

Executive Summary



SOUTH
CORRIDOR
PROJECT

**Portland-Milwaukie
Light Rail Project**

May 2008

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S. EXECUTIVE SUMMARY

The Portland-Milwaukie Light Rail Project Supplemental Draft Environmental Impact Statement (SDEIS) examines a proposal to develop light rail transit in the final segment of the South Corridor project connecting downtown Portland, Oregon, the City of Milwaukie and north Clackamas County. Figure S-1 shows the regional setting for the proposed project.

The South Corridor is part of a larger high capacity transit corridor known as the South/North Corridor, which extends from Clackamas County to downtown Portland and north to the Columbia River and Vancouver, Washington. Figure S-2 shows the regional high capacity transit system serving this area. In 1998, the Federal Transit Administration (FTA), Metro, and the Tri-County Metropolitan Transportation District (TriMet) released the *South/North Corridor Draft Environmental Impact Statement (DEIS)*. This SDEIS augments the South/North DEIS by updating information on the purpose and need, alternatives considered, affected environment, and anticipated environmental impacts for the Portland-Milwaukie Corridor to reflect the changed conditions since the *South/North DEIS* was published. It also incorporates findings developed through the *South Corridor Supplemental Draft Environmental Impact Statement (SDEIS)*, issued in December 2002.

This SDEIS has been prepared in compliance with the National Environmental Policy Act (NEPA). The FTA is the federal lead agency for this SDEIS, and Metro is the project's local lead agency, working in cooperation with TriMet. The purpose of this SDEIS is to present details of the project alternatives and their environmental and transportation performance to decision-makers and the public to help them identify a preferred alternative.

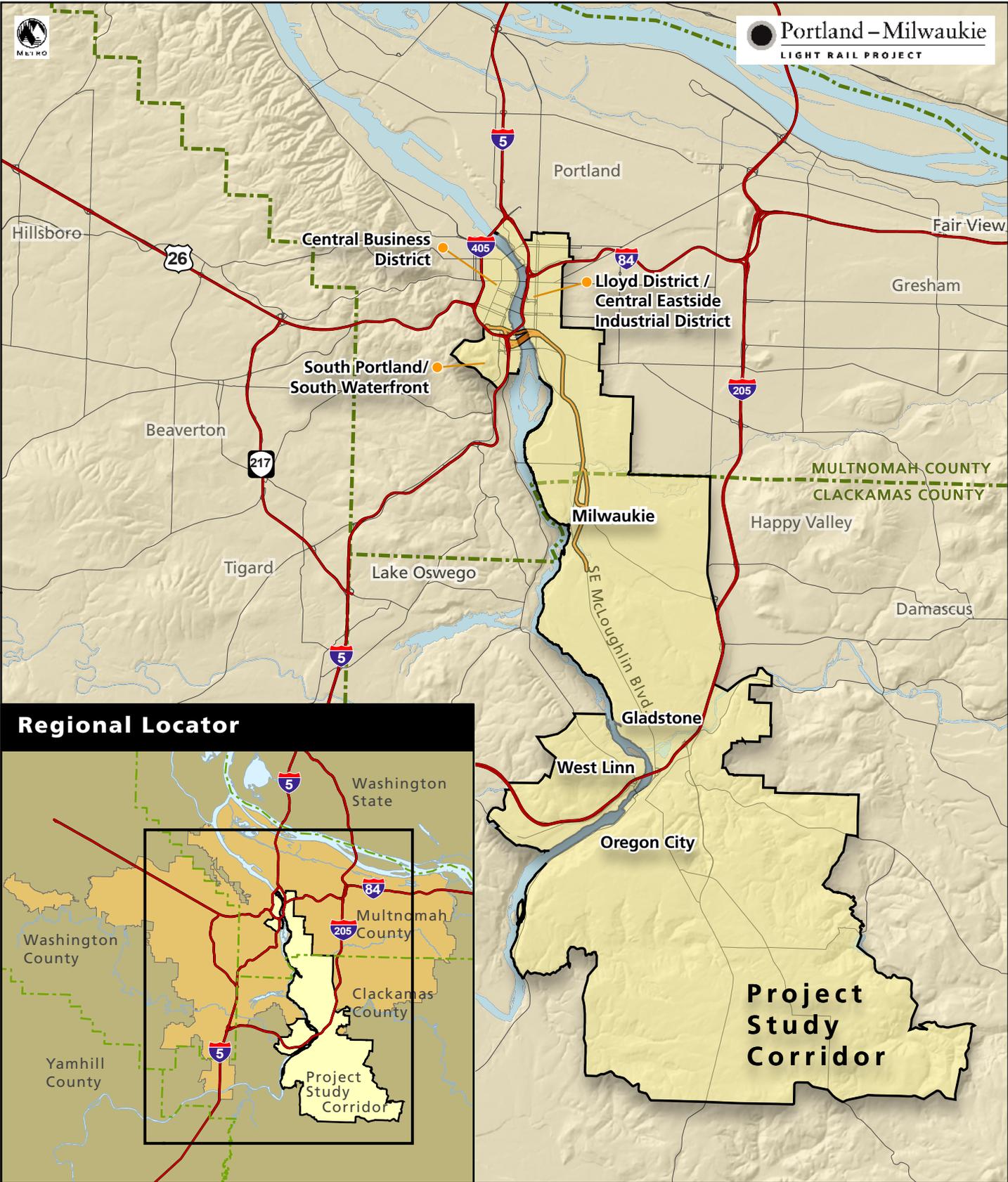
S.1 PORTLAND-MILWAUKIE CORRIDOR

The Portland-Milwaukie Corridor is part of the larger South/North Corridor and is a subset of the South Corridor. The corridor is located in the Portland, Oregon metropolitan region, the population and economic center of an extensive area that includes southern Washington and much of Oregon. The Portland-Vancouver metropolitan area incorporates the urban portion of three Oregon counties (Multnomah, Clackamas, and Washington) and the urban portion of Clark County, Washington. Figure S-2 shows other planned high-capacity transit projects in addition to the Portland-Milwaukie Light Rail Project. This includes the Columbia River Crossing Project which would extend the light rail to Vancouver, Washington.

The Portland-Milwaukie corridor includes the city of Milwaukie and much of southeast Portland and the Portland Central City, including the Portland Central Business District, the South Waterfront district, and the Central Eastside Industrial District (CEID). These areas have some of the region's highest concentrations of population and employment, and they include many of the region's major educational, health services, government/civic, and entertainment facilities.

CHAPTER CONTENTS

S.1 Portland-Milwaukie Corridor.....	S-1
S.2 Project History and Decision-Making Process	S-4
S.3 Purpose and Need.....	S-4
S.4 Alternatives Considered.....	S-5
S.5 Transportation Impacts	S-13
S.6 Environmental Consequences	S-16
S.7 Evaluation of the Alternatives	S-20
S.8 Next Steps	S-23



Portland-Milwaukie Light Rail Project

Figure S-1

Regional Setting

- Project Study Corridor
- Urban Growth Boundary
- Light Rail alternative
- County Line
- Freeway





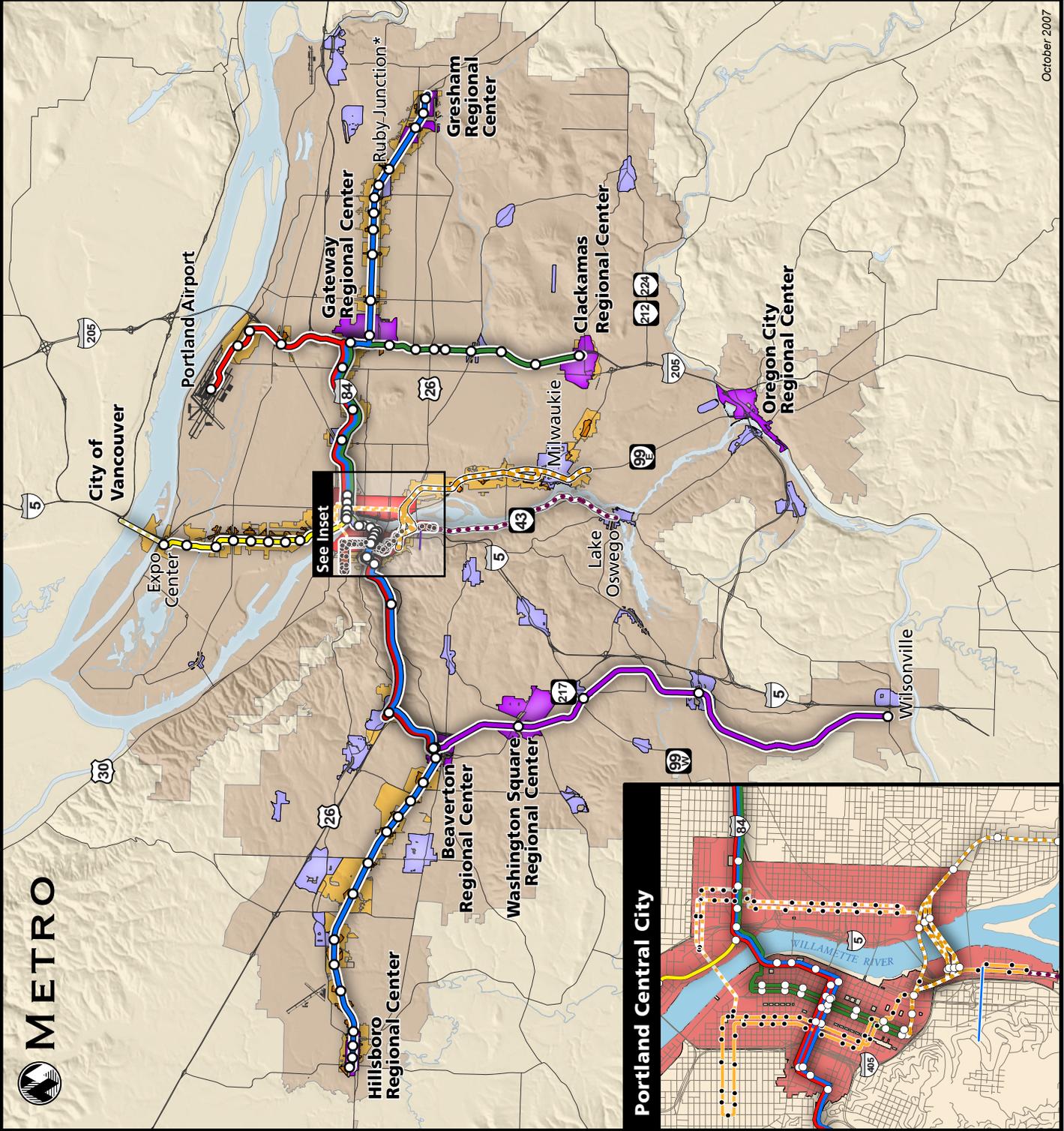
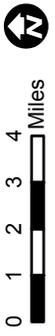
Portland - Milwaukie Light Rail Project

Regional Setting with Regional Rail System

Figure S-2

- High Capacity Transit**
 - MAX Blue Line
 - MAX Red Line
 - MAX Yellow Line
 - MAX Green Line
 - WES Commuter Rail
- Portland Streetcar
- Portland Aerial Tram
- Proposed or Planned Transit Projects**
 - Columbia River Crossing
 - Portland-Milwaukie
 - Lake Oswego to Portland
 - Portland Streetcar Loop Project
- 2040 Growth Concept**
 - Central City
 - Regional Center
 - Town Center
 - Station Community
 - Station Community Core
 - Urban Growth Boundary

* Ruby Junction is an operations and maintenance facility located in Gresham near SE 199th Avenue and SE Burnside Street. For more information see Appendix H: Conceptual Design Information.



October 2007

Travelers within the corridor use a variety of local, regional, state, and interstate facilities. TriMet is the provider of public transportation, operating fixed-route transit buses, on-demand van and small bus service for the elderly and disabled, and light rail lines throughout the region.

S.2 PROJECT HISTORY AND DECISION-MAKING PROCESS

In 2003, the Metro Council identified a Locally Preferred Alternative (LPA) for the South Corridor, calling for two phases of light rail investment. The LPA selection followed the publication of the *South Corridor Project SDEIS* in December 2002. Phase I of the South Corridor LPA was the I-205/Portland Mall project, which released a Final EIS in November 2004 and is now under construction. Phase II is the light rail segment between downtown Portland and Milwaukie, and it would connect directly to Phase I's Portland Mall segment at Portland State University

The region's decision to select light rail for the South Corridor and move forward in two phases of investment is documented in the South Corridor Project LPA Report (Metro, April 2003). *The South Corridor I-205/Portland Mall FEIS* of 2004 further confirmed the LPA's selection of light rail for the Portland-Milwaukie corridor.

Other planning and environmental studies that have guided the development of light rail in the South Corridor include:

- *1993 Tier I and Tier II South/North Alternatives Analysis* (1993 South/North Alternatives Analysis)
- *1998 South/North Corridor Project Draft Environmental Impact Statement* (1998 South/North DEIS)
- *2000 South Corridor Transportation Alternatives Study* (2000 SCTAS)
- *2002 South Corridor Supplemental Draft Environmental Impact Statement* (2002 South Corridor SDEIS)
- *2003 Downtown Amendment to the South Corridor Project Supplemental Draft Environmental Impact Statement* (2003 Downtown Amendment)

To prepare for the Portland-Milwaukie SDEIS, Metro and TriMet conducted a Refinement Study beginning in October 2006. The study, which responded to recommendations in the 2003 LPA Report, reviewed the findings of earlier studies and examined refinements to the 2003 LPA. As a result, the study's steering committee recommended a number of alignment and design options to be studied in this SDEIS. A more detailed description of the history and decision-making process for light rail may be found in Chapter 2, Alternatives Considered.

S.3 PURPOSE AND NEED

The purpose and need for this project was originally defined by the *South/North Corridor Project DEIS* in 1998. The purpose and need was updated with the South Corridor Draft SEIS in December 2002 and the subsequent South Corridor LPA decision in 2003. The purpose is:

To implement a major transit improvement in the South Corridor that maintains livability in the metropolitan region, supports land use goals, optimizes the transportation system, is environmentally sensitive, reflects community values, and is fiscally responsive.

Since the Phase I investment for the South Corridor is nearly complete, this SDEIS focuses on the remaining need to develop light rail within the Portland-Milwaukie corridor as Phase II of the South Corridor.

The *need* for a major transit investment in the Portland-Milwaukie Corridor is identified as:

- Historic and projected rapid population and employment growth in the corridor, which creates an unmet demand for increased travel choices and transit capacity.
- High levels of existing traffic congestion and travel delay in the corridor and deteriorating travel conditions in the future.
- The need for high-quality transit service in the corridor to achieve regional and local land use objectives.

S.3.1 Project Goals and Objectives

The Goals and Objectives established for the Portland-Milwaukie Light Rail Project derive from the purpose and need analysis summarized above and as originally defined for the South/North Corridor Study and reaffirmed through the *South Corridor SDEIS*.

The goals and objectives of the Portland-Milwaukie Light Rail Project (in its capacity as the south segment of the South/North Corridor) are to:

- Provide high-quality transit service in the corridor
- Ensure effective transit system operations in the corridor
- Maximize the ability of the transit system to accommodate future growth in travel demand in the corridor
- Minimize traffic congestion and traffic infiltration through neighborhoods in the corridor
- Promote regionally agreed upon land use patterns and development in the corridor
- Provide for a fiscally stable and financially efficient transit system
- Maximize the efficiency and environmental sensitivity of the engineering design of the proposed project

S.4 ALTERNATIVES CONSIDERED

This SDEIS examines a No-Build Alternative and a Light Rail Alternative for the Portland-Milwaukie Corridor. The No-Build Alternative is required under NEPA and represents future conditions without the Portland-Milwaukie Light Rail Project. The No-Build Alternative represents both a possible outcome of the process and a reference point to gauge the benefits, costs, and impacts of the Light Rail Alternative. It assumes the same levels of growth in population and employment through the year 2030 as discussed above (see Section S.1), but depicts the region's future transportation system without the Portland-Milwaukie Light Rail Project.

The Light Rail Alternative, which includes the 2003 LPA and other related alignment and design options, is shown in Figures S-3 to S-5 and is described below.

S.4.1 2003 LPA

The 2003 LPA includes approximately 6.4 miles of light rail, 11 stations and a new bridge across the Willamette River. The route would begin near Portland State University (PSU), at the southern end of downtown Portland, connecting with the Portland Mall light rail currently being constructed at SW Fifth and Sixth Avenues. The 2003 LPA would end in downtown Milwaukie at SE Lake Road. This alternative represents the baseline for the project's Light Rail Alternative and provides a point of comparison to the other options below.

From the connection with the Portland Mall at SW Jackson Street, the 2003 LPA alignment would turn east and follow SW Lincoln Street to SW 1st Avenue, intersecting SW 4th and SW 1st Avenues and SW Naito Parkway. The route would have a bridge over SW Harrison Street and SW Harbor Drive, descending to an at-grade station at SW River Parkway. It would then continue under the I-5 Marquam Bridge on a new bridge over the Willamette River, touching down south of the existing Oregon Museum of Science and Industry (OMSI) building. The light rail alignment then would continue east, crossing the Oregon Pacific Railroad (OPR) either at grade or grade-separated and then underneath the SE Martin Luther King Jr. Boulevard viaduct before turning southeast and running along the west side of Union Pacific Railroad (UPRR) right-of-way. From near SE 7th Avenue and SE Division Street, the 2003 LPA would continue south parallel to the freight rail tracks.

Between SE 7th Avenue and SE Powell Boulevard, the alignment would be adjacent to and south of the UPRR tracks. South of SE Powell Boulevard, the alignment would be in the center of SE 17th Avenue to south of SE Schiller Street, where it would then continue east along the east side of SE McLoughlin Boulevard (OR 99E). Between SE Reedway Street and SE Tacoma Street, the alignment is located between SE McLoughlin Boulevard and the UPRR tracks.

Just north of SE Tacoma Street, the alignment moves west away from the alignment along the UPRR and crosses over the SE McLoughlin Boulevard northbound access ramp then under SE Tacoma Street. The alignment continues south along the west side of SE Main Street to SE Milport Road then turns east to the Tillamook Branch Line and crosses over the UPRR freight rail line and under Highway 224. The alignment remains along the east side of the Tillamook Branch Line through Milwaukie and terminates at SE Lake Road.

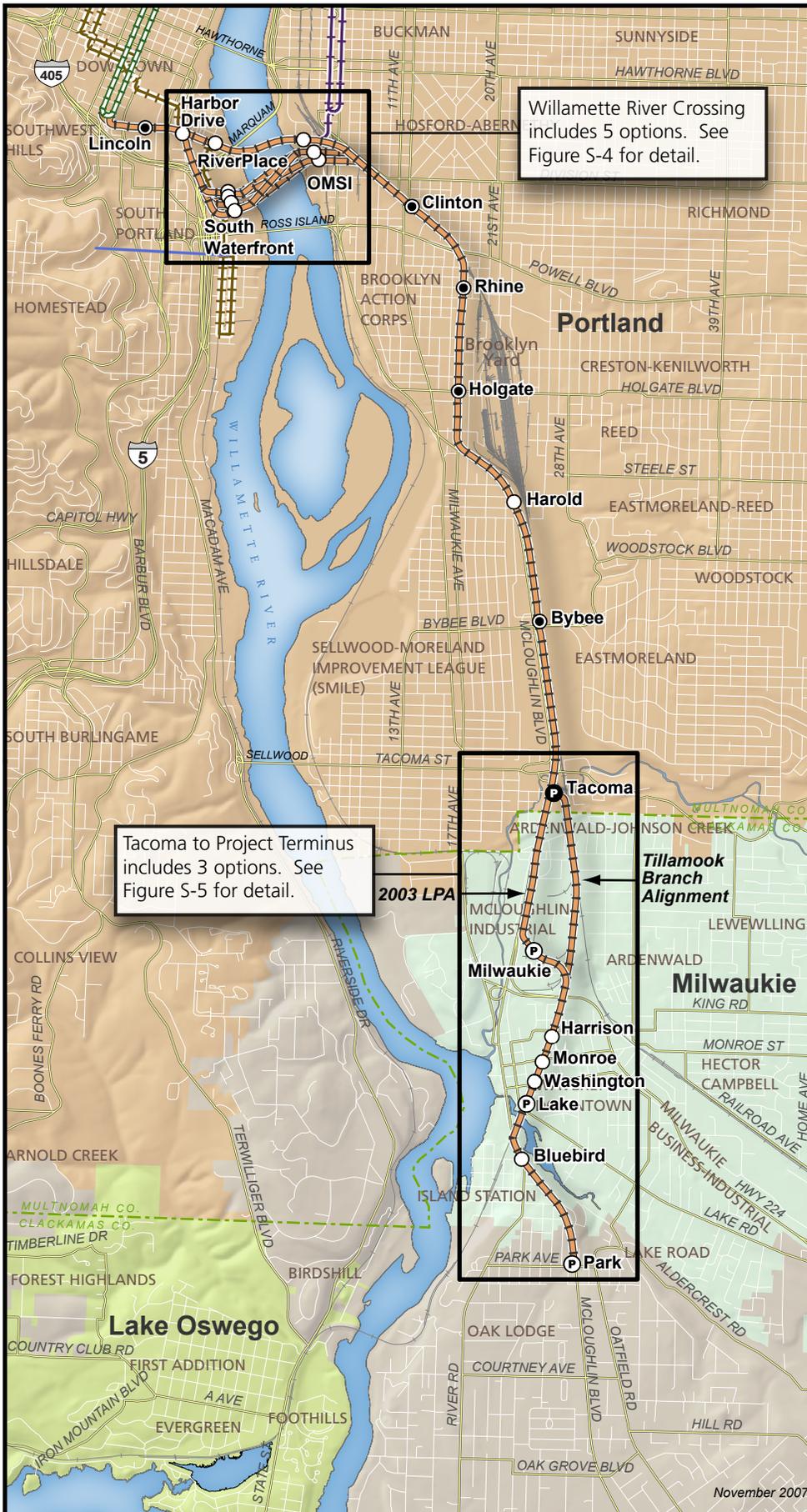
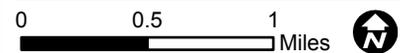
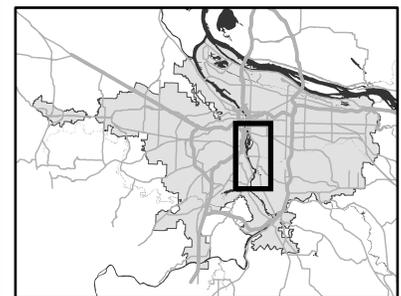
Portland-Milwaukie Light Rail Project

Light Rail Alternative Options

Figure S-3

-  Light Rail alternative
-  Station
-  Station option
-  Park and Ride
-  Park and Ride option
-  Existing Streetcar
-  Portland Aerial Tram
-  Light Rail: Under Construction
-  Portland Streetcar Loop Project
-  Railroad
-  County line

 **Portland – Milwaukie**
LIGHT RAIL PROJECT



Portland - Milwaukie Light Rail Project

Project Options: Willamette River Crossing

Figure S-4

- 1. 2003 LPA
- 2. Meade-Sherman
- 3. Meade-Caruthers
- 4. Porter-Sherman
- 5. Porter-Caruthers

○ Station option

Existing Streetcar

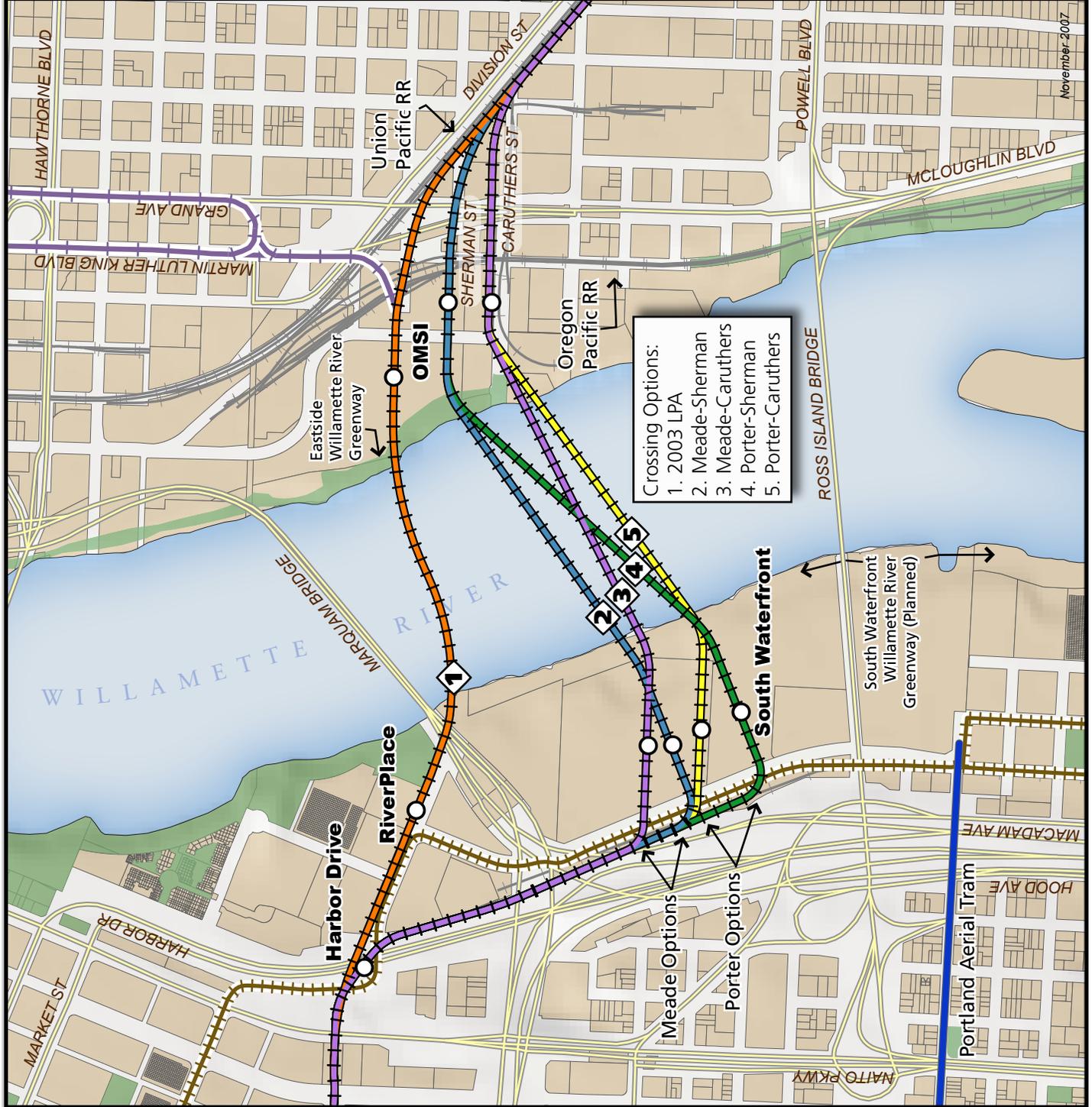
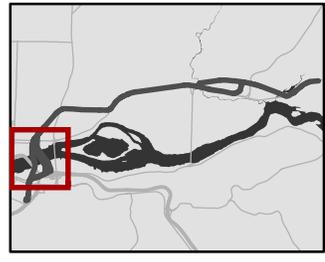
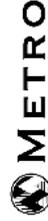
Portland Aerial Tram

Portland Streetcar
Loop Project

Railroad

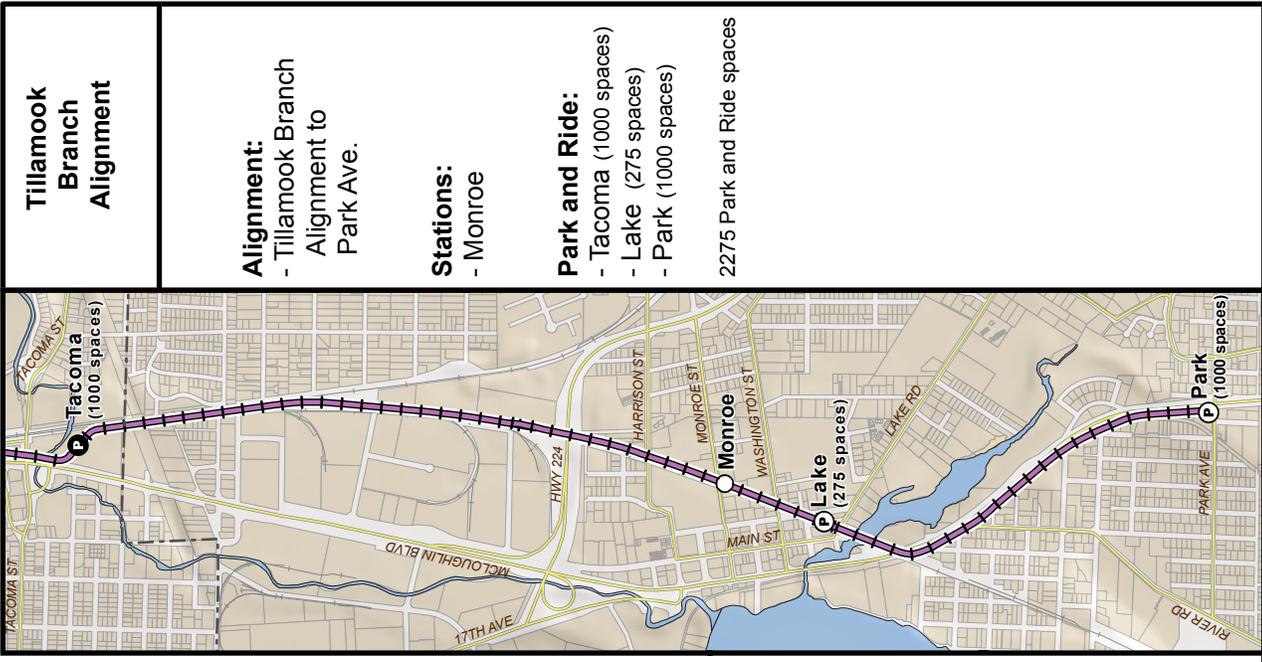
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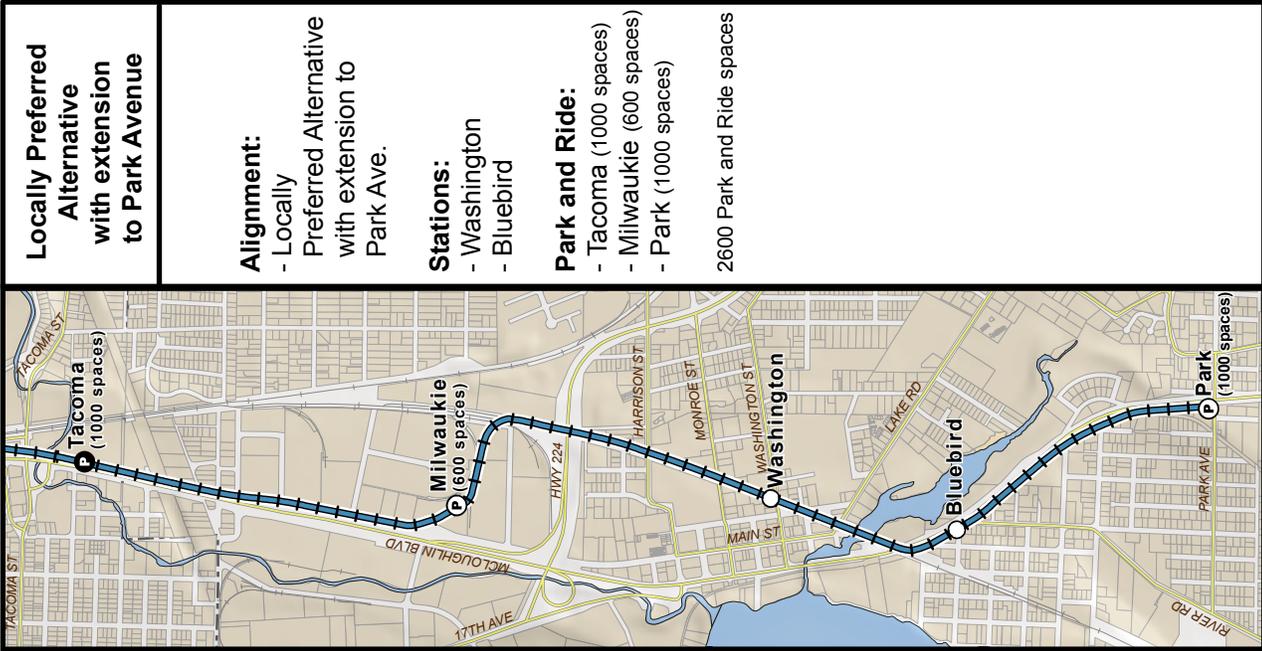
Crossing Options:
1. 2003 LPA
2. Meade-Sherman
3. Meade-Caruthers
4. Porter-Sherman
5. Porter-Caruthers

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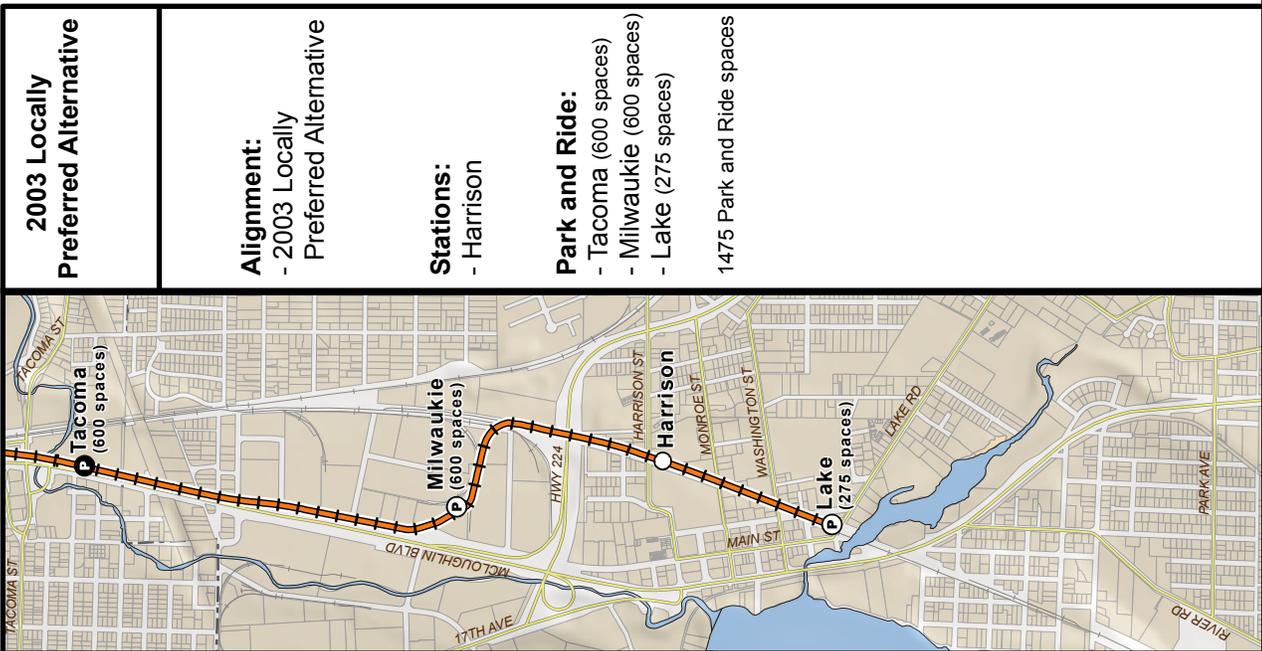
Tillamook Branch Alignment

- Alignment:**
- Tillamook Branch Alignment to Park Ave.
- Stations:**
- Monroe
- Park and Ride:**
- Tacoma (1000 spaces)
 - Lake (275 spaces)
 - Park (1000 spaces)
- 2275 Park and Ride spaces



Locally Preferred Alternative with extension to Park Avenue

- Alignment:**
- Locally Preferred Alternative with extension to Park Ave.
- Stations:**
- Washington
 - Bluebird
- Park and Ride:**
- Tacoma (1000 spaces)
 - Milwaukie (600 spaces)
 - Park (1000 spaces)
- 2600 Park and Ride spaces



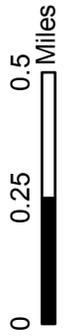
2003 Locally Preferred Alternative

- Alignment:**
- 2003 Locally Preferred Alternative
- Stations:**
- Harrison
- Park and Ride:**
- Tacoma (600 spaces)
 - Milwaukie (600 spaces)
 - Lake (275 spaces)
- 1475 Park and Ride spaces

Portland-Milwaukie Light Rail Project

Project Options: Tacoma to Project Terminus

- Light Rail alternative
- Station
- Station option
- Park and Ride
- Park and Ride option
- Railroad
- County line



S.4.2 Other Alignments and Options

The other alignments and options being considered in conjunction with the 2003 LPA include:

- **Willamette River crossing options** for a new bridge between the South Waterfront district and southeast Portland, with four location options in addition to the 2003 LPA's river crossing. The bridge would serve light rail and streetcars and would also feature a trail for bicyclists and pedestrians. There are also options for bridge height, bridge types, and accommodation for buses.
- **Extension to SE Park Avenue**, an alignment terminus option that would extend light rail about 0.8 mile south of the 2003 LPA, to SE Park Avenue, adding two stations and additional park and ride capacity. The alignment includes an elevated and at-grade crossing option on SE McLoughlin Boulevard.
- **Tillamook Branch Alignment**, an option in the McLoughlin Industrial Area that would transition to an alignment along the Tillamook Branch Line just north of Milwaukie and would include the extension to SE Park Avenue, but with only one station beyond downtown Milwaukie. The Tillamook Branch Line alignment was developed in response to concerns about light rail impacts in the industrial area in the previous *2002 South Corridor SDEIS*.

S.4.3 Stations and Park and Rides

This SDEIS also examines station and park and ride options along the corridor. The differences in station locations and features are mostly related to the 2003 LPA alignment and the other alignment options. From PSU and heading south, the station options include:

- Lincoln
- RiverPlace
- Harbor Drive
- South Waterfront (with several site options)
- OMSI (with several site options)
- Clinton
- Rhine
- Holgate
- Harold
- Bybee
- Tacoma (two site options)
- Milwaukie
- Harrison
- Monroe
- Washington
- Lake Road
- Bluebird
- Park Avenue

There are options for park and ride at the following stations:

- Tacoma (600 to 1,000 spaces)
- Milwaukie (formerly known as the Southgate site, with 600 spaces)
- Lake Road (275 spaces)
- Park Avenue (1,000 spaces)

In addition, based on the SDEIS findings about optimizing the location of park and ride spaces in the corridor, the SDEIS considered the potential for increasing the park and ride capacity at the Tacoma (to 1,250 spaces) and Park Avenue (to 1,200 spaces) stations.

The key characteristics of the Light Rail Alternative and the No-Build Alternative are summarized in Table S-1 below, and discussed in more detail in Chapter 2. A more comprehensive description of these alternatives and transportation analysis assumptions can be found in the *Detailed Description of Alternatives Report* (Metro, October 2007).

**Table S-1
Key Features of the Alternatives**

Alternative	Transit	Roadway
No-Build Alternative	<ul style="list-style-type: none"> • Existing 2007 transit services and facilities. • Some increases in route frequency and/or run times to avoid peak overloads and/or to maintain schedule reliability. • Incremental increases in service hours and vehicle procurement, consistent with available revenue sources and consistent with the RTP 2025 financially constrained transit network. • One new bus route that would connect the Clackamas Transit Center and downtown Milwaukie on SE Johnson Creek Boulevard. • Completion of the first phase of the South Corridor Project on the Portland Mall and I-205. • Assumes separate projects for a 300-space park and ride facility at SE McLoughlin Boulevard and SE Milport Road and 100-space shared park and ride at Clackamas Community College. • Minor changes in transit operations and routing in the South Corridor. • An expansion of the Powell Garage to accommodate at least 50 additional buses. 	<ul style="list-style-type: none"> • Road improvements are limited to those in the 2004 RTP financially constrained highway network. See Appendix B of the <i>Portland-Milwaukie Project Detailed Definition of Alternatives Report</i> (Metro, October 2007) for a detailed listing of the planned roadway projects within the Portland-Milwaukie project area.
Portland-Milwaukie Light Rail Alternative	<ul style="list-style-type: none"> • All transit improvements included within the No-Build Alternative. • A mostly double-tracked light rail between downtown Portland and Milwaukie terminating at either SE Lake Road or SE Park Avenue generally parallel to and east of SE McLoughlin Boulevard, with 11 to 15 LRT stations. • Adjustments to No-Build bus network: 1) eliminate/modify bus routes that would duplicate light rail service and 2) adjust routes to connect to light rail stations or transit centers. • Three park and ride facilities providing 1,475 to 2,600 spaces • Shifting of streetcar alignment to accommodate light rail along SW River Drive with the 2003 LPA alignment. • Accommodate streetcar access to new Willamette River bridge. • New Willamette River bridge with potential to accommodate rerouted buses. • Expansion of the Ruby Junction Operations and Maintenance Facility to accommodate 16 to 23 additional light rail vehicles. 	<ul style="list-style-type: none"> • Road improvements and modifications in addition to those in the 2004 RTP financially constrained highway network: <ul style="list-style-type: none"> • Modifications to segments of roadways along SW Lincoln Street; SW Harbor Drive; modifications to SE 17th Avenue in Portland and SE Main Street in Milwaukie, to accommodate the LRT alignment, depending upon the design option. • Reconfiguration of access to SE McLoughlin Boulevard at the Tacoma Station and the Milwaukie Station. • Potential at-grade crossing of SE McLoughlin Boulevard south of Milwaukie.

S.4.4 Willamette River Bridge

The Light Rail Alternative includes a new bridge for light rail across the Willamette River. The bridge would also accommodate streetcars and buses and provide a bicycle and pedestrian path. The bridge’s design details will be further defined after the selection of a Preferred Alternative, but the SDEIS explores the effects of a variety of bridge concepts and options. These allow the SDEIS to compare choices about the type of bridge, its height and width, and whether buses would operate on the bridge in addition to light rail and the streetcar.

In addition to the 2003 LPA, there are four other alignments for crossing the river between the South Waterfront and the Central Eastside Industrial District. The types of bridges considered in this SDEIS include cable-stayed, concrete segmental, and cable-stayed through truss hybrid bridge types. Table S-2 summarizes the bridge options.

The SDEIS also studies how various bridge heights may affect navigational clearances. The United States Coast Guard will ultimately decide the navigational clearance requirements for the new bridge, but the bridge types assumed for the SDEIS analysis would provide a 72-foot vertical clearance or a 65-foot clearance. Based on initial analysis results, it is possible that a clearance of approximately 75 feet may be required in order to maintain existing navigational clearances for the river.

**Table S-2
Willamette River Design Options**

	Representative Concepts		Design Options	
	Bridge Type Concept ¹		Eastside Landing	South Waterfront Street Plan ^{2,3}
2003 LPA	Cable-stayed through truss 72' clearance	Concrete segmental 65' clearance	At grade or grade-separated	NA
Meade - Sherman	Cable-stayed 72' clearance	Concrete segmental 65' clearance	At grade only	S Waterfront 2002
Porter - Caruthers	Cable-stayed 72' clearance	Concrete segmental 65' clearance	At grade only	N Macadam 1996
Meade - Caruthers	Cable-stayed 72' clearance	Concrete segmental 65' clearance	At grade only	N Macadam 1996
Porter - Sherman	Cable-stayed 72' clearance	Concrete segmental 65' clearance	At grade only	S Waterfront 2002

¹ Bridge types are representative concepts used for the SDEIS.

² Meade-Sherman and Porter Sherman use the South Waterfront Plan (2002) street network.

³ Porter-Caruthers and Meade-Caruthers use the North Macadam District Street Plan (1996), which is parallel and perpendicular to the Zidell – OHSU property line and is being reconsidered.

S.4.5 Light Rail Alternative Operations and Maintenance Facilities

The Light Rail Alternative would require an additional 16 to 23 light rail vehicles compared with the No-Build Alternative. TriMet’s existing Ruby Junction Operations Facility, located in the city of Gresham near SE 199th Avenue and SE Burnside Street, would be expanded to accommodate the operations and maintenance needs for the additional vehicles and would also provide for capacity needed to serve general system expansion.

S.5 TRANSPORTATION IMPACTS

This section summarizes the transit, highway, and freight impacts (by 2030) of the alternatives. Variations in some transportation impacts would occur due to different design options.

S.5.1 Transit Impacts

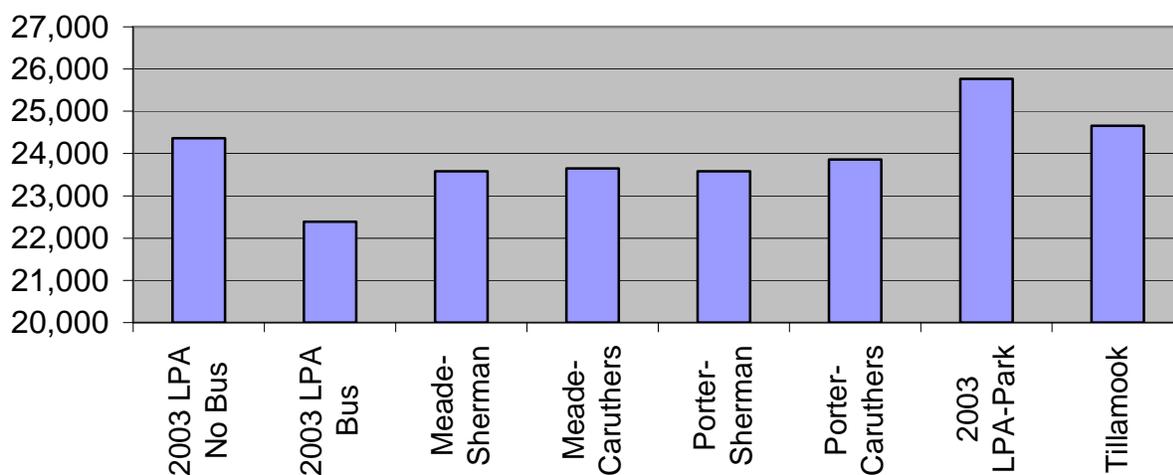
The Light Rail Alternative would offer benefits to transit riders by providing faster, more reliable service, improved access to stations, and more convenient connections to other destinations in the region. In addition to the improvements directly due to light rail, a new bridge that also serves bus and streetcar would improve transit times and access for riders on those modes.

The Light Rail Alternative total transit travel time savings would offer from one to four minutes to Pioneer Square, up to 18 minutes to PSU, and between 29 and 33 minutes for transit trips between Milwaukie and the South Waterfront area, which is not currently a direct route. Transit travel times would be competitive with automobile trips throughout the corridor, and light rail would be faster than driving for a trip from the eastside to the South Waterfront area.

S.5.1.1 Transit Ridership

The Light Rail Alternative would increase transit trips at both corridor and system levels. Between 22,000 and 25,500 daily trips on light rail would be expected in the Portland-Milwaukie Corridor by the year 2030, as shown in Figure S-6. The most light rail trips would occur with the 2003 LPA to Park because the longer route allows more stations and more park and rides, providing greater accessibility to more people. The lowest light rail ridership would occur with the 2003 LPA with the option for buses on the bridge, although buses on the bridge would increase overall transit ridership.

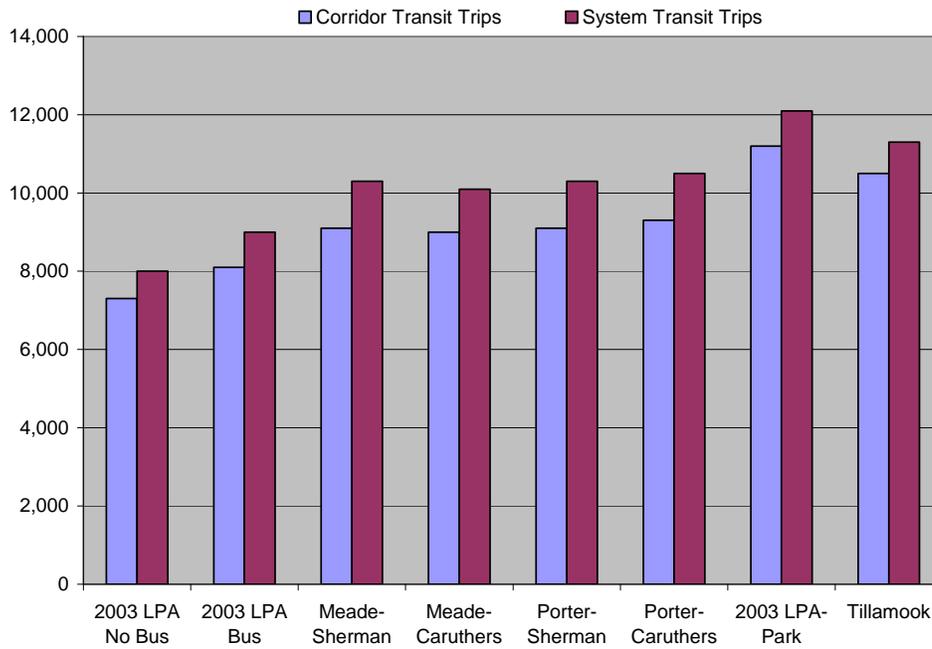
Figure S-6.
Portland-Milwaukie LRT Daily Ridership¹, Year 2030



¹ LRT ridership is boarding rides per line. Linked trips are counted twice if the passenger transfers from one LRT line to another LRT line.

The Light Rail Alternative would result in approximately 551,100 to 555,200 average weekday systemwide trips in 2030 (Figure S-7), compared to approximately 543,100 trips with the No-Build Alternative.

**Figure S-7
Corridor and System Daily Transit Trips Change from No-Build, Year 2030**



S.5.2 Traffic Impacts

S.5.2.1 Regional Traffic Impacts

The Light Rail Alternative would benefit the regional transportation system by reducing vehicle use, as measured in changes in vehicle miles traveled (VMT), vehicle hours traveled (VHT), and vehicle hours of delay (VHD).¹

The 2030 LPA to Park and the Tillamook Branch Line options would do the most to reduce VMT, VHT, and VHD in 2030 because they have the highest levels of transit use. They would reduce VMT by about 69,000 miles, VHT by nearly 6,300 hours, and VHD by about 450 hours per average weekday.

S.5.2.2 Local Transportation Impacts

The analysis of the Light Rail Alternative considers effects on local transportation facilities and uses, including bicycle and pedestrian activity, parking, congestion and delays, and freight access.

¹ Vehicle hours of delay is the amount of delay on congested roadways (above 0.9 vehicle-to-capacity ratio).

S.5.2.3 Bicycle and Pedestrian Activities

The Light Rail Alternative offers connections to several regional trails, including via a trail provided by the new bridge, as well as by existing and planned regional trails near the Tacoma station and downtown Milwaukie.

S.5.2.4 Parking

The Light Rail Alternative would affect up to 550 existing parking spaces in the corridor, but would provide between 1475 to 2600 new spaces in station areas with potential to provide higher supplies if demand warrants. In most areas, the losses have low impacts considering available supply and project demand, although along SE 17th Avenue the loss of on-street and off-street parking near TriMet's maintenance facility would result in an under supply. Light rail may offset demand by offering an alternative to driving and parking.

S.5.2.5 Congestion and Delay

Without mitigation, the Light Rail Alternative would degrade conditions below standards at up to 18 locations in Portland, Milwaukie, and Clackamas County. Most of these locations would be below standards even with No-Build, but the Light Rail Alternative would increase delays. The major affected intersections are on streets in the South Waterfront, along SE 17th Avenue, and along SE McLoughlin Boulevard. Potential mitigation measures or design refinements are available to reduce the impacts of light rail, and will be further defined through work with local jurisdictions and the Oregon Department of Transportation.

S.5.2.6 Freight Access

Some of the delays listed above as well as street modifications could affect freight access and travel times, particularly in the Central Eastside Industrial District and in the McLoughlin Industrial District. Travel times for trucks could increase by between 50 seconds in the Central Eastside Industrial District, and up to 150 seconds in the McLoughlin Industrial District. The Tillamook Branch Line Alignment would avoid the effects of the 2003 LPA in the McLoughlin Industrial District.

S.5.3 Navigational Impacts

The Portland to Milwaukie Light Rail Project proposes a new bridge over the Willamette River between the Marquam and Ross Island Bridges (shown on Figure S-2). The SDEIS evaluates effects of a proposed bridge with vertical clearances of 65 and 72 feet.

Both the Ross Island and Marquam Bridges have maximum vertical clearances of 120 feet. The lowest existing vertical clearance in this part of the river is 75 feet at the Sellwood Bridge. A survey of river users (including commercial and recreational users) found that recreational uses would be accommodated with a 65- to 72-foot clearance. Some ships arriving for the Rose Festival have higher clearance requirements than are proposed. Several industrial users may be affected because their operations periodically use crane barges that require higher clearances at high water. Additional work is being conducted with all users having potential conflicts to determine the extent of the impacts. The U.S. Coast Guard will make the final decision. At this point, it appears that most users can be accommodated with approximately 75-foot clearances.

S.6 ENVIRONMENTAL CONSEQUENCES

Table S-3 summarizes environmental impacts that would occur with the Light Rail Alternative compared to No-Build, followed by a discussion of major differences in effects by area.

**Table S-3
Summary of Environmental Impacts**

Measures	No-Build	2003 LPA	2003 LPA w/Bridge Crossing Options (range)	2003 LPA Extension to Park	2003 LPA w/Tillamook Branch Alignment	Maintenance Base
Displacements and Acquisitions						
Full Acquisitions	0	55	60-60	61	62	14
Partial Acquisitions	0	67	64-65	82	77	1
Displaced Residence/Business/Other	0	2/46/15	2-2/49-50/ 15-15	4/53/13	4/55/13	7/6/2
Land Use and Economic						
Compatibility with Local Land Use Plans	Low	High	High	High	High	High
Construction Impact: Potential Temporary Increase in Personal Income (millions)	0	\$390-428	\$406-438	\$487	\$437-484	-
Estimated Jobs Displaced	0	675	744-897	699	705	60
Tax Revenue Impact due to Property Acquisition	0	\$847,000	\$905,000- \$912,000	\$868,200	\$824,300	Not Estimated
Community Impact Assessment						
Neighborhood Benefits	Low	High	High	High	High	Low
Neighborhood Impacts	Low	Low	Low	Low	Low	Low-Medium
Visual Resources Impacts	Low	Medium-High	Medium-High	Medium-High	Medium-High	Low
Historic and Archaeological Resources						
Properties with Identified Historic Resources	0	15	15	17	17	0
Historic Resources with Expected Adverse Effects	0	3	3	4	3	0
(High/Moderate) Probability Areas for Archaeological Resources	0/0	5/1	5/1	8/1	8/1	0
Parks and Recreational Resources						
Number of Existing Parks Impacted	0	6	6	6	6	0
Number of Planned Parks Impacted	0	0	1	2	2	0
Geology and Soils Impacts	None	None	None	None	None	None
Ecosystems						
Wetland Filled / Spanned (acres)	0	0.57	0.57	0.57	0.57	0
Permanent Footprint of Project Area Stream Crossings (ft ²)	0	84,350	86,750- 101,950	96,400	96,400	0
Impervious Surface Area (acres)	0	26.1	26.5	29.2	26.6	3.7
Vegetation Impacts Excluding Open Water (acres)	0	6.71	6.71	7.78	7.03	0
Impacts to TES Fish-Bearing Streams (lineal feet)	0	188	188	302	302	0
Water Quality/Hydrology						
Combined Acreage in Floodplain	0	1.9	1.9-2.5	2.0	2.7	1.7

Measures	No-Build	2003 LPA	2003 LPA w/Bridge Crossing Options (range)	2003 LPA Extension to Park	2003 LPA w/Tillamook Branch Alignment	Maintenance Base
Noise and Vibration						
Noise Impacts without Mitigation	0	23	3	25	25	0
Vibration Impacts without Mitigation	0	33	13	36-38	34-36	0
Regional Air Quality (tons per day)						
Carbon Monoxide	606.3	605.8	Similar to LPA	Similar to LPA	Similar to LPA	Similar to LPA
Nitrogen Oxides	16.2	16.1	Similar to LPA	Similar to LPA	Similar to LPA	Similar to LPA
Volatile Organic Compounds	19.1	19.1	Similar to LPA	Similar to LPA	Similar to LPA	Similar to LPA
Carbon Dioxide	36,328	36,299	Similar to LPA	Similar to LPA	Similar to LPA	Similar to LPA
Energy Consumption						
Regional Daily Vehicle (10 ⁹ BTU)	495.173	494.819	Similar to LPA	494.632	Similar to LPA	Similar to LPA
Hazardous Materials						
All Sites of Concern/Sites of Highest Concern	0	80/35	95/38	84/35	90/42	
Public Services Impacts						
	None	Minor	Minor	Minor	Minor	None
Utilities Impacts						
	None	Minor	Minor	Minor	Minor	None

S.6.1 Displacements

The Light Rail Alternative would acquire 55 to 62 full properties, including two to four residences and 46 to 55 businesses. The expansion of the Ruby Junction maintenance base would affect 14 parcels, displacing seven residences and six businesses.

S.6.2 Land Use and Economic Impacts

The Light Rail Alternative would be more supportive of statewide planning goals and regional and local plans and policies than the No-Build Alternative. The Light Rail Alternative serves major regional employment and commercial and residential areas, and it supports Statewide Planning Goals by providing a transportation service that reduces reliance on the automobile.

The Light Rail Alternative supports the regional *2040 Growth Concept*, which directs most new development to mixed-use urban centers and along major transportation corridors. The proposed project also supports local jurisdiction land use plans and policies. For instance, the Light Rail Alternative would serve the South Waterfront area, an area targeted for major development by the City of Portland, and it would support revitalization plans for downtown Milwaukie.

Forty six to 55 businesses with up to 900 jobs could be affected by property acquisition and business displacement and relocation actions. The project's mitigation measures include compensation and relocation for property owners and businesses, which would minimize the effects. If businesses are able to relocate within the area or region, job losses would be lower. Construction of light rail would also provide near term economic benefits by providing employment, with over 10,000 additional person-year jobs and approximately \$425 million more in additional personal income, compared to the No-Build Alternative.

S.6.3 Community Impacts

The Light Rail Alternative would have generally positive effects on local communities, including low-income and minority populations within the corridor because it would increase access and mobility within the corridor and to areas throughout the region. Most of the project is located along existing transportation corridors, avoiding the division of neighborhoods and limiting property impacts, with no significant impacts to public or community facilities. Indirect impacts to neighborhood quality, such as noise and vibration impacts, would be mitigated, and no appreciable impacts to neighborhood quality are expected. Stations are expected to support neighborhood commercial centers.

S.6.4 Visual Impacts

The project would be largely within established transportation corridors in urbanized areas. In most locations, visual impacts would be low. A new bridge over the Willamette River would be the major visual change created by the project. Of the potential bridge types under consideration, a cable-stayed bridge would have the most prominent visual impact but more potential for creating visual interest, while a concrete segmental bridge would have a lower profile but somewhat less opportunity for visual distinction. In a few other locations, structures required for the project would affect localized views, including near RiverPlace for the 2003 LPA and where brief sections with elevated structures are needed for the Tillamook Branch Line alignment and the 2003 LPA to Park. Park and rides would also introduce large new structures in north Milwaukie and at SE McLoughlin Boulevard/SE Park Avenue.

S.6.5 Historical and Cultural Resources

The Light Rail Alternative would adversely impact three to four historic resources and would potentially affect six to eight areas that could contain archaeological resources. The Tillamook Branch Line alignment avoids an adverse effect to one historic resource in the Milwaukie Industrial area, compared to the 2003 LPA and the LPA to Park. The Tillamook Branch Line alignment and the 2003 LPA to Park would both have visual impacts to the historic rail trestle over Kellogg Lake.

S.6.6 Parks and Recreation

The Light Rail Alternative would affect up to six existing park or recreation resources and two to three planned parks or recreation resources. Most of these effects involve the light rail crossing over or near a resource. The affected areas are near existing or planned trails along the Willamette River. With the 2003 LPA to Park or the Tillamook Branch Line alignment, an additional acre may be needed within areas planned for a park and a trail.

S.6.7 Air Quality

Regional vehicle emissions are expected to decrease for all future conditions relative to existing conditions, and the light rail project would further support state and regional plans by providing an alternative to automobile use. The project would help reduce regional emissions for carbon monoxide, supporting federal air quality conformity requirements for the region. Greenhouse gas production would also be lower for the Light Rail Alternative, compared to No-Build.

S.6.8 Noise and Vibration

The Light Rail Alternative would result in 23 to 25 adverse noise impacts without mitigation; none of the impacts are severe and all of the impacts can be mitigated. The 2003 LPA would have 23 impacts, and the 2003 LPA to Park and the Tillamook Branch Line alignment would have an additional two impacts. The Willamette River crossing options would avoid impacts at 20 residential units at RiverPlace.

Without mitigation, the Light Rail Alternative would have 33 to 38 vibration impacts, most of which occur in areas south of the Tacoma Station. The 2003 LPA would have 28 impacts, and the 2003 LPA to Park and the 2003 LPA with the Tillamook Branch Line alignment would both have 36 to 38 impacts. Mitigation measures are available to reduce these impacts.

S.6.9 Ecosystem Impacts

The Light Rail Alternative (under the 2003 LPA, the 2003 LPA to Park, or the 2003 LPA with the Tillamook Branch Line alignment) would have impacts to less than three-fifths of an acre of wetlands. The Light Rail Alternative would cross the Willamette River and up to six streams. The 2003 LPA would cross four streams and the LPA to Park and the Tillamook Branch Line alignment would cross two additional streams. Only the Willamette River and Kellogg Creek would require construction of structures below normal high water levels. These waterways are critical habitat to endangered salmon species, but the expected long-term impact to habitat and channel integrity is expected to be low to moderate. The concrete segmental bridge type would require four piers in the river, while the cable-stayed bridge types would have two towers in the river. For the concrete segmental type, the higher number of piers and their proximity to the shoreline could increase relative impacts compared to the cable-stayed bridge type.

There are species protected under the Endangered Species Act that are likely to occur in the project area. This includes seven aquatic species, including salmon, that are likely to be present in the Willamette River and tributary streams. The project would involve alteration of their habitats and constructions could also involve activities that could harm fish.

S.6.10 Water Quality, Hydrology, and Floodplain Impacts

The Light Rail Alternative would involve 1.9 to 2.7 acres of fill within mapped floodplains in the project area. The 2003 LPA would have the least amount of fill (1.9 acres), which would be increased to 2.5 acres if a South Waterfront alignment were used (Porter-Sherman, for example). The 2003 LPA to Park would result in 2.0 acres, while the 2003 LPA with the Tillamook Branch Line alignment would impact 2.7 acres. The Ruby Junction maintenance base would involve an additional 1.7 acres of fill in a mapped floodplain. Impacts due to new impervious surface are relatively low due to the size of the watershed and because the Light Rail Alternative would adhere to all applicable stormwater management regulations.

S.6.11 Energy Impacts

Compared to the No-Build Alternative, the Light Rail Alternative would reduce total regional energy consumption, with a reduction of up to 0.354×10^9 Btu per average weekday.

S.6.12 Hazardous Materials Impacts

The project would involve construction in areas with hazardous materials releases, but the risk of exposure to people or the environment would be low. Hazardous materials would increase the complexity of construction and could increase costs. Key differences in effects are found in the South Waterfront area, where the Willamette River crossing options encounter two contaminated sites of high concern. These sites are avoided by the 2003 LPA. During bridge construction, both the 2003 LPA and Willamette River crossing options would likely encounter contaminated in-water sediments, requiring special measures, but again the 2003 LPA would appear to have lower risks. A concrete segmental bridge type would require more in-water construction than a cable-stayed bridge, and would have more potential to disturb sediments. In the southern portion of the corridor, where industrial and railroad uses are prevalent, the Tillamook Branch Line alignment would encounter fewer sites than the 2003 LPA or the LPA to Park.

S.7 EVALUATION OF THE ALTERNATIVES

This section evaluates the alternatives from four different perspectives:

- Financial analysis, which provides information to assess the fiscal feasibility of building and operating the alternatives
- Evaluation of the alternatives, which synthesizes key findings of the other chapters of this SDEIS using a range of criteria and measures to assess the alternatives' ability to meet the project's objectives
- Equity considerations
- A summary of the major tradeoffs between the alternatives

S.7.1 Financial Feasibility Analysis

This section assesses the financial feasibility of the alternatives, given the costs of the alternatives and the current, anticipated, and potential sources of revenue. The financial feasibility analysis is divided into two elements, because each element would have a different financing plan:

- **Project Capital Financial Feasibility Analysis** focuses on whether there are adequate project capital resources currently available to construct light rail and, if not, the options for resolving the project capital need for additional resources.
- **System Fiscal Feasibility Analysis** focuses on whether there are adequate resources to operate and maintain the entire transit system, including operations of the Portland-Milwaukie Light Rail Project alternatives, between now and the year 2030 and, if not, the options for resolving the system financial need. System costs include all transit operation and maintenance (O&M) costs and all transit capital expenditures to the year 2030, except for the capital costs of the Portland-Milwaukie Light Rail Project accounted for in the Project Capital Financial Feasibility Analysis.

S.7.2 Costs

S.7.3 Project Capital Costs

As shown in Table S-4, the Light Rail Alternative costs would range from \$760 million to \$940 million in 2007 dollars (without finance costs), or \$1.177 billion to \$1.423 billion in year of

expenditure (YOE) costs with financing included. The 2003 LPA is estimated to cost \$1.255 billion in YOE dollars (including finance costs), assuming a cable-stayed bridge type is selected. The 2003 LPA to Park alignment option is estimated to cost \$1.423 billion in YOE dollars, \$168.7 million more than the 2003 LPA alternative, primarily due to its longer length and 1,125 additional park and ride spaces. The Tillamook Branch Line alignment alternative is estimated to cost \$34.7 million less than the 2003 LPA to Park alternative due to fewer stations and park and ride spaces.

**Table S-4
Capital Costs of Portland-Milwaukie Light Rail Project Alignment Options
Millions of 2007 and Year-of-Expenditure Dollars**

Alignment Option: Bridge Type Concept:	2003 LPA		2003 LPA Park	2003 LPA with Tillamook
	Cable	Concrete	Cable	Cable
Right-of-Way / Real Estate	\$115.5	\$115.5	\$124.4	\$111.0
Civil, Track, Signals, Electrification, and Communications	\$357.9	\$311.9	\$427.3	\$423.7
Light Rail Vehicles (16-23)*	\$64.0	\$64.0	\$92.0	\$84.0
Operations and Maintenance Facility	\$19.6	\$19.6	\$19.6	\$19.6
Engineering and Administration	\$168.0	\$168.0	\$168.0	\$168.0
Contingency	\$93.2	\$81.7	\$111.2	\$110.6
Sub-Total in 2007 Dollars	\$818.1	\$760.7	\$942.5	\$916.9
Escalation to Year-of-Expenditure (YOE)	\$291.9	\$271.4	\$336.3	\$327.2
Finance Expenses	\$145.0	\$145.0	\$145.0	\$145.0
Total in Year-of-Expenditure Dollars	\$1,255.1	\$1,177.1	\$1,423.8	\$1,389.1

Note: Numbers may not add due to rounding.

Source: TriMet, 2008

*More vehicles are needed for the longer alignments (to Park)

With a cable-stayed bridge, the estimated costs of the four southerly Willamette River crossing options are estimated to cost \$22.5 to \$30.6 million more than the 2003 LPA in YOE dollars. If a concrete segmental bridge is chosen, the estimated costs of the four southerly river crossing options are estimated to cost \$45.7 to \$51.8 million more than the 2003 LPA. Depending on the river crossing option, a cable-stayed bridge costs \$54.8 to \$78 million more than the equivalent concrete segmental bridge.

S.7.4 Capital Funding Conclusions

The project will need to prepare a detailed financial plan for its Preferred Alternative. TriMet and Metro anticipate that funds will be needed from a variety of sources, including local, regional and state funds, as well as funds from the federal government. The primary federal source for transit projects is known as Section 5309 “New Starts funds.” These discretionary federal grants are authorized by congress and administrated by FTA, and are available on a competitive basis for new fixed-guideway transit systems and extensions to existing fixed-guideway systems that meet certain requirements. If the project can achieve a 50 percent share of its costs from federal sources, the 2003 LPA would require \$250.6 to \$304.9 million of Local and Regional Funds, depending on the choice of river crossing option and bridge type concept.

The 2003 LPA to Park alignment option would require about \$84 million more of *Federal New Starts Funds* and \$84 million more of *Local and Regional Funds* than the 2003 LPA. The Tillamook Branch Line alignment would require about \$67 million more of *Local and Regional Funds* and \$67 million more *Federal New Starts Funds* than the 2003 LPA.

Depending on the river crossing option and bridge type concept selected, \$706.3 to \$771.4 million of Section 5309 New Start Funds would be sought for the 2003 LPA alternative assuming a 60 percent New Starts share. Based on a 60 percent share from federal sources, the 2003 LPA would require \$132.8 to \$176.3 million of *Regional and Local Funds*, depending on the choice of river crossing option and bridge type concept. The 2003 LPA to Park alignment option would require about \$101 million more New Start funds and \$67 million more of *Local and Regional Funds* than the 2003 LPA for the same range of river crossing options and bridge type concepts. The Tillamook Branch Line alignment requires about \$80 million more New Start funds and \$53 million more of *Local and Regional Funds* than the 2003 LPA for the same range of river crossing options and bridge type concepts.

S.7.5 Operating and System Costs

No-Build transit operating and maintenance costs in this corridor are estimated to be \$32.38 million in 2007 dollars. Operations and maintenance for the Light Rail Alternative would cost \$5.52 to \$6.55 million (2007) a year more than the No-Build Alternative. Costs for the 2003 LPA are \$5.52 to \$5.63 million (2007 dollars) higher than the No-Build Alternative, depending on whether or not buses are rerouted to run on the bridge. The 2003 LPA to Park has the highest operating costs, at \$6.55 million higher than No-Build.

The *total system cost* of an alternative is the sum of *system capital costs* and *system operating costs*. The *total system cost* for the No-Build alternative in YOE dollars (covering the period fiscal year 2007 through FY 2030) would be about \$156 to \$190 million less than the total system cost for the 2003 LPA and alignment options.

S.7.5.1 System Feasibility

A transit system cash flow analysis of all the alternatives and alignment options has found that there are sufficient funds available to meet transit system needs without any additional system revenues.

Implementation of the Funding Plan

Implementation of a funding plan would depend on successfully obtaining:

- A timely decision for a locally preferred alternative
- Agreement among the local and regional funding partners as to each entities' share of local and regional funds
- Formal commitments of capital funding from the regional and local funding partners, including, if part of the final funding plan, voter approval of any general obligation bonds incorporated in the funding plan
- A sufficient New Starts rating to be eligible for federal funding
- FTA and congressional authority to proceed to construction

- A Full Funding Grant Agreement between TriMet and FTA that provides Section 5309 New Starts funds in the amount required by the finance plan

S.7.6 Social Equity Considerations

The proposed Light Rail Alternative would pass through 11 neighborhoods: seven in the City of Portland, four in the City of Milwaukie, and one in unincorporated Clackamas County (Ardenwald neighborhood is in both Portland and Milwaukie). Several of these neighborhoods have minority and/or Hispanic populations greater than the regional average of 17.1% and 8.0%, respectively (2000 US Census). These neighborhoods are in Downtown Portland (23.7% minority) and in and near Milwaukie's McLoughlin Industrial area (23.5% minority and 15.7% Hispanic). Several neighborhoods also have a percentage of low-income residents that is greater than the regional average of 8.7%: Downtown Portland (32.1%); Brooklyn (11.9%); Hosford-Abernethy (12.9%); and Sellwood-Moreland (10.8%); and Ardenwald (13.9%).

The Light Rail Alternative has limited impacts to neighborhoods. Displacement impacts are low. Noise and vibration impacts are also limited, and impacts can be mitigated. The project also would provide light rail stations in or near all the neighborhoods with minority, Hispanic or low income populations, improving transit times and accessibility to destinations throughout the region. This would include greater access to employment sites, public services, and educational resources in the region. Overall, no disproportionately adverse effects are anticipated.

S.8 NEXT STEPS

The analysis and preparation of this SDEIS represents one phase in the development of the Portland-Milwaukie Light Rail Project. This section addresses some of the more important and immediate landmarks.

S.8.1 Selection of a New Locally Preferred Alternative (LPA)

This SDEIS, related technical documents, and comments received during the public review period will provide a basis for local jurisdictions to recommend and adopt a preferred alternative and design option(s) that will collectively comprise a new LPA.

The Portland-Milwaukie Light Rail Project has established a steering committee and, with the help of participating jurisdictions and general public, will have the opportunity to develop and present independent recommendations on project elements to be included in the new LPA. The project has also established a Citizen Advisory Committee and a working group focused on river crossing issues.

The release of this SDEIS marks the start of a 45-day public comment period that will include a public hearing. Public comments will be accepted at the hearing and in writing throughout the comment period. After the close of the public comment period, the Metro Council will consider public comments, including recommendations from the steering committee, the Citizen Advisory Committee and other jurisdictions. The recommendations of these parties will be considered by the TriMet Board of Directors, the Joint Policy Advisory Committee on Transportation (JPACT), and the Metro Council. Metro will prepare and adopt report that will document the selection of the new LPA and option(s), which will then be forwarded to FTA.

S.8.1.1 Development and Release of the Final EIS

After the selection of a new LPA, the project will seek authorization from the FTA to begin preliminary engineering. A Final EIS will be prepared to respond to public comments on this SDEIS and to update environmental information to reflect refinements to the Preferred Alternative, including the development of mitigation commitments for the Preferred Alternative. Following the release of the Final EIS, the FTA will issue a Record of Decision documenting its findings on the environmental effects and mitigation commitments, including whether the project has satisfied the requirements of all applicable federal regulations. These include meeting the requirements of the Endangered Species Act, requiring consultation and approval with the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service, which must occur before publication of the FEIS. The U.S. Coast Guard and the U.S. Army Corps of Engineers must also provide approvals for the new bridge prior to its construction. Chapter 6 provides an extended list of the permits and approvals that would be required. With the Record of Decision, the project would be eligible for additional federal funding, allowing final design, right-of-way acquisition, permitting, and construction activities to be initiated.

S.8.2 Implementation of the Finance Plan

The financial analyses in this SDEIS show that the Portland-Milwaukie Light Rail Project will require, in varying degrees, significant revenue that is currently not available. The financial analysis also identifies required new levels, and proposed sources, of revenue. New federal funds would be secured through the Federal Section 5309 New Starts authorization and appropriations cycles and through the FTA grant process. New local funds would be secured through one or more local intergovernmental agreements.

S.8.3 Project Timeline

The release of the SDEIS and its following 45-day public comment period allows the region to identify a Preferred Alternative, which is expected to occur by mid-summer 2008. Other key dates in the project's anticipated schedule include:

- Preliminary Engineering for the Preferred Alternative: Fall 2008 to early 2010
- Development of the Final EIS: Fall 2008/Summer 2009
- Federal Record of Decision: Late 2009
- Final Design and Construction Planning: 2010 to 2011
- Project Construction and Testing: 2011 to 2015
- Revenue Operations: as early as 2015