FINAL

Transit
Technical Report

I-5 Rose Quarter Improvement Project

Oregon Department of Transportation

January 8, 2019

Contents

Tables

Figures[1]

Appendices

[1] Appendix A includes written descriptions of all figures referenced in this Technical Report. If needed, additional figure interpretation is available from the ODOT Senior Environmental Project Manager at (503) 731-4804.

Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
API	Area of Potential Impact
CPC Plan	*I-5 Rose Quarter Interchange Improvement Project Construction Phasing Concept Plan*
EB	eastbound
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
I-405	Interstate 405
I-5	Interstate 5
I-84	Interstate 84
MAX	Metropolitan Area Express
mvmt	million vehicle miles travelled
NB	northbound
NEPA	National Environmental Policy Act
ODOT	Oregon Department of Transportation
OHP	Oregon Highway Plan
ORS	Oregon Revised Statute
OTP	Oregon Transportation Plan
OPTP	Oregon Public Transportation Plan
RTP	*Regional Transportation Plan*
SAC	Stakeholder Advisory Committee
SB	southbound
SPIS	Safety Priority Index System
STIP	Statewide Transportation Improvement Program
TMA	Transportation Management Association
TSP	transportation system plan
WB	westbound

Executive Summary

The I-5 Rose Quarter Improvement Project (Project) is located in Portland, Oregon, along the 1.7-mile segment of Interstate 5 (I-5) between Interstate 405 (I-405) to the north (milepost 303.2) and Interstate 84 (I-84) to the south (milepost 301.5). The Project also includes the interchange of I-5 and N Broadway and NE Weidler Street (the Broadway/Weidler interchange) and the surrounding transportation network, from approximately N/NE Hancock Street to the north, N Benton Avenue to the west, N/NE Multnomah Street to the south, and NE 2nd Avenue to the east.

The purpose of the Project is to improve the safety and operations on I-5 between I-405 and I-84, the Broadway/Weidler interchange, and adjacent surface streets in the vicinity of the Broadway/Weidler interchange. The existing short weaving distances and lack of shoulders for crash/incident recovery in this segment of I-5 are physical factors that may contribute to the high number of crashes and safety problems. In achieving the purpose, the Project would also support improved local connectivity and multimodal access in the vicinity of the Broadway/Weidler interchange.

This report identifies existing and anticipated future transit conditions, including long-term effects of the No-Build Alternative and the long-term, short-term (construction), and cumulative effects of the Build Alternative.

The Project team used data and plans provided by TriMet, Metro, the City of Portland, and the Oregon Department of Transportation to qualitatively assess existing and future-year transit conditions in the Project Area.

The concentration of mixed land uses and major activity centers in the Area of Potential Impact (API), coupled with its proximity to other population and employment hubs, creates a transit supportive environment. Within the API, major transit trip generators and destinations include the Moda Center, Veterans Memorial Coliseum, Rose Quarter Transit Center, and businesses along the Broadway/Weidler couplet.

TriMet operates several fixed-route bus and rail lines within the API, while the City of Portland provides streetcar service. While most north-south and east-west lines pass through the Rose Quarter Transit Center, service is also provided on the Broadway/Weidler couplet. In addition to the Rose Quarter Transit Center, 10 bus stops and 4 streetcar stations exist within the API. The highest activity bus stops include N Vancouver Avenue at N Weidler, N Williams Avenue at N/NE Weidler, and N Williams at N/NE Broadway.

Overall, the potential impacts of the Build Alternative are not expected to be significant.

Anticipated transit impacts under the No-Build Alternative include the following:

- Direct Impacts

  - As buses and streetcars are generally anticipated to continue operating in mixed traffic, transit operation impacts (e.g., corridor travel times) would be similar to those experienced by motor vehicles. No direct light rail impacts are anticipated.
  - Transit operations along the Broadway/Weidler couplet could be impacted if motor vehicle capacity is reduced to make way for protected bike lanes between the existing curbs. However, signal timing and stop spacing adjustments could potentially minimize or offset these impacts.
  - The addition of transit boarding islands on N/NE Multnomah Street would improve passenger conditions, as the new bus stops would provide an opportunity to include enhancements such as lighting, shelters, Americans with Disabilities Act (ADA)-accessible ramps, and rider information. Transit boarding islands are separated from the sidewalk by a bike channel, reducing conflicts between transit vehicles and bikes at stops. For both streetcars and buses, boarding islands allow the creation of accessible in-lane stops with near-level or level boarding.

- Indirect Impacts
  - As TriMet increases transit service within and near the API, the resulting transit operations impacts would affect a higher volume of transit vehicles. As ridership is expected to grow in tandem with these service enhancements, conditions in the No-Build Alternative would, in turn, impact a higher volume of transit passengers. These impacts would be associated with transit vehicle travel times and delays.
  - The addition of transit boarding islands on N/NE Multnomah could increase ridership on Line 8-Jackson Park/NE 15th Avenue, through the provision of a more accessible, comfortable, and attractive transit stop environment.
  - Improved streetcar operations in the API and increased transit ridership could lead to higher volumes of boardings in the API.

Anticipated transit impacts under the Build Alternative include the following:

- Short-Term (Construction) Impacts
  - Construction activities would likely impact most transit stops within the API, potentially resulting in temporary stop closures or relocations. Closure durations would depend on the nature and extent of construction activities. Transit stops outside of construction areas (and/or stops in areas where construction is no longer occurring) may also be impacted as a result of temporary bus re-routes.
  - Demolition of structures over I-5, and the resulting temporary street closures, would temporarily impact transit operations by requiring buses to use detour routes. Some bus lines would follow lengthy detour routes (due to limited street connectivity in the area), some of which may be on streets with

reduced vehicle capacity. The combined effects would result in increased bus travel times.

  - Streetcar operations would be accommodated during construction. Two options for accommodating streetcar service through the Project Area during construction are 1) including streetcar tracks in temporary structures that would be constructed to carry the east/west bicycle, pedestrian, and motor vehicle trips through the Broadway/Weidler corridor, or 2) by operating a temporary "bus bridge" that would maintain transit connectivity to the east side streetcar stations and could include construction of a new turnback at Lloyd.

- Long-Term and Operational Direct Impacts
  - Streetcar travel times through the API are expected to slightly decrease in both directions, while bus travel times throughout the API are expected to slightly increase (except for southbound buses from 5 to 6 PM).
  - The impacts of adding transit boarding islands on Multnomah would be similar to the No-Build Alternative.
  - The addition of transit boarding islands on Broadway and Weidler would improve passenger conditions, as the new bus stops would provide an opportunity to include enhancements such as lighting, shelters, ADA-accessible ramps, and rider information.
  - The Build Alternative could result in upgrades to the three transit stops that would be modified (or relocated) as part of the Broadway/Weidler/Williams cover:
    - Line 8-Jackson Park/NE 15th Avenue
    - Line 17-Holgate/Broadway
    - Line 77-Broadway/Halsey
- Indirect Impacts
  - The addition of transit boarding islands on Broadway and Weidler could increase ridership on Lines17-Holgate/Broadway and 77-Broadway/Halsey through the provision of a more accessible, comfortable, and attractive transit stop environment. Transit boarding islands are separated from the sidewalk by a bike channel, reducing conflicts between transit vehicles and bikes at stops. For both streetcars and buses, boarding islands allow the creation of accessible in-lane stops with near-level or level boarding.
- Cumulative Impacts
  - Long construction periods (coupled with circuitous bus detour routes) could temporarily suppress transit ridership due to passenger inconvenience.

- Improved transit access, more transit service (new routes and additional frequency) and increasing population within the API could contribute to overall longer-term ridership gains.
- While transit operations (e.g., travel times) would generally trend with motor vehicle impacts, opportunities could arise to implement Enhanced Transit Corridors Plan recommendations on API corridors in tandem with this Project. This could result in improved operations, which could, in turn, grow ridership due to transit's increased attractiveness. The Enhanced Transit Corridors Plan helps identify where transit priority, streamlining, and access treatments could be most beneficial on the planned TriMet Frequent Service network within the City of Portland. Such improvements could help make transit more attractive and reliable for people to get to work and school and to meet their daily needs, especially for people who depend upon transit.

1 Introduction

1.1 Project Location

The I-5 Rose Quarter Improvement Project (Project) is located in Portland, Oregon, along the 1.7-mile segment of Interstate 5 (I-5) between Interstate 405 (I-405) to the north (milepost 303.2) and Interstate 84 (I-84) to the south (milepost 301.5). The Project also includes the interchange of I-5 and N Broadway and NE Weidler Street (Broadway/Weidler interchange) and the surrounding transportation network, from approximately N/NE Hancock Street to the north, N Benton Avenue to the west, N/NE Multnomah Street to the south, and NE 2nd Avenue to the east.

Figure 1 illustrates the Project Area in which the proposed improvements are located. The Project Area represents the estimated area within which improvements are proposed, including where permanent modifications to adjacent parcels may occur and where potential temporary impacts from construction activities could result.

1.2 Project Purpose

The purpose of the Project is to improve the safety and operations on I-5 between I-405 and I-84, of the Broadway/Weidler interchange, and on adjacent surface streets in the vicinity of the Broadway/Weidler interchange and to enhance multimodal facilities in the Project Area.

In achieving the purpose, the Project would also support improved local connectivity and multimodal access in the vicinity of the Broadway/Weidler interchange and improve multimodal connections between neighborhoods located east and west of I-5.

1.3 Project Need

The Project would address the following primary needs:

- **I-5 Safety:** I-5 between I-405 and I-84 has the highest crash rate on urban interstates in Oregon. Crash data from 2011 to 2015 indicate that I-5 between I-84 and the merge point from the N Broadway ramp on to I-5 had a crash rate (for all types of crashes[2]) that was approximately 3.5 times higher than the statewide average for comparable urban interstate facilities (ODOT 2015a).

[2] Motor vehicle crashes are reported and classified by whether they involve property damage, injury, or death.

Figure 1. Project Area

  - Seventy-five percent of crashes occurred on southbound (SB) I-5, and 79 percent of all the crashes were rear-end collisions. Crashes during this 5-year period included one fatality, which was a pedestrian fatality. A total of seven crashes resulted in serious injury.
  - The Safety Priority Index System (SPIS) is the systematic scoring method used by the Oregon Department of Transportation (ODOT) for identifying potential safety problems on state highways based on the frequency, rate, and severity of crashes (ODOT 2015b). The 2015 SPIS shows two SB sites in the top 5 percent and two northbound (NB) sites in the top 10 percent of the SPIS list.
  - The 2015 crash rate on the I-5 segment between I-84 and the Broadway ramp on to I-5 is 2.70 crashes per million vehicle miles. The statewide average for comparable urban highway facilities is 0.77 crashes per million vehicle miles travelled (mvmt).
  - The existing short weaving distances and lack of shoulders for accident/incident recovery in this segment of I-5 are physical factors that may contribute to the high number of crashes and safety problems.

- **I-5 Operations:** The Project Area is at the crossroads of three regionally significant freight and commuter routes: I-5, I-84, and I-405. As a result, I-5 in the vicinity of the Broadway/Weidler interchange experiences some of the highest traffic volumes in the State of Oregon, carrying approximately 121,400 vehicles each day (ODOT 2017), and experiences 12 hours of congestion each day (ODOT 2012a). The following factors affect I-5 operations:
  - Close spacing of multiple interchange ramps results in short weaving segments where traffic merging on and off I-5 has limited space to complete movements, thus becoming congested. There are five on-ramps (two NB and three SB) and six off-ramps (three NB and three SB) in this short stretch of highway. Weaving segments on I-5 NB between the I-84 westbound (WB) on-ramp and the NE Weidler off-ramp, and on I-5 SB between the N Wheeler Avenue on-ramp and I-84 eastbound (EB) off-ramp, currently perform at a failing level-of-service during the morning and afternoon peak periods.
  - The high crash rate within the Project Area can periodically contribute to congestion on this segment of the highway. As noted with respect to safety, the absence of shoulders on I-5 contributes to congestion because vehicles involved in crashes cannot get out of the travel lanes.
  - Future (2045) traffic estimates indicate that the I-5 SB section between the N Wheeler on-ramp and EB I-84 off-ramp is projected to have the most critical congestion in the Project Area, with capacity and geometric constraints that result in severe queuing.
- **Broadway/Weidler Interchange Operations:** The complexity and congestion at the I-5 Broadway/Weidler interchange configuration is difficult to navigate for vehicles (including transit vehicles), bicyclists, and pedestrians, which impacts

access to and from I-5 as well as to and from local streets. The high volumes of traffic on I-5 and Broadway/Weidler in this area contribute to congestion and safety issues (for all modes) at the interchange ramps, the Broadway and Weidler overcrossings of I-5, and on local streets in the vicinity of the interchange.

- The Broadway/Weidler couplet provides east-west connectivity for multiple modes throughout the Project Area, including automobiles, freight, people walking and biking, and Portland Streetcar and TriMet buses. The highest volumes of vehicle traffic on the local street network in the Project Area occur on NE Broadway and NE Weidler in the vicinity of I-5. The N Vancouver Avenue/N Williams couplet, which forms a critical north-south link and is a Major City Bikeway within the Project Area with over 5,000 bicycle users during the peak season, crosses Broadway/Weidler in the immediate vicinity of the I-5 interchange.
- The entire length of N/NE Broadway is included in the Portland High Crash Network—streets designated by the City of Portland for the high number of deadly crashes involving pedestrians, bicyclists, and vehicles.[3]
- The SB on-ramp from N Wheeler and SB off-ramp to N Broadway experienced a relatively high number of crashes per mile (50-70 crashes per mile) compared to other ramps in the Project Area during years 2011-2015. Most collisions on these ramps were rear-end collisions.
- Of all I-5 highway segments in the corridor, those that included weaving maneuvers to/from the Broadway/Weidler ramps tend to experience the highest crash rates:
  - SB I-5 between the on-ramp from N Wheeler and the off-ramp to I-84 (SB-S5) has the highest crash rate (15.71 crashes/mvmt).
  - NB I-5 between the I-84 on-ramp and off-ramp to NE Weidler (NB-S5) has the second highest crash rate (5.66 crashes/mvmt).
  - SB I-5 between the on-ramp from I-405 and the off-ramp to NE Broadway (SB-S3) has the third highest crash rate (4.94 crashes/mvmt).

- **Travel Reliability on the Transportation Network:** Travel reliability on the transportation network decreases as congestion increases and safety issues expand. The most unreliable travel times tend to occur at the end of congested areas and on the shoulders of the peak periods. Due to these problems, reliability has decreased on I-5 between I-84 and I-405 for most of the day. Periods of congested conditions on I-5 in the Project Area have grown over time from morning and afternoon peak periods to longer periods throughout the day.

[3] Information on the City of Portland's High Crash Network is available at https://www.portlandoregon.gov/transportation/54892.

1.4 Project Goals and Objectives

In addition to the purpose and need, which focus on the state's transportation system, the Project includes related goals and objectives developed through the joint ODOT and City of Portland N/NE Quadrant and I-5 Broadway/Weidler Interchange Plan process, which included extensive coordination with other public agencies and citizen outreach. The following goals and objectives may be carried forward beyond the National Environmental Policy Act (NEPA) process to help guide final design and construction of the Project:

- Enhance pedestrian and bicycle safety and mobility in the vicinity of the Broadway/Weidler interchange.
- Address congestion and improve safety for all modes on the transportation network connected to the Broadway/Weidler interchange and I-5 crossings.
- Support and integrate the land use and urban design elements of the Adopted N/NE Quadrant Plan (City of Portland et al. 2012) related to I-5 and the Broadway/Weidler interchange, which include the following:
    - Diverse mix of commercial, cultural, entertainment, industrial, recreational, and residential uses, including affordable housing
    - Infrastructure that supports economic development
    - Infrastructure for healthy, safe, and vibrant communities that respects and complements adjacent neighborhoods
    - A multimodal transportation system that addresses present and future needs, both locally and on the highway system
    - An improved local circulation system for safe access for all modes
    - Equitable access to community amenities and economic opportunities
    - Protected and enhanced cultural heritage of the area
    - Improved urban design conditions
- Improve freight reliability.
- Provide multimodal transportation facilities to support planned development in the Rose Quarter, Lower Albina, and Lloyd.
- Improve connectivity across I-5 for all modes.

2 Project Alternatives

This technical report describes the potential effects of no action (No-Build Alternative) and the proposed action (Build Alternative).

2.1 No-Build Alternative

NEPA regulations require an evaluation of the No-Build Alternative to provide a baseline for comparison with the potential impacts of the proposed action. The No-Build Alternative consists of existing conditions and any planned actions with committed funding in the Project Area.

I-5 is the primary north-south highway serving the West Coast of the United States from Mexico to Canada. At the northern portion of the Project Area, I-5 connects with I-405 and the Fremont Bridge; I-405 provides the downtown highway loop on the western edge of downtown Portland. At the southern end of the Project Area, I-5 connects with the western terminus of I-84, which is the east-west highway for the State of Oregon. Because the Project Area includes the crossroads of three regionally significant freight and commuter routes, the highway interchanges within the Project Area experience some of the highest traffic volumes found in the state (approximately 121,400 average annual daily trips). The existing lane configurations consist primarily of two through lanes (NB and SB), with one auxiliary lane between interchanges. I-5 SB between I-405 and Broadway includes two auxiliary lanes.

I-5 is part of the National Truck Network, which designates highways (including most of the Interstate Highway System) for use by large trucks. In the Portland-Vancouver area, I-5 is the most critical component of this national network because it provides access to the transcontinental rail system, deep-water shipping and barge traffic on the Columbia River, and connections to the ports of Vancouver and Portland, as well as to most of the area's freight consolidation facilities and distribution terminals. Congestion on I-5 throughout the Project Area delays the movement of freight both within the Portland metropolitan area and on the I-5 corridor. I-5 through the Rose Quarter is ranked as one of the 50 worst freight bottlenecks in the United States (ATRI 2017).

Within the approximately 1.5 miles that I-5 runs through the Project Area, I-5 NB connects with five on- and off-ramps, and I-5 SB connects with six on- and off-ramps. Drivers entering and exiting I-5 at these closely spaced intervals, coupled with high traffic volumes, slow traffic and increase the potential for crashes. Table 1 presents the I-5 on- and off-ramps in the Project Area. Table 2 shows distances of the weaving areas between the on- and off-ramps on I-5 in the Project Area. Each of the distances noted for these weave transitions is less than adequate per current highway design standards (ODOT 2012b). In the shortest weave section, only 1,075 feet is available for drivers to merge onto I-5 from NE Broadway NB in the same area where drivers are exiting from I-5 onto I-405 and the Fremont Bridge.

Table 1. I-5 Ramps in the Project Area

I-5 Travel Direction	On-Ramps From	Off-Ramps To
Northbound	• I-84 • N Broadway/N Williams Avenue	• NE Weidler Street/NE Victoria Avenue • I-405 • N Greeley Avenue
Southbound	• N Greeley Avenue • I-405 • N Wheeler Avenue/N Ramsay Way	• N Broadway/N Vancouver Avenue • I-84 • Morrison Bridge/Highway 99E

Notes: I = Interstate

Table 2. Weave Distances within the Project Area

I-5 Travel Direction	Weave Section	Weave Distance
Northbound	I-84 to NE Weidler Street/NE Victoria Avenue	1,360 feet
Northbound	N Broadway/N Williams Avenue to I-405	1,075 feet
Southbound	I-405 to N Broadway	2,060 feet
Southbound	N Wheeler Avenue/N Ramsay Way to I-84	1,300 feet

Notes: I = Interstate

As described in Section 1.3, the high volumes, closely spaced interchanges, and weaving movements result in operational and safety issues, which are compounded by the lack of standard highway shoulders on I-5 throughout much of the Project Area.

Under the No-Build Alternative, I-5 and the Broadway/Weidler interchange and most of the local transportation network in the Project Area would remain in its current configuration, with the exception of those actions included in the Metro 2014 *Regional Transportation Plan* (RTP) financially constrained project list (Metro 2014).[4] One of these actions includes improvements to the local street network on the Broadway/Weidler corridor within the Project Area. The proposed improvements include changes to N/NE Broadway and N/NE Weidler from the Broadway Bridge to NE 7th Avenue. The current design concept would remove and reallocate one travel lane on both N/NE Broadway and N/NE Weidler to establish protected bike lanes and reduce pedestrian crossing distances. Proposed improvements also include

[4] Metro Regional Transportation Plan ID 11646. Available at: https://www.oregonmetro.gov/sites/default/files/Appendix%201.1%20Final%202014%20RTP%20%20Project%20List%208.5x11%20for%20webpage_1.xls

changes to turn lanes and transitions to minimize pedestrian exposure and improve safety. The improvements are expected to enhance safety for people walking, bicycling, and driving through the Project Area. Implementation is expected in 2018-2027.

2.2 Build Alternative

The Project alternatives development process was completed during the ODOT and City of Portland 2010-2012 N/NE Quadrant and I-5 Broadway/Weidler Interchange planning process. A series of concept alternatives were considered following the definition of Project purpose and need and consideration of a range of transportation-related problems and issues that the Project is intended to address.

In conjunction with the Stakeholder Advisory Committee (SAC) and the public during this multi-year process, ODOT and the City of Portland studied more than 70 design concepts, including the Build Alternative, via public design workshops and extensive agency and stakeholder input. Existing conditions, issues, opportunities, and constraints were reviewed for the highway and the local transportation network. A total of 19 full SAC meetings and 13 subcommittee meetings were held; each was open to the public and provided opportunity for public comment. Another 10 public events were held, with over 100 attendees at the Project open houses providing input on the design process. Of the 70 design concepts, 13 concepts advanced for further study based on SAC, agency, and public input, with six concepts passing into final consideration.

One recommended design concept, the Build Alternative, was selected for development as a result of the final screening and evaluation process. The final I-5 Broadway/Weidler Facility Plan (ODOT 2012a) and recommended design concept, herein referred to as the Build Alternative, were supported by the SAC and unanimously adopted in 2012 by the Oregon Transportation Commission and the Portland City Council.[5] The features of the Build Alternative are described below.

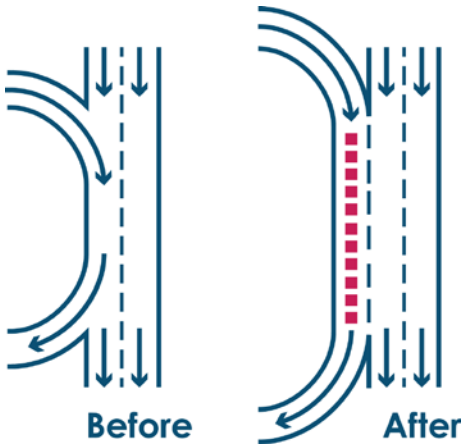
The Build Alternative includes I-5 mainline improvements and multimodal improvements to the surface street network in the vicinity of the Broadway/Weidler interchange. The proposed I-5 mainline improvements include the construction of auxiliary lanes (also referred to as ramp-to-ramp lanes) and full shoulders between I-84 to the south and I-405 to the north, in both the NB and SB directions. See Section 2.2.1 for more detail.

Construction of the I-5 mainline improvements would require the rebuilding of the N/NE Weidler, N/NE Broadway, N Williams, and N Vancouver structures over I-5.

[5] Resolution No. 36972, adopted by City Council October 25, 2012. Available at: https://www.portlandoregon.gov/citycode/article/422365

With the Build Alternative, the existing N/NE Weidler, N/NE Broadway, and N Williams overcrossings would be removed and rebuilt as a single highway cover structure over I-5 (see Section 2.2.2). The existing N Vancouver structure would be removed and rebuilt as a second highway cover, including a new roadway crossing connecting N/NE Hancock and N Dixon Streets. The existing N Flint Avenue structure over I-5 would be removed. The I-5 SB on-ramp at N Wheeler would also be relocated to N/NE Weidler at N Williams, via the new Weidler/Broadway/Williams highway cover. A new bicycle and pedestrian bridge over I-5 would be constructed at NE Clackamas Street, connecting Lloyd with the Rose Quarter (see Section 2.2.4.3).

Surface street improvements are also proposed, including upgrades to existing bicycle and pedestrian facilities and a new center-median bicycle and pedestrian path on N Williams between N/NE Weidler and N/NE Broadway (see Section 2.2.4.4).



What are Ramp-to-Ramp or Auxiliary Lanes?

Ramp-to-Ramp lanes provide a direct connection from one ramp to the next. They separate on-and off-ramp merging from through traffic, and create better balance and smoother maneuverability, which improves safety and reduces congestion.

2.2.1 I-5 Mainline Improvements

The Build Alternative would modify I-5 between I-84 and I-405 by adding safety and operational improvements. The Build Alternative would extend the existing auxiliary lanes approximately 4,300 feet in both NB and SB directions and add 12-foot shoulders (both inside and outside) in both directions in the areas where the auxiliary lane would be extended. Figure 2 illustrates the location of the proposed auxiliary lanes. Figure 3 illustrates the auxiliary lane configuration, showing the proposed improvements in relation to the existing conditions. Figure 4 provides a cross section comparison of existing and proposed conditions, including the location of through lanes, auxiliary lanes, and highway shoulders.

A new NB auxiliary lane would be added to connect the I-84 WB on-ramp to the N Greeley off-ramp. The existing auxiliary lane on I-5 NB from the I-84 WB on-ramp to the NE Weidler off-ramp and from the N Broadway on-ramp to the I-405 off-ramp would remain.

The new SB auxiliary lane would extend the existing auxiliary lane that enters I-5 SB from the N Greeley on-ramp. The existing SB auxiliary lane currently ends just south of the N Broadway off-ramp, in the vicinity of the Broadway overcrossing structure.

Figure 2. Auxiliary Lane/Shoulder Improvements

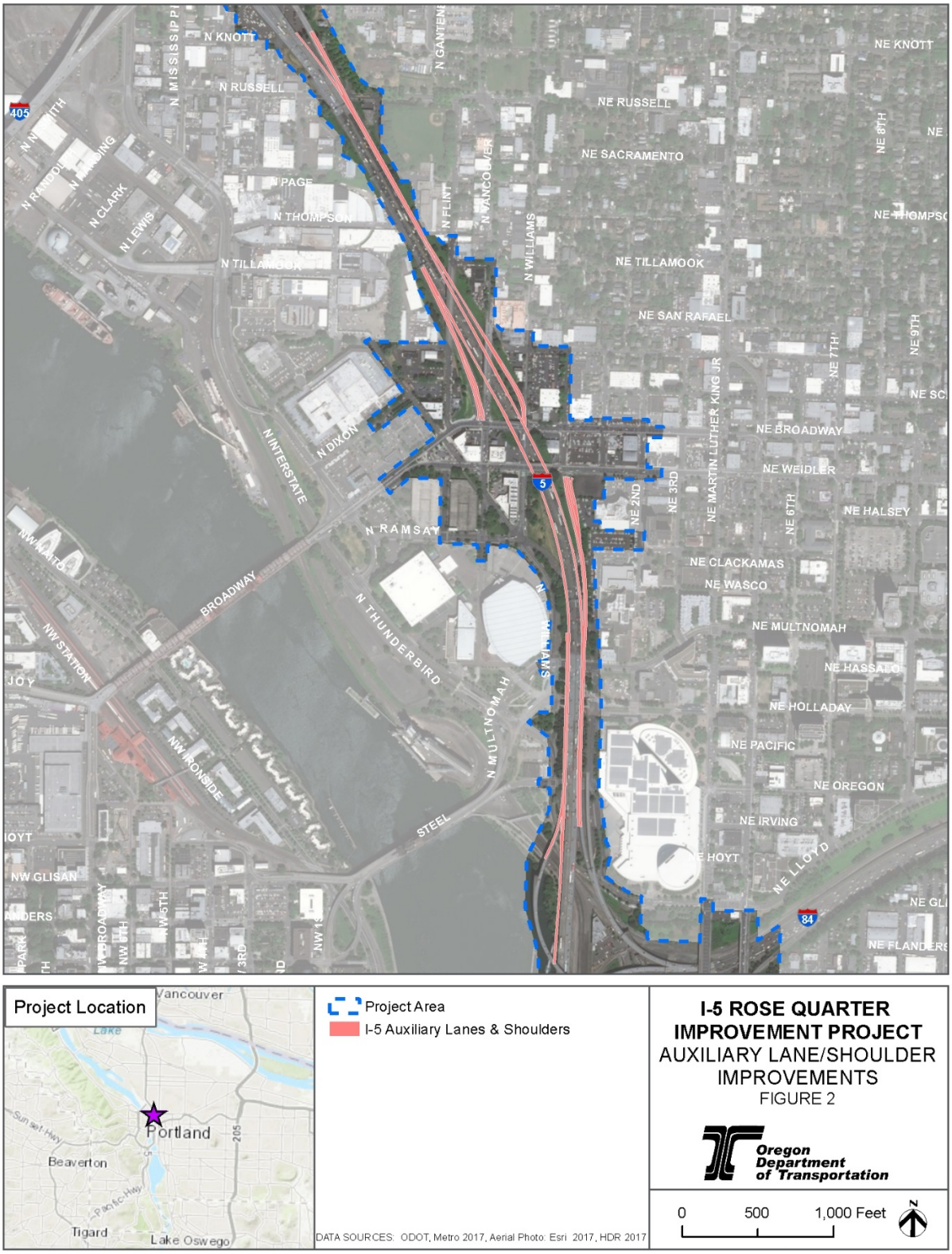


Figure 3. I-5 Auxiliary (Ramp-to-Ramp) Lanes – Existing Conditions and Proposed Improvements

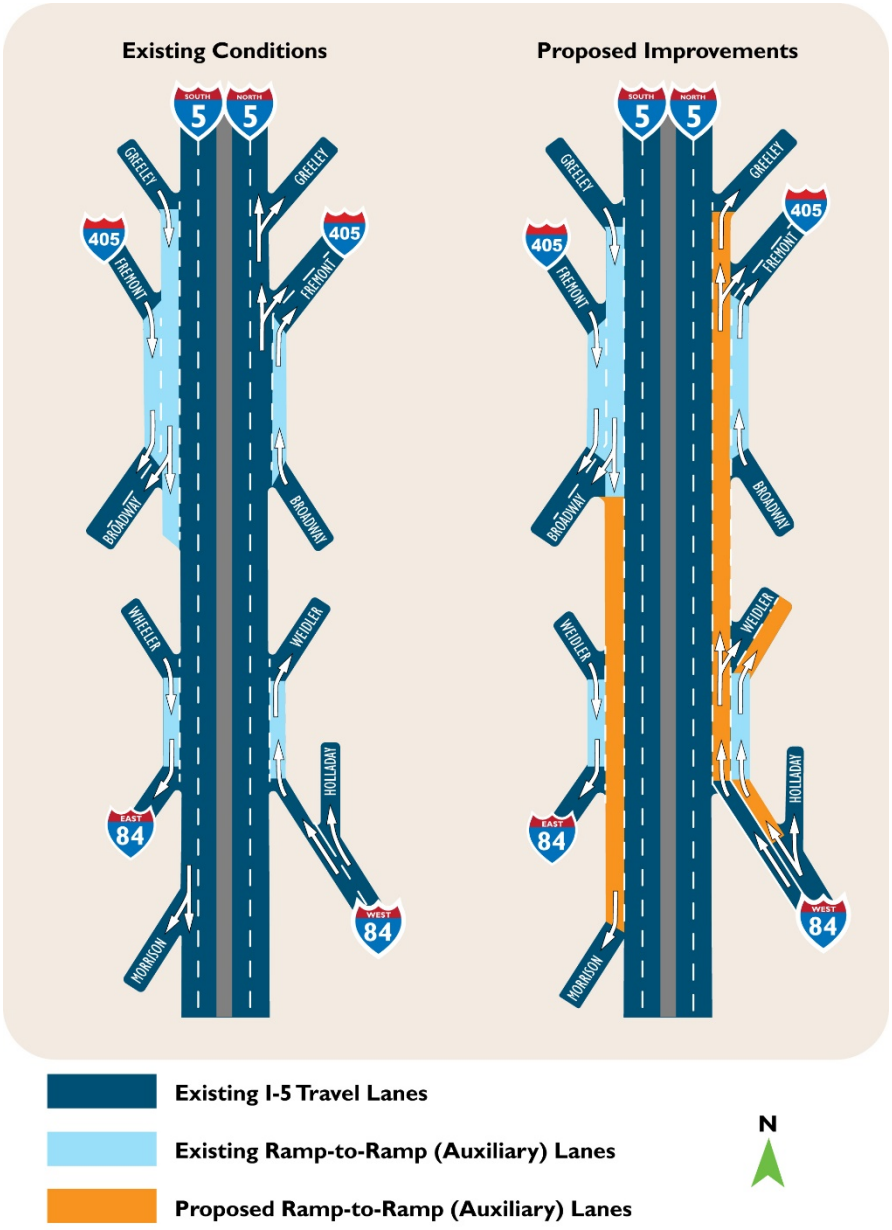
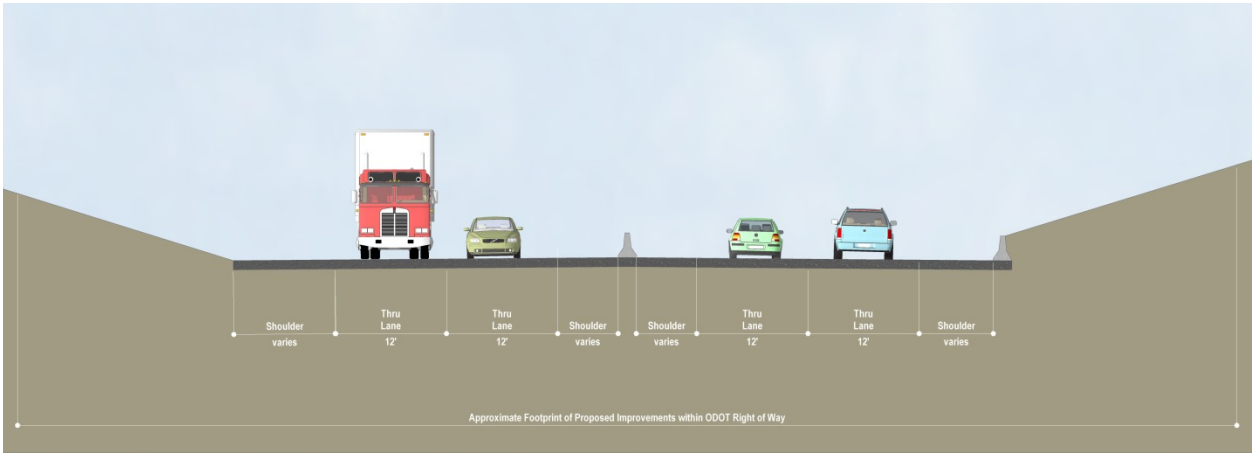
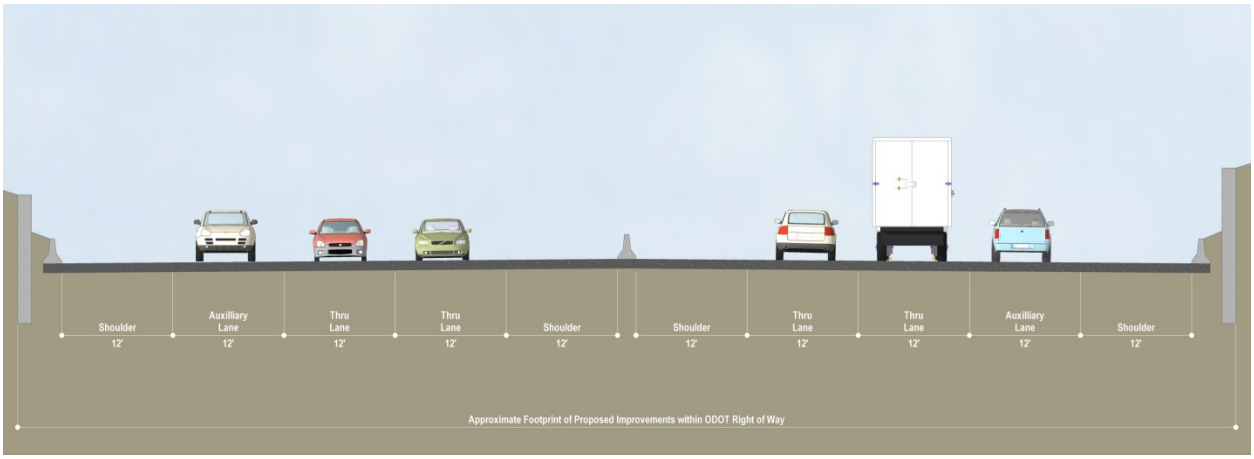


Figure 4. I-5 Cross Section (N/NE Weidler Overcrossing) – Existing Conditions and Proposed Improvements



Existing Lane Configuration



Proposed Lane Configuration

Under the Build Alternative, the SB auxiliary lane would be extended as a continuous auxiliary lane from N Greeley to the Morrison Bridge and the SE Portland/Oregon Museum of Science and Industry off-ramp. Figure 4 presents a representative cross section of I-5 (south of the N/NE Weidler overcrossing within the Broadway/Weidler interchange area), with the proposed auxiliary lanes and shoulder, to provide a comparison with the existing cross section.

The addition of 12-foot shoulders (both inside and outside) in both directions in the areas where the auxiliary lanes would be extended would provide more space to allow vehicles that are stalled or involved in a crash to move out of the travel lanes. New shoulders would also provide space for emergency response vehicles to use to access an incident within or beyond the Project Area.

No new through lanes would be added to I-5 as part of the Build Alternative; I-5 would maintain the existing two through lanes in both the NB and SB directions.

2.2.2 Highway Covers

2.2.2.1 Broadway/Weidler/Williams Highway Cover

To complete the proposed I-5 mainline improvements, the existing structures crossing over I-5 must be removed, including the roads and the columns that support the structures. The Build Alternative would remove the existing N/NE Broadway, N/NE Weidler, and N Williams structures over I-5 to accommodate the auxiliary lane extension and new shoulders described in Section 2.2.1.

The structure replacement would be in the form of the Broadway/Weidler/Williams highway cover (Figure 5). The highway cover would be a wide bridge that spans east-west across I-5, extending from immediately south of N/NE Weidler to immediately north of N/NE Broadway to accommodate passage of the Broadway/Weidler couplet. The highway cover would include design upgrades to make the structure more resilient in the event of an earthquake.

Figure 5. Broadway/Weidler/Williams and Vancouver/Hancock Highway Covers

The highway cover would connect both sides of I-5, reducing the physical barrier of I-5 between neighborhoods to the east and west of the highway while providing additional surface area above I-5. The added surface space would provide an opportunity for new and modern bicycle and pedestrian facilities and public spaces when construction is complete, making the area more connected, walkable, and bike friendly.

2.2.2.2 N Vancouver/N Hancock Highway Cover

The Build Alternative would remove and rebuild the existing N Vancouver structure over I-5 as a highway cover (Figure 5). The Vancouver/Hancock highway cover would be a concrete or steel platform that spans east-west across I-5 and to the north and south of N/NE Hancock. Like the Broadway/Weidler/Williams highway cover, this highway cover would provide additional surface area above I-5. The highway cover would provide an opportunity for public space and a new connection across I-5 for all modes of travel. A new roadway connecting neighborhoods to the east with the Lower Albina area and connecting N/NE Hancock to N Dixon would be added to the Vancouver/Hancock highway cover (see element "A" in Figure 6).

2.2.3 Broadway/Weidler Interchange Improvements

Improvements to the Broadway/Weidler interchange to address connections between I-5, the interchange, and the local street network are described in the following subsections and illustrated in Figure 6.

2.2.3.1 Relocate I-5 Southbound On-Ramp

The I-5 SB on-ramp is currently one block south of N Weidler near where N Wheeler, N Williams, and N Ramsay come together at the north end of the Moda Center. The Build Alternative would remove the N Wheeler on-ramp and relocate the I-5 SB on-ramp north to N Weidler. Figure 6 element "B" illustrates the on-ramp relocation.

2.2.3.2 Modify N Williams between Ramsay and Weidler

The Build Alternative would modify the travel circulation on N Williams between N Ramsay and N Weidler. This one-block segment of N Williams would be closed to through-travel for private motor vehicles and would only be permitted for pedestrians, bicycles, and public transit (buses) (Figures 6 and 7). Private motor vehicle and loading access to the facilities at Madrona Studios would be maintained.

2.2.3.3 Revise Traffic Flow on N Williams between Weidler and Broadway

The Build Alternative would revise the traffic flow on N Williams between N/NE Weidler and N/NE Broadway. For this one-block segment, N Williams would be converted from its current configuration as a two-lane, one-way street in the NB direction with a center NB bike lane to a reverse traffic flow two-way street with a 36-foot-wide median multi-use path for bicycles and pedestrians. These improvements are illustrated in Figures 6 and 7.

Figure 6. Broadway/Weidler Interchange Area Improvements

Figure 7. Conceptual Illustration of Proposed N Williams Multi-Use Path and Revised Traffic Flow

The revised N Williams configuration would be designed as follows:

- Two NB travel lanes along the western side of N Williams to provide access to the I-5 NB on-ramp, through movements NB on N Williams, and left-turn movements onto N Broadway.
- A 36-foot-wide center median with a multi-use path permitted only for bicycles and pedestrians. The median multi-use path would also include landscaping on both the east and west sides of the path.
- Two SB lanes along the eastern side of N Williams to provide access to the I-5 SB on-ramp or left-turn movements onto NE Weidler.

2.2.4 Related Local System Multimodal Improvements

2.2.4.1 New Hancock-Dixon Crossing

A new roadway crossing would be constructed to extend N/NE Hancock west across and over I-5, connecting it to N Dixon (see Figure 6, element “E”). The new crossing would be constructed on the Vancouver/Hancock highway cover and would provide a new east-west crossing over I-5. Traffic calming measures would be incorporated east of the intersection of N/NE Hancock and N Williams to discourage use of NE Hancock by through motor vehicle traffic. Bicycle and pedestrian through travel would be permitted (see Figure 6, element “F”).

2.2.4.2 Removal of N Flint South of N Tillamook and Addition of New Multi-Use Path

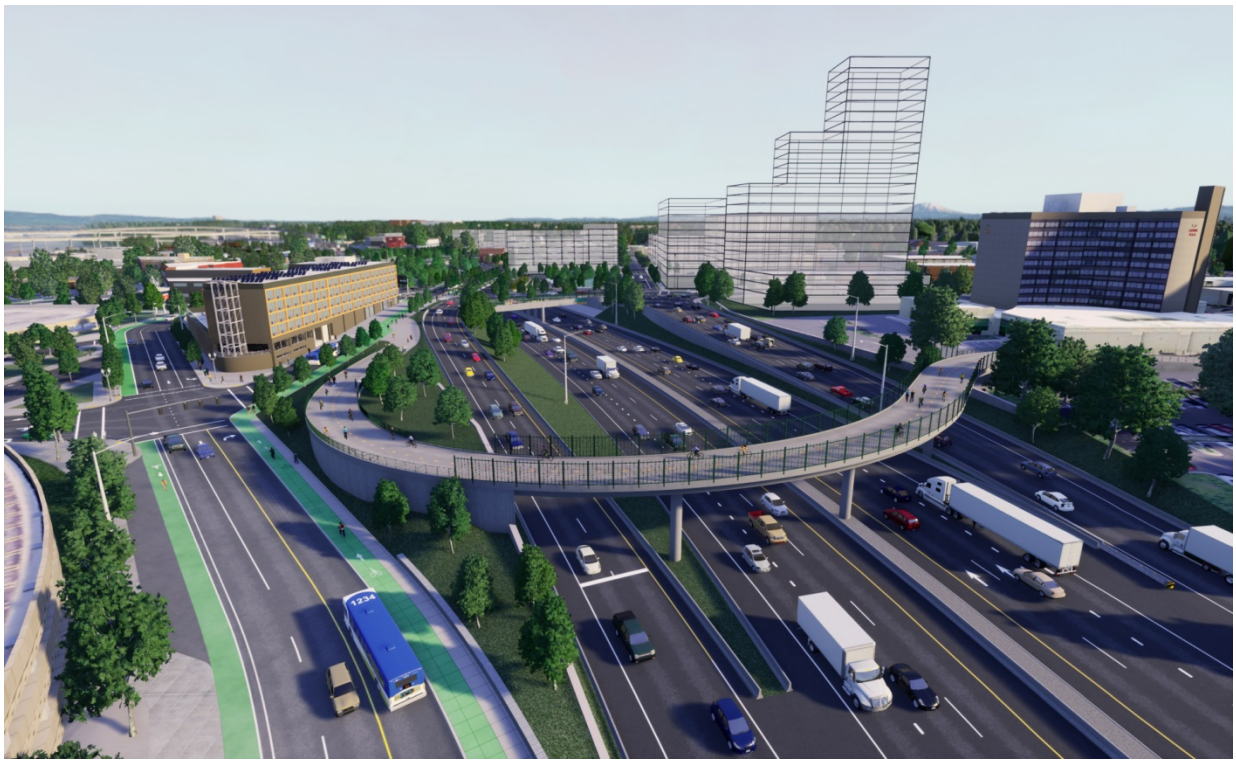
The existing N Flint structure over I-5 would be removed, and N Flint south of N Russell Street would terminate at and connect directly to N Tillamook (see Figure 6, element "G"). The portion of Flint between the existing I-5 overcrossing and Broadway would be closed as a through street for motor vehicles. Driveway access would be maintained on this portion of N Flint to maintain local access.

A new multi-use path would be added between the new Hancock-Dixon crossing and Broadway at a grade of 5 percent or less to provide an additional travel route option for people walking and biking. The new multi-use path would follow existing N Flint alignment between N Hancock and N Broadway (see Figure 6, element "G").

2.2.4.3 Clackamas Bicycle and Pedestrian Bridge

South of N/NE Weidler, a new pedestrian- and bicycle-only bridge over I-5 would be constructed to connect NE Clackamas Street near NE 2nd Avenue to the N Williams/ N Ramsay area (see Figure 6, element "H," and Figure 8). The Clackamas bicycle and pedestrian bridge would offer a new connection over I-5 and would provide an alternative route for people walking or riding a bike through the Broadway/Weidler interchange.

Figure 8. Clackamas Bicycle and Pedestrian Crossing



2.2.4.4 Other Local Street, Bicycle, and Pedestrian Improvements

The Build Alternative would include new widened and well-lit sidewalks, Americans with Disabilities Act (ADA)-accessible ramps, high visibility and marked crosswalks, widened and improved bicycle facilities, and stormwater management on the streets connected to the Broadway/Weidler interchange.[6]

A new two-way cycle track would be implemented on N Williams between N/NE Hancock and N/NE Broadway. A two-way cycle track would allow bicycle movement in both directions and would be physically separated from motor vehicle travel lanes and sidewalks. This two-way cycle track would connect to the median multi-use path on N Williams between N/NE Broadway and N/NE Weidler.

The bicycle lane on N Vancouver would also be upgraded between N Hancock and N Broadway, including a new bicycle jug-handle at the N Vancouver and N Broadway intersection to facilitate right-turn movements for bicycles from N Vancouver to N Broadway.

Existing bicycle facilities on N/NE Broadway and N/NE Weidler within the Project Area would also be upgraded, including replacing the existing bike lanes with wider, separated bicycle lanes. New bicycle and pedestrian connections would also be made between the N Flint/N Tillamook intersection and the new Hancock-Dixon connection.

These improvements would be in addition to the new Clackamas bicycle and pedestrian bridge, upgrades to bicycle and pedestrian facilities on the new Broadway/Weidler/Williams and Vancouver/Hancock highway covers, and new median multi-use path on N Williams between N/NE Broadway and N/NE Weidler described above and illustrated in Figure 6.

[6] Additional details on which streets are included are available at http://i5rosequarter.org/local-street-bicycle-and-pedestrian-facilities/

3 Regulatory Framework

Federal, state, regional, and local plans and policies have been established that guide the development of transportation projects. Some of these plans and policies relate to the design and operation of the Project. The *Land Use Technical Report* (ODOT 2019a) includes detailed descriptions of the most applicable regulatory documents (i.e., Oregon Statewide Planning Program, Transportation Planning Rule, Metro RTP, and City of Portland Comprehensive Plan). Additional planning and policy documents that are directly related to implementing a transportation project in this location are described below.

3.1 Federal Plans and Policies

3.1.1 ADA Guide

The ADA Guidelines contains scoping and technical requirements for accessibility to buildings and facilities by individuals with disabilities under the ADA of 1990. These scoping and technical requirements are to be applied during the design, construction, and alteration of buildings and facilities to ensure accessibility and usability to individuals with disabilities. The 2010 ADA Standards for Accessible Design, dated September 15, are the most recent guidelines (U.S. Department of Justice 2010).

3.1.2 Federal Highway Administration (FHWA) Bicycle and Pedestrian Guides

The purpose of FHWA guidance is to describe federal legislative and policy direction related to safety and accommodation for bicycling and walking. The Intermodal Surface Transportation Efficiency Act of 1991 enacted significant changes to federal transportation policy and programs that expanded consideration of and eligibility for funding bicycle and pedestrian improvements. The Transportation Equity Act for the 21st Century (TEA-21) in 1998 and the Safe Accountable, Flexible, Efficient Transportation Equity Act: a Legacy for Users (SAFETEA-LU) in 2005 continued these provisions. The Moving Ahead for Progress in the 21st Century Act (MAP-21) of 2012 enacted some program and funding changes but continued broad consideration and eligibility for bicycling and walking. Bicycle and pedestrian design standards are included in the American Association of State Highway and Transportation Officials (AASHTO) guidance document *A Policy on Geometric Design of Highways and Streets – 2011* (AASHTO 2011) and in the ODOT 2012 *Highway Design Manual* (ODOT 2012b).

3.1.3 Federal Transit Administration Regulations

The Portland Streetcar Loop project connecting the streetcar from northwest Portland to the Oregon Museum of Science and Industry was funded in part with a $75 million Small Starts grant from the Federal Transit Administration (FTA). The Small Starts grant requires the grantee to complete and operate the project as

scoped in the grant award. If the Portland Streetcar service on N/NE Broadway and N/NE Weidler is disrupted during construction of the I-5 Rose Quarter Improvement Project, the City should inform FTA of the duration of the service disruption. A temporary disruption of service would not constitute a breach of the Small Starts grant agreement.

3.2 State Laws, Plans, and Policies

3.2.1 Oregon Transportation Plan

The 2006 Oregon Transportation Plan (OTP) is the state's long-range multimodal transportation plan (ODOT 2007). The OTP is the overarching policy document among a series of plans that together form the state transportation system plan (TSP). The OTP considers all modes of Oregon's transportation system as a single system and addresses the future needs of Oregon's airports, bicycle and pedestrian facilities, highways and roadways, pipelines, ports and waterway facilities, public transportation, and railroads. It assesses state, regional, and local public and private transportation facilities. The OTP establishes goals, policies, strategies, and initiatives that address the core challenges and opportunities facing Oregon. The OTP provides the framework for prioritizing transportation improvements based on varied future revenue conditions, but it does not identify specific projects for development.

3.2.2 Oregon Public Transportation Plan

The Oregon Public Transportation Plan (OPTP) is one of the modal elements of the OTP and was adopted in 1997. An updated OPTP, developed by ODOT in coordination with stakeholders and the public, was adopted in September 2018 (ODOT 2018). The new OPTP establishes common understandings for local, regional, and state agencies, including the following:

- Vision and goals for public transportation
- Policy and strategy framework to inform decision making
- Possible priorities under different levels of funding for public transportation
- Opportunities and challenges in investment and implementation
- Positioning public transportation as a key part of Oregon's transportation system

3.2.3 Oregon Highway Plan

The 1999 Oregon Highway Plan (OHP; ODOT 1999) defines policies and investment strategies for Oregon's state highway system for the next 20 years. It further refines the goals and policies of the OTP and is part of Oregon's TSP. The OHP has three main elements:

- The Vision presents a vision for the future of the state highway system, describes economic and demographic trends in Oregon and future transportation

technologies, summarizes the policy and legal context of the OHP, and contains information on the current highway system.

- The Policy Element contains goals, policies, and actions in five policy areas: system definition, system management, access management, travel alternatives, and environmental and scenic resources.
- The System Element contains an analysis of state highway needs, revenue forecasts, descriptions of investment policies and strategies, an implementation strategy, and performance measures.

3.2.4 ODOT Highway Design Manual

The ODOT 2012 *Highway Design Manual* (ODOT 2012b) provides uniform highway design standards and procedures for ODOT. It is intended to provide guidance for the design of new construction; major reconstruction (4R); resurfacing, restoration, and rehabilitation (3R); or resurfacing (lR) projects. The manual is used for all projects that are located on the state highways and by all ODOT personnel for planning studies and project development. The flexibility contained in the manual supports the use of Practical Design concepts and Context Sensitive Design practices.

The manual conforms to the AASHTO document *A Policy on Geometric Design of Highways and Streets - 2011* (AASHTO 2011). National Highway System or federal-aid projects on roadways that are under the jurisdiction of cities or counties will typically use the AASHTO design standards or ODOT 3R design standards. State and local planners will also use the manual in determining design requirements as they relate to the state highways in TSPs, Corridor Plans, and Refinement Plans.

3.2.5 Division 51: Access Management Rules

Division 51 establishes procedures, standards, and approval criteria used by ODOT to govern highway approach permitting and access management consistent with Oregon Revised Statutes (ORS), Oregon Administrative Rules, statewide planning goals, acknowledged comprehensive plans, and the OHP. The intent of Division 51 is to provide a highway access management system based on objective standards that balance the economic development objectives of properties abutting state highways with the transportation safety and access management objectives in a manner consistent with local TSPs and the land uses permitted in local comprehensive plan(s) acknowledged under ORS Chapter 197.

3.3 Regional and Local Plans

3.3.1 TriMet Plans

TriMet has adopted service enhancement plans for various portions of the metropolitan area. The North/Central Service Enhancement Plan encompasses the Area of Potential Impact (API) for this Project (TriMet 2016). Service enhancements

included in the plan for this area include extended service hours for Line 4 Division/Fessenden and a new bus route connecting the Parkrose/Sumner Transit Center to downtown via NE Prescott Street, NE Alberta Street, and NE Martin Luther King Jr. Boulevard to the Rose Quarter Transit Center and the Steel Bridge.

TriMet is currently considering long-term plans for the Steel Bridge, including consideration of a new transit-only crossing, as well as the long-term layout and function of the Rose Quarter Transit Center. No final documents or policy decisions have been made regarding these opportunities.

3.3.2 Metro Regional Transportation Plan

Metro's RTP, adopted in 2014, serves as the region's regional TSP, consistent with Oregon Transportation Planning Rule requirements. The RTP must be consistent with the OTP, state modal and facility plans that implement the Oregon Transportation Plan, and the Oregon Transportation Planning Rule. Local plans must be consistent with the RTP. The following transit-related RTP projects are within or adjacent to the API: Rose Quarter junction track and intersection improvements (including possible grade separation and bike accommodation), Rose Quarter Transit Center Reconstruction, streetcar extension to Hollywood via Sandy Boulevard or Broadway/Weidler, and streetcar extension from Lloyd to NE Portland. However, none of these projects are on Metro's financially constrained project list, which provides eligibility for state and federal funding.

3.3.3 City of Portland Transportation System Plan and Modal Plans

The City of Portland TSP, which is necessary to meet state and regional planning requirements, was updated in 2018 (City of Portland 2018a). The TSP is an element of the City's Comprehensive Plan, and it contains several modal plans including bicycle, pedestrian, and freight, as well as neighborhood area plans and street plans. Transportation projects included in the TSP that are in or adjacent to the Project Area include streetcar turnarounds at NE Grand Avenue and NE Weidler and at NE Grand and NE Oregon Street, new traffic signals along NE Grand and NE Martin Luther King Jr. Boulevard, a new bicycle and pedestrian bridge across I-84 in the vicinity of NE 7th, redesign of the Rose Quarter Transit Center, and a multi-use pathway along the east bank of the Willamette River north of the Steel Bridge.

3.3.4 Go Lloyd

Go Lloyd was founded in 1994 as the Lloyd District Transportation Management Association (TMA). TMAs are public/private partnerships formed so that employers, developers, building owners, and government entities can work collectively to establish policies, programs, and services to address local transportation issues and foster economic development. Go Lloyd is managed by a board of directors and works closely with local government agencies, non-profits, and business to promote transportation and economic development improvements for Lloyd.

Go Lloyd tracks transportation activities and plans in the district and prepares an annual report that includes results of the Employee Commute Choice Survey. Survey results are used to report on transportation mode split to the district and help to measure the effectiveness of various programs. Go Lloyd does not adopt specific plans and policies but has worked closely with the City of Portland on the N/NE Quadrant Plan as part of the Central City Plan and Comprehensive Plan updates.

3.4 Other Relevant Guidance

3.4.1 American Association of State Highway and Transportation Officials (AASHTO)

AASHTO is a standards-setting body that publishes specifications, test protocols, and guidelines, which are used in highway design and construction throughout the United States. AASHTO sets transportation standards and policy for the United States but is not an agency of the federal government; rather, it is an organization of the states themselves. Policies of AASHTO are not federal laws or policies, but rather are ways to coordinate state laws, policies, and design standards in the field of transportation. The association represents not only highways but includes air, rail, water, and public transportation.

The voting membership of AASHTO consists of the Department of Transportation of each state in the United States as well as those of Puerto Rico and the District of Columbia. The United States Department of Transportation; some U.S. cities, counties, and toll-road operators; most Canadian provinces; the Hong Kong Highways Department; the Ministry of Public Works and Settlement; and the Nigerian Association of Public Highway and Transportation Officials have non-voting associate memberships.

3.4.2 National Association of City Transportation Officials Urban Street Design Guide

The National Association of City Transportation Officials is an association of 62 American cities and 10 transit agencies. The Urban Street Design Guide provides guidance on the design and operation of urban streets (NACTO 2018). The guide is not prescriptive but provides recommendations and description of best practices for implementing urban streets that function safely for all modes of travel.

4 Methodology and Data Sources

This section presents the methodology used to analyze existing and future transit conditions on I-5, I-405 and I-84, the Broadway/Weidler interchange, and adjacent surface streets. Potential cumulative impacts were assessed based on the Metro RTP-based regional travel demand model, in which traffic numbers consider identified reasonably foreseeable future actions.

4.1 Project Area and Area of Potential Impact

The API for the transit study generally corresponds to the Project Area, as shown on Figure 1, except along N Broadway, where the API extends west to N Larrabee Avenue (see Figure 9).

4.2 Resource Identification and Data Sources

The Project team used data and plans provided by TriMet, Metro, the City of Portland, and ODOT to qualitatively assess existing and future-year transit conditions in the Project Area. Existing data sources included bus, streetcar, and light rail routing; route- and stop-level ridership; and transit stop features. Future-year (2045) data included planned and programmed capital projects and transit service enhancements. The sections immediately below further describe the data and sources in greater detail.

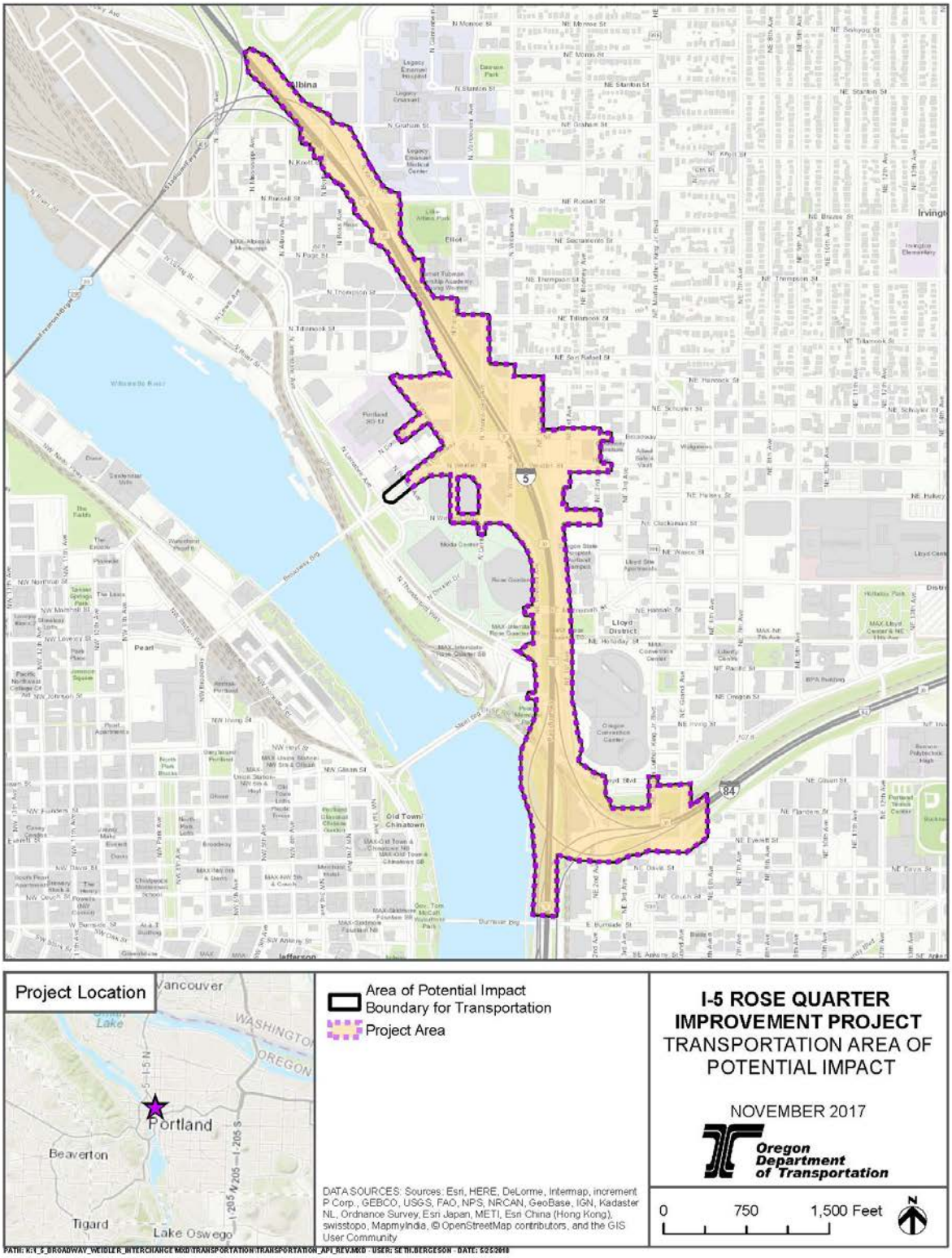
4.3 Assessment of Impacts

4.3.1 Existing Conditions Assessment

Using existing available data, the Project team prepared a high-level, qualitative narrative and tabular summary of the API's existing fixed-route transit environment. This assessment included the following:

- Existing bus, streetcar, and light rail routing, service levels (e.g., days of service, span of service, frequencies) and route-level ridership provided by TriMet and Portland Streetcar Inc.
- Existing average daily boardings/alightings at API transit stops provided by TriMet and Portland Streetcar Inc.
- Major pedestrian and bicycle access routes to transit, including gaps (based primarily on the active transportation assessment described in the *Active Transportation Technical Report* (ODOT 2019b)
- Major transit user generators and destinations, based on existing land use data

Figure 9. Transportation Area of Potential Impact



4.3.2 Future Year (2045) No-Build and Build Assessments

The Project team qualitatively described anticipated transit benefits and impacts of the 2045 No-Build and Build scenarios. The analysis drew from the existing conditions assessment, while also considering funded and planned transit service enhancements and funded/planned ODOT, City of Portland, and TriMet infrastructure projects. In addition to projects identified in the ODOT Statewide Transportation Improvement Program (STIP) and Portland TSP and Capital Improvement Plan, these projects include TriMet's planned capital investments and service enhancements identified in TriMet's North/Central Service Enhancement Plan (TriMet 2016). The analysis compared the transit performance of the Build Alternative with the performance of the No-Build Alternative and included a qualitative assessment of the operational impacts associated with the Build Alternative.

4.4 Cumulative Impacts

The cumulative impacts analysis considered the Project's impacts combined with other past, present, and reasonably foreseeable future actions that would result in environmental impacts in the Project Area. Because transportation impacts typically occur on a broader, system-wide scale, the Project team considered actions within and immediately beyond the Project Area. The cumulative impact assessment qualitatively assessed the magnitude of impacts associated with projects listed in the financially constrained element of Metro's RTP (Metro 2014) and other shorter-term projects and service improvements identified by TriMet, in combination with anticipated Project impacts. This assessment also identified the contribution of the Project to overall cumulative impacts.

5 Affected Environment

With its proximity to Portland's central core, the API includes several major transit corridors providing local and regional connectivity. This section discusses existing major transit generators, transit infrastructure, routes, stops, and ridership within the API and concludes with a description of current transit planning designations.

5.1 Transit Generators

The API's concentration of mixed land uses and major activity centers (coupled with its proximity to other population and employment hubs) creates a transit-supportive environment. Within the API, major transit trip generators and destinations include the Moda Center, Veterans Memorial Coliseum, Rose Quarter Transit Center, and businesses along the Broadway/Weidler couplet. Immediately beyond the API, major activity nodes include the Oregon Convention Center and Lloyd. The N Williams/ N Vancouver corridor and the NE Martin Luther King Jr. Boulevard/NE Grand corridor also support transit ridership in this area.

5.2 Transit Routes

TriMet operates several fixed-route bus and rail lines within the API, while the City of Portland provides streetcar service. While most north-south and east-west lines pass through the Rose Quarter Transit Center, service is also provided on the Broadway/Weidler couplet. The sections below describe existing transit service in greater detail, based on Fall 2017 data provided by TriMet and the City of Portland. Unless otherwise noted, all lines provide standard service (not frequent) and operate on weekdays and weekends. "Frequent Service" lines are defined by TriMet as transit lines that run every 15 minutes or better throughout most of the service day.

5.2.1 4-Division/Fessenden

Line 4 travels between Gresham and St. Johns via SE Division Street, Downtown Portland, the Steel Bridge, Rose Quarter Transit Center, N Williams, and N Fessenden Street. Within the API, the line follows N Williams (formerly NE Wheeler Avenue) and the Williams/Vancouver couplet. Line 4 is a designated Frequent Service line that serves approximately 16,500 riders on an average weekday.

5.2.2 6-Martin Luther King Jr. Boulevard

Line 6 travels between Downtown Portland and Vancouver, Washington, via the Hawthorne Bridge, NE/SE Martin Luther King Jr. Boulevard, N Vancouver, and I-5. Within the API, SB buses use NE Martin Luther King Jr., while NB buses use NE Grand. Line 6 is a designated Frequent Service line that serves approximately 5,600 riders on an average weekday.

5.2.3 8-Jackson Park/NE 15th Avenue

Line 8 travels between the Oregon Health and Sciences University campus and NE Portland via SW Sam Jackson Park Road, Downtown Portland, the Steel Bridge, Rose Quarter Transit Center, NE 15th Avenue, and NE Dekum Street. Within the API, the line follows N Williams (formerly NE Wheeler) and NE Multnomah. Line 8 is a designated Frequent Service line that serves approximately 6,210 riders on an average weekday.

5.2.4 17-Holgate/Broadway

Line 17 travels between Outer Southeast Portland and Concordia University via SE Holgate Boulevard, Downtown Portland, the Broadway Bridge, the Broadway/Weidler couplet, NE 24th Avenue, and NE 27th Avenue. Within the API, the line travels EB on N/NE Weidler and WB via N/NE Broadway. Line 17 serves approximately 6,160 riders on an average weekday.

5.2.5 35-Macadam/Greeley

Line 35 travels between Oregon City and the University of Portland via Oregon 43, Lake Oswego, Downtown Portland, the Steel Bridge, Rose Quarter Transit Center, N Greeley Avenue and N Willis Street. Within the API, the line follows N Interstate and passes beneath the Broadway Bridge. Line 35 serves approximately 3,730 riders on an average weekday.

5.2.6 44-Capitol Highway/Mocks Crest

Line 44 travels between Portland Community College (Sylvania campus) and St. Johns via SW Capitol Highway, SW Barbur Boulevard, Downtown Portland, the Steel Bridge, Rose Quarter Transit Center, Williams, N Willamette Boulevard, and N Lombard Street. Within the API, the line follows N Williams (formerly NE Wheeler) and the Williams/Vancouver couplet. Line 44 serves approximately 4,680 riders on an average weekday.

5.2.7 77-Broadway/Halsey

Line 77 travels between Northwest Portland and Troutdale via NW 21st Avenue, the NW Everett/Glisan couplet, the Steel Bridge, Rose Quarter Transit Center, NE Broadway, and NE Halsey Street. Within the API, the line follows N Williams (formerly NE Wheeler) and N/NE Multnomah. Line 77 serves approximately 5,300 riders on an average weekday.

5.2.8 85-Swan Island

Line 85 provides weekday service between Rose Quarter Transit Center and Swan Island via Interstate, N Greeley Avenue, and N Going Street. Within the API, the line follows Interstate, N Ramsay Way, and N Williams (formerly NE Wheeler). Line 85 serves approximately 450 riders on an average weekday.

5.2.9 MAX Blue Line

The Metropolitan Area Express (MAX) Blue Line is a light rail corridor linking Hillsboro and Gresham via Beaverton, Downtown Portland, NE Portland, and several transit centers along its path. Within the API, the line parallels NE Holladay Street. The Blue Line is a designated Frequent Service line that serves approximately 55,890 riders on an average weekday.

5.2.10 MAX Green Line

The MAX Green Line is a light rail corridor linking Downtown Portland and Clackamas Town Center via NE and SE Portland and serving several transit centers along its path. Within the API, the line parallels Holladay. The Green Line is a designated Frequent Service line that serves approximately 21,360 riders on an average weekday.

5.2.11 MAX Red Line

The MAX Red Line is a light rail corridor linking Hillsboro and Portland International Airport via Beaverton, Downtown Portland, NE Portland, and several transit centers along its path. Within the API, the line parallels Holladay. The Red Line is a designated Frequent Service line that serves approximately 20,950 riders on an average weekday.

5.2.12 Portland Streetcar “A” and “B” Loops

The Portland Streetcar follows a loop linking several districts in Portland’s central core, including Downtown Portland, the Pearl District, Lloyd, Central Eastside Industrial District, and South Waterfront. The “A” Loop travels clockwise, while the “B” Loop travels counterclockwise. Within the API, the streetcar alignment follows the Broadway/Weidler couplet and the Martin Luther King Jr./Grand couplet. Combined, the “A” and “B” loops serve approximately 6,900 riders on an average weekday. Both loops provide service every 15 minutes during business hours and every 20 in the evenings and on the weekends.

5.3 Existing Transit Infrastructure

Within the API, buses and streetcars generally operate in mixed traffic conditions, while MAX light rail operates within an exclusive right of way. Transit preferential treatments exist in some locations, including bus-only lanes (e.g., Vancouver immediately north of N Broadway and N Williams [formerly NE Wheeler] between Interstate and Ramsay) and a streetcar-only lane on NE Martin Luther King Jr. between NE Davis Street and Lloyd Boulevard.

5.4 Transit Stops and Rider Activity

The Rose Quarter Transit Center is located immediately south and east of the Moda Center. Served by six bus lines and four MAX light rail lines, the transit center

includes multiple bus stops in the area bounded by Interstate, Multnomah, and N Williams (formerly NE Wheeler); light rail platforms are located on Holladay directly beneath I-5 (Figures 10 and 11). Combined, the bus and MAX stops/stations within the transit center serve over 11,000 passengers each weekday.[7]

Beyond the Rose Quarter Transit Center, 10 bus stops and 4 streetcar stations exist within the API. Table 3 shows ridership activity for each transit stop, based on Fall 2017 data provided by TriMet and Portland Streetcar. The highest activity bus stops include Vancouver at N Weidler, Williams at N/NE Weidler, and Williams at N/NE Broadway. Located within proximity of one another, these three stops function as a major transfer point between multiple bus and streetcar lines, while also serving major destinations including the Moda Center and nearby commercial and residential areas. These transit stops also include the highest number of monthly wheelchair ramp deployments.

Table 3. Existing Transit Stops and Ridership Activity

Stop ID#	Stop Location	Line(s) Served	Stop Direction	Stop Position	Average Weekday Boardings	Average Weekday Alightings	Total Boardings/ Alightings	Average Monthly Lifts
611	N Broadway & N Benton	17	Eastbound	Farside	8	15	23	4
627	N Broadway & N Vancouver	17	Westbound	Nearside	13	30	43	17
633	NE Broadway & NE 2nd	17	Westbound	Nearside	11	9	20	5
6008	N Vancouver & N Tillamook	4, 44	Southbound	Nearside	36	13	49	8
6009	N Vancouver & N Weidler	4, 44	Southbound	Nearside	54	68	122	35
6220	N/NE Weidler & N Williams	17	Eastbound	Nearside	30	27	57	25
6232	NE Weidler & NE 2nd	17	Eastbound	Nearside	7	20	27	3
6357	N Williams & N/NE Broadway	4, 44	Northbound	Farside	42	31	73	26
11480	N Williams & N/NE Weidler	4, 44	Northbound	Nearside	27	51	78	27

[7] TriMet, Fall 2017

Stop ID#	Stop Location	Line(s) Served	Stop Direction	Stop Position	Average Weekday Boardings	Average Weekday Alightings	Total Boardings/ Alightings	Average Monthly Lifts
12374	N Broadway & N Benton	17	Westbound	Nearside	13	10	23	6
13607	N Weidler & N Ross	Streetcar "A" Loop	Eastbound	N/A	18	45	58	14
13608	NE Weidler & 2nd	Streetcar "A" Loop	Eastbound	N/A	20	67	87	19
13618	NE Broadway & NE 2nd	Streetcar "B" Loop	Westbound	N/A	60	29	89	6
13618	N Broadway & NE Ross	Streetcar "B" Loop	Westbound	N/A	18	45	58	14
1097*	Rose Quarter Transit Center (bus stop)	4, 44	Northbound	N/A	889	147	1,036	118
2592*	Rose Quarter Transit Center (bus stop)	4, 8, 44, 77, 85	Southbound	N/A	702	1,187	1,889	335
11814*	N Interstate & Rose Quarter Transit Center	35	Northbound	Nearside	126	34	160	9
11817*	N/NE Multnomah & Rose Quarter Transit Center	8, 77	Eastbound	Nearside	226	254	480	115
8340/ 8377*	Rose Quarter Transit Center MAX Station**	MAX Blue, Red, Green, Yellow	Eastbound/ Westbound	N/A	3,728	3,940	7,668	N/A

Source: TriMet, Fall 2017.

Notes: N/A = Not applicable

* Transit stop is part of the Rose Quarter Transit Center.

** Does not include "Interstate/Rose Quarter" MAX station (served by MAX Yellow Line), as this station is located outside of the Area of Potential Impact.

Figure 10. Existing Transit Routes and Stops – North

EXISTING TRANSIT ROUTES AND STOPS- NORTH

I-5/ROSE QUARTER
IMPROVEMENT PROJECT

LEGEND

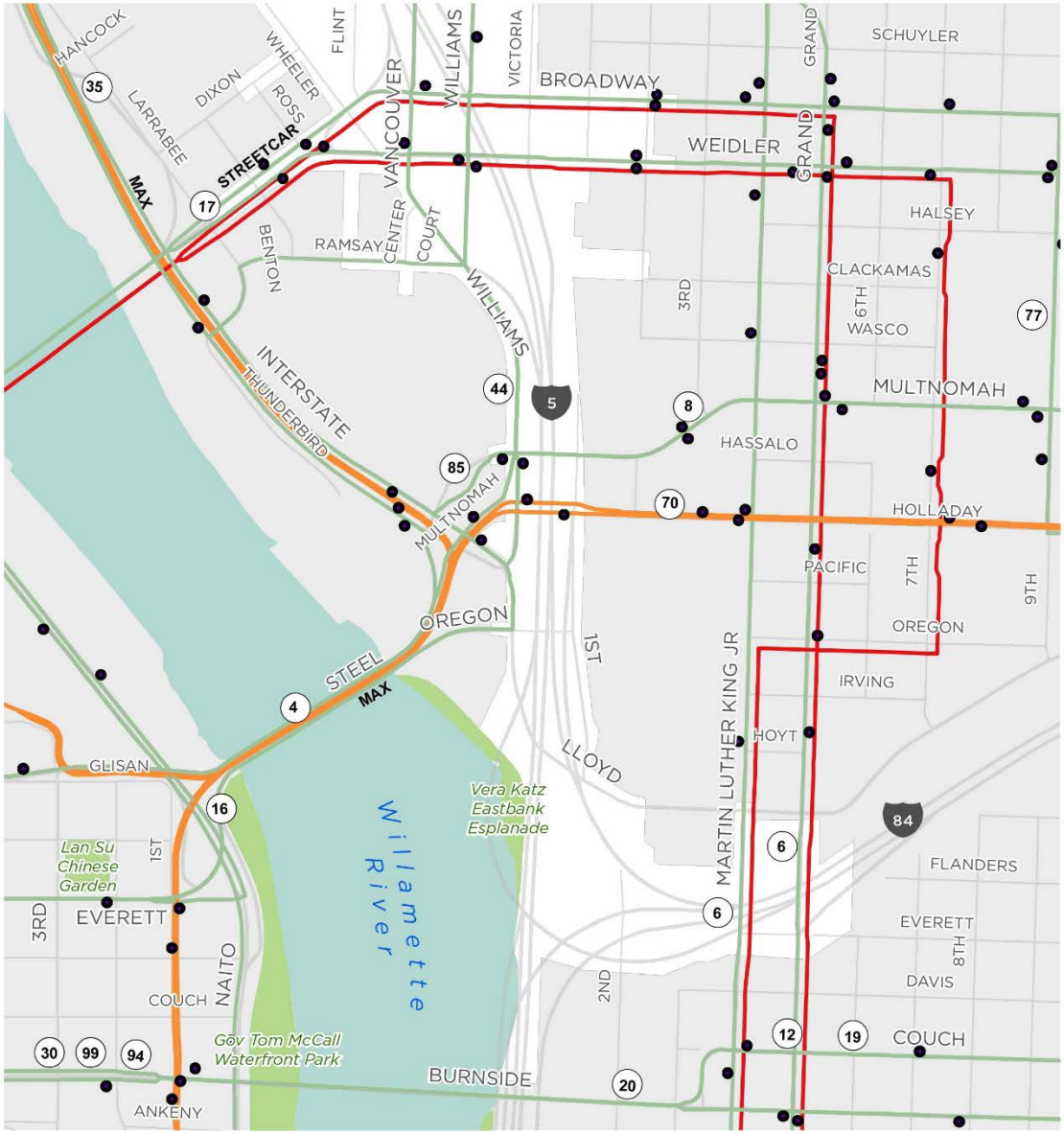
Bus
MAX
Street Car
Bus Lines
Transit Stops
Water
Area of Potenial Impact
Parks

N

Data provided by Metro and the City of Portland.
Map produced November 2018.

0 500 1,000 FEET

Figure 11. Existing Transit Routes and Stops – South



EXISTING TRANSIT ROUTES AND STOPS- SOUTH

I-5/ROSE QUARTER
IMPROVEMENT PROJECT

Data provided by Metro
and the City of Portland.
Map produced January 2018.

0 500 1,000 FEET

LEGEND

- Bus
- MAX
- Street Car
- Bus Lines
- Transit Stops
- Water
- Area of Potenial Impact
- Parks

5.6 Transit Planning Designations

The Portland 2035 TSP, as well as the Central City 2035 Plan (City of Portland 2018a, City of Portland 2018b), designate several API streets as Major Transit Priority Streets, defined as facilitating "the frequent and reliable movement of transit vehicles that connect Central City, regional centers, and town centers with each other and to other major destinations. Major Transit Priority Streets are provided frequent service or are expected to receive that level of service in the future to support envisioned growth" (City of Portland 2018a). Designated Major Transit Priority Streets within the API include the following:

- N/NE Broadway
- NE Grand
- NE Holladay
- N Interstate
- NE Martin Luther King Jr. Boulevard
- NE Multnomah
- NE Oregon
- N Vancouver
- N/NE Weidler
- N/NE Wheeler [Note: NE Wheeler to be renamed as N Williams between Ramsay and Oregon].
- N Williams

The Portland 2035 TSP and Central City 2035 Plan designate "Transit Access Streets." These corridors "facilitate movement of transit vehicles connecting town centers, neighborhood centers, and industrial and employment areas with other destinations and other transit service. Transit Access Streets are provided fixed-route service that is commensurate with the level of demand" (City of Portland 2018a). The following streets are designated as Transit Access Streets:

- N Greeley
- N Mississippi south of N Fremont
- N Multnomah
- N Ramsey
- N/NE Russell

6 Environmental Consequences

This section discusses the anticipated beneficial and adverse impacts of the Project with regard to transit for the No-Build and Build Alternatives.

6.1 No-Build Alternative

As described in Section 2.1, the No-Build Alternative consists of existing conditions and other planned and funded transportation improvement projects that would be completed in and around the Project Area by 2045.

6.1.1 Direct Impacts

Under the No-Build Alternative, the proposed I-5 mainline and Broadway/Weidler interchange area improvements would not be constructed, and the current road system would remain in place. As buses are generally anticipated to continue operating in mixed traffic in the No-Build Alternative, transit operation impacts (e.g., corridor travel times) would be similar to those experienced by motor vehicles, as described in the *Traffic Analysis Technical Report* (ODOT 2019c). No direct light rail impacts are anticipated.

While design details for the planned protected bike lanes on Broadway/Weidler are not complete, transit operations along this couplet could be impacted if motor vehicle capacity is reduced to make way for the protected bike lanes between the existing curbs. However, signal timing and stop spacing adjustments could potentially minimize or offset these impacts.

The addition of transit boarding islands on N/NE Multnomah would improve passenger conditions, as the new bus stops would provide an opportunity to include enhancements such as lighting, shelters, ADA-accessible ramps, and rider information. Specific impacts to transit stops elsewhere in the API are unknown, as sufficient detail regarding TriMet's pending stop spacing policy, as well as potential stop-level improvements along existing transit lines, has not been developed.

6.1.2 Indirect Impacts

As TriMet increases transit service within and near the API, the resulting transit operations impacts would affect a higher volume of transit vehicles. As ridership is expected to grow in tandem with these service enhancements, conditions in the No-Build Alternative would, in turn, impact a higher volume of transit passengers. These impacts would be associated with transit vehicle travel times and delays.

The addition of transit boarding islands on N/NE Multnomah could increase ridership on Line 8-Jackson Park/NE 15th Avenue, through the provision of a more accessible, comfortable, and attractive transit stop environment.

Improved streetcar operations in the API and increased transit ridership could lead to higher volumes getting on and off streetcars in the API.

6.2 Build Alternative

Under the Build Alternative, the Project's proposed roadway, bicycle, and pedestrian improvements would be constructed, as described in Section 2.2.

6.2.1 Short-Term (Construction Impacts)

The *I-5 Rose Quarter Interchange Improvement Project Construction Phasing Concept Plan* (CPC Plan) describes an approximately 4- to 5-year completion schedule (HDR 2017). While the CPC Plan identifies potential issues within and adjacent to the API, it focuses more attention to construction of the Broadway/Weidler/Williams highway cover, as this cover represents the largest and most complex element of the overall Project.

A detailed construction phasing plan would be developed during the design phase (beginning in early 2019). This plan would include plans for maintaining bus and streetcar service and would seek to minimize impacts to the traveling public on all modes.

The subsections below describe anticipated short-term (construction) transit-related impacts. The assessment assumes that construction phasing and activities would follow "Scenario C," as described in the CPC Plan.

6.2.1.1 All Areas

Construction activities would likely impact most transit stops within the API, potentially resulting in temporary stop closures or relocations. Closure durations would depend on the nature and extent of construction activities. Transit stops outside of construction areas (and/or stops in areas where construction is no longer occurring) may also be impacted as a result of temporary bus re-routes. Additionally, transit user experience would likely be impacted as a result of construction disruptions to existing stops, potential bus detours, and possible need for more transfers to reach a given destination. Transit users would likely have a more difficult time accessing their stops on foot or by bike because of indirect routes and out-of-direction travel, which could result in reduced ridership. For more information about how construction would impact people walking or biking to connect to transit, refer to the *Active Transportation Technical Report* (ODOT 2019b).

TriMet has indicated that it may consider temporarily rerouting affected bus lines in the area for the duration of construction to avoid a series of temporary route changes that would be confusing for riders. Future discussions and negotiations would determine specific details regarding accommodations needed to maintain streetcar service and comparable transit connections during construction.

6.2.1.2 Broadway/Weidler/Williams Cover Area

Anticipated short-term impacts in the Broadway/Weidler/Williams cover area are described below. Per the CPC Plan, the Project team assumed that the construction activities described below would occur sequentially.

- Demolition of the Williams structure over I-5 would result in a temporary closure of the Broadway/Williams intersection and approaching streets. Complete closure of this intersection (and roadway approaches) would temporarily impact TriMet Line 17 WB, Portland Streetcar "B" Loop (on N/NE Broadway), and Lines 4 and 44 NB (on Williams), effectively requiring buses to use detour routes. Depending on the line under focus, some bus lines would need to follow potentially lengthy detour routes (due to limited street connectivity in the area), some of which may be on streets with reduced vehicle capacity (resulting from the temporary conversion of one-way streets to two-way operation). The combined effects would result in increased bus travel times.
- Demolition of the Weidler structure over I-5 would not substantially impact transit operations on N/NE Weidler (Line 17 EB and Portland Streetcar "A" Loop), as a temporary detour bridge (with similar vehicle capacity) would be constructed immediately adjacent to the structure. However, the proximity of demolition activity to the N Weidler/N Williams intersection would likely result in a closure of Williams in this area, thereby temporarily impacting Lines 4 and 44 NB. Buses serving these routes would potentially need to follow lengthy detour routes on congested streets, likely resulting in increased travel times.
- Demolition of the Broadway structure over I-5 would result in a temporary closure of the Broadway/Williams intersection and approaching streets. Bus and motor vehicle traffic on N/NE Broadway would be re-routed onto the newly completed cover's southern portion (in vicinity of N/NE Weidler). This detour would not substantially impact transit operations on N/NE Broadway (Line 17 WB and Portland Streetcar "B" Loop), as the realigned Broadway alignment would include similar vehicle capacity. The temporary closure of Williams north of N/NE Broadway would temporarily impact Lines 4 and 44 (NB). With the southern portion of the Broadway/Weidler/Williams cover complete, buses would likely divert one block east to Victoria. However, the detour route's added length, combined with reduced roadway capacity on Victoria, would likely result in increased travel times.
- The CPC Plan included two options for accommodating streetcar operations during construction:
    - Construction of streetcar tracks on the temporary structures that would be constructed to carry the east/west bicycle, pedestrian, and motor vehicle trips through the Broadway/Weidler corridor. This would require that the temporary structures be constructed to accommodate the substantial loads associated with streetcar vehicles, and that the structures be built large enough to accommodate connections for the temporary track to the existing, permanent streetcar tracks. This option would require a bus bridge to operate for a

limited period of time. The term “bus bridge” refers to temporarily replacing rail transit service with buses serving the same stations during a rail service disruption; streetcar users would transfer to a bus to travel through the Project Area and then transfer back to a streetcar to complete their trip.

- Implement a bus bridge to operate buses through the Project Area for a substantial portion of the construction period. The bus bridge could operate between the east end of the Broadway bridge to OMSI and replace the streetcar route on the east side; or it could include construction of a new, permanent streetcar turnback in Lloyd. This turnback would allow the bus bridge to connect the east end of the Broadway Bridge to Lloyd and allow for maintaining streetcar service along the remainder of the east side route to OMSI.

6.2.1.3 Vancouver/Hancock Cover Area

Anticipated short-term impacts in the Vancouver/Hancock cover area are described below. Per the CPC Plan, the Project team assumed that construction activities described below would occur sequentially.

- Demolition of the Vancouver structure over I-5 would temporarily impact Lines 4 and 44 (SB). Buses would likely detour via Flint to traverse I-5 before continuing to the Rose Quarter Transit Center via additional temporary routing options. These detours would increase bus travel times.
- Although demolition of the Flint structure would not directly impact transit operations, buses on Vancouver could experience longer travel times as motor vehicle traffic shifts from Flint to Vancouver. This issue would persist until completion of the Hancock/Dixon connector.

6.2.1.4 Moda Center and Clackamas Bicycle/Pedestrian Bridge

Anticipated short-term impacts within the Moda Center and Clackamas bicycle and pedestrian bridge areas are described below.

- The magnitude of short-term transit impacts would depend on the scale and duration of construction activities (and any associated closures) on Williams, Vancouver, N Wheeler, and Ramsay. Potentially affected bus lines include Lines 4, 44, and 85. Full street closures would require buses to follow potentially lengthy detour routes on congested streets, likely resulting in increased travel times.
- Construction of the new auxiliary lanes and shoulders, as well as construction on the local street network, could impact transit operations in the vicinity of Rose Quarter Transit Center, namely on N Williams (formerly NE Wheeler) (Lines 4, 8, 35, 44, and 85), Multnomah (Lines 8 and 77), and the MAX Blue and Red Lines passing directly beneath the highway. The magnitude of impacts would depend on the scale of construction staging and structure widening needs (and any associated closures). While buses could use detour routes (with likely increased travel times), complete closures of light rail beneath I-5 would require TriMet to

establish a bus bridge. A bus bridge would substantially increase passenger travel times.

- Short-term transit impacts associated with the Clackamas bicycle and pedestrian bridge would likely concentrate near the bridge's western endpoint, namely N Williams between N Ramsay and N/NE Weidler. As Williams serves Lines 4 and 44 (NB), buses could encounter delays and/or detours depending on the nature of construction activities in the area. Full closures of Williams would require buses to follow potentially lengthy detour routes on congested streets, likely resulting in increased travel times.

6.2.2 Long-Term and Operational Direct Impacts

Specific transit-related elements of the Build Alternative include the following:

- The transit-related reasonably foreseeable future actions described in Section 6.3.2.3.
- Conversion of Williams (immediately south of N/NE Weidler) to a bus-only facility; NB motor vehicles would be diverted to other streets
- Modification (or relocation) of the following bus stops to accommodate the Broadway/Weidler/Williams cover:
  - N Vancouver at N Weidler (Stop #6009)
  - N/NE Weidler at N Williams (Stop #6220)
  - N Williams at N/NE Weidler (Stop #11480)

Conversion of N Williams (immediately south of N/NE Weidler) to a bus-only facility could improve bus travel times for Lines 4-Division/Fessenden and 44-Mocks Crest (compared with the No-Build Alternative). The traffic signal at the intersection of N Williams with N/NE Weidler would be designed to accommodate NB bicycle, pedestrian, and transit crossings. The ultimate signal timing at this intersection could provide some form of transit priority, which would likely result in travel time savings for Lines 4-Division/Fessenden and 44-Mocks Crest compared to the No-Build Alternative.

6.2.2.1 Streetcar Travel Time

The EB streetcar tracks in N/NE Weidler would be realigned in the Build Alternative. The streetcar tracks would shift one lane to the south at N Benton to avoid potential traffic queues at the N Weidler/N Williams intersection. The remainder of the streetcar alignment and operation would be similar to the No-Build Alternative.

Travel time routes were modeled in VISSIM[8] to provide a comparison of the travel times of the Portland Streetcar along N/NE Broadway and N/NE Weidler Street. The travel time routes for both the WB and EB Streetcar were between NE Grand and the east side of Broadway Bridge.

[8] VISSIM 10 is a widely used, behavior-based multi-purpose traffic microsimulation program.

The travel time results for the future No-Build and Build conditions are presented in Table 4. As shown below, the streetcar travel times for the Build Alternative would be similar to the No-Build Alternative, with a slight decrease for Build Alternative travel times due to the changes in traffic volumes and lane configurations. The EB streetcar travel times during the afternoon peak period are generally greater than during the morning peak.

Table 4. Future Conditions – Streetcar Travel Time (minutes)

Route	Alternative	AM Period		PM Period	
		7-8 AM	8-9 AM	4-5 PM	5-6 PM
Westbound Streetcar	No-Build	4.1	4.3	4.5	4.7
	Build	3.9	4.0	4.3	4.5
Eastbound Streetcar	No-Build	3.5	3.6	4.7	4.9
	Build	3.6	3.6	4.4	4.8

6.2.2.2 Bus Travel Time

Bus travel times were estimated based on the VISSIM simulations and were used to assess bus operation in the future conditions. Four bus lines traverse the Project Area. Lines 4 and 44 travel on N Williams and N Vancouver between N/NE Multnomah and NE Russell within the API. Line 17 travels WB on N/NE Broadway from NE Grand to N Larrabee, and Line 7 travels EB on N/NE Broadway between NE Grand and N Larrabee. As shown in Table 5, Lines 4 and 44 travel times are slightly higher for the Build Alternative. These two routes pass through the Hancock intersection, which would operate under free-flow in the No-Build Alternative but operates under signal control under the Build Alterative. Line 17 travel times for the Build Alternative would be slightly longer than those for the No-Build Alternative.

Table 5. Future Bus Travel Time

Bus Travel Time, Minutes								
	7-8 AM		8-9 AM		4-5 PM		5-6 PM	
	No-Build	Build	No-Build	Build	No-Build	Build	No-Build	Build
Bus 4 and 44 NB	5.0	5.2	5.0	5.1	5.2	5.3	5.1	5.3
Bus 4 and 44 SB	4.4	4.9	4.6	6.0	4.9	4.9	6.0	4.6
Bus 17 WB	4.5	5.0	5.0	5.1	5.0	5.1	5.1	5.1
Bus 17 EB	4.0	5.1	4.2	5.1	5.1	4.6	5.1	4.6

Notes: EB = eastbound; NB = northbound; SB = southbound; WB = westbound

The impacts of adding transit boarding islands on N/NE Multnomah would be similar to the No-Build Alternative. The reconfigured stops would provide an opportunity to improve passenger conditions (e.g., lighting, shelters, ADA-accessible ramps, and rider information).

The Build Alternative could also result in upgrades to the three transit stops that would be modified (or relocated) as part of the Broadway/Weidler/Williams cover. These stops would continue functioning as a major transfer point between multiple bus and streetcar lines, while also serving major destinations, including the Moda Center and nearby commercial and residential areas. The following three transit stops would be improved:

- Line 8-Jackson Park/NE 15th Avenue
- Line 17-Holgate/Broadway
- Line 77-Broadway/Halsey

The addition of transit boarding islands on Broadway and Weidler in the Build Alternative could increase ridership on Lines17-Holgate/Broadway and 77-Broadway/Halsey through the provision of a more accessible, comfortable, and attractive transit stop environment.

With the No-Build and Build Alternatives, transit operations along the Broadway/Weidler couplet could be impacted if motor vehicle capacity is reduced to construct the planned protected bike lanes between the existing curbs. However, signal timing and stop spacing adjustments could potentially minimize or offset these impacts.

No direct light rail impacts are anticipated.

6.2.3 Long-Term and Operational Indirect Impacts

The addition of transit boarding islands on Broadway/Weidler could increase bus ridership on 17-Holgate/Broadway and 77-Broadway/Halsey through the provision of a more accessible, comfortable, and attractive transit stop environment.

6.3 Cumulative Effects

Cumulative impacts are environmental effects that result from the incremental effect of the Build Alternative when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (Title 40 Code of Federal Regulations 1508.7).

The analysis of cumulative impacts involves a series of steps conducted in the following order:

- Identify the resource topics that could potentially experience direct or indirect impacts from construction and operation of the proposed action.

- Define the geographic area (spatial boundary) within which cumulative impacts will be assessed, as well as the time frame (temporal boundary) over which other past, present, and reasonably foreseeable future actions will be considered.
- Describe the current status or condition of the resource being analyzed as well as its historical condition (prior to any notable change) and indicate whether the status or condition of the resource is improving, stable, or in decline.
- Identify other actions or projects that are reasonably likely to occur within the area of potential impact during the established time frame and assess whether they could positively or negatively affect the resource being analyzed.
- Describe the combined effect on the resource being analyzed when the direct and indirect impacts of the project are combined with the impacts of other actions or projects assumed to occur within the same geographic area during the established time frame.

6.3.1 Spatial and Temporal Boundaries

The geographic area used for the cumulative impact analysis is the same as the API described in Section 4.1 and shown on Figure 9. The time frame for the cumulative impact analysis extends from the beginning of large-scale urban development in and around the Project Area to 2045, the horizon year for the analysis of transportation system changes.

6.3.2 Past, Present, and Reasonably Foreseeable Future Actions

The past, present, and reasonably foreseeable future actions that were considered in assessing cumulative effects are summarized in the following subsections.

6.3.2.1 Past Actions

Past actions include the following:

- Neighborhood and community development
  - Historical development of the Portland area and accompanying changes in land use
  - Development of the local transportation system (including roads, bicycle and pedestrian facilities, and bus transit)
  - Utilities (water, sewer, electric, and telecommunications)
  - Parks, trails, bikeways
- Commercial and residential development in and around the Project Area
  - Veterans Memorial Coliseum (1960)
  - Lloyd Center (1960)
  - Legacy Emanuel Medical Center (1970)

  - Oregon Convention Center (1990)
  - Rose Garden (1995)
- Regional transportation system development
  - Marine terminal facilities on the Willamette River
    - Port of Portland (1892)
    - Commission of Public Docks (1910)
    - Port of Portland (1970; consolidation of Port of Portland and Commission of Public Docks)
  - Freight rail lines (late 1800s and early 1900s)
  - Highways
    - I-84 (1963)
    - I-5 (1966)
    - I-405 (1973)
  - Rail transit system
    - MAX light rail (1986) and subsequent upgrades and expansions
    - Portland Streetcar (2001) and subsequent expansions
  - Transit system upgrades
    - Reorganization of TriMet's bus routes to transition from a hub-and-spoke network to a grid-like pattern
    - Restoration of Frequent Service on MAX and major bus lines
    - Transit stop upgrades in tandem with other transportation projects
    - Reconfiguration of Williams to reduce bike/bus conflicts

6.3.2.2 Present Actions

Present actions include the ongoing operation and maintenance of existing infrastructure and land uses, including the following:

- Ongoing safety improvements for bicycles and pedestrians
- Local and regional transportation system maintenance
- Utility maintenance

6.3.2.3 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions included projects listed in the financially constrained element of Metro's RTP (Metro 2014) and other shorter-term projects and service improvements identified by TriMet. Within and immediately beyond the API, projects listed in the financially constrained element of Metro's RTP that may

impact transit operations include the construction of protected bike lanes and enhanced pedestrian crossings on the Broadway/Weidler couplet and an undefined list of multimodal safety improvements in Portland's Central City (Metro 2014). These projects were assumed to be in place under the No-Build Alternative. It was also assumed that these projects would be designed according to applicable agency standards.

TriMet identified additional possible future infrastructure projects in vicinity of the API (TriMet, personal correspondence, 2017):

- A new transit crossing of the Willamette River in vicinity of the Steel Bridge (the specific location has not been determined).
- Infrastructure improvements on Line 6-Martin Luther King Jr. Boulevard, as part of the City of Portland's Enhanced Transit Corridors Plan (specific improvements and locations have not been determined). The Enhanced Transit Corridors Plan would help identify where transit priority, streamlining, and access treatments could be most beneficial on the planned TriMet Frequent Service network within the City of Portland. Such improvements can help make transit more attractive and reliable for people to get to work, school, and to meet their daily needs, especially for people who depend upon transit.
- Transit boarding islands on N/NE Multnomah (specific locations have not been determined).

TriMet's shorter-term transit service actions include splitting Line 4-Division/ Fessenden into two routes to improve schedule reliability. The route would be split in Downtown Portland. The agency completed a longer-term vision, the North/Central Service Enhancement Plan, in 2016 (TriMet 2016). While a specific implementation time frame has not been set, the plan proposes transit service adjustments on several routes passing through the API, including the following:

- Adding earlier and later service on Line 4-Division/Fessenden
- Rerouting Line 70-12th/NE 33rd Avenue to Swan Island via the Rose Quarter Transit Center; eliminating Line 85-Swan Island
- Increasing frequency on Line 77-Broadway/Halsey
- Rerouting Line 24-Fremont from Emanuel Hospital to Downtown Portland via the Fremont Bridge (I-405)
- Establishing a new bus line linking the Parkrose-Sumner Transit Center and Downtown Portland via the Rose Quarter Transit Center
- Identifying opportunities to improve bus service reliability through transit signal priority and other infrastructure improvements
- Working with partner jurisdictions to improve sidewalks and pedestrian crossings in vicinity of transit stops (TriMet 2016)

Although not specified in the North/Central Service Enhancement Plan, TriMet also intends to increase service on the MAX Yellow Line as part of a future extension to Vancouver, Washington (TriMet, personal correspondence, 2017).

TriMet is also planning policy changes regarding bus stop spacing standards to improve on-time performance and increase service efficiency. An outcome of the policy change would be the relocation and/or consolidation of some existing bus stops. Under the policy, bus stop spacing would ideally be 1,200 feet as long as certain criteria are met, including availability of adequate sidewalks between stops. The policy has not yet been finalized.

Portland Streetcar Inc. plans to develop a new streetcar line on NW 18th and 19th Avenues serving Montgomery Park. Portland Streetcar Inc. has not yet determined how the new route would connect into the existing system, but one option would be to cross the Broadway Bridge and operate on the N/NE Broadway/Weidler couplet to NE Oregon at NE Grand. All streetcar routes are planned to operate at 10-minute headways by 2025 (TriMet, personal correspondence, 2017).

6.3.3 Results of Cumulative Impact Analysis

The cumulative transit impacts of past and future actions, combined with the Project, would include the following:

- Long construction periods (coupled with circuitous bus detour routes) could temporarily suppress transit ridership due to passenger inconvenience.
- Improved transit access, more transit service (new routes and additional frequency), and increasing population within the API could contribute to overall longer-term ridership gains.
- While transit operations (e.g., travel times) would generally trend with motor vehicle impacts, opportunities could arise to implement Enhanced Transit Corridors Plan recommendations on API corridors in tandem with this Project. This could result in improved operations, which could, in turn, grow ridership due to transit's increased attractiveness.

6.4 Conclusions

The Project team used data and plans provided by TriMet, Metro, the City of Portland, and ODOT to qualitatively assess existing and future-year transit conditions in the Project Area. Overall, although some impacts such as service delays, bus stop closures, and re-routes associated with the construction period are likely, they are not considered significant.

Anticipated transit impacts under the No-Build Alternative include the following:

- Direct Impacts
    - As buses and streetcars are generally anticipated to continue operating in mixed traffic, transit operation impacts (e.g., corridor travel times) would be

similar to those experienced by motor vehicles. No direct light rail impacts are anticipated.

  - Transit operations along the Broadway/Weidler couplet could be impacted if motor vehicle capacity is reduced to make way for protected bike lanes between the existing curbs. However, signal timing and stop spacing adjustments could potentially minimize or offset these impacts.
  - The addition of transit boarding islands on Broadway and Weidler would improve passenger conditions, as the new bus stops would provide an opportunity to include enhancements such as lighting, shelters, ADA-accessible ramps, and rider information.

- Indirect Impacts
  - As bus and streetcar service increases within and near the API, the resulting transit operations impacts would affect a higher volume of transit vehicles. As ridership is expected to grow in tandem with these service enhancements, conditions in the No-Build Alternative would, in turn, impact a higher volume of transit passengers. These impacts would be associated with transit vehicle travel times and delays.
  - The addition of transit boarding islands on Broadway/Weidler could increase bus ridership on 17-Holgate/Broadway, and 77-Broadway/Halsey through the provision of a more accessible, comfortable, and attractive transit stop environment.
  - Improved streetcar operations in the API and increased transit ridership could lead to higher volumes getting on and off streetcars in the API.

Anticipated transit impacts under the Build Alternative are summarized below:

- Short-Term (Construction) Impacts
  - Construction activities would likely impact most transit stops within the API, potentially resulting in temporary stop closures or relocations. Closure durations would depend on the nature and extent of construction activities. Transit stops outside of construction areas (and/or stops in areas where construction is no longer occurring) may also be impacted as a result of temporary bus re-routes.
  - Demolition of structures over I-5 and the resulting temporary street closures would temporarily impact transit operations by requiring buses to use detour routes. Depending on the line under focus, some bus lines would need to follow potentially lengthy detour routes (due to limited street connectivity in the area), some of which may be on streets with reduced vehicle capacity (resulting from the temporary conversion of one-way streets to two-way operation). The combined effects would result in increased bus travel times.

- Long-Term and Operational Direct Impacts
  - Transit operations impacts would be similar to those experienced by motorists, as buses and streetcars would generally continue operating in mixed traffic. Streetcar travel times are expected to decrease within the API (primarily due to a track reconfiguration), and bus travel times are expected to slightly increase within the API (with the exception of SB buses from 5 to 6 PM). No direct light rail impacts are anticipated.
  - The revised traffic flow on N Williams is not expected to have a significant impact on transit operations
  - Similar to the No-Build Alternative, transit operations along the Broadway/Weidler couplet could be impacted if motor vehicle capacity is reduced to make way for the protected bike lanes between the existing curbs. However, signal timing and stop spacing adjustments could potentially minimize or offset these impacts.
  - The impacts of adding transit boarding islands on N/NE Multnomah would be similar to the No-Build Alternative.
  - The Build Alternative could result in upgrades to the three transit stops that would be modified (or relocated) as part of the Broadway/Weidler/Williams cover.
  - The EB streetcar tracks in N/NE Weidler would be realigned under the Build Alternative. The streetcar tracks would shift one lane to the south at N Benton to avoid potential traffic queues at the N Weidler/N Williams intersection. This should result in an improved travel time through the API. The remainder of the streetcar alignment and operation would be similar to the No-Build Alternative.
- Indirect Impacts
  - The addition of transit boarding islands on Broadway/Weidler could increase bus ridership on 17-Holgate/Broadway and 77-Broadway/Halsey through the provision of a more accessible, comfortable, and attractive transit stop environment.
- Cumulative Impacts
  - Long construction periods (coupled with circuitous bus detour routes) could temporarily suppress transit ridership due to passenger inconvenience.
  - While transit operations (e.g., travel times) would generally trend with motor vehicle impacts, opportunities could arise to implement Enhanced Transit Corridors Plan recommendations on API corridors in tandem with this Project. This could result in improved operations, which could, in turn, grow ridership due to transit's increased attractiveness.

7 Avoidance, Minimization, and Mitigation Measures

The planned protected bike lanes on Broadway and Weidler would create more complex interactions between people walking and biking along the streets in the API, particularly at streetcar and bus stops. The design of the stops adjacent to the protected bike lanes would need to focus on safety for all users and predictable operations for transit vehicles.

The Build Alternative is anticipated to increase bus travel times for some routes during the morning peak period. Implementing the relevant elements of TriMet's Enhanced Transit Corridors Plan could address the reduced bus and streetcar travel times. The Enhanced Transit Corridor projects include a range of capital and operational treatments throughout the system to improve transit capacity, reliability, and travel time. Within the API, these treatments include bus and turn lanes (BAT lanes), far-side bus stops, street/traffic modifications, curb extensions, and transit signal priority.

To address short-term impacts during construction, TriMet has indicated that it may consider implementing bus route detours around the impacted area for the duration of the construction period to avoid multiple temporary changes for a single bus route. Discussion and negotiations would determine accommodations needed for streetcar service and comparable transit connections.

8 Contacts and Coordination

To complete this report, the preparers coordinated with TriMet to obtain route- and stop-level transit ridership data and policies and plans for future improvements; and Portland Streetcar Inc. to obtain policies and plans for future improvements. Other contacts included various ODOT staff and other members of the consultant team.

9 Preparers

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John Cullerton, Parametrix	Transportation Lead	B.S., Geography, University of Oregon (1977)	38
Ryan LeProwse, Parametrix	Traffic Analysis	B.S., Civil Engineering, University of Portland (1999)	19
Rory Renfro, Alta Planning and Design	Transit (bus/light rail) and active transportation	M.S., Urban & Regional Planning, Portland State University (2007) B.S., Urban & Regional Planning, Arizona State University (2001)	17
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