2. ALTERNATIVES CONSIDERED

The Portland-Milwaukie Light Rail Project Supplemental Draft Environmental Impact Statement (SDEIS) is being prepared under the National Environmental Policy Act (NEPA), which requires environmental review for projects with federal funding or that involve other federal actions or approvals. The Federal Transit Administration (FTA), Metro and TriMet are considering a 6.4- to 7.2-mile extension of light rail for the South Corridor between downtown Portland, Oregon, the City of Milwaukie, and north Clackamas County. FTA is the federal lead agency under NEPA.

There are two primary alternatives considered in this SDEIS:

- Portland-Milwaukie Light Rail Alternative (Light Rail Alternative)
- No-Build Alternative

This chapter describes the Light Rail Alternative and reviews the previous studies and decisions that led to a proposal for light rail in the project corridor. Section 2.1 provides details of the alternatives, including alignment and design options, in this SDEIS. Section 2.2 includes capital cost and operating and maintenance costs for the Light Rail Alternative. Section 2.3 describes the modes and alignments that have been studied and eliminated from further consideration and why they were eliminated. Appendix L. Background on Alternatives Development, provides additional detail on the modes and alignments that have been studied and why they were eliminated.

2.1 PORTLAND-MILWAUKIE LIGHT RAIL ALTERNATIVE

This SDEIS continues the NEPA environmental process initiated in 1993 for the South/North Corridor Project and continued in the South Corridor SDEIS, the Downtown Amendment to the South Corridor Project SDEIS, and South Corridor Final Environmental Impact Statement. The Light Rail Alternative is based on the Locally Preferred Alternative (LPA) the Metro Council adopted for the South Corridor in 2003. It also includes additional alignment and design options that have emerged since the LPA was adopted.

In preparation for this SDEIS, Metro and TriMet conducted a Refinement Study beginning in October 2006. The purpose of the Refinement Study was to address issues that were identified at the time that the 2003 LPA was adopted and since and to finalize options for study in the SDEIS. Areas of focus were on the Willamette River Crossing, the alignment through the North Industrial area in Milwaukie, and the terminus park and ride. The Portland-Milwaukie Steering Committee, a group of elected and appointed officials representing Metro, the cities of Milwaukie, Portland and Oregon City; Multnomah and Clackamas counties; TriMet and the Oregon Department of Transportation,
The Light Rail Alternative, including the alignment and design options being studied for this SDEIS, includes:

- **2003 LPA** from the Portland Mall to SE Lake Road in Milwaukie, and includes approximately 6.4 miles of light rail, 11 stations, and a new bridge across the Willamette River.

- **Willamette River crossing options** between the South Waterfront District and southeast Portland, with four location options in addition to the 2003 LPA river crossing, plus options for bridge height, bridge type, and whether the bridge would accommodate buses.

- **Extension to SE Park Avenue**, an alignment terminus option that would extend light rail approximately 0.84 mile from SE Lake Road to SE Park Avenue and possibly add two stations and provide additional park and ride capacity at SE Park Avenue.

- **Tillamook Branch Line**, an alignment option in the North Milwaukie Industrial Area that would transition to an alignment along the existing Tillamook Branch Railroad Line just south of the Tacoma Station and would include the extension to SE Park Avenue.

Other localized options include:

- Harold Street Station, an additional station in southeast Portland

- Station options in downtown Milwaukie, in addition to the station at SE Harrison Station that was identified in the 2003 LPA

- Bridge options that would accommodate bus access

- Options for elevated or at-grade crossings of the Oregon Pacific Railway (OPR) Line and SE McLoughlin Boulevard east of the Willamette River

The analysis of the Light Rail Alternative is based on comparing the 2003 LPA to the alignment and design options, and each design and alignment option is combined with the 2003 LPA for analysis. For example, the Tillamook Branch Line option is combined with the 2003 LPA river crossing, and the Willamette River crossing options are combined with the 2003 LPA terminus at SE Lake Road.

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 this SDEIS process and a reference point to gauge the benefits, costs, and impacts of the Light Rail Alternative. Characteristics of the Light Rail Alternative and the No-Build Alternative are summarized in Table 2.1-1 and described below.

### 2.1.1 Light Rail Alternative Alignment and Design Options

This section describes the 2003 LPA alignment, the alignment and design options, and station and park and ride options that comprise the Light Rail Alternative. Alignment options specify the general light rail route choices within a given segment of the corridor. Design options are more detailed choices, including elevated or surface crossings or segments and station locations. Figure 2.1-1 shows the alignment, station, and park and ride options.
Portland-Milwaukie Light Rail Project

Light Rail Alternative Options

**Figure 2.1-1**

- **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

Tacoma to Project Terminus includes 3 options. See Figure 2.1-3 for detail.

Willamette River Crossing includes 5 options. See Figure 2.1-2 for detail.
Table 2.1-1
Summary of Transit and Roadway Improvements/Modifications

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Transit</th>
<th>Roadway</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-Build Alternative</td>
<td>• Existing 2007 transit services and facilities.</td>
<td>Road improvements are limited to those in the 2004 RTP financially</td>
</tr>
<tr>
<td></td>
<td>• Some increases in route frequency and/or run times to avoid</td>
<td>constrained highway network. See Appendix B of the Portland-Milwaukie</td>
</tr>
<tr>
<td></td>
<td>peak overloads and/or to maintain schedule reliability.</td>
<td>Project Detailed Definition of Alternatives Report (Metro, October 2007)</td>
</tr>
<tr>
<td></td>
<td>• Incremental increases in service hours and vehicle procurement,</td>
<td>for a detailed listing of the planned roadway projects within the</td>
</tr>
<tr>
<td></td>
<td>consistent with available revenue sources and consistent with</td>
<td>Portland-Milwaukie project area.</td>
</tr>
<tr>
<td></td>
<td>the RTP 2025 financially constrained transit network.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• One new bus route that would connect the Clackamas Transit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Center and downtown Milwaukie on SE Johnson Creek Boulevard.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Completion of the first phase of the South Corridor Project on the</td>
<td></td>
</tr>
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<td></td>
<td>Portland Mall and I-205.</td>
<td></td>
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<tr>
<td></td>
<td>• Assumes separate projects for a 300-space park and ride facility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>at SE McLoughlin Boulevard and SE Milport Road and 100-space</td>
<td></td>
</tr>
<tr>
<td></td>
<td>shared park and ride at Clackamas Community College.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Minor changes in transit operations and routing in the South</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corridor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• An expansion of the Powell Garage to accommodate at least 50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>additional buses.</td>
<td></td>
</tr>
<tr>
<td>Portland-Milwaukie Light</td>
<td>All transit improvements included within the No-Build Alternative.</td>
<td>The following road improvements and modifications in addition to those</td>
</tr>
<tr>
<td>Rail Alternative</td>
<td>• A mostly double-tracked light rail between downtown Portland and</td>
<td>in the 2004 RTP financially constrained highway network:</td>
</tr>
<tr>
<td></td>
<td>Milwaukie terminating at either SE Lake Road or SE Park Avenue</td>
<td>• Modifications to segments of roadways along SW Lincoln Street; SW</td>
</tr>
<tr>
<td></td>
<td>generally parallel to and east of SE McLoughlin Boulevard, with</td>
<td>Harbor Drive; modifications to SE 17th Avenue in Portland and SE</td>
</tr>
<tr>
<td></td>
<td>11 to 15 LRT stations.</td>
<td>Main Street in Milwaukie, to accommodate the LRT alignment,</td>
</tr>
<tr>
<td></td>
<td>• Adjustments to No-Build bus network: 1) eliminate/modify bus routes</td>
<td>depending upon the design option.</td>
</tr>
<tr>
<td></td>
<td>that would duplicate light rail service and 2) adjust routes to</td>
<td>• Reconfiguration of access to SE McLoughlin Boulevard at the</td>
</tr>
<tr>
<td></td>
<td>connect to light rail stations or transit centers.</td>
<td>Tacoma Station and the Milwaukie Station.</td>
</tr>
<tr>
<td></td>
<td>• Three park and ride facilities providing 1,475 to 2,600 spaces.</td>
<td>• Potential at-grade crossing of SE McLoughlin Boulevard south of</td>
</tr>
<tr>
<td></td>
<td>• With the 2003 LPA, shifting of streetcar alignment along SW River</td>
<td>Milwaukie.</td>
</tr>
<tr>
<td></td>
<td>Drive to accommodate light rail.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accommodates streetcar access to new Willamette River bridge.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accommodates bus access to new Willamette River bridge if bus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>option is selected, allowing rerouting of buses from congested</td>
<td></td>
</tr>
<tr>
<td></td>
<td>streets.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Expansion of the Ruby Junction Operations and Maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Facility to accommodate 16 to 23 additional light rail vehicles.</td>
<td></td>
</tr>
</tbody>
</table>

The Light Rail Alternative would include a light rail line from the Portland Mall in downtown Portland to a terminus either at SE Lake Road in Milwaukie or SE Park Avenue south of Milwaukie. Within this alignment are the following alignment options: the 2003 LPA alignment option, options at the Willamette River crossing segment (Figures 2.1-2), and the options at the Tacoma Station-to-project terminus segment (Figure 2.1-3).
Figure 2.1-2

Project Options: Willamette River Crossing

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
Arterial road

Portland – Milwaukie Light Rail Project

November 2007
Portland-Milwaukie Light Rail Project

Project Options: Tacoma to Project Terminus

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

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

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

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

November 2007
The transit operations that would be included as part of the Light Rail Alternative are described in Section 2.1.1.5 and Chapter 4, Transportation. The Light Rail Alternative would also include the highway and road projects in the No-Build Alternative, which are described in Section 2.1.2.

2.1.1.1 2003 LPA Alignment

This section describes the 2003 LPA alignment from the Portland Mall to a terminus station at SE Lake Road in Milwaukie.

2003 LPA Alignment: Portland Mall to SW Naito Parkway

The Light Rail Alternative would follow the 2003 LPA between the Portland Mall and SW Naito Parkway as there are no alignment options other than the 2003 LPA in this section. The 2003 LPA alignment would connect with the I-205/Portland Mall Light Rail project that is currently under construction in downtown Portland. From the connection with the Portland Mall between SW 5th and SW 6th Avenues at SW Jackson Street, the alignment would turn east and cross SW 5th Avenue, the I-405 on-ramp and SW Grant Street. It would then continue east in the center of SW Lincoln Street to SW 1st Avenue, where SW Lincoln Street ends. The alignment would intersect SW 4th and SW 1st Avenues and SW Naito Parkway at grade.

2003 LPA Alignment: Willamette River Crossing

After crossing SW Naito Parkway, the 2003 LPA alignment would cross over the SW Harrison Street connector and SW Harbor Drive and continue east toward RiverPlace on a structure and come to grade at SW River Drive with a station east of SW Moody Street. The 2003 LPA includes what was formerly known as the Caruthers Bridge (it is not referred to as the Caruthers Bridge in the SDEIS because it is not actually on Caruthers Street while some other alignment options are). The bridge would run under the Marquam Bridge then ascend over the Willamette River. The bridge would accommodate streetcars, bicycles, and pedestrians in addition to light rail. An option for use of the bridge by transit buses is also being considered.

On the east side of the Willamette River, the alignment would be just south of the Oregon Museum of Science and Industry (OMSI) building, and a station would be located at SE Water Avenue. The light rail alignment would continue east, crossing the Oregon Pacific Railroad (OPR) either at grade or grade-separated over OPR and under 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.

The four other Willamette River crossing options are described in Section 2.1.1.2.

2003 LPA Alignment: SE Division Street to SE Tacoma Street

The Light Rail Alternative would follow the 2003 LPA alignment from SE 7th Avenue and SE Division Street to just north of SE Tacoma Street as there are no other alignment options in this segment. Between SE 7th Avenue and SE Powell Boulevard, the alignment would be adjacent to and south of the UPRR tracks.
The alignment crosses SE Powell Boulevard at SE 17th Avenue and transitions to the center of SE 17th Avenue. It would continue to run in the center of SE 17th Avenue to south of SE Schiller Street. South of SE Schiller Street, immediately north of SE McLoughlin Boulevard (Highway 99E), the alignment leaves SE 17th Avenue, moving to the east where it would run along the east side of SE McLoughlin Boulevard. Between SE Reedway Street and SE Tacoma Street, the alignment is located between SE McLoughlin Boulevard and the UPRR tracks.

**2003 LPA Alignment: SE Tacoma Street to SE Lake Road**

Just north of SE Tacoma Street, the 2003 LPA alignment moves west away from the alignment along the UPRR and crosses over the northbound SE McLoughlin Boulevard access ramp then under SE Tacoma Street. The Tacoma Station platform is situated along SE McLoughlin Boulevard and the alignment continues south along the east side of SE McLoughlin Boulevard.

SE Main Street, which functions as a frontage road, diverges from SE McLoughlin Boulevard south of the Tacoma Station at SE Ochoco Street. The alignment continues south along the west side of SE Main Street to SE Milport Road then turns east to the Milwaukie Station and Park and Ride at the site formerly occupied by the Southgate Theater. South of the Milwaukie Station, the alignment would continue east to the Tillamook Branch Line then, cross over the UPRR freight rail line and under Highway 224. The alignment would remain along the east side of the Tillamook Branch Line through Milwaukie and terminate at SE Lake Road.

The two other terminus options are described in Section 2.1.1.4.

**2.1.1.2 Willamette River Crossing Alignment Options and Bridge Type Concepts**

River Crossing options were developed during the 2007 Refinement Study. More information on the development of these options is available in section 2.3.3.1. The river crossing options evaluated are:

- Meade-Sherman
- Porter-Caruthers
- Meade-Caruthers
- Porter-Sherman

An additional river crossing alignment proposal, which is a modification of the Meade-Sherman and Porter-Sherman options, emerged during the SDEIS analysis, as well.

All of the Willamette River crossing options (other than the 2003 LPA, which has options with and without buses) would accommodate buses as well as pedestrians, bicycles, streetcars, and light rail. The locations of the Willamette River crossing options focus on where transit service would be provided west and east of the Willamette River and on the underlying street network in the South Waterfront District. The street network in this area of South Waterfront has not yet been constructed. The four alignment options that would serve South Waterfront are based on two possible street network configurations. Meade-Sherman and Porter-Sherman are based on the adopted *South Waterfront Plan (2002)* street network, which is perpendicular to the river. Porter-Caruthers and Meade-Caruthers are based on the *North Macadam District Street Plan (1996)* network. This configuration is an east-west grid that matches that of the older neighborhoods to the west and would parallel the Oregon Health & Science University (OHSU) property line.
The four alignment options diverge from the 2003 LPA alignment after crossing SW Naito Parkway. While 2003 LPA alignment would continue east to serve RiverPlace, these four options continue to the south to serve the South Waterfront District (see Figure 2.1-2).

The river crossing options would be grade-separated over SW Harbor Drive with an elevated station to provide access to RiverPlace. The alignments would continue south along a vacated trolley right of way to the South Waterfront District between the Marquam Bridge and the Ross Island Bridge, and would cross the river in the vicinity of SW Meade or SW Porter Streets.

East of the river, the alignments would serve OMSI and the Central Eastside Industrial District (CEID) along either SE Sherman or SE Caruthers Streets. These alignments would proceed east and cross the OPR line at grade and under SE Martin Luther King Jr. Boulevard viaduct. From near SE 7th Avenue and SE Division Street, all alignment options would continue south parallel to and west of the UPRR tracks.

Meade-Sherman Alignment Option

Within the South Waterfront District, the alignment for the Meade-Sherman option would be based on the adopted South Waterfront street plan. At the proposed SW Meade Street, the alignment would turn toward the river and cross the existing Portland Streetcar tracks and SW Moody Street at grade. A station is proposed between SW Moody Street and the planned location of SW Bond Street. From SW Moody Street to the west riverbank, the alignment would begin to climb. The alignment would cross the planned SW Bond Street and SW River Parkway at grade, and then be elevated to cross over the proposed Willamette Greenway Trail.

On the east side of the river, it would touch down approximately one block south of OMSI and north of the Portland Opera building and run on the alignment in line with SW Sherman Street as described above. A station would be located east of SE Water Avenue.

Porter-Caruthers Alignment Option

The Porter-Caruthers alignment option continues south to the street alignment of SW Porter Street, as proposed in the 1996 North Macadam District Street Plan, which is fairly close to same point at which the Meade-Sherman option would turn. It would then run east along a proposed SW Porter Street alignment. This alignment would be along the OHSU property line. The bridge would be located approximately one block south of the Meade-Sherman alignment option. This option would also be elevated over the proposed Greenway Trail.

On the east bank, this alignment would turn east to run along the north side SE Caruthers Street. An at-grade station would be located to the east of the intersection of SE Water Avenue and SE Caruthers Street.

Meade-Caruthers Alignment Option

West of the river, this alignment is differentiated by the South Waterfront District street network. This option would be aligned with 1996 North Macadam District Street Plan network and would turn east approximately one block to the north of the proposed Meade-Sherman alignment described above.

The alignment on the east side would be similar to the Porter-Caruthers option described above.
Porter-Sherman Alignment Option

This option would extend the farthest south along SW Moody Street on the west side of the Willamette River, continuing south one block from SW Meade Street to SW Porter Street based on the adopted South Waterfront street network, then turn to the northeast to cross the river. The alignment on the east side would be similar to the Meade-Sherman option described above.

Refined Willamette River Crossing Alignment

During the SDEIS process, an additional option emerged as a result of suggestions from area property owners and other stakeholders. If selected as part of a new LPA, this refined alignment would be evaluated in more detail in the Final Environmental Impact Statement (FEIS). The alignment west of river would run parallel to, and between, the Meade-Sherman and Porter-Sherman alignments. The alignment on the east side would be similar to the Meade-Sherman option, described above, and is expected to have similar impacts.

Willamette River Bridge

The Willamette River Crossing option concept designs were developed to further understand the impacts. The current designs include deck widths that range from 58-66 feet depending on the location on the bridge and the bridge type. This would include a 13-foot lane in each direction that would be shared by light rail, streetcar and buses and two 12-foot bicycle/pedestrian lanes. The cross sections, which are depicted in Appendix H, also include a small walkway next to the tracks and accommodation for railings, shy distances and bridge structures.

Bridge concepts were developed to explore the range of impacts of the most likely bridge types for the alignment options. More details on the design will be developed through a bridge type, size, and location study, which will be conducted following the adoption of a revised LPA.

The 2003 LPA presents different engineering parameters than the other four river crossing options, resulting in an assumption of different bridge types. The types considered in this SDEIS include cable-stayed, concrete segmental, and cable-stayed through truss hybrid bridge types. Figure 2.1-4 illustrates these three bridge types. Table 2.1-2 summarizes the bridge considerations for the alignment options. In addition, the SDEIS studied two vertical navigational clearances, 65 and 72 feet. Each bridge type was studied with the vertical clearance most appropriate to it, in order to represent the range of likely impacts. The navigational needs are being assessed through a river user survey, which is discussed in Chapter 4, Section 4.3.1 under Navigational Impacts. The United States Coast Guard will ultimately decide the navigational clearance requirements based on this assessment.
Bridge Type Assumptions

**Cable-stayed through truss**
2003 LPA
72 foot clearance

**Concrete Segmental**
2003 LPA, Meade-Sherman, Porter-Caruthers, Meade-Caruthers, Porter-Sherman
65 foot clearance

**Cable-stayed**
Meade-Sherman, Porter-Caruthers, Meade-Caruthers, Porter-Sherman
72 foot clearance

*Portland-Milwaukie Light Rail Project*  
*Figure 2.1-4*

1 inch equals approximately 240 feet
### Table 2.1-2
Willamette River Design Options Used for the Comparative Analysis

<table>
<thead>
<tr>
<th>Bridge Type Concept</th>
<th>Design Options</th>
<th>Street Plan²,³</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003 LPA⁴</td>
<td>Cable-stayed through truss 72' clearance</td>
<td>Concrete segmental 65' clearance</td>
</tr>
<tr>
<td>Meade - Sherman</td>
<td>Cable-stayed 72' clearance</td>
<td>Concrete segmental 65' clearance</td>
</tr>
<tr>
<td>Porter - Caruthers</td>
<td>Cable-stayed 72' clearance</td>
<td>Concrete segmental 65' clearance</td>
</tr>
<tr>
<td>Meade - Caruthers</td>
<td>Cable-stayed 72' clearance</td>
<td>Concrete segmental 65' clearance</td>
</tr>
<tr>
<td>Porter - Sherman</td>
<td>Cable-stayed 72' clearance</td>
<td>Concrete segmental 65' clearance</td>
</tr>
</tbody>
</table>

1. Bridge types are representative concepts used for the analysis phase. Different bridge types and heights could emerge in the bridge type size and location study after adoption of the study.
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.
4. The 2003 LPA Willamette River bridge was formerly known as the Caruthers Bridge.

### Cable-Stayed Through Truss

With the 2003 LPA, the Willamette River bridge was assumed to require a cable-stayed bridge with a steel stiffening truss. This bridge type combines stay cables and the triangle truss shape to support the bridge. The light rail vehicles and potentially buses would operate through the middle of this truss structure, so it is sometimes referred to as a “through truss”. The cables connect the top of the truss to a tower that supports the bridge. Pedestrian and bicycle paths would be cantilevered outside of the truss, but would be supported by the same overall structural concept.

The cable-stayed truss structure type was preferred for the 2003 LPA alignment for the following reasons. The deck of the bridge could be considerably lower than for box girder or arch type bridges. This would allow a slope that meets the ADA requirements and provides 72 feet of river clearance. The 2003 LPA is the only river crossing alignment option that assumes a horizontally curved alignment over the river. This means loading from moving vehicles would not be symmetrically applied to the structure. The truss would provide for stiffness and bending resistance for the loads on a horizontally curved deck.

One in-water pier was assumed within the center portion of this span type. The width of this structure was assumed to be approximately 58 feet.

### Other Cable-Stayed Bridge Options

With the other Willamette River crossing options, the cable-stayed bridge type was assumed with a 72-foot clearance. This bridge type uses stay cables to connect the bridge deck directly to towers. These options, unlike the 2003 LPA option, would not require a curved alignment. Therefore, loads are balanced symmetrically so a stiffening truss would not be required. Pedestrian and bicycle paths
were assumed to be integral with the bridge deck and supported by the same overall structural concept.

While more expensive and having a higher profile than the concrete segmental, it is being considered because it requires fewer piers, has a thinner bridge deck which would allow for a higher navigational clearance while being able to meet ADA requirements and land at grade closer to shore, in addition, some prefer the more dramatic profile from an aesthetic standpoint.

Two in-water pier/towers were assumed to be required for this span type. The width of these structures was assumed to be 66 feet.

**Concrete Segmental Bridge Type**

A segmental box girder (e.g. concrete segmental) type bridge was studied at a river clearance of 65 feet. This bridge is constructed from a series of concrete or steel segments, either precast and assembled, or cast in place. The segments vary in thickness with thicker segments at the piers and thinner segments mid-span. This type of bridge has all structure loads borne by members below the deck surface.

This structure type was assumed for a 65 foot river clearance for the following reasons. A lower clearance would accommodate the thicker deck required by this bridge types while allowing for a slope that meets the ADA requirements and still lands for an at grade station in desired locations. This bridge type is being considered because it is more commonly constructed than other types, is likely to have a lower construction cost, is more flexible in addressing curves at approaches, and does not require tall pier towers to project above the deck surface. Additional design work is necessary to determine if this type can accommodate increased clearances.

Four in-water pier/towers were assumed to be required for this bridge type. The width of these structures was assumed to be approximately 59 feet.

**Navigational Issues**

The bridge height options were developed based on information about existing bridge clearances. The 72 foot clearance used in the options was based on the Sellwood Bridge, which is south of the proposed bridge, which was originally permitted at 72 feet. However, the SDEIS analysis found that the Sellwood bridge was actually constructed at 75 feet based on low water as measured in Columbia River datum. Additional discussion of the analysis of the navigational effects of the new bridge options is provided in Chapter 4, Transportation. Based on the analysis to date, it is likely that a bridge clearance of 75 feet would be proposed for a new Preferred Alternative in order to match the existing clearance of the Sellwood Bridge. The United States Coast Guard is responsible for issuing bridge permits after considering all reasonable navigational requirements. The permit would be issued following publication of the Final Environmental Impact Statement (FEIS).

**2.1.1.3 SE Tacoma Street to Project Terminus Alignment Options**

The alignment options in this section were developed based on recommendations of a Transit Working Group established by the City of Milwaukie following the adoption of the LPA in 2003, and the 2007 Refinement Study that was initiated to determine the options that would be included in this SDEIS. Additional information on the development of these options is available in section
2.3.2.3 and Appendix L. The alignment options south of SE Tacoma Street in addition to the 2003 LPA are:

- 2003 Locally Preferred Alternative with extension to Park
- Tillamook Branch Line Alignment

Figure 2.1-3 shows the 2003 LPA and the two alignment options. Design options include station locations, park and ride capacities, and a grade-separated or at-grade crossing of SE McLoughlin Boulevard south of downtown Milwaukie.

2003 Locally Preferred Alternative with Extension to Park Avenue

This alignment follows the 2003 LPA to SE Lake Road. Rather than terminating at SE Lake Road, it would cross over SE Lake Road and Kellogg Lake alongside the existing freight rail trestle. It would cross SE McLoughlin Boulevard, SE River Road, and SE 22nd Street either on an elevated structure or at grade. An elevated crossing would require a station at SE Bluebird Street to be elevated. The alignment would run on the west side of SE McLoughlin Boulevard and terminate north of SE Park Avenue.

Tillamook Branch Line Alignment

The Tillamook Branch Line alignment would turn to the southeast at the Tacoma Station. South of the station, it crosses under the Springwater Corridor multi-use path, then rises to cross over the Tillamook Branch Line tracks and remains on an elevated structure until it descends to cross under Highway 224. It runs along the east side of the rail line through downtown Milwaukie. This option would also extend to SE Park Avenue and has the same options to cross SE McLoughlin Boulevard, SE River Road, and SE 22nd Street either at or above grade.

2.1.1.4 Station and Park and Ride Options

Station and park and ride locations are shown in Figures 2.1-1 through 2.1-3. Stations would be approximately 200 to 250 feet long and could have either one center platform or two platforms with one on each side of the tracks. The single center platforms would be approximately 15 to 20 feet wide. With two platforms on each side, each platform would be approximately 12 to 15 feet wide. The platforms would allow for level boarding. Major elements that would be incorporated on the platform include shelters, lighting, furniture, and fencing and railings.

Park and rides are located at the Tacoma, Milwaukie, Lake Road and Park Avenue Stations, with a number of options for how many parking spaces would be provided. This allowed the project to explore how parking supply could be arranged to help support the high demand for park and ride access in the southern part of the project corridor.

Portland State University to Tacoma Street Station Options

Station locations are shown in Figures 2.1-1 and 2.1-2. There would not be park and ride at the stations between PSU and SE Tacoma Street. Other than the Lincoln Station, the station location options west of the Willamette River differ by alignment. With the 2003 LPA, RiverPlace would be served with an at-grade station, but the options that would serve South Waterfront would have an elevated station near SW Harbor Drive. Stations in South Waterfront would be between planned locations for SW Moody at SW Meade or SW Porter Streets.
East of the river, with the 2003 LPA, the OMSI station would be located just south of the existing OMSI building west of SE Water Avenue. The Sherman and Caruthers options would have a station between SE Water Avenue and Martin Luther King Jr. Boulevard to serve OMSI and the CEID.

In response to community input received since the 2003 LPA was adopted, an option for a station at SE Harold Street that was not included in the original LPA has been included in this SDEIS. This has being studied as an additional station rather than a substitute. A technical analysis will determine whether this additional station would be cost effective and compatible with existing land use.

**SE Tacoma Street to Project Terminus Station and Park and Ride Options**

The combinations of station and park and ride locations have been identified in order to undertake this SDEIS analysis (see Figure 2.1-3). A revised LPA could incorporate elements from several options. The locations of stations in downtown Milwaukie will play a key role in how the city develops. Decisions on the locations will be based on technical analysis and community input.

Between the Tacoma Station and the project terminus, there are options for park and rides at the following stations:

- Tacoma Street Station, with a new 600- or 1000-space park and ride structure.\(^1\)
- Milwaukie Station, which would be included in the 2003 LPA, but not the Tillamook Branch Line option. This would be with a new 600-space park and ride structure at the former Southgate Theater site.
- Lake Road, with a new 275-space park and ride structure located on the east side of the light rail tracks between SE Lake Road and SE 21st Avenue, is included in the 2003 LPA.
- Park Avenue, with a new 1,000-space park and ride structure located south of SE Park Avenue, across the street from the terminal station, which would be located north of SE Park Avenue. This facility would be not be included with the 2003 LPA, but would be part of both the 2003 LPA with extension to Park and the Tillamook Branch Line alignment.\(^2\)

**2.1.1.5 Light Rail Alternative Transit Operations**

Buses would likely serve all the light rail station locations along each option other than the Harold Street Station. Operations for bus, streetcar, Portland Aerial Tram, and light rail would affect or be affected by the project, mainly by enhancing connections. These connections are components of the transportation analysis. This section describes other key considerations concerning transit operations.

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\(^1\) During the SDEIS analysis, in order to optimize the location of park and ride spaces, traffic analysis was also conducted for up to 1,250 spaces at the Tacoma Station. See Chapter 4 for more details.

\(^2\) As with the Tacoma Station, in order to optimize the location of park and ride spaces, Park Avenue Station was also analyzed for up to 1,200 spaces. See Chapter 4 for more details.
**Willamette River Crossing Bus and Streetcar Transit Service**

The new Willamette River crossing could provide an additional crossing for buses and streetcar on a transitway. Buses that currently travel between Southeast and Southwest Portland on the Ross Island Bridge could use the bridge to improve travel time and reliability. For this SDEIS analysis, lines #9 Powell, #17 Holgate and #19 Woodstock would be modified to use the new Willamette River crossing instead of the Ross Island Bridge. West of the river, with the 2003 LPA alignment, buses would access the transitway from SW River Parkway. With the options that serve South Waterfront, buses would use SW Harrison Street to and from the Portland Mall and would access the transitway at the intersection of SW 1st Avenue and SW Lincoln Street.

East of the Willamette River, buses would enter and exit the transitway at SE 8th and SE 9th Avenues near SE Division Street. Buses cannot share stations with light rail along the transitway, so pullouts would be provided at stations along the transitway for buses.

The planned Portland Streetcar Loop would also be able to use the new bridge. This would require additional track work, connections and switches. The decision to extend the streetcar is not being made with this project, but the bridge would be developed to accommodate a streetcar extension. With the 2003 LPA alignment, streetcars on the west side of the river would connect with the transitway on SW River Parkway near the bridge. With the options that serve South Waterfront, streetcars would enter the transitway near SW Moody and SW Bond Streets. East of the river, streetcars would connect near SE Water Avenue.

Table 2.1-3 shows the frequency of transit service by mode that is planned on the new bridge for all the river crossing options in 2030.

### Table 2.1-3

**Willamette River Crossing Frequency of Service (Number of Crossings per Hour)**

<table>
<thead>
<tr>
<th>Mode</th>
<th>2030 Light Rail Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak</td>
</tr>
<tr>
<td>Light rail</td>
<td>8</td>
</tr>
<tr>
<td>Streetcar¹</td>
<td>6</td>
</tr>
<tr>
<td>Bus²</td>
<td>21</td>
</tr>
</tbody>
</table>

¹ Streetcar service for the Portland Streetcar Loop would require 12 additional vehicles.
² Bus service provided by #9 Powell, #17 Holgate, and #19 Woodstock

**Portland-Milwaukie Corridor Bus Transit Service**

The bus service on SE McLoughlin Boulevard north of Milwaukie that is currently provided by lines #31 Estacada, #32 Oatfield, #33 McLoughlin, #41 Tacoma, and #99X McLoughlin Express would be restructured to provide better coverage in the area and would no longer provide service north of Milwaukie. Lines #99X and #32 Oatfield would terminate in Milwaukie. Line #31 Estacada would continue to run from Milwaukie, alternating between Damascus and Estacada, and would extend south from Milwaukie to Clackamas Community College to provide service currently provided by line #33 McLoughlin. Line #33 McLoughlin would be restructured to provide service between Milwaukie and Clackamas Community College. Headways (the frequency of service) on some corridor routes would be adjusted to meet estimated demand.
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 and Maintenance 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.

The Columbia River Crossing project is currently considering a proposal to extend the Interstate MAX light rail line to Vancouver, Washington. If this project is constructed, the Ruby Junction facility would be expanded to accommodate the operations and maintenance needs for those additional vehicles, as well. Appendix H provides conceptual design information about the potential expansion.

Other Light Rail Facilities

The operation of the light rail system also involves a number of other facilities and system features:

- Crossover tracks and switches are used to allow trains to safely pass from one set of tracks to the other during track maintenance, to bypass a stalled train, or turn in the opposite direction. Crossovers are currently assumed north of the Bybee Station, and near SE Adams Street.

- Tail tracks or storage tracks are usually placed at a terminus station, and provide areas for inbound and outbound train storage and turnaround. For a terminus at the Lake Station or at Park Avenue, storage tracks are provided about 250 feet to the north of the stations.

- Pocket tracks allow trains to be moved off of the main tracks and stored. This allows disabled trains to move off the main tracks to maintain service, and provide storage for trains that may be needed to serve special events or other operational needs. A pocket track would be located between the Clinton Station and SE Powell Boulevard.

- The light rail system would be electrically powered using an overhead catenary (contact wire), supported on poles. The power to the catenary is fed from an electrical traction power substation. Substations are usually located adjacent to the right-of-way or near stations.

2.1.1.6 Light Rail Construction

This section discusses general activities that would be associated with construction of the Light Rail Alternative. This description is based on conceptual design and typical assumptions about construction approaches. Construction practices and approaches will continue to be refined during preliminary and final design stages.

The major construction activities include:

- Delivery of materials and equipment
- Demolition (buildings, pavement, other obstructions) and Utilities (major relocations or disruptions)
- Clearing and grubbing
- Fill and excavation
- Elevated structure construction, including elevated stations if included
- Retaining wall construction
• Pile driving or drilling
• Roadway construction including roadway crossings
• Trackway construction
• At-grade station construction
• Parking garage construction
• Construction activity in or near a water body or sensitive area

Construction Sequence and Activities

Linear projects such as the Portland to Milwaukie Light Rail Project are typically divided into various segments or line sections for construction. The construction sequence would vary depending upon existing conditions, the characteristics of the light rail facilities, and the sensitivity of the locations within the segments (in-street versus off-street for example).

Preliminary engineering will further define the design and requirements for the facilities to be constructed. This refinement will inform selection of contracting methods and the development of work-specific construction planning. Work specific construction plans would be developed during the final design effort to establish the limits for the various construction phases and construction contracts, their estimated schedule and duration, appropriate sequencing, and the minimum necessary level of restrictions to be placed on construction work to address mitigation of impacts. Final refinement of construction plans continuing into construction procurement selection and negotiations and early contractor provided plans that finalize the requirements to ensure appropriate mitigation of construction impacts. Where possible, construction activities would be coordinated with other capital improvement projects, including projects carried out by the local jurisdictions or a potential Columbia River Crossing project, to help minimize construction impacts. In addition, extensive involvement of local jurisdictions in preliminary engineering and continuing through construction will help ensure coordination to resolve impacts, in particular by seeking to reduce inspection and approval times.

Construction Duration

Although overall project construction is assumed to require three to four years, the major activities usually occur over about a two year period. The duration of heavy civil construction in front of any particular property will typically not exceed six to twelve months, with some exceptions possible. For instance, complex structures such as the Willamette River Bridge may take longer to construct.

Construction Staging Areas

Contractor mobilization is part of the initial construction work and typically requires the development of staging areas. Staging areas are needed in advance of all construction work, but the need and proximity vary depending on the features being constructed, availability of space, presence of sensitive areas, schedule restrictions, and contractor desires. Bridges and aerial structures are most practically staged adjacent or very near the construction site. Other types of staging and materials storage are more flexible in location. Staging areas cannot be identified at this time as the staging needs are a function of design work to be performed in preliminary and final engineering.
Project staging areas are typically used to accomplish or accommodate one or more of the following: stockpile, load, and haul excavations and demolished materials; receive and stockpile materials and equipment; assembly and, in limited cases fabrication of project elements, laydown of major pre-fabricated elements prior to erection/assembly, construction field administration offices, and possibly for construction worker parking. Noise, dust, and truck traffic are impacts that can result from activities associated with construction phasing.

**Construction Traffic**

Construction of the Light Rail Alternative would result in temporary impacts to local and regional automobile and truck traffic. Construction activities include construction operations, truck routes, and staging schemes, and their related effects that disrupt existing traffic patterns, add volume to specific locations, and often require localized reduction of traffic capacity to allow construction to occur.

Truck traffic would be greatest and have potential effects at the locations generating the highest amounts of excavation and spoils and delivery of materials, which are the same features that are listed under staging area needs, the Willamette River Bridge, and other aerial structures.

**Demolition and Utility Work**

The initial phase of construction work would normally involve demolition/clearing and rerouting of utilities. In some areas it would be necessary to demolish existing buildings or structures prior to starting construction of light rail facilities. Demolition would involve implementing stormwater erosion control measures, tearing down buildings and structures, removing debris, and containment and disposal of hazardous materials. Demolished structures could potentially contain asbestos material, lead paint, or other regulated materials. Public and private utilities, both underground and aerial are relocated as required. There may also be underground storage tanks associated with some structures and excavations for utilities, thus increasing the risk of potential soil contamination. Both demolition and utility work can also generate noise and dust, and truck traffic associated with debris removal.

**At-Grade Light Rail Construction**

Open track segments of the route, consisting of at-grade tracks, would require clearing, grading, and typically shallow excavations. Clearing may include demolition and/or removal of pavement, vegetation, and other surface features, and implementation of an erosion, sediment, and stormwater control plan. During the grading phase, the contractors would install culverts or other permanent drainage structures and below-grade light rail infrastructure. This may require temporary steel plates in the roadway and temporary lane closures. Where in-street track is proposed within existing or expanded street right-of-way, grading is generally minimal, but extensive reconstruction of streets, sidewalks, and other existing facilities may occur.

Shallow, near-surface excavations would be required to construct the subgrade and track and station platform slabs for at-grade segments. Overhead catenary support poles would be placed in the street or on the sidewalks, before the overhead catenary system would be installed above the trackway. This work in streets, or including street reconstruction can disrupt traffic.

Some at-grade light rail construction is likely to require retaining walls. This increases the quantity of excavation, duration of construction in an area and, depending on wall type, may increase noise impacts.
Elevated Light Rail Construction

There are several sections requiring elevated trackways or guideways. The construction of elevated trackways over existing streets may impact traffic because of temporary road closures. Clearing and grading activities, along with demolition of other structures for newly acquired right-of-way would likely be greater where the elevated trackway transitions to at-grade track.

Elevated guideways and stations for light rail—similar to structures such as highway bridges—are generally constructed of steel, reinforced concrete or combinations of both. Construction would begin with preparation to build foundations that may consist of shallow spread footings, deep driven or, augered piles, or drilled shafts. Noise and vibration can result from foundation installation. Once foundations are in place, concrete columns and crossbeams would be constructed.

The superstructure is constructed and may be built of steel, cast-in-place concrete, or precast concrete. If steel and/or precast concrete is used, they can be transported to the site and lifted onto the substructure from the street. If cast-in-place concrete is used, then a temporary structures would be required to support the superstructure until the cast concrete has gained enough strength (during curing) to support itself.

Parking Structures

Parking garages are typically built of pre-cast or cast-in-place concrete and are most practically constructed with nearby staging and storage areas. They generate concentrated truck and material traffic that may impact local traffic, and may generate episodic noise during excavation and foundation construction.

Willamette River Bridge

The SDEIS is evaluating three bridge type options: a cable-stayed through truss, a cable-stayed, and a concrete segmental option. The cable-stayed through truss is only associated with the 2003 LPA river crossing option.

All three of the bridge types and the locations being considered for the bridge would require the placement of columns in the water, but outside of the navigational channel. Barges or temporary work trestles could also be used for all three bridge types and locations. The concrete segmental alternative is assumed to require four in-water support columns. The cable-stayed alternative would have two in-water support columns, and the cable-stayed through-truss would have one in-water columns. Construction methods for the support columns would include drilled shafts within a cofferdam, driven piles, or cast-in-place piles (with or without a cofferdam). Construction would take place either from barges, with form-travelers, using temporary work trestle or a combination for each alternative.

Abutments would be placed to allow grade-separated clearance of trails anticipated on the west bank, and existing on the east bank. Abutment on the west is anticipated to be placed 100 feet west of the existing top of bank. Abutment on the east is anticipated to be placed between 25 and 50 feet east of the existing top of bank. Abutment construction could include drilled shafts, driven piles, or cast-in-place piles.

While the length of time required for construction of each type of bridge would vary, construction is anticipated to take approximately 36 to 42 months depending upon the build option selected, final bridge type determination, work hours and conditions contained in regulatory approvals or permits. In-water construction would be staged to occur during work windows determined by resource
agencies to protect fish habitat or through negotiation with the resources agencies outside work windows with appropriate mitigation and protective measures.

2.1.2 No-Build Alternative

The No-Build Alternative represents transportation and environmental conditions with no light rail connection between Portland and Milwaukie. The No-Build Alternative is required by NEPA and provides a reference point to gauge the benefits, costs, and impacts of the Light Rail Alternative and the alignment and design options under study. The No-Build Alternative includes assumptions about future growth in population and employment in the region and in the project corridor through the year 2030. Projected population and employment growth through the year 2030 are discussed in Chapter 1 Purpose and Need.

The No-Build Alternative also includes the regional transportation system with the committed transportation investments that would occur with or without the Portland-Milwaukie Light Rail Project. Transportation components of the No-Build Alternative are summarized in Table 2.1-1 and include:

- Roadway improvements
- Transit capital improvements
- Transit operating characteristics

The No-Build Alternative roadway improvements are projects in the corridor that are currently planned and for which a source of funding has been identified. They are listed in the “financially constrained” project list of the 2004 Regional Transportation Plan (RTP), the currently adopted transportation plan for the region. The highway and road projects in the No-Build Alternative would also be included in the Light Rail Alternative. See the Detailed Definition of Alternatives Report (Metro, October 2007) and Chapter 4 for additional information on the No-Build Alternative.

2.2 CAPITAL COST

Capital cost estimates for the Light Rail Alternative range from $818 million to $942.5 million in 2007 dollars, or approximately $1.255 to 1.424 billion in the year of expenditure (YOE) dollars and including finance costs. This section presents the capital cost estimates for the project in 2007 dollars. Cost estimating methodology and further detail on capital cost is available in the Portland-Milwaukie Capital Cost Results Report (Metro, 2008). Chapter 5, Evaluation and Financial Analysis, of this SDEIS provides capital costs in YOE dollars.

The costs presented in this chapter include the full cost of capital improvements for the alternatives and options in this SDEIS for horizon year 2030, based on the service levels and operating requirements needed to meet 2030 demand. Fewer light rail vehicles, buses, and ancillary facilities such as maintenance facility expansions would be required for opening day service levels. Opening day would likely occur in 2015 for the build alternatives, 15 years in advance of the 2030 horizon year. In Chapter 5, costs are presented that correspond to an opening day funding scenario. These opening day costs in year of expenditure dollars would form the basis of a project funding plan and would constitute the basis for developing federal funding requests and local match requirements.
2.2.1 Capital Cost Estimates

The 2003 LPA is estimated to cost $818.1 million. The 2003 LPA with the extension to SE Park Avenue is estimated to cost $942.5 million. The Tillamook Branch Line alignment, which would include the extension to SE Park Avenue, is estimated to cost $916.9 million. Table 2.2-1 shows the estimated capital cost (in year 2007 dollars) for the 2003 LPA and the two alignment options between SE Tacoma Street and SE Park Avenue.

<table>
<thead>
<tr>
<th>Cost categories</th>
<th>2003 LPA</th>
<th>2003 LPA - Park(^2)</th>
<th>2003 LPA with Tillamook(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right-of-Way(^3)</td>
<td>$115,477</td>
<td>$124,432</td>
<td>$111,018</td>
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<td>Utilities</td>
<td>$16,418</td>
<td>$17,624</td>
<td>$17,426</td>
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<td>Street Construction</td>
<td>$33,240</td>
<td>$35,258</td>
<td>$29,935</td>
</tr>
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<td>Track Grade Construction</td>
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<td>Structures(^4)</td>
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<td>Special Conditions</td>
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<td>Communications</td>
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<td>Light Rail Vehicles(^5)</td>
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<td>Operations and Maintenance Facility</td>
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<td>$19,603</td>
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<td>Engineering and Administration</td>
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<td>$168,000</td>
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<td>Contingencies (^6)</td>
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<td><strong>Total (2007 dollars)</strong></td>
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<td><strong>$942,495</strong></td>
<td><strong>$916,889</strong></td>
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<tr>
<td>Total YOE (including inflation and finance charges)(^7)</td>
<td><strong>$1,225,100</strong></td>
<td><strong>$1,423,800</strong></td>
<td><strong>$1,389,100</strong></td>
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1 Costs are displayed in thousands of dollars. Total capital cost includes all of the capital cost associated with the option for the entire alignment and are based on a 2030 service levels. Costs are based on the Detailed Definition of Alternatives Report and associated plan set. These costs do not include inflation or financing. For year of expenditure (YOE) cost see Chapter 5.1. Cost for adding buses to the Willamette Bridge are included. Costs do not reflect reductions because fewer buses would necessary for the Light Rail Alternative compared to the No-Build.

2 Costs are based on cable stayed through truss bridge type for the Willamette River Crossing that would provide at least 72-feet of clearance. A concrete segmental bridge type is estimated to cost approximately $54.7 million less, but it is based on a 65-foot navigational clearance and includes two additional piers. The cost of the concrete segmental bridge type does not reflect the cost necessary to increase the bridge height or address additional environmental mitigation related to the additional piers.

3 Right-of-way cost includes the expansion of Ruby Junction Operation and Maintenance facility.

4 Structures includes all bridges.

5 Based on 2030 fleet size with 16 light rail vehicles (LRVs) for the SE Lake Road terminus, 21 LRVs with the 2003 LPA to Park Avenue, and 23 LRVs with the Tillamook Branch Line. The opening year fleet would require fewer light rail vehicles and lower capital costs. The Willamette River crossing options require the same number of vehicles.

6 Contingencies include those that are sometimes allocated to specific cost categories, as well as general contingencies.

7 See Chapter 5 for details on YOE calculations. YOE total is approximate due to rounding.
Estimated costs for the Willamette River options compared to the 2003 LPA are shown in Table 2.2-2. The assumed bridge type for the 2003 LPA Willamette River crossing alignment is a cable-stayed through truss due to site and navigational constraints. The Willamette River crossing options were estimated with a cable-stayed bridge type, which is less expensive; however, the option would require longer segment and bridge lengths. The Meade-Sherman option would increase the cost of the alignment to SE Lake Road to $834.8 million, the Porter-Caruthers to $840.5 million, the Meade-Caruthers to $839.9 million and the Porter-Sherman option to $840.7 million.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (2007 dollars)</td>
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<td>Difference from 2003 LPA</td>
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<td>$16,623</td>
<td>$21,393</td>
<td>$21,714</td>
<td>$22,559</td>
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</table>


1 Costs are displayed in thousands of dollars. Total capital cost includes all of the capital cost associated with the option for the entire alignment (with 2003 LPA to SE Lake Road) and are based on a 2030 service levels. Costs are based on the Detailed Definition of Alternatives Report and associated plan set. These costs do not include inflation or financing. For year of expenditure (YOE) cost see Chapter 5. Cost for adding buses to the Willamette Bridge are included.

2 Costs are based on cable-stayed through truss bridge type for the 2003 LPA and a cable stayed bridge for Willamette River Crossing options. These bridge types could provide at least 72-feet of clearance. A concrete segmental bridge type is estimated to cost approximately $54.7 million less for the LPA and between $40 million to $42.7 million less for Willamette River Crossing options. The concrete segmental is based on a 65-foot navigational clearance and includes two additional piers. The cost of the concrete segmental bridge type does not reflect the cost necessary to increase the bridge height or address additional environmental mitigation related to the additional piers.

3 Estimates are based on a SE Lake Road terminus and 2030 fleet size with 16 light rail vehicles.

2.2.2 Operating and Maintenance Cost Estimates

The operating and maintenance (O&M) costs have been estimated for the transit portion of option as described in Section 2.1 of this chapter. All O&M cost estimates are for service levels in the year 2030, and all O&M costs are expressed in 2007 dollars. O&M costs are used as input into the project’s financial analysis summarized in Chapter 5 of this SDEIS.

Table 2.2-3 provides a summary of the annual O&M costs for the options being considered for the Portland-Milwaukie Corridor. The table breaks down O&M costs between bus and light rail costs. All costs in the table are in 2007 dollars at 2030 service levels.

<table>
<thead>
<tr>
<th>Table 2.2-3</th>
<th>Annual Operating and Maintenance Costs by Alignment Option</th>
<th>1,2</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>No-Build</td>
<td>2003 LPA</td>
</tr>
<tr>
<td>South Corridor</td>
<td></td>
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<tr>
<td>Bus</td>
<td>$22,837,990</td>
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<tr>
<td>Light Rail</td>
<td>$0</td>
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<tr>
<td>Total Corridor</td>
<td>$22,837,990</td>
<td>$28,378,029</td>
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</table>


1 Costs are in 2007 dollars at year 2030 service levels. Costs include buses operating on the proposed Willamette River Bridge with the exception of the No-Build Alternative. The buses on bridge design option saves approximately $116,300 annually as a result of operating cost saved due to the bridge alignment and increased speeds.

2 Operations and maintenance costs would vary by option. The South Waterfront alignment options would cost more to operate than the 2003 LPA alignment. The Meade-Caruthers would cost an additional $64,087, the Porter-Caruthers would cost an additional $81,163, the Porter-Sherman would cost an additional $103,119 and the Meade-Sherman would cost an additional $108,984 to operate in the year 2030 compared to the 2003 LPA.
The 2003 LPA would increase annual O&M expenditures over the No-Build Alternative by approximately $5.6 million to $28.4 million (2007 dollars at 2030 service levels). In particular, the 2003 LPA to Park and the Tillamook Branch Line alignment would increase annual O&M costs over the No-Build Alternative by approximately $6.8 million and $6.6 million, respectively.

2.3 DETERMINATION OF ALTERNATIVES

The Light Rail Alternative evaluated in this SDEIS represents the most promising solution to the project’s purpose and need. It is based on over 30 years of regional land use and transportation planning, including an environmental alternatives analysis process initiated in 1993. This section summarizes the alternatives that have been evaluated, the screening and selection process, and the reasons that alternatives were not brought forward for further evaluation. Appendix L provides more information on the various planning and environmental processes between 1993 and 2002, including the numerous modes and alignments evaluated and why they were carried forward or eliminated.

2.3.1 Project Development Process

Planning and implementing transit improvements involves a series of steps required by NEPA and FTA. These steps ensure a thorough technical and environmental analysis, with the opportunity for community involvement, including public review and comments. These steps are designed to evaluate the range of all reasonable alternatives that could meet the project’s purpose and need. The following are the key environmental processes completed:

- **1993 Tier I and Tier II South/North Alternatives Analysis** (1993 South/North AA)
- **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)

Figure 2.3-1 shows the detailed project development process for the project. In addition, in preparation for the Portland-Milwaukie SDEIS, the following documents were prepared during the Refinement Study Metro initiated in 2006:

- **Portland-Milwaukie Refinement Report** (Metro, May 2007)
- **Portland-Milwaukie Light Rail Project Downtown Milwaukie Alignments Review** (Metro, June 2007)
- **Portland-Milwaukie Light Rail Project Downtown Milwaukie Workshop Summary SE Main Streets/SE 21st Avenue** (Metro, August 2007)

2.3.2 Screening and Selection of Alternatives

The process of selecting alternatives involves decisions on the following:

- Mode (for example, bus, river, commuter rail and light rail)
- Alignment (the location within a specific corridor)
- Design options (such as bridge type or height)
- Termini
2.3.2.1 Modes Evaluated

This section describes the evaluation of the modes during the development of the South/North and South Corridor Projects. Figure 2.3-2 illustrates the narrowing and refinement of modes. Additional information is available in Appendix L.

The modes that have been evaluated include:

- No-Build
- River transit
- Commuter rail
- High Occupancy Toll (HOT) and High Occupancy Vehicle (HOV) lanes
- Busway
- Bus Rapid Transit (BRT) including intelligent transportation management (ITS)
- Streetcar
- Light rail

Tier I of the 1993 South/North Alternatives Analysis evaluated a wide range of alternative High Capacity Transit (HCT) modes, including light rail, busway, river transit, and commuter rail. Through this analysis, the region identified light rail as the preferred mode. Light rail was found to provide the highest quality transit service and the greatest assurance of effective transit system operations, and it would best meet financial, growth accommodation, land use, and environmental objectives adopted for the corridor. Therefore, light rail was the only mode evaluated in the 1998 South/North DEIS. Tier II of the 1993 South/North Alternatives Analysis focused on identifying the light rail alignments that would be evaluated in the 1998 South/North DEIS.

Following the defeat of a ballot measure that would have reaffirmed local funding for the South/North Light Rail Project, a wide range of HCT alternatives, including river transit, high occupancy vehicle lanes, high occupancy toll lanes, bus rapid transit and busway, but not light rail, were evaluated in the 2000 SCTAS. Following completion of the study, the Policy Committee guiding the study, a group of elected and appointed officials representing Metro, the cities of Milwaukie, Portland and Oregon City; Multnomah and Clackamas counties; TriMet and the Oregon Department of Transportation, determined that river transit, commuter rail, and HOT and HOV lanes failed to meet the project’s purpose and need described in Chapter 1, such as supporting land use goals, reflecting community values, and providing high-quality transit as described below.

River Transit

A River Transit Alternative was studied the 1993 South/North AA and 2000 SCTAS. It was eliminated following both alternatives analysis studies rather than being advanced to either of the subsequent environmental impact statement (EIS) processes. The River Transit Alternative would provide regularly scheduled point-to-point passenger-only boats operating over a defined route and could serve both commuter and recreational trips.

River Transit Alternative was not recommended for study because it would have:

- Poor service to the major activity center in the corridor
• Poor service to downtown Portland
• Potential impacts to threatened and endangered fish
• Poor accessibility for bus transfers and park and ride trips
The River Transit Alternative therefore failed to meet the following purpose and need statements to:
• Support land use goals
• Maintain the livability of the region
• Be environmentally sensitive
• Optimize the transportation system

**Commuter Rail**

Commuter rail was evaluated during the 1993 South/North AA and the 2000 SCTAS. It was eliminated following both alternatives analysis studies rather than being advanced to either of the subsequent environmental impact statement (EIS) processes. Commuter rail service is typically passenger train service that uses existing freight or passenger railroad tracks and has longer trip lengths and station spacing than light rail. Operations are focused on peak commute periods serving peak directional flows from outlying communities to major employment centers.

Reasons for removing Commuter Rail Alternatives from further study included:
• Commuter rail attracted only five percent of the ridership projected for light rail in the same corridor.
• Commuter rail would not directly serve the main trip generators in the corridor
• Trips to downtown Portland would be slow with transfers required either at Union Station or at a Hawthorne Bridge/OMSI Station.
• Commuter rail would be unlikely to influence land use in the same manner as light rail

While implementation costs would be less than for light rail, the cost-effectiveness of commuter rail in the South/North Corridor would be poor due to the low ridership potential.

The Commuter Rail Alternative therefore failed to meet the following purpose and need statements to:
• Support land use goals
• Optimize the transportation system
• Be fiscally responsible

**High Occupancy Vehicle Lanes and High Occupancy Toll Lanes**

High occupancy lane alternatives were studied in the 2002 SCTAS. High Occupancy Vehicle (HOV) lanes are reserved for vehicles that have two or more persons, including the driver. An HOV is a transit bus, vanpool, or any other vehicle that meets the minimum occupancy requirements. A High Occupancy Toll (HOT) lane would charge a toll to single occupant vehicles (SOV) for access a HOV lane.
The rationale for removing the HOV and the HOT Lanes Alternatives from further study in the 2002 South Corridor SDEIS included:

- Lowest public acceptance of all alternatives studied
- Lack of direct connection to Clackamas Regional Center
- Elimination and reduction of local access to Highway 224
- Lack of compatibility with land uses
- Environmental impacts
- High number of displacements
- Lack of downstream capacity to handle additional vehicles attracted to the facility

The HOV/HOT Lanes Alternative therefore failed to meet the following purpose and need statements to:

- Support land use goals
- Optimize the transportation system
- Be environmentally sensitive
- Reflect community values

**Busway and Bus Rapid Transit**

The Policy Committee determined that in addition to light rail, the following modal alternatives best met the project’s purpose and need and should be studied in the 2002 South Corridor SDEIS:

- Busway
- Bus Rapid Transit (BRT)

BRT describes a variety of capital improvements designed to reduce transit travel time and improve transit system reliability. A busway is a roadway for the exclusive use of transit buses.

The Policy Committee heard substantial testimony expressing support for including light rail alternatives in the 2002 South Corridor SDEIS. The central and southeast Portland neighborhoods, City of Milwaukie neighborhoods, and Clackamas area citizens urged the Policy Committee to add Milwaukie and I-205 light rail as alternatives for further study in the 2002 South Corridor SDEIS.

In response, in addition to the Busway and BRT Alternatives, a lower-cost Milwaukie light rail alignment and a concept for I-205 light rail between the Clackamas Town Center and the Gateway Transit Center were developed and evaluated in the 2002 South Corridor SDEIS. Light rail was selected as the LPA at the end of the 2002 South Corridor SDEIS.
Figure 2.3-2
Narrowing and Refinement of Modal Alternatives
1993-2003

Tier 1 Scoping
- Light Rail
- Busway
- River Transit

Tier 2 DEIS
- Light Rail

Wide Range of Alternatives
- No-Build
- Bus Rapid Transit
- Busway
- Commuter Rail
- High Occupancy Vehicle Lanes
- High Occupancy Toll Lanes
- River Transit

Narrowing of Alternatives Decision
- No-Build
- Bus Rapid Transit
- Busway
- High Occupancy Vehicle Lanes
- Commuter Rail
- High Occupancy Toll Lanes
- River Transit

Refinement of Alternatives Phase
Refine:
- No-Build
- Bus Rapid Transit
- Busway
Determine Feasibility of:
- Milwaukie Light Rail
- I-205 Light Rail

Alternatives Evaluated in the SDEIS
- Baseline (No-Build)
- Bus Rapid Transit
- Busway
- Light Rail

Locally Preferred Alternative
- Preliminary Engineering/FEIS: I-205 Light Rail
- SDEIS: Milwaukie Light Rail
The reasons for removing the BRT Alternative in the 2003 LPA decision were because BRT had:

- The fewest number of corridor transit trips
- The worst reliability due to the lack of separated right of way
- The least number of protected intersections
- The less travel time-savings for most major origin and destination locations
- The second smallest reductions in vehicle miles traveled and vehicle hours of delay
- The greatest number of hazardous materials sites near the alignment
- Little public support

The Busway Alternative was not recommended as the LPA due to:

- Low public acceptance due to potential traffic impacts, displacements and noise impacts
- Strong opposition in the Milwaukie to Clackamas Regional Center segment due to traffic impacts
- Slower transit travel time than light rail
- Most noise impacts
- Most displaced businesses
- Greatest number of riparian and ecosystem impacts of all the alternatives considered
- Greatest amount of new impervious surfaces
- Concerns about the capacity of the Hawthorne Bridge and Portland Mall

**Streetcar**

At public meetings held during the development and refinement of the options for the Portland-Milwaukie corridor, several citizens asked why a streetcar option was not being proposed. Streetcar has not been studied during an environmental process in the South Corridor because it does not meet the purpose and need for this corridor. The reasons streetcar does not meet the purpose and need are discussed in this section.

Streetcars would not offer the higher speeds and reliability that light rail would in this congested corridor because of its protected right of way. Streetcars operate in mixed traffic so speed and reliability are affected by adjacent autos, thus slowing travel time and affecting reliability. In a congested corridor with longer trips it would be preferable to operate in a separated right of way rather than in mixed traffic.

Streetcars serve an important function within a transportation system, but are smaller and have significantly less capacity than light rail. The ridership forecast of 22,000 to 27,000 trips per day in this corridor exceeds the ability of streetcars to provide service efficiently. Meeting this demand would mean accommodating an afternoon peak demand of 1,300 to 2,280 passengers per hour in the peak direction. This would require eight light rail trains consisting of two light rail vehicles or 22 streetcars. The addition of the 22 streetcars could increase traffic issues in the corridor.
Riders would also need to transfer at a higher rate to reach destinations served by the MAX system, and transfer opportunities from streetcar to light rail would be more limited than if the corridor were served by an extension of the regional light rail system.

Because streetcars are nine inches narrower than light rail vehicles, streetcars cannot operate on the transit mall without modification to stations, vehicles or both. Through routing with the yellow line light would not be practical for the same reasons. Therefore, considering rider benefits, operating costs, integration with the existing light rail system, effects on traffic, and other environmental issues, streetcar would not be an effective option for this corridor, compared to light rail. In sum, streetcar does not “optimize the transportation system” for this corridor and, therefore, does not meet the project purpose and need for the corridor. However, streetcars are a mode that is being implemented in the region. The new bridge across the Willamette River will accommodate the planned Portland Loop Streetcar.

**Light Rail**

Following completion of the 2002 South Corridor SDEIS process, the Metro Council adopted a two-phased light rail strategy for the South Corridor. The Combined Light Rail Alternative was selected with the I-205 alignment as the first phase, to be followed by the Portland-Milwaukie alignment as the second phase. A two-phased strategy was adopted for the South Corridor because it would:

- Provide light rail to Clackamas Regional Center and Milwaukie Town Center
- Result in the greatest increase in corridor and system-wide transit trips
- Result in the greatest reduction in vehicle miles traveled and vehicle hours of delay
- Result in the greatest reduction in traffic infiltration into neighborhoods
- Better support activity centers as measured by access to fast and reliable transit service to town and regional centers
- Provide greater access to high quality transit service as measured by population located within one-quarter mile of fixed guideway stations, the number of park and ride spaces and lots, the ease of transfers, and the reliability of the alternative
- Result in the greatest reduction in air pollution
- Result in the most significant economic benefit in the region in both jobs created during construction and additional personal income

### 2.3.3 Selection of Alignments and Options

This section discusses the selection of alignment options included in this SDEIS. The options selected are based on the previous environmental and design efforts, which are discussed in this chapter and Appendix L to this SDEIS. They also reflect the results of planning processes and analyses undertaken since the completion of the 2002 South Corridor SDEIS, including the Refinement Study completed in 2007. Other alignments considered prior to the 2002 South Corridor SDEIS are discussed in Appendix L.

The Portland-Milwaukie Steering Committee approved the alignment and design options that would be studied in this SDEIS based on the Portland-Milwaukie Project Refinement Report (Metro, May 2008).
2007) and the ability of options to meet the purpose and need established for the Portland-Milwaukie Light Rail Project, described in Chapter 1.

2.3.3.1 Selection of Willamette River Crossing Options

Since 1998 the South Waterfront area has undergone dramatic changes. The South Waterfront Plan, adopted by the Portland City Council in 2002, has triggered significant public and private investments in the area. Over 1,000 housing units have been completed and approximately 1,700 additional housing units are planned. In 2006, the City of Portland completed work on the Portland Aerial Tram, which provides access from the South Waterfront area to OHSU. OHSU has completed a 400,000-square-foot Center of Health and Healing and is currently developing a new master plan for a 19-acre university complex. In addition, OMSI’s acquisition of six acres south of the current museum site creates new opportunities on the east bank of the river.

During the 2006 Refinement Study, in order to provide better transit service to South Waterfront, several options between the Marquam Bridge and the Ross Island Bridge were developed and evaluated to identify the options that would be most promising in terms of meeting the project purpose and need. The alignment options developed during the 2007 Refinement Study and the 2003 LPA alignment are shown in Figure 2.3-3.

There were two alignment options between SW Lincoln Street and South Waterfront in the Refinement Study, one along SW Naito Parkway and the other along the former Lake Oswego trolley alignment. One option would have run just to the north of the Ross Island Bridge. The bridge locations on the east side of the river included SE Caruthers Street, SE Division Place, and just north of the Ross Island Bridge. All options were designed to accommodate pedestrians and bicycle facilities and could accommodate streetcars and buses as well as light rail.

The Ross Island Bridge and SW Naito Parkway options were eliminated from further consideration by the Portland-Milwaukie Steering Committee. The Portland-Milwaukie Light Rail Project Refinement Report cites the following issues with the Ross Island Bridge option:

- Lack of service to the CEID and OMSI
- Potentially significant impact to the historic Ross Island Bridge
- Substantial property impacts on the east side
- Elevated station in South Waterfront
- High cost

The option, therefore, fails to meet the following project purpose statements, to:

- Be environmentally sensitive
- Support land use goals
- Be fiscally responsive
Portland - Milwaukie Light Rail Project

Refinement Study
Light Rail Alignments:
Willamette River Crossing

Figure 2.3-3

Crossing Options
1. 2003 LPA
2. Meade-Caruthers
3. Porter-Division
4. Naito Parkway
5. Ross Island

Station option

- Existing Streetcar
- Portland Aerial Tram
- Portland Streetcar Loop Project
- Railroad

Figure 2.3-3

Portland - Milwaukie Light Rail Project

Oregon Pacific RR

Portland Aerial Tram

ROSS ISLAND BRIDGE

November 2007

0 250 500 1,000 Feet
The SW Naito Parkway option had the following issues:

- Longest alignment
- Longest travel time
- Very significant infrastructure cost
- Significant property impacts
- Elevated station in South Waterfront.
- Poor streetcar connections
- Lack of service to RiverPlace

This option was eliminated because it failed to meet the following project purpose statements, to:

- Optimize the transportation system
- Be fiscally responsive
- Support land use goals

Results of the refinement study are available in the *Portland-Milwaukie Light Rail Project Refinement Report* (Metro, May 2007).

In May 2007, the Portland-Milwaukie Steering Committee directed project staff to further develop options in an area between SE Sherman Street and SE Division Place and SW Meade and SW Porter Streets. The Steering Committee approved study of four options in this area at its July 2007 meeting. These are described in Section 2.1.1.2.

### 2.3.3.2 Selection of the Tacoma Station to Project Terminus Light Rail Alignment Options

The Tillamook Branch Line alignment in the North Milwaukie Industrial Area was studied in 1998 *South/North DEIS* and the 2002 *South Corridor SDEIS*. The 2003 LPA alignment was studied in the 2002 *South Corridor SDEIS*. Following the 2002 *South Corridor SDEIS*, the alignment parallel to SE McLoughlin on SE Main Street in the North Milwaukie Industrial Area and along the Tillamook Branch Line alignment in downtown Milwaukie was selected as the LPA. Figure 2.3-4 illustrates the processes since the adoption of the 2003 LPA that led to the selection of options for this SDEIS.
Milwaukie Transit Working Group

In 2003, following the adoption of the LPA, the City of Milwaukie convened a Transit Working Group to address issues that had not been resolved at the time the LPA was adopted. The Transit Working Group was charged with:

- Recommending a permanent site for the bus transit center in Milwaukie
- Developing a traffic and parking mitigation plan for the adopted LPA in the industrial area, including revisiting the Tillamook alignment (which had been studied in the 2002 SDEIS).

The Transit Working Group developed nine alignment and design options on SE Main Street and SE McLoughlin Boulevard and along the Tillamook Branch Line to mitigate for the loss of parking and access to businesses in the North Milwaukie Industrial Area. Figure 2.3-5 shows the alignments evaluated by the Transit Working Group. The group recommended a Tillamook Branch Line alignment in the McLoughlin Industrial Area, with a transit center south of Kellogg Lake. This replaced the park and ride capacity that would be lost because this alignment option would not include the park and ride at the former Southgate Theater site. The Transit Working Group Recommendation was adopted by the Milwaukie City Council in 2004. However the city later learned that the property at Kellogg Lake was not available for a transit center and park and ride.

Refinement Study

Since the Kellogg Lake site was not available for use, additional terminus and park and ride locations needed to be identified in order to carry the Tillamook Branch Line option into this SDEIS. One purpose of the 2007 Refinement Study was to identify terminus and park and ride locations. The refinement study discovered a large unmet demand for park and ride facilities in the corridor. Alignment options were developed that would extend the alignment from SE Lake Road to SE Park Avenue along SE McLoughlin Boulevard with park and ride facilities at SE Park Avenue and SE Sparrow Street.

During the Refinement Study, three options were initially developed for the section between SE Tacoma Street and the project terminus at the southern portion of the project:

- 2003 LPA
- 2003 LPA with extension to SE Park Avenue
- Tillamook Branch Line to SE Park Avenue

Figure 2.3-6 shows the alignments, station and park and ride options initially evaluated in the 2007 Refinement Study. On May 14, 2007, the Portland-Milwaukie Steering Committee recommended that these options be included in this SDEIS.

During the refinement phase, representatives from the Portland Waldorf School and other parties in Milwaukie suggested additional alignments through downtown Milwaukie. At the request of the Mayor of the City of Milwaukie, the Portland-Milwaukie Steering Committee agreed to give Milwaukie more time to fully examine the idea of an alignment along SE McLoughlin Boulevard and/or SE Main Street between Highway 224 and SE Lake Road. Metro and TriMet staff supported Milwaukie by developing options and making information and staff available so that the potential impacts of the SE McLoughlin Boulevard and/or SE Main Street alignment could be better understood.
9 options were studied as part of the Milwaukie Working Group in 2003-2004.
Alignment: - 2003 Locally Preferred Alternative

Park and Ride: - Tacoma - Milwaukie - Lake

1875-2275 Park and Ride spaces

Alignment: - Locally Preferred Alternative with extension to Park Ave.

Park and Ride: - Tacoma - Milwaukie - Lake - Sparrow - Park

2875-3875 Park and Ride spaces

Alignment: - Tillamook Branch Alignment to Park Ave.

Park and Ride: - Tacoma - Lake - Sparrow - Park

1875-2875 Park and Ride spaces

Refinement Study Light Rail Alignments: Tacoma to Project Terminus

Portland-Milwaukie Light Rail Project

Figure 2.3-6

November 2007
The project team considered possible options along SE McLoughlin Boulevard and SE Main Street and developed five options. Alignment options included placing light rail on the west and in the center of SE McLoughlin Boulevard and a SE McLoughlin Boulevard/SE Main Street couplet. Details are available in *Portland-Milwaukie Light Rail Project Downtown Milwaukie Alignments Review*, published by Metro in June 2007.

These alignments were considered in a series of meetings with the Riverfront Board, North Milwaukie Industrial Area business community, the downtown business community and the Milwaukie Planning Commission. The *Portland-Milwaukie Light Rail Project Downtown Milwaukie Alignments Review* (Metro, June 2007) contained an initial assessment of each alignment using a number of factors that must be considered in an SDEIS.

After hearing testimony that included concerns from ODOT, the Johnson Creek Watershed Council, the Riverfront Board, and the public, the Milwaukie Planning Commission recommended that SE McLoughlin Boulevard alignments not be advanced for further study. The Milwaukie City Council voted on July 3, 2007, to recommend removing SE McLoughlin Boulevard alignments from further study. At its July 9, 2007, meeting the Portland-Milwaukie Steering Committee concurred with this recommendation.

Based on the *Portland-Milwaukie Light Rail Project Downtown Milwaukie Alignments Review*, public comment and deliberation by the City Planning Commission and City Council, the SE McLoughlin Boulevard options were determined not to warrant further evaluation in this SDEIS as they did not meet the Project Purpose and Need as follows:

- **Support land use goals and reflect community values.** Milwaukie’s Downtown Framework plan, developed over a three-year public process, has as a centerpiece the creation of an enhanced connection between downtown and a revitalized riverfront. Implementation of the Riverfront Park Plan is a critical piece of this plan. All of the options on SE McLoughlin Boulevard require taking substantial portions of this small park. The Milwaukie City Planning Commission and Riverfront Board both cited impacts to the park and the connection between downtown and the riverfront as key reasons for opposing any options on SE McLoughlin Boulevard.

- **Optimize the transportation system.** All of the options involve numerous traffic impacts to SE McLoughlin Boulevard. ODOT raised particular concerns about traffic backups and safety of an at-grade crossing of SE McLoughlin Boulevard in the proximity to downtown Milwaukie and impacts to the already at capacity intersection at SE 17th Avenue, SE Harrison Street and SE McLoughlin Boulevard. ODOT staff indicated that additional travel lanes on SE McLoughlin Boulevard might be a required mitigation.

- **Be environmentally sensitive.** The alternative involved major impacts to Riverfront Park, which is an important park to the City of Milwaukie. Impacts to the park would invoke a federal regulation known as Section 4(f), which would not allow FTA to approve a project with parks impacts unless no other feasible and prudent alternative was available. Alternatives that avoid these impacts are available.

- **Be fiscally responsive.** The Downtown Alignment Report noted significant additional cost factors for all options on SE McLoughlin Boulevard, including reconstruction of significant portions of SE Main Street and SE McLoughlin Boulevard, revision to an overpass under Highway 224, and a number of additional business displacements.
The Milwaukie City Planning Commission suggested, however, that alignment concepts on SE Main and SE 21st Streets be developed. At the July 9, 2007, Portland-Milwaukie Steering Committee meeting, the Mayor of the City of Milwaukie requested that project staff work with the citizens of Milwaukie to explore these options. Public workshops were held to draft and review alignment options on SE Main Street or a SE Main Street/SE 21st Avenue couplet. Over 150 participants developed nine options that the project team synthesized into two design options.

Public comments were taken and included in the *Downtown Milwaukie Workshops Summary* (Metro, August 2007). The downtown Milwaukie alignment options studied on SE McLoughlin Boulevard, SE Main Street and SE 21st Avenue are illustrated in Figure 2.3-7. The workshop summary report also compared the options and the LPA along with a variety of factors that are considerations in the SDEIS.

The Milwaukie City Council met on August 7, 2007, to provide guidance as to whether an additional option should be considered for study. The City of Milwaukie staff recommended against including additional alignment options in the SDEIS due to:

- Incompatibility with the Downtown and Riverfront Framework Plan.
- Risk to other functional requirements of SE Main Street.
- Prior local support for, and technical affirmation of, a non-SE Main Street option.

The city’s staff report concluded that the design options would harm key aspects of the Milwaukie vision, could damage the functionality of SE Main Street, and are not necessary for the light rail project. The City of Milwaukie staff recommendation is outlined in detail in a letter dated August 7, 2007, to the Mayor and City Council from the City Manager, Community Development and Public Works Director, Community Services Director, Planning Director, Engineering Director, and Operations Director.

The City Council also heard testimony from residents, business representatives and school parents, which ran four to one against bringing in any of the options. The Council agreed four to one not to recommend the addition of either of the downtown alignments into this SDEIS. The Mayor of Milwaukie submitted a letter to the Portland-Milwaukie Steering Committee recommending that no new alignments be added through downtown Milwaukie. At its August 9, 2007, meeting, the Portland-Milwaukie Steering Committee reviewed the various documents and a staff recommendation and determined not to bring in any of the SE Main Street or SE Main Street/SE 21st Avenue options between Highway 224 and SE Lake Road.

Based on a review of public testimony, the *Downtown Milwaukie Workshops Summary* and staff reports, the SE Main Street and SE Main Street/SE 21st Avenue options have been determined to not warrant further evaluation in this SDEIS as they do not meet the Project Purpose and Need as further outlined below:

- **Support land use goals and reflect community values.** The Milwaukie Downtown Framework plan was developed during more than three years of public process. It envisions retention of existing businesses and revitalization of retail and other mixed use development on SE Main Street. The potential loss of over 100 parking spaces, business displacements and effects to access to existing and future businesses conflict with this vision.
Portland-Milwaukie Light Rail Project

Refinement Study Light Rail Alignments: Additional Downtown Milwaukie Alignments

Figure 2.3-7
Alignment Options

- 2003 LPA
- Extension to Park Ave.

McLoughlin Options
- McLoughlin double-track
- McLoughlin/Main couplet

Main Street Options
- Main double-track
- Main/21st couplet

Railroad
• **Optimize the transportation system.** The addition of seven new signals and limits on left turns would impede traffic circulation in an already constrained downtown. Access to the park and ride would be more difficult and would require more traffic to flow onto downtown streets. In addition, running through the heart of a major downtown street would decrease reliability in comparison with the Tillamook Branch Line right-of-way.

• **Be fiscally responsive.** The alignment options are anticipated to have significant additional costs over the LPA due to the need for reconstruction of highway overpasses, additional traffic signals, and additional paved track.

**Light Rail Terminus North of Downtown Milwaukie**

During testimony about the Milwaukie options, several citizens suggested that the light rail project terminate at SE Tacoma Street or in the North Milwaukie Industrial Area. Both terminus points would be on the north side of Highway 224, separated from downtown Milwaukie. A transfer would be required to reach downtown Milwaukie.

Metro’s *2040 Growth Concept* calls for connecting regional and town centers with high-quality transit service. These areas have the greatest concentration of households and jobs and would be well served by transit service increasing the overall capacity of the corridor and providing an alternative to auto travel. Requiring travelers coming from the north to make a transfer on their way to downtown Milwaukie would significantly degrade the quality of service that could be provided. Transfers add time and uncertainty to a trip, which could deter potential riders. Forcing a transfer just north of this major population and activity center is contrary to the goal of improving access to centers and to basic transit planning principles.

In addition, there is significant demand for transit service from downtown Milwaukie as well as locations south and east of the town center. Truncating the project north of downtown Milwaukie would hinder the ability to serve this large unmet demand and would result in potential parking spillover from the Milwaukie park and ride onto city streets.

In sum, a permanent terminus north of the town center has been determined to not warrant further evaluation in this SDEIS as it would not support land use goals or optimize the transportation system and, therefore, would not meet the Project’s Purpose and Need.
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