as one of the sub-options for Alternative 1C (at-grade or below-grade). Therefore, the path would either ramp up (at-grade) or ramp down (below-grade) as described above.
- **Alternative 3: Reroute** would not provide a separated facility with ramping structures. The grade would be minimal (less than 2 percent).

## Directness of Route

All the Realign and Retrofit alternatives provide a direct connection from the existing path on McLoughlin Boulevard with no crossings. However, horizontal clearance requirements lead to some variation in total distance between the alternatives.

- **Alternative 1A: Low Route** would involve significant ramping, which would increase the total distance of the path. However, providing higher grades (e.g., 7.4 percent) would decrease ramping distance by 50 percent as compared to a grade of 5 percent. The path would need to be located at least 70 feet from the pier centerline or 50 feet from the first bay centerline to maintain a 10-foot vertical clearance. This adds about 140 feet of additional horizontal travel distance from the roadway.
- **Alternative 1B: High Route** would require a path 30 feet away from the viaduct, which would lead to about 60 feet in additional travel distance from the roadway. After the viaduct, the path would be adjacent to the roadway.
- **Alternative 1C: Hybrid Route (At-Grade)** would require a path 30 feet away from the viaduct, which would lead to about 60 feet in additional travel distance from the roadway. After the viaduct, the path would be adjacent to the roadway, so would be direct.
- **Alternative 1C: Hybrid Route (Below-Grade)** would require a path 30 feet away from the viaduct, which would lead to about 60 feet in additional travel distance from the roadway. After the viaduct, the path would be tunneled within the right-of-way of McLoughlin Boulevard, so would be direct.
- **Alternative 2A: McLoughlin Boulevard Reorganization** would include a shared-use path from Alternative 1, so the scoring for this alternative would align with the scores above.
- **Alternative 2B: Viaduct Augmentation** and **Alternative 2C: Viaduct Rebuild** would provide a shared-use path adjacent to the roadway from 10<sup>th</sup> Street to 8<sup>th</sup> Street, and thus would have no out-of-direction travel. Southwest of 8<sup>th</sup> Street, the alignment would continue as one of the sub-options for Alternative 1C (at-grade or below-grade). Therefore, the path would be direct.
- **Alternative 3: Reroute** requires out-of-direction travel along 10<sup>th</sup> Street and Main Street and would require two crossings of McLoughlin Boulevard. Therefore, this alternative provides an indirect route.

## Personal Security

Personal security refers to how people walking and biking perceive their personal safety when using a facility. In addition, personal security can include considerations such as emergency egress and access to emergency services. Personal security is increased in locations where there are "eyes on the street", or users of the shared-use path are in sight of other individuals. This is bolstered especially when there are many active users of the facility and of nearby land uses during all hours and days of the week. Therefore, alternatives that are more in sight of McLoughlin Boulevard and nearby businesses would achieve a higher sense of personal security.

Personal security can also be increased by providing pedestrian-scale lighting at night, performing routine maintenance on the path to ensure it is kept free of debris, and planning for gathering spaces to invite more activity onto the path. The presence of other users on the path can increase security, so as the connection gets more used, security will increase. Finally, multiple points of egress and the ability to easily access emergency services can increase personal security.

Research<sup>5</sup> shows that perceptions of personal safety directly influence the choice to bike. It is also found that the level of bike ownership is directly influenced by latent 'comfortability of biking'. Increasing on-street and separate bike lanes have the maximum effects on attracting more people to biking by increasing the perception of bikeability in the city, comfortability of biking in the city, and increasing bike users' sense of safety. Therefore, a separated shared-use path, as recommended in Alternatives 1 and 2, would provide the greatest sense of personal security. However, there are some variations in the design of the shared-use paths within these alternatives that further influence the perception of personal security.

- **Alternative 1A: Low Route** would provide less personal security as the alignment would necessitate users to ramp down to water level, which could create the perception of isolation. Users of the shared-use path would be far from activity on McLoughlin Boulevard and would be mostly out of sight. In addition, there are no points of egress or access to emergency services other than the on- and off-ramps. Since the alternative is not visible from adjacent street activity, it offers a low perceived sense of security.
- **Alternative 1B: High Route** and **Alternative 1C: Hybrid Route (At-Grade)** have a higher sense of security as they are adjacent to the roadway for most of the alignment, with the exception of the viaduct section. During this section, the path would be about 30 feet away from the roadway, which would lead to less direct access to McLoughlin Boulevard, though the path would still be visible from the roadway.
- **Alternative 1C: Hybrid Route (Below-Grade)** has a moderate sense of security as it would be 30 feet from the roadway in the viaduct section, and then would provide a tunnel through the arch bridge pier. A tunnel could lower the sense of security as the path would not be visible from the roadway.
- **Alternative 2A: McLoughlin Boulevard Reorganization** would include a shared-use path from Alternative 1, so the scoring for this alternative would align with the scores above.
- **Alternative 2B: Viaduct Augmentation** and **Alternative 2C: Viaduct Rebuild** would provide a shared-use path adjacent to the roadway from 10<sup>th</sup> Street to 8<sup>th</sup> Street, and thus would provide a high sense of security. Southwest of 8<sup>th</sup> Street, the alignment would continue as one of the sub-options for Alternative 1C (at-grade or below-grade).
- **Alternative 3: Reroute** passes through Main Street, which has more commercial activity and thus may heighten the sense of security at certain times of the day.

<sup>5</sup> Habib, K. N., Mann, J., Mahmoud, M., & Weiss, A. (2014). Synopsis of bicycle demand in the City of Toronto: Investigating the effects of perception, consciousness and comfortability on the purpose of biking and bike ownership. *Transportation Research Part A: Policy and Practice*, 70, 67–80. <https://doi.org/10.1016/j.tra.2014.09.012>

## User Experience Summary

Table 2 presents the summary of the user experience performance measures.

**Table 2. User Experience Summary**

	Vertical and Horizontal Separation	Shared-Use Path Facility Width	Shared-Use Path Grade	Directness of Route	Personal Security
Alternative 1A: Low Route	Very high horizontal and vertical separation	Wide	High (5 to 7.4% at ramps)	High out-of-direction travel	Low personal security
Alternative 1B: High Route	High horizontal and vertical separation	Wide (14' pinch point through arch bridge)	Moderate (3 to 5% through arch bridge)	Moderate out-of-direction travel	Moderate personal security
Alternative 1C: Hybrid Route (At-Grade)	High horizontal and vertical separation	Wide (14' pinch point through arch bridge)	Moderate (3 to 5% through arch bridge)	Moderate out-of-direction travel	Moderate personal security
Alternative 1C: Hybrid Route (Below-Grade)	High horizontal and vertical separation	Wide (13' pinch point through utility structure and 13'9" pinch point through arch bridge pier)	High (5 to 7.4% at tunnel)	Moderate out-of-direction travel	Moderate to low personal security
Alternative 2A: McLoughlin Boulevard Reorganization	High horizontal and vertical separation	N/A	N/A	N/A	N/A
Alternative 2B: Viaduct Augmentation	High horizontal and vertical separation	Moderate (10' pinch point at viaduct; same as 1C after the viaduct)	Low (less than 2%) at viaduct; same as 1C after the viaduct	Low out-of-direction travel	High personal security at viaduct; same as 1C after the viaduct
Alternative 2C: Viaduct Rebuild	High horizontal and vertical separation	Wide (no pinch point at viaduct; same as 1C after the viaduct)	Low (less than 2%) at viaduct; same as 1C after the viaduct	Low out-of-direction travel	High personal security at viaduct; same as 1C after the viaduct
Alternative 3: Reroute	Low horizontal and vertical separation	N/A	Low (less than 2%)	Very high out-of-direction travel	High personal security

## Level of Traffic Stress

Level of traffic stress (LTS) is an analysis developed to measure the perceived stress a person experiences when walking or biking along a roadway. Contributing factors that increase stress for people walking and biking include vehicular speed, vehicular volume, proximity to vehicles, and lack of dedicated or physically separated facilities. Both pedestrian and bicycle LTS are measured on a scale of one (1) to four (4), with LTS 1 being suitable for all ages and abilities including children, and LTS 4 being suitable only for the strong and fearless type of user. For planning purposes, LTS 2 is generally acceptable as it meets the needs of the broadest population.

Bicycle and pedestrian LTS analyses were conducted under existing conditions and for each of the alternatives along McLoughlin Boulevard and Main Street following the methodology outlined in the ODOT Analysis Procedures Manual (APM) (Reference 6).

### Pedestrian Level of Traffic Stress

The existing and future PLTS was calculated for McLoughlin Boulevard and surrounding streets. The following inputs are used in the PLTS methodology. These were obtained for the study segments from GIS data, google maps, and the preliminary concept designs for Alternatives 1 and 2:

- **Sidewalk condition and width:** The alternatives will provide a shared-use path in good condition with a width of 12 feet or greater.
- **Buffer type and width:** The alternatives will provide a vertical or landscaped with trees buffer with a width of at least 5 feet.
- **Bike lane width:** There will be no bike lane.
- **Parking width:** There will be no continuous parking protecting the shared-use path.
- **Number of lanes and posted speed:** There are four lanes on McLoughlin Boulevard with a posted speed of 30 MPH.
- **Illumination presence:** Illumination will be provided.
- **General land use:** With the construction of the tumwata village, the general land use of the area will be more pedestrian-friendly. The area is highly recreational.

In the existing condition, McLoughlin Boulevard scores a PLTS 3 and Main Street scores a PLTS 2. For Alternative 3, McLoughlin Boulevard remains at a PLTS 3. While a detailed concept for Main Street has not been determined, Main Street would likely remain at a PLTS 2 or drop to a PLTS 1, depending on the width of the bicycle facilities provided. For Alternatives 1 and 2, McLoughlin Boulevard scores a PLTS 1 due to the provision of a shared-use path, and Main Street remains at a PLTS 2. Figure 9 and Table 3 present the existing PLTS for Oregon City and West Linn near the study area.

**Table 3. Pedestrian Level of Traffic Stress**

Street	Existing	Alternative 1/2 (Realign/Retrofit)	Alternative 3 (Reroute: No-Build)
McLoughlin Boulevard	PLTS 3	PLTS 1	PLTS 3
Main Street	PLTS 2	PLTS 2	PLTS 1 or 2

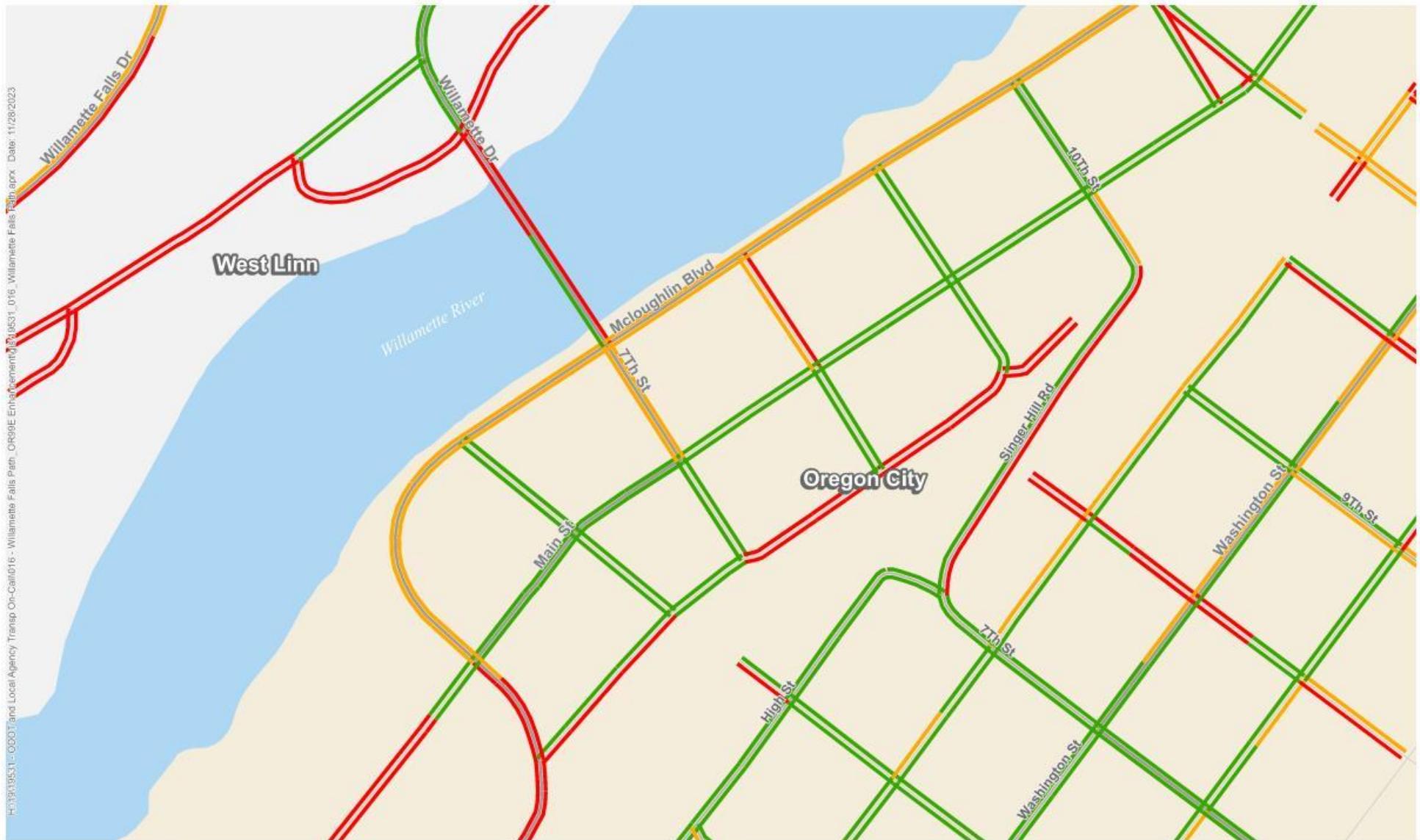


Figure 9

## Bicycle Level of Traffic Stress

The existing and future BLTS was calculated for McLoughlin Boulevard and surrounding streets. The following inputs are used in the BLTS methodology for segments. These were obtained for the study segments from GIS data, google maps, and the preliminary concept designs for Alternatives 1 and 2:

- **Prevailing or posted speed:** The posted speed on McLoughlin Boulevard is 30 MPH.
- **Number of lanes:** McLoughlin Boulevard has four lanes.
- **Width/presence of bike lane:** The bicycle facility will be a 14-foot shared-use path.
- **Width/presence of parking lane:** There will be no continuous parking protecting the shared-use path.
- **Average Daily Traffic (ADT):** The ADT along the study segment of McLoughlin Boulevard is 19,200
- **Functional Class:** The functional classification is Urban Other Principal Arterial.

McLoughlin Boulevard generally scores a BLTS 4 along the study segment (with a small section of BLTS 3) and Main Street scores a BLTS 3. For Alternative 3, McLoughlin Boulevard remains at a BLTS 4. While a detailed concept for Main Street has not been determined, Main Street would likely score a BLTS 1 or 2, depending on the width of the bicycle facilities provided. For Alternatives 1 and 2, McLoughlin Boulevard scores a BLTS 1 due to the provision of a shared-use path, and Main Street remains at a BLTS 3. Figure 10 and Table 4 present the existing BLTS for Oregon City and West Linn near the study area.

**Table 4. Bicycle Level of Traffic Stress**

Street	Existing	Alternative 1/2 (Realign/Retrofit)	Alternative 3 (Reroute: No-Build)
McLoughlin Boulevard	BLTS 4	BLTS 1	BLTS 4
Main Street	BLTS 3	BLTS 3	BLTS 1 or 2

## Level of Traffic Stress Summary

- The BLTS for McLoughlin Boulevard would improve from a BLTS 4 to a BLTS 1 for Alternatives 1 and 2.
- The PLTS for McLoughlin Boulevard would improve from a PLTS 3 to a PLTS 1 for Alternatives 1 and 2.

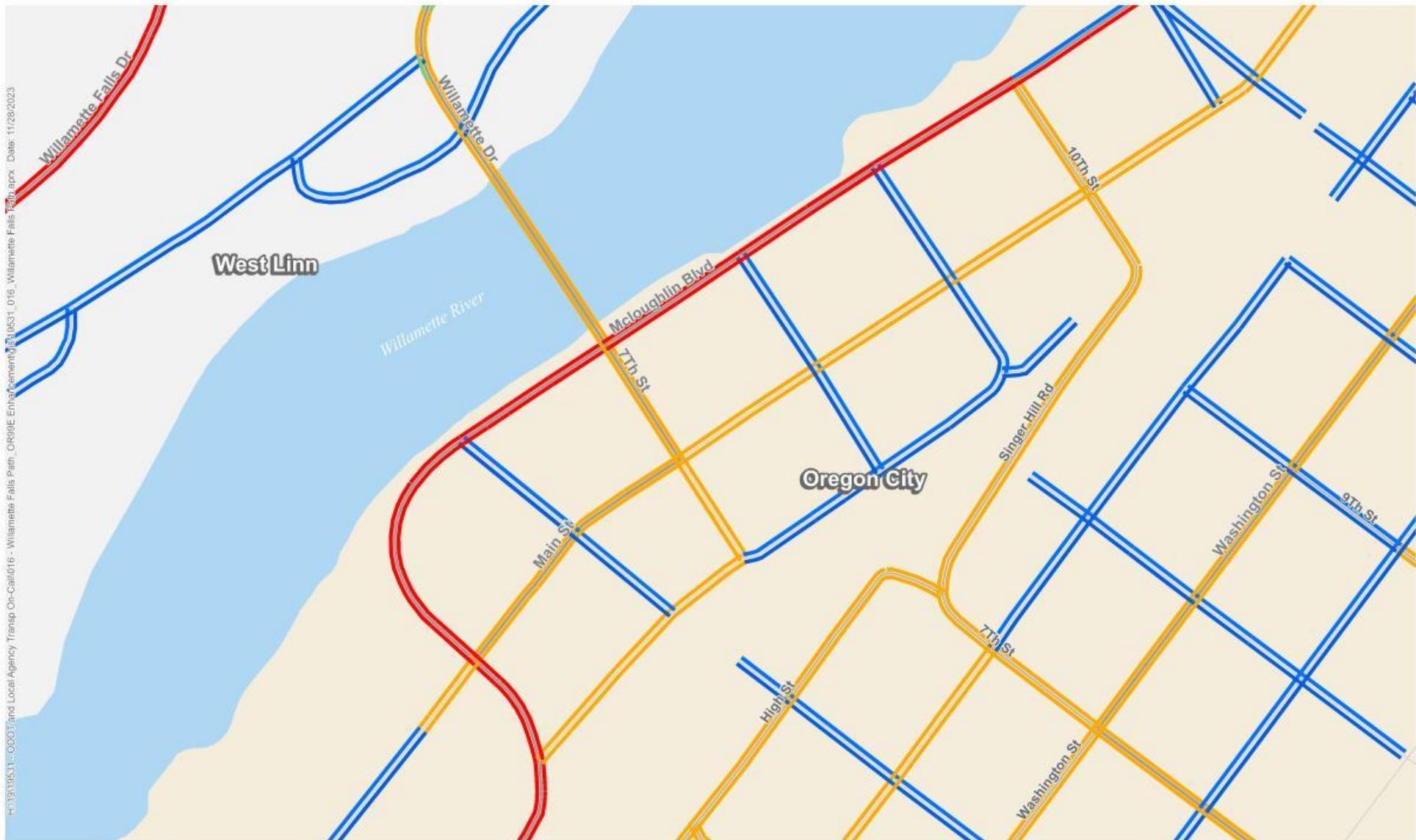


Figure 10

Existing Bicycle Level of Traffic Stress  
Oregon City, Oregon

## Travel Demand

The travel demand section of this memorandum provides a qualitative assessment of the opportunities for increased walking and biking activity levels generated as a result of the built McLoughlin Boulevard shared-use path between 10<sup>th</sup> Street and the future tumwata village. It also includes a quantitative travel demand analysis based on Metro's travel demand model.

### Existing Walking and Biking Activity

To understand the existing levels of walking and biking activity, two data sources were assessed:

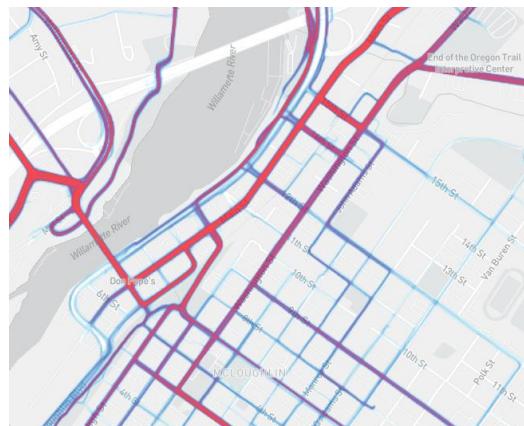
- Strava Heatmap Data
- City Pedestrian and Bicycle Counts

#### Strava Heatmaps

Strava, a phone application and online network allows users to log walking and biking activity, can provide a high-level understanding of the transportation facilities being used for active transportation<sup>6</sup>.

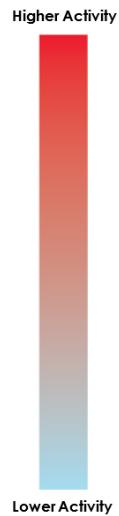
Figure 11 and shows walking activity and Figure 12 shows the biking activity in downtown Oregon City. There is more bicycle activity on Main Street, the Historic arch bridge, and Railroad Avenue.

**Figure 11. Bicycle Strava Heatmap**



Source: Strava Data

**Figure 12. Pedestrian Strava Heatmap**



As shown in Figure 11, higher levels of biking activity are shown northeast of 10<sup>th</sup> Street along the existing shared-use path adjacent to the Willamette River. Southwest of 10<sup>th</sup> Street, where the existing shared-use path terminates, biking activity declines immediately.

As shown in Figure 12, higher levels of walking activity are shown along McLoughlin Boulevard with activity levels tapering down toward 6<sup>th</sup> Street.

Highest levels of biking and walking activities are shown on Main Street and across the historic arch bridge. Within the Project area, biking and walking activities across McLoughlin Boulevard are limited to 10<sup>th</sup> Street (signalized intersection) and the historic arch bridge/7<sup>th</sup> Street.

<sup>6</sup> Most trips logged are recreational, so do not capture most commuting or other trips and may be skewed towards users who are comfortable using higher stress facilities than more vulnerable users (e.g., elderly and youth).

### City Pedestrian and Bicycle Counts

Existing pedestrian and bicycle counts were reviewed based on the Downtown Oregon City Pedestrian and Bicycle Count Summary, 2020 (Reference 7). Within the Project area, pedestrian and bicycle counts were collected at McLoughlin Boulevard south of 13<sup>th</sup> Street. Table 5 summarizes the total pedestrian, wheelchair, bicycle, and other counts at this location.

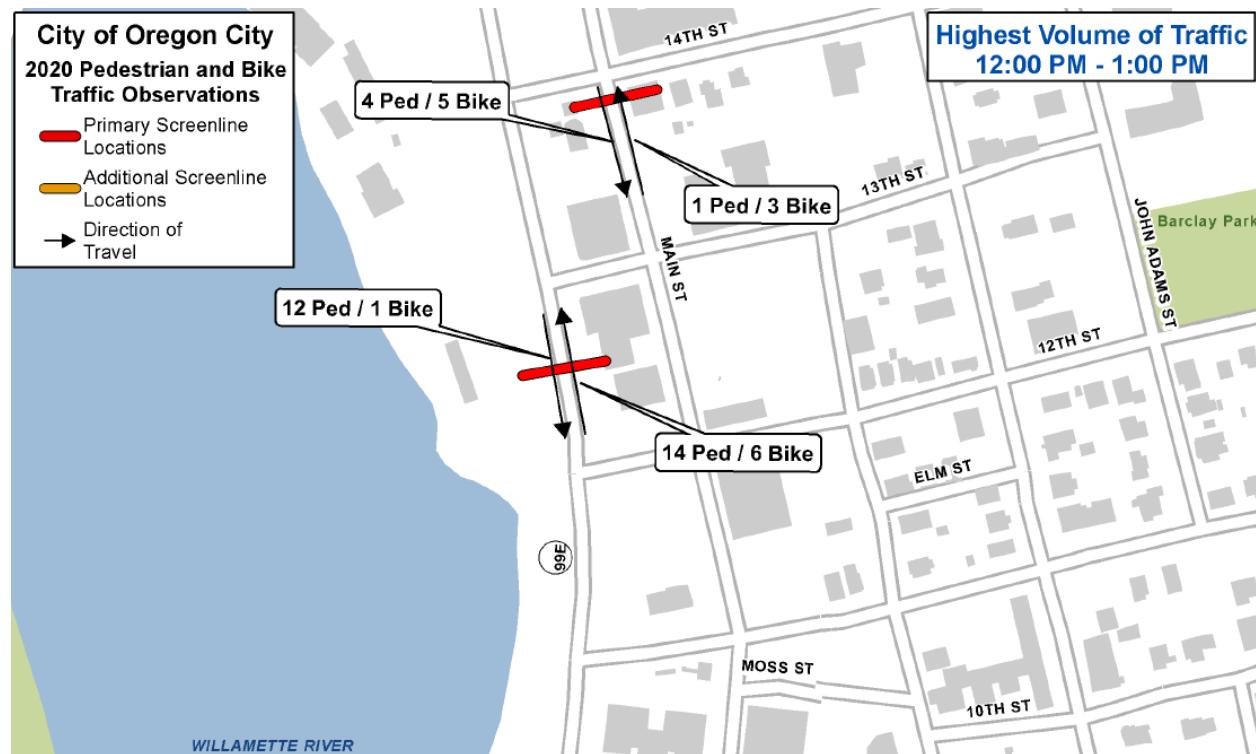
**Table 5. Pedestrian and Bicycle Count Data, 2020 (6-Hour Counts)**

Ped	Wheelchair	Peds + Wheelchair	Adult on Bike	Child on Bike	Other	Bikes + Other
91	-	91	20	-	-	20

As summarized in Table 5, a total of 91 pedestrians and 20 bicyclists were recorded walking and biking, respectively along McLoughlin Boulevard between 13<sup>th</sup> Street and 12<sup>th</sup> Street. Data collection occurred from 7:00 to 9:00 AM, 11:00 AM to 1:00 PM, and 4:00 to 6:00 PM on Thursday, September 24, 2020. Note that these counts were collected during the COVID-19 pandemic and may represent lower than typical volumes.

Figure 13 shows the direction of travel for pedestrians and bicycles<sup>7</sup> counted from 12:00 to 1:00 PM (the network-wide peak hour).

**Figure 13. Direction of Travel Observations (12:00 PM to 1:00 PM)**



<sup>7</sup> "Pedestrians" includes wheelchairs and "Bicycles" includes adults on bicycles, children on bicycles, and other devices.

The Strava heatmap data and pedestrian and bicycle count summary provide a high-level understanding of existing walking and bicycle activity levels along McLoughlin Boulevard.

As described previously, a wide and comfortable shared-use path facility is provided north of 10<sup>th</sup> Street. The improved shared-use path that was constructed as part of the McLoughlin Boulevard Phase 1 improvement project is illustrated in Figure 14.

**Figure 14. McLoughlin Boulevard Shared-Use Path northwest of 10<sup>th</sup> Street**



When people walking and biking reach 10<sup>th</sup> Street from points north (i.e., Clackamas River Trail, Gladstone, Milwaukie, Portland), the shared-use path terminates and they are forced to travel along the narrow 5-foot sidewalk (Figure 15), cross McLoughlin Boulevard, or turn around.

**Figure 15. McLoughlin Boulevard Shared-Use Path southwest of 10<sup>th</sup> Street**



The inadequate facilities limit the potential for continuous walking and biking activity southwest of 10<sup>th</sup> Street. Filling this gap with a separated shared-use path will create a continuous link and induce demand

for people walking and biking along McLoughlin Boulevard as well as provide a physically separated and comfortable connection to tumwata village and the future planned open space.

## Existing Demand & Future Opportunities

### Downtown Oregon City

Downtown Oregon City is a regional center within the Portland Metro area, serving a broad population and boasting a strong retail and restaurant sector, a transit center and Amtrak train station, the County Courthouse, and numerous small businesses that make Oregon City a thriving place. While parts of downtown are currently walkable, there is ample room for improvement when it comes to pedestrian and bicycle safety. The City is committed to making downtown an attractive place to walk, bike, and use transit to support a greater number of visitors and residents in a way that does not exacerbate vehicle traffic and parking constraints.

### tumwata village and Future Open Space

The Confederated Tribes of Grande Ronde (Tribe's) 23-acre property at tumwata/Willamette Falls will attract many new visitors to downtown Oregon City in the future. Based on the tumwata village website "Over the past 160 years, the site has been transformed by heavy industry and altered into something far from its original, natural state. But the Tribe is now taking the site down a new path. We are going to heal this land and restore the natural landscape. We are going to expand access to the falls for everyone, share the story and culture of the Grand Ronde and add thoughtful new development that will revitalize the entire area."



Source: tumwatavillage.org/

To prepare for the increased traffic, the City of Oregon City commissioned a Transportation Demand Management (TDM) Plan. This plan calls for, "creating safe connections to the riverwalk and full site through multiple transportation modes and efficient parking standards will complement the Falls area and Downtown Oregon City for years to come."

The McLoughlin Boulevard shared-use path will serve as a key non-motorized connection to the tumwata village from points north-northwest where parking may be more accessible.

## Metro Travel Demand Model

The future shared-use path travel demand was estimated based on Traffic Analysis Zone (TAZ) data from Metro's travel demand model. Metro provided year 2015 and 2040 automobile volumes from the 2018 Regional Transportation Plan (RTP, Reference 8) for TAZ 730, which includes the tumwata village. In addition, new employment and household estimates were provided from the 2023 Draft RTP (Reference 9). These values are provided in **TAZ 730 Employment and Households Estimates** Table 6. The employment and household estimates increased between the 2018 RTP and the draft 2023 RTP, most notably for households.

As most of the travel demand along the new shared-use path connection is expected to be related to new households, a growth rate of 217% was applied to the automobile volumes from the 2018 RTP (outlined in red).

**Table 6. TAZ 730 Employment and Households Estimates**

	2015/2020 <sup>1</sup> Employment	2027/2030 Employment	2040/2045 Employment	2015/2020 Households	2027/2030 Households	2040/2045 Households
2018 RTP	669	793	893	0	85	161
2023 RTP	771	882	1080	0	189	511
% Growth	15%	11%	21%	-	122%	217%

<sup>1</sup>First year is from the 2018 RTP, second year is from the updated 2023 RTP

Appendix B provides the 2018 RTP estimates for PM peak hour (5 PM) automobile volumes travelling to and from TAZ 730 in 2040. There are currently 256 vehicles travelling out of the TAZ (43 from the node in tumwata village and 213 from the node at Main Street and 8<sup>th</sup> Street) and 172 vehicles travelling into the TAZ (21 into the node at tumwata village and 151 into the node at Main Street and 8<sup>th</sup> Street). With a growth rate of 217%, this leads to 556 vehicles out and 373 vehicles in.

### Shared-Use Path Demand (Walking and Biking Trips)

The RTP only provides automobile volumes. As a result, the project team used a mode share assumption to estimate the percentage of walking and biking trips. The draft 2023 RTP states that as of 2019, the Portland region had a 6.2% walking and biking mode split for all trips. Transit made up another 8.1% of trips. The 2045 target is a 33.7% pedestrian and bicycle mode share. The Oregon City TSP also states that the non-drive alone target is 45% to 55% and includes a goal to triple the walking, biking, and transit mode share by 2035.

Therefore, the pedestrian/bicycle mode share can be estimated as 6.2% to 33.7%. Given the importance of the McLoughlin Boulevard shared-use path connection and planned development, a mode share of about **33%** seems appropriate for evaluating 2045 travel demand.

Figure 16 and Figure 17 show the inbound and outbound traffic percentages for TAZ 730, respectively. 17% of all inbound traffic used Main Street to access the TAZ, rather than McLoughlin Boulevard. Similarly, 23% of all outbound traffic was travelling along Main Street to access McLoughlin Boulevard east of 10<sup>th</sup> Street. With the addition of the shared-use path connection west of 10<sup>th</sup> Street, pedestrians and bicyclists following this pattern would now be expected to travel via the new connection on McLoughlin Boulevard instead.

Figure 16. Inbound Automobile Percentages for TAZ 730 (PM Peak Hour)

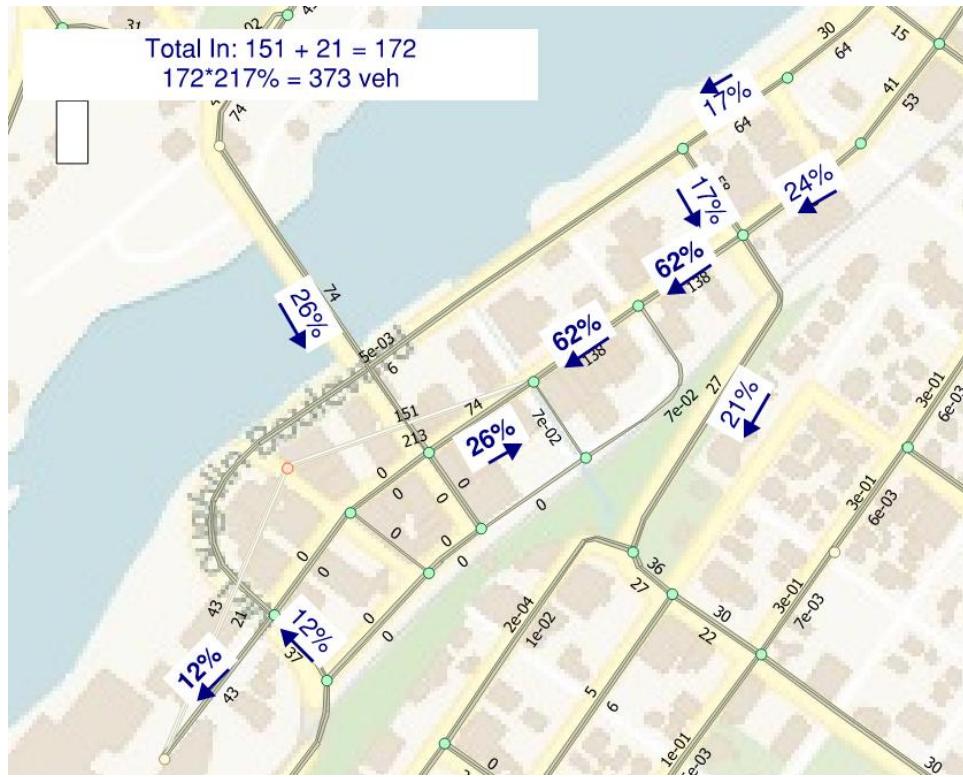
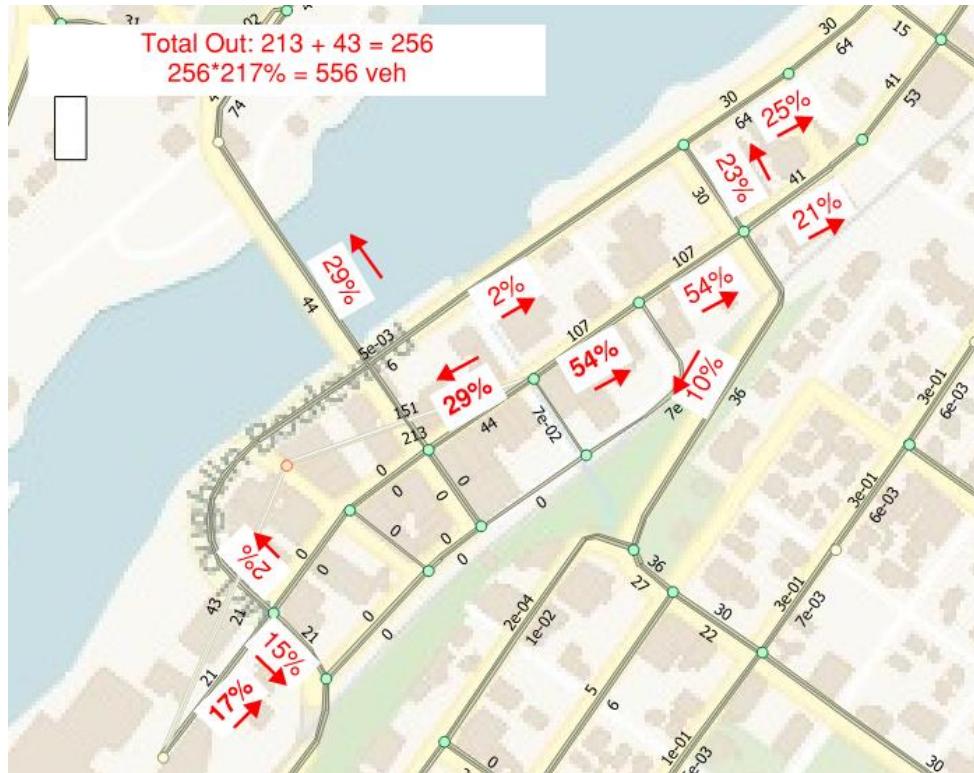


Figure 17. Outbound Automobile Percentages for TAZ 730 (PM Peak Hour)



As shown in Table 7, applying a mode share of 33% leads to an assumption of 32 inbound and 64 outbound pedestrians and bicyclists that would now use the new shared-use path on McLoughlin Boulevard instead of the shared-use path in the peak hour.

**Table 7. McLoughlin Boulevard Shared-Use Path Walking and Biking Trips**

	TAZ 730 Vehicles	% Vehicles On McLoughlin and 10 <sup>th</sup>	Vehicles On McLoughlin and 10 <sup>th</sup> Total (67%)	Pedestrian/Bicycle Total (33%)	Total Vehicle + Pedestrian/Bicycle
Inbound	373	17%	63	32	95
Outbound	556	23%	128	64	192

## Travel Demand Summary

- The shared-use path connection could generate approximately 96 walking and biking trips in the peak hour by 2045.
- Within the Project area, there is a direct correlation between walking and biking activity levels and lack of comfortable walking and biking facilities present. Based on field observations. Relatively low levels of walking and biking have been observed along McLoughlin Boulevard within the Project area.
- A wide, comfortable, and accessible shared-use path is located northeast of the Project area which receives relatively high levels of walking and biking activity. This shared-use path was built as part of the McLoughlin Boulevard Improvement Project – Phase 2.
- A continuous shared-use path connection from points northeast (downtown Oregon City, Clackamas River Trail, Gladstone, Milwaukie, Portland) to tumwata village will provide the option for people to walk and bike to the future tumwata village site.
- Constructing a shared-use path to fill the existing gap between the terminus of the McLoughlin Boulevard shared-use path (northeast of Project area) and the tumwata village development and future open space will increase walking and biking activity levels along McLoughlin Boulevard.

## Crossing Analysis

The shared-use path alternatives are located on the Willamette River side of McLoughlin Boulevard. Providing connectivity across McLoughlin Boulevard to the future shared-use path alignment from downtown Oregon City is critical to the success and accessibility of the shared-use path.

### Signalized Crossings

There are three existing signalized crossings along McLoughlin Boulevard in the Project area.

- McLoughlin Boulevard/10<sup>th</sup> Street – Signal
- McLoughlin Boulevard/7<sup>th</sup> Street – Pedestrian Signal
- McLoughlin Boulevard/Main Street – Signal

All locations provided a dedicated and protected phase for people crossing McLoughlin Boulevard. The distance between 10<sup>th</sup> Street and 7<sup>th</sup> Street is approximately 1,000 feet. The distance between 7<sup>th</sup> Street and Main Street is approximately 900 feet.

## Unsignalized Crossings

There are three existing unsignalized crossings along McLoughlin Boulevard in the Project area.

- McLoughlin Boulevard/9<sup>th</sup> Street – Unsignalized
- McLoughlin Boulevard/8<sup>th</sup> Street – Unsignalized
- McLoughlin Boulevard/6<sup>th</sup> Street – Unsignalized

Although legal crossings, the three unsignalized intersections do not have marked crosswalks and do not have streetlights or curb ramps on the river side of McLoughlin Boulevard.

## Target Crossing Spacing

The ODOT HDM provides a range of target crossing spacings based on established urban context. The more urban the area and higher likelihood of pedestrian activity, the higher the recommended frequency of crossings. As part of the Corridor Vision (Reference 10), the Project established an urban context of Traditional Downtown/CBD. The target crossing spacing for the Traditional Downtown/CBD urban context is 250 to 550 feet.

## Recommended Crossing Location

Based on the recommended target crossing spacing, an additional crossing is recommended between 10<sup>th</sup> Street and 7<sup>th</sup> Street. A crossing at McLoughlin Boulevard/8<sup>th</sup> Street or McLoughlin Boulevard/9<sup>th</sup> Street would achieve the recommended target crossing spacing for the Traditional Downtown/CBD urban context.

Due to sight distance challenges as a result of the curvature of McLoughlin Boulevard, an additional crossing is not recommended between 7<sup>th</sup> Street and Main Street.

## Crossing Treatment Guidance

The ODOT Traffic Manual outlines a process for crosswalk marking selection and uncontrolled crossings. The matrix presented in Figure 18 provides a reference for recommended and optional treatments based on number of lanes, presence of a refuge island, AADT, and posted speed of a roadway.

Based on data provided on [ODOT's TransGIS website](#), McLoughlin Boulevard has four lanes, no refuge island, a speed of 30 MPH, and an Average Annual Daily Traffic of approximately 19,000 vehicles per day.

**Figure 18. Uncontrolled Marked Crosswalk Treatments**

Table 310.3-A: Uncontrolled marked crosswalk treatments

Lanes Crossed**	Refuge Island	AADT & Posted Speed***																	
		<3000 veh/day			3000-9000 veh/day			9000-12,000 veh/day			12,000-15,000 veh/day			>15,000 veh/day					
		≤30 mph	35 mph	40-45 mph	≤30 mph	35 mph	40-45 mph	≤30 mph	35 mph	40-45 mph	≤30 mph	35 mph	40-45 mph	≤30 mph	35 mph	40-45 mph	≤30 mph	35 mph	40-45 mph
1	N/A	A <sup>†</sup> B C E G	C A E I	C A B C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G
2	Yes	A <sup>†</sup> B C D E G	C A E I	C A B C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G
	No	A <sup>†</sup> B C D E F G	C A E I	C A B C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G
3	Yes	A <sup>†</sup> B C D E G	C A E I	C A B C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G
	No	A <sup>†</sup> B C D E F G	C A E I	C A B C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G
	Yes	A <sup>†</sup> B C D E G	C A E I	C A B C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G
4	Yes	A <sup>†</sup> B C D E G	C A E I	C A B C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G
	No	A <sup>†</sup> B C D E F G	C A E I	C A B C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G	C A E G

\* Treatment "A" recommended for school crosswalks and midblock crosswalks.

\*\* Total motor vehicle lanes crossed to complete the crossing, including TWLT and left/right turn lanes. Bicycle lanes and refuge islands at least 6 feet wide are not lanes crossed. STRE approval required for uncontrolled marked crosswalks across 5+ lanes.

\*\*\* See Speed discussion in the Special Considerations subsection. 85<sup>th</sup> percentile speed may be used instead of the posted speed.

Except at roundabouts, uncontrolled marked crosswalks should not be installed where the posted speed is 50 mph or higher.

This table does not apply to temporary marked crosswalks. See the TCP Manual (4) for temporary uncontrolled marked crosswalks.

Installation of a treatment(s) at any location is subject to an engineering study that accounts for factors such as sight distance, safety, operations, other field conditions, and local land use.

X = Treatment optional.

X = Treatment recommended.

X = Treatment recommended and should be installed with other identified treatments.

The absence of a letter means the treatment is generally not appropriate, but exceptions may be considered through the engineering study and STRE approval process.

A = Continental-style crosswalk markings, parking restrictions on crosswalk approach (see Table 310.3-B), lighting according to the ODOT Traffic Lighting Design Manual. Crossing warning sign(s) for school crosswalks, midblock crosswalks, or speed ≥ 30 mph.

B = Raised crosswalk, except on freight routes, emergency response routes, arterial roadways, and snowplow routes.

C = If 2+ lanes in one direction, wide advance stop bar and STOP HERE FOR Pedestrians sign.

D = In-street pedestrian crossing sign (R1-6a). If refuge island present, install on the refuge island.

E = Curb extension.

F = If crossing 2-way traffic, pedestrian refuge island (at least 6 feet wide).

G = Rectangular rapid flashing beacon (RRFB).

H = Reduce number of motor vehicle lanes.

I = Traffic signal or pedestrian hybrid beacon (PHB).

Blue = All treatments shown in category optional. Treatment "A" recommended for school and midblock crosswalks.

Green = Visibility enhancements recommended.

Yellow = RRFB treatment recommended.

Red = Traffic signal or PHB recommended.

## Recommended Crossing Treatments

Based on the guidance identified in the ODOT HDM, the following crosswalk treatments are **recommended**.

- Wide advance stop bar and STOP HERE FOR Pedestrians sign
- Pedestrian refuge island<sup>8</sup>
- Traffic signal or pedestrian hybrid beacon

Note that as a pedestrian hybrid beacon treatment is not preferred by ODOT at this time, a traffic signal is recommended.

Recommended crosswalk treatments that should be **installed with other identified treatments include**:

- Continental-style crosswalk markings, parking restrictions on crosswalk approach (see Table 310.3-B) lighting according to ODOT Traffic Lighting Design Manual. Crossing warning sign(s) for school crosswalks, midblock crosswalks, or speed ≥ 30mph.

**Optional** crosswalk treatments include:

- Curb extensions<sup>9</sup>
- Reduce number of motor vehicle lanes
- Grade Separated Crossing

A grade separated crossing will provide the greatest level of comfort and reduce risk for people crossing McLoughlin Boulevard. The idea of a grade-separated undercrossing is being explored based on the opportunity presented by the elevated viaduct.

<sup>8</sup> Treatment not feasible with existing roadway configuration

<sup>9</sup> Treatment not feasible with existing roadway configuration

Today, access to the historical 8<sup>th</sup> Street dock is provided by a stairwell located at the southeast corner of the McLoughlin Boulevard/8<sup>th</sup> Street intersection. The stairwell provides access underneath and to the edge of Willamette River.

**Figure 19. Grade Separated Undercrossing**



As shown in Figure 19, a grade separated undercrossing is being explored that would utilize the space of the existing stairwell to bring people under the viaduct to access the future shared-use path on the Willamette River side of McLoughlin Boulevard.

The grade separated undercrossing will require significant cut-fill to the earth at the current location of the stairwell to provide ADA accessible ramps.

### Crossings Recommendations and Summary

The following key findings and recommendations have been identified based on the crossing analysis.

- Recommended target crossing spacing for McLoughlin Boulevard is currently not met.
- A crossing at McLoughlin Boulevard/8<sup>th</sup> Street or McLoughlin Boulevard/9<sup>th</sup> Street would achieve the recommended target crossing spacing from the HDM.
- Due to sight distance challenges, a crossing is not recommended between 6<sup>th</sup> Street and Main Street.
- Recommended crossing treatments include:
  - Wide advance stop bar and STOP HERE FOR Pedestrians sign.
  - Traffic signal.
  - Continental-style crosswalk markings, parking restrictions on crosswalk approach (see Table 310.3-B) lighting according to ODOT Traffic Lighting Design Manual. Crossing warning sign(s) for school crosswalks, midblock crosswalks, or speed  $\geq 30\text{mph}$ .

## Placemaking Opportunities

Placemaking refers to the creation of public spaces that improve urban vitality and promote people's health, happiness, and wellbeing. Placemaking aims to highlight and enhance the local community's assets and contribute to the imageability of the neighborhood or city. The existing shared-use path northeast of 10th Street has placemaking elements, such as sculptures, seating, landscaping, and interpretive signs. In addition, the planned tumwata village will also have many placemaking elements, especially along the riverwalk that will connect visually to the Willamette Falls.

Therefore, the shared-use path connection is vital in continuing the sense of place all along the Oregon City waterfront. Note that for many alternatives, from a structural perspective, tradeoffs may need to be made between the material for the shared-use path and the provision of placemaking elements. For example, the use of lighter materials (such as aluminum) instead of concrete for the path would allow extra weight for bump-outs or other amenities.

- **Alternative 1A: Low Route** would have the potential to create a wide shared-use path with its floating design, and provide many opportunities for benches, lighting, and immediate access to the river. Bump-outs and other placemaking elements should be placed at piers in order to avoid additional structural challenges.
  - This option would bring the path closest to the water, and thus could be themed around river elements.
  - In addition, there are opportunities at the ramping structures and where the path meets the McLoughlin Boulevard "elbow" to create gateways or landmarks that invite users in and mark the start and end of the path connection.
- **Alternative 1B: High Route** would also be able to provide a wide shared-use path, but at road-level. Placemaking elements like benches would also be possible, but with less connection to the river. However, small 'balconies' could be designed with interpretive signs and/or sculptures to create viewing points over the river. In addition, there would be opportunities at the entrance point and at the exit point near the McLoughlin "elbow" to create gateways to the path.
- **Alternative 1C: Hybrid Route (At-Grade)** would provide a more disjointed alignment, with parts of the shared-use path fully separated, on-street, and on a structure around the arch bridge. There is the most opportunity for placemaking on the viaduct section of the route. Placemaking is important in this alternative in order to provide a sense of continuity along the alignment.
- **Alternative 1C: Hybrid Route (Below-Grade)** would also provide a disjointed alignment, with parts of the shared-use path fully separated, on-street, and on a tunnel. There is the most opportunity for placemaking on the viaduct section of the route, with little to no opportunity through the tunnels section due to limited width. Placemaking is important in this alternative in order to provide a sense of continuity along the alignment.
- **Alternative 2A: McLoughlin Boulevard Reorganization** has the opportunity to provide many placemaking elements within the right-of-way of McLoughlin Boulevard to support the chosen shared-use path alignment, such as landscaping.
- **Alternative 2B: Viaduct Augmentation** would provide a fully separated shared-use path from 10<sup>th</sup> Street to 8<sup>th</sup> Street via a cantilevered structure, but is limited in width to 10 feet. Therefore, there is little opportunity for placemaking. Southwest of 8<sup>th</sup> Street, the alignment would continue as one of the sub-options for Alternative 1C (at-grade or below-grade).
- **Alternative 2C: Viaduct Rebuild** would rebuild the viaduct, providing opportunity for a wider shared-use path with more placemaking opportunities. Southwest of 8<sup>th</sup> Street, the alignment would continue as one of the sub-options for Alternative 1C (at-grade or below-grade).

- **Alternative 3: Reroute** would have limited room for placemaking as it proposes a facility within the right-of-way of Main Street, which has limited space for any placemaking elements.

## Noise

Several studies have shown that biking downtown, especially during the commute, may be associated with health and safety risks due to potentially high levels of exposure to air and noise pollution<sup>10</sup>. Prolonged exposure to high levels of noise generated by road traffic can also cause health problems and have detrimental effects on individuals' well-being.<sup>11</sup>

- **Alternative 1A: Low Route** would lead to lower amounts of noise pollution for people walking, biking, or rolling on the path as the structure would be further from road traffic on McLoughlin Boulevard.
- **Alternative 1B: High Route** and **Alternative 1C: Hybrid Route** would have 30 feet of separation from the roadway at the viaduct section, leading to lower noise pollution. The section adjacent to the roadway would lead to more noise pollution.
- **Alternative 2A: McLoughlin Boulevard** would include a shared-use path from Alternative 1, so the scoring for this alternative would align with the scores above.
- **Alternative 2B: Viaduct Augmentation** and **Alternative 2C: Viaduct Rebuild** would be adjacent to McLoughlin Boulevard for the entire segment, so would have higher levels of noise pollution.
- **Alternative 3: Reroute** would route people walking and biking on a lower-traffic street with less noise, but would still require crossings of McLoughlin Boulevard.

## Placemaking Opportunities Summary

- **Alternative 1A: Low Route** has the most opportunities for placemaking due to its floating design. It would also lead to the least amount of noise pollution for path users.
- Alternatives that include horizontal separation from the roadway for some portion of the path (**Alternatives 1B and 1C**) would also have lower noise pollution for that portion.
- Alternatives with pinch points may have limited space for placemaking. Alternatives with cantilevered structures need to weigh the tradeoffs between path material, placemaking elements, and cost.
  - **Alternative 1B and 1C (At-Grade)**, as well as the at-grade versions of **2B** and **2C**, have a pinch point at the tunnel.
  - **Alternative 1C (Below-Grade)** has a pinch point within the tunnel.
  - **Alternative 2B** must be 10 feet wide or less at the viaduct.

## Safety Analysis

### Pedestrian and Bicycle Risk Factors

The Oregon Bicycle and Pedestrian Safety Implementation Plan assigns state highways a bike and pedestrian crash risk score based on the presence of risk factors associated with each crash type; the

<sup>10</sup> de Hartog, J. J., Boogaard, H., Nijland, H., & Hoek, G. (2011). Do the health benefits of cycling outweigh the risks? *Epidemiology*, 22. <https://doi.org/10.1097/01.ede.0000391897.18320.1d>

<sup>11</sup> Osei, F. A., & Effah, E. A. (2022). Health effects caused by noise - the case of Africa: Evidence in literature from the past 25 Years. *Asian Journal of Advanced Research and Reports*, 19–27. <https://doi.org/10.9734/ajarr/2022/v16i230452>

higher the score, the more risk factors present. The Project area scores in the highest category for both the bike and pedestrian crash risk scores throughout Oregon. The Project area includes several factors that are associated with higher crash risk:

### Pedestrian Risk Factors:

- Principal Arterial
- Number of Lanes ( $\geq 4$  Lanes)
- High-Access Density
- No Sidewalks (or Only One Side)
- Mixed Use Zoning
- Proximity to Schools (1 Mile)
- Proximity to Transit Stops (1/4 Mile)

### Bicycle Risk Factors:

- Principal Arterial
- Number of Lanes ( $\geq 4$  Lanes)
- No Bike Lane
- High-Access Density
- Mixed Use Zoning
- Proximity to Schools (1 Mile)
- Proximity to Transit Stops (1/4 Mile)

The risk factor screening for the Project area is included in the [ODOT Active Transportation Needs Inventory \(ATNI\) online map](#). The results of the pedestrian and bicycle risk factor screening are presented in Figure 20 and Figure 21, respectively.

McLoughlin Boulevard has a pedestrian risk factor score in the top 20<sup>th</sup> percentile from Railroad Avenue to 8<sup>th</sup> Street; the score is lower east of 8<sup>th</sup> Street. McLoughlin Boulevard is a principal arterial with four lanes, mixed use zoning, and is near schools and transit stops. In addition, the existing sidewalk in the Project area are narrow, curb-tight, and uncomfortable for people walking and rolling.

McLoughlin Boulevard has a bicycle risk factor score in the top 20<sup>th</sup> percentile for the study area. The score is derived from its risk factors of being a principal arterial; having four lanes, having no bike lanes; being in a mixed-use zoning area; and being close to schools and transit. In addition, some segments have high access densities.

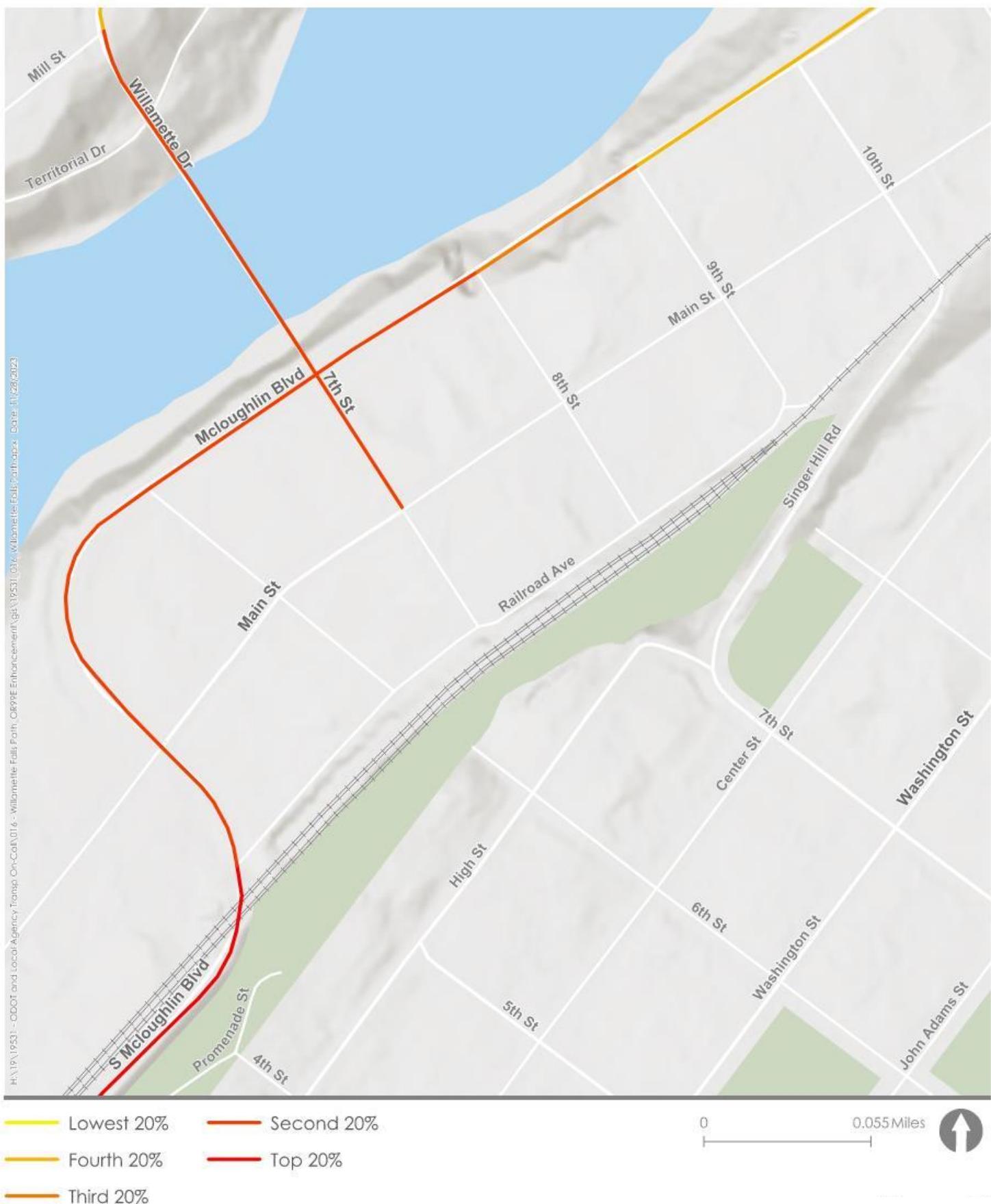


Figure 20

## Pedestrian Crash Risk Scores Oregon City, OR

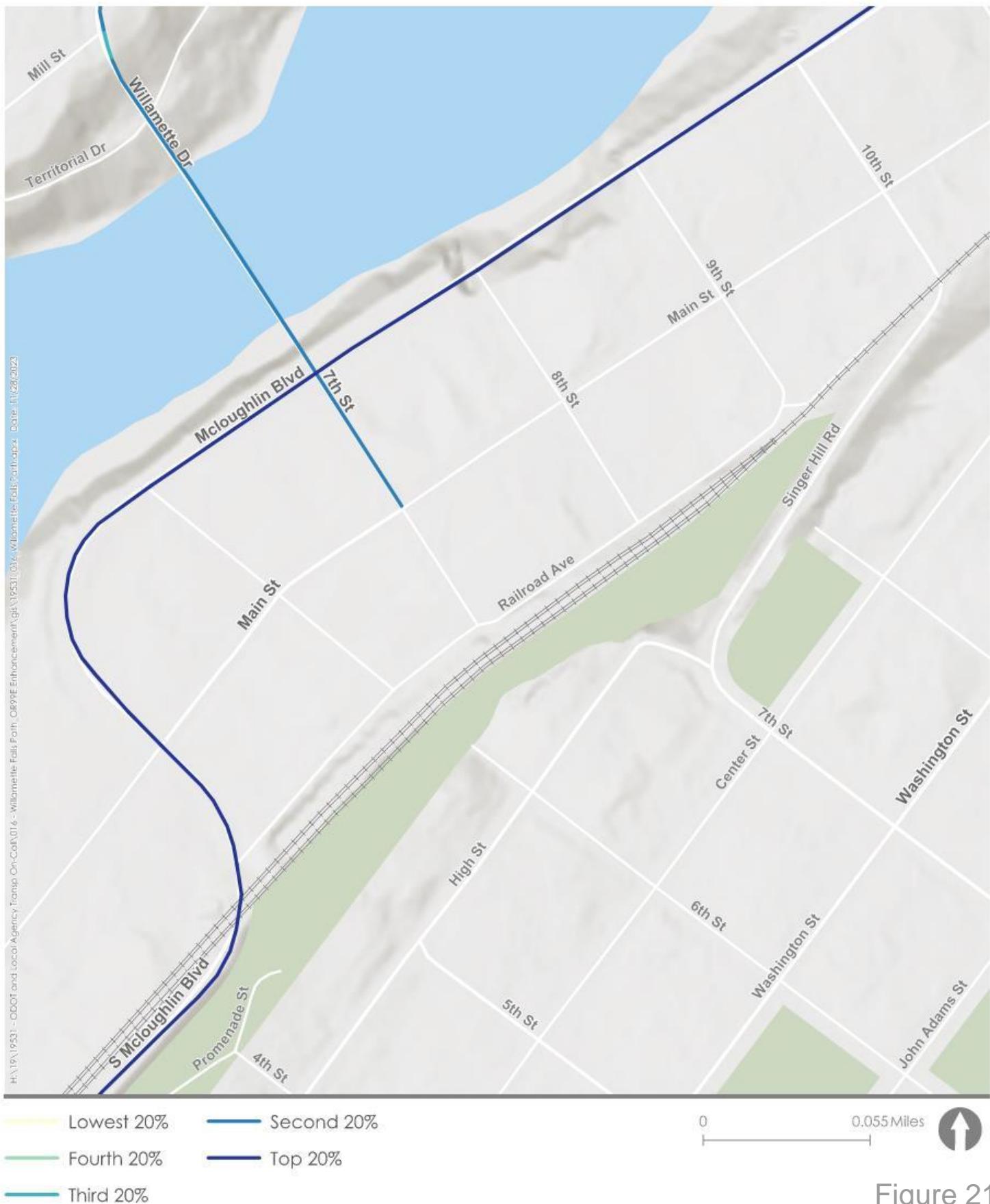


Figure 21

## Crash Reduction Factors

Crash Reduction Factors (CRFs) estimate a facility treatment or “countermeasure’s” ability to reduce crashes and crash severity. CRF values are used to identify countermeasures with the greatest safety benefit for a particular crash type or location. A CRF values indicates the estimated percentage of reduction of crashes for a countermeasure.

### FHWA Clearinghouse

Based on Federal Highway Administration (FHWA) Clearinghouse, installing a shared -use path has a CRF of 25% targeted at vehicle and bicycle crashes for all crash severities in urban areas. Shared-use paths should be considered at locations where on-street facilities are not feasible or along rural roadways.

## Crash Analysis

The project team analyzed 5-year crash data from 2017 to 2021 along McLoughlin Boulevard from 10<sup>th</sup> Street to Railroad Avenue and along Main Street from McLoughlin Boulevard to 10<sup>th</sup> Street. A total of eight crashes involving pedestrians were reported and no crashes involving people biking were reported in the Project area.

The one reported crash involving a pedestrian on McLoughlin Boulevard occurred in 2021 at the intersection of 10<sup>th</sup> Street. The crash resulted in a minor injury for the pedestrian. There was one serious injury in the Project area, which occurred at the intersection of 10<sup>th</sup> Street and Main Street. Figure 22 presents the reported pedestrian crashes in the study area.

## Safety Summary

- There was one reported crash involving a pedestrian on McLoughlin Boulevard between 2017 and 2021, at the intersection of 10th Street. It resulted in a minor injury.
- McLoughlin Boulevard scores as having high pedestrian and bike crash risk.



### — Study Segment

0 0.07 Miles



Figure 22

## Pedestrian Crashes Oregon City, OR

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## Next Steps

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The alternative safety and active transportation analysis along with the High-Level Environmental Screening (Reference 11) will inform the selection of the top three most promising alternatives as part of TM#6: Most Promising Alternatives.

The contents of this document will be reviewed and refined further by the Project Development Team (PDT), ODOT staff, and Oregon City staff and revised to produce the Final Alternative Safety and Active Transportation memorandum.

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## References

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1. Technical Memorandum #4: Alternative Concepts
2. Technical Memorandum #2: Evaluation Criteria and Performance Measures
3. American Association of State Highway Transportation. *Guide for the Development of Bicycle Facilities*, 2012.
4. Oregon Department of Transportation. Highway Design Manual, 2023
5. Technical Memorandum #3: Plans and Policies Review
6. Oregon Department of Transportation. *Analysis Procedures Manual*, 2023.
7. City of Oregon City. *Downtown Oregon City Pedestrian and Bicycle Count Summary*, 2020.
8. Metro, *2018 Regional Transportation Plan*, 2018.
9. Metro, *2023 Draft Regional Transportation Plan*, 2023.
10. Technical Memorandum #1: Corridor Vision
11. High-Level Environmental Screening

## Appendix A: 3D Model Visualizations for Shared-Use Path Alternatives

# Alt. 1A: Low Route



# Alt. 1A: Low Route



# Alt. 1A: Low Route



## Alt. 1B: High Route



# Alt. 1B: High Route



## Alt. 1B: High Route



# Alt. 1B: High Route

tumwata village  
development



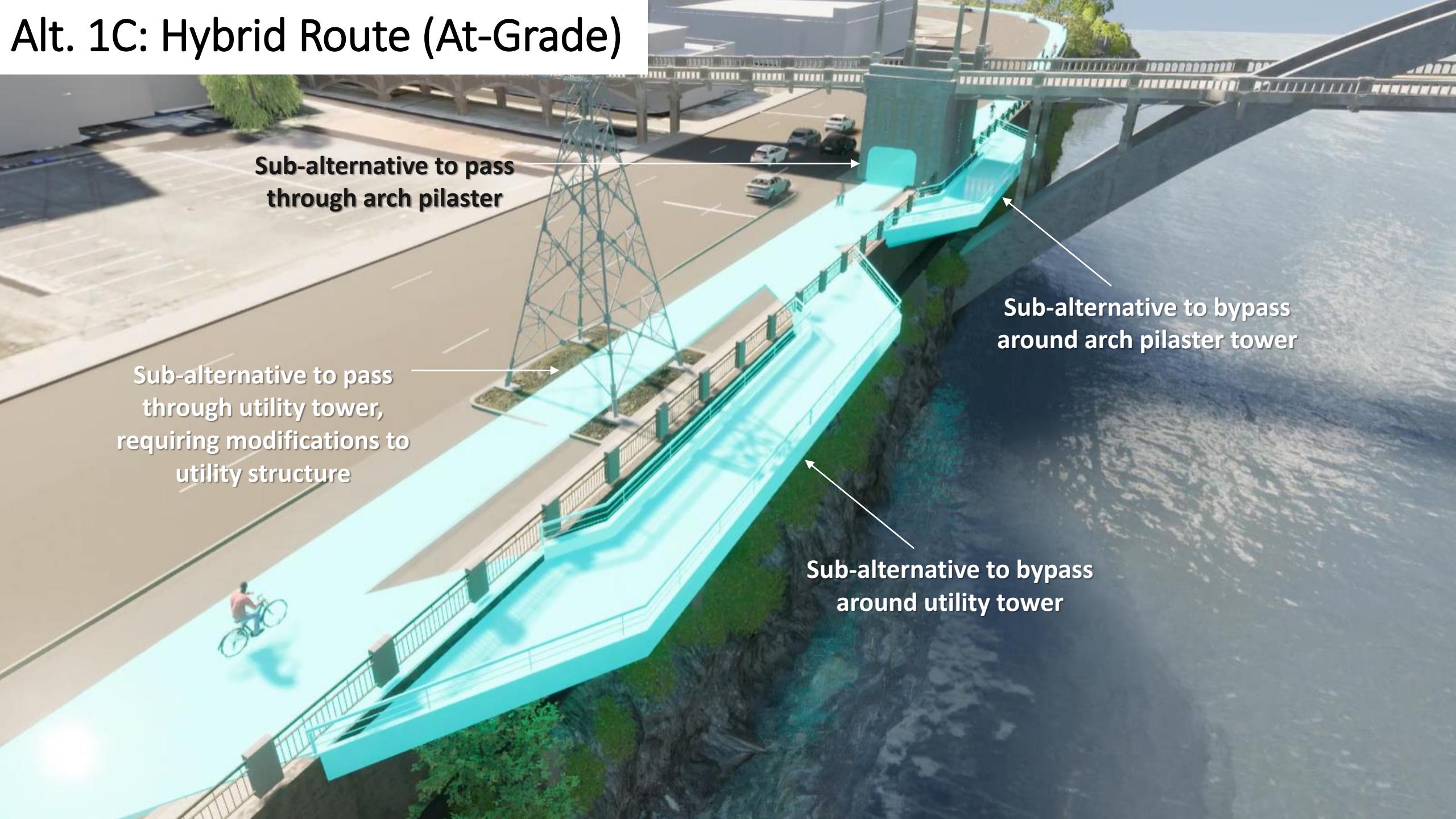
# Alt. 1C: Hybrid Route



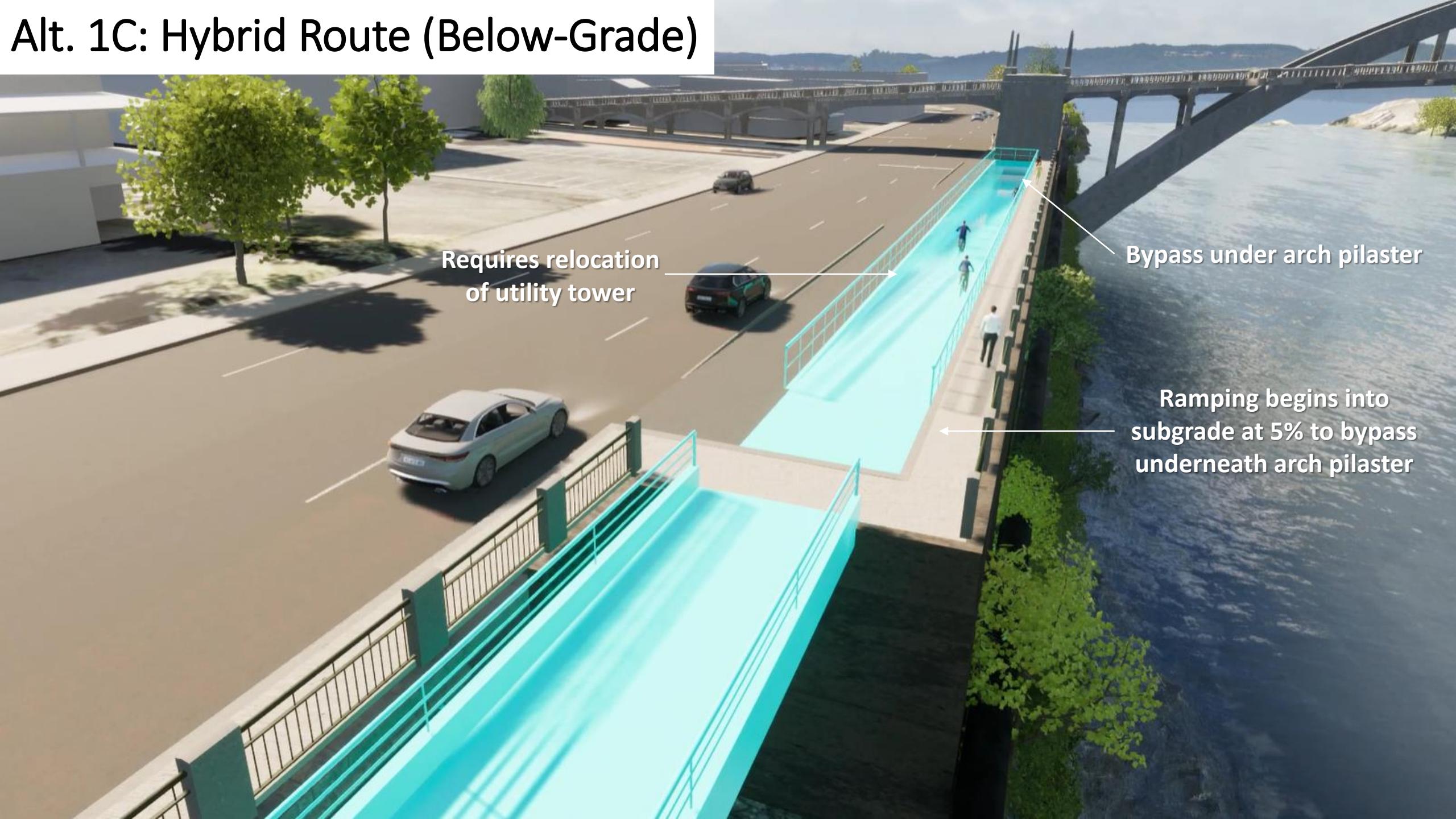
# Alt. 1C: Hybrid Route (At-Grade)



# Alt. 1C: Hybrid Route (At-Grade)



# Alt. 1C: Hybrid Route (Below-Grade)

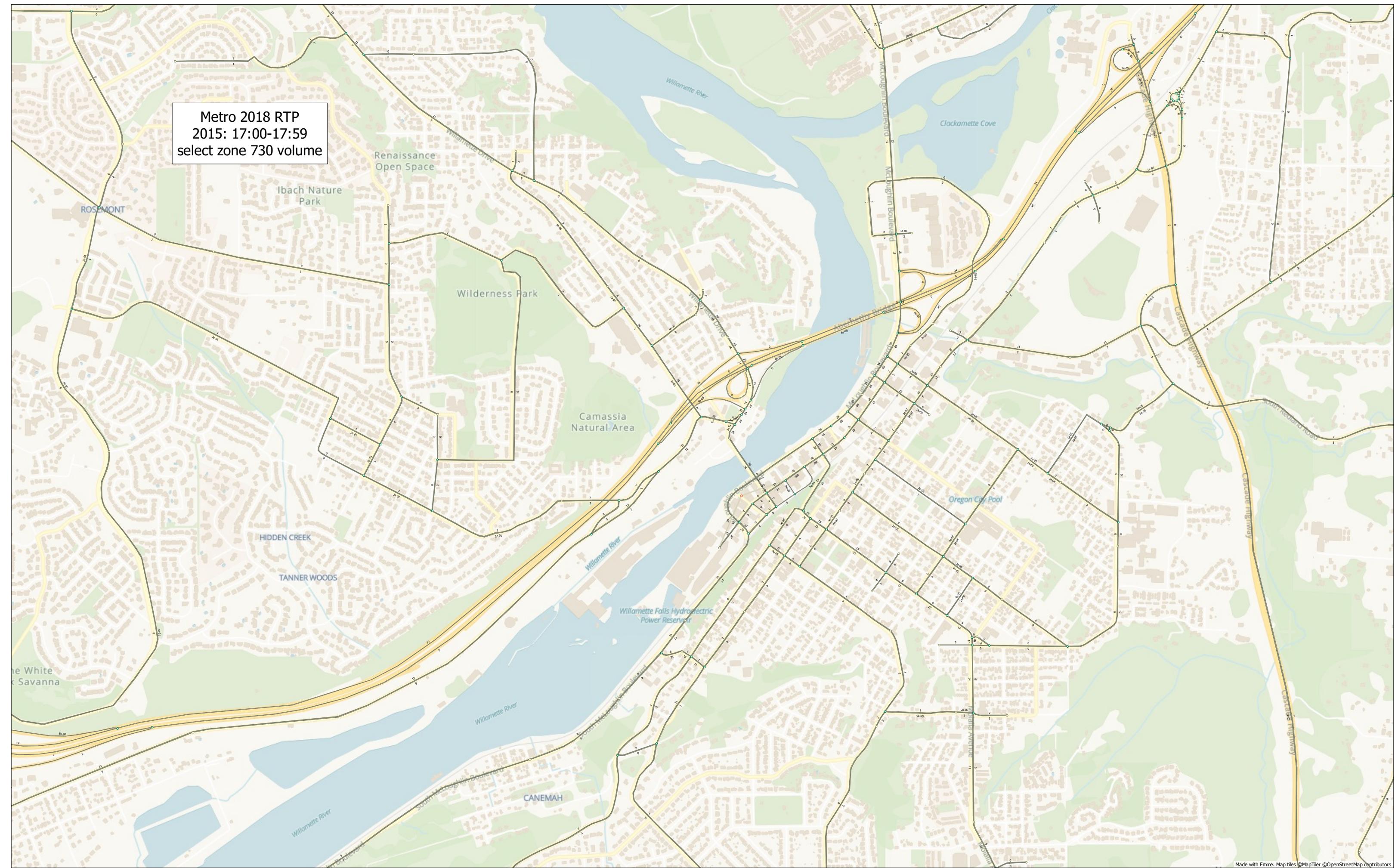


# Alt. 1C: Hybrid Route



## Appendix B: 2018 Metro RTP TAZ 730 Automobile Volumes

Metro 2018 RTP  
2015: 17:00-17:59  
select zone 730 volume



Metro 2018 RTP  
2040FC: 17:00-17:59  
select zone 730 volume

