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SDEIS CHAPTERS

APPENDICES

LIST OF TABLES

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LIST OF ACRONYMS

AA - Alternatives Analysis
ACDP- Air Contaminant Discharge Permit
ACHP - Advisory Council for Historic Preservation
Act - The Magnuson-Stevens Act
ADA - American with Disabilities Act
ADT - Average Daily Traffic
AGR - Annual Growth Rate
ANSI - American National Standards Institute
APE - Area of Potential Effect
APTA - American Public Transit Association
AQMA - Air Quality Maintenance Area
AQMP - Air Quality Maintenance Program
AWD - Average Weekday
BA - Biological Assessment
BMP - Best Management Practice
BO - Biological Opinion
BRT- Bus Rapid Transit
Btu - British Thermal Unit
CAA - Clean Air Act
CCC - Clackamas Community College
CEI - Cost Effectiveness Index
CEID - Central Eastside Industrial District
CEQ - Council on Environmental Quality
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS - Comprehensive Environmental Response, Compensation and Liability Information System
CFR - Code of Federal Regulations
CIH - Certified Industrial Hygienist
CMAQ - Congestion Management and Air Quality Improvement Program
CMS - Congestion Management System
CO - Carbon Monoxide
Corps - United States Army Corps of Engineers
CRAG - Columbia Region Association of Governments
CRC - Clackamas Regional Center
CRD - Columbia River Datum
C-TRAN - Clark County Public Transportation Benefit Area Authority
CTC - Clackamas Town Center
dB - Decibel
dBA - A-weighted decibel
DBE - Disadvantaged Business Enterprise
DEIS - Draft Environmental Impact Statement
DEQ - Oregon Department of Environmental Quality
DLCD - Oregon Department of Land Conservation and Development
DO - Design Option
DSL - Oregon Division of State Lands
ECSI - Environmental Clean-up Site Information
EFH - Essential Fish Habitat
EIS - Environmental Impact Statement
EPA - U.S. Environmental Protection Agency
EQC - Oregon Environmental Quality Commission
ESU - Evolutionarily Significant Unit
Expo - Portland Metropolitan Exposition Center
FEIS - Final Environmental Impact Statement
FEMA - Federal Emergency Management Agency
FFGA - Full Funding Grant Agreement
FHPM -Federal Aid Highway Program Manual
FHWA - Federal Highway Administration
FINDS - Facility Index Notification System
FIRE - Finance, Insurance and Real Estate
FIRM - Flood Insurance Rate Maps
FRG - Fully Regulated (hazardous waste) Generator
FTA - Federal Transit Administration
FWPCA - Federal Water Pollution Control Act
FY - Fiscal Year
GPS - Global Positioning System
HCT - High-Capacity Transit
HOT - High Occupancy Toll
HOV - High Occupancy Vehicle
ISCP - Indirect Source Construction Permit
JPACT - Joint Policy Advisory Committee on Transportation
LCDC - Land Conservation Development Commission
L_{dn} - 24-hour, Time Averaged, A-weighted Sound Level
L_{eq} - Equivalent Continuous Sound Levels
L_{max} - Maximum Noise Levels
L_{xx} - Statistical Noise Level Descriptor
LOC - Letter of Credit
LOS - Level of Service
LPA - Locally Preferred Alternative
LPS - Locally Preferred Strategy
LRT - Light Rail Transit
LRV - Light Rail Vehicle
LUFO - Land Use Final Order
LUST - Leaking Underground Storage Tank
LWCFA - Land and Water Conservation Fund Act
MAX - Metropolitan Area Express
MOA - Memorandum of Agreement
MOU - Memorandum of Understanding
MPO - Metropolitan Planning Organization
MTC - Milwaukie Town Center
NAAQS - National Ambient Air Quality Standards
NAC - Noise Abatement Criteria
NEPA - National Environmental Policy Act
NHDB - Oregon Natural Heritage Database
NHPA - National Historic Preservation Act
NMFS - National Marine Fisheries Service
NOI - Notice of Intent
NO_X - Nitrogen Oxides
NPDES - National Pollutant Discharge Elimination System
NPS - National Park Service
NRHP - National Register of Historic Places
O&M - Operations and Maintenance
OAR - Oregon Administrative Rule
ODFW - Oregon Department of Fish and Wildlife
ODOE - Oregon Department of Energy
ODOT - Oregon Department of Transportation

OEP - Office of Environment and Planning
OHSU - Oregon Health and Sciences University
OIT - Oregon Institute of Technology
OMSI - Oregon Museum of Science and Industry
ONHP - Oregon Natural Heritage Project
ORS - Oregon Revised Statutes
OTP - Oregon Transportation Plan
P&R - Park and Ride
PCB - polychlorinated biphenyls
PCC - Portland Community College
PE - Preliminary Engineering
PGE - Portland General Electric
PI - Public Involvement
PIP - Productivity Improvement Program
PM_{10} - Particulate matter (10 microns or less in size)
PMSA - Permanent Metropolitan Statistical Area
ppm - Parts Per Million
PPV - Peak Particle Velocity
Pre-AA - Preliminary Alternatives Analysis
PS&E - Plan, Specification & Estimate
PSU - Portland State University
RCRA - Resource Conservation and Recovery Act
RCRIS - Resource Conservation and Recovery Information System
RFP - Regional Framework Plan
RLIS - Regional Land Information System - Metro
RMS - Root Mean Square
ROD - Record of Decision
ROW - Right-of-Way
RTP - Regional Transportation Plan
RUGGOs - Regional Urban Growth Goals and Objectives
SAAQS - State Ambient Air Quality Standards
SCS - Soil Conservation Service
SDEIS - Supplemental Draft Environmental Impact Statement
SE - Southeast
SEE - Social, Economic and Environmental
SHPO - State Historic Preservation Officer
SIP - State Implementation Plan
SMART - South Metro Area Rapid Transit (City of Wilsonville)
SQG - Small Quantity Generator
STIP - State Transportation Improvement Program
STP - Surface Transportation Program
SW - Southwest
TA - FHWA Technical Advisory
TAC - Technical Advisory Committee
TC - Transit Center
TCM - Transportation Control Measure
TDM - Transportation Demand Management
TEA-21 - Transportation Efficiency Act for the 21st Century
TES - Traction Electrification System
TIP - Transportation Improvement Program
TM - Track Mile
TOD - Transit Oriented Development
TPR - Transportation Planning Rule
TriMet - Tri-County Metropolitan Transportation District of Oregon
TRIS - Tone Release Inventory System
TSM - Transportation Systems Management
TSS - Total Suspended Solids
TWC - Train Wayside Communication System
UGB - Urban Growth Boundary
UPRR - Union Pacific Railroad
URA - Urban Renewal Area
URD - Urban Renewal District
USC - United States Code
USDA - United States Department of Agriculture
USDOT - United States Department of Transportation
USFS - United States Forest Service
USFWS - United States Fish and Wildlife Service
USGS - United States Geological Survey
UST - Underground Storage Tank
V/C - Volume-to-Capacity Ratio
VdB - Vibration decibels
VE - Value Engineering
VHT - Vehicle Hours Traveled
VMT - Vehicle Miles Traveled
VOCs - Volatile organic compounds
WET II - Wetlands Evaluation Technique
YOE - Year of Expenditure

PROJECT NOMENCLATURE

This SDEIS discusses the South Corridor Project alternatives and design options, including the No-Build Alternative, five build alternatives, and several design options and terminus options. The following selected project nomenclature provides brief definitions for terms used throughout this SDEIS. Most of the terms are defined in much greater detail throughout this document. More complete descriptions of each alternative and the design and terminus options are included in Chapter 2. Options that are marked (×) were used for the comparison of the alternatives. See Table 2.2-3 for a detailed description of those options used for the comparative analysis.

Alternatives and Design Options. Alternatives specify the general location of proposed transit improvements within a given segment of the Corridor. Design options specify detailed route choices within an alternative. The following alternatives are analyzed in this document. Design options associated with each alternative are listed under the alternative.

Bus Rapid Transit Alternative

Clackamas Park-and-Ride Lot Design Options

- Linwood Park-and-Ride Lot Design Option×
- Johnson Road Park-and-Ride Lot Design Option

Busway Alternative

East Hawthorne Bridge Design Options

- Water Avenue Design Option×
- 7th Avenue Design Option

Clinton Street Station Design Options

- At-Grade Station Design Option×
- Above-Grade Station Design Option

Brooklyn Yard Design Options

- 17th Avenue Design Option×
- West of Brooklyn Yard Design Option

Clackamas Park-and-Ride Lot Design Options

- Linwood Park-and-Ride Lot Design Option×
- Johnson Road Park-and-Ride Lot Design Option

Milwaukie Light Rail Alternative

Brooklyn Yard Design Options

- 17th Avenue Design Option×
- West of Brooklyn Yard Design Option

North Milwaukie Design Options

- Southgate Crossover Design Option×
- Tillamook Branch Line Design Option

Milwaukie Terminus Options

- Lake Road Terminus Option×
- Milwaukie Middle School Terminus Option

Clackamas Park-and-Ride Lot Design Options

- Linwood Park-and-Ride Lot Design Option×
- Johnson Road Park-and-Ride Lot Design Option

I-205 Light Rail Alternative

Clackamas Town Center Design Options

- East of Clackamas Town Center Terminus Option×
- North of Clackamas Town Center Terminus Option

Combined Light Rail Alternative

Brooklyn Yard Design Options

- 17th Avenue Design Option×
- West of Brooklyn Yard Design Option

North Milwaukie Design Options

- Tillamook Branch Line Design Option×
- Main Street Design Option

Milwaukie Terminus Options

- Lake Road Terminus Option×
- Milwaukie Middle School Terminus Option

Clackamas Town Center Terminus Options

- East of Clackamas Town Center Terminus Option×
- North of Clackamas Town Center Terminus Option

Segment Names. The following segments have been identified and used for the analysis:

Portland to Milwaukie Segment,
Milwaukie to Clackamas Segment,
Milwaukie to Oregon City Segment, and
Gateway to Clackamas Segment.

Transit Centers. The following is a list of Transit Centers related to the Project alternatives. Not all transit centers are included in each alternative. Where there are options regarding the placement of the transit center, these are listed under the general description.

Downtown Portland Transit Mall ×
Milwaukie Transit Center
- Southgate Transit Center ×
- Milwaukie Middle School Transit Center

Gateway Transit Center ×
Oregon City Transit Center ×
Clackamas Town Center Transit Center
- East of CTC Transit Center ×
- North of CTC Transit Center

Park-and-Ride Lots. The following is a list of park-and-ride lots associated with the alternatives. The park-and-ride lots associated with each alternative are listed under that alternative.

Bus Rapid Transit Alternative

Portland to Milwaukie Segment
- Southgate Park-and-Ride Lot (600 spaces) ×

Milwaukie to Clackamas Segment
- Clackamas Park-and-Ride Lot Design Options
  - Linwood/Harmony Park-and-Ride Lot (600 spaces) ×
  - Johnson Road Park-and-Ride Lot (270 spaces)
- New Hope Shared Use Park-and-Ride Lot (300 spaces) ×

Milwaukie to Oregon City Segment
- Park Avenue Park-and-Ride Lot (150 spaces) ×
- Roethe Road Park-and-Ride Lot (150 spaces) ×
- Clackamas Community College Park-and-Ride Lot (100 spaces) ×

Busway Alternative

Portland to Milwaukie Segment
- Tacoma Street Park-and-Ride Lot (600 spaces) ×
- Milwaukie Southgate Park-and-Ride Lot (600 spaces) ×

Milwaukie to Clackamas Segment
- Clackamas Park-and-Ride Lot Design Options
  - Linwood/Harmony Park-and-Ride Lot (600 spaces) ×
  - Johnson Road Park-and-Ride Lot (270 spaces)
- New Hope Shared Use Park-and-Ride Lot (300 spaces) ×

Milwaukie to Oregon City Segment
- Park Avenue Park-and-Ride Lot (150 spaces) ×
- Roethe Road Park-and-Ride Lot (150 spaces) ×

Clackamas Community College Park-and-Ride Lot (100 spaces) ×

Milwaukie Light Rail Alternative

Portland to Milwaukie Segment
- Tacoma Street Park-and-Ride Lot (600 spaces) ×
- Milwaukie Southgate Park-and-Ride Lot (600 spaces - Southgate Crossover D.O.) ×
- Lake Road Station (275 spaces - Lake Road Terminus Option) ×

Milwaukie to Clackamas Segment
- Clackamas Park-and-Ride Lot Design Options
  - Linwood/Harmony Park-and-Ride Lot (600 spaces) ×
  - Johnson Road Park-and-Ride Lot (270 spaces)
- New Hope Shared Use Park-and-Ride Lot (300 spaces) ×

Milwaukie to Oregon City Segment
- Park Avenue Park-and-Ride Lot (150 spaces) ×
- Roethe Road Park-and-Ride Lot (150 spaces) ×

Clackamas Community College Park-and-Ride Lot (100 spaces) ×

I-205 Light Rail Alternative

Portland to Milwaukie Segment
- Southgate Park-and-Ride Lot (600 spaces) ×

Milwaukie to Oregon City Segment
- Park Avenue Park-and-Ride Lot (150 spaces) ×
- Roethe Road Park-and-Ride Lot (150 spaces) ×
- Clackamas Community College Park-and-Ride Lot (100 spaces) ×

Clackamas to Gateway Segment
- Clackamas Town Center East Park-and-Ride Lot (500 spaces) ×
- New Hope Shared Use Park-and-Ride Lot (300 spaces) ×
- Fuller Road Park-and-Ride Lot (1,000 spaces) ×
- Holgate Boulevard Park-and-Ride Lot (400 spaces) ×
- Powell Boulevard Park-and-Ride Lot (400 spaces) ×

Combined Light Rail Alternative. This alternative would include the park-and-ride lots listed above for the Milwaukie and I-205 LRT Alternatives except the Linwood/Harmony Park-and-Ride Lot.

Station Names. Stations associated with each alternative are listed below.

Bus Rapid Transit Alternative

Portland to Milwaukie Segment

Hawthorne Boulevard Station (northbound) ×
Clay Street Station (southbound) ×
Holgate Boulevard Station×
17th Avenue Station×
Southgate Transit Center Station×

Milwaukie to Clackamas Segment

Oak Street Station×
Freeman Way Station×
Linwood/Harmony Station×
Johnson Road Station
OIT Station×
CTC North Transit Center Station×

Milwaukie to Oregon City Segment

Park Avenue Station×
Oak Grove Boulevard Station×
Concord Avenue Station×
Roethe Road Station×
Jennings Road Station×
Arlington Road Station×
Oregon City Transit Center Station×

Busway Alternative

Portland to Milwaukie Segment

OMSI Station×
Clinton Street Station ×
Rhine Street Station×
Holgate Boulevard Station ×
Lafayette Street Station
Holgate Boulevard Station
Bybee Boulevard Station ×
Tacoma Street Station ×
Southgate Transit Center Station ×

Milwaukie to Clackamas Segment

Oak Street Station ×
Freeman Way Station ×
Linwood/Harmony Station ×
Johnson Road Station
OIT Station ×
CTC North Transit Center Station ×

Milwaukie to Oregon City Segment

Park Avenue Station×
Oak Grove Boulevard Station×
Concord Avenue Station×
Roethe Road Station×
Jennings Road Station×
Arlington Road Station×
Oregon City Transit Center Station×

Milwaukie Light Rail Alternative

Portland to Milwaukie Segment

SW Main Street Station ×
OMSI Station ×
Clinton Street Station ×
Rhine Street Station ×
Holgate Boulevard Station ×
Lafayette Street Station
Holgate Boulevard Station
Bybee Boulevard Station ×
Tacoma Street Station ×
Southgate Transit Center Station×
Harrison Street Station ×
Lake Road Station×

Milwaukie to Clackamas Segment

Oak Street Station×
Freeman Way Station×
Linwood/Harmony Station×
Johnson Road Station (Johnson Road Park-and-Ride Lot Design Option)
OIT Station×
Clackamas Town Center North Transit Center Station×

Milwaukie to Oregon City Segment

Park Avenue Station×
Oak Grove Boulevard Station×
Concord Avenue Station×
Roethe Road Station×
Jennings Road Station×
Arlington Road Station×
Oregon City Transit Center Station×

I-205 Light Rail Alternative

Portland to Milwaukie Segment

Hawthorne Boulevard Station (northbound) ×
Clay Street Station (southbound) ×
Holgate Boulevard Station×
17th Avenue Station×
Southgate Transit Center Station×

Milwaukie to Oregon City Segment

Park Avenue Station×
Oak Grove Boulevard Station×
Concord Avenue Station×
Roethe Road Station×
Jennings Road Station×
Arlington Road Station×
Oregon City Transit Center Station×

Gateway to Clackamas Segment

Gateway Transit Center Station ×
SE Main Street Station ×
Division Street Station ×
Powell Boulevard Station ×
Holgate Boulevard Station ×
Foster Road Station ×
Flavel Street Station ×
Fuller Road Station ×
Clackamas Town Center East Transit Center Station ×
Clackamas Town Center North Transit Center Station

Combined Light Rail Alternative

Portland to Milwaukie Segment

SW Main Street Station ×
OMSI Station ×
Clinton Street Station ×
Rhine Street Station ×
Holgate Boulevard Station ×
Lafayette Street Station
Holgate Boulevard Station
Bybee Boulevard Station ×
Tacoma Street Station ×
Southgate Transit Center Station×
Harrison Street Station ×
Lake Road Station×

Milwaukie to Oregon City Segment

Park Avenue Station×
Oak Grove Boulevard Station×
Concord Avenue Station×
Roethe Road Station×
Jennings Road Station×
Arlington Road Station×
Oregon City Transit Center Station×

Gateway to Clackamas Segment

Gateway Transit Center Station ×
SE Main Street Station ×
Division Street Station ×
Powell Boulevard Station ×
Holgate Boulevard Station ×
Foster Road Station ×
Flavel Street Station ×
Fuller Road Station ×
Clackamas Town Center East Transit Center Station ×
Clackamas Town Center North Transit Center Station

SOUTH CORRIDOR PROJECT
CLACKAMAS AND MULTNOMAH COUNTIES, OREGON

SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT

Submitted pursuant to the National Environmental Policy Act
42 U.S.C. 4322(2)(c)

by the

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL TRANSIT ADMINISTRATION
FEDERAL HIGHWAY ADMINISTRATION

and

METRO

in cooperation with

U.S. ARMY CORPS OF ENGINEERS, PORTLAND DISTRICT
TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT OF OREGON

12/5/02	
Date of Approval	R.F. Krochalis, Regional Administrator For the Federal Transit Administration
12/6/02	
Date of Approval	David Cox, Division Administrator For the Federal Highway Administration
12/9/02	
Date of Approval	Mike Burton, Executive Officer For Metro
12/9/02	
Date of Approval	Fred Hansen, General Manager For the Tri-County Metropolitan Transportation District of Oregon

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Abstract:

The proposed action would be an improvement to the existing urban transportation system in the South Corridor portion of the larger South/North Corridor in the Portland, Oregon metropolitan region. This South Corridor Supplemental Draft Environmental Impact Statement is a supplement to the South/North Corridor Project Draft Environmental Impact Statement that was published in February 1998. Alternatives considered include the No-Build Alternative, the Bus Rapid Transit Alternative, the Busway Alternative, the Milwaukie Light Rail Alternative, the I-205 Light Rail Alternative and the Combined Light Rail Alternative. The analysis and impact assessment considered potential long-term, short-term and cumulative effects on transit service, ridership, accessibility, regional and local roadways, freight movements, land use, economics, neighborhoods, visual and aesthetic resources, ecosystems, water quality and hydrology, geology and seismology, noise and vibration, energy, hazardous materials, parklands, historic and cultural resources and public services. The analysis also considered financial feasibility of the alternatives. The information from these studies will be used to select the Locally Preferred Alternative for the South Corridor Project.

Comment on this document may be submitted in writing or may be made orally at a public hearing. Written comments should be submitted to Sharon Kelly, South Corridor EIS Manager at the above address. Comments are due by 5:00 p.m., Friday, February 7, 2003.

Metro Publication No.: 2002-10962-TRN

P. PREFACE

This South Corridor Supplemental Draft Environmental Impact Statement (SDEIS) has been prepared in compliance with the National Environmental Policy Act (NEPA). The Federal Transit Administration (FTA) has provided partial funding for the preparation of the SDEIS. FTA and the Federal Highway Administration (FHWA) are Federal co-lead agencies for this SDEIS. Metro is the local lead agency. The U.S. Army Corps of Engineers (Corps) is a cooperating federal agency and the Tri-County Metropolitan Transportation District of Oregon (TriMet) is a cooperating local agency. This SDEIS has been prepared in accordance with FTA guidelines *Procedures and Technical Methods for Transit Project Planning* (FTA: September 1986, latest revision January 1995) and the FHWA/Urban Mass Transportation Administration's *Environmental Impact and Related Procedures* (29 CFR Parts 635, 640, 650, 712, 771 and 790; 49 CFR Part 622: August 1987, 23 CFR Part 771 revised April 1991).

P.1 Federal Transportation Project Development Process

The federal transportation project development process is designed to be an integral part of the metropolitan area's long-range transportation planning process. It provides decision-makers and the public with better and more complete information before the final decisions are made. Early in the process, the regional transportation planning efforts identify corridors and/or sub-areas with significant transportation problems that may need a major transportation investment. The local jurisdiction, in cooperation with FTA and/or FHWA completes an Alternatives Analysis (AA) or Major Investment Study (MIS) and Environmental Impact Statement (EIS) to determine the Locally Preferred Alternative (LPA) to address identified transportation problems. The Regional Transportation Plan (RTP) and short-range Transportation Improvement Program (TIP) are amended to reflect the LPA. Following completion of the National Environmental Policy Act (NEPA) process, the project may qualify for federal funding and the implementation process can be initiated.

Following is a brief summary of the primary steps taken through the federal transportation planning development process. A more detailed discussion of the South Corridor Project's history follows in Section P.2.

- **Systems Planning**. During the systems planning phase, local jurisdictions identify the transportation problems within sub-areas and/or corridors and determine whether a major transportation investment should be evaluated for possible implementation. The local jurisdictions establish priorities for development and the lead local agency submits an application to the federal government for advancing a corridor into the federal project planning process.

- **Scoping.** An early step in the Federal project development process is a series of meetings with affected jurisdictions and agencies and the general public to determine the scope of the proposed project. The scoping meetings are used to determine agency/public concerns and establish agency responsibilities. These meetings also help to outline the range of alternatives to be considered and the anticipated scope of environmental issues to be analyzed.

- **Environmental Impact Statement (EIS).** The lead Federal and local agencies prepare draft and final environmental impact statements (DEIS/FEIS). The purpose of an EIS is to disclose the environmental impacts associated with the study alternatives. This South Corridor SDEIS is intended to provide information on new South Corridor Alternatives that were not previously evaluated in the *South/North DEIS* (Metro, February 1998). Following the completion of this SDEIS, the region will select a LPA. The FEIS will focus on documenting the impacts of the LPA. The FEIS document also will identify ways to mitigate identified significant impacts of the LPA, prior to the final design and construction of a federally funded project.

- **Preliminary Engineering (PE).** Following the completion of the SDEIS and the selection of the LPA, FTA may authorize a project to proceed into the preliminary engineering phase. PE can proceed simultaneously with the FEIS process. Preliminary engineering is intended to advance the level of design for the LPA so that accurate cost estimates can be developed and to incorporate mitigation measures into the design.

- **Final Design and Construction.** Following completion of the FEIS and PE processes, FTA and FHWA will issue a Record of Decision (ROD). The ROD certifies the adequacy of the environmental analysis and commitments to specific mitigation measures. A full-funding grant agreement (FFGA) may then be executed between the local jurisdiction and FTA. This agreement will allow for the development of final design for the project, the purchase of required right-of-way and the construction of the project.

P.2 Project History

Following is a brief summary of the South Corridor Project History. A more detailed summary of the previous phases of the project can be found in Chapter 2 of this SDEIS.

Between the early 1980s and 1993, the region undertook several System Planning and Pre-Alternative Analysis studies in the North Corridor, South Corridor and Portland Central Business District (CBD). Both the South and North Corridors were identified in the RTP as High-Capacity Transit Corridors. In October 1993, following several local system planning studies and priority corridor studies, the FTA issued notice in the *Federal Register* of its intent to publish an EIS for the combined South/North Corridor. The scoping notice described a two-tiered process. First, an initial set of alternatives would be identified, analyzed, evaluated and narrowed for further study. Second, a small set of the most promising alternatives selected through the narrowing process would be studied further within the *South/North DEIS*.

Scoping included an evaluation of a wide range of mode, alignment and terminus alternatives. At the conclusion of Scoping in December 1993, the range of alternatives was narrowed based on initial technical analysis and public comment. The project then completed three narrowing steps that led to the selection of alternatives described and considered within the *South/North DEIS*: 1) Tier I Narrowing of Terminus and Alignment Alternatives; 2) Tier I Design Option Narrowing; and 3) Cost-Cutting. Each of these three steps included:

- The adoption and application of a wide range of criteria and measures;
- The development and documentation of technical analysis of the costs, the transportation and environmental benefits and impacts of the study alternatives; and
- An early and pro-active public involvement program, including a public comment period prior to narrowing and a local selection process, which included the involvement of the South/North Citizen Advisory Committee (CAC), the Steering Committee and the participating jurisdictions and agencies.

In November 1995, the Metro Council adopted the *South/North Major Investment Study (MIS) Final Report* (Metro: November 1995) which documented the project's compliance with the FTA's and FHWA's *Major Metropolitan Planning Rule*. The *MIS Final Report* included the selection of the design concept and scope of the LPA for the South/North Corridor. In April 1996, the FTA concurred that Metro had met the federal MIS requirements for the South/North Corridor, and approved Metro's request to advance the corridor into PE concurrent with the preparation of the *South/North DEIS*.

The South/North DEIS was published in February 1998. The purpose of the DEIS was to summarize the benefits, cost and impacts associated with the alternatives and to provide citizens, agencies and jurisdictions with information needed to make an informed judgement when selecting the LPA to advance into the PE/FEIS stages of project development. Following the publication of the DEIS, there was an approximately 6-week public comment period and three public hearings were held. Upon closure of the public comment period, local jurisdictions, project committees and the Metro Council selected the Full-Length light rail alternative from Clackamas Regional Center to Vancouver as the LPA, with South Corridor identified as the first construction segment. Unfortunately, in November 1998, the voters of the region did not re-approve the primary local match for the South/North Project and the region was required to reassess the project.

Following the defeat of the local funding measure, a series of "listening posts" were held where elected officials from Metro, TriMet and the jurisdictions in the region solicited comments and input from citizens around the region regarding how the region should proceed with transit solutions in the South and North Corridors. Following the "listening posts" a group of business leaders and citizens requested that a revised Full-Interstate Avenue Alternative in the North Corridor be evaluated as a smaller and lower cost project. An SDEIS, focusing on the North Corridor Interstate Avenue Alternative, was published in April 1999. Following a public comment period and public hearing, in June 1999 the Metro Council amended the LPA and defined the North Corridor Interstate MAX Light Rail Project as the first construction segment for the South/North Corridor and selected the new Full-Interstate Alignment Alternative. The *North Corridor Interstate MAX Light Rail Project FEIS* was published in October 1999. The North Corridor Project is currently under construction and expected to begin operations in September 2004.

Following the "listening posts" and amendment to the LPA in the North Corridor, the region refocused on Transportation Alternatives in the South Corridor. The South Corridor Transportation Alternatives Study (SCTAS) was initiated to examine non-light rail alternatives. The purpose of the SCTAS was to develop, evaluate and prioritize non-light rail transportation options that were responsive to community needs and the travel demand in the South Corridor that could be implemented expeditiously and moved forward into advanced design, environmental analysis and construction. The SCTAS examined the following eight alternatives: No-Build Alternative, Radial Commuter Rail Alternative (Oregon City – Portland), Circumferential Commuter Rail Alternative (Milwaukie – Beaverton), River Transit Alternative, High Occupancy Vehicle (HOV) Lanes Alternative, High Occupancy Toll (HOT) Lanes Alternative, Bus Rapid Transit Alternative (BRT), and Busway Alternative.

Based on the findings in the *Evaluation Report* (Metro: October 2000), the South Corridor Study Policy Group (a committee of elected and appointed officials in the South Corridor) narrowed the list of alternatives to be studied further in the South Corridor SDEIS. The Policy Group determined that HOV lanes, HOT lanes, Commuter Rail and River Transit did not meet the study's Purpose and

Need and should not be studied further. In addition, after hearing from citizen groups in Southeast Portland, Milwaukie and Clackamas County, the Policy Group decided that the SDEIS should examine both a revised Milwaukie Light Rail Alternative and an I-205 Light Rail Alternative.

P.3 Role of Federal, State and Local Agencies

Seven state and local jurisdictions are participating in the South Corridor Project: Metro, TriMet, the Oregon Department of Transportation (ODOT), the City of Portland, the City of Milwaukie, Oregon City and Clackamas County. FTA and FHWA, as the co-lead Federal agencies, and Metro, as the lead local agency, are responsible for the SDEIS. The coordination effort takes place within a process that the FTA and FHWA prescribe for evaluating the environmental impacts, benefits, costs, and financing associated with the proposed project in order to qualify for Federal funding. Metro, with assistance from TriMet, consultants and the participating local jurisdictions, has prepared the technical analysis supporting this document. FTA and FHWA furnished technical and procedural guidance to Metro and independently evaluated this SDEIS prior to its approval and publication. A comment period follows publication of the SDEIS, after which the LPA would be selected.

P.4 Organization of the SDEIS

The SDEIS has an executive summary plus six chapters and several appendices. The SDEIS Chapters are briefly summarized below.

The **Executive Summary** provides a summary of the major findings of the SDEIS. The Executive Summary is intended to provide the reader with a basic understanding of the transportation problems in the South Corridor, the alternatives evaluated to address those problems and the significant benefits, costs and impacts associated with the study alternatives. In addition, summary information is provided on the possible financing options for the study alternatives.

Chapter One, Purpose and Need, describes the South Corridor study area and existing transportation facilities, a discussion of state and local land use and transportation planning goals and regulations is provided, and, specific transportation problems within the roadway and transit systems in the corridor are described. The chapter concludes with the project's goal and objectives, which provide context for the selection of a locally preferred alternative (LPA).

Chapter Two, Alternatives Considered, provides an overview of the screening and selection process, an overview of previous studies in the corridor and a description of the study alternatives. The chapter defines the transit and roadway capital improvements, transit operations improvements, capital costs and operating and maintenance costs for the study alternatives.

Chapter Three, Affected Environment and Environmental Consequences, discusses the significant impacts of the alternatives on the built and natural environments. This section identifies the potential significant long-term (operational), short-term (construction) and cumulative impacts of the study alternatives. Potential mitigation measures that would address significant impacts are identified.

Chapter Four, Transportation Impacts, describes the anticipated transit, traffic and other transportation impacts that would result from the study alternatives.

Chapter Five, Financial Analysis and Evaluation of Alternative, describes the financial analysis for the South Corridor Project and presents potential financing options for the alternatives. This chapter also provides a comparison of the alternatives in terms of costs and financial feasibility. Each alternative is evaluated in terms of how effectively and equitably it meets the project's goal and objectives. Finally, significant trade-offs between the alternatives are discussed.

Chapter Six, Community Participation, Agency Coordination and Required Permits, presents a summary of public involvement process and activities, coordination with local, regional, state and Federal Agencies related to the project. A summary of the Federal, State of Oregon, regional and local permits that would be required to construct the study alternatives is included.

Appendices are includes at the end of the SDEIS to provide more detailed information on a number of topics including agency coordination and correspondence, environmental justice, supporting documents, list of recipients, list of preparers and conceptual designs of transit centers and park-and-ride lots.

P.5 Supporting Documents

The lead agencies have prepared and published a variety of in-depth reports that document the technical analysis used to prepare this SDEIS. The primary reports leading to the publication of this South Corridor SDEIS are listed in Appendix C, Supporting Documents, and are available for review at Metro's Transportation Planning Office, 600 NE Grand Avenue, Portland, Oregon, 97232.

P.6 Community Participation

An extensive and pro-active public involvement program has been conducted throughout the larger South/North Transit Corridor Study and the preparation this South Corridor SDEIS. The public involvement program has been designed and implemented to meet the FTA's and FHWA's goals of providing complete information, timely public notice, full public access to key decisions, and early and continuing involvement of the public (23 CRG Part 450.316l; October 1993). Chapter 6, Community Participation, Agency Coordination and Required Permits, contains a more detailed description of the Public involvement activities.

P.7 Completion of the Environmental Impact Statement Process

This South Corridor SDEIS is being circulated to Federal, state, regional and local agencies and officials, and will be made available to interested people and groups. During the public comment period (a minimum of 45 days) the public, agencies and jurisdictions will have the opportunity to provide comments on this SDEIS in writing, via facsimile, via e-mail, on the transportation telephone hotline and/or at the public hearing(s). After the public comment period closes, an LPA will be drafted. The South Corridor Policy Committee, the Local Advisory Groups and the Local Jurisdictions will have the opportunity to develop recommendations on project elements to be included in the LPA. The recommendations will be forwarded to Metro's Joint Policy Advisory Committee on Transportation (JPACT) and to the Metro Council, who will adopt the final LPA. During the subsequent PE phase an FEIS will be prepared, focusing on the LPA, its impacts and measures to mitigate any significant adverse impacts.

S. EXECUTIVE SUMMARY

A. About the Executive Summary

The Executive Summary is presented to brief policymakers, agencies and the public about the findings of the *South Corridor Project Supplemental Draft Environmental Impact Statement* (SDEIS). Because the summary presents results of the SDEIS in a truncated form, some information is incorporated only by reference to the SDEIS itself. Every effort has been made to present the most pertinent results in as clear a manner as possible so that the reader may understand the breadth of information contained in the SDEIS without necessarily having to read the entire document. The reader is encouraged to consult the SDEIS document for more detailed information.

B. About the South Corridor SDEIS

The South Corridor is the southern segment of the South/North Corridor, and the SDEIS fundamentally updates the *South/North Corridor Draft Environmental Impact Statement* (DEIS), which was issued by the Federal Transit Administration (FTA) and Metro in February 1998. As such, the SDEIS (and this Executive Summary) focuses almost exclusively on the South Corridor by providing updated and additional information on the purpose and need, alternatives considered, affected environment and anticipated environmental impacts for the South Corridor, reflecting the changed conditions since the South/North DEIS was published.

The South Corridor SDEIS has been prepared in compliance with the National Environmental Policy Act (NEPA). The Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA) are the federal co-lead agencies for the SDEIS, and Metro is the project's local lead agency. Preparation of the SDEIS is one step in the Federal transportation project development process that is intended to be an integral part of a metropolitan area's long-range transportation planning process. The purpose of the South Corridor SDEIS is to provide decision-makers and the public with better and more complete information before final project-level decisions are made. The SDEIS is intended to provide citizens, agencies and jurisdictions with information needed to make an informed decision when selecting the preferred alternative to advance into the next stages of project development.

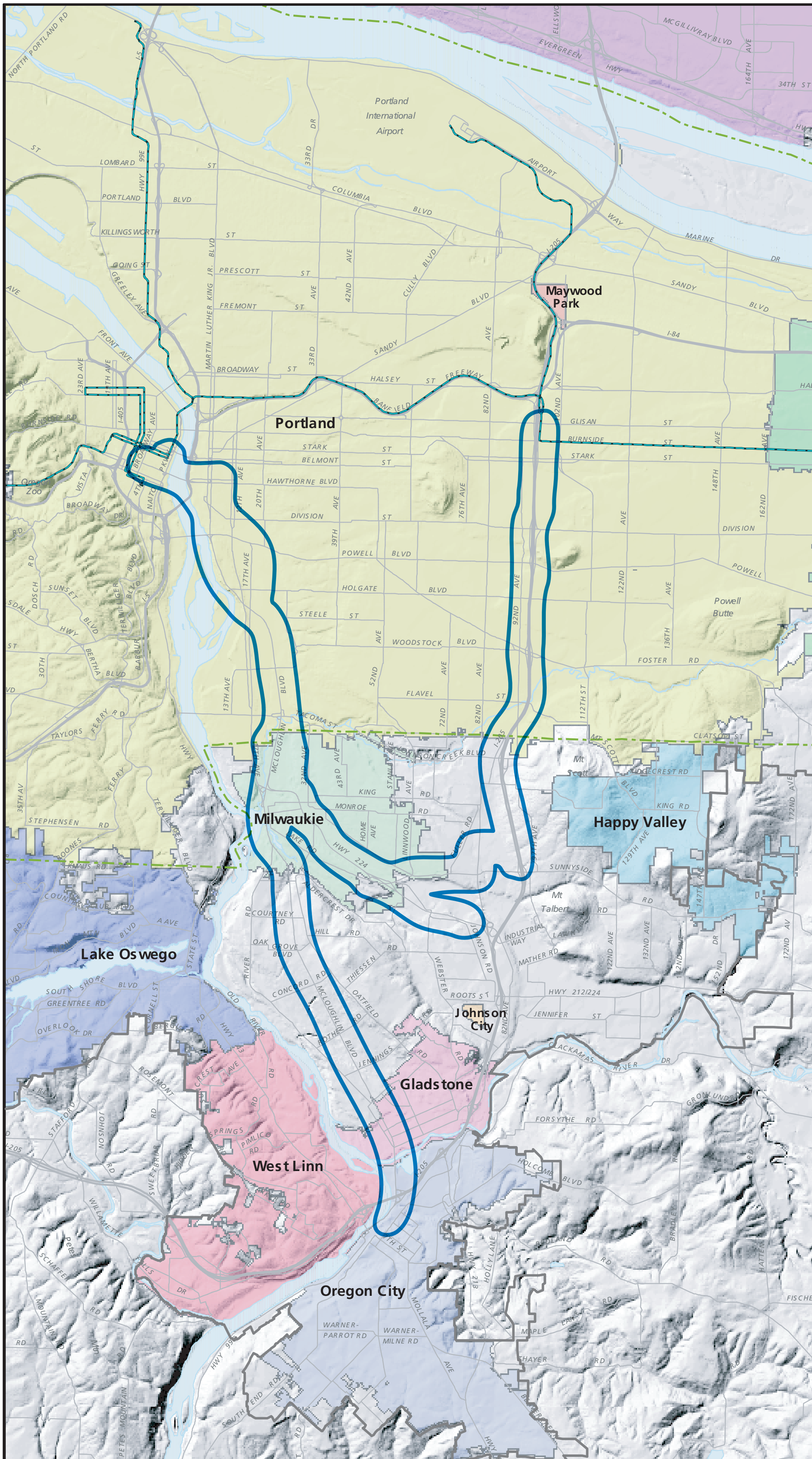
S.1 DEFINITION OF THE SOUTH CORRIDOR

The South Corridor is part of the larger South/North Corridor within the Portland, Oregon and Vancouver, Washington metropolitan region. As shown in Figure S.1-1, this region includes four counties: Multnomah, Clackamas and Washington counties in Oregon and Clark County in Washington. This region is the population and economic center of an extensive area, including much of Oregon, southern Washington and northern Idaho. The South Corridor is defined as the travel shed between the urban and urbanizing portion of Clackamas County and the Portland Central City, as shown in Figure S.1-2. Travel within the corridor uses a variety of local, regional, state and interstate facilities. The Tri-County Metropolitan Transportation District (TriMet) is the provider of public transportation in the South Corridor, and currently operates fixed-route transit buses, on-demand van and small bus service for the elderly and disabled, and light rail lines throughout the region.

SOUTH CORRIDOR PROJECT

Jurisdiction Boundaries

Figure S.1-1



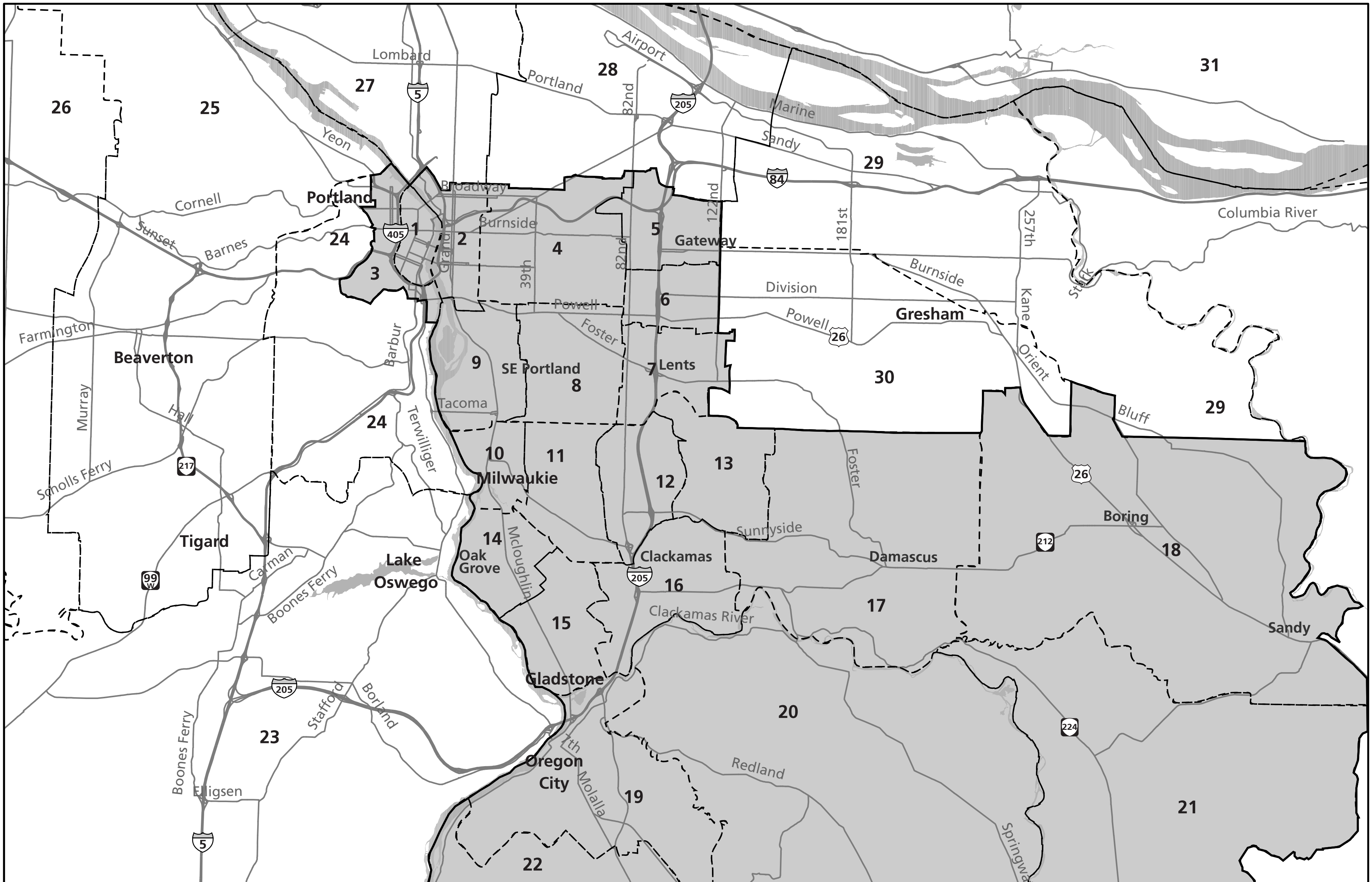
Legend

- Corridor Alternatives
- Existing LRT line
- County line
- Urban Growth Boundary
- Portland
- Vancouver
- Milwaukie
- Lake Oswego
- Happy Valley
- Gladstone
- Johnson City
- Maywood Park
- Gresham
- West Linn
- Oregon City
- Unincorporated

0 1 2
Miles

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO



SOUTH CORRIDOR PROJECT

Figure S.1-2

Study Area

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

South Corridor Study Area

2 31 District TAZ Boundaries

0 2 4 Miles

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S.2 PROJECT HISTORY AND DECISION-MAKING PROCESS

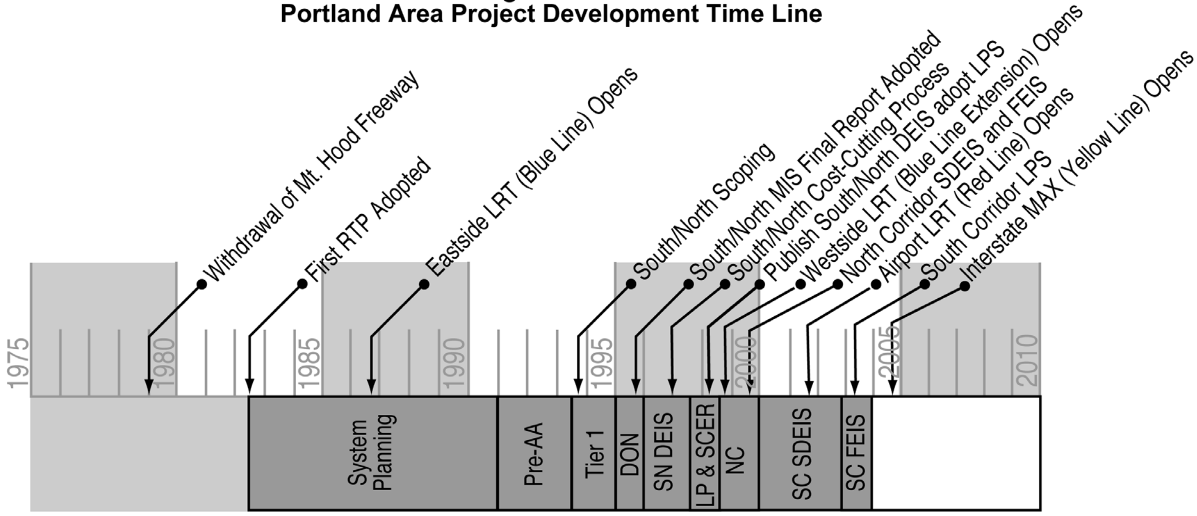
The need to examine high capacity transit (HCT) options in the South Corridor was established over two decades of system and sub-area planning studies. Following is a description of the study stages that have culminated in the development of this SDEIS (see Figure S.2-1 for a time line illustrating these project phases). A more detailed description of the project's history and decision-making process may be found in Section 2.1 of the SDEIS.

1980–1993: Early South/North Corridor Planning Studies

- **System Planning Studies.** Since the mid-1980s, there has been a series of major transportation analyses and actions taken that implemented the region's basic policy shift away from constructing radial freeways and toward a greater emphasis on meeting travel demand through improvements in public transportation. These included the 1982 *Regional Transportation Plan* (RTP); and a system-level Phase I study of regional transitways between 1984 and 1986 that recommended more detailed studies of the South Corridor.

- **Preliminary Alternatives Analysis.** Both Milwaukie and I-205 HCT alternatives were evaluated in the Preliminary Alternatives Analysis (Pre-AA) planning phase. In the Milwaukie Corridor, the Pre-AA evaluated a light rail alignment that would connect downtown Portland with Milwaukie, the Clackamas Regional Center and Oregon City. In the I-205 Corridor a light rail alignment was evaluated that would connect the Oregon City, the Clackamas and Gateway regional centers, and continue into downtown Portland via the existing Blue Line. In 1993, the Metro Council selected the Milwaukie Corridor as the priority corridor in the south.

Figure S.2-1
Portland Area Project Development Time Line



List of Acronyms

DEIS - Draft Environmental Impact Statement	LRT - Light Rail Transit
DON - Design Option Narrowing	MIS - Major Investment Study
FEIS - Final Environmental Impact Statement	Pre-AA - Preliminary Alternatives Analysis
LPS - Locally Preferred Strategy	RTP - Regional Transportation Plan
S/N - South/North Corridor	SDEIS - Supplemental Draft Environmental Impact Statement
NC - North Corridor	LP - Listening Posts
SC - South Corridor	SCER - Sourh Corridor Evaluation Report

1993-1998: South/North Corridor Major Investment Study (MIS) and Draft Environmental Impact Statement (DEIS) This phase of project development was initiated in 1993 and consisted of three main activities:

- **Scoping.** The Federal *Scoping Process* was undertaken to identify the range of mode and alignment alternatives to be studied further in the project's DEIS.

- **Tier I Narrowing of Alternatives and Major Investment Study (MIS).** In 1995, Tier I narrowed the range of alternatives and options to be studied further in the DEIS. and resulted in the Metro Council's and FTA's approval of the *South/North Major Investment Study* (Metro: November 1995).

- **Tier II Draft Environmental Impact Statement (DEIS).** Begun in January 1996, the DEIS included a cost-cutting process that was initiated in November 1996 that further refined the range of alternatives and options under study. Based on the revised set of alternatives and options, the South/North Corridor DEIS was published in February 1998. After considering the DEIS and public comments, the Metro Council adopted the project's locally preferred alternative in July 1998.

1998: Project Funding Vote and Reassessment. In response to the failure of a November 1998 ballot measure that would have approved local funding for the South/North Corridor light rail project, JPACT and the Metro Council initiated two processes as a result of community input. A redesigned Interstate Avenue light rail alignment was proposed in the North Corridor. The South Corridor began to more fully evaluate non-light rail options.

1999: North Corridor Project Development. The following project development activities supplemented the South/North DEIS and resulted in a Full Funding Grant Agreement with FTA and construction of the Interstate MAX light rail line:

- **North Corridor Supplemental Draft EIS (SDEIS).** Shortly after the November 1998 ballot measure, local business and community leaders proposed a new modified Interstate LRT alignment. A SDEIS was subsequently prepared for the new alignment (now known as the Yellow Line or Interstate MAX). In June 1999, The Metro Council amended the South/North locally preferred alternative to include the Full Interstate Alternative as the preferred alternative, and to define the first construction segment of the South/North Project as the segment between the Rose Quarter and the Expo Center.

- **North Corridor Interstate MAX Light Rail Project Final EIS (FEIS).** Subsequent to the selection of the locally preferred alternative for the SDEIS, Metro and TriMet published the North Corridor FEIS (October 1999) and FTA issued its Record of Decision for the project (January 2000). The Yellow Line is currently under construction and is scheduled to be completed and in operation by September 2004.

1999–Present: South Corridor Project Development. The following activities supplement the South/North DEIS and resulted in the publication of this South Corridor SDEIS:

- **South Corridor Transportation Alternatives Study.** In April 1999, Metro's Joint Policy Advisory Committee on Transportation (JPACT) directed Metro staff to develop and advance a set of non-light rail options that would address the transportation problems in the South Corridor. Scoping, which concluded in May 2000, identified the array of mode and general alignment alternatives to be studied further. In November 2000, the South Corridor Project Policy Committee narrowed the range of alternatives to be studied further in the South Corridor SDEIS. The alternatives included; the No-Build Alternative; the Bus Rapid Transit (BRT) Alternative; and the Busway Alternative. After this decision, the Policy Committee heard substantial additional public comment requesting the addition of light rail alternatives. In response, the Policy Committee added the Milwaukie LRT Alternative, the I-205 LRT Alternative; and the Combined (Milwaukie and I-205) LRT Alternative.

- **South Corridor SDEIS.** In February 2002, the FTA and FHWA issued a scoping notice in the Federal Register, announcing their intent to work with Metro and TriMet to prepare an SDEIS based on this range of alternatives and a range of options for each alternative. The SDEIS provides a summary of the significant benefits, costs, impacts and trade-offs associated with the alternatives and options. The SDEIS will be used to inform the public and local decision makers in their selection of the locally preferred alternative for the South Corridor. Following receipt of public comment, the region will select the locally preferred alternative to advance into the FEIS, preliminary engineering, final design and construction.

S.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

A. Purpose, Need, Goal and Objectives

The South Corridor Policy Committee defined the Purpose and Need for a major transit investment in the South Corridor as follows:

Purpose (and Goal) of the Project: to implement a major transit program in the South Corridor that maintains livability in the metropolitan region, supports land use goals, optimizes the transportation system, is environmentally sensitive, reflects community values and is fiscally responsive.

Need for the Project: historic and projected rapid population and employment growth in the Corridor, creating an unmet demand for increased travel opportunities and transit capacity; high levels of existing traffic congestion and travel delay in the corridor and deteriorating travel conditions in the future caused by population and employment growth; and the need for high-quality transit service in the South Corridor to achieve regional and local land use objectives.

Objectives for the South Corridor Project to address identified needs include:
- Provide high quality transit service in the corridor.
- Ensure efficient transit system operations in the corridor.
- Maximize the ability of the transit system to accommodate future growth in travel demand in the corridor.
- Minimize traffic congestion and traffic infiltration through neighborhoods in the corridor.
- Promote desired land use patterns and developments in the corridor.
- Provide for a fiscally stable and financially efficient transit system.
- Maximize the efficiency and environmental sensitivity of the engineering design of the proposed project.

B. Need for the Project: Growth and Transportation Problems and Opportunities

Population and Employment Growth. Over the past twenty-five years, the population of the four-county region grew by approximately 56 percent. Since 1980, the rate of employment growth in the region has been almost 50 percent greater than the national average. With over 120,000 current jobs in the South Corridor portion of Clackamas County, employment is forecast to reach 184,700 jobs by 2020. These high rates of population and employment growth in the corridor will create demand for additional transit service; result in deteriorating travel conditions; and create opportunities for high-density, mixed-use activity centers that can be well served by high-capacity transit alternatives.

Traffic Congestion and Vehicle Delay. High levels of population and employment growth in the corridor will continue to cause deteriorating conditions on the corridor's transportation system. Over the next twenty years, Vehicle Miles Traveled (VMT) in the region is forecast to increase by 20 percent, leading to a doubling in the miles of major roadways in the corridor that are congested (i.e., roads that would have volumes greater than 90 percent of the roadway's capacity), which indicates a rapidly-deteriorating level of service in the corridor. For example, SE McLoughlin Boulevard and I-205 would be at or over capacity during peak periods for virtually their entire length within the South Corridor.

Transit System Conditions. As a result of increased congestion in the South Corridor, transit operating speeds on SE McLoughlin Boulevard, the corridor's primary transit trunkline, have deteriorated. Deterioration in transit travel times means that TriMet must increase service hours and the size of its bus fleet, thereby incurring increased operating costs, in order to maintain a constant level of service. If transportation network improvements are not made in the South Corridor, these conditions will continue to worsen over time. Under the No-Build Alternative, transit travel times from downtown Portland to the Milwaukie Town Center and the Clackamas Regional Center would increase by over 50 percent by 2020.

Land Use Policies. Over the past 25 years, there has been a continuous progression of state, regional and local policy decisions and investments aimed at establishing growth in corridors and activity centers that are or are planned to be supported by high capacity transit. As a result, land use designations, zoning patterns and water, sewer and other infrastructure plans and investments in all jurisdictions have been located and sized on the basis of development forecast in current and planned high capacity transit corridors. In particular, on a regional level, Metro's *Region 2040 Growth Concept* is predicated on implementation of a south/north transit spine to link key activity centers in the corridor. Without a high-capacity transit investment in the corridor, the region's entire growth management strategy could be at risk – and with it, the economic vision, livability and development goals and land use plans for the region may not be realized.

S.4 ALTERNATIVES CONSIDERED

The purpose of this section is to provide a description of the six alternatives that are under consideration for the South Corridor. Figures S-4.1 through S.4-5 illustrate the alternatives. Table - S.4-1 compares the components of each of the alternatives.

Except for the No-Build Alternative, each of the alternatives has one or more sets of design options, which are relatively small-scale variations in the proposed alignment and/or other characteristic (e.g., a park-and-ride lot) of an alternative. This section summarizes the characteristics of each alternative based on a set of design options used throughout the SDEIS for the analysis of alternatives (see Table 2.2-3 in Chapter 2 of the SDEIS for a listing of those design options by alternative). A more comprehensive description of the alternatives may be found in Chapter 2 – Alternatives Considered and in the *Detailed Description of Alternatives Report* (Metro: July 2002). Table S.4-1 provides summary information describing the project's alternatives. Figures S.4-1 through S.4-5 show the locations and alignments of all alternatives with the exception of the No-Build.

No-Build Alternative. The transit service network, related transit facilities and roadway improvements included in the No-Build Alternative are consistent with the *2000 Regional Transportation Plan* (RTP) 2020 financially constrained transit and road network (Metro: adopted August 2000). The transit capital improvements in the No-Build Alternative would be included in all other alternatives. The No-Build Alternative would include four park-and-ride lots within the South Corridor (880 parking spaces) and roadway improvements that are defined in the financially constrained road network of the RTP. The No-Build also includes a 1.5 percent per year annual systemwide transit service increase, approximately 27 percent more than in 2000. Buses in the South Corridor would continue to operate in mixed traffic on increasingly congested streets and highways. Light rail service would operate on three interconnected lines. (A future extension of the Yellow Line into downtown Vancouver, Washington is also an element of the financially constrained transit network of the RTP and hence the No-Build Alternative).

Build Alternatives. Each of the build alternatives represent a different approach to addressing the transportation needs of the South Corridor. Details about each of the alternatives are included in Table S.4-1. The general concept for each alternative is described below:

- **Bus Rapid Transit (BRT) Alternative** provides improved bus operations, reliability and travel time for a modest capital investment. BRT would operate between Downtown Portland, Milwaukie, and Oregon City, as well as between Milwaukie and the Clackamas Regional Center.

- **Busway Alternative** provides higher level of reliability and improved travel times through primarily exclusive bus operations in a separate guideway from downtown Portland to Milwaukie and the Clackamas Regional Center. A BRT connection from Oregon City would enter the busway in Milwaukie.

- **Milwaukie Light Rail Alternative** provides a direct high-capacity rail transit connection between Downtown Portland & Milwaukie on exclusive right-of-way. BRT lines would connect from Oregon City and the Clackamas Regional Center and transfer to light rail at the Milwaukie Transit Center.

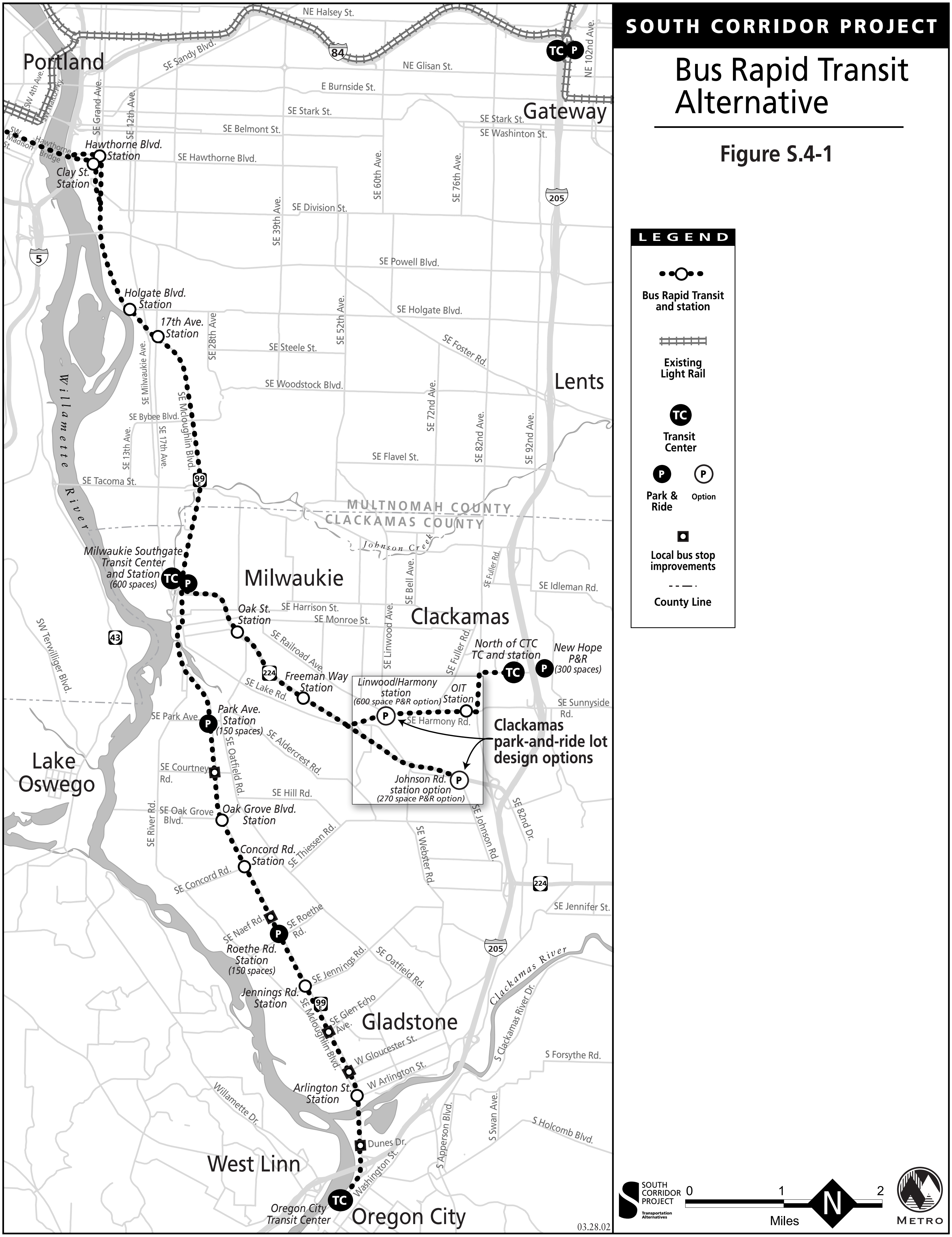
- **I-205 Light Rail Alternative** provides a direct high-capacity rail transit connection between Downtown Portland and the Gateway and Clackamas Regional Centers via the existing east-west light rail alignment to Gateway and an extension along existing reserved right-of-way on I-205 from Gateway to the Clackamas Regional Center. BRT would connect Downtown Portland to Milwaukie and Oregon City.

- **Combined Light Rail Alternative** provides direct high-capacity rail transit connections between Downtown Portland and Milwaukie and between Downtown Portland and Clackamas Regional Center via the Gateway Regional Center. BRT would connect Milwaukie with Oregon City.

Table S.4-1
Description of Alternatives – Compared to No-Build

	Bus Rapid Transit	**Busway**	**Milwaukie LRT**	**I-205 LRT**	**Combined LRT**
Purpose of the Alternative	Provide improved bus operations, reliability and travel time for modest capital investment	Provide higher level of reliability and improved travel times through exclusive bus operations	Provide direct high-capacity rail transit connection between Downtown Portland and Milwaukie on exclusive right-of-way	Provide direct high-capacity rail transit connection between Downtown Portland and Gateway and Clackamas Regional Centers	Provide direct high-capacity rail transit connections between Downtown Portland and Milwaukie and Downtown Portland and Clackamas RC
Transit Service *(Compared to No-Build)*	Two additional trunk bus lines	Two additional trunk bus lines Reroute 3 bus lines to access Busway Add BRT, Milwaukie to Oregon City	Replace McLoughlin trunk buses with LRT, Portland to Milwaukie Add BRT, Milwaukie to Clackamas & Milwaukie to Oregon City	Replace I-205 bus with LRT Add Portland to Oregon City BRT service – 2 trunk lines.	Replace McLoughlin trunk buses with LRT. Replace I-205 bus with LRT Add BRT, Milwaukie to Oregon City
Capital Improvements *(Compared to No-Build)*	17 BRT stations Queue bypass lanes, signals, bus-only ramps, shoulder lanes 2 additional P&R lots (420 – 750 spaces) Expand CTC Relocate MTC to Southgate	6.7 miles of busway 9 Busway Stations Bus-only ramps 3 new and 1 expanded P&R lots (1,290 to 1,620 spaces) Expand CTC Relocate MTC to Southgate or Middle School 11 BRT Stations	6.5 mile LRT line 16 new LRVs 8-10 new LRT stations 3-4 new and 1 expanded P&R lots (960 to 1,895 added spaces) Expand CTC Relocate MTC to Southgate or Middle School Expand Ruby Jct. LRT Maintenance Facility 13 BRT stations Bus-only ramps Shoulder lanes	6.7 mile LRT line 20 new LRVs 8 new LRT stations 5-6 new P&R lots (2,100 to 2,600 added spaces) Reconfiguration or relocation of CTC Relocate MTC to Southgate Expand Ruby Jct. LRT Maintenance Facility 11 BRT stations	13.2 miles of LRT 25 LRVs 16-18 new LRT stations 6-8 new and 1 expanded P&R lots (2,640 to 3,745 added spaces) Reconfiguration or relocation of CTC Relocate MTC to Southgate or Middle School Expand Ruby Jct. LRT Maintenance Facility 7 BRT stations
Capital Costs *(YOE $, Opening Day)*	$116 million	$281 million	$417 million - LRT $72 million - BRT	$349 million - LRT $60 million - BRT	$800 million – LRT $22 million – BRT
Annual Operating Cost - 2020 *($2002 over No-Build)*	$7.2 million	$8.2 million	$7.4 million	$11.9 million	$12.2 million

Source: Metro, November 2002.
Notes: MTC = Milwaukie Transit Center, P&R = Park and Ride, CTC= Clackamas Transit Center, $YOE = Year of Expenditure Dollars (2006), LRT = Light Rail Transit, $2002 = 2002 dollars, LRVs = Light Rail Vehicles, BRT= Bus Rapid Transit



SOUTH CORRIDOR PROJECT

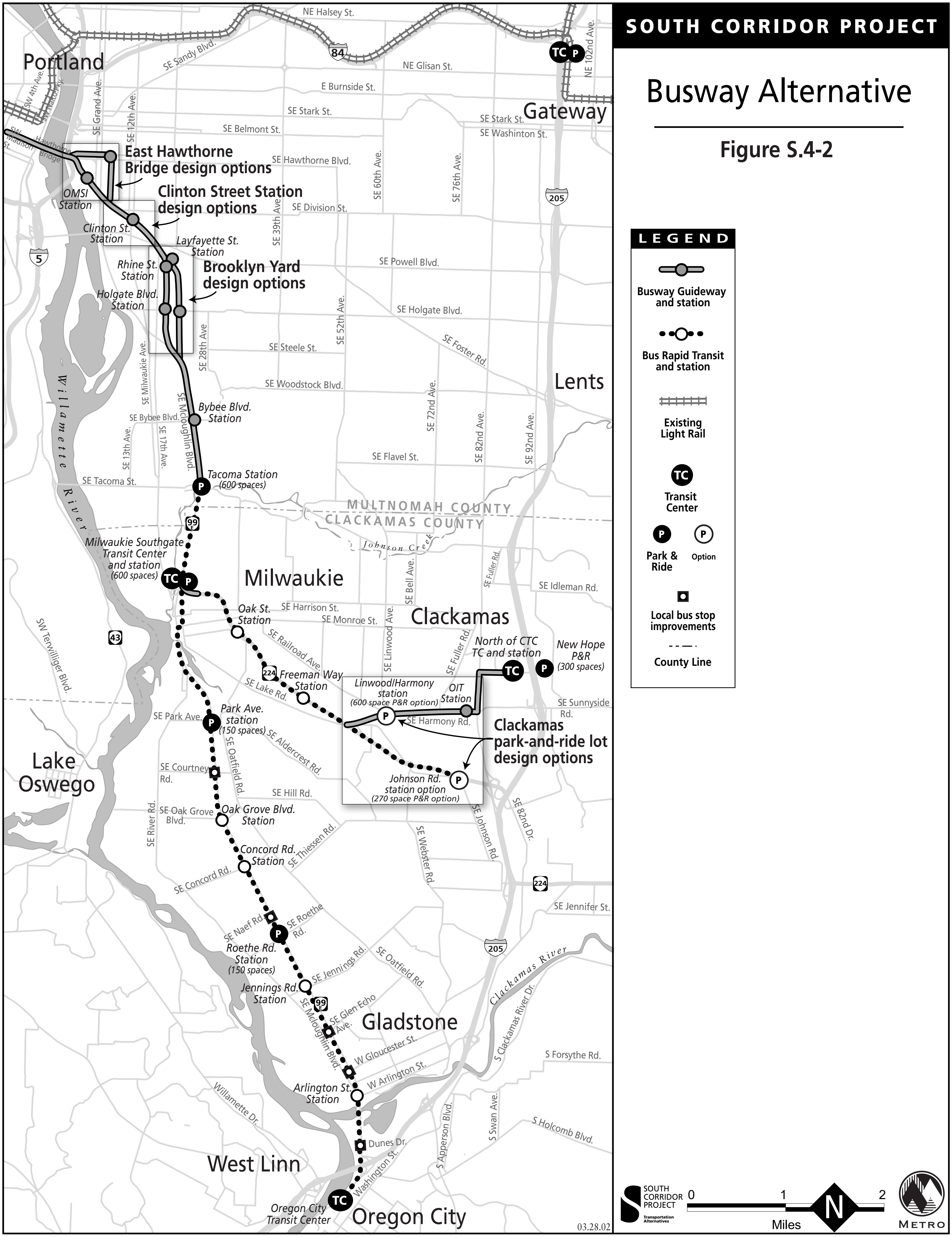
Bus Rapid Transit Alternative

Figure S.4-1

SOUTH CORRIDOR PROJECT

Busway Alternative

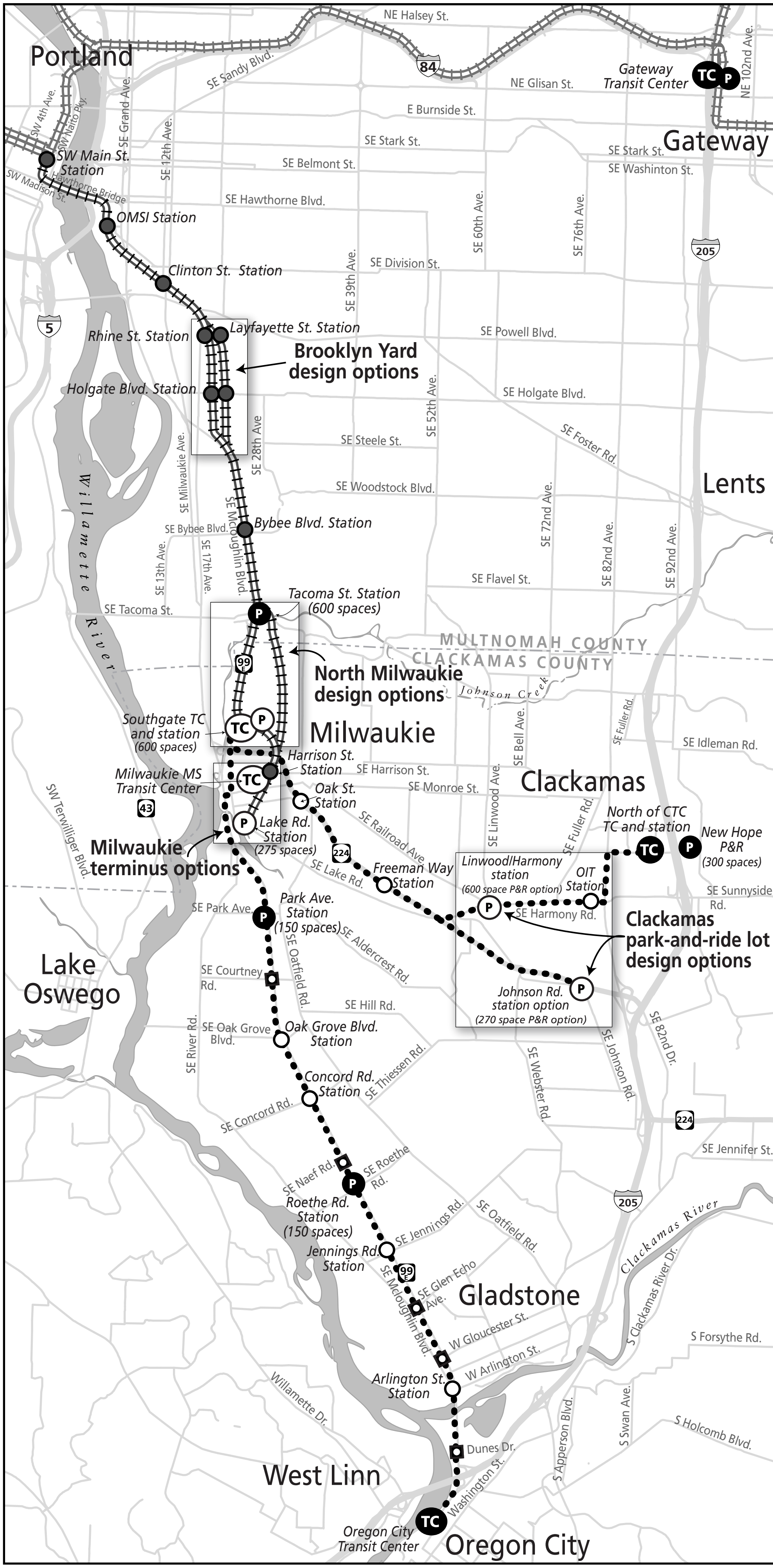
Figure S.4-2



SOUTH CORRIDOR PROJECT

Milwaukie Light Rail Alternative

Figure S.4-3



LEGEND

- Light Rail and station
- Bus Rapid Transit and station
- Existing Light Rail
- TC Transit Center / TC Option
- P Park & Ride / P Option
- Local bus stop improvements
- County Line

SOUTH CORRIDOR PROJECT Transportation Alternatives

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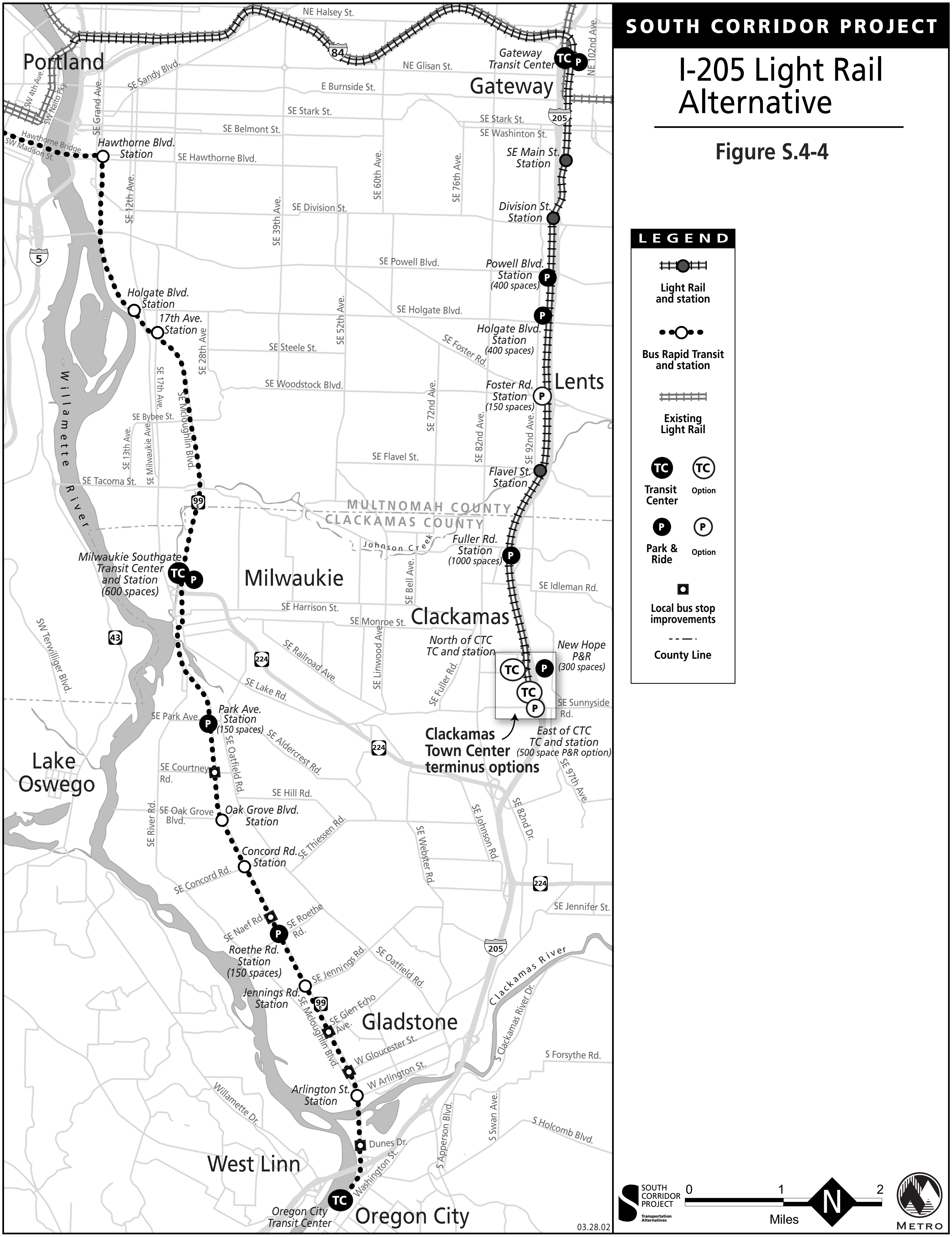
METRO


SOUTH CORRIDOR PROJECT
I-205 Light Rail Alternative
Figure S.4-4
LEGEND
Light Rail and station
Bus Rapid Transit and station
Existing Light Rail
Transit Center
Option
Park & Ride
Option
Local bus stop improvements
County Line
Portland
Gateway
Lents
Milwaukie
Clackamas
Lake Oswego
Gladstone
West Linn
Oregon City
Gateway Transit Center
SE Main St. Station
Division St. Station
Powell Blvd. Station (400 spaces)
Holgate Blvd. Station (400 spaces)
Foster Rd. Station (150 spaces)
Flavel St. Station
Fuller Rd. Station (1000 spaces)
North of CTC TC and station
New Hope P&R (300 spaces)
East of CTC TC and station (500 space P&R option)
Clackamas Town Center terminus options
Hawthorne Blvd. Station
Holgate Blvd. Station
17th Ave. Station
Milwaukie Southgate Transit Center and Station (600 spaces)
Park Ave. Station (150 spaces)
Oak Grove Blvd. Station
Concord Rd. Station
Roethe Rd. Station (150 spaces)
Jennings Rd. Station
Arlington St. Station
Oregon City Transit Center
MULTNOMAH COUNTY
CLACKAMAS COUNTY
Willamette River
Clackamas River
Johnson Creek
NE Halsey St.
NE Glisan St.
E Burnside St.
SE Stark St.
SE Belmont St.
SE Hawthorne Blvd.
SE Division St.
SE Powell Blvd.
SE Holgate Blvd.
SE Steele St.
SE Woodstock Blvd.
SE Flavel St.
SE Foster Rd.
SE Idleman Rd.
SE Harrison St.
SE Monroe St.
SE Railroad Ave.
SE Lake Rd.
SE Aldercrest Rd.
SE Hill Rd.
SE Thiessen Rd.
SE Concord Rd.
SE Jennings Rd.
SE Oatfield Rd.
SE Webster Rd.
SE Johnson Rd.
SE 82nd Dr.
SE Sunnyside Rd.
SE 97th Ave.
SE Jennifer St.
S Forsythe Rd.
S Holcomb Blvd.
S Swan Ave.
S Apperson Blvd.
S Clackamas River Dr.
Willamette Dr.
Washington St.
Dunes Dr.
W Arlington St.
W Gloucester St.
SE Glen Echo Ave.
SE Mcloughlin Blvd.
SW Terwilliger Blvd.
SE Park Ave.
SE Courtney Rd.
SE Oak Grove Blvd.
SE River Rd.
SE Naef Rd.
SE Roethe Rd.
SE Tacoma St.
SE Bybee St.
SE 13th Ave.
SE Milwaukie Ave.
SE 17th Ave.
SE 28th Ave
SE 12th Ave.
SE Grand Ave.
SE Sandy Blvd.
SE 39th Ave.
SE 52nd Ave.
SE 60th Ave.
SE 72nd Ave.
SE 76th Ave.
SE 82nd Ave.
SE 92nd Ave.
NE 102nd Ave.
SE Bell Ave.
SE Linwood Ave
SE Fuller Rd.
SE Washington St.
Hawthorne Bridge
SW Madison St.
SW 4th Ave.
SW Naito Pky.
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SOUTH CORRIDOR PROJECT
METRO
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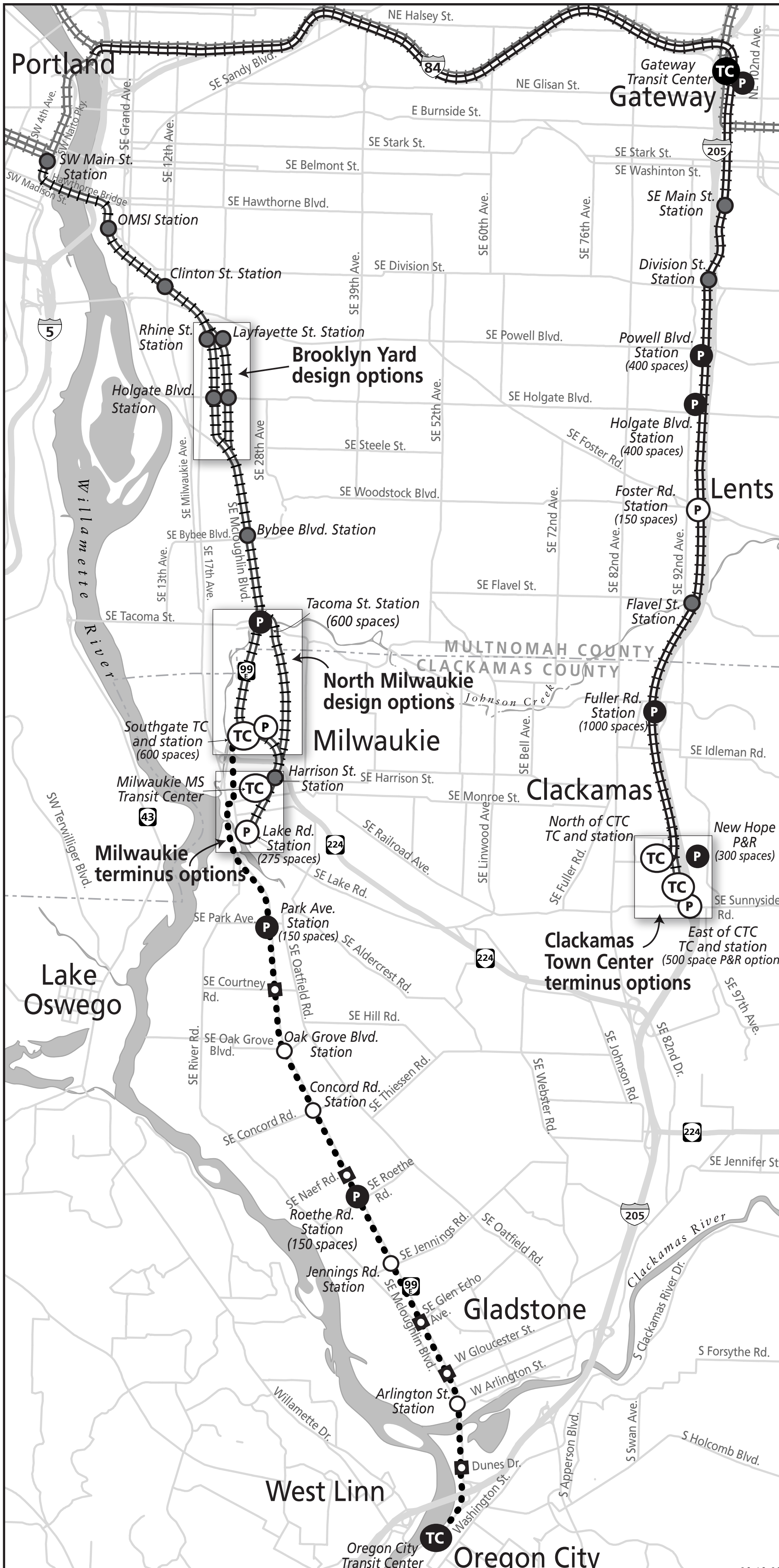
Combined Light Rail Alternative

Figure S.4-5



LEGEND

- Light Rail and station
- Bus Rapid Transit and station
- Existing Light Rail
- TC Transit Center / TC Option
- P Park & Ride / P Option
- Local bus stop improvements
- County Line

SOUTH CORRIDOR PROJECT Transportation Alternatives

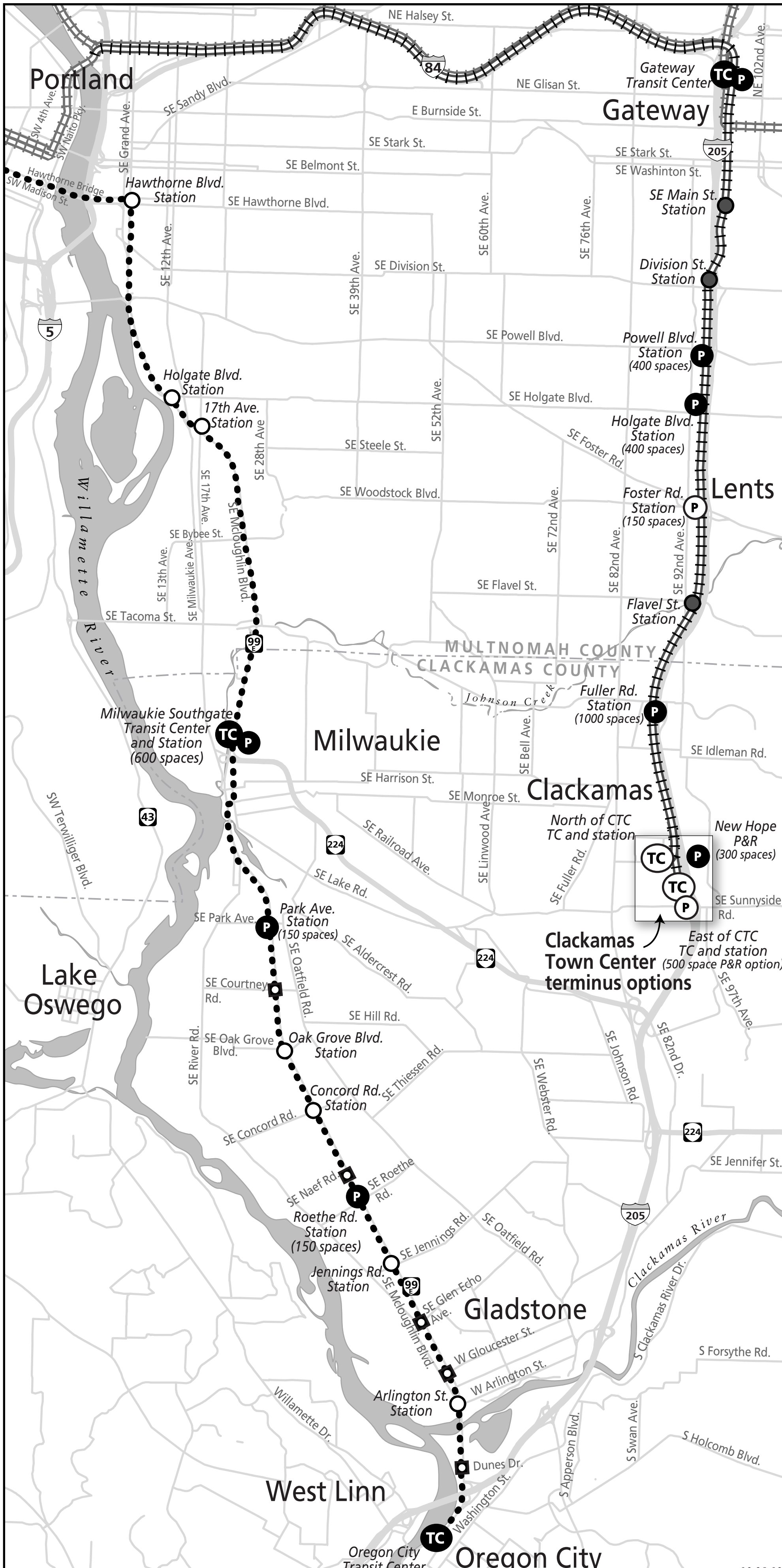
0 1 2 Miles N

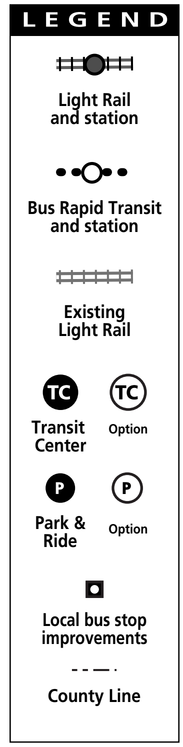
METRO

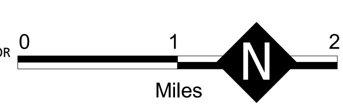
SOUTH CORRIDOR PROJECT

I-205 Light Rail Alternative

Figure 2-4







SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

S.5 TRANSPORTATION IMPACTS

This section summarizes the transit, highway and freight impacts (2020) of the alternatives. Variations in some transportation impacts would occur due to different design options.

S.5.1 Transit Impacts

The alternatives would impact transit service and facilities in the corridor by changing the amount of service; the residential and employee access to fixed-guideway stations; transit travel times; reliability; and ridership.

Amount of Transit Service. The No-Build Alternative would include a limited number of new bus routes and improved headways on existing routes that would result in a 37.8 percent increase in transit vehicle miles traveled (for more information, see Table 4.2-1 of the SDEIS). Vehicle hours increase proportionately more than vehicle miles, indicating slower speeds on increasingly congested streets and highways under the No-Build Alternative. Compared to the No-Build Alternative, all of the build alternatives increase the amount of transit service and transit capacity in the corridor.

Residential and Employee Quarter-Mile Walk Access to Fixed-Guideway Stations. Neither the No-Build Alternative nor the BRT Alternative would result in an increase in the number of residents or employees with quarter-mile walk access to a fixed-guideway station, compared to existing conditions with the addition of the Yellow Line north of the Rose Quarter (year 2020) because neither alternative includes fixed guideway stations in the South Corridor. The Busway, Milwaukie LRT and I-205 LRT alternatives would increase the number of residents with quarter-mile walk access to a fixed-guideway station. The Combined LRT Alternative would provide access to approximately 50% more jobs and residents than either the Milwaukie LRT, Busway or I-205 LRT Alternatives.

Transit Travel Times. With a few exceptions (see Table S.5-1), all of the alternatives would improve average weekday p.m. peak hour transit travel times in 2020 from the Pioneer Square and the Rose Quarter to the Milwaukie Town Center and the Clackamas Regional Center, compared to the No-Build Alternative. Total transit travel times would improve by one to 15 minutes.

Reliability. The alternatives with reserved right-of-way for transit (all but No-Build and BRT) would provide the greatest amount of separation of transit vehicles from the adjacent automobile traffic (see Table S.5-1), which would generally provide for a higher level of reliability than an alternative operating in mixed traffic. The BRT Alternative would provide a higher level of reliability than the No-Build Alternative because of intersection and signalization improvements.

Ridership. All of the build alternatives would result in an increase in transit ridership systemwide, in the South Corridor and on BRT, Busway and LRT trunk lines. BRT, Busway and LRT ridership ranges from 24,700 average weekday boarding rides (2020) for the BRT Alternative to 60,600 for the Combined LRT Alternative. The BRT, Busway and Milwaukie LRT alternatives would increase originating rides by 4,800 to 7,900 rides per average 2020 weekday (an originating ride is defined as a one-way person trip from a point of origin to a destination, independent of whether that trip would include a transfer from one transit vehicle to another or not). The I-205 LRT and Combined LRT alternatives would increase originating rides by 13,700 and 16,100 originating rides, respectively.

Table S.5-1
Summary of Transit Impacts, by Alternative[1]

Measures	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Measures of Transit Service						
Corridor Place Miles[2]	1,833,240	2,418,640	2,453,920	2,480,690	2,781,700	2,698,350
Population with Fixed-Guideway Access[3]	0	0	7,990	9,350	8,290	19,910
Employment with Fixed-Guideway Access[3]	0	0	21,290	24,390	8,390	32,780
P.M. Peak Hour Transit Travel Time (In-Vehicle / Total)[4]						
From Pioneer Square to:						
Milwaukie Town Center	25 / 31	25 / 32[5]	23 / 30	14 / 30	25 / 32	14 / 31
Clackamas Regional Center	47 / 55	38 / 46	34 / 42	27 / 47	37 / 46	37 / 47
P.M. Peak Hour Transit Travel Time (In-Vehicle / Total)[4]						
From Rose Quarter to:						
Milwaukie Town Center	30 / 40	32 / 41[5]	30 / 39	20 / 29	32 / 42	20 / 31
Clackamas Regional Center	41 / 53	41 / 53	41 / 53	36 / 46	29 / 38	29 / 38
Measures of Reliability						
Miles of Fixed Guideway[6]	0	0.2	6.7[7]	6.7[7]	6.7[7,8]	13.2[8]
% of Passenger-Miles in Reserved Right-of-Way	0%	0%	20%	18%	18%	31%
% of Intersections Protected	N/A	53%	63%	65%	87%	97%
Transit Mode Share[9] From:						
Downtown Portland	56%	60%	62%	56%	60%	57%
Clackamas Regional Center	3%	3%	3%	3%	5%	6%
Gateway Regional Center	9%	9%	9%	9%	12%	12%
Milwaukie Town Center	5%	5%	5%	6%	4%	6%
BRT Bus Line, Busway Bus Line and LRT Boarding Rides[10]						
Portland to Milwaukie	0			25,330[13]	13,750[11]	20,950[13]
Milwaukie to Oregon City	0	24,760[11]	30,600[12]	15,360[11]		6,810[11]
Milwaukie to Clackamas	0				0	0
Gateway to Clackamas	0	0	0	0	33,270[13]	32,300[13]
Total	**0**	**24,760**	**30,600**	**40,690[14]**	**47,020**	**60,060[15]**
Systemwide Transit Ridership						
Originating Rides[16]	475,000	480,400	482,900	479,800	488,700	491,100

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. All data is for an average weekday in 2020, unless otherwise specified.

1. The analyses of alternatives are based on a common set of design options, as defined in Table 2.2-3 and described in Section 2.2 of the SDEIS – characteristics of an alternative may vary with other design options.
2. Place miles = transit vehicle capacity (seated and standing) for each vehicle type, multiplied by vehicle miles traveled for each vehicle type (see Table S.3-1).
3. Changes in population and employment compared to the number of residents and employment that would be within a quarter-mile of a fixed-guideway station that would be provided with the region's existing transit system and the addition of the Yellow Line.
4. In minutes, for travel in the p.m. peak period. In-vehicle time is only the time that a passenger would spend within a public transit vehicle. Total time is the sum of in-vehicle time and all other time related to completing the trip, including walking and waiting time.
5. Compared to the No-Build Alternative, the BRT Alternative would include additional bus stops (i.e., BRT stations) in the Portland to Milwaukie Segment, which would increase the average travel time for buses in the segment, while improving reliability and transit accessibility.
6. A fixed-guideway facility would provide an exclusive grade- and/or barrier-separated transit right-of-way (i.e., a busway or light rail alignment) – see Section 2.2 of the SDEIS for more detail.
7. Note that the BRT, Busway and Milwaukie Light Rail alternatives would rely on the Hawthorne Bridge for the routing of BRT or busway trunkline bus routes or the light rail line, and the reliability of these trunklines would be adversely affected by bridge lifts that would occur during off-peak time periods. The BRT, Busway and Milwaukie Light Rail alternatives would all include 0.2 mile bus ramps from SE Main Street to Highway 224.
8. Includes only the new portion of light rail alignment that would be added with that alternative.
9. Transit mode share is the percentage of all trips traveling from the activity center to the South Corridor during the p.m. peak two hours that would be taken on transit.
10. Boarding rides are defined as anytime a passenger would board a transit vehicle, independent of whether the boarding would be the result of a transfer from another transit vehicle or not (i.e., unlinked). With several alternatives, the BRT or busway bus lines would span two or more segments and the boarding rides for those lines are grouped together, as illustrated in the table. There would be other boarding rides in the corridor under each alternative, which would be provided by local bus routes, including some local bus routes that would use the busway guideway under the Busway Alternative.
11. BRT bus lines – see Section 2.2 of the SDEIS for a more detailed description of BRT bus lines.
12. Busway bus lines – see Section 2.2 of the SDEIS for a more detailed description of busway bus lines.
13. Light rail line – see Section 2.2 of the SDEIS for a more detailed description of light rail lines.
14. Total includes approximately 7,400 boarding rides that would transfer between BRT buses and Milwaukie LRT.
15. Total includes approximately 3,500 boarding rides that would transfer between BRT buses and Milwaukie LRT.
16. An originating ride (i.e., a linked trip) is defined as a one-way trip from an origin (e.g., one's home) to a destination (e.g., one's place of work), independent of whether the trip would require a transfer or not.

S.5.2 Traffic Impacts

A. Regional Traffic Impacts.

Regional traffic impacts are assessed through three regional congestion measures: vehicle miles traveled (VMT); vehicle hours traveled (VHT); and vehicle hours of delay (VHD). Also included are vehicle volumes at two congestion cutlines (that capture traffic flows on a set of parallel roadways); and parking spaces that would be removed. All of the build alternatives would help to reduce congestion and related problems, compared to the No-Build Alternative. The Combined LRT Alternative would do the most to reduce VMT and VHD in 2020; VMT and VHT would be reduced by over 71,000 miles and by over 4,000 hours per average weekday, and VHD would be reduced by 720 hours (see Table S.5-2). The reduction in VMT, VHT and VHD would be over three times greater with the I-205 LRT Alternative than it would be with the BRT, Busway and Milwaukie LRT alternatives.

Table S.5-2
Summary of Traffic Impacts

Measures	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Measures of Regional Travel[2]						
Vehicle Miles of Travel	36,248,000	36,222,100	36,214,700	36,228,000	36,181,400	36,176,800
Vehicle Hours of Travel	1,344,800	1,343,600	1,342,940	1,344,060	1,340,820	1,340,790
Vehicle Hours of Delay	51,280	51,260	51,180	51,280	50,710	50,560
Average Weekday Vehicle Volumes at Select Cutlines[3]						
E-19: I-205 and Parallel Streets at SE Powell Blvd.	56,300	55,900	55,900	55,800	55,400	55,400
E-20: SE McLoughlin Blvd. and Parallel Streets at SE Powell Blvd.	20,700	20,500	20,300	20,400	20,400	20,300
Parking Spaces Removed[4]						
Portland to Milwaukie	0	43	468	539	43	539
Milwaukie to Clackamas	0	25	175	25	0	0
Gateway to Clackamas	0	0	0	0	430	430
Milwaukie to Oregon City	0	392	392	392	392	392
Total	**0**	**460**	**1,035**	**956**	**865**	**1,361**

Source: Metro, September 2002.

Note: BRT = bus rapid transit; LRT = light rail transit. Unless otherwise noted, all data is average weekday 2020.

1 The analyses of alternatives are based on a common set of design options, as defined in Table 2.2-3 and described in Section 2.2 of the SDEIS – characteristics of an alternative may vary with other design options.

2 Vehicle miles and hours traveled excluded transit vehicles.

3 The number of vehicles that would cross the cutline (an imaginary east-west or north-south line between two geographic points) on a designated set of parallel streets in both directions within the two-hour p.m. peak period. The numbers E-19 and E-20 are Metro's designation for these two cutlines, illustrated in Figure 4.1-1 of the SDEIS. Cutline E-19 is comprised of the following roadways: SE 26th, 39th, 52nd, 72nd, 82nd, 112th, 122nd and 136th avenues, SE Foster Road and I-205. E-20 is comprised of the following roadways: SE McLoughlin Boulevard, SE Milwaukie Street and SE 17th Avenue.

4 On-street and off-street parking spaces that would be removed.

Cutline Vehicle Volumes. In summary, all of the build alternatives would reduce p.m. peak vehicle volumes at the cutlines on I-205 and SE McLoughlin Boulevard at SE Powell Boulevard. The largest reductions on I-205 and parallel streets would result from the I-205 LRT and Combined LRT alternatives and the largest reductions on SE McLoughlin Boulevard would occur with the Busway and Combined LRT alternatives.

Parking Spaces Removed. Except for the No-Build Alternative, all of the alternatives would result in the removal of on-street and/or off-street parking spaces, ranging from 460 spaces removed with the BRT Alternative to 1,361 spaces removed with the Combined LRT Alternative (see Table S.5-2).

B. Local Traffic Impacts

Local traffic impacts are measured in terms of level of service (LOS), volume-to-capacity (V/C) changes or long queue lengths that would occur at intersections or on key roadway segments. These impacts could be the result of: changes in traffic volumes related to the provision of light rail service (particularly the access and egress of vehicles from park-and-ride lots); transit vehicle priority treatments at intersections; and/or modifications to existing roadways that could reduce roadway capacity or at-grade street crossings by light rail. Most of the local traffic impacts that would result from the alternatives under consideration could be fully or substantially mitigated through a range of identified mitigation measures. Following are the local traffic impacts that would be difficult and costly or infeasible to mitigate:

- **Hawthorne Bridge.** The Busway, Milwaukie LRT and Combined LRT alternatives would result in vehicle queuing and additional automobile travel time, which would be difficult and costly to fully mitigate.

- **SE 11th and 12th Avenues and SE Clinton Street.** With the Busway, Milwaukie LRT and Combined LRT alternatives, busway and light rail at-grade crossings of SE 11th and 12th Avenues and SE Clinton Street would result in vehicle queuing and delays during peak periods which would be difficult and costly to fully mitigate.

- **SE 17th Avenue and SE Holgate Boulevard.** With the Milwaukie LRT and Combined LRT alternatives and the Brooklyn Yard Design Option, the light rail at-grade crossing of SE Holgate Boulevard would result in vehicle queues that could occasionally block SE 17th Avenue during peak periods. Mitigation measures might not fully mitigate the traffic impacts.

- **SE McLoughlin Boulevard and SE Milport Road.** With all Alternatives, except the No-Build Alternative and the Milwaukie LRT and Combined LRT alternatives with the Tillamook Branch Line Design Option, westbound vehicle queues would develop during the p.m. peak period on SE Milport Road due to the Milwaukie Southgate Park-and-Ride Lot. Delays related to the queuing would be difficult and costly to fully mitigate.

- **Foster Road Park-and-Ride Lot.** It was initially identified as a 150 surface parking lot, located below I-205 on a vacant parcel between SE Foster Road and SE Woodstock Boulevard. ODOT and FHWA have determined that this site would not meet ODOT and FHWA access control standards for Interstate interchanges and FHWA would not approve an interchange access break for a park-and-ride lot in this location.

- **Fuller Road Park-and-Ride Lot Access.** With the I-205 LRT and Combined LRT alternatives, it would be difficult to fully mitigate traffic delay that would occur during the a.m. peak period at the intersection of SE Fuller Road and SE Johnson Creek Boulevard. In addition, ODOT has plans to improve the interchange at I-205 and SE Johnson Creek Boulevard. The improved interchange could eliminate certain turning movements at the intersection of SE Fuller Road with SE Johnson Creek Boulevard. Mitigation concepts that would address the restricted access to the park-and-ride lot could include moving the park-and-ride lot or realigning SE Fuller Road.

S.6 ENVIRONMENTAL CONSEQUENCES

This section summarizes environmental impacts that would occur with the alternatives. Table S-6.1 summarizes the environmental consequences of the alternatives.

S.6.1 Land Use and Economic Impacts

Each build alternative would contribute to the effectiveness of the overall transportation system in the corridor, and would, therefore, help to maintain the economic growth of the region. The LRT alternatives would have the greatest potential to positively impact regional land use and development patterns by providing a fourth spoke in the region's LRT system, which would provide high capacity transit connections between the Portland Central City and several regional and town centers. Additionally, light rail stations would have the potential to serve as nodes to attract transit-oriented development, more so than the BRT and busway stations. Short-term economic benefits of the build alternatives would be significant, with the largest increase in short-term employment resulting from the Combined LRT Alternative (over 7,000 additional person-year jobs and approximately $287 million in additional personal income, compared to the No-Build Alternative – 2002 dollars) (see Table S.6-1).

S.6.2 Community Impacts

Community impacts are defined as adverse impacts to neighborhood character, cohesion and livability that could result from traffic, access, noise, vibration, displacements and visual impacts resulting from the alternatives. The Busway and Combined LRT alternatives would result in the greatest number of potential displacements (53), and the BRT Alternative would result in the fewest (six). See sections S.5.2, S.6.3 and S.6.5 for summaries of the local traffic, visual, and noise and vibration impacts, respectively. The build alternatives would also provide potential benefits by improving neighborhood access to community facilities and services. The Combined LRT Alternative would result in the greatest number of benefits from improved access, while the BRT Alternative would result in the fewest improvements in transit access (see Section S.5.1 for additional detail).

S.6.3 Visual Impacts

Impacts to the visual and aesthetic environment are defined as changes to the existing conditions that would be brought about by the capital facilities included within the alternatives. Visual impacts are identified by assessing viewer sensitivity, level of change (from the No-Build Alternative) and level of impact. There would be no significant visual impacts with the BRT Alternative. The Busway Alternative would have a relatively high level of impact on the visual environment at two locations. The Milwaukie LRT Alternative would also have a high level of impact on the visual environment at two other locations. The I-205 LRT Alternative would have a high level of impact on the visual environment at one location.

S.6.4 Air Quality Impacts

In 1997, the Environmental Protection Agency (EPA) approved the carbon monoxide (CO) and ozone Air Quality Maintenance Plan (AQMP) for the Portland/Vancouver region. In January 2001, the US Department of Transportation issued its determination of conformity for the Financially

Constrained System of the 2000 Regional Transportation Plan (The No-Build Alternative) finding that the RTP supports the purpose of the region's State Implementation Plan (SIP). Consistency with the AQMP requires that CO and ozone levels be kept within Federal and state standards. Under all of the alternatives, Federal and state air quality standards would be met. The I-205 LRT and Combined LRT alternatives would result in the greatest reductions in each pollutant type, while the Milwaukie LRT Alternative would result in the smallest reduction in emissions.

S.6.5 Noise and Vibration Impacts

Table S.6-1 summarizes the number of adverse noise and vibration impacts (adverse impacts are those noise and vibration impacts that would exceed Federally-adopted standards) that would occur under each alternative without and with identified mitigation measures. Note that there would be noise and vibration impacts that are not categorized as adverse under each alternative, except with the No-Build Alternative, and it would not be feasible to mitigate some of those impacts (see Section 3.4 of the SDEIS for more detailed information). The I-205 and Combined LRT Alternatives would result in the greatest number of noise and vibration impacts. These impacts could be mitigated.

S.6.6 Ecosystems Impacts

In general, most of the potential impacts to wetlands would be avoided through the current conceptual design, and the remaining impacts would be relatively small for potential projects of this scale. Table S.4-1 summarizes the remaining impacts of the alternatives to wetlands. The No-Build Alternative would result in no impacts to wetlands. The Milwaukie LRT and Combined LRT alternatives would result in the filling of less than two-thirds of an acre of wetlands, while the Busway Alternative would result in the filling of approximately one-third of an acre of wetlands. Only 0.03 of an acre of wetland would be filled under the BRT and I-205 alternatives.

The build alternatives could potentially impact streams bearing fish that are listed as threatened or endangered. The Busway would impact 131 feet of streams that are habitat for listed species and the Milwaukie and I-205 LRT Alternatives would impact 58 and 55 feet of streams respectively. The Combined LRT Alternative would impact 113 feet of stream habitat.

S.6.7 Water Quality and Hydrology Impacts

In general, the current design of the alternatives would avoid most of the potential impacts to floodplains. Table S.6-1 summarizes the remaining impacts of the alternatives to floodplains. In summary, the Busway, Milwaukie LRT and Combined LRT alternatives would result in 9,000 to over 30,000 cubic yards of fill within the 100-year floodplain compared to only 200 cubic yards of fill with the I-205 LRT Alternative (based on the existing 100-year floodplain maps and on the expected modifications to the maps - see Section 3.12 of the SDEIS for more information on floodplain definitions).

S.6.8 Energy Impacts

Compared to the No-Build Alternative, each of the build alternatives would reduce total regional energy consumption: the greatest reduction in operational energy consumption would occur with the Combined LRT Alternative (a reduction of 0.503×10^9 British Thermal Units (BTU) per average weekday in 2020), and the smallest reduction would occur with the Milwaukie LRT Alternative (a reduction of 0.101 x 10^9 BTU per average weekday) (see Table S.5-1). Energy consumption for construction would be greatest under the Combined LRT Alternative (4,874.890 x 10^9 BTU), compared to a low of 630.71 x 10^9 BTU with the BRT Alternative.

S.6.9 Geology, Soils and Seismic Impacts

The South Corridor alternatives would generally cross land that is already urbanized, and the long-term impacts to the geologic environment of all of the alternatives would consist of: relatively minor changes in topography and drainage patterns; minor settlement of near-surface materials; increased erosion; and potential changes in slope stability. Short-term impacts related to construction of the build alternatives would be relatively minor, limited to stability of partially-constructed slopes, temporary changes to drainage, erosion and sedimentation.

S.6.10 Hazardous Materials Impacts

Existing hazardous waste sites and facilities on or near the proposed transit improvements could present a low-level risk to the project during construction. Clean up of hazardous sites would be completed prior to construction related to transit improvements. The number of sites that would be displaced by the alternatives is summarized in Table S.6-1. All alternatives would result in the displacement of six sites in the Milwaukie to Oregon City Segment. The Busway, Milwaukie LRT and Combined LRT alternatives would result in five or seven additional site displacements.

S.6.11 Historic, Archaeological, Cultural and Parks Impacts

Within the South Corridor's area of potential effect, there are seven individual historic resources listed in the *National Register of Historic Places*. An additional 17 sites are eligible for listing and 21 are potentially eligible for listing. There are five potential archaeological sites located within the South Corridor's area of potential effect. There are also 24 public parkland resources located within approximately 150 feet of the study alternatives. Neither the No-Build nor the BRT alternatives would have an adverse impact on historic resources (see Table S.6-2). The I-205 LRT and Combined LRT alternatives would adversely affect one historic resource and the Busway alternative would adversely impact two historic. The Milwaukie LRT and Combined LRT alternatives would adversely affect five historic resources.

The No-Build Alternative would have no potential adverse impacts to identified archaeologically-sensitive areas. The BRT and the I-205 LRT alternatives would have the potential to adversely affect one archaeologically-sensitive site. The Busway Alternative would have the potential to affect four possible archaeological sites, compared to three potentially affected sites with the Combined LRT Alternative and two with the Milwaukie LRT Alternative.

The No-Build and BRT alternatives would not result in the use of any identified parkland. All of the other alternatives would result in the use of the Springwater Trail. The Milwaukie LRT and Combined LRT alternatives would both result in the use of an informal park or open space at the west end of the Hawthorne Bridge and at the Milwaukie Middle School site.

Table S.6-1
Summary of Environmental Impacts, by Alternative[1]

Measures	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Land Use and Economic[2]						
Long-Term Annual Employment	0	61	67	36	101	95
Short-Term Employment	0	710	1,480	3,610	3,090	7,260
Short-Term Personal Income	$0.0	$27.9	$58.1	$142.4	$121.7	$285.7
Displacements: Residential / Business / Institutional or Public						
Portland to Milwaukie	0 / 0 / 0	0 / 0 / 0	1 / 44 / 1	1 / 35 / 1	0 / 0 / 0	1 / 35 / 1
Milwaukie to Clackamas	0 / 0 / 0	0 / 4 / 0	0 / 5 / 0	0 / 4 / 0	0 / 0 / 0	0 / 0 / 0
Gateway to Clackamas	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	13 / 1 / 0	13 / 1 / 0
Milwaukie to Oregon City	0 / 0 / 0	0 / 2 / 0	0 / 2 / 0	0 / 2 / 0	0 / 2 / 0	0 / 2 / 0
Total	**0 / 0 / 0**	**0 / 6 / 0**	**1 / 51 / 1**	**1 / 41 / 1**	**13 / 3 / 0**	**14 / 38 / 1**
Regional Air Quality[3]						
Carbon Monoxide	406.425	406.189	406.090	406.209	405.755	405.668
Nitrogen Oxides	65.786	65.746	65.733	65.750	65.669	65.655
Volatile Organic Compounds	50.961	50.931	50.919	50.934	50.877	50.866
Noise and Vibration: Adverse Impacts[4] Without / With Identified Mitigation						
Portland to Milwaukie	0 / 0	0 / 0	0 / 0	4 / 0	0 / 0	4 / 0
Milwaukie to Clackamas	0 / 0	0 / 0	0 / 9	0 / 0	0 / 0	0 / 0
Gateway to Clackamas	0 / 0	0 / 0	0 / 0	0 / 0	30 / 0	30 / 0
Milwaukie to Oregon City	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
Total	**0 / 0**	**0 / 0**	**0 / 9**	**4 / 0**	**30/ 0**	**34 / 0**
Ecosystems: Acres of Wetland Filled / Spanned						
Portland to Milwaukie	0 / 0	0 / 0	0.36 / 0	0.56 / 0	0 / 0	0.56 / 0
Milwaukie to Clackamas	0.02 / 0	0.01 / 0	0.03 / 0	0.01 / 0	0 / 0	0 / 0
Gateway to Clackamas	0 / 0	0 / 0	0 / 0	0 / 0	0.03 / 0.07	0.03 / 0.07
Milwaukie to Oregon City	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
Total	**0 / 0**	**0.03 / 0**	**0.39 / 0**	**0.057 / 0**	**0.03 / 0.07**	**0.59 / 0.07**
Linear feet of streams with threatened or endangered fish species						
Total	**0**	**0**	**131 feet**	**58 feet**	**55 feet**	**113 feet**
Water Quality/Hydrology: **Additional Impervious Acres**						
Portland to Milwaukie	0.0	3.5	20.2	16.4	3.5	16.4
Milwaukie to Clackamas	6.5	10.2	20.2	10.2	0.0	0.0
Gateway to Clackamas	0.0	0.0	0.0	0.0	23.2	23.2
Milwaukie to Oregon City	0.0	10.8	10.8	10.8	10.8	10.8
Ruby Junction	0.0	0.0	0.0	0.0	1.4	1.4
Total	**6.5**	**24.5**	**51.0**	**37.4**	**38.9**	**51.4**
Water Quality and Hydrology: **Cubic Yards Fill In Flood Plain**						
Portland to Milwaukie[5]	0	0	9,500 / 38,000	9,200 / 32,600	0	9,200 / 38,600
Milwaukie to Clackamas	0	0	0	0	0	0
Gateway to Clackamas	0	0	0	0	200	200
Milwaukie to Oregon City	0	0	0	0	0	0
Total	**0**	**0**	**9,500 / 38,000**	**9,200 / 32,600**	**200**	**9,400 / 38,800**
Energy Consumption						
Regional Daily Vehicle (10^9 BTU)	322.522	322.328	322.266	322.421	322.058	322.019
Construction Energy (10^9 BTU)	0.000	630.710	1,310.641	2,547.210	2,327.680	4,874.890
Hazardous Materials Sites Displaced: CERCLIS / ECSI[6]						
Portland to Milwaukie	0 / 0	0 / 0	1 / 5	1 / 7	0 / 0	1 / 7
Milwaukie to Clackamas	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
Gateway to Clackamas	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
Milwaukie to Oregon City	0 / 6	0 / 6	0 / 6	0 / 6	0 / 6	0 / 6
Total	0 / 6	0 / 6	0 / 11	1 / 13	0 / 6	1 / 13

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.

1 The analyses of alternatives are based on a common set of design options, as defined in Table 2.2-3 in the SDEIS.
2 Short-term economic impacts would be the result of construction-related activities within the Portland metropolitan area, expressed in person-year jobs. Long-term impacts would be the result of the on-going operation of the transit facility and additional transit vehicles (based on 2020 service levels) and would be expressed in full-time equivalent jobs.
3 All emission reductions are measured for the Portland metropolitan region in tons per average weekday in the year 2020.
4 Based on adverse noise impacts as defined by the FHWA and the FTA criteria. The alternatives, except for the No-Build Alternative, would result in increased noise levels at some receivers to the point where noise abatement would be considered – see Section 3.4 of the SDEIS for more information.
5 Two estimates are provided: the greater estimate is based on the existing 100-year Floodplain as described on the FEMA Flood Insurance Rate Maps (FIRM); and the lower estimate is based on an expected modification to the FIRM maps.
6 CERCLIS = Comprehensive Environmental Response, Compensation and Liability Information System, which tracks Federal superfund sites; ECSI = Environmental Clean-up Site Inventory, which is the Oregon Department of Environmental Quality's list of significant hazardous materials sits.

Table S.6-2
Summary of Historic and Parkland Impacts

Characteristic	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Historic Resources Adversely Affected						
Portland to Milwaukie	0	0	2	5	0	5
Milwaukie to Clackamas	0	0	0	0	0	0
Gateway to Clackamas	0	0	0	0	1	1
Milwaukie to Oregon City	0	0	0	0	0	0
Archaeologically-Sensitive Areas Potentially Affected						
Portland to Milwaukie	0	0	2	2	0	2
Milwaukie to Clackamas	0	0	1	0	0	0
Gateway to Clackamas	0	0	0	0	1	1
Milwaukie to Oregon City	0	1	1	1	1	1
Parklands: Number of Parks Used						
Portland to Milwaukie	0	0	1	3	0	3
Milwaukie to Clackamas	0	0	0	0	0	0
Gateway to Clackamas	0	0	0	0	1	1
Milwaukie to Oregon City	0	0	0	0	0	0

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
[1] The analyses of alternatives are based on a common set of design options, as defined in Table 2.2-3 and described in Section 2.2 of the SDEIS – characteristics of an alternative may vary with other design options.

S.7 EVALUATION OF THE ALTERNATIVES

This section evaluates the alternatives for the South Corridor Project from four different perspectives:

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

S.7.1 Financial Feasibility Analysis

The purpose of this section is to provide an assessment of the financial feasibility of the alternatives under consideration, given the costs of the alternatives and given the current, anticipated and potential sources of revenue. The financial feasibility analysis for the South Corridor Project has been divided into the two following elements, because each element would have a different financing plan:

The Project Capital Financial Feasibility Analysis focuses on whether there are adequate project capital resources currently available to construct each alternative, and, if not, the options for resolving the project capital need for additional resources.

The System Fiscal Feasibility Analysis focuses on whether there are adequate resources to operate and maintain the entire transit system, including operations of the South Corridor Project alternatives, between now and the year 2020, and, if not, the options for resolving the system financial need. System costs include all transit operation and maintenance (O&M) costs and all transit capital expenditures to the year 2020, except for the capital costs of the South Corridor Project alternatives accounted for in the Project Capital Financial Feasibility Analysis.

S.7.1.1 Costs

This section summarizes the project capital costs and changes to the system costs that would occur with each of the alternatives.

A. Project Capital Costs

Table S.7-1 presents the South Corridor Project costs for each of the alternatives, in year-of-expenditure (YOE) dollars. The project capital costs would include all facility improvements and vehicle purchases required by each alternative, in excess of the capital costs that are currently committed and included within the No-Build Alternative. YOE project capital costs range from \$119.04 to \$131.15 million with the BRT Alternative to \$825.57 to \$ 873.21 million with the Combined LRT Alternative.

Table S.7-1
Summary of Project Capital and Operating Costs, by Alternative (in millions of dollars)

	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Project Capital Costs in YOE Dollars[1]					
Low	$119.04	$267.10	$466.82	$507.39	$825.57
High	$131.15	$299.29	$517.97	$514.90	$873.21
Annual O&M Costs[2]					
Bus	$22.42	$23.46	$15.59	$17.88	$14.06
Light Rail	$0.00	$0.00	$7.03	$9.28	$13.34
Total	**$22.42**	**$23.46**	**$22.62**	**$27.16**	**$27.40**
Annual O&M Costs: Difference from the No-Build Alternative[2]					
Bus	$7.19	$8.24	$0.36	$2.65	-$1.17
Light Rail	$0.00	$0.00	$7.03	$9.28	$13.34
Total	**$7.19**	**$8.24**	**$7.39**	**$11.92**	**$12.17**

Source: TriMet, November 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; YOE = year-of-expenditure; O&M = operating and maintenance.
[1] Low = the cost of an alternative if the lowest cost design option was selected in each instance; high = the cost of an alternative if the highest-cost design option was selected in each instance (see Table 2.3-2 of the SDEIS for the cost difference between design options by alternative. Project capital costs include the cost of improvements that would occur prior to opening day (September, 2008) and those capital costs that would be incurred between 2008 and 2020.
[2] O&M costs are in 2002 dollars for the South Corridor, based on 2020 service levels.

B. System Costs

System costs include all capital and O&M expenditures by TriMet over the 20-year planning period, except the capital costs for the South Corridor Project. Total system cost is the aggregate of system operating costs and system capital costs. System operating costs include all annual transit operating and maintenance costs, including the cost of operating and maintaining: 1) the existing transit system; 2) customary increases in transit service hours throughout the system that are required to maintain headways and capacity; 3) the applicable South Corridor Project alternative, and 4) the expanded bus network in the South Corridor that would be required to support the project alternative. Table S.7-2 summarizes the cumulative system operating costs (shown in YOE dollars) covering the 20-year planning period for each alternative.

Table S.7-2
Summary of System Costs, Revenues and Working Capital Analysis:
Cumulative Total from FY 2002 to FY 2020, by Alternative (in billions of YOE dollars)

	No Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
System Costs						
O&M	$9.742	$9.944	$9.967	$9.942	$10.068	$10.315
Capital	$1.098	$1.098	$1.098	$1.098	$1.098	$1.098
Total System Costs	**$10.840**	**$11.042**	**$11.065**	**$11.040**	**$11.166**	**$11.413**
Total System Revenues	**$11.220**	**$11.191**	**$11.196**	**$11.222**	**$11.230**	**$11.225**
System Feasibility Analysis						
Low Year of Working Capital[1]		1.0	0.6	0.5	-0.5	-2.4
Years with Working Capital Below 2.0 months		11	13	13	15	15

Source: TriMet, November 2002.
Note: FY = fiscal year; YOE = year-of-expenditure; BRT = bus rapid transit; LRT = light rail transit; O&M = operating and maintenance.
[1] Without additional revenues.

S.7.1.2 Currently Available Revenues

Two categories of available revenue resources are examined within this section: revenue resources reserved for South Corridor Project capital costs; and revenue resources reserved for transit system costs.

A. Currently Available Transit Project Capital Revenues

Currently, there are $69.4 million of revenues available for project capital costs, consisting of the following (not all sources or amounts are available for all alternatives):

- **$24.4 Million in Regional Surface Transportation Program (STP) Funds** through Metro.
- **$30 Million in Clackamas County Tax Increment Funds** for expenditure within the Clackamas Town Center Urban Renewal District only.
- **$15 Million in TriMet General Funds** for Opening Year Costs.

B. Available Transit System Revenues

System revenues are derived from a series of sources. As shown in Table S.7-2, existing transit system revenue sources are projected to provide between $11.191 and $11.230 billion (YOE dollars) between FY 2002 and FY 2020, depending on the alternative. The difference in revenue between alternatives reflects differences in passenger revenues and interest earnings. The major sources of available System revenue include the following:

- **Payroll Tax Revenues.** TriMet currently levies a 0.6218 percent tax on the gross payrolls of private businesses and municipalities within its district. The tax is dedicated to TriMet and is TriMet's largest source of operating revenue, accounting for nearly 54 percent ($152 million) of its operating revenues in FY 2001.
- **Self-Employment Tax Revenues.** TriMet also levies a 0.6218 percent tax on the gross profits earned within its district by self-employed individuals.
- **State In-Lieu Revenues.** State of Oregon government offices located within TriMet's district boundaries are not subject to the municipal payroll tax – instead, the offices make in-lieu of tax payments to TriMet.

S.7.1.3 Existing Revenue Needs

This section summarizes the identified project capital and system revenue needs for the alternatives.

A. Existing Project Capital Revenue Need

As shown in Table S.7-3, project capital shortfalls occur with all of the build alternatives, ranging from $79.64 million for the low-cost BRT Alternative to $803.81 million for the high-cost Combined LRT Alternative (note that the low-cost alternative is based on selecting the lowest-cost design option in each instance and the high-cost alternative is based on selecting the highest-cost design option in each instance). Table S.7-3 presents the low and high-cost range for each alternative. Section 2.2 and Section 2.3 of the SDEIS provide a description of the various design options and the cost differences between the design options, respectively. Options for eliminating these shortfalls, including possible federal funds, are discussed in Section S.7.1.4.

Table S.7-3
Summary of Project Capital Costs, Available Revenue and Revenue Need[1], by Low- and High- Cost Alternative (in millions of YOE dollars)

	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Low-Cost					
Project Capital Cost	$119.04	$267.10	$466.82	$507.39	$825.57
Available Capital Revenues	$39.40	$39.40	$39.40	$69.40	$69.40
Project Capital Need	**$79.64**	**$227.70**	**$427.42**	**$437.99**	**$756.17**
High-Cost					
Project Capital Cost	$131.15	$299.29	$517.97	$514.90	$873.21
Available Capital Revenues	$39.40	$39.40	$39.40	$69.40	$69.40
Project Capital Need	**$80.55**	**$259.89**	**$478.57**	**$445.50**	**$803.81**

Source: TriMet, November 2002.
Note: YOE = year-of-expenditure; BRT = bus rapid transit; LRT = light rail transit.
[1] Includes capital costs that would be incurred before opening day (i.e., September 2008) and between 2008 and 2020, for both BRT improvements and fixed-guideway improvements. Low cost = the cost and configuration of an alternative if the lowest-cost design option was selected in each instance; high cost = the cost and configuration of an alternative if the highest-cost design option was selected in each instance.

B. Existing System Revenue Need

System costs and revenues for the alternatives were projected on a year-by-year basis over the 20-year period from 2000 to 2020. While there would be some variations in the results by alternative, depending on the design options selected, those differences would not have a material effect on the basic conclusions described below. As shown in Table S.7-2, existing system revenues are insufficient for all of the build alternatives to maintain beginning year operating reserves at the desired two-month levels over 11 to 15 years, depending on the alternative. While existing revenues are sufficient to avoid negative operating results for the BRT, Busway and Milwaukie LRT alternatives, the I-205 LRT and Combined LRT alternatives would exhibit negative operating results in FY 2013 and FY 2011, respectively.

S.7.1.4 Proposed Additional Revenues

This section identifies the potential capital and system revenue sources that could be used to meet the South Corridor Project alternatives' identified revenue need.

A. Potential Project Capital Revenue Sources

Following is a description of the potential revenue sources to address the identified project capital revenue need:

- **Federal Section 5309 New Starts Funds.** FTA Section 5309 New Starts grants are discretionary federal funds available for new fixed-guideway transit systems and extensions to existing fixed-guideway systems. Currently, up to 80 percent of New Starts project costs can qualify for New Starts funding, however Congress and FTA are considering reducing the maximum New Starts share to 50 percent or 60 percent.

- **Federal Section 5309 Bus Funds.** FTA Section 5309 bus grants are discretionary funds available for bus acquisition and bus-related improvements, including BRT improvements. By statute, Section 5309 Bus funds require 20 percent local matching funds. In total, up to $104.9 million of Section 5309 Bus funds could be requested for the BRT Alternative. Up to $55.9 million of Section 5309 Bus funds could be used for the BRT component of the Milwaukie LRT Alternative, $50.4 million for the BRT component of the I-205 LRT Alternative and $13.2 million for the BRT component of the Combined LRT Alternative.

- **Other Local and Regional Funds**. A variety of additional local and regional funding sources will be considered to fund the locally preferred alternative. Depending on the alternative selected, additional local funds may be requested. For those alternatives exhibiting a larger funding gap than can be met with existing resources, a general obligation bond could be considered.

B. Potential System Revenue Sources

Increased Operating Revenues. TriMet's enabling legislation limits the employer payroll and self-employment tax rates to 0.6 percent; with upward adjustments permitted to account for revenues lost when areas are withdraw from the TriMet district (thus creating a tax rate of 0.6218 percent). As part of a larger transit expansion strategy, TriMet has been examining the possibility of increasing the pre-adjustment employer payroll and self-employment tax rates from 0.6 percent to 0.7 percent over a ten-year period in increments of 0.01 percent per year. This potential rate increase would require legislative approval of an amendment to TriMet's funding statute. If approved, a portion of the proceeds of such a tax rate increase could be used for South Corridor Project capital costs.

S.7.1.5 System Fiscal Feasibility Conclusions and Risk Assessment

This section summarizes the conclusion of the fiscal feasibility analysis for project capital and systemwide funding needs.

A. Project Capital Funding

Table S.7-4 shows the unidentified local capital funding required for all of the alternatives. The amount of this funding changes based on the level of Federal New Starts (S. 5309) funds received. The required level of additional funding has been identified for two likely scenarios, 50% or 60% Federal New Starts funding. Opening day (2008) costs are those costs required to initiate service for a project, but not to provide for system growth until the 2020-planning horizon. The 2008 to 2020 revenues required are those revenues required to purchase additional vehicles and/or additional capital facilities to operate at 2020 service levels. Tables 5.1-8 and 5.1-9 in the SDEIS more fully illustrate these scenarios.

It should be noted that even with a FFGA, a project must have funds appropriated to it on an annual basis to actually receive Federal funds. Appropriations are subject to budget limits, the demand for appropriations from other projects and other congressional dynamics. As a result, the amount of New Starts funds appropriated to a project in a given year may be less than what the project would require that year. If fewer New Starts funds were to be allocated than would be needed within one or more fiscal years, the finance plan could use interim borrowing to maintain its optimum construction schedule. Interim-borrowed funds would be repaid with later appropriated New Starts funds, but the project would incur interest costs in the interim.

Table S.7-4
Additional Local Capital Funding Required (Millions of Year of Expenditure Dollars)

	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
50% Section 5309 Funds					
Opening Day	$0	$101.5	$169.4	$105.1	$330.6
2008-2020	$0	$7.6	$15.2	$51.4	$28.4
60% Section 5309 Funds					
Opening Day	$0	$73.3	$127.7	$70.2	$250.6
2008-2020	$0	$6.1	$12.2	$41.1	$22.7
BRT					
Opening Day & 2008-20	$11.23	$0	$13.98	$12.61	$3.30

Source: Metro November 2002
Note: Capital costs for each alternative are based upon a set of design options discussed in Table 2.3-1 of the SDEIS.

All other alternatives require additional local funds to match identified Federal and local sources of funding. These range from the BRT Alternative at $11.3 million to the Combined LRT alternative at $359.0 million, depending upon the degree of Federal Section 5309 funds received.

B. System Fiscal Feasibility

In Section S.7.1.3, it was demonstrated that all of the alternatives would require additional system revenues to meet the minimum working capital standard in all years. A detailed system financing plan will be adopted after selection of the locally preferred alternative and documented in the project's Final Environmental Impact Statement. One possible component of a finance plan to address the system revenue need would be to seek and receive authority from the Oregon Legislature for a tax rate increase (the rate increase would be enacted by the TriMet Board of Directors). As previously mentioned, the fiscal condition of transit system operations is considered adequate if the beginning-of-year operating reserve (measured in months of operations) is maintained at two-months. With the tax rate increase there would be sufficient system revenues to operate all South Corridor Project alternatives and, in addition, implement substantial service increases in other portions of the system and still maintain beginning year operating reserves at desired levels.

C. Implementation of the Finance Plan

Implementation of the funding plan for the South Corridor Project would depend on successfully obtaining:

- The required capital funding commitments from state, regional and local sources, including voter approval of required general obligation bonds, if any, to meet the requirements of the locally preferred alternative;
- Congressional authority to proceed to construction;
- Legislative approval of a new or increased authority for operating revenues;
- TriMet Board enactment of a new or increased operating revenue source;
- Execution of a FFGA between TriMet and FTA, which would provide sufficient Section 5309 New Starts funds to finance opening day costs of the fixed-guideway component, if any, of the locally preferred alternative; and
- Sufficient appropriations of Section 5309 Bus funds by Congress to finance the BRT component, if any, of the locally preferred alternative.

S.7.2 Effectiveness Evaluation

The purpose of this section is to draw upon the wide array of analyses presented in the Executive Summary and the SDEIS to assess the effectiveness of the project's alternatives. Effectiveness is measured on the basis of an alternative's ability to meet the South Corridor Project's objectives, using a variety of decision-making criteria, each with one or more quantitative and/or qualitative measures. It is important to note that these criteria are not weighted or ranked in order of importance. Select measures for the evaluation criteria are summarized in table S.7-5. This information is presented in summary form in a table because most if not all of the measures discussed are presented elsewhere in this executive summary. For a detailed discussion of the evaluation of alternatives, effectiveness measures and significant trade-offs, please see Section 5.2 of this SDEIS.

S.7.3 Social Equity Considerations

The percentage of minority populations in almost one-third of the South Corridor's neighborhoods has minority and/or Hispanic populations that are greater than the regional average of 17.1% and 8%, respectively (2000 US Census), and over one third have a percentage of low-income residents that is greater than the regional average of 8.7%. Unlike projects that would negatively impact minority and/or low-income neighborhoods without serving them, the South Corridor Project is expressly aimed at serving many minority and/or low-income neighborhoods. Further, none of the alternatives would result in disproportionate negative consequences to low-income or minority neighborhoods that would not be served and benefited by the transit improvements that would occur with an alternative, nor would the impacts to those neighborhoods be disproportionate to the benefits that they would receive.

Table S.7-5
Significant Trade-Offs – Comparison of Alternatives

Evaluation Criteria	Selected Measures	Bus Rapid Transit	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Provide High Quality Transit Service	**BRT, Busway and LRT Ridership (2020 weekday)**	24,760 BRT 24,760 Total	30,600 BRT & Busway 30,600 Total	25,330 LRT +15,360 BRT 40,690 Total	33,270 LRT 13,750 BRT 47,020 Total	53,250 LRT 6,810 BRT 60,060 Total
	Travel Time Savings (vs. No-Build) Milwaukie to Pioneer Sq. Milwaukie to Rose Quarter Clackamas to Rose Q Clackamas to Pioneer Sq	1 min. slower* 1 min slower* = No-Build 9 min faster	1 min faster 1 min faster = No-Build 13 min faster	1 min faster** 11 min faster 7 min faster 13 min faster	= BRT*** = BRT*** 15 min. faster 9 min faster	1 min faster** 9 min. faster 15 min. faster 8 min. faster
	Reliability (% of Protected Intersections)	53%	63%	65%	87%	97%
	Access to Transit Park and Ride Spaces Provided	1,900 **BRT adds more stops and provides more service than No-Build*	2,500	2,775 ***Travel time = 14 min, walk to P. Sq to 1ststst& Main adds time*	3,750 ****BRT provides service between Portland and Oregon City*	4,625 *** Travel time = 14 min, walk to Pioneer Sq. to 1stst& Main adds time*
Ensure Effective Transit System Operations	**Operational Variables** changes to system compared to No-Build that could affect operations	- Introduces Articulated buses into system - Hawthorne Bridge reliability issues	- Introduces Articulated buses into system - More Exclusive R-O-W Crossing protection than BRT - Hawthorne Bridge reliability issues	- Milwaukie transfer required for BRT from Clackamas and Oregon City - Hawthorne Bridge reliability issues	- Downtown Cross-Mall capacity impacts	- Hawthorne Bridge introduces potential delays and reliability impacts - Downtown Cross-Mall capacity impacts
Maximize Ability of Project to Handle Growth	**Ability to Accommodate Additional System Demand**	Expansion constrained by Transit Mall, Hawthorne Bridge	Expansion constrained by Transit Mall, Hawthorne Bridge	LRT on 1st Ave in Downtown relieves demand on Cross-Mall – provides added LRT capacity	Downtown Cross-Mall alignment is main LRT capacity constraint	Downtown Cross-Mall alignment is main LRT constraint
Minimize Traffic Congestion and Neighborhood Infiltration	**Reduction in Vehicle Miles Traveled**	-25,900	-33,300	-20,000	-66,600	-71,200
	Reduction in Vehicle Hours Traveled	-1,200	-1,860	-740	-3,980	-4,010
	Reduction in Vehicle Hours of Delay	-20	-100	0	-570	-720
Promote Desired Land Use Patterns	**Support of Activity Centers** Town and Regional Centers Served based on Region 2040 Plan	- Central City, 2 Regional Centers and 1 Town Center by BRT	- Central City, 1 Regional Center and 1 Town Center by Busway - 1 Regional Center via BRT	- Central City, 1 Town Center by LRT - 2 Regional Centers via BRT	- Central City, 2 Regional Centers and 1 Town Center by LRT - 1 Town Center 1 Regional Center by BRT	- Central City, 2 Regional Centers and 2 Town Centers by LRT - 1 Regional Center via BRT
Fiscally Stable and Financially Efficient Transit System	**Capital Costs** (millions of $ YOE, opening year)	$116	$116 $281	$417 – LRT $72 – Bus	$349 – LRT $60 – Bus	$800 – LRT $22 – Bus
	Operating Costs (millions of $ 2002 difference from No-Build, Bus and LRT)	$7.19	$8.24	$7.39	$11.92	$11.92
	Efficiency (boarding rides per service hour)	70	81	171	159	258
Maximize Engineering Design and Environmental Sensitivity	**Displacements**	6 businesses	51 businesses 1 residence 1 public/inst.	41 businesses 1 residence 1 public/inst.	3 businesses 13 residences	38 businesses 14 residences 1 public/Inst.
	Noise and Vibration (impacts that can't be mitigated)	0	0	0	0	0

Source: Metro, November 2002.
Notes: CBD = Central Business District, Downtown Portland, $YOE = Year of Expenditure Dollars, BRT = Bus Rapid Transit, Opening Year = 2008, LRT = Light Rail Transit, Cross-Mall = Cross-Mall LRT alignment in Downtown (SW Yamhill and SW Morrison Streets).

S.8 ISSUES TO BE RESOLVED

The analysis and preparation of the SDEIS represents one phase in the course of the South Corridor Project. There are still numerous issues to be resolved, and this section addresses some of the more important and immediate landmarks.

S.8.1 Selection of the Locally Preferred Alternative (LPA)

This SDEIS, related technical documents, and comments received during the public review period will provide a basis for local jurisdictions to recommend and adopt a preferred alternative and design option(s) that will collectively comprise the LPA. There are many points of view that must be brought to bear on these important decisions. The alternatives and options presented in the SDEIS offer a wide range of alternatives, each with their unique set of benefits, costs and impacts.

The South Corridor Project Policy Committee, participating jurisdictions and general public will have the opportunity to develop and present independent recommendations on project elements to be included in the LPA. These recommendations will be forwarded to the TriMet Board of Directors, the Joint Policy Advisory Committee on Transportation (JPACT) and the Metro Council. Metro will prepare and adopt an LPA report that will document the selection of the preferred alternative and option(s), which will then be forwarded to FTA, completing the local decision step in the Federal environmental process.

S.8.2 Implementation of the Finance Plan

The financial analyses in this SDEIS show that the alternatives will require, in varying degrees, significant revenue that is currently not available. The financial analysis also identifies required new levels, and proposed sources, of revenue. New Federal funds would be secured through the Federal Section 5309 New Starts authorization and appropriations cycles and through the FTA grant process. New local funds would be secured through one or more local intergovernmental agreements. Finally, implementation of the financial plan includes completing all Federal NEPA and FTA requirements, and the execution of a Full Funding Grant Agreement (FFGA) with FTA. Definition of all items that are considered eligible for Federal funding must be specified in the FFGA.

S.8.3 Completion of the Mitigation Plan

Design, determination of impacts and estimates of costs for any major project, such as the South Corridor Project, proceed from conceptual, to preliminary, to final as the project advances to construction. At this SDEIS stage of the process, numerous impacts have been identified and many mitigation measures have already been incorporated into the conceptual design and cost estimates or committed to by the project. Examples include: conformance with applicable state and Federal policy concerning relocation assistance; initial coordination with the Oregon State Historic Preservation Officer (SHPO), and other affected parties to ensure compatible design of transit facilities with historic resources; avoidance, minimization of impacts and appropriate mitigation for impacts to wetland areas; and mitigation for 100- year floodplain encroachment.

In addition, the South Corridor Project will commit to further ways to mitigate or finalize the mitigation of certain impacts. Examples of areas requiring further study and commitment to mitigation include: final designs regarding landscaping and architectural design treatment of project facilities; traffic capacity problems at intersections where there would be significant project impacts on traffic; final definitions (e.g., location, height, extent, type, etc.) of noise and vibration mitigation for selected alternatives and options; final wetland replacement plan; a memorandum of agreement (MOA) negotiated between the project sponsors and SHPO; demonstration of compliance with all Federal "Section 4(f)" requirements concerning parklands and historic properties through completion of a Draft and Final 4(f) Statement; and development of traffic management plans for the construction phase.

Depending on input during the public comment period and on selection of the LPA, the South Corridor Project will develop a series of more detailed mitigation plans for inclusion in the project's Final Environmental Impact Statement (FEIS).

1. PURPOSE AND NEED

This chapter defines the South Corridor and identifies the transportation challenges and policies that influence the Corridor and that warrant consideration of a major transit investment. Within this chapter, the southeast quadrant of the Portland/Vancouver metropolitan area comprising the South Corridor is described and specific transportation and land use issues affecting the selection of a transportation alternative for the Corridor are identified.

The South Corridor is a subset of the South/North Corridor, and this *South Corridor Supplemental Draft Environmental Impact Statement* (SDEIS) fundamentally updates the *South/North Corridor Draft Environmental Impact Statement* (DEIS), which was issued by the Federal Transit Administration (FTA) and Metro in February 1998. As such, this SDEIS focuses almost exclusively on the South Corridor by providing updated and additional information on the purpose and need, alternatives considered, affected environment, and anticipated environmental impacts for the South Corridor, reflecting the change in conditions since the South/North DEIS was published. Section 2.1 provides a detailed description of the South Corridor Project's history and decision-making process, including the publication of the South/North DEIS and subsequent activities that led to the publication of this SDEIS.

This chapter provides a summary of the purpose of and need for a major investment in the South Corridor; a geographical and demographic description of the South Corridor; a description of the South Corridor's existing transportation system; an overview of impacts in the South Corridor from high population and employment growth; a description of the existing and projected traffic congestion in the South Corridor; a summary of the existing and projected impacts of congestion on the operation of the transit system in the South Corridor; an overview of the land use policies that affect the South Corridor transportation network and operating conditions; an overview of how state, regional and local transportation policies affect the South Corridor; and a summary of the South Corridor Project's Goal and Objectives.

1.1 Statement of the South Corridor's Purpose and Need

The *purpose* of a major transit investment in the South Corridor is:

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

The *need* for a major transit investment in the South Corridor is identified as:

- *Historic and projected rapid population and employment growth in the South Corridor, creating an unmet demand for increased travel opportunities and transit capacity.*
- *High levels of existing traffic congestion and travel delay in the South Corridor and deteriorating travel conditions in the future caused by population and employment growth.*
- *The need for high-quality transit service in the South Corridor to achieve regional and local land use objectives.*

The following subsections detail these issues and conclude with the definition of the South Corridor Project's Goal and Objectives.

1.2 Description of the South Corridor

The South Corridor is part of the larger South/North Corridor within the Portland, Oregon/ Vancouver, Washington metropolitan region. This metropolitan region is the population and economic center of an extensive area that includes southern Washington, much of Oregon, and northern Idaho. The Portland metropolitan area incorporates the urban portion of three Oregon counties – Multnomah, Clackamas and Washington Counties – and the urban portion of Clark County, Washington. Portland, Oregon is the largest city in the region and is located at its geographic center. Vancouver, Washington is the largest city in Clark County. The corridor study area is generally defined as the "travel-shed" between the urbanizing portion of Clackamas County and the Portland Central City.

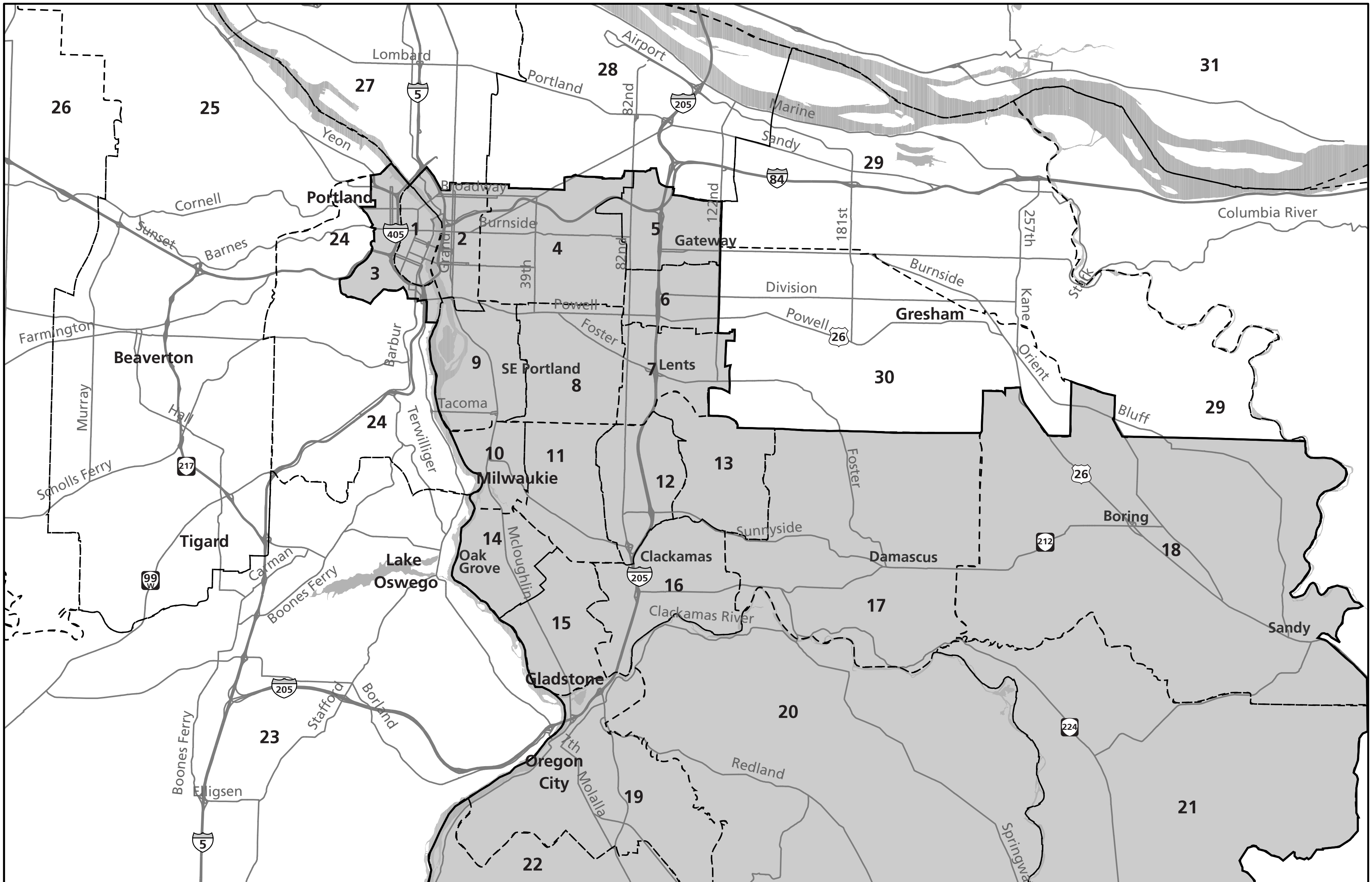
As shown in Figure 1.2-1, the South Corridor consists of the cities of Oregon City, Gladstone, and Milwaukie; the Clackamas Regional Center area of unincorporated Clackamas County; a portion of southeast Portland; and the Portland Central City. Figure 1.2-2 illustrates the corridor segments that connect the Central City with the Clackamas Regional Center and Oregon City. The South/North Corridor includes the South Corridor and portions of Portland and Vancouver to the north.

1.3 Description of the South Corridor Transportation System

The Willamette River separates east Portland from west Portland and dictates the configuration of the road network serving the South Corridor. Figure 1.3-1 illustrates the existing transportation network in the South Corridor. Downtown Portland connects to the regional highway system in the northern portion of the Corridor via a series of bridges over the Willamette River. Two interstate highway system bridges connect downtown Portland with I-5: the Marquam Bridge (south) and the Fremont Bridge (north). The Morrison Bridge provides a direct connection to I-5 northbound, and to the SE Grand Avenue and SE Martin Luther King Junior Boulevard couplet, which transition into SE McLoughlin Boulevard (SE Grand Avenue, SE Martin Luther King, Jr. Boulevard, and SE McLoughlin Boulevard constitute Highway 99 East).

SE McLoughlin Boulevard, a major arterial serving the southern portion of the Corridor, provides the primary access between the City of Portland, the inner SE Portland neighborhoods, the City of Milwaukie, the Oak Grove neighborhood, the City of Gladstone, and the City of Oregon City. Highway 224 is the major arterial that connects Milwaukie and SE McLoughlin Boulevard with the Clackamas Regional Center area. The Clackamas Regional Center area is connected on the north to the Gateway Regional Center and on the south to the Oregon City Regional Center via I-205. I-205 extends across the Columbia River to Clark County to the north and across the Willamette River, connecting to I-5 in the south.

Two major public transit operators serve the Portland/Vancouver metropolitan region. The Tri-County Metropolitan Transportation District of Oregon (TriMet) serves the Oregon portion of the region and the Clark County Public Transportation Benefit Area Authority (C-TRAN) serves Clark County. TriMet provides an extensive bus network throughout the Oregon portion of the region and it operates and is actively expanding its light rail network.



SOUTH CORRIDOR PROJECT

Figure 1.2-1

Study Area

South Corridor Study Area

31 District TAZ Boundaries

0 2 4 Miles

SOUTH CORRIDOR PROJECT Transportation Alternatives

METRO

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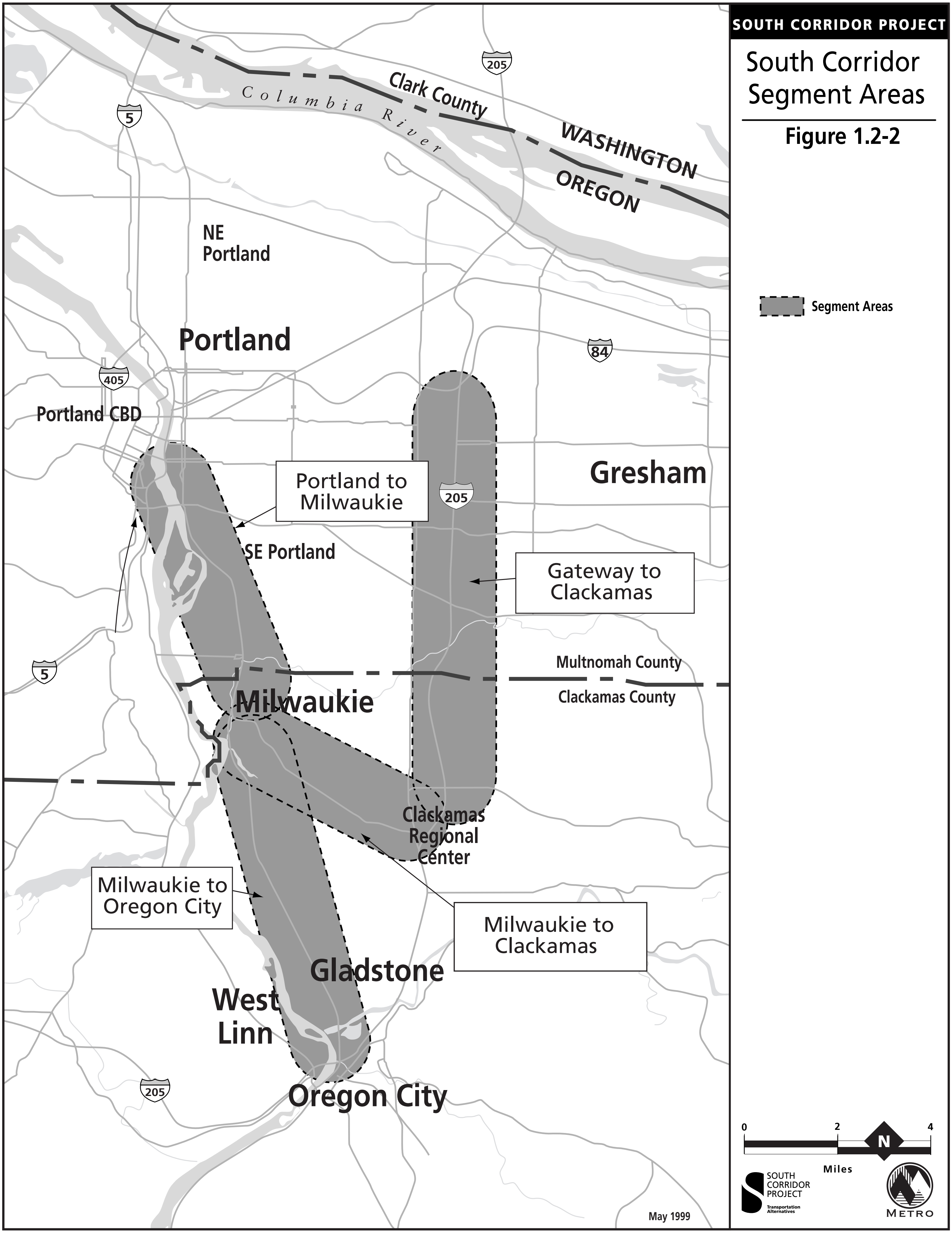
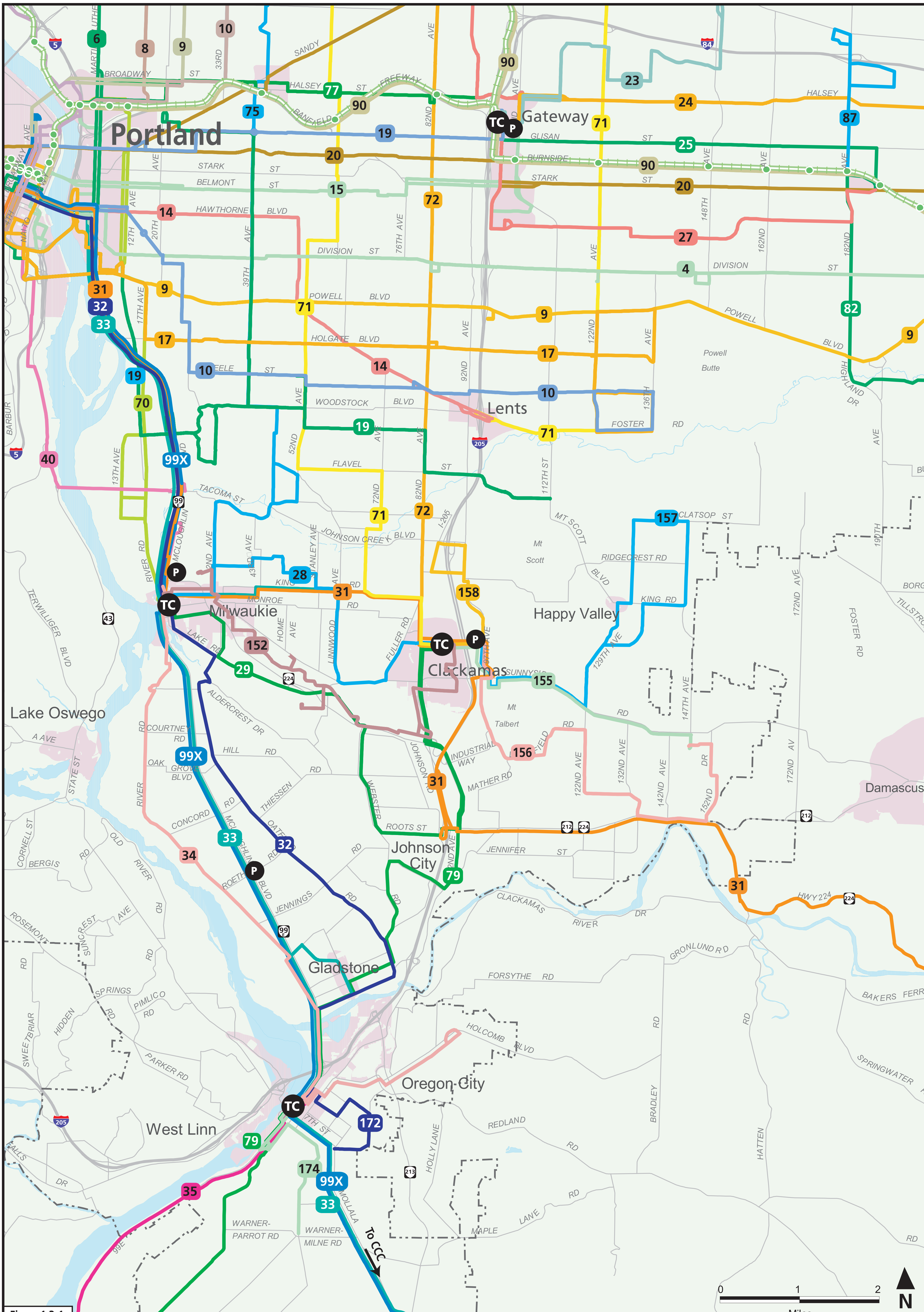
SOUTH CORRIDOR PROJECT

South Corridor Segment Areas

Figure 1.2-2





METRO

South Corridor - Existing Transportation Network

LEGEND

Bus Route	Light Rail and Station	Park & Ride	Transit Center	UGB
29		P	TC	

SOUTH CORRIDOR STUDY
Transportation Alternatives

C-TRAN operates an extensive bus network through Clark County, Washington. An agreement between TriMet and C-TRAN allows TriMet buses to provide service to Vancouver and C-TRAN buses to provide service to Portland. TriMet and C-TRANS also provide transit services for the elderly and disabled throughout their districts. Independent transit districts in the cities of Wilsonville, Molalla, and Sandy operate community-level local transit services.

Bus service within the South Corridor is provided by TriMet, which operates trunk routes on SE McLoughlin Boulevard. These bus lines connect the Portland central business district (CBD) with Milwaukie, Clackamas Regional Center, and Oregon City. This bus service was upgraded in September 1999 to provide a 15-minute frequency during the day and a 7.5-minute frequency during the peak travel hours. TriMet also is in the process of adding and upgrading shelters on SE McLoughlin Boulevard as part of a continuing program of upgrades to these key bus routes. Line 72 Killingsworth-82nd Avenue provides bus service along NE/SE 82nd Avenue, parallel to I-205, between Clackamas Town Center and the Gateway Transit Center. Line 72 operates with 10-minute or better service between 6:00 a.m. and 7:00 p.m. and is consistently one of the highest ridership lines on the TriMet system.

TriMet also provides light rail service (i.e., the Metropolitan Area Express, or MAX) on the Blue Line between Gresham, downtown Portland, Beaverton and Hillsboro, and on the Red Line between the Portland International Airport and downtown Portland. The initial 5.8-mile segment of the Yellow Line (i.e., Interstate MAX), which will serve the northern section of the South/North Corridor, is currently under construction and is scheduled to begin operation in September 2004. The Yellow Line will serve downtown Portland and North Portland and will connect with the Blue Line and the Red Line at the Rose Quarter Transit Center. Both the Blue Line and the Red Line provide light rail service to and from the Gateway Transit Center.

1.4 High-Growth Impacts the Portland/Vancouver Region and the South Corridor

This section summarizes the high population and employment growth that has occurred within the Portland/Vancouver metropolitan region, Clackamas County, and the South Corridor that has led to transportation problems within the corridor.

A. Portland/Vancouver Metropolitan Region

Over the past 25 years, the population of the four-county region has grown by approximately 56 percent, from 1,100,900 residents in 1975 to 1,789,500 residents in 2000. The population trends over this period consisted of three distinctly different cycles. The 1970s were a period of rapid growth with a population growth rate of 2.1 percent per year on average. The early and mid-1980s were marked by a recession, with population remaining virtually flat. Population has been growing rapidly since 1988, with a net increase of about 350,000 residents added to the region over this period.

Since 1980, the rate of employment growth in the Portland/Vancouver metropolitan region has been almost 50 percent greater than the national average. From 1980 to 2000, employment growth in the Portland/ Vancouver region averaged 3.1 percent per year, increasing from 676,400 jobs in 1980 to 1,164,600 jobs in 2000, while the national average was 1.9 percent. During the late 1980s and into the 1990s, the region's job growth ranked as the fourth fastest in the country, with annual job growth peaking at about 52,000 net new jobs in 1994 and averaging about 32,000 per year. Employment growth slowed in the early 1990s, particularly in 1991, during a short national recession. In the late 1990s the region experienced strong job growth, with an average increase of close to 38,000 net new jobs from1993 to 1998, reflecting nearly a 4.0 percent annual growth rate. Table 1.4-1 presents projected corridor growth from 2000 to 2020.

Table 1.4-1
Existing and Projected Households and Employment in the South Corridor, by Sub-Area[1]

	Households			Employment		
Sub-Area[1]	**2000**	**2020**	**Change**	**2000**	**2020**	**Change**
Gateway (5)	9,910	13,760	39%	19,520	23,870	22%
Lents (7)	8,150	10,170	25%	6,110	7,380	21%
SE Portland (8)	19,320	21,690	12%	9,160	9,910	8%
Inner SE (9)	8,800	10,440	19%	18,530	21,830	18%
Milwaukie (10)	3,420	5,000	46%	7,770	12,490	61%
Clackamas Reg. Center (12)	7,100	9,570	35%	23,000	36,690	59%
Gladstone (15)	7,990	8,920	12%	8,120	9,090	12%
Oregon City (19)	10,050	16,940	69%	15,930	23,750	49%
South Corridor Total (1-22)	**199,350**	**292,580**	**47%**	**431,580**	**582,320**	**35%**
Regional Total (1-31)	**691,360**	**992,500**	**44%**	**1,160,890**	**1,609,700**	**39%**

Sources: US Census, 2000 and Metro Data Resource Center, 2002.
[1] Number designation in parenthesis is a corridor sub-area number. Sub areas are illustrated in Figure 1.2-1.

The current (2001-2002) national economic slow-down has affected Oregon and the Portland/ Vancouver metropolitan region. However, the economic slow-down is not expected to persist, and recent economic indicators show that improvement has already begun. The 2020 regional population and household projections account for this slow down and subsequent recovery and have been developed with knowledge that the economy will ebb and flow, with slower rates during some years and higher rates during others.

B. South Corridor

The South Corridor includes portions that lay within Clackamas County and portions that are included within the Portland Central City.

Clackamas County. Clackamas County is a fast growing part of the region. Between 1980 and 1998, the number of households in the county increased by about 2.3 percent per year and the number of jobs increased by 3.8 percent per year. The portion of the South Corridor that is located within Clackamas County currently contains about 91,150 households, with an expected growth rate of 2.7 percent per year between 2000 and 2020, reaching an estimated total of 155,400 households by 2020. The portion of the South Corridor in Clackamas County currently contains about 121,400 jobs. With an expected growth rate of 2.2 percent per year, employment in this portion of the South Corridor is projected to reach 184,700 jobs by 2020. The Clackamas Regional Center has been a major development node in recent years and is projected to continue to develop rapidly. In addition, the Metro Council is considering expansion of the urban growth boundary (UGB) east of Happy Valley, as well as in several other areas around the region. If this area is brought into the UGB, it could significantly increase the amount of urban development that would occur in the urbanizing portion of Clackamas County, resulting in further demands on the transportation infrastructure.

Portland Central City. The South Corridor encompasses Portland's Central City, which includes the CBD, the Central Eastside Industrial District (CEID), the Lloyd District, and the Rose Quarter.

The Central City contains the largest concentration of employment in the region. As of 2000, the Central City contained 205,400 jobs and 27,600 households. Employment in the Portland Central City is expected to grow by 1.3 percent per year, reaching a total of 265,100 jobs by 2020. The number of households is expected to grow to 38,500 over the same period. This forecast growth in employment and households in the South Corridor will:

- Create a demand for additional transit service;
- Result in deteriorating travel conditions; and
- Create opportunities for high-density development nodes that can be well served by high-capacity transit alternatives.

Several southeast Portland neighborhoods are also in the South Corridor. Southeast Portland is primarily an established urban residential area with older industrial uses along major transportation corridors such as SE McLoughlin Boulevard. The portion of southeast Portland in the Corridor currently contains 88,500 households and is expected to grow at 0.5 percent per year to 98,600 by 2020.

1.5 The Effect of Traffic Congestion and Vehicle Delay on the South Corridor

High levels of growth in population and employment are expected to continue to cause deteriorating conditions on the transportation system in the South Corridor. Topographic features, land use patterns, a deficient road network and economic conditions fostering growth in Clackamas County have combined to make congested traffic conditions typical of daily travel to, from and within the South Corridor. In the future, traffic problems in the corridor are forecast to worsen as a result of projected growth. Over the past two decades, traffic volumes on the South Corridor's regional roadways have increased significantly. Table 1.5-1 summarizes the historic growth in traffic volumes on SE McLoughlin Boulevard and I-205, the primary highways connecting activity centers in the South Corridor and downtown Portland. Growth in traffic volumes on SE McLoughlin Boulevard from 1985 to 1998 ranged from 16 percent at I-205 to 63 percent at Highway 224 in Milwaukie. Growth in traffic volumes along I-205 (which opened its full length in 1983) between 1985 and 1998 ranged from 79 percent at SE Sunnyside Road to 99 percent at SE Foster Road.

Table 1.5-1
Historic Growth in South Corridor Traffic Volumes

	1985 ADT [1]	1995 ADT [1]	1998 ADT [1]	% Change (1985-1998)
SE McLoughlin Boulevard at:				
SE 17th Avenue	39,000	45,000	46,900	20%
Highway 224	31,100	48,600	50,700	63%
I-205	32,700	35,300	37,800	16%
I-205 at:				
SE Powell Boulevard	76,600	144,300	147,900	88%
SE Foster Road	72,300	139,400	143,800	99%
SE Sunnyside Road	66,300	111,400	119,000	79%

Source: Oregon Department of Transportation, 1998.
[1] ADT = average daily traffic (vehicle volumes in both directions).

Growth in traffic within the South Corridor is forecast to continue over the next two decades. Table 1.5-2 summarizes the impacts of population and employment growth on traffic in the South Corridor. As shown, a 16 percent increase in vehicle miles of travel (VMT) is anticipated in the South Corridor by 2020. This VMT growth is projected to lead to a doubling of the miles of major roads in the South Corridor that are congested (i.e., have volumes that are in excess of 90 percent of the design capacity of the roadway). This highly disproportionate increase in congestion compared to VMT indicates that traffic conditions in the corridor will quickly and significantly deteriorate over the next 20 years.

Table 1.5-2
Current and Projected South Corridor VMT and Congestion

	Vehicle Miles Traveled		Road Miles with V/C > 0.90	
Sub-Area	**2000**	**2020**	**2000**	**2020**
Gateway (5)	66,866	66,123	1.82	2.33
Lents (7)	37,213	43,523	0.00	2.68
Inner SE (9)	12,049	13,581	0.87	0.86
Milwaukie (10)	5,245	6,261	0.47	0.67
Clackamas Reg. Ctr. (12)	71,436	86,353	0.00	1.17
Gladstone (15)	9,297	11,731	0.13	1.36
Oregon City (19)	45,470	52,402	1.08	2.15
South Corridor Total (1-22)	**611,770**	**709,352**	**11.01**	**25.63**
Regional Total (1-31)	**2,234,575**	**2,704,771**	**38.57**	**91.02**

Source: Metro, November 2002.
Note: VMT = vehicle miles traveled, V/C = volume-to-capacity ratio. Number in parentheses refers to the Transportation Analysis Zones)see figure 1.2-1.

As shown in Table 1.5-3, by 2020 traffic on SE McLoughlin Boulevard is projected to be at or over capacity for its entire length within the South Corridor. A similar situation would exist on I-205 where major segments of the freeway would operate in over-capacity conditions. As a result of this projected deterioration of traffic operation service levels, drivers in the South Corridor would experience a significant increase in the average number of hours they sit in delayed traffic based on the No-Build Alternative (2000 RTP Financially Constrained Network) (see Section 2.2).

Table 1.5-3
Projected P.M. Peak-Hour Conditions in South Corridor
Southbound – Year 2020 [1]

Location (Southbound Direction)	Volume [2]	V/C Ratio [3]
SE Grand Avenue near SE Powell Boulevard	5,695	1.05
SE McLoughlin Boulevard Near Sellwood	4,145	1.15
SE McLoughlin Boulevard South of Milwaukie CBD	2,591	1.62
SE McLoughlin Boulevard South of Concord Road	2,034	0.97
SE McLoughlin Boulevard at Clackamas River	3,066	1.46
I-205 South of SE Flavel Street	6,700	1.02
I-205 at Clackamas River	7,217	1.03
I-205 at SE Powell Boulevard	6,750	1.02
I-205 at I-84	5,135	0.85

Source: Metro, November 2002.
[1] Based on the No-Build Alternative.
[2] Vehicles per hour.
[3] V/C = ratio is the vehicle volume on a roadway facility at a given point, divided by the roadway's vehicle capacity at that same point.

Table 1.5-4 shows that, as the major regional highway facilities exceed capacity, the neighborhood arterials that parallel SE McLoughlin Boulevard would absorb regional travel demand, creating congestion and delay within the neighborhoods.

Table 1.5-4
P.M. Peak-Hour Conditions on Highways and Arterials Paralleling

SE McLoughlin Boulevard Southbound – Year 2020[1]

Location[2] (Southbound Direction)	Facility	Volume[3]	V/C[4] Ratio
Near SE Powell Boulevard	SE Milwaukie Avenue	665	0.94
Near SE Flavel Street	I-205	6,700	1.02
	SE 82nd Avenue	1,567	1.18
Southeast of Milwaukie CBD	Hwy 224	2,458	1.17
Near Clackamas River	I-205	7,217	1.03

Source: Metro, November 2002.
Note: CBD = central business district
[1] Based on the No-Build Alternative.
[2] Letter/number designation in parenthesis is a Metro cutline number.
[3] Vehicles per hour.
[4] V/C = ratio of vehicle volume to capacity.

Measured on a volume-to-capacity (V/C) basis, these parallel arterials will suffer the same levels of congestion as the major highways.

1.6 The Effect of Transit System Conditions on the South Corridor

TriMet operates several major trunk routes on SE McLoughlin Boulevard connecting Oregon City, Milwaukie, and the Portland Central City. As previously mentioned, traffic congestion on the highway has worsened in the past 10 years, resulting, in part, in slower transit travel speeds on SE McLoughlin Boulevard. On portions of SE McLoughlin Boulevard through Milwaukie, peak-hour transit speeds are relatively slow for limited-stop service on a regional highway. As a result, transit travel times between Oregon City and the Portland Central City have increased by an average of 5 minutes in recent years. A deterioration in transit travel times means that TriMet must increase service hours, operating costs, and the size of the bus fleet in order to maintain a constant level of service, resulting in a loss of operating efficiency.

If transportation network improvements are not made in the South Corridor, these conditions will continue to worsen over time. For example, as shown in Table 1.6-1, under the No-Build Alternative, transit travel times from downtown Portland to the Milwaukie CBD and the Clackamas Regional Center are projected to increase by 56 percent and 58 percent, respectively, by 2020.

Table 1.6-1
Current and Projected Bus Travel Times[1] in the South Corridor
Between Downtown Portland and Select Locations

Location	2000	2020[2]	% Change
Clackamas Regional Center	33	47	42%
Milwaukie Town Center	22	25	14%
Oregon City Regional Center	41	52	27%

Source: Metro, November 2002.
[1] In-vehicle time in minutes during the p.m. peak hour in the peak direction.
[2] Based on the No-Build Alternative.

As congestion causes travel times to increase, schedule reliability will worsen. Timed-transfer operations are particularly sensitive to trunk line reliability. As a result, operations of the Milwaukie, Clackamas Town Center, and the Oregon City Transit Centers are projected to become less reliable over time. As reliability decreases and transit time increases, transit ridership can be expected to decrease as well.

Financial efficiency has been one of TriMet's primary goals over its three-decade existence. During the 1990s, fiscal efficiency in government has increased as a priority as Oregonians have expressed their concerns about taxation and governmental efficiency by passing major tax limitation measures in 1990, 199,6 and 1997. During this same period, adoption of the Americans with Disabilities Act (ADA) has required TriMet to expand its special needs transit service, and the large population and employment growth in Washington and Clackamas Counties has compelled TriMet to increase suburban bus service. By their nature, both of these services exhibit relatively high operating costs per rider. Thus, during a period of particular sensitivity to governmental efficiency, strong demands on the bus system have tended to lower TriMet's operating efficiency.

Looking forward, there are many factors that will challenge the region and TriMet's ability to keep the cost per ride on the transit system at an affordable level. Elements of the strategy undertaken by TriMet to improve its operating efficiencies include:

- Endorsing major new regulations requiring transit-supportive land use patterns;
- Adhering more strictly to TriMet's adopted policy to implement periodic fare increases designed to maintain farebox revenue; and
- Improving the operating efficiencies along major regional trunk lines through the implementation of high-capacity transit solutions such as light rail transit (LRT), busway, or bus rapid transit (BRT).

1.7 The Effect of State, Regional, and Local Land Use Policies on the South Corridor

Over the past quarter century there has been a continuous progression of state, regional, and local policy decisions and investments, in both the Oregon and Washington portions of the region, aimed at establishing growth corridors and activity centers that are supported by high-capacity transit.
In 1973, the Oregon Legislature passed Senate Bill 100, which established the Land Conservation and Development Commission (LCDC) and established the requirement for local jurisdictions to prepare, adopt, and enforce comprehensive land use plans. The LCDC adopted goals and guidelines that provided specific direction to cities and counties for development of these comprehensive land use plans. In 1979, to comply with the statewide urbanization goal (Goal 14) the Columbia Region Association of Governments (CRAG, Metro's predecessor) adopted the region's first UGB. The UGB defined the area in which urban development and investment could occur in the Oregon portion of the metropolitan region. Oregon State law requires that the UGB contain sufficient land to accommodate expected growth for 20 years. State law also requires that county governments prohibit or sharply restrict the type and density of development allowed outside the UGB. As noted above, additional urban development in areas outside the current UGB (if the UGB is expanded in Clackamas County) would put additional pressure on the South Corridor's existing transportation infrastructure.

To implement the UGB policies, local comprehensive plans are required to make adequate provision for the urban services needed to support the development envisioned inside the UGB, while complying with other statewide goals. Since 1976, all applicable local and regional land use plans and policies in the Oregon portion of the region have been formulated on the basis of providing high-capacity transit in regional corridors such as the South Corridor. As a result, for 25 years, land use designations, zoning patterns and water, sewer, and other infrastructure plans and investments in all local jurisdictions have been located and sized on the basis of development forecast in high-capacity transit corridors.

In 1991, to strengthen the connections between land use policies and transportation policies, the LCDC developed and adopted the Transportation Planning Rule (TPR) to implement Statewide Planning Goal 12, Transportation. The TPR requires cities and counties to:

- Consider changes to land use densities and designs as a way to meet transportation needs;
- Adopt changes to their subdivision and development ordinances to encourage more transit- and pedestrian-friendly development and street patterns; and
- Amend their comprehensive plans to allow transit-oriented developments along transit routes.

In 1992, Metro district voters approved a new home rule charter for Metro, which expanded Metro's land use responsibility. The charter directs Metro to prepare and adopt a "Future Vision" for the region, looking ahead for a period of 50 years and addressing "preservation of regional land and natural resources" and "how and where to accommodate the population growth." The charter further directs Metro to adopt ordinances that would require local comprehensive plans and zoning regulations to comply with the *Regional Framework Plan* (RFP).

Metro responded to the charter requirements by developing the *Regional Urban Growth Goals and Objectives,* which contain the *Region 2040 Growth Concept.* These regional land use policies are further defined and implemented through the RFP and the *Regional Transportation Plan* (RTP). Collectively these plans establish the policy approach for managing the UGB and identify development patterns that would help to achieve the regional goals and objectives. The plan is designed to absorb 720,000 additional residents into the Oregon portion of the metropolitan region by 2040 with limited expansion of the UGB.

The *Region 2040 Growth Concept* designates the Portland Central City as the highest density employment hub in the Portland metropolitan region. The role of the Central City as the region's financial, cultural, tourism, retail, and commercial center is reinforced by the plan. The plan designates several "Regional Centers" and defines them as mixed-use areas consisting of high-density employment and residential developments served by high-capacity transit. The *Region 2040 Growth Concept* also designates "Town Centers," and defines them as smaller and slightly less dense than the Regional Centers. Within the South Corridor, the area around the Clackamas Town Center, the Gateway area, and the central area of Oregon City are designated as Regional Centers. The central area of Milwaukie, central Happy Valley, central Gladstone, and the Lents district are designated as Town Centers. The *Region 2040 Growth Concept* is predicated on implementation of a south/north transit spine linking the key activity centers in the Corridor. If high-capacity transit improvements such as those evaluated in this South Corridor SDEIS are not implemented, the region's entire growth management strategy could be at risk.

If the *Region 2040 Growth Concept* (including implementation of the RFP and RTP) is not achieved, the economic vision, livability, and development goals and land use plans for the region would not be realized and would have to be revised. As more and more public and private investment is made based on these regional land use and transportation plans, it is becoming increasingly difficult to turn back on the state, regional, and local transportation plans and policies. Given the links in the region among land use, transportation and transit, economic development and livability, as well as the growing public and private investment in support of these policies, it is essential to consider high-capacity transit options in the South Corridor.

1.8 The Effect of State, Regional and Local Transportation Policies on the South Corridor

In 1973, a Governor's Task Force was formed to clarify the transportation policy of the Oregon portion of the region. At its conclusion, the Task Force decided to assign most of the new commuter growth caused by development to transit. As a result, regional and local transportation planning has shifted from an emphasis on accommodating automobiles to a broader approach aimed at maximizing the efficient use of land through implementation of a multi-modal transportation system.

This shift in regional transportation planning priorities was reinforced in 1976, when the U.S. Department of Transportation (USDOT) formally approved the withdrawal of the proposed Mt. Hood Freeway from the Interstate system. In 1978, the CRAG adopted the *Regional Transportation Corridor Improvement Strategy*, which established the priority for transit ways in the region's major radial corridors. This action was followed in 1979 by the withdrawal of the proposed I-505 freeway in northwest Portland from the federal Interstate system. These actions initially made approximately $200 million, and ultimately approximately $500 million, available to the Portland/Vancouver metropolitan area for substitute transportation projects. Shortly after the Mt. Hood Freeway withdrawal, the Governor of Oregon requested that the CRAG assist in allocating the funds and that priority for the use of the funds be given to "regional transit corridor projects." This action symbolized the shift in policy that new major radial highway capacity would no longer be constructed in the region. Instead, future capacity and maintenance of level of service on major radial corridors depend primarily on high-capacity transit. Highway improvements would be employed primarily to alleviate bottlenecks, balance the system, and respond to safety and operational problems.

There were also secondary implications of these transportation policy decisions. The decision to prioritize major regional transit corridors meant that:

- The remainder of the transportation system would be sized and designed to be compatible with transit;
- The pattern and type of development in the Portland region would be dependent on high capacity transit; and
- The comprehensive plans of the counties and cities in the region would be based on these policies.

In retrospect, over the past two and a half decades, this policy has fundamentally affected almost every major planning and development decision in the region. Since the withdrawal of the Mt. Hood Freeway, there has been a series of major transportation analyses and policy decisions implementing the basic policy shift.

In 1980, the *Southeast Corridor Improvement Strategy* prepared by Metro concluded by identifying short-term improvements to alleviate several traffic bottlenecks along SE McLoughlin Boulevard, and a long-term commitment to expanding transit service and rideshare programs in the corridor. In 1982, Metro adopted its first *Regional Transportation Plan*. With respect to the major radial corridors in the region (including what is now known as the South/North Corridor) this plan concluded that "...adding significant highway capacity to existing major routes...would violate two established regional policies...adequate transportation capacity to meet growth in travel demand in the radial corridors must be provided by selective highway improvements to remove bottlenecks and ‘balance’ the capacity of the overall highway system together with a major expansion in transit....” It also determined that a phased approach to implementing the third priority transitway (after the Eastside and Westside light rail projects) be undertaken.

In 1986, Metro completed a Phase I study of transit alternatives in the region. This system-level planning effort consisted of several elements, including the Milwaukie Corridor Study, the I-205 Corridor Study, and the Bi-State Light Rail Study. These Phase I studies recommended that Phase II studies of light rail be undertaken in the I-5 North, SE McLoughlin, and I-205 corridors.

In 1986, ODOT published a Final Environmental Impact Statement (FEIS) for SE McLoughlin Boulevard, which called for the addition of two general-purpose traffic lanes between SE Tacoma and SE Harold Streets and the addition of a reversible travel lane between SE Harold Street and the Ross Island Bridge. The conversion of these additional travel lanes to High Occupancy Vehicle (HOV) was to be considered in the future. Many parts of the McLoughlin Boulevard Project were developed, including the Tacoma Street Overpass, highway access limitation south of SE Tacoma Street, and the modifications to the interchange between McLoughlin Boulevard (Highway 99E) and Highway 224.

Both Milwaukie and I-205 high-capacity transit (HCT) alternatives were evaluated during the Pre-Alternatives Analysis (Pre-AA). This phase of the study was designed to select a priority corridor to advance as the region’s next priority after the Westside Light Rail Project. The North and South Corridors were evaluated separately. The South Corridor analysis compared HCT alternatives in the Milwaukie Corridor and the I-205 Corridor. The North Corridor analysis compared HCT alternatives in the I-5 and I-205 Corridors.

For the Milwaukie Corridor, the analysis evaluated a light rail alignment connecting downtown Portland, Milwaukie, the Clackamas Regional Center, and Oregon City in a “Y” configuration branching at Milwaukie. The I-205 Corridor analysis evaluated an I-205 light rail line that connected Oregon City with the Clackamas Regional Center, and Gateway, continuing along the Eastside LRT line to downtown Portland, a longer version of the I-205 LRT Alternative under study in this SDEIS that would terminate at Clackamas Regional Center. A light rail connection between Portland International Airport and Gateway continuing to downtown Portland was also evaluated. Ultimately, the Airport MAX segment of the I-205 light rail line was constructed and began operation in September 2001.

In April 1993, the Metro Council selected the Milwaukie Corridor to be the priority corridor for the South Corridor and selected the I-5 Corridor as the priority corridor for the North Corridor (Metro Resolution No. 93-1784). Further, the Council adopted an action plan to merge the corridors into a single South/North Corridor for purposes of completing an Alternatives Analysis and DEIS.

As previously discussed, I-205 has been a part of the definition of the South Corridor Project since the 1993 Pre-AA study. Although the Milwaukie and I-5 corridors were chosen as priority corridors for immediate HCT project development, the development of a project in the I-205 Corridor remained an important regional objective. In 1995, two years after the conclusion of the Pre-AA, the region adopted the *Region 2040 Growth Concept,* which created an integrated transportation and land use strategy of focusing higher-density development in “Regional Centers” and “Town Centers” connected by high- capacity transit. The I-205 segment of the South Corridor would connect the Gateway Regional Center and the Clackamas Regional Center to the Portland Central

City, thus helping the region achieve its adopted land use vision of development nodes connected by high-capacity transit. The inclusion of the I-205 Segment in the South Corridor supports the pattern of land use and development that is defined in the *Region 2040 Growth Concept*. The goal of connecting "Regional Centers" with high capacity transit adheres to this vision and is more consistent with the regional vision than the land use plans that were in place during the 1993 Pre-AA Study. The rapid growth occurring in these centers has resulted in the conclusion by the South Corridor Policy Group that further examination of high-capacity transit in the South Corridor is warranted at this time.

With the start of construction of the Westside light rail extension in 1991 (and subsequent opening in 1998) the east/west spine of the regional system was established. Subsequently, regional policymakers focused on the need to determine whether a south/north transit spine was needed, and if so, what set of mode and alignments would make up that spine. In 1993, the Metro Council and the C-TRAN Board of Directors determined that light rail options for the Milwaukie Corridor and I-5 North Corridor should be examined as an integrated South/North Corridor. A Major Investment Study was completed in 1995, which selected light rail as the Locally Preferred Strategy (LPS). The South/North DEIS was published in February 1998 and the South/North LPS was adopted in July 1998. The light rail alternative was selected as the LPS and the initial construction segment for the South/North Corridor Project was defined as the South Segment.

In November 1998, regional voters failed to reaffirm local funding for the South/North Project. After the November vote Metro, along with the other regional partners, held a number of "listening posts" throughout the region. The majority of those commenting at the listening post meetings supported the multi-modal emphases that the region has been adopted as a tool to maintain livable communities. On April 8, 1999 the Joint Policy Advisory Committee on Transportation (JPACT) directed Metro staff to start work on a program that advanced non-light rail transportation options to address the transportation problems in the South Corridor.

In April 1999, an SDEIS was published for the north portion of the Corridor, and in June 1999 the LPS was amended to move forward the North Corridor Interstate MAX Project (i.e., the Yellow Line) as the first construction segment in the South/North Corridor. The North Corridor Interstate MAX FEIS was published in October 1999. Construction of the Interstate MAX Project connecting the Rose Quarter area with neighborhoods in North Portland and the Expo Center is currently underway, and it is expected to open in September 2004.

The *South Corridor Transportation Alternatives Study* began when the Policy Committee reached agreement on the range alternatives to be studied. The study alternatives were described in the *Wide Range of Alternatives Report* (Metro, 1999) and included river transit, commuter rail, bus rapid transit, busway, HOV lanes, and high occupancy toll (HOT) lanes. The benefits and impacts of the alternatives were described in the *South Corridor Evaluation Report* (Metro, 2000). Based on the findings in the *Evaluation Report* and public input, the South Corridor Transportation Alternatives Study Policy Group narrowed the list of alternatives to be studied further in a SDEIS. The Policy Group determined that HOV lanes, HOT lanes, commuter rail, and river transit did not meet the study's goals and objectives and should not be carried forward for additional analysis. The Policy Group also determined that the SDEIS should continue to examine a Bus Rapid Transit Alternative and a Busway Alternative. Additionally, after hearing from citizen groups in Southeast Portland and Milwaukie, the Policy Group decided that a revised light rail alternative should be included in the study. After citizen input and recommendations from the City of Milwaukie and Clackamas County, the Policy Group determined that the SDEIS should evaluate both a Milwaukie LRT Alternative with a terminus in central Milwaukie and an I-205 Light Rail Alternative between the Gateway and Clackamas Regional Centers. The Policy Group decided that the alternatives that would be evaluated further in the SDEIS would include the following:

- No-Build Alternative
- Bus Rapid Transit Alternative
- Busway Alternative
- Milwaukie Light Rail Alternative
- I-205 Light Rail Alternative
- Combined Light Rail Alternative (both Milwaukie Light Rail and I-205 Light Rail)

These alternatives are described in more detail in Chapter 2, Alternatives Considered.

1.9 Project Goal and Objectives

The Goal and Objectives established for the South Corridor Project (the south segment of the South/North Corridor) derive from the purpose and need analysis summarized above and as originally defined for the South/North Transit Corridor Study. The Goal of the Project is:

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

The Objectives of the South Corridor Project (the south segment of the South/North Corridor) are to:

1. Provide high quality transit service in the corridor.

2. Ensure effective transit system operations in the corridor.

3. Maximize the ability of the transit system to accommodate future growth in travel demand in the corridor.

4. Minimize traffic congestion and traffic infiltration through neighborhoods in the corridor.

5. Promote desired land use patterns and development in the corridor.

6. Provide for a fiscally stable and financially efficient transit system.

7. Maximize the efficiency and environmental sensitivity of the engineering design of the proposed project.

This supplement to the *South/North Corridor Project Draft Environmental Impact Statement* (Metro: February 1998) evaluates alternative ways to create a southern transit spine in the South Corridor to achieve these objectives.

2. ALTERNATIVES CONSIDERED

The purpose of this chapter is to describe the transit improvements and related highway improvements under consideration for the South Corridor (see Chapter 1: Purpose and Need for a description of the project area). The alternatives currently being considered follow:

- No-Build Alternative;
- Bus Rapid Transit Alternative;
- Busway Alternative;
- Milwaukie Light Rail Alternative;
- I-205 Light Rail Alternative; and
- Combined Light Rail Alternative.

In addition to these alternatives, there are several design options (i.e., alignment variations of an alternative) ranging from two design options each for the Bus Rapid Transit (BRT) and I-205 Light Rail (LRT) Alternatives to eight design options each for the Busway, Milwaukie LRT, and Combined LRT Alternatives.

Section 2.1 of this chapter summarizes the screening and selection process for the South Corridor Project that resulted in the alternatives being considered in this Supplemental Draft Environmental Impact Statement (SDEIS). Section 2.2 describes the transit and roadway capital improvements and the transit operating characteristics for each of the alternatives under consideration. Sections 2.3 and 2.4 summarize the capital and operating and maintenance costs of the alternatives, respectively, which are the basis of the financial analysis described in Chapter 5.

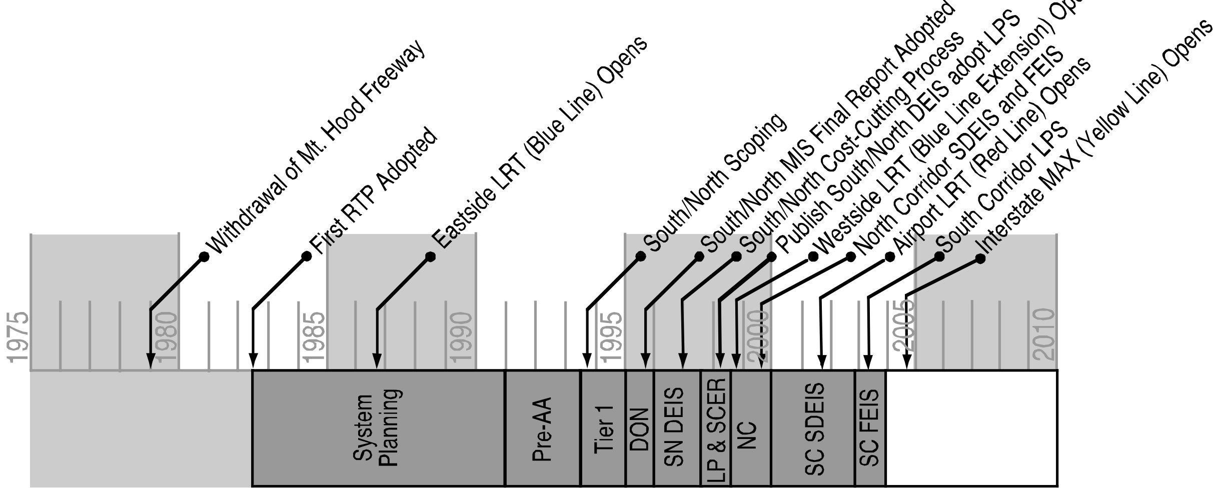
For a more detailed description of the alternatives under consideration, refer to the *Detailed Definition of Alternatives Report* (Metro, April 2002). The current design of the alternatives under consideration may be found in the conceptual design plans and profiles prepared by Metro and the Tri-County Metropolitan Transportation District of Oregon (TriMet) in February 2002.

2.1 Screening and Selection Process

The need to examine high-capacity transit (HCT) options in the South Corridor was established over two decades of system, sub-area, and planning studies and federal environmental impact and alternatives analysis studies. The previous study stages were System Planning, Preliminary Alternatives Analysis (Pre-AA), Scoping, Tier I Narrowing of Terminus and Alignment Alternatives, and preparation of the South/North Draft Environmental Impact Statement (DEIS), North Corridor SDEIS and Final Environmental Impact Statement (FEIS), and the South Corridor Transportation Alternatives Study.

Figure 2.1-1 is a timeline illustrating the sequencing of these phases. A summary of the major milestones that occurred within each phase follows. For more detail on the planning background for the South Corridor, see the *South Corridor Transportation Alternatives Study: Background Document* (Metro, January 2000), and Section 6.1 of this SDEIS for a description of the public involvement process used through the various phases of the study development.

Figure 2.1-1
Portland Area Project Development Time Line



List of Acronyms

DEIS	- Draft Environmental Impact Statement	LRT	- Light Rail Transit
DON	- Design Option Narrowing	MIS	- Major Investment Study
FEIS	- Final Environmental Impact Statement	Pre-AA	- Preliminary Alternatives Analysis
LPS	- Locally Preferred Strategy	RTP	- Regional Transportation Plan
S/N	- South/North Corridor	SDEIS	- Supplemental Draft Environmental Impact Statement
NC	- North Corridor	LP	- Listening Posts
SC	- South Corridor	SCER	- Sourh Corridor Evaluation Report

2.1.1 System Planning Studies

During the 25 years following the withdrawal of the Mt. Hood Freeway from the Federal Highway Interstate System, there were a series of major transportation analyses and actions taken that implemented the basic policy shift away from constructing radial freeways and toward a greater emphasis on meeting demand through improvements in public transit. In 1978, the Columbia Regional Council of Governments (CRAG – predecessor to Metro) adopted the *Regional Transportation Corridor Improvement Strategy*, which identified the need to consider transitways in the major radial corridors in the region. In 1982, Metro adopted its first *Regional Transportation Plan* (RTP), determining that a phased approach to implementing the third-priority transitway serving Portland and Clackamas County (after the Banfield and Westside light rail projects, which are now combined as the Blue Line). Between 1984 and 1986, Metro, in cooperation with its regional partners, conducted a system-level Phase I study of transitways in the region, which included the South Corridor (i.e., the Milwaukie and I-205 Corridors). The Phase I study recommended more detailed Phase II studies of the South Corridor.

2.1.2 Preliminary Alternatives Analyses

Both Milwaukie and I-205 HCT alternatives were evaluated during the Pre-AA. This phase of the study was designed to select a priority corridor to advance as the region's next priority after the Westside Light Rail Project. North and South Corridors were evaluated separately. The South Corridor analysis compared HCT alternatives in the Milwaukie Corridor and the I-205 Corridor. The North Corridor analysis compared HCT alternatives in the I-5 and I-205 Corridors.

For the Milwaukie Corridor, the analysis evaluated a light rail alignment connecting downtown Portland, Milwaukie, Clackamas Regional Center, and Oregon City in a “Y” configuration branching at Milwaukie. For the I-205 Corridor, an I-205 light rail line was evaluated to connect Oregon City with Clackamas and Gateway Regional Centers, continuing along the Banfield light rail line to downtown Portland. The Pre-AA I-205 light rail line was a longer version of the I-205 LRT Alternative in this SDEIS, which would operate between the Gateway and Clackamas Regional Centers. A light rail connection between Portland International Airport and Gateway, continuing to downtown Portland, was also evaluated. Ultimately, the Airport Metropolitan Area Express (MAX) segment of the I-205 light rail line was constructed and began operation in September 2001.

In April 1993, the Metro Council selected the Milwaukie Corridor to be the priority corridor for the South Corridor and selected the I-5 Corridor as the priority corridor for the North Corridor (Metro Resolution No. 93-1784). Further, the Council adopted an action plan to merge the corridors into a single South/North Corridor for purposes of completing an AA and DEIS.

The groundwork for inclusion of the I-205 segment in the evaluation of South Corridor alternatives began with the 1993 Pre-AA study. Although the Milwaukie and I-5 corridors were chosen as priority corridors for immediate HCT project development, the I-205 corridor remained an important transit corridor. In 1995, two years after the conclusion of the Pre-AA, the region adopted the *Region 2040 Growth Concept,* which created an integrated transportation and land use strategy of focusing higher-density development in “Regional Centers” and “Town Centers” connected by high-capacity transit. The I-205 segment of the South Corridor would connect the Gateway and Clackamas Regional Centers to the Portland Central City, helping the region achieve its adopted land use vision of development nodes connected by high-capacity transit. Including the I-205 segment in the South Corridor supports the pattern of land use and development defined in the *Region 2040 Growth Concept.* The goal of connecting “Regional Centers” with high-capacity transit adheres to this vision and is more consistent with the regional vision than the land use plans that were in place during the 1993 Pre-AA Study.

2.1.3 Scoping

The South/North Project was initiated in October 1993, when the Federal Transit Administration (FTA) issued notice in the *Federal Register* of its intent to publish an environmental impact statement (EIS) for the South/North Corridor. The *Scoping Notice* described a two-tier process: first, an initial set of alternatives would be identified, analyzed and evaluated; second, only a small set of the most promising alternatives selected through that process would be studied further in the DEIS. The Scoping Process included an evaluation, public comments, and narrowing process that included a series of eight mode and alignment workshops. Within the 30-day public comment period, four public scoping meetings were held to receive comments on the project’s proposed range of alternatives and impacts to be studied further. In December 1993 the Federal Scoping Process concluded with the adoption of the *Tier I Description of Alternatives Report* by the South/North Steering Committee (Metro, December 1993).

2.1.4 Tier I Activities

The purpose and outcome of the Tier I activities was to narrow the range of alternatives to be considered within the subsequent Tier II South/North DEIS. The primary milestones that occurred during the Tier I phase of the study, which was initiated in January 1994, were the narrowing of terminus and alignment alternatives through the Metro Council’s adoption of the *Tier I Final Report* (December 1994: Resolution No. 94-1989); the narrowing of design options through the adoption of the *Design Option Narrowing Final Report* by the South/North Steering Committee and endorsed by the Metro Council (Metro, January 1996); the narrowing of downtown Portland light rail alignments through the Metro Council's adoption of the *Downtown Portland Tier I Final Report* (December 1995: Resolution No. 95-2243); the Metro Council's adoption of the *MIS Final Report* (November 1995: Resolution No. 95-2243); and FTA's approval of the *MIS Final Report* and advancement of the South/North Corridor into Preliminary Engineering.

2.1.5 Tier II South/North Draft Environmental Impact Statement

The purpose of the Tier II phase of the study was to prepare and publish the South/North DEIS and to select a locally preferred alternative (LPA). Work on the South/North DEIS was initiated in January 1996. In December 1996, prior to completion of the DEIS, the South/North Steering Committee and the Metro Council evaluated the defeat of a November 1996 ballot measure that would have provided State of Oregon funding for a portion of the cost of the South/North Project. In response to the election results, project staff were directed to undertake a cost-cutting process, which included more than 200 public meetings, and resulted in the Metro Council's adoption of the *Cost-Cutting Measures Final Report* (Metro, May 1997). The cost-cutting process helped to further refine the set of alternatives and options studied within the South/North DEIS.

The South/North DEIS was published on February 27, 1998. The DEIS summarized the significant benefits, costs, and impacts associated with the alternatives and options under study. The DEIS also documented the trade-offs between various alternatives and design options. Following the conclusion of the DEIS public comment period on April 24, 1998, Metro initiated the process that led to the adoption of the *South/North Locally Preferred Strategy Final Report* by Metro's Joint Policy Advisory Committee on Transportation (JPACT) and by the Metro Council in July 1998.

2.1.6 North Corridor Supplemental Draft and Final Environmental Impact Statement

In November 1998, voters defeated a local funding ballot measure that would have re-approved the local funding for the South/North Project. In response to the loss of local funding, elected officials in the region held a series of *listening posts*, where they invited the public to comment on how to best meet the region's future transportation needs. Generally, the majority of those commenting supported a multi-modal transportation emphasis as a tool to maintain livable communities. Of those commenting specifically on the South/North Project, many suggested moving forward with a shorter project and were particularly supportive of a line to the north only.

In March 1999, a group of local business and community leaders asked TriMet and Metro to investigate development of a new light rail alignment in the North Corridor, proposing a new *Full Interstate Avenue Alignment* (i.e., the Yellow Line or Interstate MAX). The TriMet Board of Directors and Metro Council directed project staff to prepare a SDEIS examining the benefits, costs, and impacts associated with the proposed alignment alternative. The new alignment significantly reduced costs, displacements and other impacts as compared to the adopted Locally Preferred Strategy (LPS) in the North Corridor. The North Corridor SDEIS was published in the *Federal Register* in April 1999.

After considering the SDEIS, public comment and recommendations from participating local jurisdictions, the Metro Council amended the South/North LPS to include the *Full Interstate Avenue Alignment* as the preferred alternative and to define the segment between the Rose Quarter and the Expo Center as the first construction segment. The federal environmental process for the first segment of the North Corridor was completed in 1999 when FTA, TriMet, and Metro published the

North Corridor FEIS (October 1999) and FTA issued its Record of Decision (ROD) for the project in the *Federal Register* in January 2000. The Yellow Line between the Rose Quarter and the Expo Center is currently under construction and is scheduled to begin operation by September 2004.

2.1.7 South Corridor Transportation Alternatives Study

In April 1999, in response to the defeat of the November 1998 ballot measure and the subsequent *listening posts*, JPACT directed Metro staff to develop a study work program for the South Corridor that would evaluate and advance non-light rail transportation options to address the transportation problems in the corridor. The South Corridor Transportation Alternatives Study began with a scoping process, which concluded in May 2000. Comments received during the scoping process were documented in the *South Corridor Transportation Alternatives Study Public Comments for Scoping* (Metro, May 2000). The comments were considered by the Policy Committee when they issued the *South Corridor Study Wide Range of Alternatives* report (Metro, July 2000), which identified the array of alternatives (mode and general alignment) for further study and evaluation in the South Corridor Transportation Alternatives Study.

In October 2000, Metro and the study participants published the *South Corridor Transportation Alternatives Study Evaluation Report*, which documented the study's evaluation and assessment of seven non-light rail transportation modes or approaches that could be used to address the corridor's transportation problems. The following modes were evaluated in the report:

- No-Build Alternative
- Commuter Rail Alternative
- River Transit Alternative
- High Occupancy Vehicle (HOV) Lanes
- High Occupancy Toll (HOT) Lanes
- Bus Rapid Transit Alternative
- Busway Alternative

After the *Evaluation Report* was published, a series of open houses were held to accept public comment on the study's findings. In November 2000, after considering the technical issues (i.e., benefits, costs, and environmental impacts in relationship to the corridor's transportation and land use problems and opportunities), public comments, and technical advisory group's recommendations the project's Policy Committee narrowed the range of mode alternatives to advance into further study (refer to Appendix E for a list of the Policy Committee members).

The Policy Committee determined that commuter rail, river transit, HOV lanes, and HOT lanes failed to meet the project's goals and objectives such as supporting land use goals, reflecting community values, and providing high-quality transit service in the corridor. The Policy Committee determined that the following alternatives best met the project's goals and objectives and should be studied further in the South Corridor SDEIS:

- No-Build Alternative
- Bus Rapid Transit Alternative
- Busway Alternative

The Policy Committee also heard substantial public comments expressing support for including light rail alternatives in the 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 SDEIS. The Policy Committee directed staff to proceed with development of a lower-cost Milwaukie light rail alignment and develop a concept for an I-205 light rail alignment that would operate between the Clackamas Town Center and the Gateway Transit Centers (TC). After reviewing the subsequent analyses, the Policy Committee determined that both Milwaukie and I-205 light rail should be included in the SDEIS as elements of the following alternatives:

- Milwaukie LRT Alternative
- I-205 LRT Alternative
- Combined (I-205 and Milwaukie) LRT Alternative

The Policy Committee directed staff to work with the FTA, the Federal Highway Administration (FHWA), and other federal, state, and local agencies and jurisdictions to prepare a SDEIS for the South Corridor based on this range of six alternatives. In preparation for the SDEIS, the Policy Committee also evaluated and selected a range of design options for each of the alternatives that would be studied further in the SDEIS. In February 2002, FTA and FHWA issued a supplemental scoping notice in the *Federal Register,* announcing their intent to prepare and publish a SDEIS based on this range of alternatives.

This SDEIS contains findings that will be used to inform the public and local decision makers in their selection of the LPA for the South Corridor. It summarizes the significant benefits, costs, and environmental impacts associated with the alternatives and options described in Section 2.2. Where choices are to be made between alternatives and options, this SDEIS summarizes the trade-offs between those choices. Following receipt of public comment on this SDEIS, the region will select the preferred alternatives and options to advance into the FEIS, final design, and construction. Those alternatives and options will be documented in the *LPA Report*. The process, criteria, and measures to be used in the *LPA Report* adoption process are described in the *South Corridor Financial Analysis and Evaluation Methods Report* (Metro, July 2002).

2.2 Definition of South Corridor Project Alternatives

The section provides a description of the six alternatives under consideration for the South Corridor:

- the No-Build Alternative,
- the BRT Alternative,
- the Busway Alternative,
- the Milwaukie LRT Alternative,
- the I-205 LRT Alternative, and
- the Combined LRT Alternative.

A more comprehensive description of these alternatives can be found in the *Detailed Description of Alternatives Report* (Metro, July 2002). This section summarizes the transit (bus and light rail) and roadway capital improvements for each alternative and the bus and light rail operating characteristics for each alternative. Table 2.2-1 summarizes the transit and roadway improvements that would be included with all of the South Corridor alternatives. Table 2.2-2 summarizes the transit vehicles and service characteristics for the alternatives. Table 2.2-3 summarizes the design options used within this SDEIS for the comparative analysis (that is to say, that with other design options some of the characteristics of the alternatives may vary; any variations by design option are noted throughout this SDEIS). Table 2.2-4 summarizes the primary transit facilities (e.g., number of stations and park-and-ride lots) for each alternative. Table 2.2-5 summarizes how the primary transit facilities would vary by design option by segment. Table 2.2-6 summarizes the fixed guideway operating characteristics by alternative.

Table 2.2-1
Summary of Transit and Roadway Improvements for All Alternatives

Alternative	Transit Improvements	Roadway Improvements
No-Build Alternative	• Existing 2002 transit services and facilities; • TriMet service standards (see Section 2.2.1.2.A for more detail); • Some increases in route frequency and/or run times to avoid peak overloads and/or maintain schedule reliability; • Incremental increases in service hours and vehicle procurement, consistent with available revenue sources and consistent with the RTP 2020 financially constrained transit network, forecast to be approximately 1.5% per year; • Three new bus routes in the South Corridor: 1) a route that would connect the Clackamas TC and the Milwaukie TC; 2) a route that would connect Oak Grove with the Clackamas TC; and 3) a route that would operate on I-205, connecting the Parkrose, Gateway and Clackamas TCs; • Completion of the first segment of the Yellow Line from the Rose Quarter to the Expo Center, and an extension of the Yellow Line to downtown Vancouver; • Currently planned transit capital improvements, such as a 300-space surface P&R lot at the New Hope Church and a 150-space P&R lot in the vicinity of SE McLoughlin Boulevard and SE Roethe Rd; • Minor changes in transit operations and routing in the South Corridor; and • An additional (fourth) bus operations and maintenance facility and expansion of the Powell Garage to accommodate at least 50 additional buses.	• Road improvements are limited to those in the RTP financially constrained highway network – see Section 2.2.1 of the *South Corridor Project Detailed Definition of Alternatives Report* (Metro: July 2002) for a detailed listing of the planned roadway projects within the South Corridor.
BRT Alternative	• All transit improvements included within the No-Build Alternative; • A variety of BRT facility components, generally on SE McLoughlin Blvd, between the Hawthorne Bridge and Oregon City, and generally along Highway 224 and SE Harmony Rd, between Milwaukie and the Clackamas TC; • A range of BRT facility components that would include queue-bypass lanes, bus-priority traffic signal treatments, bus-only ramps, and shoulder bus lanes, intended to improve the speed and reliability of buses, and 17 BRT stations; • The addition of 2 BRT trunklines (i.e., limited-stop and high-frequency bus service), one connecting downtown Portland and Oregon City, generally via SE McLoughlin Blvd and Milwaukie, and one connecting downtown Portland and the Clackamas TC, generally via SE McLoughlin Blvd, Milwaukie and Hwy 224; • Two additional P&R lots providing 420 to 750 additional spaces (combined capacity, in addition to the No-Build Alternative); and expansion of the Southgate P&R Lot by 270 spaces; and • Relocation of the Milwaukie TC to the vicinity of the Southgate P&R Lot, and expansion of the Clackamas TC at its current site.	• Road improvements would generally be limited to those in the RTP financially constrained highway network; except for: • Removal of parking on the north side of SW Madison St, between SW 1st and 4th Aves, to create a third general purpose travel lane.
Busway Alternative	• All transit improvements included within the No-Build Alternative; • A separated guideway for transit buses, with grade-separation or traffic signal priority at intersections, with a segment generally located parallel to SE McLoughlin Blvd, between the Hawthorne Bridge and SE Ochoco St, and with another segment located between SE Freeman Way and the Clackamas TC, including 9 fixed guideway stations; • BRT facility improvements, generally along SE McLoughlin Blvd, between Milwaukie and Oregon City, and along Hwy 224, between Milwaukie and SE Freeman Way, with 11 BRT stations; • The addition of 2 trunklines (i.e., limited-stop, high-frequency bus lines) that would access the guideway, one between downtown Portland and Oregon City, generally via the guideway and SE McLoughlin Blvd, and one connecting downtown Portland and the Clackamas TC, generally via the guideway and Hwy 224; • Re-routing of 3 bus lines to access the separated guideway in the Portland to Milwaukie Segment, two of which would terminate at the Milwaukie TC during off-peak time periods (i.e., providing only local neighborhood feeder service); • Three additional P&R lots providing 1,020 to 1,350 additional spaces (combined capacity, in addition to the No-Build Alternative), and expansion of the Southgate P&R by 270 spaces; and • Relocation of the Milwaukie TC to the vicinity of the Southgate P&R Lot, and expansion of the Clackamas TC at its current site.	• Road improvements would generally be limited to those in the RTP financially constrained highway network; except for: • Removal of parking on the north side of SW Madison St, between SW 1st and 4th Aves, to create a third general purpose travel lane.
Milwaukie Light Rail Alternative	• All transit improvements included within the No-Build Alternative; • An approximately 6.5-mile mostly double-tracked LRT alignment between downtown Portland and Milwaukie (which would be an extension of the Yellow Line from SW 1st Ave in downtown Portland), generally parallel to and east of SE McLoughlin Blvd, with 8 to 10 LRT stations;	• Road improvements would generally be limited to those in the RTP financially constrained highway network; except for:

Milwaukie Light Rail Alternative (continued)	• BRT facility improvements, generally along SE McLoughlin Blvd, between Milwaukie and Oregon City, and along Hwy 224, and SE Harmony Rd, between Milwaukie and the Clackamas TC, including 13 BRT stations; • Adjustments to No-Build bus network: 1) eliminate/modify bus routes that would duplicate LRT service; and 2) adjust routes to connect to LRT stations or modified transit centers; • The addition of 2 BRT trunklines (i.e., limited-stop and high-frequency bus service) that would utilize BRT facility improvements, one operating between the Oregon City TC and the Milwaukie TC, with connections to the South Corridor LRT, generally operating via SE McLoughlin Blvd, and one connecting the Milwaukie TC with the Clackamas TC, generally via SE McLoughlin Blvd and Hwy 224; • Three to four additional P&R lots providing 690 to 1,625 additional spaces (combined capacity, in addition to the No-Build Alternative), and expansion of the Southgate P&R Lot by 270 spaces (Southgate Crossover DO); or removal of the Southgate P&R Lot (eliminating 330 spaces with the Tillamook Branch Line DO); • Relocation of the Milwaukie TC to the vicinity of the Southgate P&R Lot (Southgate Crossover DO) or to the vicinity of the Milwaukie Middle School (Tillamook Branch Line DO); and • Expansion of the Ruby Junction O&M facility to accommodate 16 additional LRVs.	• Minor modifications to segments of roadways along SE 17th Ave in Portland and SE Main St in Milwaukie, to accommodate the LRT alignment, depending upon the design option; • Elimination of 1 SB travel lane on SW 1st Ave between SW Salmon and Main Sts and 1 NB lane between SW Yamhill and Salmon Sts.
I-205 Light Rail Alternative	• All transit improvements included within the No-Build Alternative; • An approximately 6.7-mile double-tracked LRT alignment, that would connect the existing Gateway TC and the Clackamas TC, generally parallel to I-205 (South Corridor LRT service would extend into downtown Portland via the existing Blue Line, and Red Line service would terminate at the Gateway TC), with 8 new LRT stations; • BRT facility improvements, generally along SE McLoughlin Blvd, between downtown Portland and Oregon City, including 11 BRT stations; • The I-205 bus route included in the No-Build Alternative, between the Parkrose and Clackamas TCs would be eliminated; • The addition of 1 transit trunkline (i.e., limited-stop and high-frequency bus service) that would utilize BRT facility improvements, connecting downtown Portland and Oregon City, generally via SE McLoughlin Blvd; • Five to six additional P&R lots providing 2,100 to 2,600 additional spaces (combined capacity, in addition to the No-Build Alternative), and expansion of the Southgate P&R Lot by 270 spaces; • Reconfiguration or relocation of the Clackamas TC, depending on the terminus option; and • Expansion of the Ruby Junction O&M facility to accommodate 20 additional LRVs[1].	• Road improvements would generally be limited to those in the RTP financially constrained highway network; except for: • One minor modification to SE Fuller Rd to accommodate the LRT alignment; and • Removal of parking on the north side of SW Madison St, between SW 1st and 4th Aves, to create a third general purpose travel lane.
Combined Light Rail Alternative	• All transit improvements included within the No-Build Alternative; • An approximately 6.5-mile double-tracked LRT alignment between downtown Portland and Milwaukie (which would be an extension of the Yellow Line from SW 1st Ave in downtown Portland), generally parallel to and east of SE McLoughlin Blvd, with 8 to 10 LRT stations; • An approximately 6.7-mile double-tracked LRT alignment, that would connect the existing Gateway TC (which is serviced by the existing Blue and Red Lines) and the Clackamas TC, generally parallel to I-205 (I-205 LRT service would extend into downtown Portland via the existing Blue Line, and Red Line service would terminate at the Gateway TC), with 8 LRT stations; • BRT facility improvements, generally along SE McLoughlin Blvd, between Milwaukie and Oregon City, with 7 BRT stations; • Adjustments to No-Build bus network: 1) eliminate/modify bus routes that would duplicate LRT service; and 2) adjust routes to connect to LRT stations or modified transit centers; • The addition of 1 BRT trunkline (i.e., limited-stop and high-frequency bus service) that would utilize BRT facility improvements, connecting Milwaukie and Oregon City, generally via SE McLoughlin Blvd; • Six to eight additional P&R lots providing 2,370 to 3,475 additional spaces (combined capacity), and expansion of the Southgate P&R Lot by 270 spaces (Southgate Crossover DO) or removal of the 330 space P&R lot (Tillamook Branch Line DO); • Reconfiguration or relocation of the Clackamas TC, depending on the terminus option, and relocation of the Milwaukie TC to the vicinity of the Southgate P&R Lot or to the vicinity of the Milwaukie MS, depending on the terminus option; and • Expansion of the Ruby Junction O&M facility to accommodate 25 additional LRVs[1].	• Road improvements would generally be limited to those in the RTP financially constrained highway network; except for: • One minor modification to SE Fuller Rd to accommodate the LRT alignment; and • Elimination of one SB travel lane on SW 1st Ave between SW Salmon and Main Sts and one NB travel lane between SW Yamhill and Salmon Streets.

Source: *Detailed Definition of Alternatives Report*. (Metro: July 2002).
Note: LRT = light rail transit; TC = transit center; BRT = bus rapid transit; P&R = park-and-ride; Clackamas TC = Clackamas Town Center Transit Center; RTP = *2000 Regional Transportation Plan* (Metro: August 2000); NB = northbound; SB = southbound.

1 Based on modifying the Red Line to operate as a shuttle between Gateway TC and Portland International Airport. If the Red Line were to continue to serve downtown Portland, then the expansion of the Ruby Junction O&M facility would need to accommodate an additional 33 LRVs with the I-205 LRT Alternative and an additional 37 LRVs with the Combined LRT Alternative.

Table 2.2-2
Transit Vehicles and Service Characteristics for All Alternatives (2020)

Attribute		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Number of Buses							
South Corridor	In Service	254	255	255	223	235	219
	Spares	63	64	64	56	59	55
	Total	317	319	319	279	294	274
Systemwide	In Service	827	826	826	799	806	792
	Spares	208	207	207	200	203	198
	Total	1,035	1,033	1,033	999	1,009	990
Number of LRVs							
South Corridor	In Service	0	0	0	14	28	32
	Spares	0	0	0	2	5	5
	Total	0	0	0	16	33	37
Systemwide	In Service	110	110	110	124	128	132
	Spares	17	17	17	19	20	20
	Total	127	127	127	143	148[1]	152[1]
Transit VMT (Weekday)							
South Corridor	Bus	28,530	32,410	32,730	28,450	29,180	26,820
	LRV[2]	0	0	0	1,680	2,670	3,180
Non-Corridor	Bus	67,740	67,620	67,620	67,400	67,400	67,400
	LRV[2]	13,090	13,090	13,090	12,950	13,090	13,100
Systemwide	Bus	96,270	100,030	100,350	95,850	96,580	94,220
	LRV[2]	13,090	13,090	13,090	14,630	15,760	16,280
Place Miles[3] (Weekday)							
South Corridor	Bus	1,833,240	2,418,640	2,453,920	2,033,810	2,071,480	1,853,800
	LRV	0	0	0	446,880	710,220	844,550
Non-Corridor	Bus	4,393,510	4,385,660	4,385,590	4,371,200	4,371,200	4,371,200
	LRV	3,482,200	3,482,200	3,482,200	3,444,700	3,481,940	3,483,270
Systemwide	Bus	6,276,750	6,804,300	6,839,510	6,405,010	6,442,680	6,225,000
	LRV	3,482,200	3,482,200	3,482,200	3,891,580	4,192,160	4,327,820
Revenue Hours (Weekday)							
South Corridor	Bus	1,964	2,147	2,167	1,886	1,979	1,823
	LRV	0	0	0	68	112	136
Non-Corridor	Bus	4,387	4,372	4,371	4,375	4,375	4,375
	LRV	641	641	641	614	641	612
Systemwide	Bus	6,351	6,519	6,538	6,261	6,354	6,198
	LRV	641	641	641	682	753	748

Source: *Detailed Definition of Alternative Report* (Metro: April 2002).
Note: BRT = bus rapid transit; LRT = light rail transit; LRV = light rail vehicle; VMT = vehicle miles traveled.
[1] Based on modifying the Red Line to operate as a shuttle between Gateway TC and Portland International Airport with I-205 LRT and the Combined LRT alternatives. If the Red Line were to continue to serve downtown Portland, then there would be a total of 160 systemwide LRVs with the I-205 LRT Alternative and 164 LRVs with the Combined LRT Alternative – there would be no increase in South Corridor LRVs. There would also be increases in non-corridor VMT, place miles and revenue hours for the I-205 LRT and Combined LRT alternatives.
[2] For LRVs, *transit VMT* is measured in train miles rather than car miles.
[3] Place miles = *transit vehicle capacity* (seated and standing) for each vehicle type multiplied by *vehicle miles traveled for each vehicle type.*

2.2.1 No-Build Alternative

This section describes the attributes of the No-Build Alternative (see Table 2.2-1). The No-Build Alternative serves both as a viable alternative that could be selected through the project development process, and as a reference point to gauge the benefits, costs, and impacts of the other alternatives under study. The bus service network, related transit facilities and roadway improvements included in the No-Build Alternative are consistent with the 2000 RTP’s 2020 financially constrained transit and road network (Metro, August 2000). This section summarizes the capital improvements (i.e., transit and roadway) and transit operating characteristics of the No-Build Alternative. More detail on the capital improvements and operating characteristics of the No-Build Alternative can be found in the *Detailed Definition of Alternatives Report* (Metro, July 2002).

2.2.1.1 No-Build Capital Improvements

This section summarizes the transit and roadway improvements that would be implemented with the No-Build Alternative. These proposed capital improvements are consistent with the financially constrained transit and road network of the RTP.

A. No-Build Transit Improvements

In addition to the existing transit capital facilities in the South Corridor, the No-Build Alternative would include the following transit capital improvements: 1) a 300-space shared-use park-and-ride lot at the New Hope church east of the Clackamas Town Center on SE Monterey Avenue; and 2) a 150-space park-and-ride lot in the vicinity of SE McLoughlin Boulevard and SE Roethe Road.

Outside of the South Corridor, the No-Build Alternative would include the completion of the first segment of the Yellow Line (i.e., Interstate MAX light rail line) between downtown Portland and the Expo Center in North Portland, as well as an extension of the Yellow Line across the Columbia River into downtown Vancouver. The first segment of the Yellow Line is under construction and scheduled to begin revenue service in September 2004. The No-Build Alternative would include the existing Blue Line (i.e., the Eastside MAX and the Westside MAX light rail lines) between Gresham and Hillsboro, and the existing Red Line (i.e., Airport MAX light rail line) between the Portland International Airport and downtown Portland. In addition, the No-Build Alternative would include scheduled transit vehicle replacements and additional transit vehicles to accommodate the expansion of service and forecast increases in transit ridership to 2020. The transit capital improvements in the No-Build Alternative would be included in all other alternatives, except as noted (i.e., with light rail alternatives, fewer additional buses would be purchased). The No-Build Alternative's capital costs are accounted for in Section 5.1 and Table 5.1-3 of this SDEIS as system capital expenses.

Table 2.2-3
Design Options Used for the Comparative Analysis of Alternatives

Alternative	Segment	Design Option
Bus Rapid Transit	Milwaukie to Clackamas	• Linwood P&R Lot Design Option
Busway	Portland to Milwaukie	• Water Avenue Design Option • At-Grade Station Design Option • 17th Avenue Design Option
	Milwaukie to Clackamas	• Linwood P&R Lot Design Option
Milwaukie Light Rail	Portland to Milwaukie	• 17th Avenue Design Option • Southgate Crossover Design Option • Lake Road Terminus Option
	Milwaukie to Clackamas	• Linwood P&R Lot Design Option
I-205 Light Rail	Gateway to Clackamas	• East of CTC Terminus Options
Combined Light Rail	Portland to Milwaukie	• 17th Avenue Design Option • Tillamook Branch Line Design Option • Lake Road Terminus Option
	Gateway to Clackamas	• East of CTC Terminus Options

Source: Metro, February 2002.
Note: P&R = park-and-ride lot; CTC = Clackamas Town Center. This table defines the design option(s) that are used when the alternatives are compared in tables in this SDEIS. In instances where there are significant variations associated with the design options, these are clarified in footnotes and/or text.

Table 2.2-4
Primary Transit Facilities in the South Corridor for All Alternatives[1]

Transit Facility	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Separated Guideway[2]						
Light Rail Trackway Miles	0	0	0	6.5	6.7	13.2
Busway Guideway Miles	0	0.2	6.7	0.2	0	0
Total Miles	0	0.2	6.7	6.7	6.7	13.2
Stations						
Fixed-Guideway Stations[3]	0	0	9	10	8	18
BRT Stations	0	17	11	13	11	7
Total Stations	0	17	20	23	19	25
P&R Lots[4]						
Fixed-Guideway Lots	0	0	2	3	5	8
Other Lots	4	6	5	5	5	4
Total Lots	4	6	7	8	10	12
P&R Spaces[5]						
Fixed-Guideway Spaces	0	0	1,200	1,475	2,450[6]	3,925[6]
Other Spaces	880	1,900	1,300	1,300	1,300	700
Total Spaces	880	1,900	2,500	2,775	3,750[6]	4,625[6]
LRT O&M Facility						
Building Size[7]	183,500	223,057	223,057	223,057	239,057[8]	263,857[8]
Property Size[9]	0	0	0	10.4	10.4	10.4

Source: *Detailed Definition of Alternatives Report* (Metro: July 2002).
Note: BRT = bus rapid transit; LRT = light rail transit; LRV = light rail vehicle; P&R = park-and-ride; O&M = operating and maintenance.
1 This description of the alternatives is based on a specific set of design options for each alternative, as described in Table 2.2-3. Variations in these data that would result from a different set of design options for each alternative are documented in Table 2.2-5.
2 One-way. See Sections 2.2.2 and 2.2.3 for a definition of *BRT improvements* and *busway guideway,* respectively. With the Milwaukie and Combined LRT Alternatives, the Portland to Milwaukie Segment alignment length would include 0.53 mile of light rail track that would be in mixed traffic on the Hawthorne Bridge.
3 Fixed-guideway stations = any stations directly adjacent to a light rail line or a busway. Other stations = BRT-related stations within the corridor but not directly adjacent to a fixed guideway. All stations would be in addition to existing stations as of April 2002. The Milwaukie LRT Alternative would have 8 to 9 fixed-guideway stations; the Combined LRT Alternative would have 16 to 17 fixed-guideway stations with the Milwaukie Middle School Terminus Option.
4 Fixed-guideway lot = any park-and-ride directly adjacent to a light rail line or a busway. Other lot = a park-and-ride lot within the corridor not located directly adjacent to a fixed guideway. Does not include the existing Gateway P&R Lot.
5 Fixed-guideway spaces = spaces within any P&R lots directly adjacent to a light rail line or a busway. Other spaces = spaces within any P&R lot not located adjacent to a fixed guideway.
6 This includes 150 park-and-ride spaces at Foster Road. FHWA and ODOT have determined that a park-and-ride is not feasible at the proposed location. If no Foster Park-and-Ride is included, the number of spaces would be reduced by150.
7 The size of the Ruby Junction and Elmonica LRT O&M buildings in square feet. Expansion would occur only at Ruby Junction. The size of the bus O&M buildings and property would remain the same under each of the alternatives.
8 The LRT O&M facility building and property sizes are based on the projected LRV fleet size (see Table 2.2-2). The fleet sizes and, therefore, the O&M facility sizes for the I-205 and Combined LRT Alternatives are based on modifying the Red Line to operate as a shuttle between Gateway TC and Portland International Airport. If the Red Line were to continue to serve downtown Portland, there would be a total of 160 systemwide LRVs with the I-205 Alternative and 164 LRVs with the Combined Alternative, which would require a proportional increase in the O&M facility sizes.
9 In acres. Expansion would only occur at Ruby Junction.

B. No-Build Roadway Improvements

In addition to the existing interstate, state, regional, and local roadway facilities, the No-Build Alternative would include a variety of roadway improvements that are defined in the financially constrained road network of the RTP. A list of the most significant roadway improvements that would occur in the South Corridor under the No-Build Alternative follows:

- Sunrise Highway – construction of a new four-lane highway from 1-205 to Rock Creek Junction.
- Linwood/Harmony/Lake Road Improvements – grade separation of SE Harmony Road over the Union Pacific Railroad (UPRR) between its intersection with SE Lake Road, SE Linwood Avenue, and SE Railroad Avenue.

Table 2.2-5
Primary Transit Facilities in the South Corridor by Design Option and Affected Segment[1]

Alternative/*Segment*/Option	Design or Terminus Option	One-Way Fixed-Guideway[2] Miles	Fixed-Guideway[2] P&R Lots/Spaces	Other[3] P&R Lots/ Spaces
BRT				
Milwaukie to Clackamas	Linwood P&R Lot DO	0	0 / 0	2 / 900
	Johnson Rd P&R Lot DO	0	0 / 0	2 / 570
Busway				
Portland to Milwaukie[4]				
Water Avenue DO	17th Ave DO	4.36	1 / 600	1 / 600
	W of Brooklyn Yard DO	4.31		
7th Avenue DO	17th Ave DO	3.98	1 / 600	1 / 600
	W of Brooklyn Yard DO	3.93		
Milwaukie to Clackamas	Linwood P&R Lot DO	2.39	1 / 600	1 / 300
	Johnson Rd P&R Lot DO	2.39	0 / 0	2 / 570
Milwaukie LRT				
Portland to Milwaukie				
17th Avenue DO	SG Crossover DO w/Lake Rd TO	6.45	3 / 1,475	0 / 0
	SG Crossover DO w/MMS TO	6.11	2 / 1,200	0 / 0
	Tillamook BL DO w/Lake Rd TO	6.35	2 / 875	0 / 0
	Tillamook BL DO w/MMS TO	6.03	1 / 600	0 / 0
W of Brooklyn Yard DO	SG Crossover DO w/ Lake Rd TO	6.43	3 / 1,475	0 / 0
	SG Crossover DO w/MMS TO	6.09	2 / 1,200	0 / 0
	Tillamook BL DO w/Lake Rd TO	6.35	2 / 875	0 / 0
	Tillamook BL DO w/MMS TO	6.01	1 / 600	0 / 0
Milwaukie to Clackamas	Linwood P&R Lot DO	0 / 0	0 / 0	2 / 900
	Johnson Rd P&R Lot DO	0 / 0	0 / 0	2 / 570
I-205 Light Rail				
Gateway to Clackamas	East of CTC TO	6.70	5 / 2,450[5]	1 / 300
	North of CTC TO	6.67	4 / 1,950[5]	1 / 300
Combined Light Rail				
Portland to Milwaukie				
17th Avenue DO	SG Crossover DO w/Lake Rd TO	6.43	3 / 1,475	0 / 0
	SG Crossover DO w/MMS TO	6.09	2 / 1,200	0 / 0
	Tillamook BL DO w/Lake Rd TO	6.35	2 / 875	0 / 0
	Tillamook BL DO w/MMS TO	6.01	1 / 600	0 / 0
W of Brooklyn Yard DO	SG Crossover DO w/Lake Rd TO	6.45	3 / 1,475	0 / 0
	SG Crossover DO w/MMS TO	6.11	2 / 1,200	0 / 0
	Tillamook BL DO w/Lake Rd TO	6.37	2 / 875	0 / 0
	Tillamook BL DO w/MMS TO	6.03	1 / 600	0 / 0
Gateway to Clackamas	East of CTC TO	6.70	5 / 2,450[5]	1 / 300
	North of CTC TO	6.67	4 / 1,950[5]	1 / 300

Source: Metro and TriMet, March 2002.
Note: P&R = park-and-ride; W = west; DO = design option; w/ = with; TO = terminus option; SG = Southgate; MMS = Milwaukie Middle School; BL = branch line; LRT = light rail transit.

1 All data is only for the specified segment and the specified combination of design options within that segment. The other segments not listed for a specific alternative do not have design options that would change the characteristics of that segment's one-way fixed-guideway miles or P&R lots or spaces. The first combination of design options listed within each segment is the set of design options used for the comparative analysis of alternatives within this SDEIS (see Table 2.2-3).

2 *Fixed guideway* is either light rail tracks in exclusive right-of-way, sections of busway guideway or bus-only ramps, as defined in Sections 2.2.2.1.1 or 2.2.3.1.1. With the Milwaukie LRT and Combined LRT Alternatives, the Portland to Milwaukie Segment alignment length would include 0.53 miles of light rail track that would be in mixed traffic on the Hawthorne Bridge.

3 Other park-and-rid lots and spaces = total P&R lots and spaces within any P&R lot that would not be located adjacent to a fixed guideway.

4 There would be no difference in the busway guideway length or the number or park-and-ride lots or spaces with either of the Clinton Street Design Options.

5 This includes 150 park-and-ride spaces at Foster Road. FHWA and ODOT have determined that a park-and-ride is not feasible at the proposed location. If no Foster Park-and-Ride is included, the number of spaces would be reduced by 150.

- Harmony Road Improvements – widening of SE Harmony Road, from generally two to three lanes to five lanes, between SE 82nd Avenue and Highway 224.

- West Monterey Extension – extending SE Monterey Avenue between SE 82nd Avenue and SE Fuller Road as a two-lane roadway.
- Monterey Improvements – widening SE Monterey Avenue, from generally two to three lanes to five lanes, between SE 82nd Avenue and I-205.
- Causey Avenue Extension – extending SE Causey Avenue across I-205 to SE Bob Schumacher Road as a three-lane roadway.

The roadway capital improvements in the No-Build Alternative would be implemented under all other alternatives being considered in the South Corridor.

Table 2.2-6
South Corridor Fixed-Guideway[1] Operating Characteristics by Alternative (2020)

Operating Characteristic	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
One-Way Fixed-Guideway Miles				
Portland to Milwaukie Segment	4.4	6.5	N/A	6.5
Milwaukie to Clackamas Segment	2.4	0.2	N/A	N/A
Gateway to Clackamas Segment	N/A	N/A	6.7	6.7
One-Way Running Time[2]				
Portland to Milwaukie Segment	23:19	13:43	N/A	13:43
Milwaukie to Clackamas Segment	10.84	N/A	N/A	N/A
Gateway to Clackamas Segment	N/A	N/A	14:23[3]	14:23[3]
Round-Trip Layover Time (minutes)	N/A	26	29	26 / 24[4]
Weekday Headways[5]: (Peak Hours[6] / Daybase[7] / Night[8])				
Portland to Milwaukie Segment	5 / 10 / 15	7.5 / 10 / 15	N/A	10 / 10 / 15
Milwaukie to Clackamas Segment	6.7 / 10 / 15	N/A	N/A	N/A
Gateway to Clackamas Segment	N/A	N/A	7.5 / 10 / 15	10 / 15 / 15
Light Rail Characteristics				
Train Platform Hours[9]	N/A	93	156	184
Train Miles[10]	N/A	1,680	2,670	3,180
Car Miles[10]	N/A	3,360	5,340	6,360
Peak LRVs in Revenue Service[10]	N/A	14	28	32
LRV Fleet Size[10]	N/A	16	33	37

Source: TriMet, 2002.
Note: LRT = light rail transit; LRV = light rail vehicle; N/A = not applicable. All data is based on the design options used for the analysis of bus and light rail alternatives, as specified in Table 2.2-3. Variations in the one-way guideway miles by design options are documented in Table 2.2-5. Variations in other characteristics by design option would be negligible.

1 *Fixed guideway* is either light rail tracks, sections of busway guideway or bus-only ramps, as defined in Sections 2.2.2.1.1 and 2.2.3.1.1.
2 Average one-way through trip in minutes:seconds on the fixed guideway. The one-way travel times for the Busway Alternative would be for the entire segment, portions of which would include a busway guideway, and therefore the travel times would be the result of buses using a mixture of operating environments throughout the segment (i.e., separated guideway, queue-bypass lanes, shoulder bus lanes, bus only ramps and mixed-traffic operation – see Section 2.2.3.1 for more detailed information on the busway capital components).
3 Note that with the I-205 LRT and the Combined LRT alternatives, LRVs would continue from the Gateway TC to downtown Portland, incurring an additional 38 minutes in one-way running time on existing light rail tracks.
4 Portland to Milwaukie Segment / Gateway to Clackamas Segment.
5 Headways are the average number of minutes between revenue vehicles operating in the same direction at a given point within a given hour for the specified time period, measured at: the Hawthorne Bridge for the Portland to Milwaukie Segment, at SE Oak Street for the Milwaukie to Clackamas Segment and at SE Stark Street for the Gateway to Clackamas Segment.
6 Approximately 7:00 to 9:00 a.m. and 4:30 to 6:30 p.m.
7 Approximately 5:30 a.m. to 6:30 p.m. (excluding the 7:00 a.m. to 9:00 a.m. and 4:30 p.m. to 6:30 p.m. time periods). Headways in the hours immediately before and after the peak periods may be slightly greater than the day-base headways.
8 Approximately 6:30 p.m. to 9:00 p.m.
9 Platform hours are the hours in the South Corridor that a vehicle is being operated, both in and out of revenue service – LRVs only.
10 Weekday, South Corridor LRVs only.

2.2.1.2 No-Build Transit Operating Characteristics

This section summarizes the bus and light rail operating characteristics that would occur under the No-Build Alternative. A more detailed summary of transit operating characteristics can be found in the *Detailed Definition of Alternatives Report* (Metro, April 2002).

A. No-Build Bus Operations

Similar to TriMet's existing transit network (Figure 1.2-1), the No-Build Alternative would provide peak-hour trunkline bus service between downtown Portland and the South Corridor, generally via SE McLoughlin Boulevard north of Milwaukie, with buses operating on an average combined headway of approximately 2 ½ minutes on SE McLoughlin Boulevard and of approximately 2 minutes to and from the Milwaukie TC, in the a.m. and the p.m. peak periods, respectively. Again, similar to the existing transit network in the South Corridor, other routes would provide cross-town or feeder service and would operate at somewhat longer headways, depending on demand. In general, all fixed routes (existing and future) would operate at minimum policy headways, as outlined in *TriMet Service Standards* (TriMet, May 1989). The Standards are as follows: Urban Grid Routes, Regional/Urban Trunk Routes – 10 minutes peak and 15 minutes base; City Radials and Crosstown Routes – 15 minutes peak and 15 minutes base; Suburban Timed Transfer and Regional Trunks – 15 minutes peak and 30 minutes base; Suburban Radials/Feeders – 30 minutes peak and 30 minutes base; and Peak-Only Radials/Feeders – 30 minute peak.

Transit service improvements within the No-Build Alternative would be limited to those fundable using existing revenue sources. In general, the average annual increase in service hours projected to be available under the financially constrained transit network through 2020 would be approximately 1.5 percent per year. Systemwide, TriMet, the Clark County Public Transportation Benefit Area Authority (C-TRAN), and the South Metro Area Rapid Transit (SMART) would operate approximately 6,350 weekday revenue hours of bus service under the No-Build Alternative in 2020, approximately 27 percent more than they provided in 2000.

Following is a listing of the bus service improvements associated with the No-Build Alternative, highlighting the most significant changes that would occur relative to the existing bus network in the South Corridor (note that all route numbers and names used for new bus routes are for the purpose of this study only – they may not be the route numbers and names if they are implemented by TriMet):

- All existing transit service, as of March 2002, that was not included in the South Corridor Project's base year transit network (September 2000);
- Modifications to Route 31-Estacada that would alternately branch the route to Damascus and Estacada, and to Route 155 Sunnyside that would extend the route into Damascus;
- Modifications to local Oregon City bus service to include regularly scheduled all-day feeder routes that would connect the Oregon City TC with surrounding neighborhoods;
- The addition of Route 30-Johnson Creek, which would connect the Clackamas Town Center TC with the Milwaukie TC, generally via SE Johnson Creek Boulevard;
- The addition of Route 07-Thiessen, which would connect the Oak Grove residential area with commercial activity in the Clackamas Regional Center, generally via SE Theissen Road; and
- The addition of Route 03-Parkrose/Clackamas Town Center, which would connect the Parkrose TC, the Gateway TC, and the Clackamas Town Center TC, generally via I-205.

Under the No-Build Alternative, buses in the South Corridor would continue to operate in mixed traffic on increasingly congested streets and highways, and would generally experience increases in their travel time and a deterioration of their schedule reliability into the foreseeable future.

Under its draft *Facilities Master Plan*, which would be implemented under the No-Build Alternative, TriMet would have the operations and maintenance building capacity to accommodate increases in the bus fleet size resulting from the No-Build Alternative without any facility increases.

B. Light Rail Operating Characteristics

With the No-Build Alternative, TriMet would operate light rail service on three interconnected lines, as described in Section 2.2.1.1. Two of those lines, the Blue Line and the Red Line, are currently in revenue service. The first segment of the third line, the Yellow Line, is under construction. A future extension of the Yellow Line into downtown Vancouver, Washington is also an element of the financially constrained transit network of the RTP and the No-Build Alternative.

Under the No-Build Alternative, Blue Line light rail trains would generally operate every 4 ¼ minutes between Gresham and Hillsboro during the peak period, and every 10 minutes during off-peak times. Red Line light rail trains would operate as they currently do, between downtown Portland and the Portland International Airport, at 15-minute headways during peak and off-peak periods. When service is initiated on the first segment of the Yellow Line, trains will operate between downtown Portland and the Expo Center in North Portland. Under the No-Build Alternative, light rail trains would operate on the Yellow Line between downtown Portland and downtown Vancouver at 6-minute headways in peak periods and 10-minute headways during off-peak periods. There would be no light rail service in the South Corridor under the No-Build Alternative.

2.2.2 Bus Rapid Transit (BRT) Alternative

This section summarizes the capital and operating characteristics of the BRT Alternative (see Table 2.2-1 and Figure 2.2-1). It is important to note that the BRT Alternative is differentiated from a typical bus network both by its capital facility improvements and by its operating plan, which would both be designed to improve the speed and reliability of trunkline bus service in the South Corridor.

2.2.2.1 BRT Capital Improvements

This section provides a description of the transit and roadway capital improvements that would be included in the BRT Alternative (see Table 2.2-4).

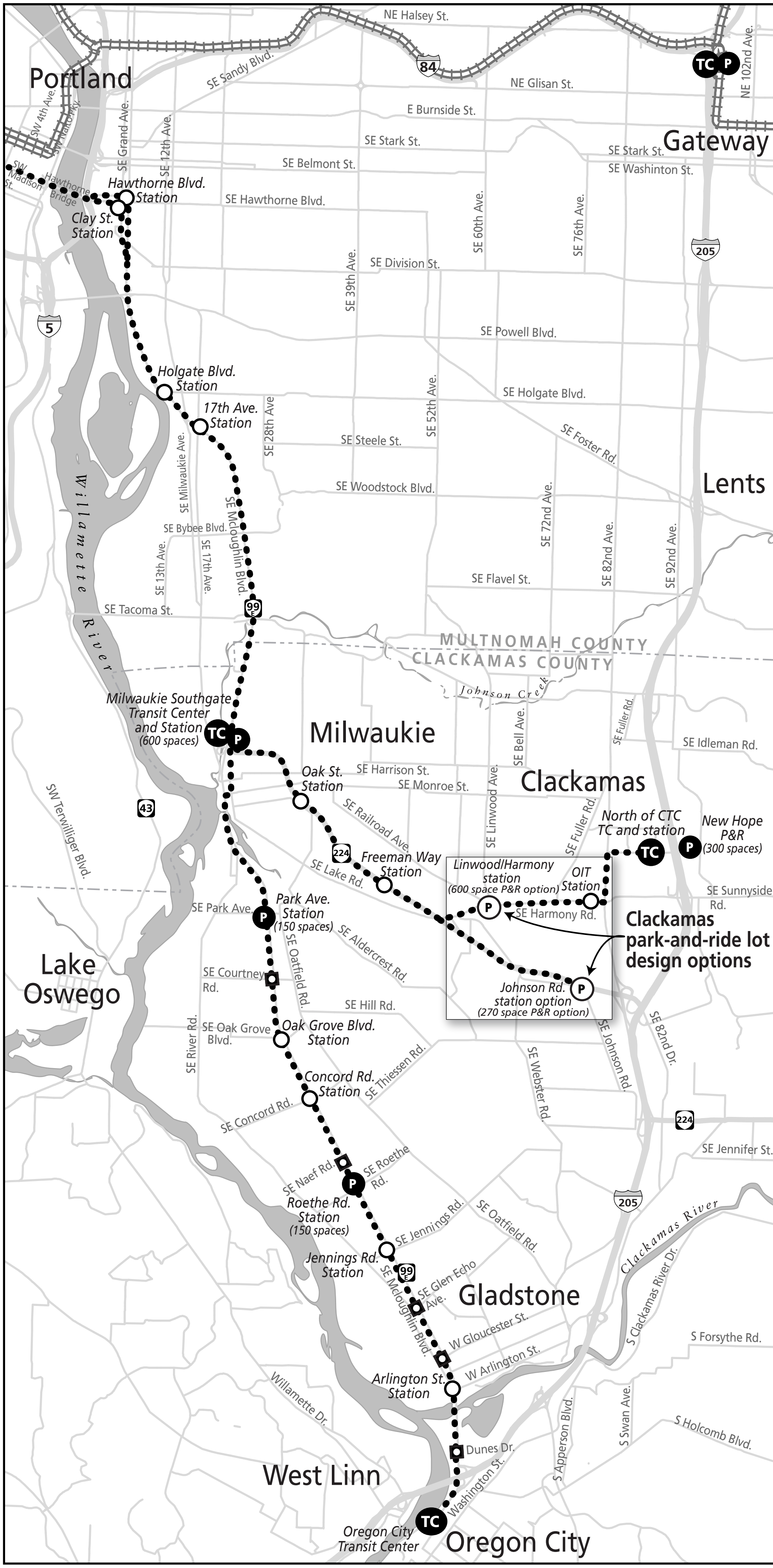
2.2.2.1.1 BRT Transit Capital Improvements

The BRT Alternative would include all of the transit capital improvements in the No-Build Alternative, as well as a variety of localized capital improvements designed primarily to improve the speed and reliability of trunkline buses in the South Corridor. When implemented together these individual capital elements would result in an integrated corridor strategy and program.

SOUTH CORRIDOR PROJECT

Bus Rapid Transit Alternative

Figure 2.2-1



LEGEND

Bus Rapid Transit and station

Existing Light Rail

TC Transit Center

P Park & Ride

P Option

Local bus stop improvements

County Line

SOUTH CORRIDOR PROJECT Transportation Alternatives

0 1 2 Miles

N

METRO

A. General Definition of BRT

Generally, a BRT program is broadly defined, and could include any mixture of the following or additional elements: sections of exclusive and/or barrier-separated bus lanes, intelligent transportation system treatments that use vehicle location monitoring systems and traffic signal priority, simplified and quicker fare payment systems, special vehicles, and stations with improved passenger amenities. No single element within this set of treatments typifies a BRT program. Instead, it is the application of a wide range of treatments throughout a corridor in an integrated and coordinated fashion that constitutes a BRT program. Relative to a busway strategy (see Section 2.2.3), a BRT program would typically provide transit buses with numerous shorter segments of separation from mixed traffic, and that separation may be less definitive than with a busway guideway (i.e., a paint stripe and lane marking versus a concrete barrier).

While BRT systems typically include a wide breadth of components throughout a corridor that are designed to increase the speed and reliability of the bus line, BRT systems also tend to include many short and/or long segments where the BRT buses merge in and out of general purpose traffic or operate within general purpose travel lanes. In addition, while many intersections within a BRT system may offer traffic signal priority to BRT buses, they typically do not offer full signal pre-emption found in many light rail and busway systems.

B. South Corridor BRT Elements

The BRT Alternative would include the same transit capital improvements that would be included in the No-Build Alternative. In addition, the BRT Alternative would include transit capital facilities designed to improve the speed and reliability of trunkline buses in the South Corridor. Within the South Corridor, the BRT Alternative would be composed of the following primary elements, and each element would be applied to specific sites to address specific travel time and/or reliability problems or opportunities in the selected travel corridor:

- **Queue-Bypass Lanes.** Queue-bypass lanes would be extensions of general-purpose, right-turn lanes at signals (approximately 500 feet in length), which would allow buses to share the right-turn lane with general traffic and to bypass the queue of vehicles in the general purpose through lanes. In general, queue-bypass lanes would be coupled with bus-priority traffic signal treatment.

- **Bus-priority Traffic Signal Treatment.** Bus-priority traffic signal treatments would allow equipped buses at treated intersections to receive traffic signal priority. Traffic signal priority would either extend an already-green phase as the bus approaches the signal, or it would decrease the length of a red light for an approaching bus. In general, bus-priority would only occur when an equipped bus is behind schedule, as determined through an on-board global positioning system (GPS) and a computer-based route schedule. Both BRT buses and standard buses equipped with bus-priority devices would be able to activate bus-priority traffic signals.

- **Bus-Only Ramp.** Bus-only ramps would provide relatively short sections of grade-separation for buses, providing a protected transition from one facility to another and/or a grade-separated crossing of a roadway or rail line.

- **Shoulder Bus Lanes.** A shoulder bus lane would use the shoulder of Highway 224 that would be widened (from approximately 10 feet to approximately 17 feet) and reconstructed to roadway standards to accommodate regular bus traffic. In general, shoulder bus lanes would be for the exclusive use of transit vehicles. However, because the converted shoulders would not be replaced, the shoulder bus lanes would also serve as emergency parking for general purpose traffic on the highway. At intersections and off-ramps, general-purpose vehicles would be allowed to enter the shoulder bus lanes to make right turns.

- **BRT Stations.** The BRT Alternative would include BRT stations with the following amenities: larger, consistently designed passenger shelters; ticket machines; real-time passenger information systems that would display the estimated arrival time for the next bus (using GPS); pay telephones; benches; and bus bays sized to accommodate articulated buses. These amenities would also be found in all transit centers in the corridor that would be served by BRT buses.

- **BRT Vehicles.** Under the BRT Alternative, a fleet of 43 articulated buses would be purchased to operate on the Corridor's two BRT trunkline routes, which would each be fitted with bus-priority equipment (see Table 2.2-2). Although new technologies such as hybrid buses (electric/diesel) are starting to be used by the transit industry, they are still somewhat experimental; therefore, the analysis in this SDEIS is based on diesel-powered articulated buses.

The BRT Alternative has been designed to improve the speed and reliability of trunkline bus service connecting downtown Portland, Milwaukie, the Clackamas Regional Center, and Oregon City. In particular, the capital improvements for the BRT Alternative would be focused along SE McLoughlin Boulevard and on Highway 224 (see Figure 2.2-1 and Table 2.2-7). Following is a segment-by-segment description of the BRT Alternative. It is important to note that while the path that the BRT buses would follow would be contiguous and would follow a specific route through three of the Corridor's segments, the BRT capital improvements would be localized and would often be discontinuous. And, while there would be specific routes and buses that would be designated as BRT, all of the BRT facilities, such as a bus-only ramp, would be used by non-BRT buses when they would travel along the BRT alignment. Figure 2.2-1 illustrates both the BRT alignment and the capital improvements that would be associated with the BRT Alternative.

C. Portland to Milwaukie Segment

The Portland to Milwaukie Segment extends from the southern edge of the downtown Portland transit mall (which is located on SW 5th and 6th Avenues, between NW Glisan and SW Madison Streets), across the Hawthorne Bridge, south along SE McLoughlin Boulevard to the Milwaukie Southgate TC. Following is a list of the capital improvements that would be associated with the BRT Alternative in the Portland to Milwaukie Segment:

- BRT Stations would be located on SE Martin Luther King, Jr. Boulevard between SE Clay and Market Streets (southbound only), on SE Grand Avenue at SE Hawthorne Boulevard (northbound only), and on SE McLoughlin Boulevard at SE Holgate Boulevard and SE 17th Avenue.

- Queue bypass lanes and bus-priority traffic signal treatments would be installed at the intersections of SE McLoughlin Boulevard at SE Holgate Boulevard and at SE 17th Avenue.

- A 600-space structured park-and-ride lot would be constructed east of SE McLoughlin Boulevard and south of SE Tacoma Street and the Southgate Park-and-Ride Lot would be expanded from 330 surface spaces to 600 structured spaces.

- The Milwaukie TC would be relocated adjacent to the Southgate Park-and-Ride Lot and would include amenities similar to other BRT stations.

Table 2.2-7
BRT Intersection Improvements by Segment and Alternative

Segment / *Through Street* / *Cross Street*	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Portland to Milwaukie					
SE McLoughlin Blvd					
SE Holgate Blvd	S, Q, O	–	–	S, Q, O	–
SE 17th Ave	S, Q, O	–	–	S, Q, O	–
Milwaukie to Clackamas					
Highway 224[1]					
SE Harrison St	Q, O	Q, O	Q, O	–	–
SE Monroe St	S, N	S, N	S, N	–	–
SE Oak St	S, Q, O	S, Q, O	S, Q, O	–	–
SE 37th Ave	Q, O	Q, O	Q, O	–	–
SE Freeman Way	S, Q, O	S, Q, O	S, Q, O	–	–
EB Ramp & SE Lake Rd	B, O	B. O	B, O	–	–
SE Lake Rd[2]	O	O	O	–	–
SE Johnson Rd[2]	O	O	O	–	–
SE Harmony Rd					
SE Lake Rd	O	–	O	–	–
SE Linwood Ave	O	–	O	–	–
SE Fuller Rd	S	–	S	–	–
At CCC/OIT	S	S	S	–	–
New Hope P&R Lot	S	S	S	–	–
Milwaukie to Oregon City[3]					
SE McLoughlin Blvd					
SE Harrison St	O	O	O	O	O
SE Monroe St	O	O	O	O	O
SE Washington St	O	O	O	O	O
SE Sparrow St	P, R	P, R	P, R	P, R	P, R
SE Park Ave	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R
SE Torbank	P, R	P, R	P, R	P, R	P, R
SE Courtney	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R
SE Oak Grove Blvd	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R
SE Risley Ave	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R
SE Concord Rd	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R
SE Vineyard Rd	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R
SE Naef Rd	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R
SE Rothe Rd	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R
SE Boardman Rd	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R
SE Jennings Rd	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R
SE Glen Echo Ave	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R
SE Gloucester St	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R
SE Arlington St	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R	S, Q, O, R
SE Dunes Drive	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R	L, Q, O, R
14th Street	O	O	O	O	O
11th Street	O	O	O	O	O

Source: *Detailed Definition of Alternatives Report* (Metro, March 2002).
Note: BRT = bus rapid transit; S = BRT station; Q = queue bypass lane; O = bus-priority traffic signal treatment; E = eliminate signal; N = no left turn; P = pedestrian crossing; R = Pedestrian refuge; L = improvements to local bus stops not served by BRT buses; B = bus only lane on an off-ramp; CCC = Clackamas Community College; OIT = Oregon Institute of Technology; EB = eastbound; P&R = park-and-ride. See Section 2.2.2.1 for a more detailed description of the BRT capital improvement elements. No BRT intersection improvements would be included in the No-Build Alternative.

1 Bus-only shoulder lanes would be constructed along both shoulders of Highway 224, between the bus-only ramps to SE Main Street and approximately 500 feet east of SE Oak Street. General purpose vehicles would be allowed to use the shoulder lanes at the intersections of Highway 224 and SE Harrison and SE Oak Streets, which would function as queue bypass lanes at intersections.
2 These intersection improvements would only occur with the Johnson Road Park-and-Ride Lot Design Option.
3 Eleven additional intersections in Oregon City would receive bus-priority traffic signal treatments under all alternatives except the No-Build: on 7th Street at SE Washington, Monroe and Polk Streets, and on Molalla Avenue at Division, Pearl and Hilda-Holmes Streets, Warner-Milne and S Beavercreek Roads, Clairmont Way, Gaffney Lane and Highway 213.

D. Milwaukie to Clackamas Segment

The Milwaukie to Clackamas Segment extends from the Milwaukie Southgate TC along Highway 224 and SE Harmony Road, east to the Clackamas Town Center TC and the New Hope Church Shared-Use Park-and-Ride Lot (located just east of I-205). Two design options are being evaluated for the Milwaukie to Clackamas Segment: the Linwood Park-and-Ride Lot Design Option; and the Johnson Road Park-and-Ride Lot Design Option. The following capital improvements would be associated with the BRT Alternative in this segment and would occur with either design option:

- Transit-only ramps would connect SE Main Street in Milwaukie to the proposed eastbound and westbound shoulder bus lanes of Highway 224.

- Bus-only lanes would be constructed on the shoulders of Highway 224 (i.e., the shoulders would be reconstructed and widened from 10 feet to approximately 17 feet), generally continuous between the bus-only ramps to SE Main and approximately 500 feet east of SE Oak Street. Other vehicles would only be allowed to access the shoulder lanes to make right turns onto and to enter Highway 224 from SE Harrison and Oak Streets. Bicyclists would continue to be allowed to use the shoulder bus lanes.

- Queue bypass lanes coupled with bus-priority traffic signal treatments would be installed at the intersections of Highway 224 and SE Harrison Street, Oak Street, SE 37th Avenue, and SE Freeman Way.

- A bus-only lane would be installed on the eastbound ramp from Highway 224 to SE Lake Road, with a bus-priority treated traffic signal at the intersection for buses that would turn left onto SE Lake Road.

- Bus-priority traffic signal treatments (without queue bypass lanes) would be installed at the intersections of SE Harmony Road SE Lake Road, SE Linwood Road, SE Fuller Road and the access road to the Oregon Institute of Technology (OIT)/Clackamas Community College (CCC) branch campuses.

- BRT stations would be located at the following intersections: Highway 224 and SE Oak Street, Highway 224 and SE Freeman Way, SE Lake Road and SE Harmony Road, on SE Harmony Road at the OIT/CCC campuses, and at the New Hope Shared-Use Park-and-Ride Lot.

- The existing Clackamas Town Center TC would be slightly enlarged and reconfigured at its current site and would receive passenger amenities similar to a BRT station.

- Under the **Linwood Park-and-Ride Lot Design Option**, there would be a 600-space structured park-and-ride lot in the vicinity of SE Lake Road and SE Linwood Avenue, with a BRT station located adjacent to the park-and-ride lot.

- Under the **Johnson Road Park-and-Ride Lot Design Option**, there would be a 270-space surface park-and-ride lot constructed in the vicinity of SE Johnson Road and Highway 224. In addition, bus-priority traffic signal treatments would be installed at the intersections of SE Lake Road and SE Johnson Road with Highway 224, and a BRT station would be located adjacent to the park-and-ride lot (with this design option there would be no Linwood park-and-ride lot).

E. Milwaukie to Oregon City Segment

The Milwaukie to Oregon City Segment extends from the Milwaukie Southgate TC to Oregon City. The following capital improvements would be associated with the BRT Alternative in the Milwaukie to Oregon City Segment:

- Bus-priority traffic signal treatments would be installed at three intersections on SE McLoughlin Boulevard in downtown Milwaukie.
- BRT stations would be located at five intersections along SE McLoughlin Boulevard south of Milwaukie.
- Improvements would be made to eight local bus stops at eight intersections on SE McLoughlin Boulevard south of Milwaukie.
- Queue bypass lanes and bus-priority traffic signal treatments would be installed at 14 intersections along SE McLoughlin Boulevard south of Milwaukie.
- Bus-priority traffic signal treatments would be installed at 11 intersections on SE 7th Street and SE Molalla Avenue in Oregon City.
- A park-and-ride lot would be constructed along SE McLoughlin Boulevard at SE Park Avenue (150 spaces).
- The Oregon City TC would be upgraded to include BRT station amenities.

F. Gateway to Clackamas Segment

The Gateway to Clackamas Segment extends from the Gateway TC in the north, which is currently and would continue to be served by the Blue and Red Lines, along I-205 to the Clackamas Regional Center in the south. There would be no capital improvements in the segment with the BRT Alternative.

2.2.2.1.2 BRT Roadway Capital Improvements

The BRT Alternative would include all of the roadway capital improvements included with the No-Build Alternative. In addition, parking would be removed from the north side of SW Madison Street between SW 1st and 4th Avenues in downtown Portland to create a third general-purpose travel lane.

2.2.2.2 BRT Transit Operating Characteristics

The section summarizes the bus and light rail operating characteristics of the BRT Alternative within the South Corridor (see Table 2.2-2).

2.2.2.2.1 BRT Bus Operations

This section provides a general description of bus operations within the South Corridor under the BRT Alternative, followed by a description of the specific routing of BRT bus routes (i.e., the BRT alignment), which can be found in the segment-by-segment description of the BRT alignment below.

The transit network for the BRT Alternative would be built on the No-Build transit network described in Section 2.2.1.2. Modifications to the No-Build transit network would be made to make use of the BRT capital improvements described in Section 2.2.2.1 in order to improve the speed and reliability of trunkline bus service between activity centers in the South Corridor and downtown Portland. Line 99X would be replaced by the new trunkline service described below.

In particular, two new trunkline routes for BRT buses would be added to the No-Build transit network. The first trunkline route would generally operate on SE McLoughlin Boulevard between the downtown Portland transit mall, the Milwaukie TC, and the Oregon City TC. Approximately every-other bus would extend south to serve the CCC campus in Oregon City. Between the Oregon City TC and downtown Portland this route would only serve transit centers, BRT stations, and the downtown Portland transit mall. South of the Oregon City TC it would provide local service to CCC.

The second BRT trunkline route would provide trunkline bus service between the downtown Portland transit mall and the Milwaukie and the Clackamas Town Center TCs, generally operating on SE McLoughlin Boulevard and Highway 224. The trunkline route would follow the BRT alignment described below. Between downtown Portland and the Clackamas Regional Center the trunkline route would only serve transit centers, BRT stations, and the downtown Portland transit mall. In addition, approximately every-other bus would continue east past the Clackamas Town Center TC, providing local bus service between the transit center and Damascus via SE Sunnyside Road.

Under the BRT Alternative, lines 31 Estacada/Damascus, 32 Oatfield, and 33 McLoughlin would remain unchanged relative to the No-Build Alternative, and their peak-hour period operating plan would remain unchanged. However, during off-peak periods, lines 31 and 32 would operate as local neighborhood feeder routes, terminating at the Milwaukie TC rather than continuing to downtown Portland.

Under its draft *Facilities Master Plan*, which would be implemented under the No-Build Alternative, TriMet would have the operations and maintenance facility capacity to accommodate increases in the bus fleet size associated with the BRT Alternative without any facility increases.

A segment-by-segment description of the BRT alignment in the South Corridor follows. In general, the alignment description provides a summary of the routing of the BRT trunkline bus routes in relationship to the BRT capital facilities that would be constructed in the Corridor. The alignment description starts in the north and works south and to the east.

A. Portland to Milwaukie Segment

From the downtown Portland transit mall, the BRT alignment would extend east, with buses operating in mixed traffic on SW Main (westbound) and Madison (eastbound) Streets to the outside lanes of the Hawthorne Bridge. The alignment would transition to SE Martin Luther King, Jr. Boulevard and SE Grand Avenue via the SE Madison Street and SE Hawthorne Boulevard approach structures, respectively, in mixed traffic. Continuing south, the alignment would transition to SE McLoughlin Boulevard, also in mixed traffic, using queue bypass lanes and bus-priority treated traffic signals, and serving BRT stations. The BRT alignment would then transition from SE McLoughlin Boulevard east onto SE Ochoco Street and south onto SE Main Street, in mixed traffic, and then access the Southgate TC and Park-and-Ride Lot.

At the park-and-ride lot, the BRT alignment would branch into an eastern BRT alignment to the Clackamas Town Center TC and New Hope Shared-Use Park-and-Ride Lot and a southern BRT alignment to the Oregon City TC. From the park-and-ride lot, the eastern BRT alignment would continue south on SE Main Street in mixed traffic, then transition onto shoulder bus-only lanes on Highway 224, via westbound and eastbound bus-only ramps, to the highway's crossing of the Tillamook branch rail line. The southern BRT alignment would continue south on SE Main Street in mixed traffic, transitioning via SE Harrison Street to SE McLoughlin Boulevard. The BRT alignment would continue south on SE McLoughlin Boulevard to Kellogg Creek, the southern end of the Portland to Milwaukie Segment. On SE McLoughlin Boulevard, BRT buses would use the bus-priority treated traffic signals.

B. Milwaukie to Clackamas Segment

From the Tillamook branch line, the BRT alignment would continue east within the bus-only shoulders of Highway 224, using the bus-priority treated intersections and serving BRT stations. East of SE Oak Street, the alignment would transition from the bus-only shoulders to mixed traffic in the general-purpose lanes of Highway 224, using queue-bypass lanes and bus-priority treated intersections and serving BRT stations.

With either the **Linwood Park-and-Ride Lot Design Option** or the **Johnson Road Park-and-Ride Lot Design Option**, the BRT alignment would transition from Highway 224 north to SE Lake Road via bus-only lanes on the exit ramps, using bus-priority treated traffic signals and transitioning north to SE Harmony Road. With the Linwood Park-and-Ride Lot Design Option, the BRT alignment would remain on SE Harmony Road and serve the park-and-ride lot. With the Johnson Road Park-and-Ride Lot Design Option, the alignment would remain on SE Lake Road and would serve a BRT station at a similar location. With either design option, the BRT alignment would continue east on SE Harmony Road, in mixed traffic, using queue bypass lanes and bus-priority treated traffic signals and would serve a BRT station at the OIT/CCC campus.

From SE Harmony Road, the alignment would transition north onto SE 82nd Avenue, in mixed traffic, and then onto SE Monterey Avenue, also in mixed traffic, serving the Clackamas Town Center TC, and extending east across I-405 to serve the New Hope Shared-Use Park-and-Ride Lot.

C. Milwaukie to Oregon City Segment

From the Milwaukie Southgate TC, the BRT alignment would continue south in mixed traffic, using queue-bypass lanes and bus-priority treated traffic signals and serving BRT stations. After crossing the Clackamas River, the BRT alignment would enter the Oregon City TC at 11th Street.

D. Gateway to Clackamas Segment

No BRT improvements would occur in the Gateway to Clackamas Segment under the BRT Alternative.

2.2.2.2.2 BRT Light Rail Operations

With the BRT Alternative, there would be no change from the No-Build Alternative to TriMet's light rail operations outside of the South Corridor, and no light rail operations within the South Corridor.

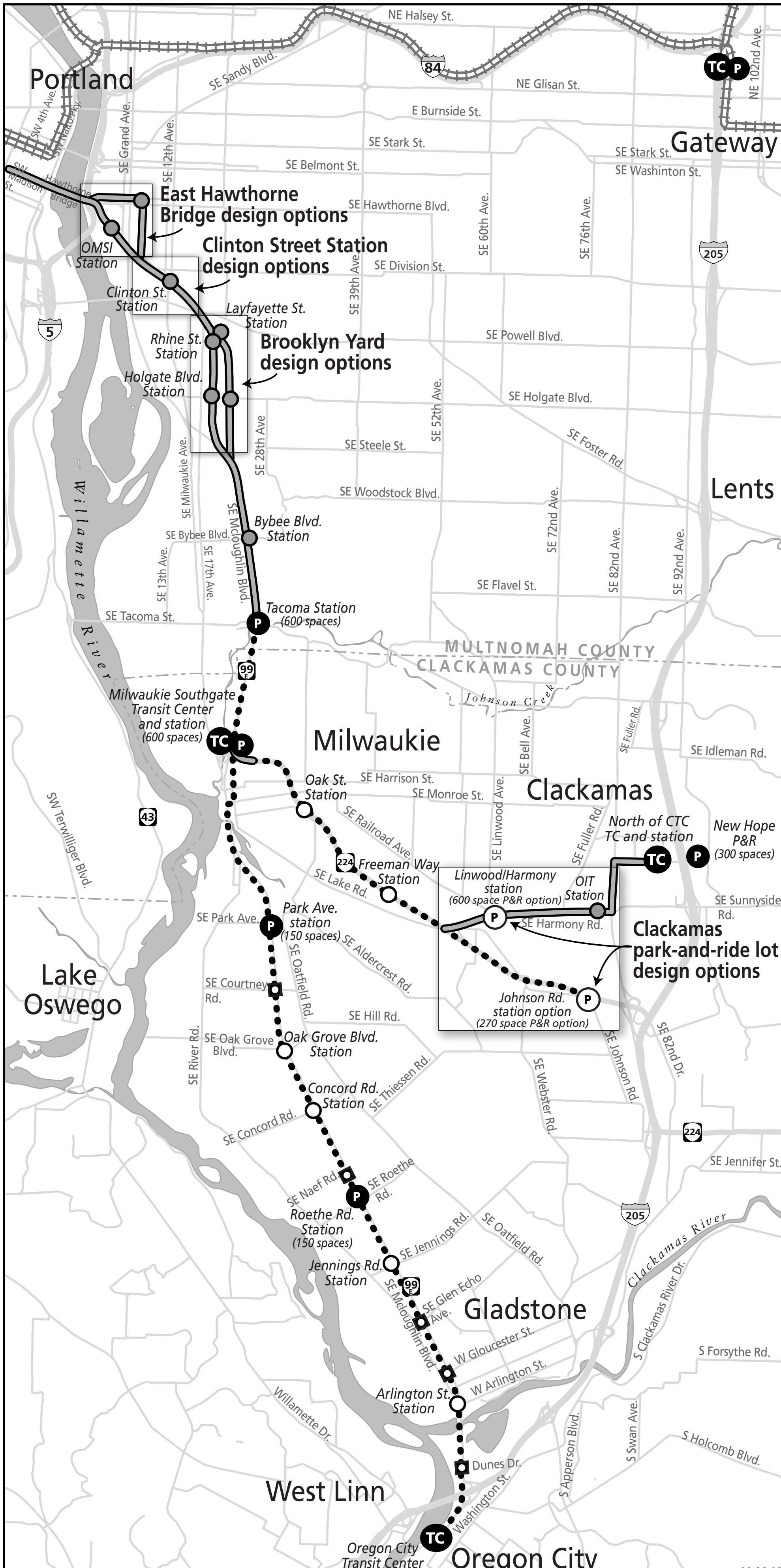
2.2.3 Busway Alternative

The purpose of this section is to provide a description of the capital and operating characteristics of the Busway Alternative (see Table 2.2-1 and Figure 2.2-2).

SOUTH CORRIDOR PROJECT

Busway Alternative

Figure 2.2-2



2.2.3.1 Busway Capital Improvements

The section provides a summary of the transit and roadway capital improvements that would make up the Busway Alternative.

2.2.3.1.1 Busway Transit Capital Improvements

This section provides a generic description of a busway facility, followed by a description of the South Corridor Busway Alternative. The Busway Alternative would include all of the transit capital improvements in the No-Build Alternative, as well as capital facilities, including a busway guideway, designed to improve the speed and reliability of the corridor's trunkline bus routes.

A. General Description of a Busway Guideway

A busway, or busway guideway, typically refers to a paved, separated, and protected right-of-way for exclusive use by transit buses. A busway may be relatively short or may extend the full length of a transit corridor. A busway typically is differentiated from bus-only lanes by the degree of physical separation and protection provided to the buses from adjacent and intersecting mixed traffic, with a busway providing a more definitive barrier, such as a concrete curb, while a bus lane might be separated by a paint stripe and other lane markings. Busways are usually located in a major radial transit corridor parallel to congested radial freeways, highways, or arterials, although they may service circumferential or cross-town corridors as well. Busways may include on-line and off-line stations and park-and-ride lots (i.e., located directly adjacent to the busway, compared to facilities physically removed from the busway that would be accessed by local streets in mixed traffic). A bus route may operate exclusively on a busway, or partly within the busway guideway and partly on mixed-traffic streets. And finally, a busway may be fully self-contained with no access points to general-purpose streets, or may include a variety of entrances and exits to access local roadways.

The purpose of a busway is to provide a controlled environment within which transit buses can operate at a relatively high speed with a relatively high degree of reliability, and without interference from slower, more congested general-purpose traffic. For example, with a busway situated adjacent to a highway and separated by a physical barrier, a stalled or damaged vehicle from an adjacent general purpose facility would not be able to be pulled off into the busway – the buses operating on the busway guideway would operate at their normal speed. In contrast, with a bus-only lane, stalled vehicles or accidents from the general-purpose lanes often block transit vehicles, causing the same delay for buses as for general-purpose vehicles. Within this SDEIS, the term *busway guideway* is used to refer to the grade-separated busway, which is a major element of the South Corridor's Busway Alternative.

B. South Corridor Busway Elements

The Busway Alternative would include all of the transit capital elements of the No-Build Alternative. In addition, it would include a variety of components designed to increase the speed and reliability of trunkline bus service in the South Corridor, assembled around a radial busway guideway that would generally be located parallel to SE McLoughlin Boulevard between the Hawthorne Bridge and the north Milwaukie industrial area and between the Lake Road on/off ramps to Highway 224 and the Clackamas Town Center TC on SE Monterey Avenue. In other areas of the corridor, the Busway Alternative would be similar to the BRT Alternative, as described in Section 2.2.2. In summary, the Busway Alternative includes all of the same transit capital components as the

BRT Alternative, except that the busway guideway would replace BRT components in portions of the Portland to Milwaukie and the Milwaukie to Clackamas Segments (see Figure 2.2-2). A summary of the transit capital elements that would make up the Busway Alternative follows:

- **Busway Guideway.** The busway guideway would be a two-way roadway for the exclusive use of transit vehicles, and would be physically separated from adjacent or cross streets to help ensure that transit buses would operate at relatively high speeds with a high degree of reliability, unaffected by adjacent general purpose traffic. The busway guideway would typically be one paved asphalt lane in each direction (i.e., two lanes total). Each lane would be approximately 11 ½ feet wide, separated by a center paint stripe, with an approximately 2-foot shoulder on one side and a 2- to 5-foot shoulder on the other side (the extra width would provide a maintenance way in some situations). Depending on the location, separation from adjacent streets would be provided by concrete curbs, planted median strips, or concrete Jersey barriers. Over the length of the busway guideway, buses would cross intersecting streets or rail lines on elevated structures, or at-grade, with bus-priority treated traffic signals that would allow approaching buses on the busway guideway to prolong their green phase or reduce their red phase.

- **Busway Stations.** A busway station would be a bus stop with related passenger amenities that would be located directly adjacent to the busway guideway. Typically, a busway station would have the same amenities as a BRT station, including larger, consistently designed passenger shelters; ticket machines; real-time passenger information systems that would display the estimated arrival time for the next bus (using GPS); pay telephones; and benches. The stations would be sized to accommodate articulated buses.

- **Queue-Bypass Lanes.** Queue-bypass lanes would be extensions of general-purpose, right-turn lanes (approximately 500 feet in length) that would allow buses to share the right-turn lane with general traffic and to bypass the queue of vehicles in the general purpose through lanes. In general, queue-bypass lanes would be coupled with bus-priority traffic signal treatment.

- **Bus-priority Traffic Signal Treatment.** Bus-priority traffic signal treatment would allow equipped buses at treated intersections to receive priority at traffic signals. Through the bus-priority system, buses that are behind schedule would either extend an already-green phase as the bus approaches the signal or decrease the length of a red light. The bus-priority traffic signal treatment would be managed through an on-board GPS unit and a computer-based route schedule. All buses using the busway or the BRT intersection improvements would be equipped with bus-priority devices that would be able to activate bus-priority treated traffic signals.

- **Bus-Only Ramps.** Bus-only ramps would provide a relatively short section of grade separation for buses, providing a protected transition from one facility to another and/or a grade-separated crossing of a roadway or rail line.

- **Shoulder Bus Lanes.** A shoulder bus lane would use the shoulder of Highway 224, which would be widened from approximately 10 feet to 17 feet) and would be reconstructed to roadway standards to accommodate regular bus traffic. In general, shoulder bus lanes would be for the exclusive use of transit vehicles; however, because the converted shoulders would not be replaced, the shoulder bus lanes would also serve as emergency parking for general purpose traffic on the highway. At intersections and off-ramps (for posted intervals of approximately 500 feet) general purpose vehicles would be allowed to enter the shoulder bus lanes.

- **BRT Stations.** The South Corridor Busway Alternative would include some of the same BRT stations as the BRT Alternative (these would be located on SE McLoughlin Boulevard, south of downtown Milwaukie, and on Highway 224, between SE Harrison Street and SE Lake Road). These BRT Stations would include the following amenities: large, consistently designed passenger shelters; ticket machines; real-time passenger information systems that would display the estimated arrival time for the next bus using GPS; pay telephones; and benches. These stations would be sized to accommodate articulated buses. The amenities would generally be located at existing transit centers in the corridor that would be served by BRT buses.

- **Busway Vehicles.** Under the Busway Alternative, 44 articulated buses would be purchased to operate on the corridor's two Busway trunkline routes, each of which would be fitted with bus-priority equipment (see Table 2.2-2).

Using these various components, the Busway Alternative would be designed to improve the speed and reliability of radial trunkline bus service connecting downtown Portland, Milwaukie, the Clackamas Regional Center, and Oregon City. A segment-by-segment description of how those capital elements would be applied in the South Corridor under the Busway Alternative follows.

C. Portland to Milwaukie Segment

The transit capital improvements associated with the Busway Alternative in the Portland to Milwaukie Segment would be affected by three sets of design options, which are described below.

East of Hawthorne Bridge Design Options

- East of the Hawthorne Bridge with the **Water Avenue Design Option** a new bus-only ramp would be constructed from the eastbound Hawthorne Bridge ramp, crossing SE Clay Street above grade and connecting to the at-grade OMSI Station (for eastbound buses). A one-lane section of busway guideway would connect the OMSI Station with SE Water Avenue (for westbound buses). South of the OMSI Station, an at-grade two-lane busway guideway would be located directly south of and parallel to SE Division Street to the Clinton Street Station.

- With the **7th Avenue Design Option**, buses would use the existing SE Hawthorne Boulevard and SE Madison Street between the Hawthorne Bridge and SE 7th Avenue. On SE 7th Avenue a separated, median busway would access an elevated two way bus-only ramp that would connect SE 7th Avenue (from SE Lincoln Street over SE Division Street) to a two-way busway guideway in the vicinity of SE Division Street and SE Caruthers Place. The busway would continue south, directly south of and parallel to SE Division Street to the Clinton Street Station.

Clinton Street Station Design Options

- With the **At-Grade Station Design Option**, the busway guideway would be at-grade at the guideway's crossing of SE Milwaukie Avenue west of the Clinton Street Station.

- With the **Above-Grade Station Design Option**, the busway guideway would be elevated over SE 11th and 12th Avenues (west of an elevated Clinton Street Station). East of the station, the alignment would come down to grade at approximately SE Brooklyn Street.

With either option, the busway guideway would continue southeast, immediately east of and parallel to the existing UPRR tracks, crossing SE Powell Boulevard on a new structure (constructed as an integrated traffic and busway guideway structure).

Brooklyn Yard Design Options

- With the **17th Avenue Design Option,** the at-grade busway guideway would be located in the center of SE 17th Avenue, with a single general purpose lane on either side, maintaining the existing two-way general purpose travel movements. A new pedestrian bridge over the existing UPRR tracks would provide access between the Lafayette Street Station and SE 20th Avenue. The at-grade busway guideway would continue south to the intersection of SE 17th Avenue and SE McLoughlin Boulevard, where it would turn to the southeast, northeast of and parallel to SE McLoughlin Boulevard.

- With the **West of Brooklyn Yard Design Option**, the at-grade busway guideway would continue from the SE Powell Boulevard overpass, directly west of and parallel to the existing UPRR tracks, to the Lafayette Station. A new pedestrian bridge over the existing UPRR tracks would provide access between the Lafayette Street Station and SE 20th Avenue. The at-grade busway guideway would continue south, directly west of and parallel to the UPRR Brooklyn Yard, to SE McLoughlin Boulevard.

The generally at-grade busway guideway would continue south, primarily east of and parallel to SE McLoughlin Boulevard, to the Tacoma Street Station and Park-and-Ride Lot (600 spaces). The at-grade busway guideway would continue south from the station and would terminate at SE Ochoco Street. South of SE Ochoco Street, the busway route would continue in mixed traffic on SE Main Street to the Milwaukie Southgate TC. With the Busway Alternative, the Milwaukie TC would be relocated adjacent to the Southgate Park-and-Ride Lot, which would be expanded from 330 to 600 spaces.

D. Milwaukie to Clackamas Segment

The following capital improvements would be associated with the Busway Alternative in the Milwaukie to Clackamas Segment and would occur with either of the two design options being evaluated in this segment:

- Transit-only ramps would connect SE Main Street in Milwaukie to the eastbound and westbound shoulder bus lanes of Highway 224.

- Bus-only lanes would be constructed on the shoulders of Highway 224 (i.e., the shoulders would be reconstructed and widened from the current 10 feet to approximately 17 feet), generally continuous between the bus-only ramps to SE Main Street and approximately 500 feet east of SE Oak Street. Other vehicles would only be allowed to access the shoulder lanes to make right turns onto and to enter Highway 224 from SE Harrison and Oak Streets. Bicyclists would continue to be allowed to use the shoulder bus lanes.

- Queue-bypass lanes coupled with bus-priority traffic signal treatments would be installed at the intersections of Highway 224 and SE Harrison Street, Oak Street, SE 37th Avenue, and SE Freeman Way.

- A generally at-grade, two-lane, two-way busway guideway would be constructed between SE Freeman Way and the Clackamas Town Center TC. The busway guideway would begin as a single-lane structure over Highway 224 just east of SE Freeman Way, which would allow outbound buses to transition from the eastbound bus-only shoulder lane on Highway 224, then cross Highway 224 onto the two-way busway guideway that would be located directly north of and parallel to Highway 224. The busway guideway would cross under SE Harmony Road and would transition between elevated and at-grade alignments south of and parallel to a reconstructed (by others) SE Harmony Road to the OIT/CCC branch campus. The busway guideway would cross SE Harmony Road at grade at SE 80th Avenue. The busway guideway would continue north in the center of SE 80th Avenue, with a general-purpose lane on either side of the guideway. The busway guideway would turn east and remain south of SE Monterey Avenue, crossing under SE 82nd Avenue to a reconstructed and reconfigured Clackamas Town Center TC, where the busway guideway would terminate.

- Stations would be located near the following intersections: Highway 224 and SE Oak Street, Highway 224 and SE Freeman Way, SE Linwood Avenue at SE Harmony Road, SE Harmony Road west of SE 80th and at the New Hope Shared-Use Park-and-Ride Lot.

- The existing Clackamas Town Center TC would be enlarged and reconfigured at its current site.

- With the **Linwood Park-and-Ride Lot Design Option**, there would be a 600-space structured park-and-ride lot in the vicinity of SE Lake Road and SE Linwood Avenue (there would be no Johnson Road Park-and-Ride Lot).

- With the **Johnson Road Park-and-Ride Lot Design Option**, there would be a 270-space surface park-and-ride lot in the vicinity of SE Johnson Road and Highway 224. In addition, bus-priority traffic signal treatments would be installed at the intersections of SE Lake Road and SE Johnson Road with Highway 224, and a BRT station would be located adjacent to the park-and-ride lot (there would be no Linwood/Harmony Park-and-Ride Lot).

E. Milwaukie to Oregon City Segment

The transit capital improvements in the Milwaukie to Oregon City Segment for the Busway Alternative would be identical to the improvements that would occur under the BRT Alternative.

F. Gateway to Clackamas Segment

No capital improvements related to the Busway Alternative would occur in the Gateway to Clackamas Segment.

2.2.3.1.2 Busway Roadway Capital Improvements

The Busway Alternative would include all of the roadway capital improvements included in the No-Build Alternative, as well as the following, more significant modifications to the corridor's roadway facilities:

- Parking would be removed from the north side of SW Madison Street between SW 1st and 4th Avenues to create a third general-purpose travel lane.

- With the **At-Grade Clinton Station Design Option**, short sections of SE 11th, 12th and Milwaukie Avenues and SE Clinton and Gideon Streets would be reconstructed and modified in the vicinity of the Clinton Street Station.

- A new overpass would be constructed over SE Powell Boulevard for general-purpose traffic traveling north on SE 17th Avenue to west on SE Powell Boulevard. This overpass would be constructed as an integrated mixed-use traffic and busway guideway structure.

- With the **17th Avenue Design Option**, SE 17th Avenue would be reconstructed to accommodate the at-grade busway guideway.

A variety of other relatively minor modifications would be made to the street network in the South Corridor to accommodate the construction and operation of the Busway Alternative (see the *Detailed Definition of Alternatives Report* for more detail).

2.2.3.2 Busway Operating Characteristics

This section summarizes the transit operating characteristics of the Busway Alternative within the South Corridor.

2.2.3.2.1 Busway Bus Operations

This section provides a general description of bus operations within the South Corridor under the Busway Alternative, followed by a description of the specific routing of busway bus routes by segment.

The transit network for the Busway Alternative would be built on the No-Build transit network described in Section 2.2.1.2. Modifications to the No-Build transit network would be made to make use of the busway guideway and the BRT capital improvements described in Section 2.2.3.1 in order to improve the speed and reliability of trunkline bus service between activity centers in the South Corridor and downtown Portland. In addition, Line 99X would be eliminated because it would duplicate the trunkline service described below.

Two new trunkline routes for busway buses would be added to the No-Build transit network. The first route would generally operate on SE McLoughlin Boulevard between the downtown Portland transit mall, the Milwaukie Southgate TC, and the Oregon City TC. Approximately every-other bus would extend south to serve CCC in Oregon City. Between Oregon City and downtown Portland, this busway route would only serve transit centers, busway or BRT stations, and the downtown Portland transit mall. It would also provide local service south of the Oregon City TC to CCC.

A second busway bus route would provide trunkline bus service between the downtown Portland transit mall, the Milwaukie Southgate TC, and the Clackamas Town Center TC, generally operating on SE McLoughlin Boulevard and Highway 224. The trunkline route would follow the routing described below. The trunkline route between downtown Portland and the Clackamas Town Center TC would only serve transit centers, busway and BRT stations, and the Portland transit mall. In addition, approximately every-other busway bus would continue east past the Clackamas Town Center TC, providing local bus service between the transit center and Damascus.

Bus travel times between the downtown Portland transit mall and the Milwaukie Southgate TC would be 23 minutes with the Busway Alternative during the peak period, and bus travel times between the Milwaukie Southgate TC and the Clackamas Town Center TC would be 11 minutes during the peak period.

Under the Busway Alternative, the routing of lines 31 Estacada/Damascus, 32 Oatfield, and 33 McLoughlin would remain unchanged relative to the No-Build Alternative, and their peak-period operating plan would remain unchanged. However, during the off-peak periods, routes 31 and 32 would operate as local neighborhood feeder routes, terminating at the Milwaukie Southgate TC rather than continuing to downtown Portland.

Under its draft *Facilities Master Plan*, which would be implemented under the No-Build Alternative, TriMet would have the operations and maintenance building capacity to accommodate increases in the bus fleet size associated with the Busway Alternative without any facility increases.

A segment-by-segment description of the busway routing in the South Corridor follows. The description summarizes the routing of the busway bus routes in relationship to the busway guideway and the BRT capital facilities that would be constructed in the Corridor. The bus routing description starts in the north and works south and to the east.

A. Portland to Milwaukie Segment

From the downtown Portland transit mall, the busway bus routes would proceed east, with buses operating in mixed traffic on SW Main (westbound) and Madison (eastbound) Streets, onto the outside lanes of the Hawthorne Bridge. The busway bus routes would transition from the Hawthorne Bridge to the busway guideway between SE 1st and Water Avenues with the Water Avenue Design Option) or would transition from the Hawthorne Bridge to the busway guideway at SE 7th Avenue and SE Lincoln Street with the 7th Avenue Design Option. The busway bus routes would remain on the busway guideway until its southern terminus at SE Ochoco Street, where they would transition onto SE Main Street, operating in mixed traffic to the Milwaukie Southgate TC.

B. Milwaukie to Clackamas Segment

South and east of the Milwaukie Southgate TC, the busway bus routes would branch into an eastern busway bus route (to the Clackamas Town Center TC and New Hope Shared-Use Park-and-Ride Lot and a southern busway bus route to the Oregon City TC. From the Milwaukie Southgate TC, the eastern busway bus route would continue south on SE Main Street in mixed traffic, and would transition onto bus-only shoulder lanes on Highway 224, via westbound and eastbound bus-only ramps, to the shoulder bus lanes on Highway 224.

From the Tillamook branch line, the busway bus route would continue east within the bus-only shoulders of Highway 224, using the bus-priority treated intersections and serving stations at SE Oak Street and SE Freeman Way. After SE Oak Street, the busway bus route would transition from the bus-only shoulders to mixed traffic in the general purpose lanes of Highway 224, would use the queue-bypass lane and bus-priority treated intersections, and would serve the station at SE Freeman

Way. Just east of SE Freeman Way, the busway bus route would transition from the general purpose lanes to the busway guideway, where it would remain until the terminus of the busway guideway at the Clackamas Town Center TC. In this section of the busway guideway, the busway bus route would serve stations at SE Harmony Road near SE Linwood Avenue and on SE Harmony Road at the Oregon Institute of Technology campus. From the Clackamas Town Center TC, the busway bus route would extend east on SE Monterey Avenue, in mixed traffic, across I-205 to the New Hope Shared-Use Park-and-Ride Lot. The busway bus route would continue east to Damascus in mixed traffic, with approximately every-other busway bus terminating at the park-and-ride lot.

With either the **Linwood Park-and-Ride Lot Design Option** or the **Johnson Road Park-and-Ride Lot Design Option**, the busway bus route would be located on the busway guideway between Highway 224 and the Clackamas Town Center TC. With the Johnson Road Park-and-Ride Lot Design Option, the busway bus route would branch at SE Lake Road, with approximately every-other busway bus accessing the busway guideway to the Clackamas Town Center TC and on to Damascus, and approximately every-other bus remaining on Highway 224 and continuing on to SE Johnson Road to access the Johnson Road Park-and-Ride Lot.

C. Milwaukie to Oregon City Segment

The southern busway bus route would continue south on SE Main Street in mixed traffic, transitioning to SE McLoughlin Boulevard via SE Harrison Street. From downtown Milwaukie, the southern busway bus route would continue south in mixed traffic, using queue-bypass lanes and bus-priority treated traffic signals, and serving the same stations as the BRT alternative. After crossing the Clackamas River, the busway bus route would enter the Oregon City TC at 11th Street. Approximately every-other busway bus would continue south to CCC.

D. Gateway to Clackamas Segment

There would be no busway bus service in this Segment under the Busway Alternative.

2.2.3.2.2 Busway Light Rail Operations

With the Busway Alternative, there would be no change from the No-Build Alternative to TriMet's light rail operations outside of the South Corridor, and no light rail operations within the Corridor.

2.2.4 Milwaukie Light Rail Alternative

The section provides a description of the capital improvements and operating characteristics of the Milwaukie LRT Alternative (see Table 2.2-1 and Figure 2.2-3).

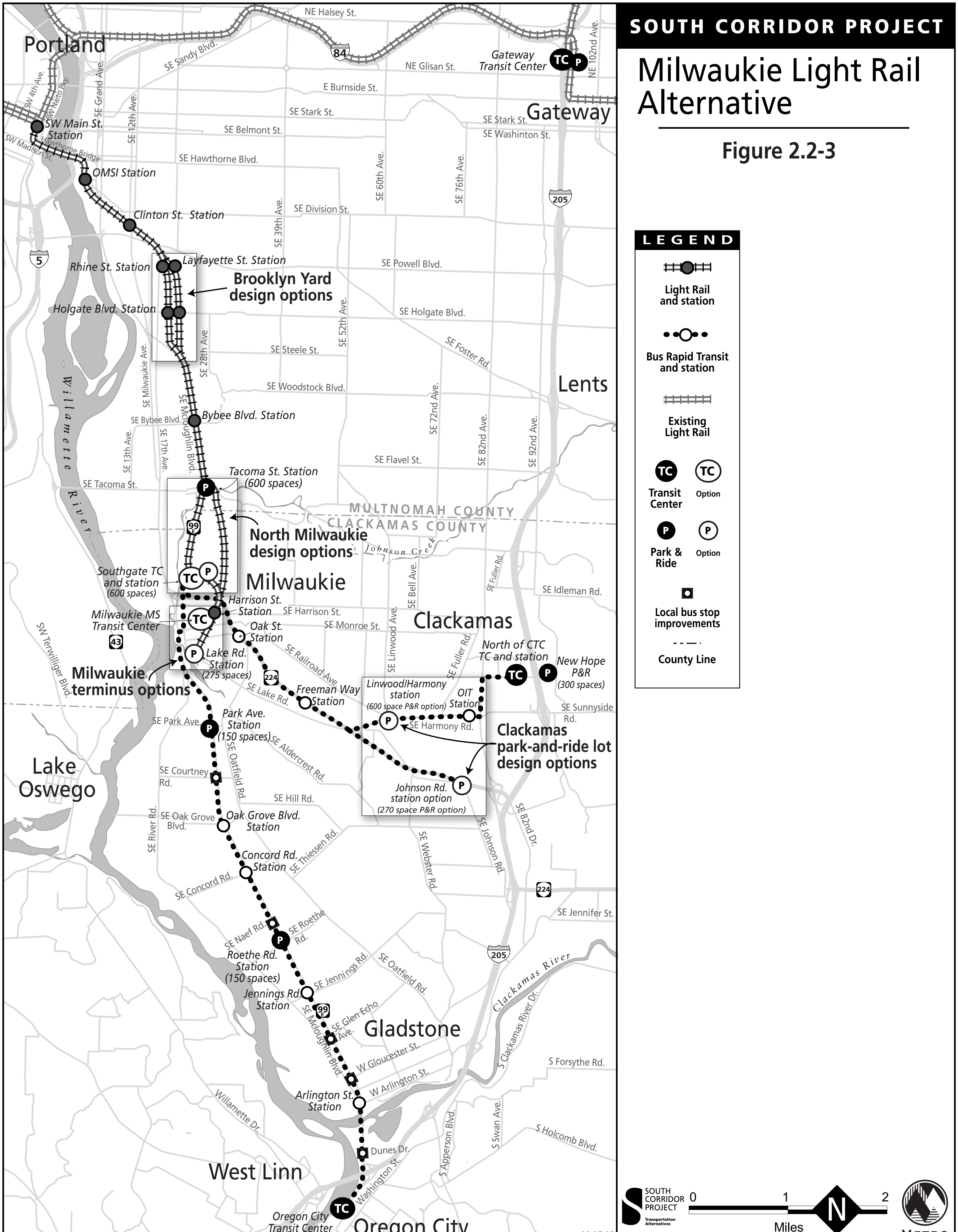
2.2.4.1 Milwaukie Light Rail Capital Improvements

This section summarizes the transit and roadway capital improvements that would be associated with the Milwaukie LRT Alternative (see Table 2.2-4).

SOUTH CORRIDOR PROJECT

Milwaukie Light Rail Alternative

Figure 2.2-3



2.2.4.1.1 Milwaukie Light Rail Transit Capital Improvements

The Milwaukie LRT Alternative would include all of the transit capital improvements in the No-Build Alternative. In addition, the Milwaukie LRT Alternative would include both light rail and bus-oriented improvements (see Figure 2.2-3).

A. Light Rail Capital Improvements

With the Milwaukie LRT Alternative, light rail capital improvements would be made only in the Portland to Milwaukie Segment. Those improvements would focus on an approximately 6.5-mile extension of the Yellow Line. The length of the extension would vary slightly depending on the design option chosen (see Table 2.2-5). The first segment of the Yellow Line is currently under construction from downtown Portland to the Expo Center in North Portland. It is scheduled to be completed and in operation by September 2004. With the Milwaukie LRT Alternative, the double-tracked light rail line would generally extend from downtown Portland to the Milwaukie Southgate TC. TriMet's fleet of light rail vehicles would increase by 16, from a total fleet size of 127 to 143 (see Table 2.2-2). The operations and maintenance facility needs for the additional 16 light rail cars would be met through an expansion of TriMet's Ruby Junction Operations and Maintenance Facility. A summary of the capital improvements associated with the light rail extension to Milwaukie and the three sets of design options currently under study follows.

The light rail line would extend from the existing double-tracked alignment on SW 1st Avenue from SW Yamhill and Morrison Streets. The tracks would turn east onto the outside lanes of the Hawthorne Bridge at SW Main and Madison Streets. After crossing the Willamette River, the alignment would turn south into the center of SE Water Avenue. The at-grade alignment would continue southeast, directly west of and parallel to the existing UPRR tracks to SE Powell Boulevard. The light rail alignment would cross over SE Powell Boulevard on a short section of single track using the existing structure, which is currently shared by the UPRR line and northbound general-purpose traffic from SE 17th Avenue to westbound SE Powell Boulevard. This structure would be widened by approximately 5 feet to accommodate the light rail alignment.

Brooklyn Yard Design Options

- With the **17th Avenue Design Option**, the light rail alignment would extend south from SE Franklin Street in the center median of SE 17th Avenue. The existing pedestrian bridge across Brooklyn Yard near the Lafayette Street Station would be replaced. The alignment would continue south along SE 17th Avenue, turning southeast north of SE McLoughlin Boulevard.

- With the **West of Brooklyn Yard Design Option**, the light rail alignment would continue south, at grade, from the UPRR tracks, running just west of and parallel to Brooklyn Yard before turning southeast immediately north of SE McLoughlin Boulevard. The existing pedestrian bridge across Brooklyn Yard near the Lafayette Street Station would be replaced.

The light rail alignment would continue south, directly east of SE McLoughlin Boulevard to SE Tacoma Street, crossing over the SE Tacoma Street ramps and under SE Tacoma Street (using an existing structure) and crossing Johnson Creek.

North Milwaukie Design Options

- With the **Southgate Crossover Design Option**, the light rail alignment would continue south, immediately east of and parallel to SE McLoughlin Boulevard, to the Tacoma Street Station. The station would be directly west of a new, structured, 600-space park-and-ride lot. The light rail alignment would continue south, transitioning from the east side of SE McLoughlin Boulevard to the west side of SE Main Street between SE Ochoco and Beta Streets. The alignment would turn east, crossing SE Main Street at-grade, into the Milwaukie Southgate TC Station and the expanded and structured Southgate Park-and-Ride Lot (i.e., from 330 spaces to 600 spaces). After the Milwaukie Southgate TC Station, the light rail alignment would continue east to the Tillamook branch line. The alignment would cross over the branch line, turning south and remaining immediately east of and parallel to the freight rail tracks to the Harrison Street Station.

- With the **Tillamook Branch Line Design Option**, the light rail alignment would turn southeast into the Tacoma Street Station after crossing Johnson Creek. After leaving the station, the alignment would turn south along the east side of the UPRR tracks. At SE Ochoco Street, the light rail alignment would cross under the Tillamook branch line. The alignment would continue south, remaining immediately east of and parallel to the branch line to the Harrison Street station, which would be adjacent to the Milwaukie Middle School TC (relocated from its existing location in downtown Milwaukie). (Note that with the Tillamook Branch Line Design Option there would be no Milwaukie Southgate TC, Station, or Park-and-Ride Lot.)

Milwaukie Terminus Options

- With the **Lake Road Terminus Option**, the light rail alignment would extend south, immediately east of and parallel to the Tillamook branch line, to a terminus station at SE Lake Road, which would service a new 275-space structured park-and-ride lot at SE Washington Street and SE Main Street.

- With the **Milwaukie Middle School Terminus Option**, the light rail alignment would terminate at the Harrison Street Station.

B. Bus Capital Improvements

This section provides a summary of the bus capital improvements that would be implemented in conjunction with the light rail alignment (see Table 2.2-7). A description of the bus improvements that would occur in the Portland to Milwaukie Segment is provided, followed by a description of bus improvements that would occur in the South Corridor's other segments.

Portland to Milwaukie Segment

The bus capital improvements that would be implemented in the Portland to Milwaukie Segment with the Milwaukie LRT Alternative would differ depending on the North Milwaukie Design Options for the light rail alignment.

- With the **Southgate Crossover Design Option**, all bus service from the south and east would use the Milwaukie Southgate TC.

- With the **Tillamook Branch Line Design Option**, bus service from the east (and a limited number of routes from the south) would use the Milwaukie Middle School TC; other bus service from the south would terminate at the Lake Road Station.

Other Segments

In all other segments, the bus capital improvements with the Milwaukie LRT Alternative would be identical to those that would occur in those segments with the BRT Alternative, except with the Tillamook Branch Line Design Option. With the **Tillamook Branch Line Option**, the bus-only ramps from SE Main Street to the shoulder bus lanes of Highway 224 would not be included and the shoulder bus lanes on Highway 224 would begin and end east of SE Harrison Street, because the transit center would be located at SE Harrison Street rather than at Southgate with the Southgate Crossover Design Option. As with the BRT Alternative, there would be no bus capital improvements in the Gateway to Clackamas Segment.

2.2.4.1.2 Milwaukie Light Rail Roadway Capital Improvements

The Milwaukie LRT Alternative would include all of the roadway capital improvements that would be included with the No-Build Alternative. In downtown Portland, one northbound general purpose travel lane on SW First Avenue between SW Salmon and SW Yamhill Streets and one southbound general purpose travel lane on SW First Avenue between SW Salmon and Main Streets would be eliminated to accommodate the light rail extension.

In the vicinity of the Clinton Street Station, traffic patterns on short sections of SE 11th, 12th, and Milwaukie Avenues and SE Clinton and Gideon Streets would be modified. In addition, a variety of other relatively minor modifications would be made to the street network in the South Corridor to accommodate the construction and operation of the Milwaukie LRT Alternative (see the *Detailed Definition of Alternatives Report* for more detail).

2.2.4.2 Milwaukie Light Rail Transit Operating Characteristics

This section provides a summary of the bus and light rail operating characteristics in the South Corridor with the Milwaukie LRT Alternative. The transit network for the Milwaukie LRT Alternative would be built on the No-Build transit network described in Section 2.2.1.2. Modifications to the No-Build transit network would be designed to integrate the Corridor's bus service with the extension of the Yellow Line and light rail service from downtown Portland to Milwaukie.

A. Bus Operating Characteristics

With the Milwaukie LRT Alternative, duplicative bus service on SE McLoughlin Boulevard between the downtown Portland transit mall and Milwaukie would be eliminated. Specifically, Line 99X would be eliminated because it would duplicate the new trunkline service described below. Further, lines 31 Estacada, 32 Oatfield, and 33 McLoughlin would provide feeder service to the light rail line and would terminate at the Milwaukie Southgate TC (with the **Southgate Crossover Design Option**) or at the Milwaukie Middle School TC (with the **Tillamook Branch Line Design Option)** because of a limited number of bus bays that would be available at the Milwaukie Middle School TC, some routes may terminate at the Lake Road Station, with the Lake Road Terminus Option only). In addition, the BRT routes that would operate between the Clackamas Town Center TC and Milwaukie and the Oregon City TC and Milwaukie (see below) would terminate at the Milwaukie Southgate TC or the Milwaukie Middle School TC.

With the **Southgate Crossover Design Option,** the bus network in the Milwaukie to Clackamas and Milwaukie to Oregon City Segments, would be identical to the bus network under the BRT Alternative. In particular, the Milwaukie LRT Alternative would include two BRT bus routes that would provide higher-speed service generally on Highway 224 and SE Harmony Road between Milwaukie and the Clackamas Town Center TC and on SE McLoughlin Boulevard between Milwaukie the Oregon City TC with the Milwaukie Southgate TC, providing feeder connections to the light rail line.

With the **Tillamook Branch Line Design Option,** the bus network in the Milwaukie to Oregon City Segment would be identical to the bus network under the BRT Alternative. In the Milwaukie to Clackamas Segment the only difference with the Tillamook Branch Line Design Option would be that the BRT bus routes on Highway 224 from the Clackamas Town Center would turn south onto SE Harrison Street to access the Milwaukie Middle School TC.

B. Light Rail Operating Characteristics

With the Milwaukie LRT Alternative, light rail operations on the Yellow Line would be extended south from downtown Portland to Milwaukie. Table 2.2-6 summarizes the operating characteristics of the Milwaukie LRT Alternative.

One-way vehicle travel times on the light rail extension between downtown Portland and Milwaukie Southgate TC would be approximately 14 minutes for both peak and off-peak periods (travel times would vary with the design option chosen). South of downtown Portland, the light rail extension would generally operate with 7 ½-minute headways in peak periods, 10-minute headways in weekday off-peak periods, and 15-minute headways during weekday evenings. The No-Build headways of 6 minutes in the peak periods and 10 minutes in the off-peak periods would be retained for the Yellow Line in and north of downtown Portland, with some trains turning back in downtown Portland. Service would generally run from 5:00 a.m. to 1:30 a.m. on weekdays, with later starting hours on Saturdays, Sundays, and holidays. Light rail trains would not exceed two cars in length and only rarely would single-car trains be operated. Random inspection would be done for proof-of payment.

2.2.5 I-205 Light Rail Alternative

This section includes descriptions of the capital and operating improvements that would occur with the I-205 LRT Alternative (see Table 2.2-1 and Figure 2.2-4).

2.2.5.1 I-205 Light Rail Alternative Capital Improvements

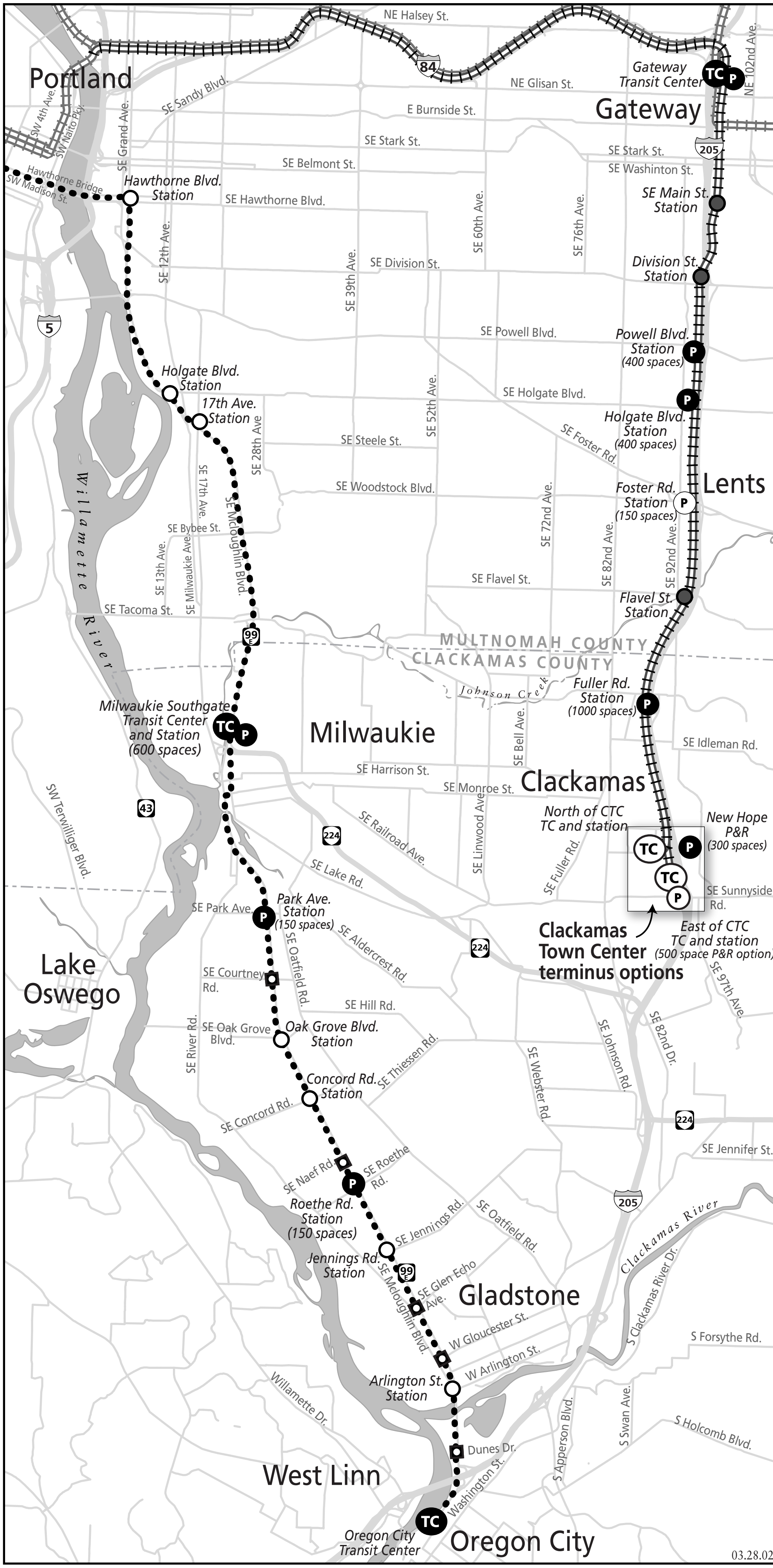
This section summarizes the transit and roadway capital improvements that would occur with the I-205 LRT Alternative (see Table 2.2-4).

2.2.5.1.1 I-205 Light Rail Alternative Transit Capital Improvements

The I-205 LRT Alternative would include all of the transit capital improvements in the No-Build Alternative, as well as additional light rail and bus-oriented capital improvements.

A. Light Rail Capital Improvements

With the I-205 LRT Alternative, light rail capital improvements would be made only in the Gateway to Clackamas Segment. Those improvements would be focused around an approximately 6.7-mile



SOUTH CORRIDOR PROJECT

I-205 Light Rail Alternative

Figure 2.2-4

LEGEND

Light Rail and station

Bus Rapid Transit and station

Existing Light Rail

Transit Center — Option

Park & Ride — Option

Local bus stop improvements

County Line

SOUTH CORRIDOR PROJECT Transportation Alternatives

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light rail line. The double-tracked light rail line would generally extend along I-205 from the existing Gateway TC, located on the existing Blue and Red Lines, to the Clackamas Town Center TC. At the Gateway TC, the three light rail lines would share common passenger boarding platforms.

North of SE Foster Road, the light rail alignment would generally be located within the right-of-way reserved for a transitway when I-205 was initially constructed, including several existing underpass structures. The design of the light rail alignment would not preclude future expansion of I-205. With the I-205 LRT Alternative, TriMet's fleet of light rail vehicles would increase by 21, from a total fleet size of 127 to 148 (see Table 2.2-2). The operations and maintenance facility needs for the additional light rail cars would be met through an expansion of TriMet's Ruby Junction Operations and Maintenance Facility. A summary of the capital improvements associated with the I-205 LRT Alternative follows.

The I-205 LRT Alternative would extend south from the existing Blue Line at a branch just south of the existing and unaltered Gateway TC at approximately NE Glisan Street, just east of I-205. The generally at-grade light rail alignment would cross under several east-west arterials before crossing under I-205 south of SE Market Street, using an existing box tunnel. The light rail alignment would continue south, generally directly west of and parallel to I-205.

The light rail line would include three new park-and-ride lots along the west side of I-205 between the Gateway TC and the Fuller Road Station: a 400-space structured lot at SE Powell Boulevard; a 400-space structured lot north of SE Holgate Boulevard and a 1,000-space structured lot on SE Fuller Road. The light rail alignment would continue south along I-205 to SE Monterey Avenue. A 150-space surface lot between SE Foster Road and SE Woodstock Boulevard was included in the description of this Alternative, but was determined to be infeasible during the SDEIS process due to safety and operational conflicts with ODOT and FHWA interchange access policies. If the I-205 LRT Alternative is selected and forwarded into a Final Environmental Impact Statement, then the park-and-ride site under the I-205 Highway would not be used and the park-and-ride spaces will either be eliminated or relocated.

Clackamas Town Center Terminus Options

- With the **East of Clackamas Town Center Terminus Option**, the light rail alignment would extend south under SE Monterey Avenue to a terminus station and 500-space structured park-and-ride lot between the eastern Clackamas Town Center parking lot and I-205. The East of Clackamas Town Center TC would be relocated adjacent to the station and park-and-ride lot.

- With the **North of Clackamas Town Center Terminus Option**, the light rail alignment would turn west after crossing under SE Monterey Avenue. The alignment would continue to a terminus station at the site of the existing Clackamas Town Center TC, which would be reconfigured. There would be no park-and-ride lot directly adjacent to the North of Clackamas Town Center Station.

B. Bus Capital Improvements

With the I-205 LRT Alternative, there would be no bus capital improvements in the Gateway to Clackamas or Milwaukie to Clackamas Segments. In the Portland to Milwaukie and the Milwaukie to Oregon City Segments, the bus capital improvements would be identical to the BRT Alternative in those segments. An array of bus capital improvements designed to improve the speed and reliability of trunkline bus service would be implemented, generally along SE McLoughlin Boulevard between the Hawthorne Bridge and Oregon City (see Table 2.2-7).

2.2.5.1.2 I-205 Light Rail Roadway Capital Improvements

The I-205 LRT Alternative would include all of the roadway capital improvements that would be included with the No-Build Alternative. In addition, a variety of other relatively minor modifications would be made to the street network in the South Corridor to accommodate construction and operation of the I-205 LRT Alternative (see the *Detailed Definition of Alternatives Report* for more detail).

2.2.5.2 I-205 Light Rail Operating Characteristics

This section summarizes the bus and light rail operating characteristics in the South Corridor with the I-205 LRT Alternative. The transit network for the I-205 LRT Alternative would be built on the No-Build transit network described in Section 2.2.1.2. Modifications to the No-Build transit network would be designed to integrate the Corridor's bus service with the extension of light rail service from the existing Gateway TC and the Clackamas Town Center TC.

A. Bus Operating Characteristics

In the Gateway to Clackamas Segment, the trunkline bus route that would generally operate along portions of I-205 between the Parkrose and Clackamas Town Center TC in the No-Build Alternative would be eliminated with the I-205 LRT Alternative because it would duplicate the service provided by the light rail line. With the I-205 LRT Alternative, no other modifications to the No-Build bus network would be made in the Gateway to Clackamas Segment, and no modifications to the No-Build bus network would be made in the Milwaukie to Clackamas Segment.

Under the I-205 LRT Alternative, the bus network and operating characteristics in the Portland to Milwaukie and Milwaukie to Oregon City Segments would be identical to the network and operations for those segments under the BRT Alternative. In particular, a new trunkline route for BRT buses would provide limited-stop, trunkline bus service, generally on SE McLoughlin Boulevard, using the BRT capital improvements between the downtown Portland transit mall, the Milwaukie Southgate TC, and the Oregon City TC.

B. Light Rail Operating Characteristics

Table 2.2-6 summarizes the projected operating characteristics of the I-205 LRT Alternative. With the I-205 LRT Alternative, the Red Line (which would operate between the Portland International Airport and downtown Portland under the No-Build Alternative) would operate only between the Portland International Airport and the Gateway TC. I-205 light rail trains would be through-routed between downtown Portland and the Clackamas Town Center TC via the Gateway TC.

One-way vehicle travel times on the light rail extension between the Gateway TC and the Clackamas Town Center TC would be approximately 14 minutes for both peak and off-peak periods (see Table 2.2-6) (travel times would vary slightly by design option). Service on the I-205 LRT Alternatives would generally operate with 7 ½-minute headways during weekday peak periods, with 10-minute headways during weekday off-peak periods, and 15-minute headways during weekday evenings. Service on the I-205 light rail line would generally run from 5:00 a.m. to 1:30 a.m. on weekdays, with later starting hours on Saturdays, Sundays, and holidays. Light rail trains would not exceed two cars in length, and only rarely would single-car trains be operated. Random inspection would be done for proof-of payment.

2.2.6 Combined Light Rail Alternative

This section provides a description of the capital improvements and operating characteristics of the Combined LRT Alternative (see Table 2.2-1 and Figure 2.2-5).

2.2.6.1 Combined Light Rail Capital Improvements

This section summarizes the transit and roadway improvements that would be associated with the Combined LRT Alternative (see Table 2.2-4).

2.2.6.1.1 Combined Light Rail Transit Capital Improvements

The Combined LRT Alternative would include all of the transit capital improvements in the No-Build Alternative, as well as additional light rail and bus-oriented improvements (see Figure 2.2-5).

A. Light Rail Capital Improvements

With the Combined LRT Alternative, light rail capital improvements would be made only in the Portland to Milwaukie and Gateway to Clackamas Segments. No light rail improvements would be made in the Milwaukie to Clackamas or Milwaukie to Oregon City Segments. With the Combined LRT Alternative, TriMet's fleet of light rail vehicles would increase by 25, from 127 under the No-Build Alternative to 152 (see Table 2.2-2). The operations and maintenance facility needs for the additional light rail would be met through an expansion of TriMet's Ruby Junction Operations and Maintenance Facility (see the *Detailed Definition of Alternative Report* for more detail).

Portland to Milwaukie Segment. The light rail capital improvements in the Portland to Milwaukie Segment under the Combined LRT Alternative would be focused around an approximately 6.5-mile light rail extension of the Yellow Line (the length of the extension would vary slightly by design option – see Table 2.2-5), which would be identical to the light rail capital improvements for that segment under the Milwaukie LRT Alternative. Like the Milwaukie LRT Alternative, the Combined LRT Alternative includes three sets of design options in this segment.

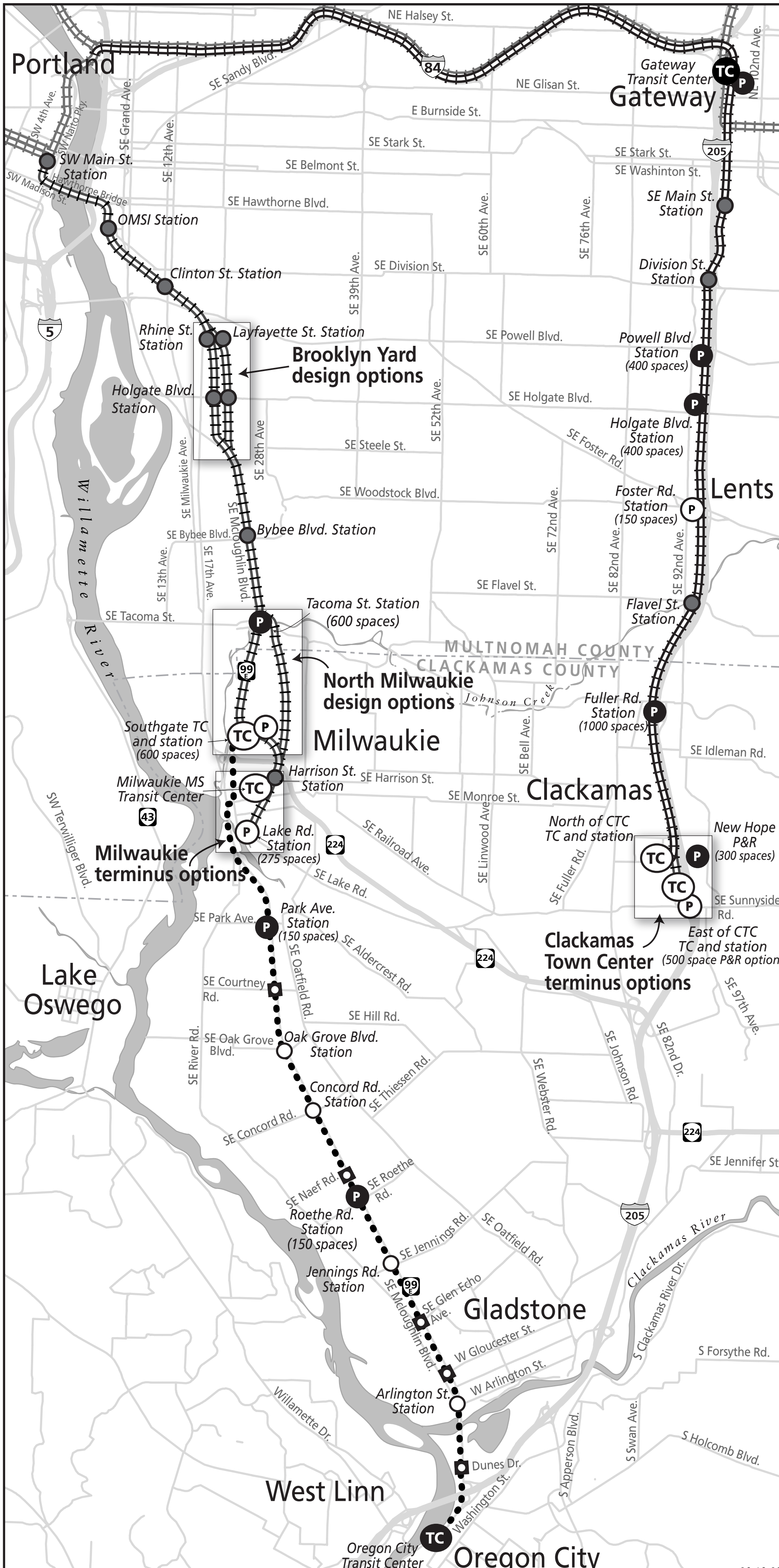
Gateway to Clackamas Segment. The light rail capital improvements in the Gateway to Clackamas Segment under the Combined LRT Alternative would be focused around an approximately 6.7-mile light rail line between the Gateway and Clackamas Town Center TCs. The length of the extension would vary slightly by design option (see Table 2.2-5), which would be identical to the light rail capital improvements for that segment under the I-205 LRT Alternative.

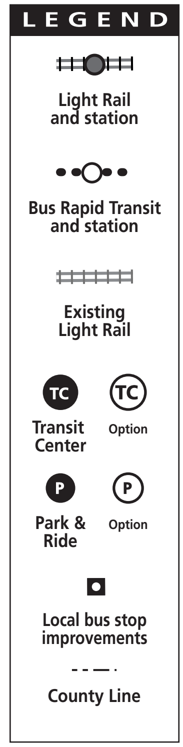
B. Bus Capital Improvements

This section summarizes the bus capital improvements that would be implemented with the Combined LRT Alternative, which would be implemented only in the Milwaukie to Oregon City Segment. There would be no bus capital improvements in the Portland to Milwaukie, Milwaukie to Clackamas, or Gateway to Clackamas Segments (see Table 2.2-7).

Combined Light Rail Alternative

Figure 2.2-5





Milwaukie to Oregon City Segment. The bus capital improvements that would be implemented in the Milwaukie to Oregon City Segment would be identical to the BRT Alternative in this segment.

2.2.6.1.2 Combined Light Rail Roadway Capital Improvements

The Combined LRT Alternative would include all of the roadway capital improvements that would be included with the No-Build Alternative.

In downtown Portland, one northbound general purpose travel lane on SW First Avenue between SW Salmon and SW Yamhill Streets and one southbound general purpose travel lane on SW First Avenue between SW Salmon and Main Streets would be eliminated to accommodate the light rail extension.

In the vicinity of the Clinton Street Station, traffic patterns on short sections of SE 11th, 12th, and Milwaukie Avenues and SE Clinton and Gideon Streets would be modified. In addition, a variety of other relatively minor modifications would be made to the street network in the South Corridor to accommodate the construction and operation of the Milwaukie LRT Alternative (see the *Detailed Definition of Alternatives Report* for more detail).

2.2.6.2 Combined Light Rail Operating Characteristics

This section summarizes the bus and light rail operating characteristics in the South Corridor with the Combined LRT Alternative. The transit network for the Combined LRT Alternative would be built on the No-Build transit network described in Section 2.2.1.2. Modifications to the No-Build transit network would be designed to integrate the Corridor's bus service with the extension of the Yellow Line from downtown Portland to Milwaukie and with the extension of light rail service from the existing Gateway TC to the Clackamas Town Center TC.

A. Bus Operating Characteristics

With the Combined LRT Alternative, the bus network would be based on the No-Build Alternative's bus network, modified to eliminate bus service that would duplicate light rail service and to feed the light rail service with local bus service. A summary, by corridor segment, of the modifications that would occur to the bus network under the Combined LRT Alternative follows.

- **Portland to Milwaukie Segment.** With the Combined LRT Alternative, the bus network in the Portland to Milwaukie Segment would be identical to the segment's bus network under the Milwaukie LRT Alternative.

- **Milwaukie to Clackamas Segment.** No modifications to the No-Build bus network would be made in the Milwaukie to Clackamas Segment under the Combined LRT Alternative.

- **Milwaukie to Oregon City Segment.** Under the Combined LRT Alternative, the bus network and operating characteristics in the Milwaukie to Oregon City Segment would be identical to the network and operations for those segments under the BRT Alternative.

- **Gateway to Clackamas Segment.** With the Combined LRT Alternative, the bus network in the Gateway to Clackamas Segment would be identical to the bus network under the I-205 LRT Alternative.

B. Light Rail Operating Characteristics

Table 2.2-6 summarizes the projected operating characteristics of the Combined LRT Alternative. Light rail operations would occur in two of the Corridor's segments: Portland to Milwaukie and Gateway to Clackamas.

- **Portland to Milwaukie Segment.** With the Combined LRT Alternative, light rail operations on the Yellow Line would be extended south from downtown Portland to Milwaukie. Table 2.2-6 summarizes the operating characteristics of the Combined LRT Alternative. One-way vehicle travel times on the light rail extension between downtown Portland and Milwaukie Southgate TC would be approximately 14 minutes for both peak and off-peak periods (travel times would vary slightly by design option). South of downtown Portland, the light rail extension would generally operate with 10-minute headways in weekday peak and off-peak periods periods, and with 15-minute headways during weekday evenings. The No-Build headways of 6 minutes in the peak periods and 10 minutes in the off-peak periods would be retained for the Yellow Line in and north of downtown Portland, with some trains turning back in downtown Portland.

- **Gateway to Clackamas Segment.** With the Combined LRT Alternative, the Red Line (which would operate between the Portland International Airport and downtown Portland under the No-Build Alternative) would only operate between the Portland International Airport and the Gateway TC. I-205 light rail trains would be through-routed between downtown Portland and the Clackamas Town Center TC via the Gateway TC. One-way vehicle travel times on the light rail extension between the Gateway and the Clackamas Town Center TCs would be approximately 14 minutes for both peak and off-peak periods (travel times would vary slightly by design option). Service on the I-205 LRT Alternative would generally operate with 10 ½-minute headways during weekday peak periods and 15-minute headways during weekday off-peak periods. Service on both the extension of the Yellow line and on the I-205 light rail line would generally run from 5:00 a.m. to 1:30 a.m. on weekdays, with later starting hours on Saturdays, Sundays, and holidays. Light rail trains would not exceed two cars in length, and only rarely would single-car trains be operated. Random inspection would be done for proof-of payment.

2.3 Capital Costs

This section presents the capital cost estimates in 2002 dollars for each alternative and design option under study. Further detail on Capital Costs can be found in the *Capital Costs Results Report* (Metro and Parsons Brinckerhoff, November 2002). A brief description of the capital costing methodology is provided, followed by a summary of the resulting capital costs. Year of expenditure capital costs for the alternatives are provided and used in Section 5.1: Financial Analysis of this SDEIS.

The costs presented in this section include the full cost of capital improvements for the alternatives in the SDEIS horizon year 2020, based on the service levels and operating requirements needed to meet 2020 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 2008 for the build alternatives, 12 years in advance of the 2020 horizon year. In Chapter 5, Evaluation and Financial Analysis, capital costs will be presented that correspond to an opening day fleet size and a 2020 fleet size. The opening day fleet size 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.

2.3.1 Capital Costing Methodology

Capital cost estimates for the South Corridor Project generally have been developed using a four-step process:

A. Definition of Alternatives and Preparation of Plan Sheets. The cost estimates are based on the alternatives and design options summarized in Section 2.2 of this SDEIS and in the *Detailed Definition of Alternatives Report* (Metro and TriMet, September 2002). Consistent with these general descriptions of the alternatives, TriMet staff and Metro's design consultant prepared plan and profile sheets for the light rail alternatives and the BRT and Busway Alternatives, respectively. Each plan and profile sheet is a unique segment of the proposed alignment, and common match lines between the plan sheets ensure that double counting of project elements has not occurred.

B. Unit Costs. Unit costs, appropriate to the current conceptual engineering level of design, were identified and estimated. Examples of unit costs include a cost per foot of light rail track or a cost per foot of retaining wall. Unit costs were derived from a variety of sources, such as engineer's estimates, completed projects, standard estimating manual, and the completion of standard estimating practices. Wherever possible, unit costs were based on actual TriMet light rail and bus capital improvement project experience, existing TriMet policies and programs, and federal regulations governing the construction of federally financed transit projects.

C. Quantity Calculations. Smaller cost segments and elements (i.e., units) were identified and tallied for each plan sheet. Cost elements were identified for all known quantities, such as the length of light rail track required or the length of retaining wall to be constructed. In addition, vehicle quantities for each alternative were calculated for the project's forecast year (2020), based on the regional travel demand forecasts and TriMet's established transit operating standards. The resulting change in fleet size by vehicle type was used to help determine if an expansion of the system's operating and maintenance facilities would be required, and if so, the extent of the required expansion.

D. Cost Calculations. For each plan sheet, the unit costs were multiplied by the quantities required for each cost element, and the total was then assigned to one of 13 cost categories (three of the cost categories – track work, track grade construction, and traction electrification – are specific to the light rail components of the alternatives). An additional plan-sheet-based cost category – right-of-way – was calculated using assessed values of identified properties. In addition to the plan sheet and unit-based cost categories, there are three systemwide costs categories: operating and maintenance facility, buses, and light rail vehicles.

Two final cost categories – contingency and engineering and administration – were calculated based on the other cost categories, using contingency rates reflecting past experience and industry standards. Each cost category has a separate contingency rate to account for unknown and future changes in project scope. Cost categories with less risk and uncertainty are assigned lower contingencies. Engineering and administration was generally calculated as a percentage of all other line items except vehicle procurement. Engineering and administration costs include the costs for final design, construction management, inspection services, intergovernmental agreements, and administrative activities (Busway and BRT engineering and administration costs also include mobilization costs).

The sum of the costs categories is the total capital cost for the alternative. Because each alternative would result in capital improvements in several segments of the corridor, costs are further broken down by the cost per segment. For example, the total Milwaukie LRT Alternative capital cost includes the cost of light rail between Portland and Milwaukie and the cost of Bus Rapid Transit improvements between Milwaukie and Oregon City and between Milwaukie and the Clackamas Regional Center. All capital costs are presented in March 2002 dollars, without consideration of future inflation or project staging and scheduling. As a result, the estimates presented in this section do not forecast the future cost of construction. In contrast, year-of-expenditure costs, as summarized in Section 5.1 of this SDEIS, are intended to reflect the cost to construct a certain alternative in a certain time frame with certain funding sources. Year-of-expenditure costs rely on a series of factors including expected inflation rates, a preliminary construction schedule, expected funding commitments, level of service on opening day, and expected appropriations.

2.3.2 Capital Cost Estimates

The resulting capital cost estimates, in year 2002 dollars, are presented in Table 2.3-1 for each of the alternatives under study (except for the No-Build Alternative, which would not require capital expenditures beyond those already programmed). Table 2.3-1 breaks down the estimated capital costs by corridor segment, and further by bus and fixed-guideway expenditure. In order of least to highest cost for the alternatives in 2020, the BRT Alternative would cost approximately $109.9 million, the Busway Alternative would cost approximately $248.8 million, the I-205 LRT Alternative would cost approximately $431.5 million, the Milwaukie LRT Alternative would cost approximately $434.1 million, and the Combined LRT Alternative would cost approximately $731.8 million (2002 dollars).

The capital cost for any alternative, except the No-Build Alternative, would depend on the design and terminus option selected. The cost for an alternative within Table 2.3-1 is based upon a common set of design options for each alternative, which were used throughout this SDEIS as the basis for comparative analyses, as defined in Table 2.2-3. If a different set of design options were to be selected for an alternative, the capital cost for that alternative would change. Table 2.3-2 provides a summary of differences in cost between the each set of design options for each alternative. However, for the Busway, Milwaukie LRT and Combined LRT alternatives, the cost differences for the design options for those alternatives in Table 2.3-2 cannot be used to calculate the total cost for those alternatives if a different set of design options were selected (see the Capital Cost Results Report (TriMet: November 2002) for a summary of the cost for those alternatives with each possible combination of design options). As a result, each alternative has a range of potential capital costs, depending on which set of design options is selected. the cost of the BRT Alternative would range from approximately $100.6 to $109.9 million; the cost of the Busway Alternative would range from approximately $224.7 to $250.8 million; the cost of the Milwaukie LRT Alternative would range from approximately $391.2 to $434.1 million; the cost of the I-205 LRT Alternative would range from approximately $425.2 to $431.5 million; and the cost of the Combined LRT Alternative would range from approximately $692.8 to $731.8 million (see Table 5.1-2). Table 2.3-3 shows the capital costs by category and alternative.

Table 2.3-1
Summary Capital Costs (Year 2002 Dollars) by Segment and Alternative[1]

Segment/*Cost Item*	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Portland to Milwaukie					
Bus	$27,290,600	$0	$0	$27,290,600	$0
Fixed Guideway	$0	$132,501,800	$312,756,700	$0	$312,756,700
Total	**$27,290,600**	**$132,501,800**	**$312,756,700**	**$27,290,600**	**$312,756,700**
Milwaukie to CTC					
Bus	$38,554,300	$0	$38,554,300	$0	$0
Fixed Guideway	$0	$71,629,300	$0	$0	$0
Total	**$38,554,300**	**$71,629,300**	**$38,554,300**	**$0**	**$0**
Gateway to CTC					
Bus	$0	$0	$0	$0	$0
Fixed Guideway	$0	$0	$0	$228,314,400	$228,314,400
Total	**$0**	**$0**	**$0**	**$228,314,400**	**$228,314,400**
Milwaukie to Oregon City					
Bus	$20,362,800	$20,362,800	$20,362,800	$20,362,800	$20,362,800
Fixed Guideway	$0	$0	$0	$0	$0
Total	**$20,362,800**	**$20,362,800**	**$20,362,800**	**$20,362,800**	**$20,362,800**
Vehicles[2] and O&M Facility[3]					
Bus[4]	$23,700,000	$24,300,000	-$345,000	$5,175,000	-$6,555,000
Fixed Guideway	$0	$0	$62,756,200	$150,362,200[5]	$176,908,000[5]
Total	**$23,700,000**	**$24,300,000**	**$62,411,200**	**$155,537,200**	**$170,353,000**
Total					
Bus	$109,907,700	$44,662,800	$58,572,100	$52,828,400	$13,807,800
Fixed Guideway	$0	$204,131,100	$375,512,900	$378,676,600	$717,979,100
Total	**$109,907,700**	$248,793,900	**$434,085,000**	**$431,505,000**	**$731,786,900**

Source: TriMet: September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; CTC = Clackamas Town Center.

1 Total capital cost for an alternative includes all of the capital costs associated with the alternative, in all segments of the South Corridor and for all modes (i.e., bus and LRT), based on 2020 service levels – see Table 2.3-3 for a breakdown of costs by mode and by segment. An alternative's capital costs are based on a set of design options used for the analysis of alternatives throughout this SDEIS, as summarized in Table 2.2-3 – see Table 2.3-2 for a summary of how the cost of the alternatives would vary by design option. Fixed-guideway costs are costs that would be associated with a busway facility or light rail facilities and vehicles.

2 Based on 2020 service levels – fewer vehicles would be required for 2008 opening-day service levels.

3 The fixed-guideway vehicle and O&M facility costs in this table include right-of-way, contingency and engineering and administration costs, while the fixed-guideway vehicle and O&M facility costs in Table 2.3-3 do not include right-of-way, contingency and engineering and administration costs.

4 Bus vehicle costs were calculated by taking the fleet size by bus type for the alternatives and subtracting the fleet size by vehicle type for the No-Build Alternative and multiplying the results by the appropriate cost per type of bus (therefore, if the bus fleet is smaller for the alternative than it would be under the No-Build Alternative, then a proportional cost saving is shown on the buses line item for that alternative). However, while the total bus fleet size for the I-205 LRT Alternative would be less than under the No-Build Alternative (see Table 2.2-3), bus costs under the I-205 LRT Alternative would be greater than under the No-Build Alternative because the cost savings in a reduced number of 40-foot buses would be more than offset by increased costs for additional articulated buses, which cost more per unit than 40-foot buses.

5 The LRV fleet sizes for the I-205 LRT and the Combined LRT alternatives are based on modifying the Red Line to operate as a shuttle between Gateway TC and Portland International Airport. If the Red Line was to continue to serve downtown Portland, then there would be a total of 160 systemwide LRVs with the I-205 LRT Alternative and 164 LRVs with the Combined LRT Alternative, which would increase the fixed-guideway and total capital costs of the I-205 LRT and the Combined LRT alternatives by approximately $42 million (2002 dollars).

Table 2.3-2
Cost Differences of the Design Options, by Alternative (2002 dollars)

Alternative	Design Option Category	Design Option	Cost Difference[1]
BRT	Clackamas P&R Lot	Linwood P&R Lot	0
		Johnson Road P&R Lot	-$10,150,900
Busway	East Hawthorn Bridge	Water Avenue Ramp	0
		7th Avenue	+$815,400[2]
	Clinton Street Station	At-Grade Station	0
		Above-Grade Station	-$2,713,000[3]
	Brooklyn Yard	17th Avenue	0
		West of Brooklyn Yard	-$12,088,900
	Clackamas P&R Lot	Linwood P&R Lot	0
		Johnson Road P&R Lot	-$9,310,200
Milwaukie LRT	Brooklyn Yard	17th Avenue	0
		West of Brooklyn Yard	-$2,736,100
	North Milwaukie	Southgate Crossover	0
		Tillamook Branch Line	-$12,753,500[4]
	Milwaukie Terminus Options	Lake Road	0
		Milwaukie Middle School	-$16,280,400[5]
	Clackamas P&R Lot	Linwood P&R Lot	0
		Johnson Road P&R Lot	-$10,150,900
I-205 LRT	Clackamas Town Center	East of CTC	0
		North of CTC	-$6,287,800
Combined LRT	Brooklyn Yard	17th Avenue	0
		West of Brooklyn Yard	-$2,736,100
	North Milwaukie	Southgate Crossover	0
		Tillamook Branch Line	-$12,753,500[4]
	Milwaukie Terminus Options	Lake Road	0
		Milwaukie Middle School	-$16,280,400[5]
	Clackamas Town Center	East of CTC	0
		North of CTC	-$6,287,800

Source: TriMet, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; P&R = park-and-ride; CTC = Clackamas Town Center.

1 These are the costs differences between the two design options within each design option set. The first design option of each set (i.e., showing a cost difference of O) was used to calculate the cost of the given alternative (see tables 2.2-3 and 2.3-1). Note that the cost differences are not necessarily additive – for example, one cannot sum the cost differences of the low cost options for the Busway Alternative and subtract the total from cost of the Busway Alternative in Table 2.3-1 to calculate the total cost of the Busway Alternative with those design options. Instead, see the *Capital Costs Results Report*. (Metro: November 2002) for a summary of the cost of each alternative with each possible combination of design options. See Table 2.3-1 for a breakdown of the capital costs by alternative, segment and mode type, and see Table 2.3-3 for a breakdown of capital costs by line item.

2 Based on the At-Grade (Clinton Street) Station Design Option – with the Above-Grade (Clinton Street) Station Design Option, the cost difference would be +$4,733,300.

3 Based on the Water Avenue Design Option – with the 7th Avenue Design Option, the cost difference would be +$1,204,900.

4 Base on the Lake Road Terminus Option – with the Milwaukie Middle School Terminus Option, the cost difference would be -$13,700,000.

5 Based on the Southgate Crossover Design Option – with the Tillamook Crossover Design Option, the cost difference would be -$17,226,900.

Table 2.3-3
Capital Costs by Cost (2002 Dollars) Category and Alternative[1]

Cost Category	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Utilities	$1,577,500	$4,778,500	$17,195,000	$3,753,600	$19,371,160
Street Construction	$12,963,620	$25,674,610	$16,163,630	$13,836,100	$17,036,080
Track Grade Construction	$0	$0	$24,872,640	$29,390,600	$54,263,300
Structures	$5,166,170	$25,567,700	$37,328,540	$28,437,690	$60,600,060
Track Work	$0	$0	$15,290,310	$12,597,470	$27,887,780
Crossings	$0	$764,900	$12,393,390	$2,006,520	$14,399,910
Stations	$4,269,360	$5,658,640	$13,130,110	$12,566,980	$21,427,740
Fare Collection	$640,000	$760,000	$2,925,290	$2,428,230	$4,713,520
Park-and-Ride Lots	$14,375,000	$20,975,000	$22,133,000	$30,423,480	$38,181,480
Traction Electrification	$0	$0	$11,912,550	$10,632,000	$22,544,540
Signal System	$4,260,000	$5,210,000	$24,415,280	$18,456,330	$38,611,600
Communications	$512,000	$608,000	$6,455,870	$7,523,340	$13,467,200
Special Conditions	$54,000	$2,178,000	$3,973,350	$2,009,100	$5,928,450
O&M Facility[2,3]	$0	$0	$3,978,680	$24,648,180	$24,681,000
Light Rail Vehicles[3,4]	$0	$0	$48,231,330	$99,477,120	$111,534,950
Buses[4]	$23,700,000	$24,300,000	-$345,000	$5,175,000	($6,555,000)
Contingency	$10,064,530	$24,658,800	$43,475,030	$44,747,330	$81,310,760
Right-of-Way	$10,964,020	$53,968,090	$60,145,830	$16,198,610	$65,380,420
Engineering & Administration	$21,361,500	$53,691,560	$70,410,170	$67,197,320	$117,001,950
Total	**$109,907,700**	**$248,793,800**	**$434,085,000**	**$431,505,000**	**$731,786,900**

Source: TriMet: September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; O&M = operating and maintenance.

1. Total capital cost for an alternative includes all of the capital costs associated with the alternative, in all segments of the South Corridor and for all modes (i.e., bus and LRT), based on 2020 service levels – see Table 2.3-1 for a breakdown of costs by mode and by segment. An alternative's capital costs are based on a set of design options used for the analysis of alternatives throughout this SDEIS, as summarized in Table 2.2-3 – see Table 2.3-2 for a summary of how the cost of the alternatives would vary by design option.
2. The light rail vehicle (LRV) fleet sizes for the I-205 LRT and the Combined LRT alternatives are based on modifying the Red Line to operate as a shuttle between Gateway TC and Portland International Airport. If the Red Line was to continue to serve downtown Portland, then there would be a total of 160 systemwide LRVs with the I-205 LRT Alternative and 164 LRVs with the Combined LRT Alternative.
3. The light rail vehicle and O&M facility costs in this table do not include right-of-way, contingency and engineering and administration costs, while the fixed-guideway vehicle and O&M facility costs in Table 2.3-1 do include right-of-way, contingency and engineering and administration costs.
4. Based on 2020 service levels. Fewer vehicles would be required for 2008 opening day service levels. The fleet sizes for the I-205 LRT and the Combined LRT alternatives are based on modifying the Red Line to operate as a shuttle between Gateway TC and Portland International Airport. If the Red Line was to continue to serve downtown Portland, then there would be a total of 160 systemwide LRVs with the I-205 LRT Alternative and 164 LRVs with the Combined LRT Alternative (see Table 2.2-2), which would increase the light rail vehicle costs of the I-205 LRT and the Combined LRT alternatives by approximately $42 million (2002 dollars).
5. The bus cost was calculated by taking fleet size by bus type for the alternative and subtracting the fleet size by vehicle type for the No-Build Alternative and multiplying the results by the appropriate cost per type of bus (therefore, if the bus fleet is smaller for the alternative than it would be under the No Build Alternative, then a cost saving is shown on the buses line item for that alternative).

2.4 Operating and Maintenance Costs

This section summarizes the annual corridor and systemwide transit operating and maintenance (O&M) costs that would be incurred with the South Corridor alternatives. For further detail on O&M costs, see the *Operating and Maintenance Costs Results Report* (TriMet, November 2002).

2.4.1 Operating and Maintenance Costing Methodology

O&M costs have been estimated for the transit portion of the alternatives described in Section 2.2 of this SDEIS. In general, the design and terminus options being considered as elements of the alternatives would result in no or an insignificant variation in O&M costs.

O&M costs were estimated by TriMet using a model in which labor and material costs were calculated as a function of service levels. In this model, vehicle miles, vehicle hours, number of vehicles, and other operating characteristics for particular alternatives were converted to the need for resources, such as employees, materials, and services, that would be required to operate those alternatives. Systemwide and non-corridor O&M costs include TriMet, C-TRAN, SMART, the Portland Streetcar, and the Wilsonville to Beaverton Commuter Rail Project costs, but only TriMet would incur O&M costs within the South Corridor.

Once derived, resources were converted to expenditures by applying unit cost factors, resulting in cost estimates for direct labor, materials and services. A list of key elements of the O&M cost model follows:

- The cost estimates include both operator and non-operator (e.g., administrative) staff.
- The current level of contracting for bus maintenance (approximately 5 percent) would continue.
- Fuel efficiency of the transit fleet would remain at current levels.
- Staff productivity factors have been derived from current TriMet experience.

All O&M cost estimates are for service levels in 2020 (the project's forecast year), as described in Section 2.2 of this SDEIS. All O&M costs are expressed in 2002 dollars. O&M costs are used as input into the project's financial analysis summarized in Section 5.1 of this SDEIS.

2.4.2 Operating and Maintenance Cost Estimates

Table 2.4-1 provides a summary of the annual O&M costs for the alternatives being considered for the South Corridor. The table breaks down O&M costs by South Corridor and non-corridor costs, and the South Corridor costs are broken down further between bus and light rail costs. All costs in the table are in 2002 dollars at 2020 service levels.

The BRT, Busway, and light rail alternatives generally would increase annual O&M expenditures over the No-Build Alternative by approximately $6.9 million to $11.8 million (2002 dollars at 2020 service levels). In particular, the I-205 LRT and the Combined LRT alternatives would increase annual O&M costs over the No-Build Alternative by approximately $11.6 million and $11.8 million, respectively. Alternately, the Milwaukie LRT and Busway Alternatives would increase annual O&M costs relative to the No-Build Alternative by approximately $7.1 million and $7.9 million, respectively. Finally, the BRT Alternative would cost approximately $6.9 million to operate over the No-Build Alternative.

Table 2.4-1
Corridor, Non-Corridor and System Annual Operating and Maintenance Costs[1], by Alternative[2]

	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
South Corridor						
Bus	$62,512,200	$69,706,500	$70,748,900	$62,874,500	$65,160,700	$61,341,100
Light Rail	$0	$0	$0	$7,025,200	$9,276,400	$13,339,200
Sub-Total	**$62,512,200**	**$69,706,500**	**$70,748,900**	**$69,899,700**	**$74,437,100**[3]	**$74,680,300**[3]
Non-Corridor	**$223,642,400**	**$223,346,300**	**$223,353,400**	**$223,363,900**	**$223,308,100**	**$223,308,100**
System Total	**$286,154,600**	**$293,052,800**	**$294,102,300**	**$293,263,600**	**$297,745,200**	**$297,988,400**

Source: TriMet, November 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
[1] Costs are in 2001 dollars at year 2020 service levels. Costs include TriMet, the Wilsonville to Beaverton Commuter Rail Project, C-TRAN, and the Portland Streetcar operating and maintenance costs.
[2] Operations and maintenance costs would not vary by design option, except with a minor difference between the Lake Road and Milwaukie Middle School terminus options: the Milwaukie Middle School Terminus Option would result in slightly lower operating and maintenance costs for the Milwaukie LRT and Combined LRT alternatives.
[3] The light rail non-corridor annual operating and maintenance costs for the I-205 LRT and the Combined LRT alternatives are based on modifying the Red Line to operate as a shuttle between Gateway TC and Portland International Airport. If the Red Line was to continue to serve downtown Portland, then there would be increases in light rail vehicle hours and miles, resulting in proportional increases in non-corridor annual operating and maintenance costs for the I-205 LRT and Combined LRT alternatives.

3. ENVIRONMENTAL ANALYSIS AND CONSEQUENCES

To allow consistent comparison of the environmental impacts associated with the Build Alternatives, a set of design options was identified to be used for the comparative analysis. These design options are listed in Table 2.2-3. It is also important to note that for the No-Build Alternative the analyses generally uses the existing conditions. Although the No-Build Alternative would include projects outlined in the *2000 Regional Transportation Plan* (RTP) Financially Constrained Network, those projects have not been designed and the environmental impacts of those projects are not known and have not been evaluated in this SDEIS. Consequently, the No-Build Alternative may have greater environmental impacts than are identified in this analysis. By using the existing conditions as the baseline for comparisons, the analysis focuses on the impacts of the project alternatives.

3.1 Land Use and Economic Activity

This section provides a summary of information on existing land uses and economic conditions in the South Corridor and the expected direct and indirect effects of the project alternatives on the region, corridor, and segments. For additional details on the land use and economic analysis, see the *Land Use and Economic Impacts Results Report* (Metro, Dorman, Hovee, November 2002).

3.1.1 Affected Environment

This section presents a summary of existing and projected households, population, employment, land use patterns, and development trends, as well as land use plans in the South Corridor. The discussion is presented in three subsections: land use and economic conditions for the four-county Portland/ Vancouver metropolitan region, which includes the South Corridor; land use and economic conditions of the Corridor; and existing and planned land uses for each of the four segments.

3.1.1.1 Portland/Vancouver Metropolitan Region

The Portland/Vancouver metropolitan region is the economic center of an extensive area that includes most of Oregon, southwest Washington, and portions of Idaho. The metropolitan region, with downtown Portland as its urban and geographic center, is located near the confluence of the Columbia and Willamette Rivers. The metropolitan region includes Multnomah, Clackamas, and Washington Counties in Oregon, and Clark County in Washington.

A. State and Regional Land Use Planning and Policy Framework

With adoption of Senate Bill 100 in 1973, the State of Oregon implemented a state-wide system of land use planning. Senate Bill 100 requires all cities and counties to adopt and implement comprehensive land use plans for their respective jurisdictions. Oregon’s Land Conservation and Development Commission (LCDC) reviews the local plans for compliance with the *Statewide Planning Goals and Guidelines*. Once compliance is acknowledged by LCDC, the local plan becomes the controlling document for land use within the geographic area covered by the plan.

The urban growth boundary (UGB) is a key tool of Oregon’s planning program. Under Goal 14, Urbanization, every city in Oregon must establish a UGB to accommodate projected 20-year land needs. Land inside the UGB is recognized as the appropriate location for urban development and supporting infrastructure, while land outside the UGB is reserved for resource uses (primarily agriculture and forestry) and limited rural development. In addition, the Transportation Planning Rule (TPR) was adopted by LCDC in 1991 to implement Goal 12, Transportation, and strengthen the land use/transportation planning connection. The TPR requires local jurisdictions to consider increased densities and a greater mix of land uses as a tool to reduce reliance on the auto; adopt changes to subdivision and development ordinances to encourage more transit-, pedestrian-, and bicycle-friendly development and street patterns; review proposed amendments to comprehensive plans to ensure that the transportation system is adequate to support planned land uses; and amend comprehensive plans to allow transit-oriented developments (TODs) along transit routes. The TPR also requires that Metro plan for a 10% reduction in vehicle miles traveled (VMT) per capita over 20 years and an additional 5% over 30 years.

The Portland metropolitan area also has a strong regional planning framework in place, with the nation's only elected regional government. The presence of a strong regional planning framework provides the Portland area a unique authority to coordinate and implement growth management policies across multiple jurisdictions. Under state law, Metro is responsible for adopting and managing the regional UGB for the urban portions of Multnomah, Washington, and Clackamas Counties and the 24 cities in the Portland metropolitan area. The Portland metropolitan area has a strong regional planning framework in place, with the nation's only elected regional government. The presence of a strong regional planning framework has provided the Portland area with a unique authority to coordinate, link and implement growth management policies, has had an impact on land use patterns in the Portland region, particularly when compared with other metropolitan areas. Infill and redevelopment have accommodated a growing share of development since the regional UGB was adopted, the average lot size for new residential development is smaller, and overall densities have increased within the UGB. Lands outside of the UGB have largely been preserved for farm use and limited rural development.

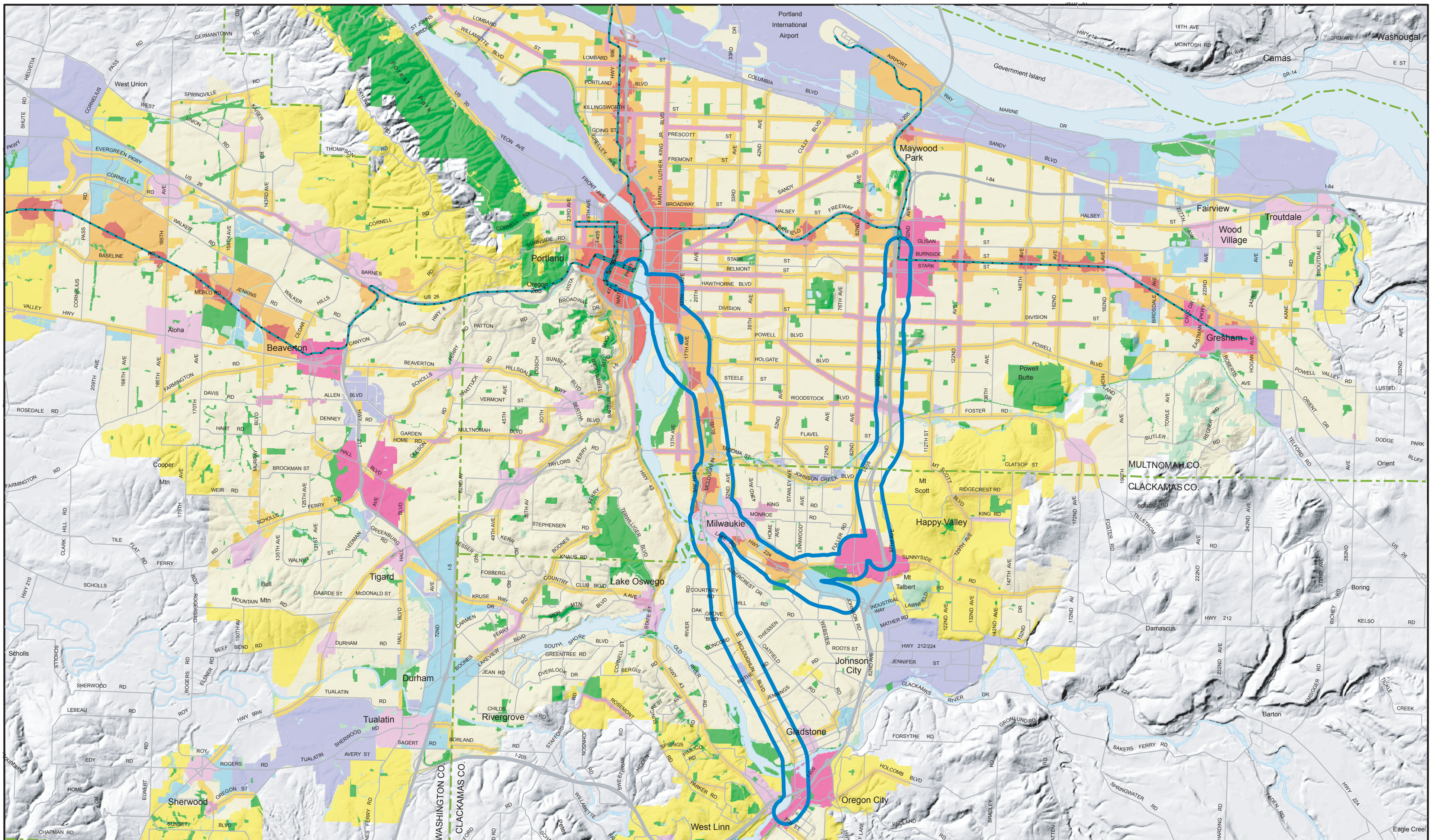
Metro adopted the *Region 2040 Growth Concept* (Growth Concept) as the strategy and tool for managing future regional land use patterns (see Figure 3.1-1). The Growth Concept is designed to:

- Encourage growth in mixed-use centers and corridors, with an increased emphasis on infill and redevelopment within the UGB;
- Protect access to nature inside the UGB and protect farm and forest land outside the UGB;
- Coordinate transportation and land use planning and expand transportation choices.

The Growth Concept incorporates policies to direct growth to a hierarchy of interrelated mixed-use urban centers, including the Central City, Regional Centers, and Town Centers. Transportation investments will play a fundamental role in the region's ability to achieve the growth management goals depicted in the Growth Concept, and the *Regional Transportation Plan* (RTP) targets 20-year transportation investments to leverage development envisioned in the Growth Concept. The Growth Concept envisions that all Regional Centers will be connected by light rail to the Central City. Currently four of seven designated Regional Centers are linked to the Central City by light rail (Gresham, Gateway, Beaverton, and Hillsboro).

B. Regional Population, Households and Employment Growth

The region's population and employment have grown significantly over the last decade, and this growth is expected to continue over the next 20 years (see Table 3.1-1). Between 1990 and 2000 the four-county region grew by approximately 27% (adding 377,000 residents) to an estimated 2000



South Corridor Project

Figure 3.1-1

2040 Growth Concept

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

Legend

- Existing Light Rail
- Corridor Alternatives
- Central city
- Corridors
- Employment areas
- Industrial areas
- Inner neighborhood
- Main streets
- Open spaces
- Outer neighborhood
- Park
- Regional centers
- Station community
- Station community core
- Town centers
- Water

Miles: 0, 1, 2

population of 1,789,000. The number of households increased by approximately 26% (144,000 households) to 697,000. Growth over the next 20 years is expected to be more moderate - population is expected to increase 32% (574,000 residents) and households are projected to increase by 42% (295,000 households). In the 1990s the region also experienced strong job growth, leading to an increase of 309,000 new jobs, or 36% growth over 10 years. Projected employment growth over the next 20 years is also expected to be more moderate, at 451,000 net new jobs (an increase of 39%).

Table 3.1-1
Existing and Projected Population, Households and Employment
For the Four-County Region*

	1990	2000	2020 (Projected)	Change 1990-2000	Change 2000-2020
Population	1,412,000	1,789,000	2,364,000	27%	32%
Households	553,000	697,000	992,000	26%	42%
Employment	856,000	1,165,000	1,616,000	36%	39%

Sources: 1990 and 2000 population and households data is from the US Census Bureau. All employment numbers and 2020 projections population and households are from the Metro Data Resource Center, 2002.
* Includes Multnomah, Clackamas, and Washington Counties in Oregon and Clark County in Washington.

C. Regional Economy and Development Trends

The region's unemployment rate currently is decreasing from a 20-year high. As the national economy recovers, Oregon and the Portland area will follow. High technology is considered a key industry to watch and is expected to contribute significantly to the region's recovery. The Portland area was particularly hard hit during the recent recession, during which the region's unemployment rate exceeded that of the rest of the state for the first time in almost 20 years. The Portland Permanent Metropolitan Statistical Area's (PMSAs) seasonally adjusted unemployment rate was 7.5% in June 2002, compared to the statewide unemployment rate of 7.2%. June marked the fifth consecutive month of employment gains for the metropolitan area; however, total employment is still nearly 2% below the June 2001 level.

Overall demand for housing is driven by population growth and demographic factors that affect household size and composition. Single- and multi-family housing sales are also affected by current low interest rates and the perception of real estate as a prime investment alternative. As of May 1, 2002, apartment vacancy rates averaged 6.5% for units constructed in and prior to 1979, 7.1% for units constructed between 1980 and 1995, and 7.8% for buildings constructed in 1996 and later. The metropolitan area has experienced a decline in multi-family building that began in 1997. Although Washington County's multi-family building has exceeded previous years, Clackamas County has seen a steady decline in the number of units permitted, from 776 in 1998 to 608 in 1999, 550 in 2000, and only 580 in 2001.

Demand for office-commercial space is driven by employment in several sectors, including Finance, Insurance, and Real Estate (FIRE), services, and government. The metropolitan area's office market has been affected by changes in the high-tech industry and by the slower economy. However, the relatively lackluster pace of office development here compared to other west coast metropolitan markets (such as San Francisco and Seattle) has meant a relatively softer impact on the downside of the market cycle. The Portland-Vancouver office market contains 34.7 million square feet of multi-tenant office space in buildings with 10,000 square feet or more of gross leasable area, 40% o f which is within the Central Business District. Overall office vacancy is 16.6%, not surprising with a January unemployment rate of 8.6%, and completion of five new buildings adding 512,832 square feet of office space. Buildings under construction total 1.3 million square feet, with 1.1 million square feet expected to be completed in 2002.

Demand for industrial space is driven primarily by manufacturing-sector employment. The Portland-Vancouver industrial market contains 174.5 million square feet of owner-user, single-, and multi-tenant buildings with 10,000 square feet or more of gross leasable area. Overall industrial vacancy is 7.74% with the highest rates in industrial parks in the southwest sub-market. Completions in the first quarter of 2002 totaled 500,000 square feet, 320,000 square feet of, which was pre-committed.

Demand for retail commercial space is driven by patterns in consumer spending. Increases in population and households are generally accompanied by increases in aggregate spending. Increases in employment also lead to increases in households' disposable income. After a decade of unparalleled growth, the Portland metropolitan area retail market now appears to be a mixed bag. At the end of 2001, the Portland-Vancouver retail market contained 37.4 million square feet of malls, shopping centers, and street retail (consisting of buildings 10,000 square feet or more of gross leasable area). Overall vacancy was 4.48% at the end of 2001. Nearly 1.7 million square feet of retail space came on-line in 2000, somewhat of a construction boom. Construction activity slowed significantly in 2001, with only 692,000 square feet coming on-line. A number of larger projects have also been delayed and/or stalled, including the Wood Village Town Center, Shops at Tanasbourne, and Cascade Station (along the Airport MAX line).

D. State and Regional Economic Development Plans and Programs

This section is a summary of economic development programs relevant to the South Corridor Project. Oregon Community Solutions teams, made up of staff from five state department, work with local governments "to craft integrated solutions to complex community development problems, and help turn local visions and opportunities into real projects that promote livability." Community Solutions objectives include rebuilding rural and distressed economies, increasing the development of affordable housing, revitalizing down towns and main streets, and reducing sprawl and congestion. The Metro/Hood River Regional Team currently manages and funds several projects within the region, which are described below.

Milwaukie. The team is working with the City of Milwaukie on implementing their plan for revitalizing downtown and reconnecting it to the Willamette River. The plan includes a transit center, transit-oriented compact development that includes housing (both affordable and market rate) and a grocery store, and development of a riverfront park and a community center.

Oregon City. Oregon City is interested in converting a capped landfill near the historic city center into a state-of-the-art Employment Center that can accommodate office, training, light industrial and commercial use, as well as support tourist activities in conjunction with the *End of the Oregon Trail Center* and business services around the new Amtrak Station. The regional team is helping the city evaluate the plan for this proposal and its impact on the city and surrounding neighborhoods, wetlands and the Willamette River, transit development, and transportation safety and capacity. Oregon City currently has two adopted downtown Urban Renewal Areas (URAs) that were created in the mid 1990s; however, no active programs are associated with those areas at this time.

Lents Town Center/Johnson Creek Restoration. The team has been involved with the Lents Urban Renewal Area activities and with related work to restore Johnson Creek and address flooding issues, and has provided ideas to promote livability and environmental protection in the design of new buildings.

Gateway Station Development/Urban Renewal Area. The team received a Community Incentive Fund application for a mixed-use affordable and market-rate housing development adjacent to the Gateway MAX station. The project presents an opportunity to balance housing in the area with jobs at the airport and at the planned Cascade Station development near the airport and I-205. TriMet is also considering redevelopment of the Gateway Park-and-Ride station to serve as an eastside "living space" for the community, much as Pioneer Square serves downtown.

Jurisdictions also have economic development plans and programs of their own. Gateway became the City of Portland's 10th Urban Renewal Area (URA) in June 2001, with a "standing principle" to "facilitate the full and productive use of the land for appropriate 'regional center' uses." The URA plan describes appropriate regional center development as mixed-use, compact, and supporting a range of travel options and opportunities for community interaction and economic advancement.

The City of Portland adopted the Lents Town Center URA as an Urban Renewal District in September 1998. The Lents URA goals and objectives include several economic development goals. These goals focus on neighborhood and commercial revitalization and the creation of family wage jobs for area residents. The Lent's Urban Renewal Plan's economic/commercial development projects include:

- Development Opportunity Strategies Program: technical and/or financial assistance in determining redevelopment feasibility;
- Storefront Improvement Program: matching grants to rehabilitate commercial storefronts or long-term vacant commercial space;
- Business Development Program: technical and/or financial assistance to improve operations, increase profitability and/or create jobs;
- Redevelopment Assistance Program: technical and/or financial assistance to commercial/industrial property developers; and
- Business Recruitment/Area Marketing Program: Promotion of opportunities within the area to prospective employers and business customers.

Milwaukie/North Clackamas County hosts the only active Enterprise Zone within the project area. Enterprise Zones are sponsored by cities and target areas of no more than 12 square miles for new business investment. Eligible (generally non-retail) businesses that locate or expand within the zone receive a 3- to 5-year exemption from the property taxes normally assessed on new plants and equipment. In exchange, participating businesses agree to work with local job training providers, increase employment by a certain percentage, and satisfy any additional local conditions.

3.1.1.2 South Corridor

The South Corridor includes lands within the jurisdiction of the cities of Portland, Milwaukie, Gladstone, and Oregon City and urban unincorporated portions of Clackamas County. Figure 3.1-2 illustrates jurisdictional boundaries for the South Corridor Project area. The Corridor contains a broad mix of urban land uses and is developed with a mix of urban densities. All of the South Corridor Alternatives are located inside the regional UGB. Existing and projected households, population, and employment for the South Corridor Project area are shown in Table 3.1-2. The

South Corridor Project

Jurisdiction Boundaries

Figure 3.1-2

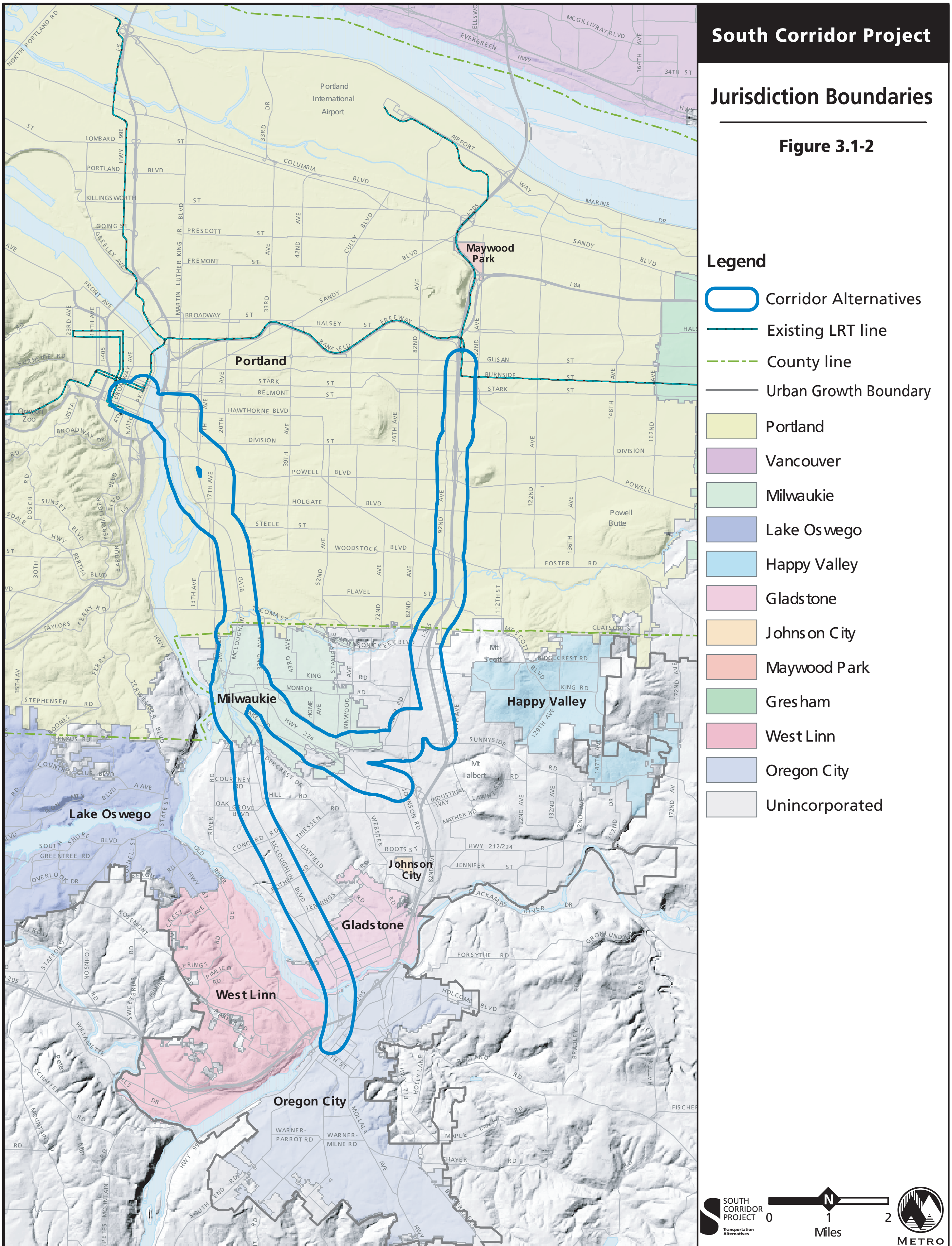


Table 3.1-2
Existing and Projected Households and Employment for the South Corridor by Sub-Area[1]

Sub-Area [1]	Households 2000	Households 2020	Households Change	Employment 2000	Employment 2020	Employment Change
Gateway	9,910	13,760	39%	19,520	23,870	22%
Lents	8,150	10,170	25%	6,110	7,380	21%
SE Portland	19,320	21,690	12%	9,160	9,910	8%
Inner SE	8,800	10,440	19%	18,530	21,830	18%
Milwaukie	3,420	5,000	46%	7,770	12,490	61%
Clackamas Reg. Center	7,100	9,570	35%	23,000	36,690	59%
Gladstone	7,990	8,920	12%	8,120	9,090	12%
Oregon City	10,050	16,940	69%	15,930	23,750	49%
South Corridor Total	**199,350**	**292,580**	**47%**	**431,580**	**582,320**	**35%**
Regional Total	**691,360**	**992,500**	**44%**	**1,160,890**	**1,609,700**	**39%**

Sources: US Census, 2000; Metro Data Resource Center, 2001.
[1] Sub areas are shown on the South Corridor Map, Figure 1.2-1.

Corridor's economy is integrated with the larger regional economy. Development and employment in the region directly affect development patterns and employer behavior in the Corridor.

The central city is the focal point of the region and the Corridor, with the highest intensity of development in downtown Portland on the west side of the Willamette River. A number of important activity centers are located close to downtown on the east side of the river, including the Convention Center, Rose Garden Arena, and the Oregon Museum of Science and Industry (OMSI). Areas close to downtown Portland are largely developed, with a pattern of inner residential neighborhoods and supporting commercial development along main streets and transportation corridors. Major arterial streets tend to be oriented in an east-west direction to link with the bridges over the Willamette River. Industrial development in the South Corridor is largely concentrated in two areas, the Central Eastside Industrial District (CEID) and the Milwaukie Industrial Area along Highway 224. Outside of the central city, the most intensive development is found in the Gateway and Clackamas Regional Center areas, with smaller-scale traditional downtown areas in Milwaukie and Oregon City.

3.1.1.3 South Corridor Segments

Following is a brief summary of the existing land use and comprehensive plan land use designations for each of the four corridor segments. Figure 3.1-3 illustrates existing land use and Figure 3.1-4 illustrates comprehensive plan designations in the South Corridor.

A. Portland to Milwaukie Segment

This segment links the Portland Central City and Milwaukie Town Center, both mixed-use centers identified in the *Region 2040 Growth Concept*. The segment extends from the southern edge of downtown Portland, across the Hawthorne Bridge, and south along SE McLoughlin Boulevard to downtown Milwaukie. The majority of this segment is within the City of Portland; south of Johnson Creek Boulevard is in the City of Milwaukie.

Existing Land Use and Development

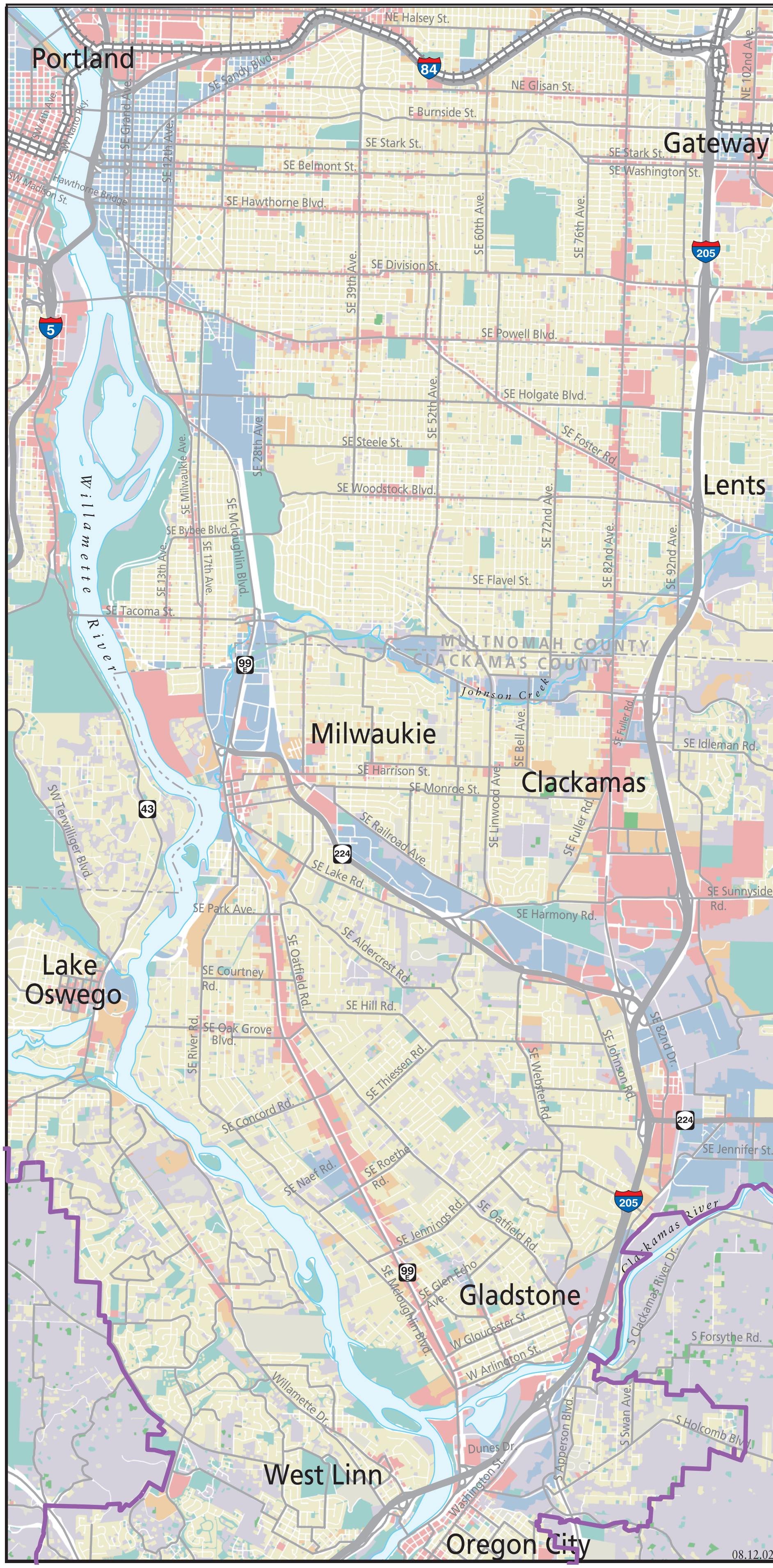
Downtown Portland is the civic, commercial and entertainment center of the region. The existing bus transit mall runs north and south through the downtown on SW 5th and 6th Avenues, forming a spine

SOUTH CORRIDOR PROJECT

EXISTING LAND USES

Source: County Assessor Data, 2002

Figure 3.1-3



- Commercial
- Industrial
- Mixed Use
- Multi Family
- Single Family
- Vacant*
- Parks & Open Spaces
- Agriculture
- Urban Growth Boundary

* The vacant land designation represents lands appearing unimproved on aerial photography, without regard to developability and accessibility. On partially developed parcels, only undeveloped areas 1/2 acre or larger are included.

SOUTH CORRIDOR PROJECT

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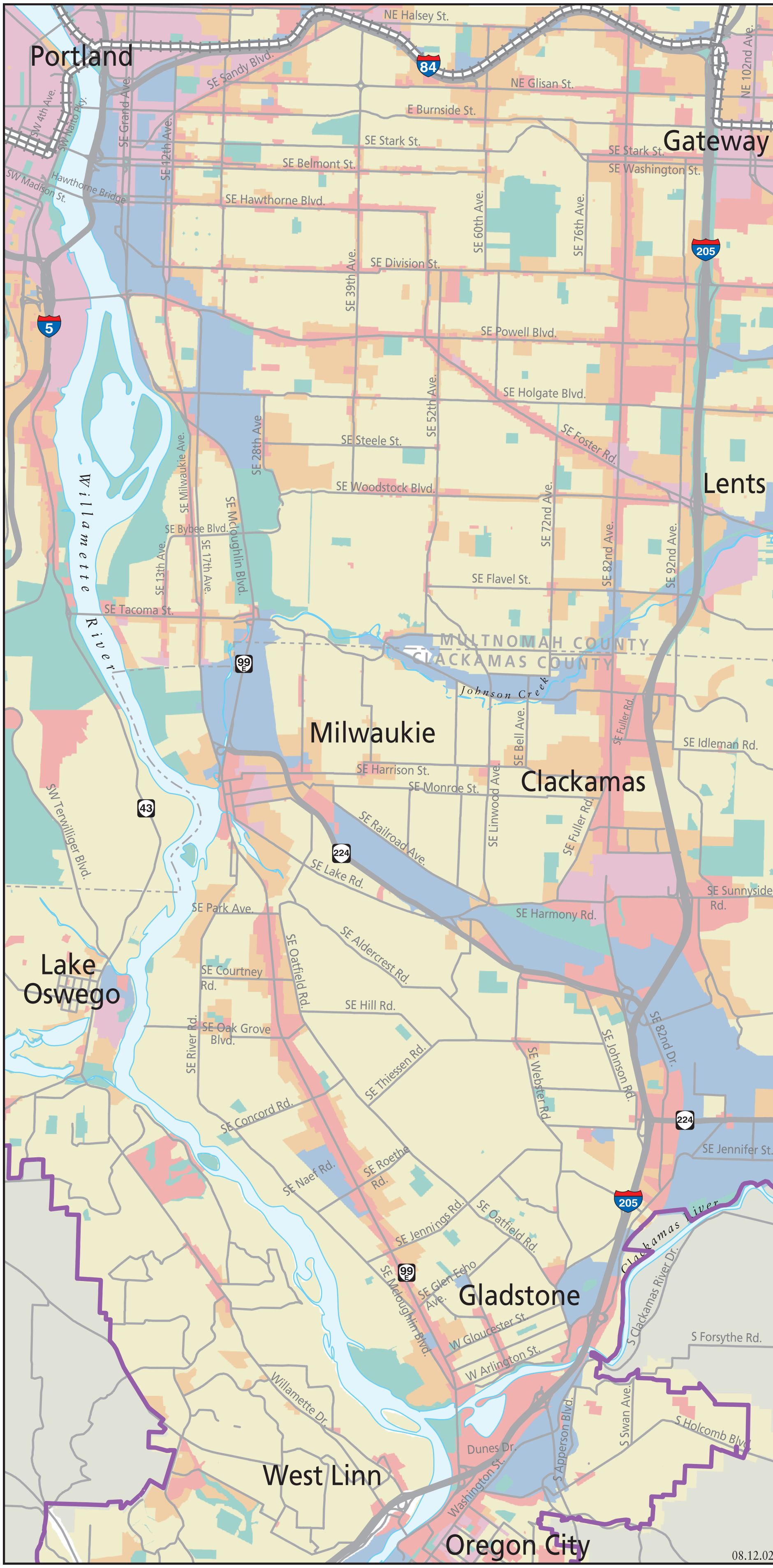
SOUTH CORRIDOR PROJECT

COMPREHENSIVE PLAN DESIGNATIONS**

Figure 3.1-4



Commercial

Industrial

Mixed Use

Multi Family

Single Family

Rural Residential

Parks & Open Spaces

Urban Growth Boundary

** Local jurisdiction comprehensive plans have been generalized for consistency throughout the corridor. Plan designations are not at the parcel level but at a larger zone level. Existing uses may not conform with existing plan designations.

SOUTH CORRIDOR PROJECT

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for the region's highest-density development and activity. Major civic buildings located at the south end of downtown near the Hawthorne Bridge include the Federal Courthouse, the Multnomah County Courthouse, the Wyatt Federal Building, Portland City Hall, and the Portland Building.

East of the Willamette River, McLoughlin Boulevard provides the primary route for traveling north and south through the segment. The CEID, one of Portland's oldest industrial areas, is located in the area between the Willamette River and about SE 12th Avenue. Other industrial uses in this segment are concentrated near the Brooklyn Rail Yards and along rail lines. TriMet's Center Street bus operations facility is located near the Brooklyn Rail Yard. Other large employers include PGE and the Fred Meyer corporate office. OMSI and a Portland Community College (PCC) satellite campus are significant regional destinations on the east bank of the Willamette River near the Marquam Bridge. Several established eastside Portland neighborhoods are located in this segment.

Westmoreland Park and the Eastmoreland Golf Course are predominant open space/recreational land uses along SE McLoughlin Boulevard near the Bybee overpass. South of Tacoma Street, existing land uses along McLoughlin Boulevard shift to more suburban and larger-scale commercial and industrial buildings. Established Milwaukie residential neighborhoods are located east of the rail corridor, with few east/west streets crossing the existing rail lines that run parallel to McLoughlin Boulevard. Johnson Creek crosses McLoughlin Boulevard in this portion of the segment.

Planned Land Use and Development

The Portland to Milwaukie Segment is largely developed, with little difference between existing land use and planned land uses. Local comprehensive plans applicable to this segment include the *Portland Comprehensive Plan*, the *Portland Central City Plan,* and the *Milwaukie Comprehensive Plan.* The *Portland Central City Plan* identifies the area near the west end of the Hawthorne Bridge for high-density central commercial uses as well as a government center. Waterfront Park and the Eastbank Esplanade are identified as open space areas. East of the Willamette River is designated as a large industrial sanctuary, which reflects the City's policy to reserve land for existing and planned industrial uses. A linear corridor along SE Grand Avenue is identified as a commercial employment area that allows a broader mix of land uses, including housing. The area around OMSI is designated for a more intensive mix of land uses, including industrial, office, and research and development. A recently adopted development strategy envisions that this area will develop at higher densities than the surrounding industrial sanctuary. South of Powell Boulevard, the Brooklyn Yard area is designated for industrial use, as is the North Industrial Area of Milwaukie. A large portion of the land in this area is planned for park/open space uses, including the Oaks Bottom area along the Willamette River, Westmoreland Park, and Eastmoreland Golf Course. Established single-family neighborhoods are generally designated as inner-city neighborhoods. Some of the major transit streets are planned for higher-density residential development and a greater mix of land uses. Main street development is planned for portions of SE Division, SE Woodstock, SE Milwaukie, and SE Tacoma Streets.

B. Milwaukie to Clackamas Segment

This segment links the Milwaukie Town Center and the Clackamas Regional Center, two mixed-use centers identified in the *Region 2040 Growth Concept*. The majority of this segment is in the City of Milwaukie; the eastern part is in unincorporated Clackamas County.

Existing Land Use and Development

The Milwaukie to Clackamas Segment is generally characterized by two residential areas separated by a large industrial district along Highway 224, linked to higher-density mixed-use areas on the west (Milwaukie Town Center) and the east (Clackamas Regional Center). At the west end of this segment, Milwaukie Town Center is located southwest of Highway 224. The downtown core area has a grid street pattern and existing land uses include low-scale commercial uses surrounded by older, established residential neighborhoods. Significant community facilities in the downtown area include Milwaukie City Hall, Ledding Library, Milwaukie Transit Center, churches, and schools.

The Milwaukie Marketplace, a community shopping center, is located east of the downtown area and north of Highway 224. East of the commercial center, a large business/industrial area extends from Railroad Avenue and the Union Pacific Railroad (UPRR) mainline to Highway 224. The business/ industrial area is a significant employment center for Milwaukie, Clackamas County, and the region.

Established residential neighborhoods of primarily single-family homes are generally located north of SE Railroad Avenue and SE Harmony Road and south of Highway 224 in this segment. Branch campus facilities for the Oregon Institute of Technology (OIT), Clackamas Community College (CCC), and the North Clackamas Aquatic Park are significant activity centers located south of Harmony Road at the east end of the segment.

This segment terminates at the Clackamas Town Center (CTC), a regional mall with approximately 1.2 million square feet of retail space. A transit center and large high-density residential area are located on the north side of the regional mall. On the west side of CTC is SE 82nd Avenue, a four-lane highway lined with fast food restaurants and big box retail stores. Other substantial land uses in the Clackamas Regional Center area include the Clackamas Promenade shopping center, the Kaiser/Sunnyside Medical Center, office buildings, hotels, and New Hope Church.

Planned Land Use and Development

Local comprehensive plans applicable in the Milwaukie to Clackamas Segment include the *Milwaukie Comprehensive Plan* and the *Clackamas County Comprehensive Plan.* The *Milwaukie Comprehensive Plan* identifies a mix of Retail Storefront, Office, Residential and Open Space uses for the downtown area. East of the Milwaukie downtown, established residential neighborhoods to the south of Highway 224 and north of SE Railroad Avenue are designated for residential use.

The large employment area between SE Railroad Avenue and Highway 224 is planned for business/ industrial park uses in the Milwaukie and Clackamas County plans. The designated industrial area extends east to I-205. The area south of SE Harmony Road that is currently developed with the OIT and CCC campuses and the Aquatic Park is designated for office/commercial use. South of these facilities, the undeveloped area owned by the North Clackamas Park District is designated for public/community use.

The most extensive commercial and mixed-use development is planned for the Clackamas Regional Center at the east end of this segment. The area near the Sunnyside/I-205 interchange is generally designated for Regional Center commercial and office uses. The regional mall and the area west of SE 82nd Avenue and south of Monterey Avenue are designated for mixed-use development. The *Clackamas Regional Center Area Design Plan* identifies areas for low-, medium-, and high-density residential uses, with the highest densities planned near commercial uses and transit services.

C. Milwaukie to Oregon City Segment

This segment links the Milwaukie Town Center and the Oregon City Regional Center via SE McLoughlin Boulevard. Land use authority in this segment is divided between the Cities of Milwaukie, Gladstone, and Oregon City and Clackamas County.

Existing Land Use and Development

This segment is generally characterized by highway-oriented commercial uses along SE McLoughlin Boulevard, with established residential neighborhoods behind the commercial development. Existing transit centers are located in both downtown areas. Existing land uses in the Milwaukie Town Center include low-scale commercial uses surrounded by older, established residential neighborhoods. In addition to retail, service, and office uses, several community facilities are located in the Milwaukie Town Center. McLoughlin Boulevard runs north to south between Milwaukie's downtown core and the Willamette River. South of Milwaukie, land uses along McLoughlin Boulevard are primarily big box and linear retail with auto sales predominating. Commercial development is typically set back from the right-of-way, with off-street parking between McLoughlin Boulevard and the buildings.

There is a substantial amount of residential development in this segment, even though McLoughlin Boulevard has a dominant commercial character. Residential neighborhoods include old and newer single-family neighborhoods and mobile home parks, with densities ranging from large lot single-family development to high-density apartment buildings. Land uses that support the residential areas, such as schools, parks, and churches, are found throughout the Milwaukie to Oregon City Segment.

Large community parks are located at the confluence of the Clackamas and Willamette Rivers. The traditional grid-pattern downtown area for Gladstone is located east of McLoughlin Boulevard along Portland Avenue. Civic uses such as city hall and the library are located in this area.

A community retail center is located between the Clackamas River and I-205 in the historic Oregon City downtown area. The traditional grid pattern downtown area is located south of the I-205 bridge over the Willamette River. As in the City of Milwaukie, McLoughlin Boulevard separates the downtown area of Oregon City from the Willamette River. A range of retail, service, office, and civic uses are located in downtown Oregon City along Main Street. A transit center is located at the south end of the downtown between Main Street and McLoughlin Boulevard. Bus connections at the transit center provide access southeast to the CCC campus near Beavercreek Road and Highway 13. The End of the Oregon Trail Center is located north of the downtown area, where an Amtrak passenger rail station is also planned.

Planned Land Use and Development

Local comprehensive plans that apply in this segment include the *Milwaukie Comprehensive Plan,* the *Clackamas County Comprehensive Plan,* the *Gladstone Comprehensive Plan,* and the *Oregon City Comprehensive Plan.* The *Milwaukie Downtown Plan* identifies the area east of SE McLoughlin Boulevard for a mix of downtown storefront, office, and residential uses. The Willamette Riverfront area west of McLoughlin Boulevard is generally designated for open space and recreational use. A boulevard design character is planned for McLoughlin Boulevard through downtown Milwaukie.

From SE Park Avenue to Oregon City, the frontage along SE McLoughlin Boulevard is generally designated for commercial uses in the *Clackamas County, Gladstone* and *Oregon City Comprehensive Plans*. Behind the McLoughlin Boulevard commercial frontage, established neighborhoods are designated for residential use. Single-family densities are the most dominant; however, there are areas designated for higher-density residential uses. The adopted plans also identify large park and open space areas near the confluence of the Clackamas and Willamette Rivers. Downtown Oregon City is generally designated for a mix of commercial and office uses.

D. Gateway to Clackamas Segment

This segment links the Gateway Regional Center, the Lents Town Center, and the Clackamas Regional Center along I-205. The majority of this segment is in the City of Portland; the portion of the segment, generally south of Johnson Creek Boulevard is in Clackamas County.

Existing Land Use and Development

Land use and development patterns in this segment have been significantly shaped by transportation facilities. Two freeways, I-84 and I-205, intersect at the north end of the segment. The Hillsboro to Gresham MAX line and the Airport MAX line converge at the Gateway transit center. Major east/ west streets such as Stark, Washington, Division, Powell, Holgate and Foster connect neighborhoods located east and west of I-205 and serve as important transit streets.

A big expansion of the outer southeast area came after World War II. By the late 1970s the area contained most of its existing landmarks, including Gateway Shopping Center, Mall 205, Portland Adventist Hospital, and strips of businesses along 102nd Avenue and other east-west arterials. In the 1980s, the area was annexed to Portland to access urban services. With the completion of I-205 in 1983 and the light rail line in 1986, Gateway became a transit hub second only to downtown Portland.

Major land uses in the Lents Town Center include commercial service and retail uses, traditional neighborhoods, Lents Park, and the Freeway Land Company industrial site east of I-205. Johnson Creek and the Springwater Corridor Trail traverse the Lents community and provide both constraints and amenities for development. Residential neighborhoods in the northern portion of this segment reflect traditional, mixed-era, and suburban development patterns. More recently developed neighborhoods typically have fewer street connections and often lack sidewalks. Connected streets are more common in the traditional neighborhoods. Natural features such as the topography of the buttes, Mt. Scott, and Johnson Creek, also constrain street connectivity and development in some portions of this segment.

Land use and development patterns in the Clackamas County portion of this segment have been more strongly shaped by the freeway. Commercial development is concentrated in interchange areas at Johnson Creek Boulevard and Sunnyside Road. Major commercial uses include the CTC regional mall, Kaiser Sunnyside Medical Center, Clackamas Promenade shopping center, big box and linear commercial uses, hotels, and office buildings. The Lincoln Memorial Cemetery and Willamette National Cemetery are important open space areas in this segment. In addition to the commercial and employment uses, there is a significant amount of housing along the I-205 corridor, including several large apartment complexes that take advantage of good access to transportation and jobs.

Planned Land Use and Development

Local plans that are applicable in the Gateway to Clackamas Segment include the *Portland Comprehensive Plan,* the *Outer Southeast Community Plan*, and the *Clackamas County Comprehensive Plan*. The most intense development is planned for the Gateway Regional Center area at the north end of the segment. Three portions of the Regional Center—Gateway, Mall 205, and 102nd Avenue—are designated for central commercial development, the City of Portland's most physically intense commercial designation. The Portland Adventist Medical Campus is designated for institutional and residential use. The area flanking 99th Avenue is designated for high-density residential and mixed employment uses. Lands fronting on major east/west streets and 82nd Avenue are generally designated for storefront commercial and general commercial uses. Large areas also have been designated for multi-dwelling residential uses, particularly along transit streets and near commercial services.

The *Outer Southeast Community Plan* identifies the Lents community as a second focal point for more intensive development. The area along SE Woodstock Boulevard is designated for mixed commercial development, and a mixed-use central employment area is identified near the intersection of SE 92nd Avenue and SE Foster Road. Areas are planned for multi-dwelling residential use near the Lents Town Center and I-205. The area south of the Springwater Corridor is generally designated for industrial and central employment uses. Johnson Creek also crosses this segment south of Foster Road. The I-205 bike path and the Springwater Corridor are identified as open space/recreational trails.

In Clackamas County, areas east of I-205 are generally designated for medium-to-high density residential use closer to the freeway, with lower-density residential areas further east and up the hill. Plan designations are more varied to the west of I-205, with low-, medium-, and high- density residential; retail and corridor commercial; and Regional Center commercial, office, and planned mixed use.

In comparing existing and planned land uses, the most significant change is envisioned for the area between Sunnyside Road and Monterey Avenue that extends from I-205 west to SE Fuller Road. Land uses in this area are expected to transition over time into a denser mix of commercial, office, and residential uses.

3.1.2 Land Use and Economic Development Environmental Consequences

This section is a summary of land use and economic development consequences that could result from the South Corridor Project Alternatives. It compares the Alternatives and evaluates long-term impacts (direct and indirect), short-term impacts associated with construction, and cumulative impacts.

3.1.2.1 Regional Land Use and Development Impacts

The Portland/Vancouver metropolitan region's economy has been growing and diversifying. While transit has not been shown to directly affect regional economic growth, the quality of the overall transportation system does influence economic activities and location decisions. Each of the build alternatives would expand transit service and transportation options in the South Corridor, improve the effectiveness of the overall transportation system, and thereby help maintain the region's economy.

The Build Alternatives, particularly the Light Rail Alternatives, have the greatest potential impact on regional land use and development patterns. When the North Interstate LRT line is completed, the region will have a light rail system in place with three major spokes to the east, west, and north. The Light Rail Alternatives in the South Corridor would provide an important fourth spoke of the regional system and enable high-capacity transit connections to the central city and several regional centers and town centers, as envisioned in the *Region 2040 Growth Concept* and the *RTP.* In addition, LRT stations have the potential to serve as nodes for transit-oriented development as demonstrated at some stations along the existing MAX system and as envisioned in the local, regional, and statewide planning efforts.

In comparison to the No-Build Alternative, the BRT and Busway Alternatives would provide more frequent and faster transit service in the South Corridor. However, these alternatives would not operate exclusively in a separate transitway and, therefore, would not provide the longer-term benefits associated with the LRT Alternatives as congestion continues to increase on surface streets in the region. In addition, BRT stations would not have the permanence or high visibility of the LRT stations, and are unlikely to have as much potential to spur or shape development patterns.

The No-Build Alternative would not contribute to achievement of the region's level of service objectives for its transportation system. Further, the No-Build Alternative would not support intensified development in the designated Regional Centers and Town Centers as called for in the *Region 2040 Growth Concept* and local comprehensive plans. As a result, the No-Build Alternative could make it more difficult to achieve the population and employment densities envisioned in the *Region 2040 Growth Concept* and would add to pressure to expand the region's UGB. Expansion of the UGB would result in increased costs to local jurisdictions within the region to provide new and/or expanded facilities and services to newly urbanized areas.

3.1.2.1.1 Compatibility with State and Regional Land Use Plans and Policies

A. Statewide Planning Goals. Oregon law mandates that statewide planning goals be implemented through state, regional, and local comprehensive plans; consequently, acknowledged local plans have the force of state law. Since 1973, when statewide land use planning legislation was adopted in Oregon, state, regional and local agencies have developed and implemented a coordinated land use policy framework that emphasizes urban containment, protection of rural resource lands from development, efficient use of lands inside the UGB, and a strong connection between land use and transportation planning.

All of the Build Alternatives would support the *Statewide Planning Goals*. The build alternatives would provide improved transit service to lands within the regional UGB and designated for urban development, consistent with the emphasis of the *Statewide Planning Goals*, particularly Goal 11, Public Facilities and Services, Goal 12, Transportation, and Goal 14, Urbanization. The proposed transit improvements would not serve rural lands or result in pressure to convert rural lands to urban uses, consistent with Goal 3, Agricultural Lands, Goal 4, Forest Lands, and Goals 11, 12 and 14.

Goal 12, Transportation, and the TPR promote the development of safe, convenient, and economic transportation systems designed to reduce reliance on the automobile so that air pollution, traffic, and other livability problems faced by urban areas in other parts of the country might be avoided. The TPR includes measures to improve the livability of urban areas, and particularly larger metropolitan areas, by promoting changes in land use patterns and the transportation system that make it more convenient for people to walk, bicycle, and use transit, and to drive less to meet their daily needs. The Build Alternatives would provide an opportunity for modal shift in the Corridor and would provide a tool for the region to achieve the TPR's VMT reduction targets. The TPR also requires local governments to consider changes to land use densities and urban design as a way to meet transportation needs. Specifically, the TPR states that local governments must consider "increasing residential densities and establishing minimum residential densities within ¼ mile of transit lines, major regional employment areas, and major regional retail shopping areas." The Build Alternatives are designed to link and serve major regional employment and shopping areas such as the Portland Central City; the Gateway and Clackamas Regional Centers; the Milwaukie, Lents, and Oregon City Town Centers; and other activity centers such as OMSI, the Portland Adventist Medical Center, and community college facilities. Some of the local jurisdictions in the South Corridor have already implemented higher density residential zoning within ¼ mile of major transit corridors. Local jurisdictions will re-evaluate their plans for station areas after selection of a LPA.

B. Regional Plans and Policies. Similar to the *Statewide Planning Goals*, regional plans and policies (including the *RUGGOs,* the *Regional 2040 Growth Concept,* the *RTP,* and the *Regional Framework Plan*) emphasize containing urban growth within the Regional UGB and support targeting public investments, including transit improvements, to reinforce and support a compact urban form. The *Region 2040 Growth Concept* directs most new development to mixed-use urban centers and along major transportation corridors. Focusing new jobs, housing, and services in these centers and corridors provides many benefits and has important implications for the region's transportation system. Adopted regional and local plans support targeting transit investments to leverage higher-density development in the designated mixed-use centers. The regional plans envision that light rail and BRT will become the backbone of the transit system, connecting regional centers to one another and the central city.

The No-Build Alternative includes transit improvements in the South Corridor as outlined in Table 2.2-1. While these improvements would be compatible with regional plans and policies, they would not provide the level of light rail or BRT service to the designated Regional Centers and Town Centers envisioned in the *Region 2040 Growth Concept*. As a result, the No-Build Alternative would provide minimal transit support for a transition to higher-density uses in areas such as the Clackamas Regional Center or the Milwaukie Town Center.

The BRT Alternative would improve the speed and reliability of bus service in the South Corridor with queue-bypass lanes, bus priority traffic signal improvements, bus-only ramps, and shoulder bus lanes. The BRT Alternative would provide a rapid bus connection among the Portland Central City, Clackamas and Oregon City Regional Centers, and Milwaukie Town Center. In addition to providing a better transit connection between these centers, the BRT Alternative would serve the employment corridor along Highway 224, but would not include a BRT connection between the Clackamas and Gateway Regional Centers. While the *Region 2040 Growth Concept* and the *RTP* generally identify the Portland to Milwaukie to Clackamas segments as appropriate corridors for light rail in the long-term, the BRT Alternative would be generally compatible with adopted regional plans.

The Busway Alternative would also improve the speed and reliability of bus service in the South Corridor when compared to the No-Build Alternative. In addition to BRT components, the Busway would include segments of separated guideway (to provide greater separation from mixed traffic) in more highly congested areas to improve the efficiency of bus service. The Busway Alternative would link the same centers as the BRT Alternative, as designated in the *Region 2040 Growth Concept*. The Busway Alternative would also serve the employment corridor along Highway 224, but would not include a BRT connection between the Clackamas and Gateway Regional Centers. While the *Region 2040 Growth Concept* and the *RTP* generally identify the Portland to Milwaukie to Clackamas segments as appropriate corridors for light rail, the Busway Alternative would be generally compatible with adopted regional plans.

The Milwaukie LRT Alternative would generally be compatible with regional plans and policies. The *Growth Concept* was amended to reflect the Land Use Final Order (LUFO) adopted for the South/North Project, and shows light rail station communities along SE McLoughlin Boulevard between the Portland Central City and the Milwaukie Town Center, and along Highway 224 between the Milwaukie Town Center and the Clackamas Regional Center. The *RTP* supports LRT in the long-term with BRT service along Highways 99E and 224 from the Portland Central City to the Clackamas Regional Center until LRT service can be provided.

The I-205 LRT Alternative would be compatible with regional plan policies that support high-capacity transit links of designated regional centers and town centers. This Alternative would link the Clackamas Regional Center and Lents Town Center with the major transit hub at the Gateway Regional Center. Riders could take light rail from Clackamas County to downtown and the Westside, or could transfer at Gateway to connect to the Gresham Regional Center or north to the Airport. The I-205 LRT Alternative would include BRT from the Portland Central City to the Milwaukie Town Center and the Oregon City Regional Center. However, the I-205 LRT Alternative would not include BRT improvements along Highway 224 and would not directly serve the Milwaukie Industrial Area. The *RTP* calls for BRT service along I-205 connecting the Oregon City, Clackamas, and Gateway Regional Centers.

The Combined LRT Alternative would be compatible with regional plans and policies. Of all build alternatives, the Combined Light Rail Alternative would provide light rail connections between the greatest number of designated regional centers and town centers, and would provide the greatest opportunity to support envisioned development and the designated mixed-use centers.

In summary, the *Growth Concept* is predicated on the implementation of a South/North transit spine linking the key activity centers in the Corridor and the Region. If high-capacity transit improvements were not implemented, the region's growth management strategy would be at risk.

3.1.2.1.2 Regional Employment and Income Impacts

Economic and employment impacts resulting from construction and operation of the alternatives would occur throughout the region. Some economic impacts result directly from of spending for a project, while others would be indirect impacts such as increased consumer or business spending.

A. Long-Term Employment and Economic Impacts

Long-term impacts include employment and economic impacts associated with operating each alternative as well as the tax base impacts of the displacements associated with each alternative.

Employment and Other Direct Impacts. Long-term direct project impacts would include changes in employment from the operation and maintenance associated with each alternative. The degree to which these jobs would be an actual economic benefit would depend in part on the source of funding for the project. Locally funded operations yield a smaller economic benefit than federally funded operations because the money would otherwise be spent on other projects in the region.

Table 3.1-3 summarizes long-term transit employment and economic impacts related to operation of each alternative as compared to the No-Build Alternative. The No-Build Alternative assumes total operating costs of just over $238 million (including operations and maintenance costs for TriMet, Wilsonville to Beaverton Commuter Rail, C-TRAN, and Portland Streetcar). Of this amount, $51.8 million is estimated to provide service to the South Corridor. The operations and employment numbers shown in Table 3.1-3 are in addition to the No-Build costs and represent increases in operating costs and employment. The Combined LRT Alternative would have the highest annual operating cost and the second highest estimated employment differential over the No-Build Alternative. The BRT Alternative would have lowest annual operating cost differential, and the Milwaukie LRT Alternative would have the lowest employment differential. The BRT would have lower operating costs than the Milwaukie LRT but higher employment numbers because additional employees will be required to operate the buses.

Table 3.1-3
Estimated Operations and Maintenance Costs and Long-Term Employment, Difference over No-Build Alternative

Alternative	Estimated Annual Operations and Maintenance Costs	Estimated Long-Term Employment		
		Bus	LRT	Total
BRT	$22,420,000	61	0	61
Busway	$23,460,000	67	0	67
Milwaukie LRT	$22,620,000	(-26)	62	36
I-205 LRT	$27,160,000	5	96	101
Combined LRT	$27,400,000	(-47)	142	95

Source: TriMet, November 2002. Costs are in 2001 dollars at 2020 service levels.

Tax Base Impacts. Each of the alternatives would have some effect on local property tax bases. The most notable impact would result from the removal of private property from the property tax rolls through public acquisition for the project. Most of the displaced businesses and residences would likely relocate or rebuild within the same area, increasing assessed value and property tax revenue elsewhere. Despite a short-term loss in assessed value and property tax revenue caused by displacement, properties near light rail stations would likely experience an increase in value when the project is completed, thereby increasing property tax revenue in the long term. Table 3.1-4 shows the estimated assessed value and property tax impacts of displacements associated with the alternatives, by jurisdiction. Actual property taxes are levied on the net assessed value of the property. The estimated tax impacts would be distributed among the various taxing districts within

Table 3.1-4
Estimate of Assessed Value and Estimated Taxes of Displaced Properties

Alternative	Estimated Assessed Value	Estimated Tax Impacts for all Taxing Districts			
		Portland	Milwaukie	Clackamas Co.	Total
BRT	$4,593,897	N/a	$82,782	N/a	$82,782
Busway	$36,023,397	$486,493	$170,485	$26,861	$683,839
Milwaukie LRT	$23,938,586	$371,429	$91,101	N/a	$462,530
I-205 LRT	$1,897,522	$16,359	N/a	$15,647	$32,006
Combined LRT	$32,534,686	$387,789	$211,809	$15,647	$615,244

Sources: Estimates of Real Market Value, MetroScan and TriMet, compiled by Metro, 2002; Property tax rates, Oregon Department of Revenue, Tables A-2 and H, 2000-2001.
Property tax estimates derived as the median of code area tax rates within each jurisdiction as follow: Portland average $19.67 per thousand; Milwaukie average $18.02 per thousand; Clackamas County $14.68 per thousand.

the areas where the properties would be acquired. The Busway Alternative would displace the highest valued amount of private property, with more than 70% of this estimated value displaced in the City of Portland, about 25% in the City of Milwaukie, and the balance, about 5%, in Clackamas County. Displacements associated with the I-205 LRT Alternative would have the lowest aggregate estimated value because much of the required land is within the I-205 right-of- way, and because displacements associated with the I-205 LRT Alternative would be mostly residences, whereas the other alternatives would displace mostly commercial and industrial uses.

Short-Term Construction-Related Employment and Income Impacts The build alternatives would result in short-term regional income and employment benefits. The short-term income impacts from construction of the new roadway would include:

- Direct added income associated with new construction jobs,
- Indirect added income from jobs created in industries supplying goods and services to the construction firms,
- Induced income resulting from additional purchases made by the households receiving the new direct and indirect income benefits,
- Potential adverse short-term business income impacts related to reduced roadway access and construction noise.

Table 3.1-5 shows the estimated cost of construction of the build alternatives. Costs of construction would range from $42.6 to $428.6 million dollars. Direct, indirect and induced income impacts from construction spending could generate between $27.9 and 285.6 million of added personal income from construction jobs, industries supplying construction materials, and other purchases from new income (as identified above). Regardless of the alternative selected, these income impacts could be expected to dissipate relatively quickly once construction is completed.

Table 3.1-5
Short-Term Construction Impacts by Alternative

Alternative	Construction Costs[2]	Construction Impacts[1] Jobs	Personal Income
BRT	$42,611,700	708	$27,888,400
Busway	$88,629,300	1,476	$58,054,200
Milwaukie LRT	$212,339,400	3,608	$142,374,900
I-205 LRT	$183,701,800	3,087	$121,669,100
Combined LRT	$428,584,400	7,257	$285,652,600

Source: TriMet, September 2002; 1999 IMPLAN data; and Hovee,
Note: BRT = bus rapid transit; LRT = light rail transit
[1] Jobs and personal income impacts include direct, indirect, and induced employment and income generated by construction expenditures.
[2] Construction costs do not include the cost of buying vehicles.

Employment related to construction expenditures would include the direct employment impacts of immediate construction hiring, as well as indirect and induced impacts. Indirect employment impacts would include employment by businesses providing goods and services to the construction firms. Induced impacts would include jobs created as a result of additional purchases made by households as a result of increased income linked to direct or indirect employment impacts. Direct, indirect, and induced job or employment impacts from construction spending would generate between 708 and 7,257 added jobs in the metropolitan region. Regardless of the alternative selected, these impacts would be expected to dissipate relatively quickly once construction is completed.

Established commercial areas in the corridor that could be directly and indirectly affected by construction activities include downtown Milwaukie, McLoughlin Boulevard, the Gateway Area, the Lents Downtown Business District, and the Clackamas Regional Center, which includes Clackamas Town Center, Clackamas Promenade and surrounding retail businesses. Construction of large public works projects can be disruptive and/or supportive of businesses in the vicinity of the construction activities. When construction activities occur in streets or near businesses, access for customers can be disrupted. Construction activity can disrupt direct access to businesses when the construction occurs in front of the business and construction impacts can be indirect when construction is in the vicinity of the business and customers are discouraged from patronizing the businesses because of the construction. Construction activity can also be good for local businesses, such as when construction workers patronize local businesses and when construction related activities utilize local contractors or businesses such as truckers or suppliers. Also, if businesses are displaced due to construction, jobs could be lost. Most businesses that are displaced choose to relocate, and most relocate in the same vicinity. Some however may choose to close their businesses or relocate in other areas of the region.

3.1.2.2 Comparison of Land Use and Development Impacts by Alternative

Accessibility historically has not been a limiting factor for development within the South Corridor. However, the projected growth in employment and households in the South Corridor would:

- Result in deteriorating travel conditions on the regional roadway system;
- Create demand for additional transit service; and
- Create opportunities for high-density development nodes identified in the *Growth Concept* that can be well served by high-capacity transit alternatives.

Tables 3.1-6 and 3.1-7 show existing and projected households, population, employment and vacant lands for areas within ¼ mile of proposed stations by alternative, by segment and by design option.

A. No-Build Alternative

The No-Build Alternative does not include specific transit station locations; consequently, data are not available on existing and projected households, population, and employment served by the No-Build transit improvements. Because the No-Build Alternative includes fewer transit improvements relative to the Build Alternatives, it can be assumed that there would be fewer direct land use and economic consequences. For example the No-Build Alternative would:

- Have fewer displacements for transit improvements than the Build Alternatives.
- Have less short-term employment, long-term employment, income and tax base impacts relative to the Build Alternatives.
- provide less transit support for increased densities in designated mixed-use centers.

The No-Build Alternative includes a minimal level of transit improvements in the South Corridor; consequently, it would be compatible with local comprehensive plans. However, the No-Build Alternative would not provide the level of transit service recommended in local comprehensive plans; therefore, the No-Build Alternative would provide less support for transit-oriented development, particularly in the Milwaukie Town Center and the Clackamas Regional Center.

Table 3.1-6
Households, Population, Employment and Vacant Lands
Within 1/4 Mile of Proposed Stations by Alternative and by Segment

Alternative	Number of Stations	Households			Population			Employment			Vacant Lands (acres)
		2000	2020	Percent Change	2000	2020	Percent Change	2000	2020	Percent Change	
BRT	17	4,298	5,660	32%	9,784	13,260	36%	18,986	26,108	38%	264.7
Portland to Milwaukie	4	625	829	33%	1,287	1,895	47%	4,739	6,212	31%	1.8
Milwaukie to Clackamas	6	1,324	2,004	51%	2,890	4,654	61%	9,271	14,035	51%	150.4
Milwaukie to Oregon City	7	2,349	2,826	20%	5,606	6,711	20%	4,976	5,861	18%	112.5
Busway	20	5,566	7,096	27%	12,427	16,532	33%	23,862	31,897	34%	285.0
Portland to Milwaukie	7	1,893	2,265	20%	3,931	5,167	31%	9,616	12,001	25%	22.2
Milwaukie to Clackamas	6	1,324	2,004	51%	2,890	4,654	61%	9,271	14,035	51%	150.4
Milwaukie to Oregon City	7	2,349	2,826	20%	5,606	6,711	20%	4,976	5,861	18%	112.5
Milwaukie LRT	23	6,384	8,679	36%	13,959	20,099	44%	25,665	35,351	38%	303.9
Portland to Milwaukie	7	1,894	2,265	20%	3,940	5,164	31%	9,801	12,140	24%	24.3
Milwaukie to Clackamas	9	2,141	3,587	68%	4,413	8,224	86%	10,888	17,350	59%	167.1
Milwaukie to Oregon City	7	2,349	2,826	20%	5,606	6,711	20%	4,976	5,861	18%	112.5
I-205 LRT	19	5,860	7,270	24%	13,191	16,948	28%	17,015	21,924	29%	313.0
Portland to Milwaukie	3	625	829	33%	1,287	1,895	47%	4,739	6,212	31%	1.8
Milwaukie to Oregon City	8	2,350	2,841	21%	5,608	6,761	21%	6,297	7,326	16%	115.8
Gateway to Clackamas	8	2,885	3,600	25%	6,295	8,292	32%	5,978	8,386	40%	195.4
Combined LRT	25	7,945	10,289	29%	17,366	23,787	37%	23,694	31,167	32%	352.3
Portland to Milwaukie	7	1,894	2,265	20%	3,940	5,164	31%	9,801	12,140	24%	24.3
Milwaukie to Oregon City	10	3,167	4,424	40%	7,131	10,331	45%	7,915	10,641	34%	132.5
Gateway to Clackamas	8	2,885	3,600	25%	6,295	8,292	32%	5,978	8,386	40%	195.4

Source: Metro, 2002.
Note: There would be no new stations with the No-Build Alternative.
Households, population, and employment figures are based on the design options used for the comparative analysis (see Table 2.2-3).
Vacant land acreage is the total acreage of any parcels that fall within 1/4 mile of the station areas.

Table 3.1-7
Households, Population, and Employment Within 1/4 Mile of Proposed Stations
by Alternative and Design Option

Alternative	Households			Population			Employment		
	2000	2020	Percent Change	2000	2020	Percent Change	2000	2020	Percent Change
BRT (17 BRT stations)	**4,298**	**5,660**	**31.7%**	**9,784**	**13,260**	**35.5%**	**18,986**	**26,108**	**37.5%**
with Johnson Road Park-and-Ride Lot DO	4,463	5,898	32.2%	10,229	13,836	35.3%	19,796	27,110	36.9%
Busway (9 Busway, 11 BRT stations)	**5,566**	**7,096**	**27.5%**	**12,427**	**16,532**	**33.0%**	**23,862**	**31,897**	**33.7%**
with 7th Avenue DO	5,802	7,397	27.5%	12,756	17,206	34.9%	25,124	33,283	32.5%
with West of Brooklyn Yard DO	5,423	6,973	28.6%	12,115	16,257	34.2%	24,399	32,696	34.0%
with Johnson Road Park-and-Ride Lot DO	5,731	7,334	28.0%	12,872	17,108	32.9%	24,673	32,899	33.3%
Milwaukie LRT (10 LRT, 13 BRT stations)	**6,384**	**8,679**	**36.0%**	**13,959**	**20,099**	**44.0%**	**25,665**	**35,351**	**37.7%**
with West of Brooklyn Yard DO	6,201	8,512	37.3%	13,559	19,725	45.5%	25,970	35,905	38.3%
with Tillamook Branch Line DO	6,383	8,664	35.7%	13,957	20,049	43.7%	24,344	33,887	39.2%
with Milwaukie MS TO	5,974	7,923	32.6%	13,193	18,394	39.4%	25,004	33,941	35.7%
with Johnson Road Park-and-RideTO	6,548	8,917	36.2%	14,404	20,675	43.5%	26,475	36,353	37.3%
I-205 LRT (8 LRT, 11 BRT stations)	**5,860**	**7,270**	**24.1%**	**13,191**	**16,948**	**28.5%**	**17,015**	**21,924**	**28.8%**
with North of CTC TO	5,954	7,314	22.8%	13,291	17,021	28.1%	17,944	23,420	30.5%
Combined LRT (18 LRT, 7 BRT stations)	**7,945**	**10,289**	**29.5%**	**17,366**	**23,787**	**37.0%**	**23,694**	**31,167**	**31.5%**
with West of Brooklyn Yard DO	7,763	10,122	30.4%	16,965	23,412	38.0%	23,999	31,721	32.2%
with Tillamook Branch Line DO	7,944	10,274	29.3%	17,364	23,737	36.7%	22,373	29,702	32.8%
with Milwaukie MS TO	7,535	9,534	26.5%	16,600	22,082	33.0%	23,033	29,756	29.2%
with North of CTC TO	8,039	10,333	28.5%	17,466	23,860	36.6%	24,623	32,663	32.7%

Source: Metro, 2002.
Note: There would be no new stations with the No-Build Alternative. LRT = light rail transit; CTC = Clackamas Town Center; MS = Middle School; DO = Design Option; TO = Terminus Option.
Bolded households, population, and employment figures are based on the design options used for the comparative analysis (see Table 2.2-3).

B. Bus Rapid Transit Alternative

Existing (2000) and projected (2020) households, population, and employment within a ¼-mile radius of the 17 BRT stations associated with this Alternative are shown in Tables 3.1-6 and 3.1-7.

As compared with the other build alternatives, the BRT Alternative has the lowest number of households and associated population within ¼ mile of the stations for 2000 and 2020. In terms of employment within ¼ mile of the stations, the BRT Alternative has higher existing and projected employment than the I-205 Alternative, but less employment than the other Build Alternatives (Busway, Milwaukie LRT and Combined LRT). The BRT Alternative includes stations along Highway 224 to serve the Milwaukie industrial area, while the I-205 LRT Alternative does not include BRT service along Highway 224. Approximately 265 acres are identified as vacant within the ¼-mile station areas associated with the BRT Alternative, making it the alternative with the smallest amount of vacant acreage within the ¼-mile station areas. The lower number of households, population, and vacant land associated with the BRT Alternative are directly related to the smaller number of stations. As noted earlier, the BRT Alternative includes 17 stations, while the other build alternatives include from 19 to 25 stations.

The BRT Alternative includes one design option in the Milwaukie to Clackamas Segment. The Linwood Park-and-Ride Lot Design Option would include a 600-space parking structure. The Johnson Road Park-and-Ride Lot Design Option would include a 270-space surface park-and-ride lot. The Linwood Park-and-Ride Lot Design Option would provide more park-and-ride capacity in this segment. While the Johnson Road Park-and-Ride Lot Design Option would provide less parking capacity, it would have slightly higher population and employment (500 to 800 more people and jobs in 2020) within ¼-mile radius than the Linwood Park-and-Ride Lot Design Option.

The BRT Alternative would be compatible with the following local comprehensive plans and policies:

- The Public Transit Policy (6.7) in the *Portland Comprehensive Plan*, which supports reduced travel times on the primary transit network, in the Central City, and in regional and town centers, to achieve reasonable travel times and levels of reliability.

- Policies and objectives in the *Milwaukie Comprehensive Plan* that promote the McLoughlin Corridor as a high priority for transit development and support relocation of the Milwaukie transit center as redevelopment occurs within the downtown area.

- Policies in the *Clackamas County Comprehensive Plan* that emphasize corridor or roadway improvements to increase transit speed, convenience, and comfort; promote park and ride lots, bus shelters, and pedestrian/bicycle connections to transit; and allow signal preemption, exclusive transit lanes, and removal of curbside parking for bus turnouts on transit trunk routes.

- Policies in the *Oregon City Comprehensive Plan (TSP)* support BRT service along McLoughlin Boulevard between CCC, Oregon City, Gladstone, and Milwaukie to connect with MAX.

The BRT Alternative includes stations that serve the inner-southeast employment areas and neighborhoods of Portland. However, the BRT Alternative does not provide accessibility to as many Portland neighborhoods as do the Busway, Milwaukie LRT, and Combined LRT Alternatives. In addition, the BRT Alternative does not serve OMSI or directly serve the Milwaukie Town Center.

The BRT Alternative would add 61 employees over the No-Build Alternative, and an estimated operating cost of $6.9 million annually (in 2001 dollars at year 2020 service levels). The BRT Alternative would displace properties with an aggregate estimated value of just over $4.5 million, resulting in an annual estimated loss of $83,000 in property tax revenue to the various taxing districts in the area, including the City of Milwaukie.

C. Busway Alternative

Existing and projected households, population, and employment within a ¼-mile radius of the 9 fixed guideway stations and 11 BRT stations associated with the Busway Alternative are shown in Tables 3.1-6 and 3.1-7. The Busway Alternative would have more households and population located with ¼ mile of stations than the BRT and I-205 LRT Alternatives, but less than the Milwaukie LRT and Combined LRT Alternatives. Existing and projected employment within ¼ mile of the stations associated with the Busway Alternative would be less than with the Milwaukie LRT Alternative, but higher than the other build alternatives (BRT, I-205 LRT, and Combined LRT).

The Busway Alternative includes stations along Highway 224 to serve the Milwaukie industrial areas, resulting in higher employment totals than the I-205 LRT Alternative, which does not include stations to serve the employment area along Highway 224.

Approximately 285 acres are identified as vacant within ¼-mile radius of the station areas associated with the Busway Alternative. In comparison with the other build alternatives, this is more than the BRT Alternative, but less than the LRT Alternatives. Because the South Corridor is largely developed, particularly in the close-in locations and along the major highway corridors, there is not a large amount of vacant land available anywhere in the Corridor. In addition, there is little variation between the vacant lands associated with any of the alternatives (ranging from a low of 265 acres for the BRT Alternative to a high of 352 acres for the Combined LRT Alternative).

The Busway Alternative includes three major design options. The major land use distinctions between these design options are summarized below:

- The Water Avenue Design Option would include a station that directly serves OMSI and the PCC work force training center. A busway station at this location would provide a convenient transit connection to the Eastbank Esplanade and Spring Water trails.

- The 7th Avenue Design Option would more directly serve employment and housing in the SE Grand Avenue corridor and would have a slightly larger population and employment base within ¼ mile of the busway station than the Water Avenue Design Option. A station at this location would provide for a more convenient transfer to buses on SE Grand Avenue and SE MLK JR Blvd. The 7th Avenue Design Option would not serve OMSI or PCC as well as the Water Avenue Design Option.

- The 17th Avenue Design Option would be located closer to the Brooklyn Neighborhood and have slightly more population and employment within ¼ mile than the West of Brooklyn Yard Design Option. The stations associated with the 17th Avenue Design Option would be located in a more visible location in the street environment, while the West of Brooklyn Yard Design Option stations would be less visible and located behind industrial buildings and adjacent to the rail corridor.

- The distinctions between the Linwood and Johnson Road Park-and-Ride Lot Design Options are described above for the BRT Alternative and are not repeated here.

There are no existing busways in the Portland metropolitan region, and none of the adopted local comprehensive plans expressly address fixed guideways using buses. However, the Busway Alternative would be generally compatible with the local comprehensive plan policies that were described previously for the BRT Alternative.

The station locations associated with the Busway Alternative are similar to the station locations associated with the BRT Alternative, with a few major exceptions. First, the Busway Alternative has four stations between the east end of the Hawthorne Bridge and Holgate Boulevard; the BRT Alternative has two stations in this segment. Second, the Busway Alternative also includes station at Bybee Boulevard and a park-and-ride and station at Tacoma. These stations would provide better transit accessibility for the Sellwood-Moreland and Eastmoreland neighborhoods than the BRT Alternative.

The Busway Alternative would also include segments of fixed guideway to provide separation of buses from congested roadways. It would provide the opportunity for faster travel times relative to the BRT Alternative. Displacements for the Busway guideway in the Portland to Milwaukie Segment would be similar to displacements associated with the Milwaukie LRT Alternative.

In the Milwaukie to Clackamas Segment, the separated Busway would again provide the opportunity for faster travel times relative to the BRT Alternative because of the greater separation from congested roadways. However, the displacement impacts and neighborhood disruption would be greater for the Busway Alternative than the BRT Alternative.

It is unknown whether the Busway stations would support or encourage transit-oriented development. The frequent transit service, permanence, and amenities of the Busway stations could attract higher-density development, similar to the type of development that has occurred around some MAX stations. However, the noise associated with the Busway may make these station areas less attractive for development, when compared with LRT Alternatives that use electric vehicles.

The Busway Alternative would employ 67 more people than the No-Build Alternative, and would have an estimated annual operating cost of $7.9 million (in 2001 dollars at 2020 service levels). The Busway Alternative would displace properties with an aggregate estimated value of just over $36 million in the cities of Portland and Milwaukie, and in Clackamas County, resulting in an annual estimated loss of $680,000 in property tax revenue to the various taxing districts in the area.

D. Milwaukie Light Rail Alternative

Existing and projected households, population, and employment within ¼-mile radius of the stations associated with the Milwaukie LRT Alternative are shown in Tables 3.1-6 and 3.1-7. The Milwaukie LRT Alternative includes 10 light rail stations and 13 BRT stations. Existing and projected households and population for the Milwaukie LRT Alternative are second only to the Combined LRT Alternative, and existing and projected employment for the Milwaukie LRT Alternative is the highest of all build alternatives for the following reasons:

- The Milwaukie LRT Alternative includes BRT stations to serve the employment corridor along Highway 224; the I-205 and Combined LRT Alternatives do not include BRT stations in the Milwaukie to Clackamas Segment.

- The Milwaukie LRT Alternative includes a total of 23 stations, more than the 19 stations associated with the I-205 LRT Alternative and only slightly less than the 25 stations associated with the Combined LRT Alternative.

- The Milwaukie LRT Alternative serves relatively dense urban neighborhoods and employment areas in inner-southeast Portland, while land use densities along the I-205 corridor are lower.

Approximately 304 acres are identified as vacant within the ¼-mile radius of station areas associated with the Milwaukie LRT Alternative. This is slightly less than the vacant land associated with the I-205 Alternative (313 acres) and the Combined LRT Alternative (352 acres). As noted above, the McLoughlin Boulevard corridor is older and more urbanized than the I-205 corridor, and this is reflected in the slightly lower amount of vacant land.

The Milwaukie LRT Alternative includes four design options. The key land use distinctions between the design options are summarized below:

- The 17th Avenue Design Option would be located closer to the Brooklyn neighborhood and would have slightly more population and employment within ¼ mile than the West of Brooklyn Yard Design Option. The stations associated with the 17th Avenue Design Option would be located in a more active and visible public street environment, while the West of Brooklyn Yard Design Option station would less visible and located behind industrial buildings.

- In north Milwaukie, the Southgate and Tillamook Branch Line Design Options would have similar numbers of households and population with ¼ mile of the stations; however, employment numbers are higher by about 1,500 for the Southgate Crossover Design Option because the Tacoma and Southgate Stations would provide more extensive access to jobs in north Milwaukie. The park-and-ride capacity for the Southgate Crossover Design Option is divided into two separate structures (Tacoma and Southgate), with a total capacity of 1,200 parking spaces. For the Tillamook Branch Line Design Option, there is a single parking structure at the Tacoma Station, with a total capacity of 600 parking spaces.

- There are two terminus options in downtown Milwaukie. Because the Lake Road Terminus Option includes an additional station and small park-and-ride lot (275 spaces) in the south downtown area, it would have higher numbers of households, population, and employment with ¼ mile of stations than the Milwaukie Middle School Terminus Option.

- The distinctions between the Linwood and Johnson Road Park-and-Ride Lot Design Options are described in the BRT Alternative and are not repeated here.

The Milwaukie LRT Alternative would be compatible with the following plans and policies:

- The designations in the *Region 2040 Growth Concept.* McLoughlin Boulevard is identified as a planned light rail line with station communities. The station community designations reflect the adopted Land Use Final Order (LUFO) for the full South/North Light Rail Project.

- The *RTP* includes the following project under Light Rail Expansion: “Provide interim bus service along McLoughlin Boulevard and Highway 224 from Clackamas Regional Center to the Portland Central City until light rail service can be provided in this corridor.”

- The Public Transit Policy (6.7) in the *Portland Comprehensive Plan,* which supports reduced travel times on the primary transit network, in the Central City, and in regional and town centers, to achieve reasonable travel times and levels of reliability.

- Policies and objectives in the *Milwaukie Comprehensive Plan* that promote the McLoughlin Corridor as a high priority for transit development.

- Objectives in the *Milwaukie Comprehensive Plan* that support relocation of the Milwaukie Transit Center as redevelopment occurs within the downtown area. The Southgate Crossover Design Option would be a larger site in a location that would better integrate the transit center, park-and-ride lot, and light rail station with the downtown area than would the Milwaukie Middle School Terminus Option.

- The Lake Road Terminus Option includes an additional LRT station and small parking structure at the south end of downtown Milwaukie. The Lake Road Terminus Option provides more extensive transit accessibility to households and jobs than the Milwaukie Middle School Terminus Option. The Lake Road Station and park-and-ride structure also could help facilitate mixed-use development consistent with the *Milwaukie Downtown Plan* and possibly provide shared-use parking opportunities for the downtown area.

- The *Clackamas County Comprehensive Plan* transit policy that emphasizes corridor or roadway improvements to increase transit speed, convenience and comfort.

- The *Clackamas County Comprehensive Plan* transit policy that states the county will work with federal, state, and regional agencies to implement LRT in the I-205, the downtown Portland to Milwaukie, and the Milwaukie to Clackamas segments.

The Milwaukie LRT Alternative includes BRT improvements and service between the Milwaukie Town Center and the Clackamas Regional Center, and between the Milwaukie Town Center and the Oregon City Regional Center. BRT service in these segments would also be compatible with local comprehensive plans and policies, as summarized in the discussion of the BRT Alternative.

Since the LUFO for the South/North LRT Project was adopted, The City of Milwaukie has requested reclassification from a Regional Center to a Town Center. The *Growth Concept* and *RTP* identify LRT as the best public transportation mode to serve and connect the Central City and Regional Centers. Regional bus is identified as the best public transportation mode to serve the Town Centers. The Milwaukie LRT Alternative provides a LRT connection of the Portland Central City and the Milwaukie Town Center. The Clackamas and Oregon City Regional Centers would not be connected to the Portland Central City with LRT under the Milwaukie LRT Alternative.

The station locations associated with the Milwaukie LRT Alternative are similar to the station locations associated with the Busway Alternative in the Portland to Milwaukie Segment, with a few key differences. First, the Milwaukie LRT Alternative includes extension of LRT into the south end of downtown Portland with a new LRT station at SW Main Street. This station would provide improved transit accessibility to the high-density cluster of government buildings near SW Main Street. However, this new segment of LRT would be located off the main transit spine along SW 5th and 6th Avenues.

Similar to the Busway Alternative, the Milwaukie LRT Alternative includes station locations to serve OMSI and neighborhoods at Clinton, Brooklyn, Sellwood, and Eastmoreland. However, the Milwaukie LRT Alternative extends the separate right-of-way and includes additional stations in the downtown area of Milwaukie. This feature would provide the opportunity for faster travel times as compared to the BRT and Busway Alternatives because of the greater level of separation from congested roadways. The displacement impacts and neighborhood disruption would be similar for the Milwaukie LRT and Busway Alternatives. The displacement and neighborhood disruption would be less severe for the BRT Alternative because improvements would generally be located within existing public right-of-way.

The LRT service, permanence, and amenities associated with the Milwaukie LRT Alternative could attract higher-density, transit-oriented development at particular locations such as the OMSI station, the North Milwaukie stations, and the downtown Milwaukie stations. The Brooklyn Yard station areas are largely designated for industrial uses, and the Bybee station area is planned for park/open space use. New mixed-use development is less likely in these station areas.

The Milwaukie LRT Alternative would add 36 employees over the No-Build Alternative, and have an estimated annual operating cost of $7 million (in 2001 dollars at 2020 service levels). The Alternative would displace properties with an aggregate estimated value of just under $24 million in the cities of Portland and Milwaukie, resulting in an estimated annual loss of $460,000 in property tax revenue to the various taxing districts.

E. I-205 Light Rail Alternative

Existing and projected households, population, and employment within ¼-mile radius of the stations associated with this Alternative are shown in Tables 3.1-6 and 3.1-7. The I-205 LRT Alternative includes 8 LRT stations and 11 BRT stations. When compared to the other build alternatives, the I-205 LRT Alternative has the lowest employment and fewer households and less population within ¼ mile of the stations than most of the other build alternatives for the following reasons:

- The I-205 and Combined LRT Alternatives would not include BRT stations to serve the employment corridor along Highway 224; all other build alternatives do.
- The I-205 LRT Alternative would have a total of 19 stations. Only the BRT Alternative has fewer (17).
- The I-205 LRT Alternative stations would generally be within the freeway right-of-way; resulting in less land within ¼ mile of the stations being available for residential or employment uses.

Approximately 313 acres have been identified as vacant within ¼-mile of the station areas associated with the I-205 LRT Alternative. This is less than with the Combined LRT Alternative (352 acres), but higher than all other build alternatives. The I-205 corridor is generally less intensively developed than the McLoughlin Boulevard corridor.

The I-205 LRT Alternative includes one terminus option. The key land use distinctions between the East of and North of CTC Transit Center Terminus Options are summarized below:

- The North of CTC Terminus Option would serve slightly more households, population, and employment within ¼ mile of the stations than the East of CTC Design Option. The North of CTC station would be closer to the high-density residential area located north of Monterey Avenue and would also be within ¼ mile of the regional mall and some employment along SE 82nd Avenue.

- The East of CTC Terminus Option would displace a commercial building close to I-205. However, this Terminus Option would include a park-and-ride structure and could reduce potential parking impacts at the regional mall. The East of CTC Terminus Option would be configured for potential long-term extension of LRT to serve housing and employment areas south of Sunnyside Road and potentially the Oregon City Regional Center.

The I-205 LRT Alternative would be compatible with the following plans and policies:

- The design type designations in the *2040 Growth Concept.* This alternative would provide a new light rail connection between the Gateway and Clackamas Regional Centers, and leverage existing light rail lines to provide additional connections to the Portland Central City and other regional centers to the east and west (Gresham, Beaverton and Hillsboro).

- The policy emphasis of the *RTP.* While the *RTP* identifies the I-205 corridor for rapid bus service, it also notes that LRT is the best public transportation mode to serve the designated central city and regional center land use components of the *Growth Concept.*

- The City of Portland's *Outer Southeast Community Plan.* The Vision Plan illustrates a proposed high-capacity transit line in the I-205 corridor between the Gateway and Clackamas Town Centers. The *Outer Southeast Plan* has been implemented with higher density zoning along transit corridors and near commercial services.

- The *Clackamas County Comprehensive Plan* transit policy that states the county will work with federal, state, and regional agencies to implement LRT in the I-205, the downtown Portland to Milwaukie, and the Milwaukie to Clackamas Town Center corridors.

The I-205 LRT Alternative includes BRT improvements and service along SE McLoughlin Boulevard in the Portland to Milwaukie and Milwaukie to Oregon City Segments. BRT service in these segments would also be compatible with local comprehensive plans and policies, as summarized in the discussion of the BRT Alternative.

The I-205 LRT Alternative includes new stations to serve key activity centers such as Portland Adventist Hospital and CTC. The I-205 LRT Alternative would provide expanded transit service and stations in three designated urban renewal areas (Gateway Regional Center, Lents Town Center and Clackamas Regional Center). All three URAs outline plans for public investments in infrastructure and amenities to attract and support private investment and more intensive development.

The service, permanence, and amenities of the I-205 LRT stations could attract higher-density, transit-oriented development at locations such as the SE Main Street Station (near Portland Adventist), the Foster Road Station (serving Lents Town Center), and the Clackamas Terminus Station (serving the regional mall and nearby office and residential development). Existing development patterns around many of the planned stations are relatively low density and auto-oriented.

There are a few key land use distinctions between the Milwaukie and I-205 LRT Alternatives. The Milwaukie LRT Alternative would bring light rail service to a more intensively developed urban environment. This would result in more displacement impacts when compared with the I-205 LRT Alternative. The Milwaukie LRT Alternative and stations would be more integrated with the surface street system. This could provide an opportunity for station-oriented development, but would also result in greater disruption of the local street system with at-grade crossings than would the I-205 LRT Alternative. The Milwaukie LRT Alternative would be focused on downtown Portland as the transit hub, while the I-205 LRT Alternative would be focused on Gateway as the transit hub. The I-205 LRT Alternative would parallel the freeway and would be grade-separated from major east-west streets. This would provide an opportunity for transit operating speeds, similar to segments where the existing MAX line parallels the Banfield freeway. The I-205 LRT Alternative would add 101 employees over the No-Build Alternative, and would have an annual estimated operating cost of \$11.4 million (in 2001 dollars at 2020 service levels). The I-205 LRT Alternative would displace properties with an aggregate estimated value of just under \$2 million in the City of Portland and Clackamas County, resulting in an annual estimated loss of \$32,000 in property tax revenue to the various taxing districts.

F. Combined Light Rail Alternative

The Combined LRT Alternative includes the LRT components of the Milwaukie and I-205 LRT Alternatives, including BRT service between Milwaukie and Oregon City. The Combined LRT Alternative, however, does not include BRT service along Highway 224 between Milwaukie and Clackamas. The Combined LRT Alternative has 18 LRT stations and 7 BRT stations, for a total of 25 stations (the most of all the build alternatives).

Reflecting the larger number of stations, the Combined LRT Alternative also would serve the highest number of households and population (existing and projected) within ¼ mile of the stations. Employment within proposed station areas associated with the Combined LRT Alternative would be lower than employment associated with the Milwaukie LRT Alternative. The projected employment would be lower for this alternative because it does not include stations to serve the employment corridor along Highway 224, while the Milwaukie LRT Alternative does. Employment associated with the Combined LRT Alternative is similar to employment associated with the Busway Alternative.

Approximately 352 acres are identified as vacant within ¼ mile of the stations associated with the Combined LRT Alternative; the highest of all build alternatives. The Combined LRT Alternative encompasses vacant land in both the McLoughlin and I-205 corridors.

The Combined LRT Alternative includes two Design Options and one Terminus Option that were described for the Milwaukie LRT Alternative (West of Brooklyn Yard, North Milwaukie, and Milwaukie Terminus Option). The Combined LRT Alternative also includes the North of CTC and East of CTC Terminus Options that were described for the I-205 LRT Alternative. The discussion of the main land use distinctions between the options is not repeated here.

The plan compatibility discussions for the Milwaukie LRT Alternative and the I-205 LRT Alternative are also relevant to the Combined LRT Alternative. The major features of the Combined LRT Alternative are summarized as follows:

- The Combined LRT Alternative would connect the largest number of mixed-use centers designated in the *Growth Concept* of all the build alternatives, including the Portland Central City to Milwaukie Town Center and the Gateway Regional Center to Lents Town Center and Clackamas Regional Center.

- The Combined LRT Alternative would have the longest separated guideway (13.2 miles).

- The Combined LRT Alternative would have the largest number of stations next to a separated guideway (18).

- The Combined LRT Alternative would have the highest number of households and population within ¼ mile of the stations, and would also encompass the most vacant land within ¼-mile radius as compared to the other build alternatives.

- The Combined LRT Alternative would provide the most aggressive implementation of regional and local plans for transit and would serve the greatest number of activity centers, but would also result in the highest displacement impacts and costs relative to the other build alternatives.

The Combined LRT Alternative would add 95 long-term employees over the No-Build Alternative, and would have an annual estimated operating cost of $11.6 million (in 2001 dollars at 2020 service levels). The Combined LRT Alternative would displace properties with an aggregate estimated value of just over $32.5 million in the Cities of Portland and Milwaukie and Clackamas County, resulting in an estimated annual loss of $615,000 in property tax revenue to the taxing districts.

G. Operations and Maintenance Facilities

BRT and Busway Alternatives

The BRT and Busway Alternatives would increase the 2020 bus fleet requirements by 30 to 50 buses compared with the No-Build Alternative. The operations and maintenance capacity for these additional buses can be accommodated with TriMet's Powell Bus Maintenance Facility (Powell facility). The Powell facility is located at the southeast quadrant of the Powell Boulevard and I-205 interchange. The initial facility was built in 1976. The site encompasses about 16 acres and is zoned for General Industrial use (IG2). The Federal Transit Administration (FTA) has approved a Categorical Exclusion (signed in 2000) to expand the capacity of the Powell facility from 187 buses to a total of 250 to 275 buses. The expansion includes storm water treatment, bus parking, new fuel and wash buildings, additional employee parking, and expansion and renovation of the maintenance building. Construction of the Powell expansion is expected to be complete by 2004. The expanded Powell facility has adequate capacity to accommodate the BRT and Busway Alternatives. The facility is compatible with City of Portland plans and zoning and local permits have been approved.

Light Rail Alternatives

The LRT Alternatives (Milwaukie, I-205, and Combined) would require expansion of the existing LRT operations and maintenance facility at Ruby Junction in the City of Gresham. The facility is located south of SE Burnside Road and east of SE 199th Avenue. The site is zoned for Heavy Industrial use. The original Ruby Junction facility had capacity for about 48 LRVs. In 2001, the City of Gresham approved a land use application for expansion of the facility to accommodate 17 to 24 additional LRVs for the Interstate MAX project. This expansion is almost complete.

Further expansion of the Ruby Junction facility would be required to accommodate additional LRVs associated with the I-205 and Combined LRT Alternatives (33 to 46 LRVs depending on the LRT Alternative chosen). The expansion would include about 10 additional acres and would require the vacation of a dead end street, SE 199th Avenue. Current land uses in the expansion area include heavy industrial uses such as a car storage/wrecking yard site, a paving company, and an auto body site. Expansion of the Ruby Junction facility would be compatible with the Heavy Industrial zoning and surrounding industrial uses. However, City of Gresham land use approvals would be required for the expansion.

3.1.3 Cumulative Impacts

The build alternatives would provide varying types and levels of transit service to support regional and local land use plans. The BRT Alternative would have the fewest direct land use impacts relative to the displacement of housing, business, or access. The BRT Alternative is also likely to have the least indirect impact on shaping development patterns or spurring mixed-use development. The Busway and LRT Alternatives would have greater direct land use impacts associated with displacement of housing and businesses as well as access and street crossings; however, these alternatives offer greater potential for indirect impacts. Portland's experience has demonstrated that new, concentrated, mixed-use development is more likely to occur in response to fixed lines and stations than in response to bus stop locations.

The build alternatives would all support regional and local comprehensive plans. These plans have targeted new growth and development to a number of activity centers such as the Portland Central City, the Gateway and Clackamas Regional Centers, and the Milwaukie and Lents Town Centers. These centers are intended to be the focus of mixed-use commercial and residential areas with pedestrian-oriented development. In addition, regional and local plans call for targeting public investments, including public transportation investments, to support the designated mixed-use centers. While the build alternatives would be only one of several tools used to implement these plans, it is unlikely that the plans could be fully implemented without public transit improvements.

In comparison, it is unlikely that the No-Build Alternative would lead to changes in land uses or development in the Corridor consistent with regional and local plans. The No-Build Alternative could indirectly increase pressure to expand the UGB because the designated regional centers and town centers would not have the transit capacity to accommodate anticipated higher-density development. State law requires Metro to provide land within the UGB to meet 20-year projected needs. If land within the UGB cannot accommodate as much growth as planned or if it occurs at a much lower density than planned, this could result in pressure to expand the UGB to provide additional land for development.

The build alternatives could have positive and negative indirect impacts on neighborhoods. The improved transit accessibility could result in increased land values in proximity to the stations, particularly for the LRT Alternatives. The higher land values could lead to "gentrification" of existing neighborhoods as lower value improvements are replaced by higher value improvements. New development could provide expanded opportunities for housing and employment in the station areas; however, it could also contribute to displacement of affordable housing.

The cumulative land use impacts of the build alternatives are most directly related to regional and local plans to target new development to the designated centers, as described above. In addition, the Gateway Regional Center, Lents Town Center, and Clackamas Regional Center are all designated as urban renewal districts. Public investment and improvements are planned to support new private investment in the urban renewal districts. The I-205 and Combined LRT Alternatives, in particular, provide the opportunity to tie into the urban renewal plans and leverage the transit improvements.

In the I-205 corridor, other cumulative land use impacts would relate to pending decisions on the size and location of the Regional UGB. The Pleasant Valley area east of I-205 is now included in the UGB, and the Damascus area is a high-priority area to bring into the UGB by the end of 2002. Urban development of these new areas (potentially in the range of 10,000 acres) would have major implications for the regional transportation system, and the I-205 corridor in particular. The I-205 and Combined LRT Alternatives would not directly serve the Pleasant Valley and Damascus areas. However, the availability of high-capacity transit service in the I-205 corridor would provide important options for travel and mobility in this eastern portion of the region.

In the McLoughlin Boulevard Corridor, the build alternatives could have cumulative impacts related to planning for the CEID and the North Milwaukie Industrial District. The Portland City Council is considering strategies to increase development densities in the CEID while retaining the industrial sanctuary. The area around OMSI is targeted for more intensive, mixed-use development and the alternatives that include a station at OMSI would help support this transition. The City of Milwaukie is also pursuing plans for more intensive development in the North Milwaukie Industrial District. This area is in transition and the Milwaukie and Combined LRT Alternatives would provide the transit investment to support redevelopment to higher-density employment uses. In addition, the LRT alternatives that extend into downtown Milwaukie would provide a tool to leverage the planned transition to more intensive uses in the downtown area.

3.1.4 Mitigation Measures

Mitigation of impacts to businesses during construction (short-term impacts) could be accomplished through a number of activities. On previous projects, TriMet has worked extensively with the businesses in the vicinity of the project, such as along Interstate Avenue during the Interstate MAX construction process. Some examples of the mitigation that could be done includes:

- Provide signage indicating access directions during construction.
- Provide signage indicating that businesses are open during construction.
- Provide temporary parking for businesses that loose parking due to construction.
- Provide business promotional information during the construction process.
- Utilize area businesses and contractors for construction activities.
- Purchase construction materials and services from local businesses.

The process of planning for the South Corridor Project has included, and will continue to include, steps to avoid or minimize impacts of all types. Displacements have been minimized through the continued refinement of the alternatives and design options. To the extent feasible and practicable, the build alternatives use or follow existing public road and railroad rights-of-way to minimize displacement impacts. Locations for related facilities such as stations, park-and-ride lots and maintenance facilities have been selected to balance displacement and other adverse impacts with the positive benefits of high-capacity transit proximity and service. In some instances, there may be opportunities for minor design modifications during preliminary and final engineering to avoid or reduce displacement impacts. Where displacements are unavoidable, relocation assistance will be available to assist displaced residences and businesses.

Loss of parking or change of access can have adverse economic impacts on business. If an existing access must be removed and cannot be relocated or reconfigured to provide adequate and safe access, the entire business use is assumed to be displaced. Even if alternative access is available, it may not be as convenient as the existing access and could result in some loss of business. Where existing parking demand could be expected to exceed the available parking spaces remaining after development of the South Corridor Project, replacement parking may need to be provided. In many instances, existing off-street parking lots could be configured to provide additional spaces. In some instances, structured park-and-ride lots might replace lost parking spaces.

3.2 Land Acquisition, Displacements, and Relocation of Existing Uses

This section summarizes displacements that would result from the South Corridor Project alternatives and design options. Displacement impacts are inherently both short and long term impacts because, though they occur during construction, they can permanently affect a community. A more detailed discussion of displacements is included in the *South Corridor Project Social, Neighborhood, and Displacement Impacts Results Report* (Metro, November 2002).

3.2.1 Affected Environment

The affected environment for the communities within the corridor can be found in Section 3.3.1.

3.2.2 Environmental Consequences

3.2.2.1 Corridor Level Comparison of Alternatives

Table 3.2-1 is a summary of the total displacements associated with each alternative as well as the range of displacement impacts associated with the design options. The Combined LRT and the Busway Alternatives would each cause 53 displacements, the most total displacements. The Busway Alternative would displace the most businesses, while most of the displacements associated with the Combined LRT Alternative would be residential. Displacements associated with the Busway and

Table 3.2-1
Summary of Displacements[1], by Alternative [2]

Alternative	Business	Public/ Institutional	Residential	Total	Range [3]
Bus Rapid Transit	6	0	0	6	4-6
Busway	51	1	1	53	39-53
Milwaukie Light Rail	41	1	1	43	33-43
I-205 Light Rail	3	0	13	16	--
Combined Light Rail	38	1	14	53	45-53

Source: Metro, 2002
[1] The number of reported displacements is based upon residential and business units, and includes displacements associated with park-and-ride facilities not included in the No-Build Alternative. It does not include the displacement of vacant buildings or accessory units.
[2] The set of Design Options used for comparison of the Alternatives are defined in Table 2.2-3.
[3] Total displacement range depending on selected design option.

Milwaukie LRT alternatives are concentrated in the industrial and commercial areas of inner Southeast Portland. The I-205 LRT Alternative and the Combined LRT Alternative would displace the most homes.

The BRT Alternative would cause the fewest displacements because of the low level of capital improvements associated with that alternative. Most of the displacement impacts would result from construction of park-and-ride lots. The I-205 LRT Alternative would also cause relatively few displacements. The displacement impacts are further discussed by segment in Section 3.2.1.2.

3.2.2.2 Segment Level Comparison of Displacements for Alternatives and Design Options

This section is a summary of the displacements associated with each alternative and design option by segment. In Table 3.2-2, the number of displacements associated with the alternative is listed first for each segment and is followed by the number of displacements associated with each design option. The following discussion describes the differences between the alternatives by segment.

A. Portland to Milwaukie Segment

BRT, Busway and two LRT Alternatives are under consideration in this segment. The BRT improvements would be constructed with the I-205 Alternative. The alternatives and design options in the Portland to Milwaukie Segment could cause a range of displacement impacts. BRT Alternative would not cause any displacements while the Busway Alternative could cause as many as 46 displacements. Nearly all of the displacements (between 33 and 44) would affect businesses, most of which would be concentrated in the CEID and the industrial portions of the Brooklyn neighborhood. The At-Grade Clinton Design Option would displace two more businesses than the Above-Grade Clinton Design Option, including a large industrial employer. Both the 17th Avenue Design Option (13 displacements) and the West of Brooklyn Yards Design Option (4 displacements) would displace large employers in the Brooklyn neighborhood.

The Milwaukie and Combined LRT Alternatives would have the same displacement impacts in this segment. The Milwaukie LRT Alternative or the Combined LRT Alternative could result in between 29 and 37 displacements. The 17th Avenue Design Option would displace four more businesses than the West of Brooklyn Yard Design Option, but some of the displacement impacts along 17th Avenue could likely be mitigated to leave businesses in place. Either option could displace major employers in the Brooklyn neighborhood. The Lake Road Terminus Option with the Lake Road Park-and-Ride lot would displace three more businesses than the Milwaukie Middle School Terminus Option. Two of the displacements would be associated with the Lake Road Park-and-Ride lot.

B. Milwaukie to Clackamas Segment

In this segment, transit improvements would be constructed with the BRT, Busway, and Milwaukie LRT Alternatives. BRT improvements in this segment are associated with the Milwaukie LRT Alternative. The proposed improvements would include multiple design options, each with different impacts. Three to five displacements would occur with the Busway Alternative and two to four displacements would occur with the BRT Alternative. The Linwood Park-and-Ride Design Option for the BRT, Busway, or Milwaukie LRT Alternative would result in the displacement of truck transfer facilities for two businesses. The Johnson Road Park-and-Ride Lot Design Option would not

Table 3.2-2
Displacements, by Alternative, Segment and Design Option

	Business	Public/Institutional	Residential	Total
BUS RAPID TRANSIT ALTERNATIVE				
Portland to Milwaukie Segment*				
Milwaukie to Clackamas Segment	**4**			**4**
Area common to all Design Options*	2			2
Linwood Park-and-Ride Design Option*	2			2
Johnson Road Park-and-Ride Design Option				
Milwaukie to Oregon City Segment*	**2**			**2**
BUSWAY ALTERNATIVE				
Portland to Milwaukie Segment	**44**	**1**	**1**	**46**
Area common to all Design Options*	29		1	30
Water Avenue Design Option*	1			1
7th Avenue Design Option				
At-Grade Clinton Design Option*	2			2
Above-Grade Clinton Design Option				
17th Avenue Design Option*	12	1		13
West of Brooklyn Yards Design Option	4			4
Milwaukie to Clackamas Segment	**5**			**5**
Area common to all Design Options*	3			3
Linwood Park-and-Ride Design Option*	2			2
Johnson Road Park-and-Ride Design Option				
Milwaukie to Oregon City Segment*	**2**			**2**
MILWAUKIE LIGHT RAIL ALTERNATIVE				
Milwaukie to Portland Segment	**35**	**1**	**1**	**37**
Area common to all Design Options*	23		1	24
17th Avenue Design Option*	8	1		9
West of Brooklyn Yards Design Option	4			4
Southgate Crossover Design Option*	1			1
Tillamook Branch Line Design Option		1		1
Lake Road Terminus Option*	3			3
Milwaukie Middle School Terminus Option				
Milwaukie to Clackamas Segment	**4**			**4**
Area common to all Design Options*	2			2
Linwood Park-and-Ride Design Option*	2			2
Johnson Road Park-and-Ride Design Option				
Milwaukie to Oregon City Segment*	**2**			**2**
I-205 LIGHT RAIL ALTERNATIVE				
Clackamas to Gateway Segment	**1**		**13**	**14**
Area common to all Design Options*	1		13	14
East of CTC Terminus Option*				
North of CTC Terminus Option				
Milwaukie to Portland Segment*				
Milwaukie to Oregon City Segment*	2			2
COMBINED LIGHT RAIL ALTERNATIVE				
Clackamas to Gateway Segment	**1**		**13**	**14**
Area common to all Design Options*	1		13	14
East of CTC Terminus Option*				
North of CTC Terminus Option				
Portland to Milwaukie Segment	**35**	**1**	**1**	**37**
Area common to all Design Options*	23		1	24
17th Avenue Design Option*	8	1		9
West of Brooklyn Yards Design Option	4			4
Southgate Crossover Design Option	1			1
Tillamook Branch Line Design Option		1		1
Lake Road Terminus Option*	3			3
Milwaukie Middle School Terminus Option				
Milwaukie to Oregon City Segment*	**2**			**2**

Source: Metro, 2002
Notes: The asterisk identifies elements of the base options; DO= Design Option; CTC= Clackamas Town Center; The Roethe Road and Southgate Park-and-Ride lots are included in the no-build alternative. The associated displacements are addressed in Section 3.3.3, Cumulative Impacts.

impact this facility and would result in two fewer displacements for the Milwaukie LRT, Busway or the BRT Alternative.

C. Milwaukie to Oregon City Segment

BRT improvements are the only alternative under study in this segment, and are included in the Busway Alternative, and the Milwaukie, I-205, and Combined LRT Alternatives. There are no design options in this segment. The Park Avenue Park-and-Ride Lot would result in the only two displacements in this segment: a car lot and a restaurant in the Oak Lodge neighborhood.

D. Gateway to Clackamas Segment

The I-205 and Combined LRT Alternatives are under consideration in this segment. Both alternatives would result in the same improvements in the segment. There are two terminus options: the East of the CTC Terminus Option and the North of the CTC Terminus Option. Both the I-205 LRT Alternative and the Combined LRT Alternative would result in 14 displacements in the Gateway to Clackamas Segment: 1 retail business, 12 single-family residences, and 1 unit of an apartment building.

3.2.2.3 Cumulative Impacts

Cumulative impacts are addressed in Section 3.3.2.4.

3.2.3 Potential Mitigation Measures

In some circumstances, the design or location of the proposed transit improvements could be modified during Preliminary Engineering to avoid or reduce displacements. Some displacements could be reduced by taking only a portion of a property or structure, or by modifying the remaining property or structure to provide for continued occupancy. Where displacements would be unavoidable, relocation assistance would be available to assist displaced residents and businesses. The project would provide compensation to property owners based on fair market value of the properties in accordance with state and federal laws[1] on property acquisition and relocation.

3.3 Neighborhoods and Communities

3.3.1 Affected Environment

The proposed South Corridor Project alternatives would pass through up to 23 neighborhoods (nine in the City of Portland, six in the City of Milwaukie, and six in unincorporated Clackamas County) as well as neighborhoods in Oregon City and the City of Gladstone. This section provides a summary of the demographics, character, and community facilities found in these neighborhoods. The locations and boundaries of each neighborhood adjacent to one or more of the proposed alternatives are shown in Figure 3.3-1.

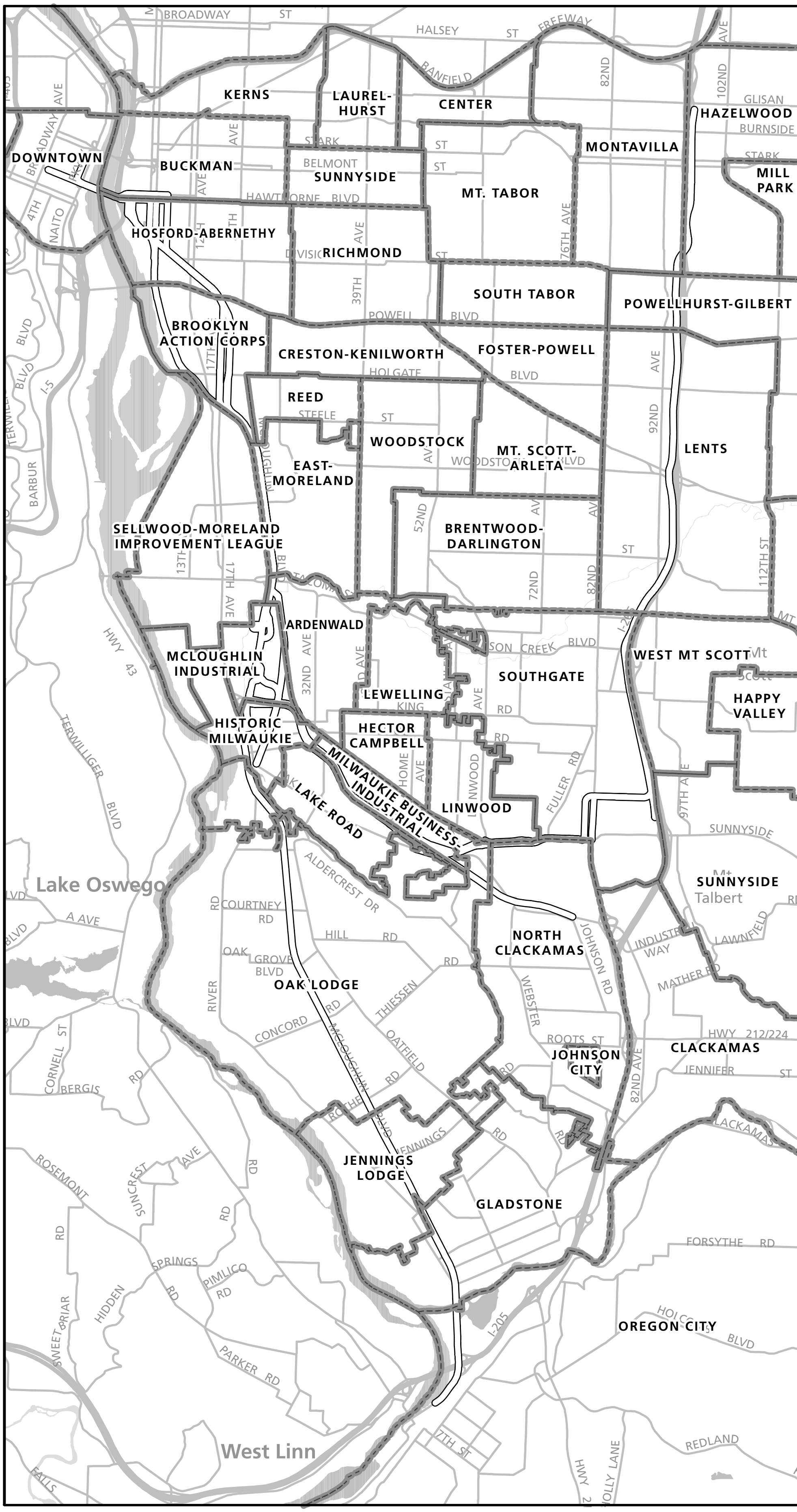
Socioeconomic information for each neighborhood is provided in Table 3.3-1 and illustrated in Figures 3.3-2, 3.3-3 and 3.3-4. The socioeconomic characteristics of each neighborhood have been

[1] Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601) and associated regulations contained in 40 CFR part 24.

South Corridor Project

Neighborhood Boundaries

Figure 3.3-1



Neighborhoods

Alignment Alternatives

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

0 1 2
Miles

December 2002

Table 3.3-1
Summary of the Socioeconomic Profile of the Neighborhoods in the South Corridor

Neighborhood	House-holds	Popula-tion	Employ-ment	% Minority[1]	% Hispanic[2]	% Poverty[3]	% Elderly[4]	% Renters[5]	Median home value[6]
Ardenwald	1,861	4,455	1,860	8.1%	3.8%	13.9%	12.9%	40.6%	$137,320
Brooklyn	1,690	3,595	9,282	14.8%	5.7%	11.9%	5.5%	63.2%	$140,045
Downtown	6,488	10,225	106,639	23.7%	4.5%	32.1%	15.3%	91.9%	$695,575
Eastmoreland	1,642	5,044	1,763	7.2%	2.6%	5.6%	11.5%	10.8%	$266,900
Gladstone	4,237	11,391	4,783	9.5%	6.1%	8.6%	11.6%	35.4%	$158,980
Hazelwood	7,691	20,021	2,441	22.7%	8.6%	12.5%	16.7%	45.2%	$137,920
Historic Milwaukie	1,089	1,941	2,720	9.8%	5.8%	5.7%	16.9%	77.0%	$149,640
Hosford-Abernethy	3436	7,229	9,111	15.4%	3.8%	12.9%	8.8%	51.4%	$177,460
Island Station	417	873	51	13.3%	3.1%	4.6%	7.6%	68.8%	$150,390
Jennings Lodge	1,993	5,003	2,052	7.8%	6.4%	10.8%	13.4%	40.8%	$157,690
Lake Road	1,240	2,815	739	8.2%	2.4%	6.5%	16.5%	33.0%	$169,875
Lents	6,676	18,358	4,900	23.5%	10.4%	15.0%	10.6%	42.7%	$109,400
Lewelling	1,493	3,770	92	8.8%	2.8%	6.2%	16.1%	31.3%	$143,460
Linwood	1,555	4,177	562	10.7%	5.5%	5.3%	12.5%	27.3%	$154,390
McLoughlin Industrial	23	158	2,859	13.3%	3.2%	n/a[7]	1.3%	78.3%	$126,210
Milwaukie Business Industrial	15	51	4,699	23.5%	15.7%	4.3%	19.6%	73.3%	$168,480
Montavilla	6,109	16,193	5,825	25.0%	6.8%	10.4%	11.3%	39.8%	$120,100
North Clackamas	3,079	8,171	5,087	7.2%	2.6%	6.0%	13.1%	17.3%	$266,900
Oak Lodge	9,466	22,814	9,428	8.7%	6.3%	6.1%	17.9%	33.7%	$167,725
Oregon City	9,162	24,951	16,014	7.6%	5.1%	8.4%	9.6%	41.4%	$157,950
Powellhurst-Gilbert	6,294	17,973	3,956	22.0%	8.6%	13.7%	10.3%	42.3%	$126,640
Sellwood-Moreland	5211	10617	3951	9.5%	3.0%	10.8%	13.1%	47.2%	$159,450
Southgate	6,089	14,599	15,425	17.6%	11.8%	10.4%	11.6%	59.9%	$126,995
Sunnyside	3,500	7,203	3763	11.3%	3.7%	8.2%	11.7%	64.3%	$147,470
West Mt. Scott	1,048	2,761	321	20.5%	3.4%	2.5%	11.1%	33.0%	$207,430
South Corridor	196,842	475,477	431,575	13.9%	5.7%	11.3%	12.6 %	43.17 %	not available
Tri-County area	569,461	1,444,219	1,014,401	17.1%	8.0%	8.7%	10.4%	27.1%	not available
Clackamas Co.	128,201	338391	180635	8.7%	4.9%	6.1%	11.1%	28.9%	$160,889
Multnomah Co.	272,098	660,486	555,161	20.8%	7.5%	11.4%	11.1%	43.1%	$116,711

Source: *Social and Neighborhood Impacts Results Report* (Metro, November 2002)

Note: The information in this table is illustrated in Figures 3.3-1 Neighborhood boundaries, 3.3-2 Percentage of households with income below the federally defined poverty level by census tract (with neighborhood overlays), 3.3-3 Percentage of minority residents by census tract (with neighborhood overlays), and 3.3-4 Percentage of Hispanic or Latino residents by census tract (with neighborhood overlays).

[1] Minority- Percentage of residents whose race is not white alone.
[2] Hispanic- Percentage of residents of Hispanic or Latino origin.
[3] Pov- Percentage of households with incomes below the Federally specified poverty level.
[4] Elderly- Percentage of residents who are age 65 or older (elderly).
[5] Renter- Percentage of occupied housing units occupied by renters.
[6] Median Home Value- Median assessed single-family home value.
[7] The number of households with poverty-level incomes was not available for this neighborhood due to the geographic level (block group rather than block) at which the results were released by the US Census Bureau.

compared to data for the entire Tri-County area[2] and significant differences from regional characteristics are noted in this summary. Housing tenure, race/ethnicity[3], elderly[4] and population (households and individuals) data for each neighborhood are based on block-level data from the 2000 US Census. "The federal government considers race and Hispanic origin to be two separate and distinct concepts" and collects census data to reflect both race and ethnicity.[5] Under this definition, a person can be a member of any racial group while being of Hispanic origin. Poverty statistics for

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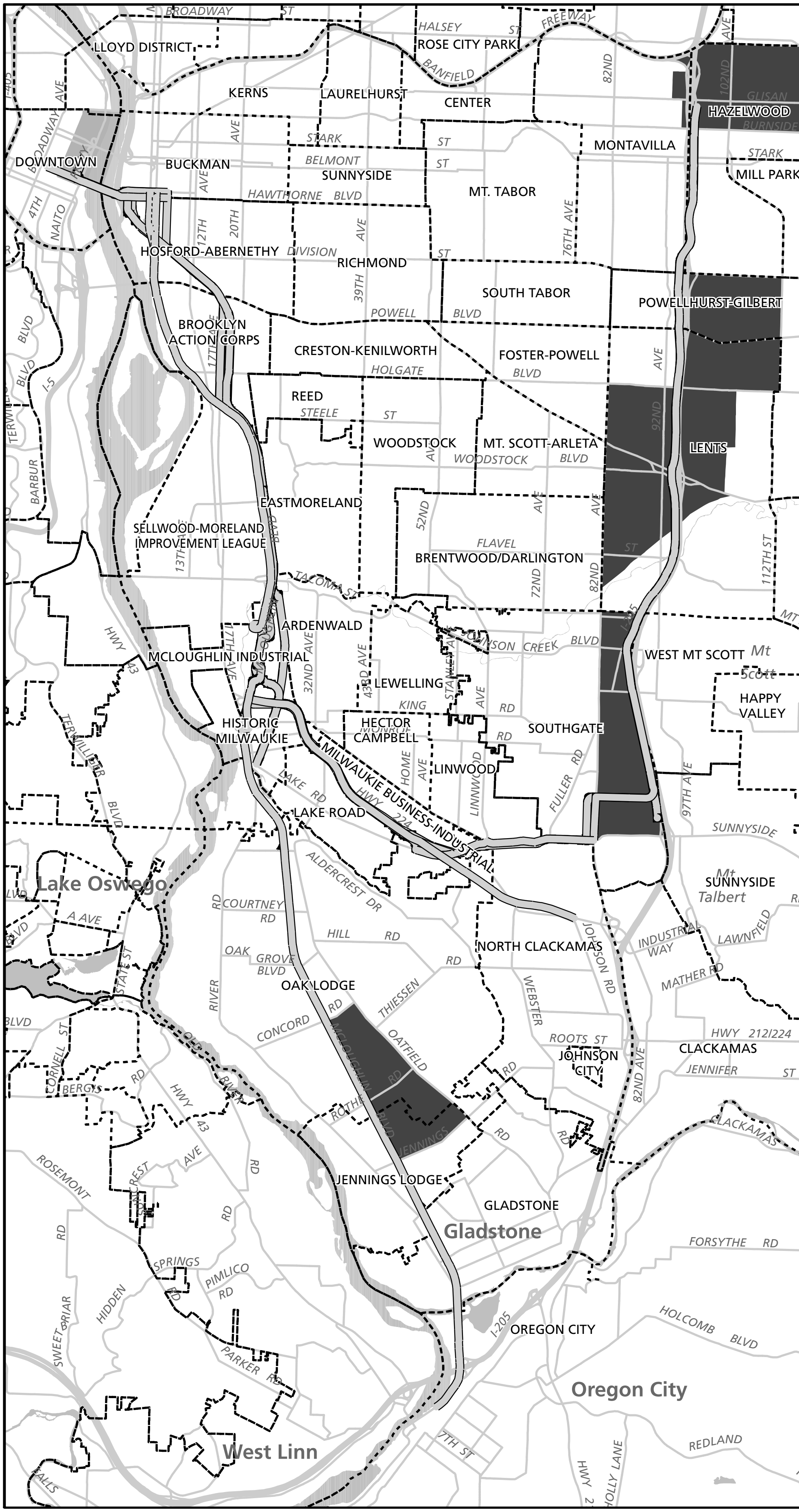
[2] The Tri-County area refers to the entire three county area (Multnomah, Washington and Clackamas Counties) and includes the South Corridor Project area.
[3] Race/ethnicity data refer to two measures: percent of residents that are members of minority groups and percent of residents that are of Hispanic or Latino origin regardless of race.
[4] The term elderly is used throughout this report, as defined by the US Census Bureau, to refer to people age 65 or older.
[5] US Census Bureau, "Overview of Race and Hispanic Origin 2000: Census 2000 Brief." www.census.gov, accessed on November 21, 2002.

South Corridor Project

Hispanic Residents By Census Tract

Figure 3.3-4



Percent Hispanic Residents *

- 0 - 8.0%
- 8.1 - 17.5%
- Alignment Alternatives
- Neighborhoods

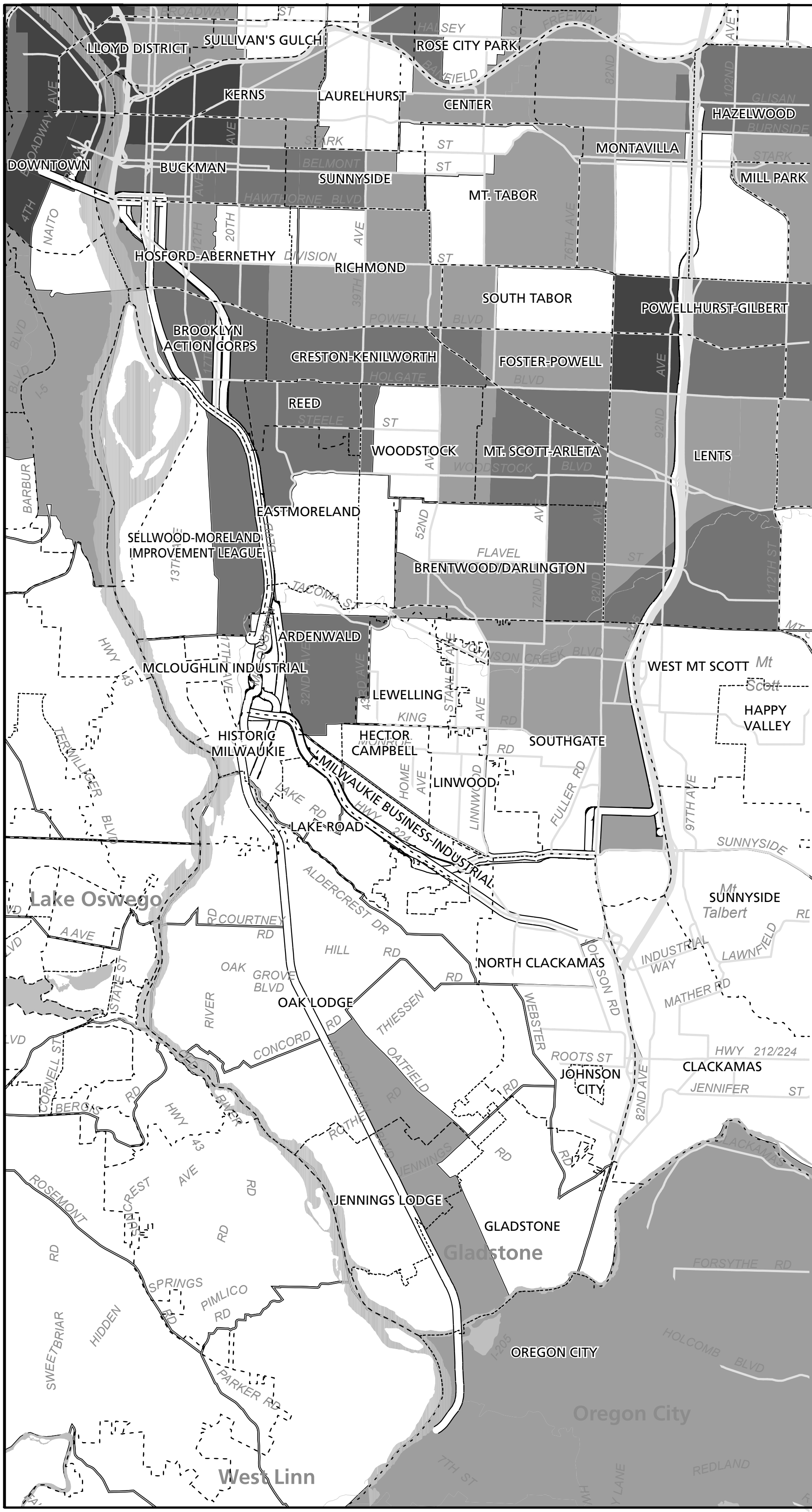
*The Tri-County average percent Hispanic is 8.0%.

SOUTH CORRIDOR PROJECT Transportation Alternatives

METRO

0 0.9 1.8 Miles

December 2002



South Corridor Project

Income Level of Households by Cencus Tracts

Figure 3.3-2

Percent Below Poverty level*

- 0.0 - 8.7%
- 8.8 - 12.9%
- 13.0 - 23.5%
- Greater than 23.5%
- Alignment Alternatives
- Neighborhoods

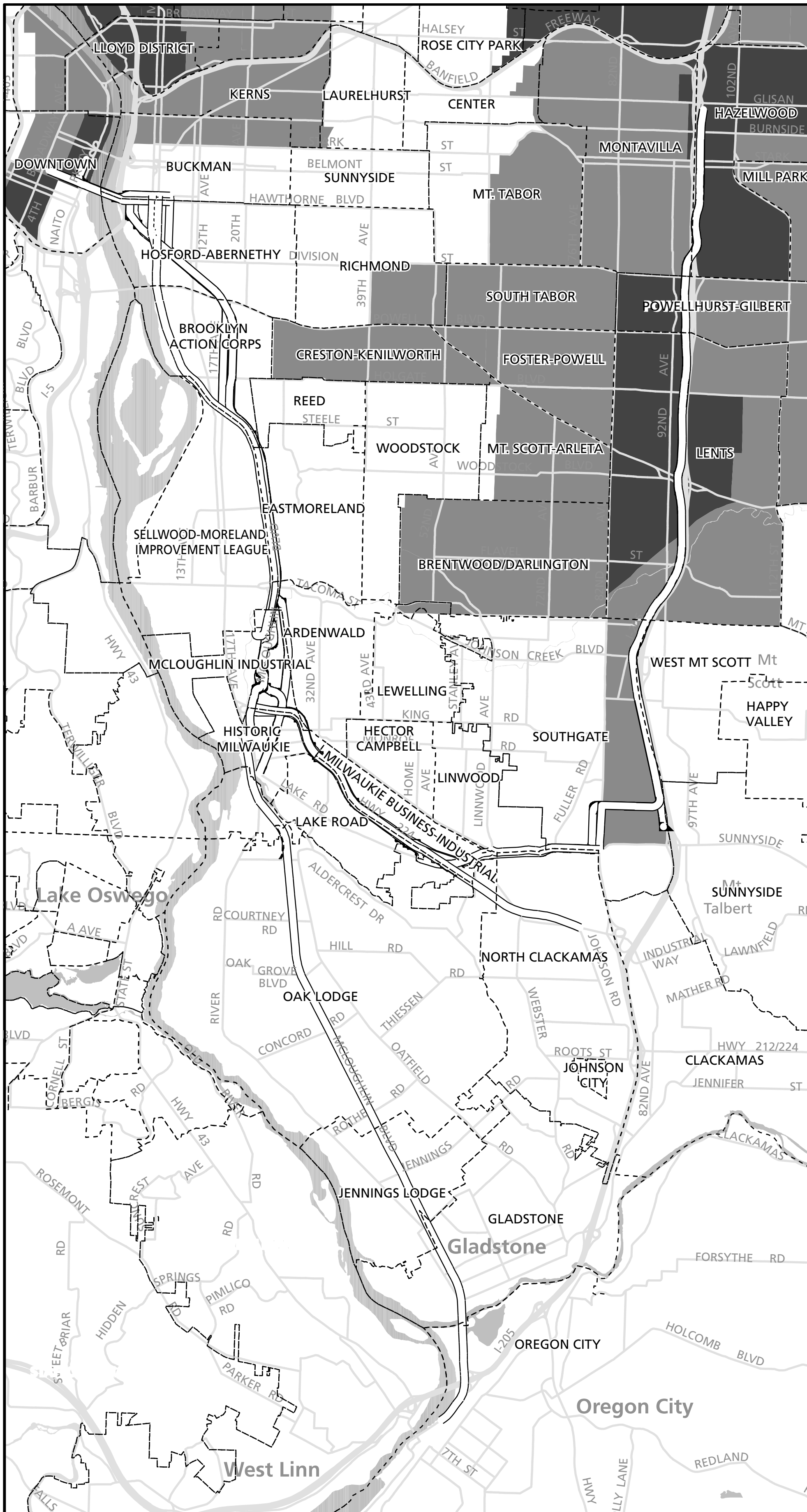
*The Tri-County average rate of poverty is 8.7%.

SOUTH CORRIDOR PROJECT Transportation Alternatives

METRO

0 0.9 1.8
Miles

December 2002



South Corridor Project

Minority Residents by Census Tact

Figure 3.3-3

Percent Minority Residents

- 0 - 17.1%
- 17.2 - 25.0%
- Greater than 25.0%
- Alignment Alternatives
- Neighborhoods

*The Tri-County average percent Minority is 17.1%.

SOUTH CORRIDOR PROJECT
Transportation Alternatives

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December 2002

each neighborhood refer to the percentage of households with incomes below the federally defined poverty level. Poverty data are based on block group[6] level data from the 2000 US Census. Employment data was collected by the State of Oregon Employment Department in 2000. The median home values were compiled through an analysis of data provided by county tax assessors. These neighborhood characteristics are referenced in the separate discussion of Environmental Justice (Appendix B, Environmental Justice Compliance). Employment and population data presented in Section 3.1.

About 32 percent of the Tri-County area's 1.4 million residents live within the South Corridor Project area and about 43 percent of the Tri-County area's one million jobs are located in the South Corridor. Nearly ¼ of those jobs are located in Downtown Portland. A smaller proportion of South Corridor residents are members of a minority group and are of Hispanic or Latino origin[7] than in the Tri-County area, but neighborhoods in the Gateway to Clackamas Segment tend to have higher proportions of Hispanic and minority residents than other areas of the corridor or the Tri-County area.

Most South Corridor neighborhoods have a higher proportion of elderly residents and a higher proportion of renter-occupied housing units than the Tri-County area. Many of the South Corridor neighborhoods have higher rates of poverty[8] than the Tri-County area average. In the Gateway to Clackamas Segment, every neighborhood, except West Mt. Scott and Sunnyside, has a higher poverty rate than the Tri-County area average. Of the South Corridor neighborhoods in the City of Portland, only Eastmoreland does not have a poverty rate that exceeds the Tri-County area average.

A. Downtown Portland (Portland to Milwaukie Segment) is the region's business and retail core, with a high density mix of retail, office, apartment and condominium housing and mixed use buildings, museums, places of worship, as well as Portland State University (PSU), numerous small and large parks and other public facilities. Federal, county, city and state offices are located in Downtown Portland including City Hall and the County and Federal Courthouses. The street system is primarily a one-way grid system with limited auto access on parts of the SW 5th and 6th Avenues transit mall. Housing is concentrated in the southeastern portion of the neighborhood, near PSU and the park blocks, and in the RiverPlace mixed use development.

The Downtown Neighborhood's poverty rate is substantially higher than the average in the Tri-County area. A significantly higher proportion of residents of the Downtown neighborhood are members of a minority group or are elderly than in the Tri-County area. A smaller proportion of Downtown residents are Hispanic than the in the Tri-County area. Renters occupy more than three times as large a percentage of housing units in Downtown Portland than in the Tri-County area. Few single family homes are located in Downtown Portland. Apartments, single room occupancy hotels and condominiums comprise most of the housing stock.

B. Inner Southeast Portland Neighborhoods (Portland to Milwaukie Segment). The Hosford-Abernethy, Brooklyn and Sellwood-Moreland Neighborhoods are characterized by a variety of land use types including commercial districts and residential areas as well as industrial and employment

[6] The US Census Bureau did not release poverty data at the block level. Because other demographic data were collected at the block level, there may be slight inconsistencies between the poverty data and the other socioeconomic data.
[7] Residents of Hispanic or Latino origin are referred to as Hispanic throughout this report.
[8] Poverty rate refers to the percentage of households with incomes below the federally defined poverty level as reported by the 2000 US Census.

centers. Most industrial development in inner Southeast Portland is located in the Hosford-Abernethy and Brooklyn neighborhoods. The CEID, a protected industrial sanctuary located in the Hosford-Abernethy and Buckman neighborhoods, is a major industrial and employment center for the city. Brooklyn Yards, a large freight rail facility, as well as Fred Meyer and TriMet headquarters and bus facility are located in the Brooklyn Neighborhood. Commercial and retail development can be found at nodes throughout the Brooklyn, Sellwood-Moreland and Hosford-Abernethy neighborhoods. Regional attractions in inner Southeast neighborhoods include Oaks Amusement Park, Oaks Bottom Wildlife Refuge, Westmoreland Park and the Oregon Museum of Science and Industry (OMSI).

A mix of well-maintained older single-family homes and small apartment complexes as well as neighborhood parks can be found in most of inner Southeast Portland neighborhoods. **Eastmoreland** is comprised nearly exclusively of single family homes and open spaces. Reed College (a private liberal arts college) and Eastmoreland Golf Course (a municipal golf course) are located in the Eastmoreland neighborhood.

The inner Southeast Portland neighborhoods have lower percentages of minority and Hispanic residents than the Tri-County area. Sellwood-Moreland and Eastmoreland have a higher percentage of elderly residents than the Tri-County area, while Brooklyn and Hosford-Abernethy have a lower percentage of elderly residents than the Tri-County area. All of these neighborhoods, except Eastmoreland, have a higher poverty rate than the Tri-County area. A higher percentage of housing units in Sellwood-Moreland, Brooklyn and Hosford-Abernethy are occupied by renters than in the Tri-County area while a small proportion of housing units in Eastmoreland (10.8 percent) are occupied by renters. Eastmoreland has among the highest single family home values in the corridor.

C. Milwaukie Neighborhoods. Ardenwald Neighborhood (Portland to Milwaukie Segment), the **Island Station Neighborhood** (Milwaukie to Oregon City Segment) the **Linwood Neighborhood** (Milwaukie to Clackamas Segment) and the **Lake Road Neighborhood** (Milwaukie to Clackamas Segment) are characterized by suburban-style single family home development with few major employers and limited commercial development. Community facilities typically include fire stations, parks and schools. The Milwaukie Public Safety Building is located in the Ardenwald neighborhood. A smaller proportion of residents are members of minority groups or are Hispanic in these neighborhoods than in the Tri-County area. A larger proportion of elderly people live in the Ardenwald and Lake Road neighborhoods and a smaller proportion of elderly people live in the Island Station Neighborhood than in the Tri-County area. Renters occupy a larger proportion of housing units in the Ardenwald, Lake Road and Island Station neighborhoods than in the Tri-County area. Ardenwald has a higher poverty rate than the Tri-County area. Renters occupy a larger proportion of the housing units in these neighborhoods than in the Tri-County area.

The **McLoughlin Industrial Neighborhood** (Portland to Milwaukie Segment and Milwaukie to Clackamas Segment) and the **Milwaukie Business-Industrial Neighborhood** are characterized by industrial and commercial uses and are major employment centers for the Milwaukie area. Renters occupy more than 70 percent of the few housing units in both these neighborhoods. In the McLoughlin Industrial neighborhood, the proportions of residents who are members of minority groups, that are Hispanic or are elderly are smaller than in the Tri-County area. Conversely, higher proportions of residents are members of minority groups, are Hispanic or are elderly in the Milwaukie Business-Industrial neighborhood than in the Tri-County area.

The **Historic Milwaukie Neighborhood** (Portland to Milwaukie Segment and Milwaukie to Clackamas Segment) includes Milwaukie's downtown core and surrounding older residential areas. Significant community facilities include Milwaukie City Hall, the Ledding Library, an on-street transit center, schools and a fire station. Three-quarters of housing units are renter-occupied and the neighborhood has a lower poverty rate than the Tri-County area. A far smaller proportion of Historic Milwaukie Neighborhood residents are members of a minority group or are Hispanic than in the Tri-County area.

D. Clackamas County Neighborhoods. The **North Clackamas Neighborhood** (Milwaukie to Clackamas Segment) is characterized by industrial and public/institutional development along SE Harmony Road and the Union Pacific Railroad, with single family residential development throughout the southern part of the neighborhood. The proposed transit alternatives along Harmony Road would be separated from the majority of the North Clackamas neighborhood by a vacant flood plain and Highway 224. This neighborhood has a smaller proportion of residents who are members of minority groups or of Hispanic or Latino origin than the Tri-County area. The median assessed home value in this neighborhood is among the highest in the corridor and the neighborhood has a lower poverty rate than the Tri-County area.

The **Oak Lodge Neighborhood, Jennings Lodge Neighborhood** and **the cities of Gladstone** and **Oregon City** (Milwaukie to Oregon City Segment) are located along SE McLoughlin Boulevard south of Milwaukie. Oak Lodge and Jennings Lodge are characterized by single family home development, some multifamily housing and auto-oriented commercial development along McLoughlin Boulevard. Gladstone and Oregon City are cities in the southern portion of the corridor where only small areas along McLoughlin Boulevard would be directly affected by the BRT Alternative. All of these areas have relatively small proportions of residents who are members of minority groups and have a higher proportion of renter occupied housing compared to the Tri-County area. Oak Lodge has a relatively large proportion of elderly residents and Oregon City has a relatively small proportion of elderly residents. Jennings Lodge has a higher poverty rate than the Tri-County area.

The **Southgate Neighborhood** (Milwaukie to Clackamas Segment and Clackamas to Gateway Segment) is bordered by I-205 to the east and Multnomah County to the north. It is a large neighborhood with diverse land uses including the Clackamas Town Center mall, multifamily and single family housing and auto-oriented retail along SE 82nd Avenue. County offices and other employment areas are concentrated in the southern part of the neighborhood. Much of the neighborhood has been designated as the Clackamas Regional Center and is part of a Clackamas County urban renewal area. Southgate is home to a relatively large proportion of residents who are Hispanic compared to the Tri-County average. Renters occupy nearly 60 percent of housing units in the neighborhood and the median single family home value is among the lowest in the corridor. A slightly higher percentage of residents are elderly in the Southgate neighborhood than the Tri-County area, partially due to the concentration of senior housing north of the Clackamas Town Center. The Southgate neighborhood also has a higher poverty rate than in the Tri-County area.

The **Sunnyside** and **West Mt. Scott Neighborhoods** (Clackamas to Gateway Segment) are bordered on the west by I-205 and are located in northern Clackamas County. West Mt. Scott and the northern portion of the Sunnyside Neighborhood are primarily residential neighborhoods comprised of single family homes with some apartments and town homes located near major arterials. Sunnyside Road is lined with auto-oriented commercial development. The Kaiser Sunnyside Medical Complex is also located in the Sunnyside neighborhood. A larger proportion of West Mt. Scott residents are members of minority groups than in the Tri-County area as a whole. Few West Mt. Scott or Sunnyside residents are Hispanic. Renters occupy 65 percent of housing units in the Sunnyside neighborhood, more than twice the Tri-County area average. West Mt. Scott has among the highest assessed home value in the corridor. Both of these neighborhoods have lower poverty rates than in the Tri-County area.

E. East Portland Neighborhoods. The **Lents** and **Powellhurst-Gilbert Neighborhoods** (Gateway to Clackamas Segment) are both divided by I-205 and were dramatically impacted by the construction of I-205 in the late 1970s. Both neighborhoods include a mix of land uses including auto-oriented retail, single family housing development and multifamily housing development. Much of the Lents neighborhood is identified as an urban renewal district by the City of Portland. The Waddle's Boys and Girls Club in Lents is a significant community facility. The Lents and Powellhurst-Gilbert neighborhoods both have higher than average proportions of residents who are minority or Hispanic than the Tri-County area average. Both neighborhoods have a higher proportion of renter occupied housing than in the Tri-County area as a whole and have lower assessed single family home values than the rest of the corridor as well as having higher poverty rates than the Tri-County area average.

The **Montavilla** and **Hazelwood Neighborhoods** (Gateway to Clackamas Segment) are located south of I-84 and are separated by I-205. Both neighborhoods are comprised of a mix of land uses including auto-oriented commercial development and traditional storefronts. The Gateway Regional Center and urban renewal district are located in the Hazelwood Neighborhood. The Portland Adventist Hospital is also located in the Hazelwood neighborhood. Both neighborhoods have a larger proportion of residents who are members of a minority group and Hazelwood has a higher proportion of residents who are Hispanic than in the Tri-County area. Montavilla has the largest proportion of minority residents of neighborhoods in the corridor. Both neighborhoods have among the lowest assessed single family home values in the corridor and have a higher proportion of renter occupied housing units than are typical in the Tri-County area. Both neighborhoods have higher poverty rates than the Tri-County area average.

3.3.2 Environmental Consequences

This section summarizes social and neighborhood impacts that would result from the alternatives and design options. Section 3.3.2.1 summarizes regional impacts that would be associated with each alternative. Displacement impacts and access to community and regional facilities and services are considered. Section 3.3.2.2 summarizes social and neighborhood impacts within each segment and compares the impacts of each alternative and design option. Where there are traffic, access, noise, displacement and visual impacts that would have a significant impact on neighborhood character, cohesion, or livability, they are identified in this section. Only significant noise or vibration impacts are addressed in this chapter. Additional information about these other topics can be found in other sections of this SDEIS. Input gathered through public involvement and outreach has been included in the discussion and will continue to be very important in identifying potential social and neighborhood impacts especially potential impacts to neighborhood cohesion and quality.

3.3.2.1 Access to Regional Community Facilities and Services

Access to regional facilities and services, as measured by the number of residents within 45 minutes of key corridor destinations using transit. Table 3.3-2 summarizes the number of corridor residents within 45 minutes (total, unweighted) of Downtown Portland, the Lloyd District, the CEID, the Gateway Regional Center and the Clackamas Regional Center by transit in 2020. In general, all of the South Corridor Alternatives would increase the number of residents with access to these major activity centers. The Combined LRT Alternative would provide the most access to all destinations except the CEID which would be better served by the all of the alternatives except I-205 Light Rail. I-205 LRT would provide the best access to the Gateway Regional Center.

Table 3.3-2
Access to Major Activity Centers: Number of Residents Within 45 Minutes[1] of Key Corridor Destinations Using Transit, by Alternative (2020)

Destination	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
45-Minute Transit Access to:						
Downtown Portland	704,400	706,800	718,400	740,000	717,400	741,800
Lloyd District	537,800	534,500	539,100	553,200	601,200	605,200
Central Eastside Industrial District	499,300	500,500	508,400	508,000	497,400	498,400
Gateway RC	568,200	568,500	565,600	574,100	645,400	640,200
Clackamas RC	351,900	413,900	400,800	384,300	463,200	438,900

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; RC = regional center.
[1] Total, unweighted times.

3.3.2.2 Long Term Impacts by Segment

A. Portland to Milwaukie Segment

The BRT Alternative would not have any significant neighborhood impacts in the Portland to Milwaukie Segment. Changes to the neighborhood environments, compared to the No-Build Alternative, would be minor and related to additional bus service in an existing transit corridor and improvements at intersections. The increased size of the Southgate Park-and-Ride from the No-Build Alternative would cause some traffic impacts at the intersection of SE Millport Street and SE McLoughlin Boulevard, affecting travel to the McLoughlin Industrial Neighborhood. The BRT Alternative would not cause any significant noise impacts in the Milwaukie to Portland segment.

The Busway Alternative would have some neighborhood impacts related to increased traffic at park-and-ride lots, new visual elements in inner Southeast Portland and some perceived neighborhood quality impacts due to the use of buses rather than light rail. The Tacoma Street Park-and-Ride Lot could cause traffic impacts on the Tacoma Street off-ramp from SE McLoughlin Boulevard, affecting travel to and from the Eastmoreland, Ardenwald and Sellwood-Moreland Neighborhoods. The Southgate Park-and-Ride Lot could cause traffic impacts to the intersection at SE Millport Street and SE McLoughlin Boulevard affecting travel to and from the McLoughlin Industrial Neighborhood, a major employment center in Milwaukie. Changes to the street pattern near SE 11th and 12th Avenues and Clinton Street with the At-Grade Clinton Design Option would provide better auto, pedestrian and bike access than the existing street pattern but it would displace a major employer. The Busway would also displace many significant industrial employers in inner Southeast Portland with either the 17th Avenue or the West of Brooklyn Yards Design Option. The Busway would operate adjacent to existing heavy rail right-of-way through many parts of the neighborhood, however many community members perceive the Busway Alternative as lacking the land use benefits and neighborhood quality benefits of the light rail alternative.

The Milwaukie LRT Alternative would have some neighborhood impacts related to increased traffic at park-and-ride lots and increased noise, as well as some perceived benefits to neighborhood quality in this segment. The Tacoma Park-and-Ride Lot and the Southgate Park-and-Ride Lot would have similar impacts to the Busway Alternative in this segment. Either the 17th Avenue or the West of Brooklyn Yards design options could displace significant industrial employers, but project engineers believe than many of the displacements along 17th Avenue could be mitigated to allow some businesses to continue operating without relocation. The Milwaukie LRT Alternative could cause four significant vibration impacts with feasible mitigation in Downtown Milwaukie. Many community members in the Portland to Milwaukie Segment perceive the Milwaukie LRT Alternative to increase the quality of their neighborhoods due to likely land use changes associated with light rail and their positive view of light rail operations. The Combined LRT Alternative would have the same benefits and impacts in this segment as the Milwaukie LRT Alternative.

B. Milwaukie to Clackamas Segment

The BRT Alternative would have some traffic and perceived impacts to neighborhood quality and cohesion in this segment. Two intersections in the Linwood Neighborhood would be impacted by additional traffic with the Linwood Park-and-Ride Lot Design Option. The intersection at SE Lake Road, SE Harmony Road and SE International Way would have additional delay and congestion compared to the No-Build Alternative impacting access between the Linwood Neighborhood and other Milwaukie neighborhoods and between Milwaukie and the Clackamas Regional Center. It would not cause any significant noise or vibration or visual impacts in the Milwaukie to Clackamas segment. Some community members have suggested that bus service on SE Harmony Road would negatively impact neighborhood quality. The increased width of Highway 224 might negatively affect pedestrian access across a highway that is already considered a major barrier between Milwaukie neighborhoods.

The Busway Alternative would have some noise impacts, visual impacts along SE 80th Avenue and some perceived impacts to neighborhood quality and cohesion. The Busway Alternative would cause significant noise impacts with feasible mitigation to nine homes. The segment of the busway along 80th Avenue would significantly change the character of the area along SE 80th Avenue from an unimproved street to a busy transit facility. The impacts in most of the segment, including traffic and neighborhood quality impacts, would be similar to those of the BRT Alternative.

The Tacoma Street and Southgate Park-and-Ride lots included as BRT elements associated with the Combined LRT Alternative, the Milwaukie LRT Alternative and the Busway Alternative would generate additional traffic along Highway 224 in the Milwaukie to Clackamas Segment, causing delay at some intersections. The impacts associated with the Milwaukie LRT Alternative would be similar to those associated with the BRT Alternative.

C. Milwaukie to Oregon City Segment

Bus Rapid Transit is the only alternative under study in the segment. The BRT improvements would also be included with the Milwaukie Light Rail, the Busway, the I-205 LRT and the Combined LRT Alternatives. The BRT improvements would not have any noise or traffic impacts in this segment, would have minor visual impacts and some perceived impacts to neighborhood cohesion and quality. Visual impacts would be related to a new park-and-ride lot at SE Park Avenue, changes to intersections and changes in the vicinity of BRT stations. Proposed changes to intersections and station areas could include landscaping, lighting and other amenities. A raised, planted median would be built at some intersections to prevent cars from making illegal left turns near intersections and to offer pedestrians a refuge while crossing SE McLoughlin Boulevard. Some community members have suggested that these medians and other BRT improvements would negatively impact neighborhood quality, the business environment and auto access along SE McLoughlin Boulevard.

D. Gateway to Clackamas Segment

The I-205 LRT and the Combined LRT Alternatives would cause several noise and vibration impacts, some visual impacts, some traffic impacts near park-and-ride lots and some perceived neighborhood cohesion and quality impacts. The I-205 LRT Alternative would cause 25 significant noise impacts with feasible mitigation and five significant vibration impacts in the Lents and Southgate neighborhoods.

The elevated station at SE Foster Road in the Lents Neighborhood would change the view of the Lents neighborhood from I-205 and has been identified as a community concern. The new park-and-ride and new street circulation system in the vicinity of the Fuller Road Station would change the character of the area, which is currently a pocket of single family homes and unimproved streets surrounded by retail, commercial and light industrial development. Six existing single family homes would be replaced with a large park-and-ride garage and unimproved streets would be replaced with access roads with sidewalks, lighting and curbs. Many homes and a church would remain and would experience changes in traffic patterns and activity levels associated with the park-and-ride lot. In addition, the Battin House, a home potentially eligible for historic status, is located in this area and would be impacted by additional traffic generated by the park-and-ride lot.

The intersection at SE 92nd and SE Powell Boulevard would be impacted by traffic associated with the Powell Boulevard Park-and-Ride Lot. This increased traffic could affect travel to and from the Lents neighborhood. Similarly, the Fuller Road Park-and-Ride Lot could cause additional delay at the intersection of SE Fuller Road and SE Johnson Creek Boulevard, impacting travel within the Southgate Neighborhood and access to I-205 from the Southgate Neighborhood.

Impacts to neighborhood cohesion would be minimal because the proposed light rail alignment would be constructed adjacent to the freeway. Some community members have expressed concern about the safety, security and neighborhood parking impacts of either the I-205 LRT Alternative or the Combined LRT Alternative on neighborhoods adjacent to I-205.

3.3.2.3 Short Term (Construction) Impacts

Temporary construction-related or short term impacts to neighborhoods could result from increased traffic congestion, truck traffic, noise, vibration, and dust. More detailed descriptions of specific types of impacts are discussed in the Noise and Vibration Impacts Results Report, Transportation Impacts Results Report and Visual and Aesthetics Impacts Results Report.

Short term impacts related to the BRT Alternative would likely be minor and limited to intersections where queue bypass lanes would be constructed and Opticom signals would be installed. TriMet would work closely with impacted businesses and residents in planning and completing construction to minimize impacts. Impacts would be limited to the Milwaukie to Oregon City, Milwaukie to

Clackamas and Portland to Milwaukie Segments. There would not be any short term impacts in the Gateway to Clackamas Segment.

Busway construction could cause short term impacts related to the construction of a bus only lane, structures and park-and-ride lots as well as other related facilities. During construction, some intersections would likely be closed at various times. Several design options in inner Southeast Portland could require new structures that would likely cause street closures and other related impacts. Along Highway 224, short term impacts would be similar to those described for the BRT. Access to homes and businesses along SE 80th Avenue would likely be affected during construction of the busway in that area. TriMet would work with affected businesses and residents to identify the construction practices that would effectively minimize those impacts. Short term impacts in the Milwaukie to Oregon City segment would be similar to those identified for the BRT Alternative. There would not be any short term impacts in the Gateway to Clackamas Segment.

Short term impacts related to the Milwaukie LRT Alternative could include impacts to intersections where light rail crosses streets at-grade and where light rail is constructed adjacent to roads as well as impacts related to park-and-ride construction. There would likely be construction related street or lane closures on the Hawthorne Bridge, in Downtown Portland, in inner Southeast Portland and Downtown Milwaukie. TriMet would work with affected businesses and residents to identify the construction practices that would best minimize those impacts. Short term impacts in the Milwaukie to Clackamas and Milwaukie to Oregon City segments would be similar to those identified for the BRT Alternative. There would not be any short term impacts in the Gateway to Clackamas Segment.

Short term impacts related to the I-205 LRT Alternative could include impacts to intersections where light rail crosses streets at-grade, to areas where park-and-rides are planned and to areas where new structures are planned. Construction impacts between Gateway and the Division Street Station would be minimal since construction would occur in existing ODOT right-of-way. New structures over Powell, Foster and near the intersection of SE 92nd Avenue and I-205 would likely result in some street closures and other related impacts such as construction noise and dust. The Fuller Road Park-and-Ride lot and related street construction could impact the adjacent residents with noise, dust and street closures. TriMet would work with affected businesses and residents to identify the construction practices that would best minimize those impacts. Short term impacts in the Portland to Milwaukie and Milwaukie to Oregon City segments would be similar to those identified for the BRT Alternative. There would not be any short term impacts in the Milwaukie to Clackamas Segment.

The short term impacts for the Combined LRT Alternative would be similar to those identified for light rail in the Milwaukie to Portland and Gateway to Clackamas Segments and the BRT in the Milwaukie to Oregon City Segment.

3.3.2.4 Cumulative Impacts

Clackamas County is planning to widen SE Harmony Road from SE Lake Road to SE 82nd Avenue. This project would result in displacements on the north side of the street and would significantly alter the character of Harmony Road in this area. Neighbors are concerned that a widened SE Harmony Road and transit improvements would significantly adversely impact the character of their community and act as a barrier between the Clackamas County Aquatic Center, located south of SE Harmony Road, and the Linwood Neighborhood, located north of SE Harmony Road. The proposed transit improvements alone would not cause significant displacements along SE Harmony Road, but the transit improvement would trigger community concerns about access across SE Harmony Road and changes to community character.

In addition to the park-and-rides included in the build alternatives, two park-and-ride lots would be constructed with the No-Build Alternative. The Roethe Park-and-Ride Lot located at SE Roethe Road in the Oak Lodge neighborhood would result in the displacement of four businesses. Some community members have expressed concerns about displacing businesses to create additional park-and-ride capacity. The Southgate Park-and-Ride in the McLoughlin Industrial Neighborhood would result in the displacement of the building that formerly was the Southgate Cinema. Today, the building is used for a variety of performing arts competitions. Beneficial cumulative impacts would include planned and new market-driven development in the neighborhoods of the South Corridor study area.

3.3.3 Potential Mitigation Measures

Potential mitigation measures are suggested for each neighborhood impact identified. During the preparation of the Final Environmental Impact Statement, mitigation of impacts associated with the selected alternative for impacts that cannot be avoided will be specifically defined and documented. Extensive coordination will occur with appropriate stakeholders. In the case of identified social or neighborhood impacts, the project will work closely with the affected neighborhoods in developing appropriate mitigation.

During the contracting process, specific mitigation plans will be developed to address short term social and neighborhood impacts. These plans will identify mitigation measures that will be implemented to minimize construction impacts to residences and businesses, which may include maintaining access to existing uses wherever possible, special signage programs, limiting contractor parking, prompt removal of construction dirt and debris, and providing screening to minimize dust and visual impacts. In the event that access or utility service to a residence or business would be temporarily disrupted, advance notice would be provided and the length of the disruption would be minimized.

3.4 Noise and Vibration

A change in environmental noise is often associated with new or expanded transportation services. In the United States today the main source of environmental noise affecting the population is transportation systems noise, specifically from vehicles traveling local streets and roads, and state and Interstate highways.

This section describes the potential noise and vibration impacts associated with the Project Alternatives, as well as information regarding the noise and vibration analysis method, existing noise and vibration environment, potential impacts, and potential mitigation. More detail on project-related noise and vibration can be found in the *South Corridor Noise and Vibration Impacts Results Report* (Metro and URS, November 2002).

3.4.1 Affected Noise Environment

The Federal Highway Administration (FHWA) traffic noise methodology was used to assess impacts related to highway modifications and bus operations, whereas the Federal Transit Administration

(FTA) noise and vibration methodology was used to assess impacts related to the operation of light rail trains. Existing environmental noise levels were measured using FHWA's Traffic Noise Model® (TNM®). ODOT also uses this model to evaluate new or expanded highway projects. FTA guidelines (DOT-T-95-16) were also used to evaluate noise and vibration associated with the Alternatives. The FTA guidelines provide criteria used to determine when noise or vibration abatement should be considered and where an adverse effect might occur. Ground vibration was measured adjacent to existing highway and LRT infrastructure to describe the existing vibration environment. Vibration effects from project alternatives were then modeled using FTA guidelines. Further analysis was done with a comprehensive three-dimensional program called Cadna/A® to determine noise impacts where local topography may affect sound propagation and the FTA screening analysis did not rule out the possibility of an adverse effect.

Both FHWA and FTA methods use dual criteria to evaluate potential noise impacts and mitigation. The FHWA's Noise Abatement Criteria (NAC) uses a fixed noise level for the project's noisiest hour as a trigger for evaluation of measures to mitigate excessive noise. For residential land uses, the "approaching NAC" level is 66 decibels (dBA) equivalent sound level (L_{eq}) during the peak-noise-hour and for the purpose of this document is described as a potential impact. The FHWA uses ODOT's significance threshold of a 10-dBA-L_{eq} increase during the peak-noise-hour to determine if an adverse noise effect would occur and require mitigation.

The FTA guidelines use a community noise descriptor, the Day-Night Average Sound Level (L_{dn}), and comparative criteria to evaluate impacts to noise-sensitive land uses, including residences. The guidelines call for comparing existing and future-with-project noise levels to determine if noise abatement should be considered when there could be somewhat increased noise or substantial noise increases could result in "severe impact" requiring evaluation of feasible mitigation measures. The FHWA criteria of "approach or exceed the NAC" and the FTA criteria of "impact" are functionally equivalent and refer to sound levels and locations "where noise abatement evaluation is required."

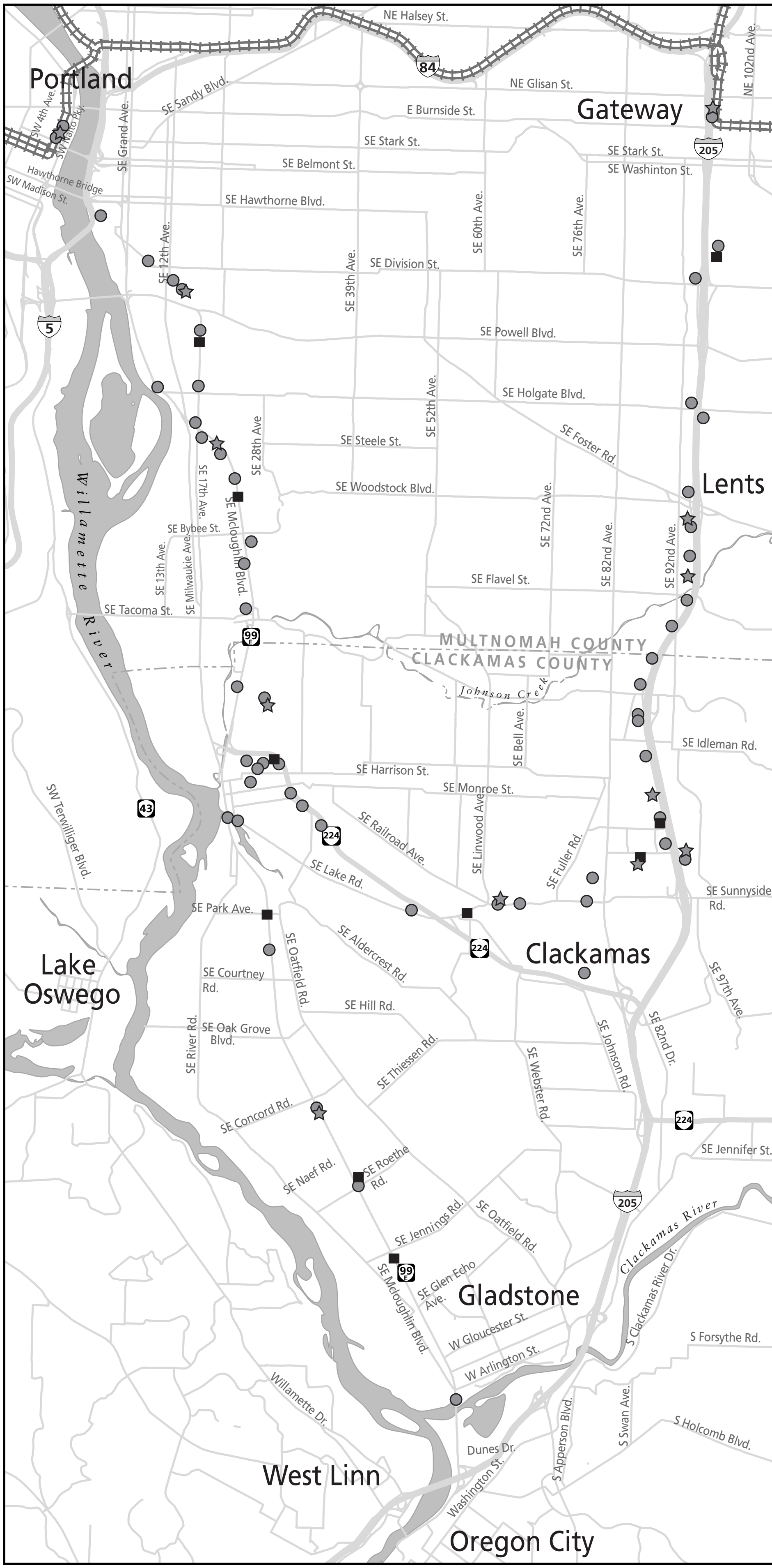
The noise and vibration survey represents the existing baseline conditions against which future project alternatives are compared. It is also used to verify the validity of existing and future noise and vibration modeling, where appropriate. Two types of noise measurements were conducted to verify existing conditions along the Alternative alignments and to calibrate the models. Sixty-three short-term (up to 1 hour) noise measurements were taken at 59 representative locations along the alternative routes. Long-term (continuous hour-by-hour) noise levels were also measured at 10 locations along the alternative routes. Prior surveys taken for the *South/North Transit Corridor Draft Environmental Impact Statement* (Metro, February 1998) were also used to help build an understanding of the existing noise and vibration environment. Short-term vibration measurements were taken at 12 locations. Multiple samples of ground-borne vibration taken at each measurement location were representative of local transportation activity. The noise and vibration measurement sites are shown in Figure 3.4-1 and the survey results are described below by project segment. Noise measurements were found to be typical of the land uses and community activity.

Ground-borne vibration generated by existing freight and passenger rail service was also analyzed. Existing freight and non-light-rail passenger lines are located in the Portland to Milwaukie and Milwaukie to Clackamas Segments. No freight or passenger rail lines operate in the Milwaukie to Oregon City or Gateway to Clackamas Segments, except the Blue Line MAX LRT at Gateway.

SOUTH CORRIDOR PROJECT

Noise and Vibration Impact

Figure 3.4-1 Monitoring Sites



LEGEND

- ■ Long-term Noise Monitoring Site
- ● Short-term Noise Monitoring Site
- ☆ Vibration Monitoring Site

3.4.1.1 Portland to Milwaukie Segment

Land uses within the Portland to Milwaukie segment include high-density office and commercial, industrial, institutional (e.g., OMSI), educational, residential, and recreational. The measured noise levels were typical for these types of land uses and community activity. Eighteen short-term and two long-term noise measurements were conducted in the Portland to Milwaukie Segment. Noise levels ranged from 48 dBA L_{eq} to 76 dBA L_{eq}. Substantial existing noise sources include freight and passenger rail (UPRR and Amtrak) and major arterial roadways such as SE McLoughlin Boulevard.

Humans perceive vibration at approximately 65 velocity decibels (VdB). Existing ground-borne vibration sources in the Portland to Milwaukie Segment are freight and passenger trains, including the MAX LRT in the downtown area, and major arterial roadways. Vibration measured at four monitoring locations in this segment ranged from 31 to 81 VdB. The average measured ground-borne vibration level of freely flowing traffic, 15 feet from the edge of shoulder on SE McLoughlin Boulevard (V-09) was 53 VdB. This level is not considered perceptible and vibration was not perceived during the monitoring. Although ground-borne vibration was perceptible on the sidewalk during LRT passbys at SW First Avenue and SE Morrison Street in downtown Portland, calculations indicate that there is no existing impact at the adjacent hotel, the nearest sensitive receptor. No freight trains were measured during the field survey but the existing freight rail line is close enough to several residential areas that ground-borne vibration may be perceptible during train passbys.

A general vibration assessment of sensitive receptors impacted by existing freight and passenger rail traffic was conducted in the areas that would be adjacent to the proposed LRT alignment. Current vibration levels at one residence approximately 80 feet from the freight rail line and east of the tracks between SE Powell Boulevard and SE Haig Street and at seven residences between SE Johnson Creek Boulevard and SE Malcolm Street were found to exceed FTA criteria. Other vibration-sensitive receptors located close to freight tracks crossovers (within 200-feet) and that may currently exceed FTA vibration criteria include:

- Three dwelling units, a church, and a fire station between the railroad crossing at SE Milwaukie Avenue and SE Gideon Street.
- Three dwelling units between SE Powell Boulevard and SE Haig Street.
- Twenty-two dwelling units and the apartment building on SE 23rd Ave between SE Reedway Street and SE Bybee Boulevard.
- Fourteen dwelling units east of the railroad tracks between SE Johnson Creek Boulevard and SE Kelvin Street.

3.4.1.2 Milwaukie to Clackamas Segment

Land uses in the Milwaukie to Clackamas Segment include residential, industrial, and commercial. Industrial uses predominate the western and central portions of the segment, with commercial land uses predominant in the eastern portion. Residential land uses are located throughout the segment, particularly south of Highway 224 and north of SE Harmony Road. Measured noise levels were typical for these types of land uses. Noise levels measured at sixteen short-term and three long-term locations ranged from 53 to 73 dBA L_{eq}. Highway 224 and SE Harmony Road are the primary arterial roadways in the segment, and the primary noise sources in the area. An active rail line in Milwaukie near the western portion of SE Harmony Road also contributes to the noise environment.

Potential sources of existing ground-borne vibration in the Milwaukie to Clackamas segment include freight and passenger trains and major arterial roadways. Vibration measurements were conducted at three locations in this segment and measurements ranged from 35 to 61 VdB. The 61-VdB measurement was of a passenger train passby measured near SE Harmony Road and SE Cedar Crest Drive. All of the measurements in this segment were below the human perception threshold and vibration was not perceived during any of the measurements.

3.4.1.3 Milwaukie to Oregon City Segment

Land uses in the Milwaukie to Oregon City segment are primarily commercial and residential with some industrial and vacant land. Land uses immediately adjacent to SE McLoughlin Boulevard (Highway 99E, the primary arterial roadway in the segment) are primarily commercial, with residences behind the first row of commercial buildings. In several locations residential land uses are immediately adjacent to SE McLoughlin Boulevard. Noise levels were typical for the types of land uses in the segment. Noise levels measured at nine short-term and three long-term locations ranged from 56 to 71 dBA L_{eq}. Roadway traffic along SE McLoughlin Boulevard was the dominant noise source.

The average ground-borne vibration level of freely flowing traffic was measured at 54 VdB, measured 32 feet from the edge of traveled way on SE McLoughlin Boulevard, in-line with the façade of a residence. The measured level was below the threshold of human perception and vibration was not perceived during the measurement.

3.4.1.4 Gateway to Clackamas Segment

Land uses in the Gateway to Clackamas Segment are primarily residential, with some dispersed commercial and industrial uses. Large commercial development exists at the north end of the segment at Mall 205 and at the south end of the segment at the Clackamas Town Center. The major transportation corridor is I-205. Noise levels in the area were found to be typical for these types of land uses. Eighteen short-term and two long-term noise measurements were taken in this segment. Traffic using I-205 is the primary noise source in the area. Noise levels ranged from 57 to 69 dBA L_{eq}; the higher noise levels within the range occur at residences with a direct view of I-205, while the lower noise levels occur at residences that are partially or completely shielded from I-205 (e.g., by existing berms, noise walls or terrain). For example, the noise level near SE Woodstock Boulevard was 67 dBA L_{eq}. This area has an unobstructed view of southbound I-205 traffic. The measured noise level near SE Holgate Boulevard was 61 dBA L_{eq}. This area has an existing berm that blocks the view of the I-205 from the residences.

Sound walls or berms generally exist along both sides of I-205 between I-84 and SE Foster Road. ODOT plans to add noise walls on the west side of I-205 between SE Johnson Creek Boulevard and SE Monterey when as a part of a planned roadway expansion plan. Noise walls were recently constructed on the eastside of I-205 between SE Johnson Creek Boulevard and SE Monterey Avenue as part of local frontage road constructed by Clackamas County.

Existing sources of ground-borne vibration in the Gateway to Clackamas Segment include the existing Blue Line MAX LRT and I-205. Four vibration measurement were taken in this segment. The vibration levels ranged from 35 to 64 VdB. At a site near NE Glisan Street, measurements were taken of several Blue Line Max LRT passbys and with no train activity. The Blue Line MAX LRT passby vibration level ranged from 58 VdB to 64 VdB. With no Blue Line LRT passbys, vibration levels ranged from 51 to 54 VdB, primarily from traffic on I-205. The existing ground-borne vibration in the Gateway to Clackamas Segment is below the human perception threshold of 65 VdB and ground-borne vibration was not perceived while during the measurements.

3.4.2 Noise and Vibration Impacts

This section describes the potential noise and vibration impact associated with the operations of the various alternatives. A description of potential mitigation is located in Section 3.4.5.

The Project's potential noise and vibration levels were evaluated to determine if the NAC or adverse effect thresholds would be exceeded. If the Project's anticipated noise or vibration levels would not be perceptible or resulted in only small increases for the LRT Alternatives and for all of the park-and-ride facilities, then no further analysis is necessary for these components and no abatement or mitigation measures would be required.

If the FHWA NAC is currently exceeded by existing traffic or would be approached (66 dBA peak-noise-hour) or exceeded (>67 dBA peak-noise-hour) where bus improvements are made, then noise abatement actions would need to be considered. Noise abatement actions would not be evaluated further or implemented if the No-Build Alternative were to be selected. If the FTA noise criteria for "impact" were exceeded by any of the Park-and-Ride facilities or by the LRT Alternatives then noise and/or vibration abatement actions would be considered.

If Busway or BRT improvements or operations increase noise levels at noise-sensitive receptors by 10 dBA or more during the peak-noise-hour then FHWA/ODOT criteria for adverse effect would be exceeded. Thus, feasible/effective noise mitigation measures need to be considered. If feasible/effective mitigation actions are not available then unavoidable adverse impacts could occur if the particular alternative were to be selected.

Noise from any of the park-and-ride facilities or any LRT alternative that is expected to exceed the FTA criteria for "severe impact" would result in a adverse effect pursuant to NEPA. Thus, feasible/effective noise mitigation measures was considered. If feasible/effective mitigation actions are not available then unavoidable adverse impacts would occur if the particular Alternative were to be selected.

Because the LRT components of the alternatives would generate more than 70 rail "events" (passbys) each day, the appropriate standard for adverse effects from LRT ground-borne vibration is 72 VdB at a sensitive receptor. If this standard is expected to be exceeded, then feasible/effective vibration mitigation measures was considered. If feasible/effective mitigation actions are not available then unavoidable adverse impacts would occur if the particular LRT Alternative were to be selected. Table 3.4-1 is a summary of potential noise and vibration impacts associated with each Alternative.

Table 3.4-1
Estimated Number of Dwelling Units Impacted by Alternative[1]

C. Alternative	Noise abatement evaluation required		Adverse Impact				Grand Total[2]
	Traffic Noise	LRT Noise	Traffic Noise	LRT Noise	LRT Vibration	Total	
BRT	48	0	0	0	0	0	48
Busway	42	0	9	0	0	9	52
Milwaukie LRT	42	7	0	0	2	2	51[(3)]
I-205 LRT	4	10	0	24	6	30	44
Combined LRT	0	17	0	24	8	32	49 [(3)]

Source: ***Noise and Vibration Impacts Results Report*** **(Metro and URS, November 2002)**

[1] Totals based on representative set of design options (See Table 2.2-3). See text for differences due to different set of design options.
[2] The grand total includes some double counting of impacts that would be affected by both LRT noise and LRT vibration. Subtracting this double counting would result in the Milwaukie LRT Alternative being reduced from 51 to 46 dwelling units, I-205 LRT Alternative would be reduced from 44 to 39 dwelling units and the Combined LRT Alternative would be decreased from 49 to 44 dwelling units affected.
[3] Two commercial buildings would also be impacted by LRT vibration and noise abatement evaluation would also be required at Milwaukie Middle School due to LRT noise.

3.4.2.1 Bus Rapid Transit Alternative

The BRT Alternative could result in noise impacts (i.e. require noise abatement consideration) to 48 dwelling units, primarily related to additional bus and traffic noise. Affected dwelling units are shown on Figure 3.4-2. None of the seven park-and-ride facilities associated with the BRT Alternative were expected to result in noise or vibration impacts.

Potential noise impacts are located in the following geographic areas. Six dwelling units are in the Portland to Milwaukie segment located east or north of SE McLoughlin Boulevard just north of either SE Holgate Boulevard (4 dwelling units) or west of SE 17th Avenue (2 dwelling units). In the Clackamas to Milwaukie segment, there are 13 of these dwelling units are located on the south side of Highway 224 and north of SE Harrison between SE 29th Avenue. There are five dwelling units on the west side and three on the east side of Highway 224 and between SE Oak and SE Monroe. In addition, 21 dwelling units are located on the north side of SE Harmony Road between SE Fuller and SE Linwood.

3.4.2.2 Busway Alternative

The Busway Alternative would result in noise impacts to 52 dwelling units: noise levels would exceed the NAC at 43 units and would have adverse impacts at 9 additional units as shown in Figure 3.4-3. No vibration impacts would be expected from bus operations.

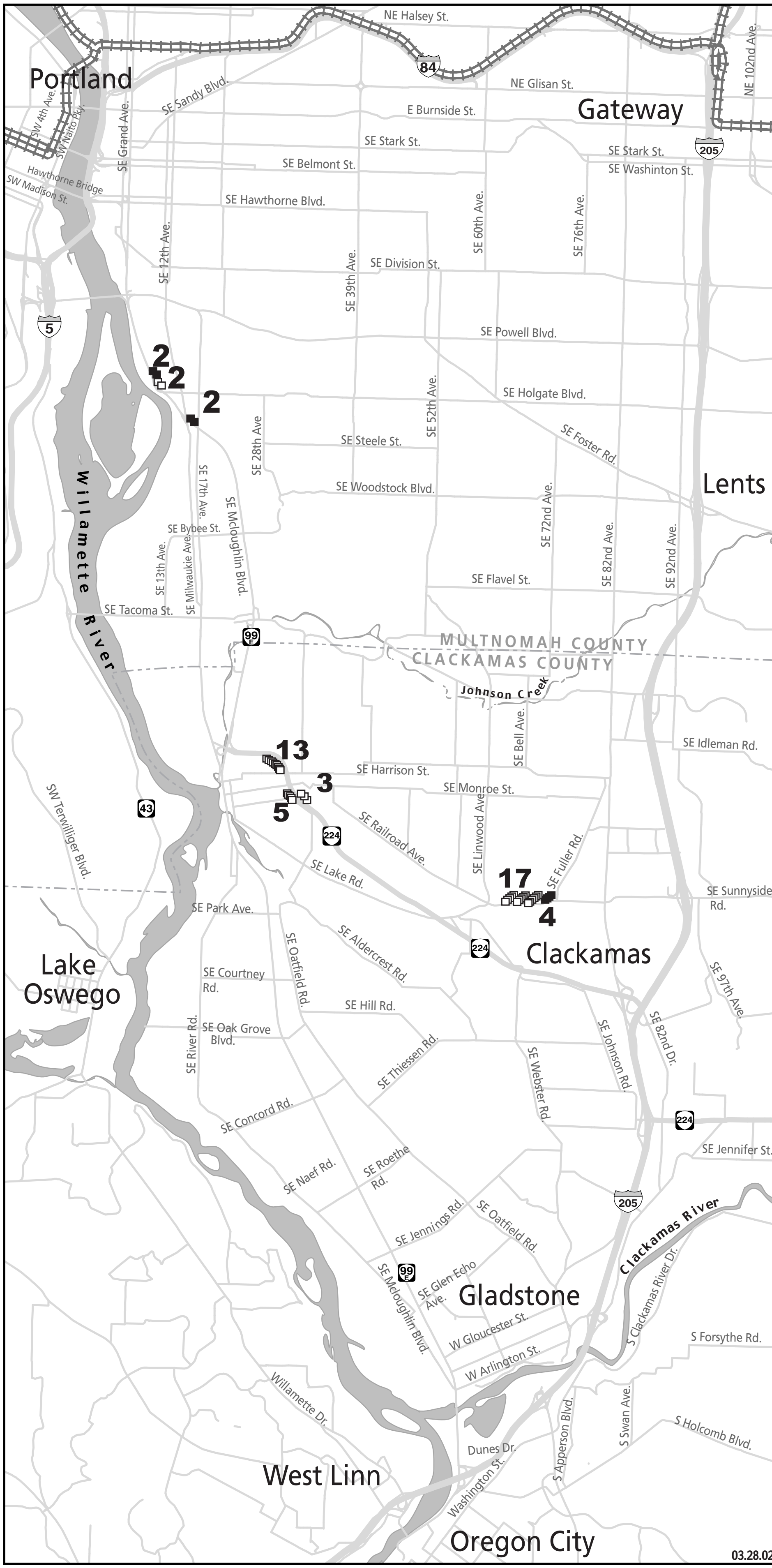
In the Portland to Milwaukie Segment the Busway Alternative noise would impact a residence located at the northwest corner of SE Rhone and SE 17th Avenue with the 17th Avenue Design Option. With the West of Brooklyn Yard Design Option, potential impacts to this dwelling unit would be avoided.

In the Milwaukie to Clackamas Segment noise would impact 13 dwelling units south of Highway 224 between SE Harrison and SE 29th Avenue and 8 units between SE Oak and SE Monroe Streets.. In addition, the Busway Alternative would impact 21 dwelling units along the north side of SE

SOUTH CORRIDOR PROJECT

Noise and Vibration Impact

Figure 3.4-2
BRT Alternative



LEGEND

Noise
- # Number of impacts at that location
- Impact (mitigation feasible)
- Impact (mitigation not feasible)
- Adverse Impact (mitigation feasible)

Vibration
- # Number of impacts at that location
- Adverse Impact (mitigation feasible)

Existing Light Rail

County Line

Note: that some dwelling units are impacted by both noise and vibration

SOUTH CORRIDOR PROJECT Transportation Alternatives

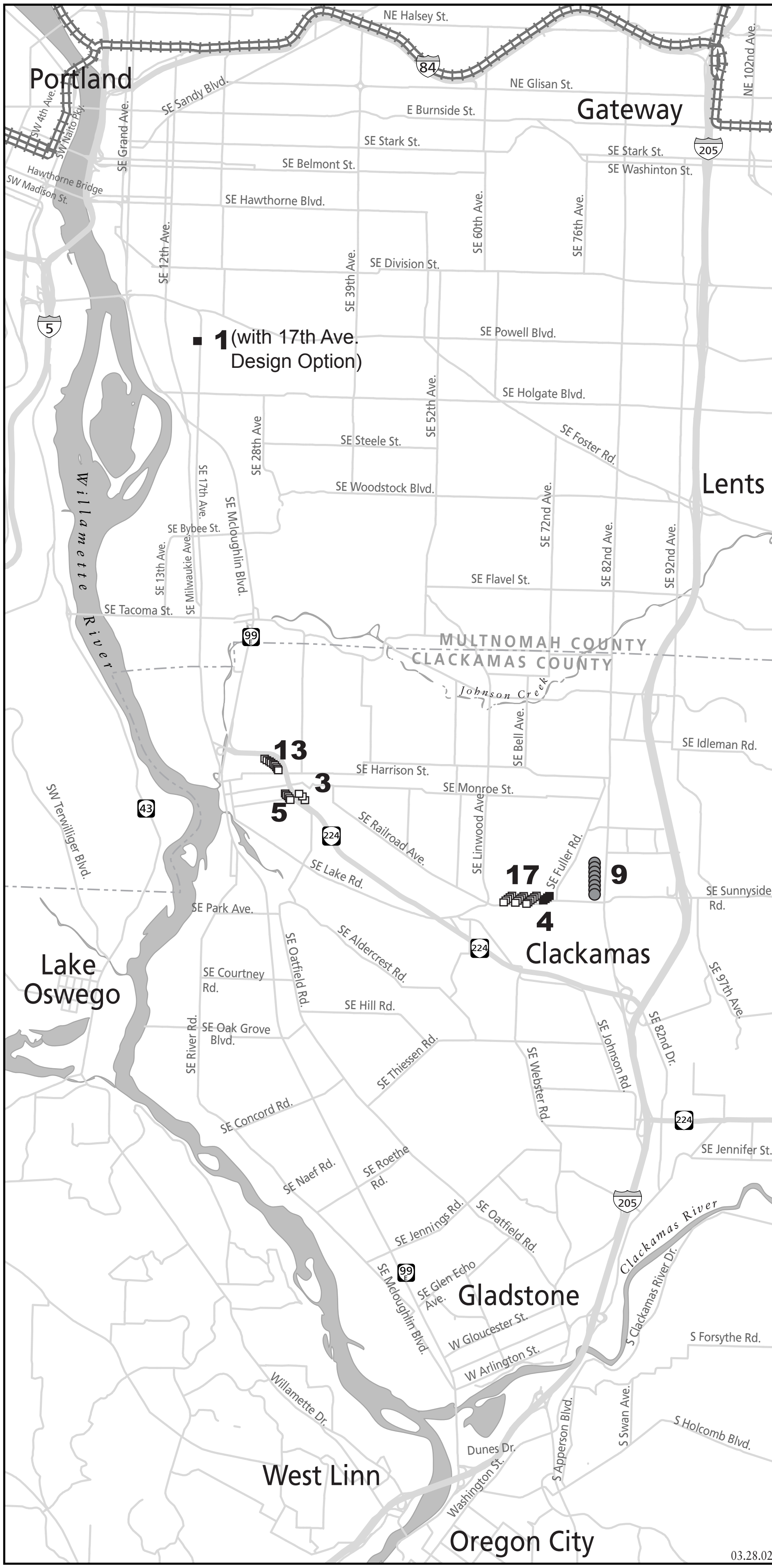
0 1 2 Miles N

METRO

SOUTH CORRIDOR PROJECT

Noise and Vibration Impact

Figure 3.4-3
Busway Alternative



LEGEND

Noise
- # Number of impacts at that location
- Impact (mitigation feasible)
- Impact (mitigation not feasible)
- Adverse Impact (mitigation feasible)

Vibration
- # Number of impacts at that location
- Adverse Impact (mitigation feasible)

Existing Light Rail

County Line

Note: that some dwelling units are impacted by both noise and vibration

SOUTH CORRIDOR PROJECT Transportation Alternatives

0 1 2 Miles N

METRO

Harmony Road between SE Fuller Road and SE Linwood Avenue. These dwelling units would also be impacted under the BRT Alternative.

Traffic noise would increase substantially as a result of Busway operations along SE 80th Avenue between SE Harmony Road and SE McBride Street near Clackamas Town Center. This street segment is currently unimproved and has minimal traffic traveling at relatively low speeds. With the Busway Alternative noise would increase by 10 dBA and would adversely impact nine dwelling units. No noise or vibration impacts were expected for the six park-and-ride facilities associated with the Busway Alternative.

3.4.2.3 Milwaukie Light Rail Alternative

The Milwaukie LRT Alternative includes both light rail operations between Portland to Milwaukie and BRT operations from Milwaukie to Oregon City and Milwaukie to Clackamas Regional Center. Potential noise and vibration impact locations are shown on Figure 3.4-4.

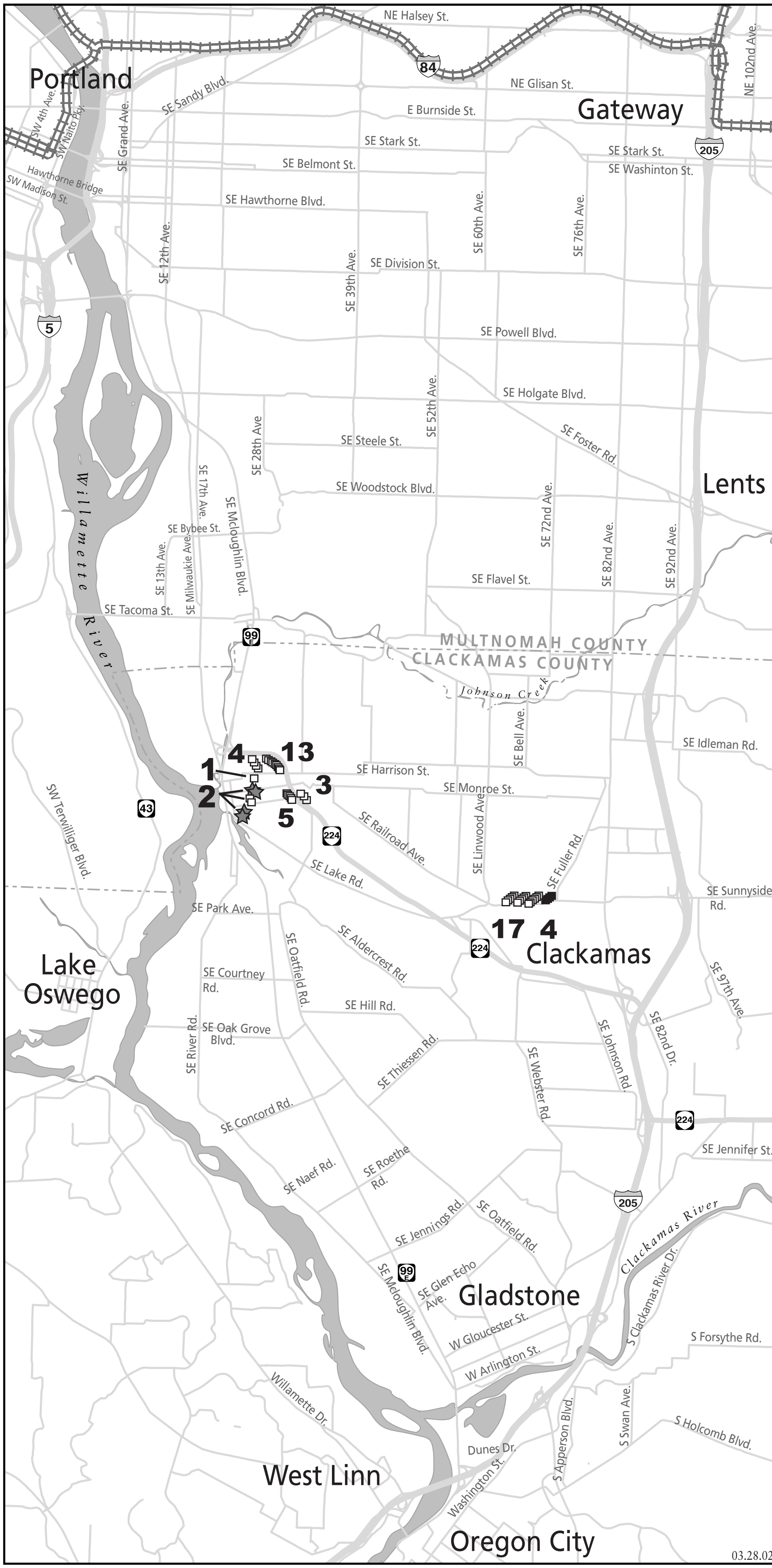
The Milwaukie LRT Alternative would result in potential noise impacts to 49 dwelling units and Milwaukie Middle School. Most of the noise impacts (42) would result from traffic noise associated with bus improvements in the Milwaukie to Clackamas Segment and are identical to those reported for the BRT Alternative. LRT noise would impact Milwaukie Middle School and seven dwelling units: four north of SE Harrison Street and west of the existing Tillamook Branch Line and three on the east side of the Tillamook Branch Line between SE Monroe Street and SE Lake Road. Vibration would impact two dwelling units and two commercial businesses south of SE Monroe Street.

The Tillamook Branch Line Design Option would increase the number of noise impacts by two. Bus noise at the Transit Center located at the Milwaukie Middle School with the Tillamook Branch Line Design Option would create a adverse noise impact. If the Milwaukie Middle School Terminus Option were selected, the impacts south of SE Monroe would be eliminated; however, an additional vibration impact would occur north of SE Harrison Street. The Milwaukie LRT Alternative would not create any ground-borne noise impacts. No noise or vibration impacts were expected for the park-and-ride facilities associated with the Milwaukie LRT Alternative, including Design Options and BRT operations.

3.4.2.4 I-205 Light Rail Alternative

The I-205 Alternative would potentially result in 38 noise impacts and 6 vibration impacts. Four of the noise impacts are related to traffic (auto/bus) and 34 are related to LRT. Twenty-four of the LRT noise impacts are considered adverse. Five of the 24 dwelling units would also experience vibration impacts. The six vibration impacts are at dwelling units. Potential noise and vibration impact locations are shown on Figure 3.4-5.

All of the LRT noise and vibration impacts associated with the I-205 LRT Alternative would occur south of SE Foster Road where reserved transit right-of-way does not exist. Four LRT noise impacts would occur just south of SE Foster Road and east of SE 92nd Avenue. These would not be considered adverse impacts. Sixteen adverse noise impacts would occur to apartment units west of SE 92nd Avenue at SE Crystal Springs Boulevard. Just south of SE Crystal Springs Boulevard, seven LRT noise impacts and two LRT vibration impacts would occur. Three of the seven LRT noise impacts would be considered adverse.



SOUTH CORRIDOR PROJECT

Noise and Vibration Impact

Figure 3.4-4
Milwaukie LRT Alternative

LEGEND

Noise
- # Number of impacts at that location
- Impact (mitigation feasible)
- Impact (mitigation not feasible)
- Adverse Impact (mitigation feasible)

Vibration
- # Number of impacts at that location
- Adverse Impact (mitigation feasible)

Existing Light Rail

County Line

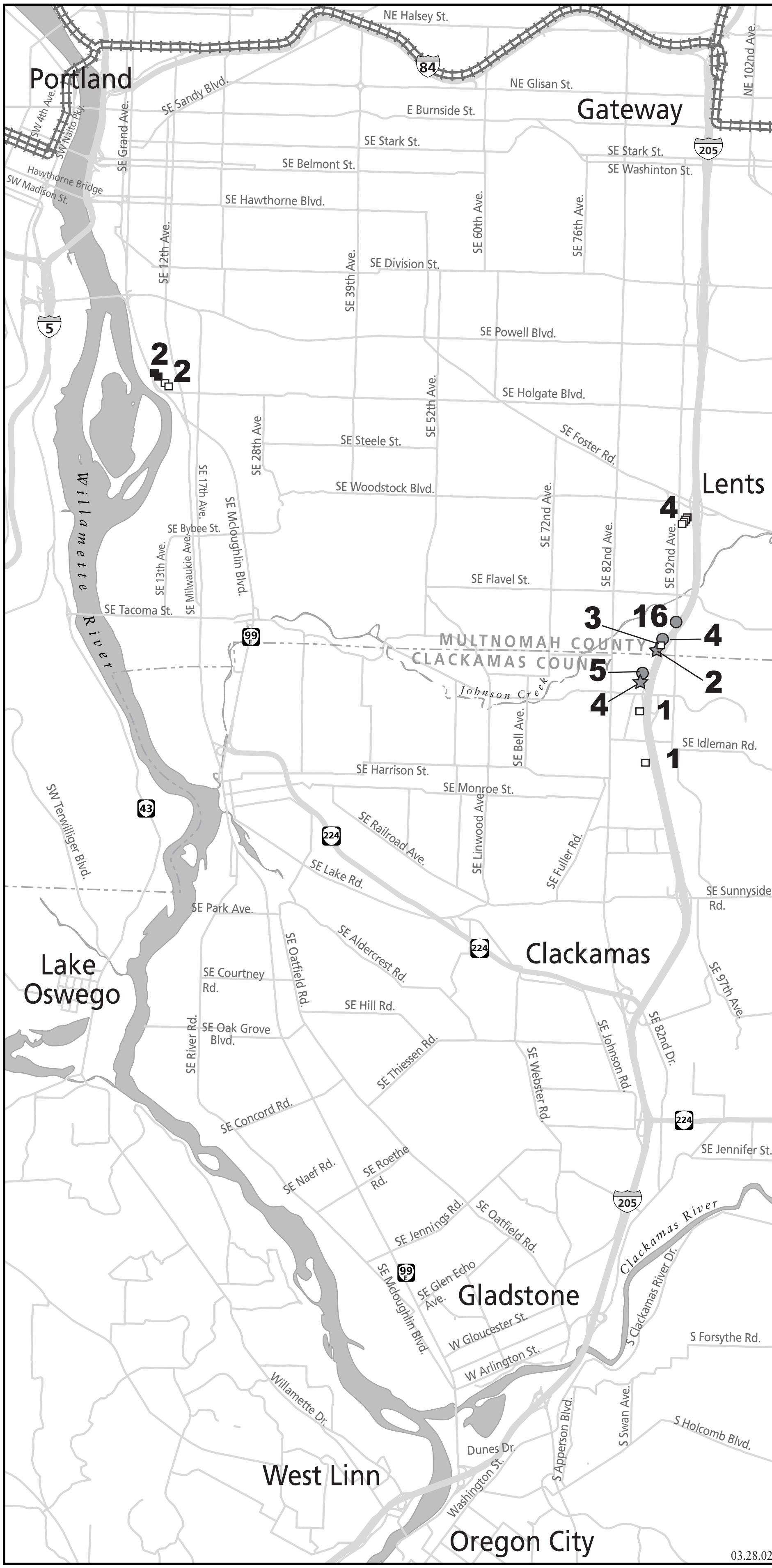
Note: that some dwelling units are impacted by both noise and vibration

SOUTH CORRIDOR PROJECT
Transportation Alternatives

0 1 2
Miles

N

METRO



SOUTH CORRIDOR PROJECT

Noise and Vibration Impact

Figure 3.4-5
I-205 LRT Alternative

LEGEND

Noise
- # Number of impacts at that location
- □ Impact (mitigation feasible)
- ■ Impact (mitigation not feasible)
- ● Adverse Impact (mitigation feasible)

Vibration
- # Number of impacts at that location
- ☆ Adverse Impact (mitigation feasible)

Existing Light Rail

County Line

Note: that some dwelling units are impacted by both noise and vibration

SOUTH CORRIDOR PROJECT Transportation Alternatives

0 1 2 Miles N

METRO

Between SE Johnson Creek Boulevard and SE Clatsop Street, adverse LRT noise impacts would occur at five dwelling units; LRT vibration impacts would also occur at four of these dwelling units. LRT noise would also impact one housing unit north of and one housing unit south of SE Otty Road.

With the bus improvements and operations included in the I-205 LRT Alternative, four dwelling units in the Portland to Milwaukie Segment would require traffic noise abatement evaluation and are located on the east side of SE McLoughlin Boulevard north of SE Holgate Boulevard.

No noise or vibration impacts were expected for the park-and-ride facilities associated with the I-205 LRT Alternative, including Design Options and BRT operations. The I-205 LRT Alternative would not cause ground-borne noise impact impacts.

3.4.2.5 Combined Light Rail Alternative

The environmental consequences of the Combined LRT Alternative would be the combined impacts of the Milwaukie and I-205 LRT Alternatives without BRT operations between Milwaukie and the Clackamas Regional Center or Portland and Milwaukie. No bus or traffic related noise vibration impacts would occur with this alternative. The same LRT noise impacts identified in the previous subsections for the Milwaukie and I-205 LRT Alternatives would apply to the Combined LRT Alternative. Similarly, the vibration and ground-borne noise impacts of the Combined LRT Alternative would be the combined impacts identified for the Milwaukie and I-205 LRT Alternatives.

Because no noise or vibration impacts were expected for the park-and-ride facilities associated with the Milwaukie and I-205 LRT Alternatives, including Design Options and BRT operations, none are expected for the Combined LRT Alternative either.

3.4.3 Short-Term Noise and Vibration Impacts

Noise and vibration related to construction would result from the operation of heavy equipment needed to construct bridges, tunnels, walls, roads, park-and-ride facilities and transit centers. Local ordinances regulate noise and the contractor will be required to adhere to these regulations.

Noise produced by construction equipment used for this project would occur with varying intensity and duration during eight basic phases of construction. Project construction is estimated to take approximately 3 years. Because of the different phases of construction and the large project area, no single location will experience construction noise for the project duration. Noise levels generated by construction equipment (or by any “point source”) decrease at a rate of approximately 6 dB per doubling of distance away from the source (Diehl, 1973). Therefore, at a distance of 100 feet the noise levels will be about 6 dB lower than at the 50-foot reference distance. Similarly, at a distance of 200 feet the noise levels would be approximately 12 dBA lower than at the 50-foot reference distance. Typically, construction noise will occur between the hours of 7 a.m. and 6 p.m. Construction noise after these hours would likely require a local variance to noise regulations.

Below is a list of locations that could experience elevated noise levels due to construction activities by alternative. The BRT Alternative would result in minor demolition and construction activities along the shoulders of SE McLoughlin Boulevard and Highway 224. Noise from the construction of a 600-space parking structure in industrial area north of the Milwaukie CBD and the 600-space structure near SE Linwood Avenue would not likely create short term impacts due the lack of sensitive receptors in immediate vicinity.

The Busway Alternative could result in new bridge near SE 7th Avenue, SE 11th/12th Avenue, SE Powell Boulevard and across Johnson Creek. Pile driving and demolition of existing structures could create short term noise impacts to the Hosford-Abernethy and Brooklyn Neighborhoods. Noise from the earthwork and potential pile driving could potentially create short-term noise impacts on the Linwood neighborhood.

The Milwaukie LRT Alternative could create short term noise impacts due to demolition and re-construction of the proposed bridge over SE Powell Boulevard. Noise from the construction of the Tacoma and Southgate park-and-ride structures would not likely create short term noise impacts since both are located in industrial areas with few sensitive noise receptors located nearby.

The I-205 LRT Alternative could create short term noise impacts adjacent to residences located near the alignment. Noise impacts could result from the operation of heavy equipment needed for grading and the construction of bridges and park-and-ride lots. The potential short term impact would be south of SE Foster Road to SE Johnson Creek Boulevard. Potential mitigation could consist of building any required noise walls early in the construction phase that would protect dwelling units from the long term and short term noise impacts.

3.4.4 Cumulative Noise and Vibration Impacts

Adverse indirect effects are not anticipated as a result of the project. Similarly, the project, when combined with other past, present, and reasonably foreseeable future actions would not cause adverse cumulative noise effects. The project is consistent with all federal, state, and local land use plans. The project would not create unavoidable adverse environmental noise or vibration effects.

3.4.5 Potential Noise Abatement and Mitigation Measures

There are a number of ways to reduce LRT noise and fewer options to reduce motor vehicle noise. These include moving the alignment, constructing a barrier between the receiver and the noise source, and reducing the number of transit vehicles and/or speeds. However, because the project alternatives generally impact more urban environments, these options are more limited than they would be were the project being constructed in sparsely developed and undeveloped areas. For example, the physical separation required to produce a substantial noise reduction is not generally available in a built-up environment where setbacks from the noise source may be minimal. Because an earth berm requires a "footprint" twice as wide as its height, the right-of-way required to construct a berm may not be available adjacent to the noise source. While the more common "thin" or "screen wall" sound barrier (soundwall) might fit the available constrained space, the numerous openings and safety sight-lines required for driveways and cross streets will render such a barrier ineffectual because it cannot provide a substantial reduction in traffic and transit noise. Reorienting an existing building to minimize noise exposure is not generally feasible.

If right-of-way is available to construct a sufficiently long continuous berm or sound wall, these structures can effectively abate noise and mitigate adverse noise effects. A sound-absorbing barrier, or "sound wall," located relatively close to a fixed guideway system along a dedicated right-of-way or on an elevated structure such as an overpass or viaduct can also effectively abate noise. Noise affecting nearly all of the sensitive structures adjacent to the proposed LRT Alternatives could be abated or mitigated by sound walls. However, at one point the tracks in the I-205 LRT Alternative would be so close to an existing dwelling that a barrier required to mitigate the adverse noise effect would be within inches of the building. Potential alternative mitigation measures that could be more appropriate at this location include: 1) acquiring the parcel, removing the sensitive use structure and converting the parcel to a non- or less-sensitive land use; 2) if space allows, relocating or reconstructing the dwelling farther away from the tracks and constructing a feasible noise barrier; or, 3) slightly realigning the tracks to allow more clearance for the noise barrier.

The choice of the location and type of mitigation will be determined during the Final Environmental Impact Statement process and will utilize the Preliminary Engineering designs which will incorporate a higher level of design detail compared to the current conceptual design. The determination on the location and type of noise mitigation will require public input from the local jurisdictions, the affected properties and the public.

Various mitigation measures may be readily incorporated singly or in concert where necessary to reduce ground vibration from LRT vehicles. While it is difficult to reduce vibration from existing highways, this is rarely a problem because ground vibration from highway traffic that propagates to nearby sensitive uses is relatively rare. Table 3.4-2 summarizes the number of dwelling units for which noise and or vibration could be abated or mitigated for the various project alternatives. Figures 3.4-2 through 3.4-5 show the areas where noise abatement actions were evaluated and found to be feasible or not feasible and the areas where adverse effects require mitigation. These findings are discussed by alternative below.

Table 3.4-2
Feasibility of Abatement and Mitigation and Estimated Dwelling Units[1]

Alternative	Feasible					Not Feasible			
	Abatement		Mitigation		Total	Abatement		Mitigation	Total
	Traffic	LRT	Traffic	LRT		Traffic	LRT		
BRT	40				40	8	0	0	8
Busway	38		9		47	5	0	0	5
Milwaukie LRT	38	7[3]		2[3]	47[3]	4	0	0	4
I-205 LRT	2	10		30[4]	42[4]	2	0	0	2
Combined LRT	0	17[3]		32[3,4]	49[3, 4]	0	0	0	0

Notes: Abatement evaluation criteria are applied to dwelling units that approach the impact threshold for consideration of noise mitigation. Mitigation is associated with significant adverse impacts.
[1] Totals based on representative set of design options (See Table 2.2-3). See text for differences due to different set of design options
[2] The total includes some double counting of impacts that would be affected by both LRT noise and LRT vibration.
[3] Two commercial buildings would also be impacted by LRT vibration and Noise abatement evaluation would also be required at Milwaukie Middle School; TC = transit center.
[4] A commercial building and the Kingdom Hall Church would be impacted by LRT vibration.
[5] Feasible noise and vibration mitigation for 5 dwelling units (counted twice).

3.4.5.1 Bus Rapid Transit Alternative

Traffic noise abatement was evaluated for the area adjacent to the northbound side of SE McLoughlin Boulevard between SE Reynolds Street and SE 17th Avenue within the Portland to Milwaukie segment. The evaluation indicated that noise barriers would not be feasible for two of the units because the barrier would need to block driveways or side-street access to achieve at least 5 dBA of noise reduction. Mitigation may be feasible for two dwelling units.

With the BRT Alternative, a traffic noise abatement evaluation would be required for the area adjacent to the southbound side of Highway 224 between SE Harrison Street and the SE 29th Avenue cul-de-sac. Analysis indicates a noise barrier 10 to 12 feet high and approximately 700 feet long adjacent to the shoulder of southbound Highway 224 could sufficiently abate traffic noise for 13 affected dwelling units. Similar noise barriers (570-feet long) south of Highway 224, approximately between SE Oak Street and SE Monroe Street and north of Highway 224 (370-feet long) between SE Oak and SE Penzance Streets, could sufficiently abate the traffic noise for five dwelling units and three dwelling units, respectively.

Traffic noise abatement was evaluated for the area north of SE Harmony Road between SE Fuller Road and SE Linwood Avenue. The evaluation indicated that a noise barrier (1,200-foot long) could be constructed on the north side. A noise barrier would not be feasible to mitigate traffic noise at four dwelling units east of SE 71st Avenue because driveway access onto SE Harmony Road would require breaks in the barrier.

3.4.5.2 Busway Alternative

Noise mitigation was evaluated for the nine affected dwelling units with adverse effects adjacent to the southbound side of SE 80th Avenue between SE Harmony Road and SE McBride Street. The analysis indicated that a noise barrier 6 to 8 feet high and approximately 1,100 feet long adjacent to the shoulder of the southbound Busway lane would be sufficient to mitigate the adverse noise impacts. Traffic noise abatement was evaluated for the area adjacent to the southbound side of Highway 224 between SE Harrison Street and the SE 29th Avenue cul-de-sac. The evaluation indicated that a noise barrier 10 to 12 feet high and approximately 700 feet long adjacent to the shoulder of southbound Highway 224 could sufficiently abate traffic noise for 13 affected dwelling units. Similar noise barriers south of Highway 224, approximately between SE Oak and SE Monroe Streets, and north of Highway 224 between SE Oak and SE Penzance Streets could abate traffic noise for five and three dwelling units, respectively.

Traffic noise abatement was evaluated for the area north of SE Harmony Road between SE Fuller Road and SE Linwood Avenue. The evaluation indicated that a noise barrier (1,200-foot long) could be constructed on the north side. A noise barrier would not be feasible to mitigate traffic noise at four dwelling units east of SE 71st Avenue because driveway access onto SE Harmony Road would require breaks in the barrier. Abatement also would not be feasible for the dwelling unit located on SE 17th Avenue at SE Rhone Street, which would be impacted by the 17th Avenue Design Option, because the barrier would have to block driveways or side-street access to achieve at least 5 dBA noise reduction. The West of Brooklyn Yard Design Option would avoid this impact.

3.4.5.3 Milwaukie Light Rail Alternative

Similar to the BRT Alternative in the Milwaukie to Clackamas Segment, traffic noise abatement was evaluated for the area adjacent to the southbound side of Highway 224 between SE Harrison Street and the SE 29th Avenue cul-de-sac. The evaluation indicated that a noise barrier 10 to12 feet high and approximately 700 feet long adjacent to the shoulder of southbound Highway 224 could sufficiently abate traffic noise for 13 dwelling units. Similar noise barriers south of Highway 224, approximately between SE Oak and SE Monroe Streets and north of Highway 224 between SE Oak and SE Penzance Streets could abate traffic noise for five and three dwelling units, respectively. A barrier on the north side of SE Harmony Road would provide abatement for 17 dwelling units. Noise abatement would not be feasible for four dwelling units on SE Harmony Road east of SE 71st Avenue.

LRT operations would have noise impacts to up to seven dwelling units and Milwaukie Middle School. A preliminary analysis indicated an approximately 6-foot-high sound absorptive barrier adjacent to the tracks near the affected dwelling units and Milwaukie Middle School would sufficiently abate the LRT noise. Alternatively, a landscaped berm could provide abatement where permitted by available space and site geometry. With the Tillamook Branch Line Design Option a noise barrier would be required between the relocated transit center and Milwaukie Middle School.

Adverse rail vibration impacts occur at two dwelling units and at two commercial buildings. Relocating the track crossovers or using special “frogs” to close gaps between running rails could mitigate these impacts; “frogs” reduce vibration to less than significant levels. The two commercial buildings are associated with the Lake Road Terminus Option. The two dwelling units could be mitigated by using resilient direct fixation fasteners. These dwelling units are part of an apartment complex located north of SE Monroe Street and south of SE Harrison Street. With the Milwaukie Middle School Terminus Option these impacts are eliminated, but a track crossover would impact a dwelling unit north of SE Harrison. Moving the track crossover north could mitigate this impact.

3.4.5.4 I-205 Light Rail Alternative

Noise and vibration mitigation is feasible for all but two of the impacted receptors. These are related to traffic noise and the receptors are located north of the intersection of SE Holgate and SE McLoughlin Boulevards.

A traffic noise abatement evaluation was conducted for four houses located north of the intersection of SE Holgate and SE McLoughlin Boulevards in the Portland to Milwaukie Segment. The evaluation indicated that noise barriers would not be feasible for two of the units because the barrier would have to block driveways or side-street access to achieve at least 5 dBA noise reduction. Mitigation may be feasible for two dwelling units.

Mitigation for light rail impacts would be designed to effectively mitigate LRT noise and would not necessarily mitigate for traffic noise from I-205. LRT sound barriers would generally be closer to the tracks and would be lower in height than sound walls designed for highway noise. The I-205 LRT alignment may conflict with noise barriers that ODOT plans to construct along I-205 from Johnson Creek Boulevard to Sunnyside Road in association with a roadway expansion project. The Light Rail Project would be responsible for developing replacement noise mitigation in areas where the project would impact existing or planned noise mitigation. Replacement mitigation will be coordinated with ODOT and will meet FHWA standards for traffic noise and FTA standards for light rail noise.

For the eight dwelling units adversely impacted by LRT noise between SE Crystal Springs Boulevard and SE Otty Road, reductions of 2 to 11 dBA would be required to mitigate the noise levels to below the criteria for severe impact. A preliminary analysis indicates that an approximately 6-foot-high sound absorptive barrier adjacent to the tracks near the affected dwelling units would sufficiently mitigate the LRT noise. Alternatively, a landscaped berm could provide mitigation where permitted by available space and site geometry. A noise absorptive barrier on the LRT structure over SE Crystal Springs Boulevard would mitigate these impacts.

A preliminary analysis indicated that an approximately 6-foot-high sound absorptive barrier adjacent to the tracks near the affected dwelling units would sufficiently abate the LRT noise for the 26 dwelling units impacted by LRT noise. These dwelling units are located between SE Foster Road and just south of SE Otty Road. Sixteen of these dwelling units are apartment units located west of SE 92nd Avenue at SE Crystal Springs Boulevard.

LRT vibration mitigation could include relocating track crossovers or using direct fixation track, special "frogs," vibration mats on top of a concrete pad, or resiliently supported track ties (tie boots) near these receptors. All of the potential impacts could be mitigated through the use of these measures.

3.4.5.5 Combined Light Rail Alternative

The LRT noise and vibration abatement and mitigation described for the Milwaukie and I-205 LRT Alternatives would be applicable to the Combined LRT Alternative. No traffic or bus-related noise abatement or mitigation would be necessary for the Combined LRT Alternative.

3.5 Air Quality

3.5.1 Air Quality Regulations and Standards

This section summarizes relevant air quality regulations and the existing air quality in the Portland metropolitan area. The federal government has established National Ambient Air Quality Standards (NAAQS) to protect the public from air pollution. In addition, the Oregon Department of Environmental Quality (DEQ) has established State Ambient Air Quality Standards (SAAQS) (shown in Table 3.5-1), which are at least as stringent as the NAAQS. The U. S. Environmental Protection Agency (EPA) has delegated air quality program implementation to DEQ.

Table 3.5-1
State and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	Federal	Oregon
Carbon Monoxide	8-hour	9 ppm	9 ppm
	1-hour	35 ppm	35 ppm
Lead	Calendar Quarter	1.5 μg/m^3	1.5 μg/m^3
Ozone	1-hour	0.12 ppm	0.12 ppm
	8-hour*	0.08 ppm	-
Nitrogen Dioxide	Annual Arithmetic Mean	0.053 ppm	0.053 ppm
Sulfur Dioxide	Annual Arithmetic Mean	0.03 ppm	0.02 ppm
	24-hour	0.14 ppm	0.10 ppm
	3-hour	0.5 ppm	0.5 ppm
PM_{10}	Annual Geometric Mean	50 μg/m^3	50 μg/m^3
	24-hour Average	150 μg/m^3	150 μg/m^3
$PM_{2..5}$	3-year Average Annual Arithmetic Mean*	15 μg/m^3	
	3-year Average, 98th Percentile 24-hour Average*	65 μg/m^3	

Sources: EPA Office of Air Quality Planning and Standards (OAQPS) and the Oregon DEQ, 2001.
Note: ppm = parts per million; μg/m^3 = micrograms per cubic meter; PM_{10} = particulates with an aerodynamic diameter of less than or equal to 10 micrometers; $PM_{2.5}$ = particulate with an aerodynamic diameter of less than or equal to 2.5 micrometers.
* EPA promulgated new standards for ozone and $PM_{2.5}$ in September 1997, but these were remanded in May 1999. In March 2002, the D.C. District Court rejected all remaining challenges to both the new ozone and $PM_{2.5}$ standards. The EPA is now preparing programs to implement these new standards as originally promulgated.

The following regulations and regulatory guidance were referenced as part of this air quality analysis:

- Oregon Administrative Regulations (OAR) Chapter 340, Division 252 (OAR 340-252) which establishes criteria and procedures for determining conformity with state or federal implementation plans of transportation plans, programs, and projects funded or approved under Title 23 of the Federal Transit Act.
- OAR 340-202, which establishes ambient air quality standards.
- OAR 340-254, which regulates indirect sources.
- EPA's Guideline for Modeling Carbon Monoxide from Roadway Intersections (November 1992)

Geographic areas in which concentrations of a pollutant exceed the ambient air quality standards are classified as nonattainment (do not attain standards) areas. Areas previously designated as nonattainment that are now in compliance with air quality standards are classified as maintenance areas. Federal regulations require states to prepare State Implementation Plans (SIPs) that identify emission reduction strategies for nonattainment and maintenance areas. The Portland area is an ozone and carbon monoxide (CO) maintenance area. DEQ has identified measures to ensure compliance and maintain healthy air quality in the Portland area.

As a result of the Clean Air Act Amendments of 1990, both Oregon and Washington developed regulations designed to ensure that transportation plans and regionally significant transportation projects are consistent (in conformance) with the SIP. There are two parts to demonstrating conformity for transportation projects. The first requirement is that estimated pollutant emissions remain below the emissions budget for on-road mobile sources to ensure compliance with ambient air quality standards for ozone based on the projects included in the RTP and the Metropolitan Transportation Improvement Program (MTIP). The second requirement for CO non-attainment or maintenance areas is that no individual project may cause a violation of the NAAQS, or an increase in the frequency or severity of an existing violation.

The Milwaukie LRT Alternative is included in the 2000 RTP's Financially Constrained network and in the 2002 Portland area MTIP. Both the RTP Financially Constrained network and the MTIP have been determined to conform with the SIP. The conformity determinations for these plans have been reviewed and approved by FHWA and FTA. The BRT Alternative, Busway Alternative, I-205 Alternative, and Combined LRT Alternative have not been included in a conforming plan. If one of these non-conforming alternatives is included as an element in the Locally Preferred Alternative, the selected alternative would need to be included in a recalculation of regional emissions for the RTP and MTIP. An updated conformity determination would be required prior to completion of a Final Environmental Impact Statement (FEIS).

The hot spots analysis performed for this SDEIS analyzed localized impacts at 11 intersections affected by the various South Corridor Project alternatives and design options. The results of the analysis showed that the NAAQS are not expected to be violated in the design year at any location for any alternative. The analysis included intersections throughout the South Corridor expected to perform poorly based on traffic analysis findings. Additional detailed analysis for specific intersections and interim years may be required for a full conformity analysis of the Locally Preferred Alternative to be prepared and documented in the FEIS.

3.5.2 Air Quality Affected Environment

The main pollutants of concern in the Portland/Vancouver area for large transportation projects such as this are CO and ozone. Air quality has improved in the Portland/Vancouver area since the early 1980s. On April 30, 1997, EPA redesignated the area as a maintenance area for ground level ozone, which contributes to smog. The region received EPA redesignation as a maintenance area for CO in October 1997. Maintenance plans are now in effect for these pollutants to ensure continued compliance with existing standards.

Ozone problems tend to be regional in nature because the chemical reactions that produce ozone occur over a period of time. Volatile organic compounds (VOCs) and nitrogen oxides (NO_x) react with sunlight to produce ozone. Vehicle emissions are the primary source of VOCs and NO_x. Other sources include lawn mowers, other gas-powered tools, and household products and paints, the use of which increases with population growth. High ozone levels typically occur downwind of Portland in Canby, Oregon. Data collected in Canby (which tends to receive the highest concentration of ozone in the region as a result of predominant summer weather patterns) during 1990 through 2001 are summarized in Table 3.5-2. To address the regional nature of ozone formation and expected population growth in the metropolitan area, the implementation of maintenance plans for this pollutant is a coordinated effort between Oregon and Washington.

Table 3.5-2
Ambient Ozone Monitoring Data for Canby, Oregon

Year	Summer Average (ppm)	Highest 1-hour (ppm)	3-Year Mean of the Annual 4th Highest Daily maximum 8-hour Value (ppm)	No. of Days >0.12 ppm
1990	0.029	0.165	-	4
1991	0.030	0.129	0.084	1
1992	0.030	0.126	0.092	1
1993	0.023	0.092	0.078	0
1994	0.029	0.117	0.079	0
1995	0.027	0.099	0.072	0
1996	0.029	0.149	0.084	1
1997	0.025	0.085	0.079	0
1998	0.026	0.137	0.081	3
1999	0.028	0.102	0.073	0
2000	0.025	0.086	0.073	0
2001	0.025	0.099	0.069	0

Source: DEQ, 2002.
Note: ppm = parts per million.
A new ozone standard became effective in September 1997, but was remanded in May 1999. In March of 2002, the D.C. District Court rejected all remaining challenges to the new ozone standard. Under the new standard, 1-hour values would no longer be evaluated for attainment purposes. EPA is now preparing programs to implement the new standards. Future compliance will be assessed using the 3-year average of the fourth highest value.

CO is a pollutant of local concern with highest concentrations usually measured near heavily congested intersections. The focus of the control strategies for carbon monoxide is on reducing emissions from vehicles, the primary source of CO in the Portland metropolitan area. Table 3.5-3 lists recent highest ambient CO concentrations for stations in Portland. DEQ maintains monitoring stations for CO in areas of Portland that typically experience maximum concentrations of CO. The Portland/Vancouver area is currently a designated attainment area for all other pollutants.

Table 3.5-3
Portland [1] Ambient Carbon Monoxide Concentrations (ppm)

Year	Highest 8-hour (ppm)	Second Highest 8-hour (ppm)	Number of Times > 9 ppm [2]
1990	9.0	7.4	0
1991	10.6	9.2	1
1992	8.0	7.8	0
1993	8.7	8.4	0
1994	7.5	6.4	0
1995	7.5	6.6	0
1996	6.6	6.5	0
1997	5.9	4.8	0
1998	4.8	4.6	0
1999	7.5	6.2	0
2000	5.4	4.4	0
2001	4.2	3.9	0

Source: DEQ, 2002.
Note: ppm = parts per million.
[1] Data include highest concentrations measured at monitoring stations in Portland, Oregon.
[2] Non-overlapping 8-hour averages that exceed 9 ppm when rounded to the nearest whole ppm.

As part of the environmental review process for new facilities that will generate additional traffic, Oregon requires an Indirect Source Construction Permit under OAR 340-254-0040. A permit must be obtained if increases in the number of parking spaces at proposed parking facilities exceed specific limits. Within the Portland CO maintenance area, a permit must be obtained for parking lots with more than 1,000 spaces, except within the Central City area of Portland, where the minimum number of spaces is 800. The proposed park-and-ride lot at the Fuller Road Station, included in the I-205 LRT and Combined LRT Alternatives, will have a capacity of 1,000 spaces and will require an Indirect Source Construction Permit. None of the other proposed park-and-ride facilities will require ISCPs. Requirements for the ISCP application are included in OAR 340-254-0060. The ISCP is required prior to construction of a parking facility and is not being prepared as part of this SDEIS, but will be done as part of the FEIS if one of these alternatives is selected.

3.5.3 Air Quality Environmental Impacts

This section summarizes the regional and air quality impacts that would result from the South Corridor alternatives, including changes in the regional pollutant emissions and local impacts at intersections. This section also summarizes the South Corridor Project's compliance with State Air Quality Implementation Plans. Additional details can be found in the *South Corridor Project Air Quality Results Report* (Metro and TW Environmental, November 2002).

3.5.3.1 Long-Term Impacts

A. Regional Impacts

Because the primary pollutants of concern for transportation-related projects are ozone and CO, and the Portland/Vancouver area is a maintenance area for both of these pollutants, regional air quality impacts are measured by forecasting changes in emissions of the ozone precursors (VOC and NO_X) and CO. Estimated regional average weekday emissions of VOC, NO_X, and CO are shown in Table 3.5-4. Regional emissions are expected to decrease for all future conditions relative to existing conditions. Table 3.5-4 shows that VMT increases between the existing (2002) and the future build and no build (2020) scenarios. The table also shows that, despite this increase in vehicle miles over a

20 year period, vehicle emissions are lower in the future. This is possible because the increase in VMT is more than offset by reductions in vehicle emissions resulting from improvements in technology over the same period and more stringent vehicle inspection and maintenance programs in the future.

Table 3.5-4
Estimated Average Weekday[1] Regional Pollutant Emissions by Existing and South Corridor Project Alternatives (tons/day)

Alternative	Daily VMT[2]	VOC	CO	NO_X
Existing Conditions	28,564,500	94.3	629.1	93.4
No-Build	36,344,300	51.0	406.4	65.8
Bus Rapid Transit	36,322,100	50.9	406.2	65.7
Busway	36,315,050	50.9	406.1	65.7
Milwaukie LRT	36,324,100	50.9	406.2	65.7
I-205 LRT	36,278,000	50.9	405.8	65.7
Combined LRT	36,271,000	50.9	405.7	65.7

Source: TW Environmental, Inc., November 2002
Notes: VMT = Vehicle miles traveled; VOC = Volatile organic compounds; CO = carbon monoxide; NOX = nitrogen oxides
[1]Year 2020, except Existing Conditions
[2] Includes Bus VMT. See *Transit Impacts and Travel Demand Forecasting Results Report* (November 2002) for VMT calculations.

B. Local Impacts (Hot Spots)

Local concentrations of CO near intersections will be affected by improvements or degradation in traffic congestion as a result of the South Corridor Project. Localized effects can be expected where an alternative would cause traffic delays, or where park-and-ride facilities cause local increases in traffic volumes. Improvements in CO concentrations would be expected where grade separation or modifications to roadway configurations would improve local traffic conditions. Eleven intersections throughout the corridor were selected for analysis based on their 2020 traffic volumes or level of service (LOS). The selected intersections are those whose conditions will be conducive to high CO concentration impacts for each transportation alternative. CO concentrations were predicted at up to 24 locations near each intersection. The highest CO concentration modeled at each intersection is shown in Table 3.5-5. Both 1-hour and 8-hour CO concentrations were forecast.

The results of the hot spots analysis show that all of the intersections modeled have maximum 1-hour and 8-hour CO concentrations below the NAAQS of 35 ppm and 9 ppm, respectively. In addition, the results show that there will be an improvement or no difference in localized CO concentrations between the existing and the future build conditions for all alternatives. A comparison of the build and no build conditions show that there will be virtually no difference between build and no build conditions for all alternatives. Traffic volumes increase between the existing (2002) and the future build and no build (2020) scenarios. The increased volumes are more than offset by reductions in individual vehicle emissions resulting from technology improvements over the same period. As a result, the estimated 1- hour and 8-hour CO concentrations for future years are lower than existing conditions. The Build Alternatives increase traffic volumes, delay, and queuing when compared to No-Build conditions. However, because future individual vehicle emission rates will be reduced and conditions are already congested at most intersections under the No-Build condition, very little change in CO concentrations is predicted near congested intersections as a result of any Build Alternative.

Table 3.5-5
Highest Projected 8-Hour[1] and 1-Hour
Carbon Monoxide Concentrations Near Intersections (ppm)

Alternative	Existing Conditions		No-Build		Build	
Intersection	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour
BRT						
82nd/Harmony/Sunnyside	7	9	6	7	6	7
McLoughlin/17th/Harrison	6	8	5	7	6	8
Busway						
McLoughin/Milport	5	6	4	5	4	5
Hwy 224/Harrison	5	7	4	6	4	6
Milwaukie LRT						
McLoughin/Milport	5	6	4	5	4	6
17th/Holgate	4	6	4	5	4	6
I-205 LRT						
82nd/Johnson Creek Blvd.	6	8	6	8	6	8
92nd/Foster	5	7	5	7	5	7
Combined LRT						
McLoughlin/Milport	5	6	4	5	4	6
82nd/Johnson Creek Blvd.	6	5	6	8	6	8
17th/Holgate	4	5	4	5	4	6

Source: TW Environmental, Inc., September 2002
Note: Concentrations are expressed in parts per million (ppm)
[1] 8-hour average concentration

C. Operations and Maintenance Facilities

Both bus and LRT maintenance facilities will be regulated under DEQ programs for stationary sources and will be required to obtain permits if emissions exceed certain thresholds. Air Contaminant Discharge Permits (ACDPs) are required either for maintenance facilities where more than 25 automobiles are painted each year or for facilities where emissions exceed certain thresholds. Emissions sources at maintenance facilities typically include painting, vehicle idling, solvent cleaning and fuel storage. Expected activities at each maintenance facility should be analyzed prior to construction or expansion. If the facilities are subject to permitting, permits must be obtained prior to construction.

3.5.3.2 Short-Term (Construction) Impacts

The primary impacts of construction will be the generation of dust from site clearing, excavation, and grading, and impacts to traffic flow in the project area. Traffic congestion increases idling times and reduces travel speeds resulting in increased vehicle emission levels. Construction of concrete structures may have associated dust-emitting sources, such as concrete mixing operations. Stationary sources such as concrete mix plants are generally required to obtained air contaminant discharge permits from the DEQ and to comply with regulations to control dust and other pollutant emissions.

Construction impacts will vary in extent and location, depending on the alternative selected and on weather conditions (rain suppresses dust). Construction impacts would logically be lowest with the No-Build Alternative and slightly higher for alternatives involving structural elements such as elevated crossings.

3.5.3.3 Cumulative Impacts

The forecast traffic volumes used to analyze the air quality impacts of the various South Corridor Project alternatives and design options include traffic from all sources. Background concentrations representing the cumulative emissions of other sources in the area are added into the predicted local concentrations for CO at intersections. Because of these inclusive analysis methodologies, the impacts shown throughout this report section represent cumulative air quality impacts.

3.5.4 Potential Air Quality Mitigation

3.5.4.1 Potential Mitigation for Long-Term Impacts

One of the benefits of mass transportation improvements, such as bus transit improvements or light rail, is reduced automobile vehicle miles traveled. Each of the Build alternatives would reduce VMT when compared with the No-Build Alternative, and would result in a reduction of regional air pollution emissions.

Maintenance facilities would have to comply with stationary source permitting programs designed to prevent adverse environmental impacts from stationary sources; therefore, no adverse impacts are expected as a result of maintenance facility operations.

The results of the local hot spots analysis shows that no exceedances of the CO NAAQS are expected as a result of any project alternative; therefore, no mitigation is required. This analysis included intersections that would potentially be affected by park-and-ride facilities. No localized CO impacts are predicted as a result of the construction of park-and-ride facilities; therefore, no mitigation is needed. An Indirect Source Construction Permit may be required prior to construction of the proposed park-and-ride lot at the Fuller Road Station, included in the I-205 LRT and Combined LRT Alternatives, if either of these alternatives is selected.

3.5.4.2 Potential Mitigation for Short-Term Impacts

Construction contractors are required to comply with state regulations (OAR 340-208-0210) requiring that reasonable precautions be taken to avoid dust emissions. Mitigation measures normally used include applying water or suppressants during dry weather and taking other measures, such as truck and equipment washing, to prevent the transport of dirt and dust from construction areas onto nearby roads. To reduce the effect of construction delays on traffic flow and resultant emissions, when possible, road or lane closures should be restricted to non-peak traffic periods.

3.6 Energy

This section summarizes the energy consumption impacts from the construction and operation of the South Corridor Project alternatives. Both long-term and short-term energy consumption is measured in British thermal units (Btu). One Btu is the quantity of energy necessary to raise one pound of water one degree Fahrenheit at one atmosphere of pressure. For more detailed information, see the *South Corridor Project Energy Impacts Results Report* (Metro and DEA, November 2002).

3.6.1 Affected Energy Environment

3.6.1.1 Existing Energy Consumption Overview

This section generally addresses types, sources, and utilization rates for various energy sources in the Pacific Northwest, including the State of Oregon. The discussion of energy use focuses primarily on fossil fuel and electrical use, and the demand for these resources. Existing (2000) energy consumption by various transportation types (automobiles, trucks, buses, and motorcycles) for the Portland metropolitan area is also characterized. The transportation facility types also include the MAX light rail system and related facilities such as park-and-ride lots and maintenance facilities.

Recent energy price increases and general apprehensions about energy shortages have occurred at the national level, including in the Pacific Northwest. Energy purchases make up a large proportion of the Oregon economy, and energy prices have generally mirrored those of the rest of the nation; in the case of electricity, prices have far exceeded national average increases.

Energy use by source in Oregon in 1997 (OOE, 2000) follows:

- Petroleum – 47 percent
- Electricity – 22 percent
- Natural Gas – 19 percent
- Other (wood, wind, solar, biomass) – 12 percent

Approximately half of the energy demand in Oregon is for transportation, with petroleum accounting for nearly 90 percent of that demand.

3.6.1.2 Existing Transportation Energy Consumption in the Portland Metropolitan Area

Base year (2000) transportation energy consumption in the Portland metropolitan area is summarized in this section, and includes energy used for motor vehicles (including automobiles, light, medium and heavy trucks, buses and motorcycles), the TriMet light rail system, transit vehicle maintenance and the operation of maintenance facilities, and park-and-ride lots. Table 3.6-1 summarizes the daily energy consumption for these activities. Year 2000 total daily transportation energy consumption in the Portland metropolitan area is estimated at 254.546×10^9 Btu.

3.6.2 Energy Environmental Impacts

The following sections focus on:

- Energy that would be consumed during operation of the South Corridor Project build alternatives (long-term impacts),
- Energy that would be consumed during construction of the South Corridor Project build alternatives (short-term impacts),
- Projected long-term energy savings for the transportation system with the operation of the South Corridor build alternatives.

Variations associated with the Design Options would result in only minor differences in energy use (less than 1 percent) on a system-wide level. In general, long-term energy use would increase slightly with those design options that increase transit travel times, and short-term energy use would increase slightly with those design options that have higher capital costs.

Table 3.6-1
Transportation Operations Energy Consumption in 2000/Portland Metropolitan Area

Vehicle Type	Percent of VMT [1]	Daily VMT [1]	Average Fuel Consumption (MPG) [2]	Daily Fuel Consumption (Gallons)	Daily Energy Consumption (Billions of Btu's*)
LD Gas Automobiles	58.6	16,739,000	22.4	747,277	93.410
LD Gas Trucks	20.0	5,713,000	18.8	303,883	37.985
MD Gas Trucks	8.6	2,456,500	13.5	181,963	22.745
HD Gas Trucks	3.5	1,000,000	5.7	175,439	21.930
LD Diesel Automobiles	0.2	57,000	26.7	2,135	0.296
LD Diesel Trucks	0.2	57,000	23.4	2,436	0.338
HD Diesel Vehicles	8.3	2,371,000	5.8	408,793	56.700
Motorcycles	0.6	171,000	50.0	3,420	0.428
Subtotal	100	28,564,500		1,825,346	233.832
MAX LRT System [3]		15,650			0.438
Vehicle Maintenance [4]					
LDV 505 Btu's/Mile					11.396
MDV 1,186 Btu's/Mile					2.913
HDV 1,714 Btu's/Mile					5.778
LRT Maintenance Facility Operation [5]					0.029
Bus Maintenance Facility Operation [5]					0.050
Park-and-Ride Operation [5]					0.007
Total					254.443

Notes: * Btu = British Thermal Unit, Btu/gallon of gasoline = 125,000 (gross), Btu/gallon of diesel = 138,700 (gross)
HD =Heavy Duty, HDV =Heavy Duty Vehicle, LD = Light Duty, LDV = Light Duty Vehicle, MD = Medium Duty,
[1] Metro, 2002
[2] CalTrans, 1997
[3] Calculated as (8.2 kwh/car mile) x (15,650 car miles) x (3,412Btu/kWh)
[4] CalTrans, 1983
[5] TriMet, 2002

3.6.2.1 Long-Term Energy Impacts

Long-term energy impacts would consist of energy consumed for operation of the vehicle transportation system including light rail, buses and vehicles traveling the roadways. The energy consumed by light rail and buses would result from maintenance, repair and operation of the light rail system, and the operations and maintenance facilities and park-and-ride lots used for light rail and buses. Table 3.6-2 summarizes the predicted daily operational energy use for the South Corridor Project Alternatives in 2020. Compared to the No-Build Alternative, all of the Build Alternatives would reduce operational energy use. For example, the No-Build Alternative would consume the

Table 3.6-2
Summary of Daily Transportation Operations Energy Consumption in 2020 (Billion Btu[1])
South Corridor Project Alternatives

Energy Use	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Motor Vehicles	295.482	295.303	295.246	295.320	294.943	294.887
LRT System	0.536	0.536	0.536	0.599	0.645	0.666
Vehicle Maintenance	26.172	26.156	26.150	26.157	26.124	26.119
LRT Maint. Facilities	0.125	0.125	0.125	0.136	0.136	0.136
Bus Maint. Facilities	0.199	0.199	0.199	0.199	0.199	0.199
Park-and-Rides	0.008	0.009	0.010	0.010	0.011	0.012
Total	**322.522**	**322.328**	**322.266**	**322.421**	**322.058**	**322.019**

Sources: DEA 2002, Metro 2002, Tri-Met 2002
[1] Btu = British Thermal Unit. One gallon of gasoline = 125,000 Btu.

most energy, with use peaking at 322.522 x 10^9 Btu/day. The Combined LRT Alternative would consume the least energy, at 322.019 x 10^9 Btu/day. The difference in energy consumption between these alternatives is 503,000,000 Btu, the equivalent of 4,024 gallons of gasoline per day.

3.6.2.2 Short-Term Energy Impacts

Short-term impacts to energy consumption that would occur from construction of the South Corridor Project alternatives are shown in Table 3.6-3. The Combined LRT Alternative would consume the most energy for construction, at approximately 4,874.89 x 10^9 Btu. Of the build alternatives, the BRT Alternative would consume the least amount of construction energy at approximately 630.71 x 10^9 Btu.

Table 3.6-3
Summary of Construction Energy Consumption (Billion Btu[1])
South Corridor Project Alternatives

Construction Component	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Total Construction Energy Demand	0	630.710	1,310.641	2,547.210	2,327.680	4,874.890

Source: DEA 2002, Metro 2002; Tri-Met 2002
1 Btu = British Thermal Unit. One gallon of gasoline = 125,000 Btu.

3.6.2.3 Summary of Energy Impacts

Table 3.6-4 summarizes the combined annual energy use for operation and construction (long-term and short-term impacts) of all the study alternatives.

Table 3.6-4
Summary of Annual[1] Energy Consumption by Alternatives (Billion Btu[2])

Alternative	Motor Vehicle[3] Annual Energy Use	Bus Annual Energy Use	LRT Annual Energy Use	Total Annual Operations Energy	Annual Operational Energy Savings[4]	Total Construction Energy
No-Build	108,588.52	844.22	224.74	109,657.48	0	0
BRT	108,492.30	874.48	224.74	109,591.52	65.96	630.710
Busway	108,468.50	877.20	224.74	109,570.44	87.04	1,310.641
Milwaukie LRT	108,530.04	843.20	249.90	109,623.14	34.34	2,547.21
I-205 LRT	108,386.90	847.28	265.54	109,499.72	157.76	2,327.68
Combined LRT	108,386.22	827.56	272.68	109,486.46	171.02	4,874.89

Sources: DEA, 2002; Metro, 2002; TriMet, 2002
[1]Assumes an annualization factor of 340 days per year.
[2]Btu = British Thermal Unit. One gallon of gasoline = 125,000 Btu.
[3] Not including buses
[4] As compared to the No-Build Alternative

3.6.2.4 Cumulative Impacts

None of the Project alternatives is expected to have a significant cumulative effect on energy supply or consumption at a regional level. Construction and operation of any of the Project Alternatives are not expected to affect local or regional fuel availability, or require the development of new energy sources. Compared to the No-Build Alternative, operation of any of the build alternatives would cumulatively add to the availability of energy by reducing overall VMT and associated energy consumption in the Portland metropolitan area.

3.6.3 Potential Energy Mitigation

One of the goals for the South Corridor Project is to reduce demand for energy. Operation of any of the Build Alternatives would reduce energy consumption for the total transportation system as compared to the No-Build Alternative. Therefore, no mitigation measures are necessary.

3.7 Visual and Aesthetic Qualities

This section summarizes information on the existing visual environment in the South Corridor and the expected visual impacts of the project alternatives. For additional details on the visual analysis, see the *Visual and Aesthetic Impacts Results Report* (Metro and URS, November 2002). *Appendix D, Visual Simulations* contains a number of photographs of several locations in the corridor where project improvements would be constructed with the project alternatives, and photo-simulations that are illustrative of how the same locations could look with the various alternatives.

3.7.1 Affected Visual and Aesthetic Environment

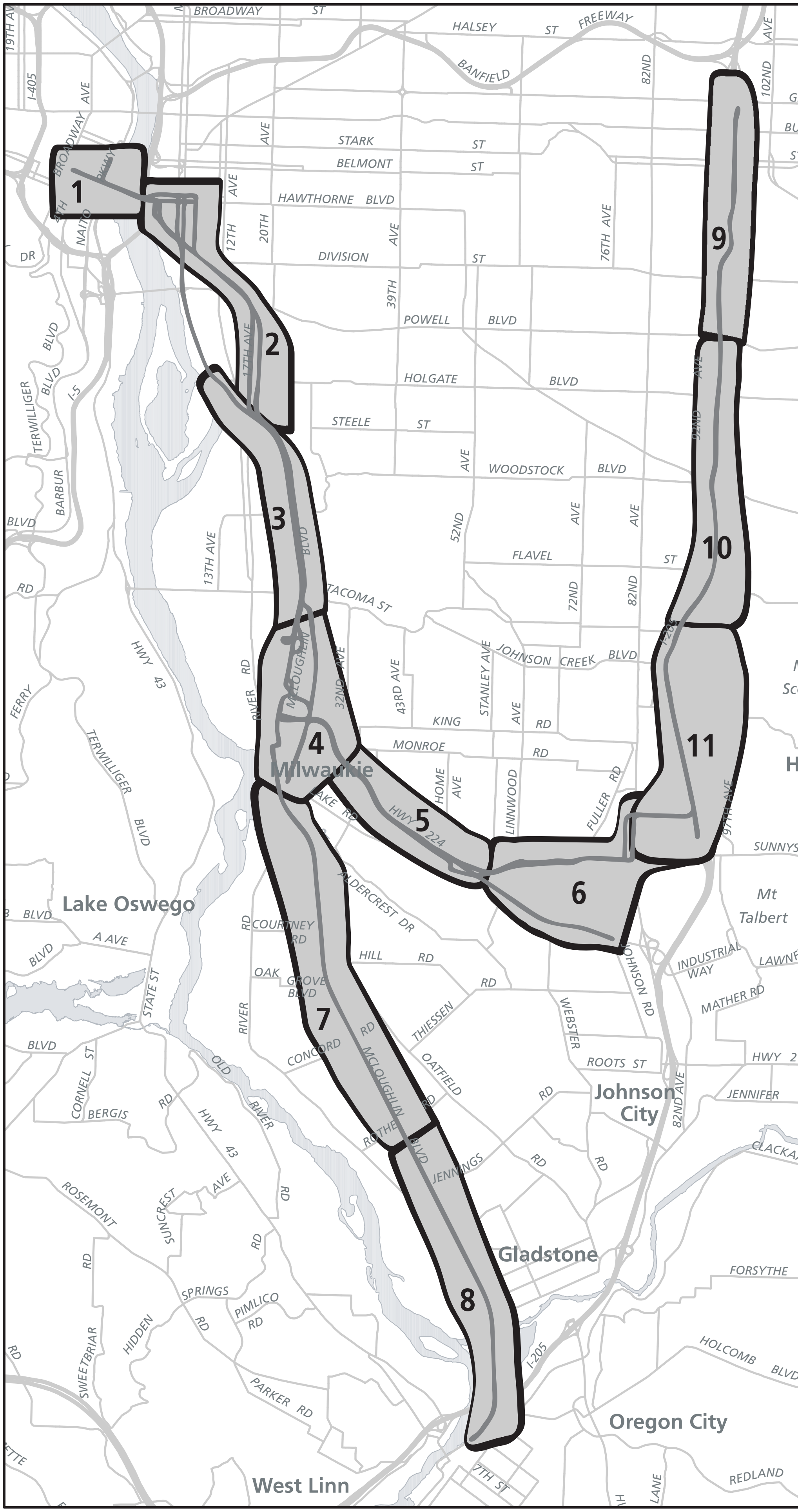
The South Corridor travel shed lies in the northern Willamette River Valley. The visual characteristics of its land form, hydrology, native vegetation and land uses reflect this larger regional landscape. A number of knobby buttes or remnants of volcanic cones, rise above the valley floor in the southern and eastern portions of the Project area. The Cascade Mountains provide a distant backdrop in the east, while the Tualatin Mountains frame the western edge of the view shed.

The Portland region encompasses a variety of towns and suburbs that surround the largest city, Portland. Urban development of the region began in the mid-1800s, with the first major overland immigration to Oregon City. Inner southeast neighborhoods developed steadily between the turn of the century and 1930. Development was closely related to the dense network of streetcars. New thoroughfares, including McLoughlin Boulevard and Highway 224, were created to serve the expanding urban and suburban area. Suburban development moved to the east in the 1920s and escalated after World War II. Older neighborhoods in outer east Portland and Milwaukie share the same streetcar-oriented history and housing stock as many inner neighborhoods, but overall development patterns reflect the later auto-oriented development patterns, including malls and retail or industrial corridors. Today, the Project area is predominantly urbanized. Inner eastside Portland neighborhoods have benefited from a wave of reinvestment, while suburban development is rapidly filling in the less dense southeastern portion of the study area. Regional and local land use plans have identified centers for focused growth and development.

Many of the identified visual resources have been informally identified by neighborhood groups as important neighborhood features, or formally designated in local or state planning documents. Figure 3.7-1 illustrates the geographic boundaries of the visual analysis units, segments, and sub-segments. *Appendix D, Visual Simulations* provides photographs of the existing environment at a number of locations in the corridor.

3.7.1.1 Portland to Milwaukie Segment

The Portland to Milwaukie Segment includes the area from downtown Portland to downtown Milwaukie. The corridor is east of the Willamette River generally along the commercial and industrial development of McLoughlin Boulevard. Dominant and recognized features include the



South Corridor Project

Visual Analysis Sub-segments

Figure 3.7-1

1. Downtown Portland
2. Inner Eastside Portland
3. McLoughlin Boulevard
4. Downtown Milwaukie
5. Highway 224
6. Highway 224 Clackamas
7. Milwaukie
8. Clackamas County
9. Gateway
10. Lents
11. I-205 Clackamas

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SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

skyline of downtown Portland, views of the Willamette River, downtown bridges, and Eastmoreland Park. Throughout the segment the Tualatin Mountains, also known as the West Hills, form the western edge of the view shed. In some places other geologic formations are visible in the distance.

The **Downtown Portland Subsegment** extends from SW Fifth Avenue to the east end of the Hawthorne Bridge. It includes the blocks designated in the Central City Plan as Government Center, historic parks, Tom McCall Waterfront Park, and the Hawthorne Bridge over the Willamette River. Most of this area is just outside the heart of commercial and cultural activity in downtown Portland. The existing MAX light rail line is several blocks to the north, and the bus Transit Mall is on the western edge of the area, on SW 5th and 6th Avenues.

The *Central City Plan* identifies the area between SW 1st Avenue and the west end of Hawthorne Bridge as a Primary View Corridor. It also designates river viewpoints to the north and south from the center of Hawthorne Bridge. Visual resources formally identified in the City's *Scenic Views, Sites, and Drives Inventory* include views of Hawthorne Bridge from the Eastbank Esplanade, the RiverPlace development and Waterfront Park, and Morrison Bridge from the Hawthorne Bridge sidewalk.

The **Inner Eastside Portland Subsegment**, once the core of the city of East Portland, is a mix of working industrial areas and pre-war, streetcar-oriented urban neighborhoods. Some of the most dominant visual features are the transportation infrastructure: the Hawthorne Bridge access ramps, the tall concrete structure of the Marquam Bridge carrying I-5 over the Willamette River, the SE Martin Luther King/Grand Avenue (Highway 99E) couplet and viaduct, SE Powell Boulevard (Highway 26), McLoughlin Boulevard (Highway 99E), and the UPRR lines that run through the area to serve downtown Portland. Most of these thoroughfares now serve as physical and visual barriers between neighborhoods. Other recognized landmarks and views include views across the Willamette River, the contemporary architecture of OMSI, views of the Steel, Marquam, and Ross Island Bridges, downtown Portland, and the Oregon Health and Sciences University (OHSU) and the West Hills.

The McLoughlin Boulevard Subsegment is centered on McLoughlin Boulevard, which separates the inner southeast Portland neighborhoods from the Willamette River. It is the primary traffic corridor between Portland and Milwaukie. North of SE Reedway Street, it is a multi-lane highway fronted with vacant land and auto-oriented development. Access is limited and the adjacent neighborhoods, which include single and multi-family housing of mixed quality and age, are not connected to the highway. South of SE Reedway Street, the character of this highway changes dramatically to that of an urban parkway. Land uses include large parks and golf courses, and the canopies of large deciduous trees frame the road, a change from the concrete and asphalt-dominant environments to the north and south. Established residential neighborhoods are located to both the east and the west. The west coast mainline rail corridor runs parallel to McLoughlin Boulevard. The transportation corridor is wide and also includes trees and wetlands. The pedestrian environment in this portion of the corridor is poor because there are no sidewalks and little connectivity.

Within the corridor, the dominant visual resources are McLoughlin Boulevard, Westmoreland Park, Eastmoreland Golf Course, and mature trees that line the transportation corridor. Because so few roads cross McLoughlin Boulevard and the railroad, those that do are significant. The Tacoma and Bybee Bridges are neighborhood gateways, and both afford scenic views of the surrounding neighborhoods and distant hills.

The Milwaukie Subsegment includes the McLoughlin Industrial and Historic Milwaukie neighborhood units. The two neighborhoods, divided by Highway 224, have distinct characters and land uses. The multi-lane McLoughlin Boulevard bisects both neighborhoods, and is generally surrounded by a loose-knit pattern of industrial, commercial, and office buildings of varying sizes, with large parking areas and a proliferation of lights and utilities. Dominant visual features include McLoughlin Boulevard itself, a row of tall old sequoia trees along the west side of McLoughlin Boulevard, and views of the Willamette River from downtown Milwaukie. The Highway 224 berm forms a visual barrier between the industrial area to the north and downtown Milwaukie.

3.7.1.2 Milwaukie to Clackamas Segment

The Milwaukie to Clackamas segment begins in downtown Milwaukie and ends in Clackamas County's designated Regional Center at the Clackamas Town Center Mall. It moves through the urban northern edge of Clackamas County.

In the **Highway 224 subsegment**, the highway passes through several residential and industrial areas. Commercial nodes exist at major cross-streets. The adjacent residential and office uses are buffered from the highway by vegetation. In general, the corridor is largely suburban and heavily landscaped. The topography generally slopes up to the north and east along the Mt. Scott Creek and Kellogg Lake valleys. A mix of old and new close-knit residential areas, loose-knit industrial and commercial areas of flat-roofed structures, utility lines, and large parking lots characterize the western end. This area includes the Milwaukie Marketplace development, which is the city's commercial core outside of downtown. To the east, Highway 224 is a wide high-speed corridor, with few sidewalks and widely spaced intersections. It is lined with trees, which buffer adjacent development from the wide concrete highway. South of the highway, the residential Lake Road neighborhood sits on a ridge, which creates a visual edge for the area.

Travelers on Highway 224 have foreground views of the highway and its landscaped right-of-way. Though most of the neighborhoods are buffered from the highway, travelers have occasional visual connections with apartment buildings and frequent views of commercial centers. To the east, the visual environment is simpler. Because of the curving nature of the highway, the large number of trees, and the continuous ridge on the south side of the highway, there are few distant views or connections with residential areas. At some points on the eastern end of this subsegment travelers can see Mt. Scott and Mt. Talbert in the distance.

Major structures and landmarks in the **Clackamas Subsegment** include the Harmony School building, branch campuses of Clackamas Community College (CCC) and the Oregon Institute of Technology (OIT), the North Clackamas Aquatic Center (NCAC), Clackamas Town Center, I-205, and the New Hope Church. Development is a mix of single-family homes, apartment complexes, and auto-oriented office and commercial buildings. The intensity of development increases from west to east, culminating in the strip commercial center of SE 82nd Avenue and the Clackamas Town Center.

The topography slopes generally from northeast to southwest. Land drops away more steeply southwest of the NCAC parking lot into the Mt. Scott Creek Valley. Phillips Creek, a small stream typical of stream corridors in the region, flows south past the former Southgate Theater into Mt. Scott Creek. Major roads through this area are heavily traveled. The streetscape consists of wide but discontinuous sidewalks. Within the surrounding neighborhoods, streets are usually narrow with parking on the shoulder, as many lack curbs and sidewalks. Harmony Road and SE 82nd Avenue are dominant surface roads through the subsegment, though I-205 forms the eastern edge of the area.

Views from major roads in the Clackamas Subsegment are often filtered through structures and across parking lots to natural elements. The topography provides prominent views of Mt.Talbert, and more distant views of forested hills to the south and west. Fore- and middle-ground views focus on trees, houses and cars, or views to the back of commercial buildings. Overall, the Clackamas Subsegment is a complex visual environment that lacks an identifiable character and strong connections to the surrounding, more traditionally settled landscape.

3.7.1.3 Milwaukie to Oregon City Segment

In this segment, the corridor is characterized by low-density, suburban, auto-oriented development that lines McLoughlin Boulevard. Almost as uniformly, however, residential neighborhoods lay just beyond this commercial corridor to the east and west. The irregular street grid in the neighborhoods connects older historic buildings and newer subdivisions, as well as several mobile home parks. The dominant landscape characteristics include the hills and Lake Oswego to the west and the Cascades to the distant south. A ridge rises to the east, roughly along SE Oatfield Road. The land slopes down to the west as it moves toward the Willamette River. At the south end of the segment, the land slopes down to the south toward the confluence of the Willamette and Clackamas Rivers.

The **Milwaukie Subsegment** is centered on McLoughlin Boulevard, a regional arterial road that connects suburban Clackamas County with the central city. It begins with a view of the Willamette River on the north end, but to the south the dominant land feature is the ridge that runs parallel to McLoughlin Boulevard, approximately along SE Oatfield Road. The land slopes down from this ridge toward the river on the west. In this area, McLoughlin Boulevard is almost consistently lined with low-density commercial buildings set back from the street with large parking lots in front. Although the subsegment is oriented around McLoughlin Boulevard, it includes several established neighborhoods filled with mature vegetation. The dominant landscape characteristics include the hills of Lake Oswego to the west and distant views of the Cascades to the south. Although development is mostly auto-oriented, some buildings stand out, including the Bomber Restaurant and the Concord School. At the segment's southern end, the McLoughlin Bridge crosses the Clackamas River. The corridor passes by Clackamette Park before ending in downtown Oregon City.

The **Clackamas County Subsegment** spans the area from Ina Avenue to downtown Oregon City. It passes through unincorporated Clackamas County and the Cities of Gladstone and Oregon City. The area centers on the McLoughlin Boulevard corridor, a wide, multi-lane thoroughfare with discontinuous sidewalks and frequent curb cuts. The character and pattern of development is similar to the Milwaukie Subsegment. It includes several established suburban neighborhoods filled with mature vegetation. The dominant landscape characteristics include the hills of Lake Oswego to the west, and the ridge that rises to the east, roughly along SE Oatfield Road. On the subsegment's south end, the environment changes to include parks, a bridge crossing of the Clackamas River, views of the Willamette River and the close-knit development of downtown Oregon City. The land slopes down to the Willamette River and to the south where it converges with the Clackamas River.

3.7.1.4 Gateway to Clackamas Segment

The Gateway to Clackamas Segment follows the I-205 corridor in Outer East Portland and into the rapidly developing Clackamas Regional Center area of northern Clackamas County. The interstate was completed in 1978, and cut a wide swath out of the developing suburban neighborhoods. The highway environment is typical of the interstate system nationwide. The environment is simple but well maintained and generally screens adjacent residential areas from the highway. Most of the land in the right-of-way is landscaped with grass, shrubs, or trees. Some of the residential areas are screened from the highway by sound walls or tall landscaped berms. A bicycle and pedestrian path runs the length of the right-of-way, connecting the adjacent neighborhoods and the major cross-streets.

The regional landscape slopes gently down to the south and includes several significant geographic resources. Rocky Butte is near the north end of the segment. Other formations within proximity of the corridor are Mt. Tabor, Kelly Butte, Mt. Scott, and Mt. Talbert. Mt. St. Helens, the Tualatin Mountains, and Mount Hood and its foothills are visible in the distance from some points.

The **Gateway Subsegment** is an area of regional importance in outer east Portland. Its agricultural history is barely visible; since the 1950s the area has developed as a shopping and service destination and major employment center. It is served by I-205 and I-84. Two TriMet light rail lines and many bus routes serve the Gateway Transit Center. In 1994, Metro designated the Gateway area as a Regional Center, a focus for employment and housing growth and transit- and pedestrian-friendly environments. The area includes the basin surrounding the interstate highway, the associated bike path, and the neighborhoods to the east and west, which are typically moderate-density single-family neighborhoods. The multi-lane, grade-separated interstate freeway is wide and dominates the area. Major roads running perpendicular to the highway—including Burnished Road, SE Stark Street, and Washington Street—all cross over it. There is a pedestrian bridge at SE Main Street.

The highway and related structures dominate the character and foreground views. The highway runs in a trench approximately 20 feet below the grade of local streets. The edges of the corridor are softened by the landscaping, but the visual environment in the corridor is simple. Landmarks include the Gateway Transit Center, Mall 205, and the Portland Adventist Academy and Hospital. As the highway corridor has cut a broad swath from the city, it also opens up views of several significant geographic landmarks, such as Mt. St. Helens, Kelly Butte, and Mt. S The existing MAX light rail line is several blocks to the north, and the bus Transit Mall is on the western edge of the area, on SW 5th and 6th Avenues.

The **Lents Subsegment** is part of the large Lents Neighborhood, which contains newer suburban development as well as pre-war developments built around streetcar service in the early 20th century. What was once the commercial center of Lents, at SE 92nd Avenue and SE Foster Road, is now the redeveloping center of the Metro-designated Lents Town Center and a City of Portland URA. The predominantly single-family residential areas include housing of mixed sizes and ages. In general, the residential areas are visually and physically separated from the highway by high berms. The bikeway runs along the west side of the highway, between the berm and the back yards of adjacent houses.

The interstate corridor is entirely elevated on a concrete structure or fill in this subsegment and access ramps slope down to meet the local cross streets: SE Powell and Holgate Boulevards, SE Foster Road, and SE Flavel Street. Large portions of the excess right-of-way around the highway are landscaped with grass and sparse trees, and the neighborhoods are screened from the highway by sound walls or high berms. A regional bicycle and pedestrian trail, the Springwater Corridor, passes through Lents, as does Johnson Creek. The land rises up to the southeast toward the base of Mt. Scott, the dominant land feature.

The **Clackamas Subsegment** of the I-205 corridor includes the portion of the corridor under the jurisdiction of Clackamas County. Mt. Scott is the dominant topographical feature, rising immediately to the east of I-205. To the southeast, forested Mt. Talbert is clearly visible and to the southwest the land generally slopes down to the Mt. Scott Creek Valley. The interstate separates the neighborhoods from one another. Connections cross only at major east-west roads. Development in this segment visibly conveys the area's history and growth. While there are pockets of pre-war and rural housing, there are also established subdivisions from the 1970s, and new subdivisions of large houses and condominiums. Southeast 82nd Avenue is lined with auto-oriented strip commercial development and the Clackamas Town Center Mall anchors the southern end of the corridor. New Hope Church sits on the east side of the highway overlooking the valley.

Mt. Scott is the dominant topographic visual feature in this subsegment. The northern face of Mt. Scott retains its trees and green character because it is largely occupied by cemeteries. The west and south faces have been developed with housing. Because the land slopes to the west, homes and businesses on the slope have filtered views of development to the west. The *Clackamas County Comprehensive Plan* Scenic and Distinctive Resource Areas map includes views to the southwest from Mt. Scott.

3.7.2 Visual and Aesthetic Impacts

Visual and aesthetic impacts are changes to the existing conditions that may be brought about by construction of the alternatives. These changes may detract from the visual environment or enhance it. Because these are subjective criteria, this assessment focuses on those changes to the visual environment that may be measured in terms of high, moderate, or low impact. Enhancement and detraction are factors that may be affected by subsequent design and mitigation considerations. The major dimensions of the impacts would be determined by the factors shown in Table 3.7-1. For each of the visual changes, the accompanying consideration is the sensitivity of the viewer to the changes. "viewer sensitivity" refers to the preferences, values, and opinions of different groups of viewers. It includes considerations of the length of time for which the project is seen, the distance of the viewer from the project, and the type of viewer (e.g., Neighborhood resident or highway traveler).

Table 3.7-1
Factors Affecting Visual Impacts

High Impact	Moderate Impact	Low Impact*
• Elevated structure	• Minimum grade separation	• At grade/below grade
• Substantial property displacement	• Low property displacement	• Within existing ROW
• Significant new parking	• Minimum parking	• No new parking
• High visual disruption	• Moderate disruption	• Low visual disruption
• Visual connection to neighborhood	• Inconsistent screening of neighborhood	• Screening of neighborhood
• Blocks scenic feature	• Disruption of visual feature	• No change to visual feature
• Removal of all vegetation	• Removal of some vegetation	• Maintains pattern of vegetation
• Changes out of scale to street	• Changes to scale of street	• Maintains existing scale

*Some impacts associated with transportation projects, such as screening, landscaping, lighting, sound walls, and pedestrian and bike improvements, can be a positive improvement in the existing conditions.

In order to help provide a better understanding of how the project alternatives could appear within the corridor, a number of visual simulations have been prepared. The visual simulations that have been prepared are created from a photograph of a specific location within the corridor where project improvements are proposed. The simulation provides an artists photographic alterations depicting how the improvements could look at that particular location. These simulations are developed based on a preliminary level of design (approximately 5-15%) and will likely change as the LPA is selected and various elements of mitigation are developed and the design of the project improvements is further refined. To review the visual simulations refer to *Appendix D, Visual Simulations*.

3.7.2.1 No-Build Alternative

The No-Build Alternative would include transportation improvements as defined in the RTP Financially Constrained network. In the Portland to Milwaukie Segment, the increased frequency of buses on McLoughlin Boulevard would not be a significant change and would not adversely impact sensitive viewers. Other projects and additional development within the Corridor could affect existing visual resources, however, since many of these projects have not been designed, it is difficult to evaluate their visual impacts. The No-Build Alternative (or existing visual landscape) is used as the baseline for comparing other alternatives.

3.7.2.2 Bus Rapid Transit Alternative

Potential impacts of the BRT Alternative in the Portland to Milwaukie Segment are summarized in Table 3.7-2. Impacts in the Portland to Milwaukie Segment would result from the increased frequency of bus service on the Hawthorne Bridge, the realignment of Main Street, and the removal of one structure and addition of a parking structure at the Southgate Transit Center. While the increased bus service on the Hawthorne Bridge is viewed as a low-level impact, the addition of a

Table 3.7-2
Summary of Potential Visual Impacts of the BRT Alternative

Segment/Location	Changing Features	Viewer Sensitivity	Level of Change	Level of Impact
Portland to Milwaukie Segment				
Downtown Portland	Remove parking	Low	Low	Low
Hawthorne Bridge	Increased buses	High	Low	Low
Hawthorne Station	Dislocation of HAND sign, widens road, center platform, sidewalk	Low	Medium	Low
SW Clay Street	Widens ramp, road, and sidewalk	Low	Low	Low
Holgate Station	Widens road; pedestrian improvements; removes building, trees, landscaping	Medium	Medium	Low
17th Station	Corner extension, pedestrian improvements	Medium	Medium	Low
SE Ochoco Street	Station, median	Low	Low	Low
Southgate TC	Parking structure, realign Main St., remove building	Medium	High	Medium
Milwaukie to Oregon City Segment				
Throughout	Bus station, pedestrian improvements, trees	Low	Medium	Low
Park Avenue	Remove buildings, add parking	Medium	Medium	Medium
Naef Road	Widen roadway, remove trees, pedestrian improvements, new trees	Low	Medium	Low
Roethe Road	Widen roadway, remove trees, pedestrian improvements, new trees	Low	Medium	Low
Jennings Avenue	Widen roadway, pedestrian improvements, new trees	Low	Low	Low
Arlington Street	Widen roadway, pedestrian improvements, new trees	Low	Low	Low
Dunes Drive	Widen roadway, pedestrian improvements, new trees	Low	Medium	Low
Milwaukie to Clackamas Segment				
Harmony Station only	Pedestrian improvements, station, removal of vegetation	Medium	Low	Low
Johnson Road P&R	Parking lot	Low	Low	Low
Harmony Station/P&R	Pedestrian improvements, station, removal of vegetation, park and ride	High	Medium	Medium

Source: *Visual and Aesthetic Impacts Results Report* (Metro and URS, November 2002).
Note: High, Medium and Low Impacts are described in Table 3.7-1.

parking structure at the Southgate Transit Center has the potential to change the current development pattern. Impacts in the Milwaukie to Oregon City Segment will result from the planned road improvements (e.g., road widening, building/tree removal and intersection improvements), primarily planned improvements on Park Avenue. Impacts in the Milwaukie to Clackamas Segment appear to be confined to planned improvements along Harmony Road. These improvements would result in the removal of roadside vegetation and the addition of pedestrian facilities and a park-and-ride lot.

3.7.2.3 Busway Alternative

Potential visual impacts of the Busway Alternative are summarized in Table 3.7-3. In general, visual impacts in the Portland to Milwaukie Segment will result from the removal of some existing structures and introduction of large structures related to the operation of the Busway. It is also important to note that the design options that are not grade separated generally have less impact than the grade-separated options, which generally introduce large physical objects/facilities into an established visual landscape. Options that include widening and/or realigning streets have a far greater visual impact than options that simply introduce pedestrian improvements or change existing circulation patterns. For instance, in the Portland to Milwaukie segment the introduction of large grade-separation structures at

Table 3.7-3
Summary of Potential Visual Impacts of the Busway Alternative

Segment/ *Design Option*	Location	Changing Features	Viewer Sensitivity	Level of Change	Level of Impact
Portland to Milwaukie Segment					
Water Avenue	Water Ave.	Ramp	Medium	Medium	Medium
	OMSI Station	Station	Medium	Medium	Low
7th Avenue	7th Avenue	Ramp and structure	Medium	High	High
At-Grade Clinton Station	At Grade Clinton/7th Ave.	Structure, realign road, remove buildings and trees, pedestrian improvements	High	High	High
	At-Grade Clinton	Realign road, remove buildings and trees, pedestrian improvements	High	Medium	Medium
Above-Grade Clinton Station	Above-Grade Clinton/7th Ave	Large structure, realign road, remove buildings and trees, pedestrian improvements	High	High	High
	Powell Boulevard	Over-crossing, sidewalks	Low	Low	Low
17th Avenue	17th Avenue	Widen and realign street, add trees, remove buildings, change development pattern	Medium	High	Medium
	Rhine Street	Building removal, station, new trees, close crossings	Medium	High	Medium
	Holgate Station	Station, remove buildings	Low	High	Medium
West of Brooklyn Yard	Lafayette Street	Station, change circulation	Low	Medium	Low
	Holgate Boulevard	Remove buildings, widen street, new trees and median	Medium	High	Medium
	McLoughlin Boulevard	Remove buildings	Low	High	Medium
	Bybee Boulevard	Station	High	Medium	Medium
	Tacoma Boulevard	New structure, widen road, parking structure	Medium	High	High
	Main Street/Hwy 224	Remove vegetation, change circulation	Medium	High	High
Milwaukie to Clackamas Segment					
	SE Monroe Street	Median	Low	Medium	Low
	Oak Street	Station, removal of landscaping	High	Medium	High
	Freeman Way	Widen roadway, removal landscaping	Low	Medium	Low
	Lake Road	Ramp structure	High	Medium	Medium
Johnson Road P&R	Linwood Station	Pedestrian improvements, station, removal of vegetation	Medium	Low	Low
	Johnson Road	Parking lot	Low	Low	Low
Linwood P&R	Harmony Station	Pedestrian improvements, station, removal of vegetation, park and ride	High	Medium	Medium
	Harmony Road	Widen roadway, remove trees in front of Harmony School	Medium	Medium	Medium
	OIT/CCC	Station, change circulation, widen roadway	Medium	Medium	Medium
	SE 80th Avenue	Frequent buses, widen roadway, change circulation, remove landscaping	High	High	High

Source: *Visual and Aesthetic Impacts Results Report* (Metro and URS, November 2002)
Note: High, Medium and Low Impacts are described in Table 3.7-1.

Seventh Avenue and at Clinton Street have a subjectively higher impact than options that use at-grade features. These visual impacts can be mitigated to some degree through careful and considered designs. These designs should recognize the existing context and scale of the given site.

3.7.2.4 Milwaukie Light Rail Alternative

Potential impacts in the Portland to Milwaukie Segment are summarized in Table 3.7-4. LRT systems elements (i.e., Catenary poles, overhead wires, and a platform) would alter the existing visual environment of the Downtown Portland Subsegment (including the Hawthorne Bridge); however, the new visual landscape would be consistent with the existing LRT environment on First Avenue. Structural retrofit of the Hawthorne Bridge could alter the existing visual environment and formal view of the Bridge; however, if the retrofit maintains the existing visual rhythms of the structure, the retrofit should not be a recognizable change.

Table 3.7-4
Summary of Potential Visual Impacts of the Milwaukie Light Rail Alternative

Design Option	Location	Changing features	Viewer Sensitivity	Level of Change	Level of Impact
	Downtown Portland	Station, remove landscaping, tracks, Catenary system	Medium	High	Medium
	SE Water Avenue	Station	Medium	Low	Low
	SE Clinton Street	Change circulation, station, remove buildings	High	High	High
	SE Powell Boulevard	Bridge	Low	Medium	Low
West of Brooklyn Yard	SE Lafayette Street	Station, remove buildings, change circulation, new corridor	Low	Medium	Low
	SE 18th Ave.	Station, remove buildings, change development pattern	Medium	High	Medium
SE 17th Avenue	17th Ave/ Rhine Street	Station, remove buildings, change circulation	Low	Medium	Medium
	McLoughlin Boulevard	Remove buildings	Low	Medium	Low
	SE Bybee Blvd	Station	High	Medium	Medium
Tillamook Branch Line	SE Tacoma St.	Station, parking structure, remove buildings & vegetation	Medium	High	High
	Tillamook Branch	Catenary system	Low	Low	Low
Southgate Crossover	SE Tacoma St.	Remove buildings, change circulation	Low	High	Medium
	McLoughlin	Intrusion on ODOT building	Medium	Medium	Medium
	Southgate	Station, parking structure, change circulation and development pattern	Medium	Medium	Medium
Milwaukie Middle School Terminus	Harrison Street	Station, remove buildings and parking lot	High	Low	Low
Lake Road Terminus	Lake Road	Station and park-and-ride	High	Low	Medium
Linwood P&R	Lake Road	Park-and-ride, remove buildings, BRT station	Medium	Medium	Medium
Johnson Road P&R	Johnson Road	Park-and-ride, BRT station	Low	Low	Low

Source: *Visual and Aesthetic Impacts Results Report* (Metro and URS, November 2002)
Note: High, Medium and Low Impacts are described in Table 3.7-1.

Visual impacts associated with Inner Eastside Portland Subsegment (with Design Options) would generally be considered positive. LRT improvements such as station design, landscaping, and street-scaping would provide a level of order that does not currently exist. LRT improvements may help to integrate institutional facilities (e.g., OMSI and PCC) into the community fabric. Visual impacts along the east side of McLoughlin Boulevard would be moderate to low. The LRT alignment in this subsegment would provide a visual barrier to travelers along McLoughlin Boulevard, blocking views of industrial land uses and the rail corridor to the east. Visual impacts from LRT alignment to the Westmoreland Golf Course could be mitigated using landscape buffers. Visual impacts along the rest of the Milwaukie LRT Alternative would be low to moderate and result from changes to land use patterns and the selected removal of structures.

3.7.2.5 I-205 Light Rail Alternative

Potential visual impacts associated with the I-205 LRT Alternative are summarized in Table 3.7-5. Visual impacts related to the introduction of LRT to the Gateway to Clackamas Town Center Segment would be expected to be low to moderate because it is an existing transportation corridor. Visual impacts would result from the addition of large grade-separated over-crossing structures at Powell Boulevard, Foster Road, and Johnson Creek Boulevard; the introduction of LRT stations; changes in traffic circulation; changes in development patterns and the removal of selected structures.

Table 3.7-5
Summary of Potential Visual Impacts of the I-205 LRT Alternative

Design Option	Location	Changing Features	Viewer Sensitivity	Level of Change	Level of Impact
	SE Main Street	Station	Medium	Medium	Low
	SE Division Street	Station	Low	Medium	Low
	SE Division Street	Bus pullouts, pedestrian improvements	Medium	Medium	Low
	SE Powell Boulevard	New over-crossing, revised bike path, parking garage	Medium	High	Medium
	SE Holgate Boulevard	Parking garage, station, revised bike path, remove landscaping	Low	High	Low
	SE Foster Road	Overpass, station	High	High	Medium
	SE Harold Street	Overpass	High	Medium	Medium
	Springwater Trail	Crossing gates, Catenary system, tracks	High	Medium	Medium
	SE Flavel Street	Bridge, station, crossing gates	High	Medium	Medium
	E 92nd to 89th Avenues	Remove buildings and trees, new bridge, fill	High	Medium	Medium
	Johnson Creek Boulevard/ Fuller Road	Overhead structure, change in development and circulation, remove buildings and vegetation	High	High	High
	Otty Road	Tunnel, path	Medium	Medium	Low
East of CTC Terminus	Clackamas Town Center	Relocate Transit Center, station	Low	Low	Low
North of CTC Terminus	Clackamas Town Center	Tunnel, redesign Transit Center, relocate road, pedestrian improvements	Medium	Medium	Low

Source: *Visual and Aesthetic Impacts Results Report* (Metro and URS, November 2002)
Note: High, Medium and Low Impacts are described in Table 3.7-1.

The North of CTC Terminus Option would require the removal of trees that currently line Monterey Avenue. The removal of this landscape barrier would make the proposed Transit Center more visible to the neighborhoods north of Monterey Avenue. The pedestrian environment would be improved by clear definition of pathways and by providing additional crossings of Monterey Avenue. The East of CTC Terminus Option could help the visual environment by clearly defining the sense of place created by the proposed station and transit center. These factors, combined with the potential for new mixed-use development, could be viewed as a positive visual impact to this area.

3.7.2.5 Combined Light Rail Alternative

Visual impacts of the Combined LRT Alternative would be the same as described for the Milwaukie LRT and I-205 LRT Alternatives. Impacts are summarized in Tables 3.7-4 and 3.7-5, above.

3.7.2.6 Operations and Maintenance Facilities

The expansion of the LRT operations and maintenance facility at Ruby Junction would require removal of several houses and small businesses and some trees and vegetation. It would alter the development pattern and scale in the area and would result in a different visual environment. However, all of the sensitive viewers (the current residents and employees) would be displaced by the project. The homes are currently surrounded by industrial uses and the new development would not be visible to other neighborhoods. The overall visual impact would be low.

3.7.3 Short-Term Visual and Aesthetic Impacts

Short-term construction-related changes to the existing visual environment would occur with all of the alternatives and design options. The construction-related impacts would be temporary and would be eliminated when the Project is complete. These impacts could include the presence of machinery, staging areas, other required structures or equipment, and activities that would limit or obstruct views or in some way damage neighborhood features identified as contributing to the neighborhood visual character. Construction-related impacts to visual resources could also include the construction materials and debris located near these views, or in areas seen by large numbers of viewers.

3.7.4 Cumulative and Aesthetic Impacts

Cumulative visual impacts would include the impacts of the various alternatives along with other reasonably foreseeable activities in the Corridor that could affect the visual environment. Cumulative impacts could result from planned and market-driven development in the neighborhoods —for example, transportation projects included in the financially constrained RTP would widen some corridors, introduce new structures, and support some changes in the development scale. Associated developments could affect existing development patterns or vegetation patterns. Cumulative impacts that may result would depend on the extent to which land cleared during the construction of the project is redeveloped and the amount of new development and redevelopment that occurs around the project facilities.

3.7.5 Potential Visual and Aesthetic Impact Mitigation

Several types of significant visual impacts have been identified that could occur throughout the Corridor if the various alternatives were constructed. They include:

- Disruptions to neighborhood pattern and scale.
- Manipulation or removal of existing landforms, vegetation and structures.
- Introduction of new elements with prominent visual characteristics, such as overhead structures, retaining walls, Catenary poles and wires, and stations that obstruct visual resources and views.
- Introduction of prominent new elements into viewsheds of formally designated visual resources such as views, viewpoints, or view corridors.

Given the types of visual impacts identified, goals for mitigation of the visual impacts from the proposed alternatives could include the following:

- Enhance design of the project elements to fit the project-related facilities into the existing neighborhood pattern and scale.
- Use project-related facilities to integrate vacant or unused areas into the neighborhood, or to improve the visual character of neighborhood areas along alignment routes.
- Buffer or reduce the loss of visual resources.
- Prevent obstructions or limitations to designated views, view corridors, or viewpoints and important neighborhood features affected by the alignment alternatives.

The goals should be addressed as much as is appropriate to reduce impacts to each affected neighborhood unit. In each affected neighborhood, potential mitigation measures will vary to fit neighborhood scale and character. In some neighborhoods, potential measures could improve the visual character of impacted areas or locations where viewers experience the impacts on a daily or long-term basis. In other areas, project elements would be prominent visual features even with mitigation, and would have significant impacts on visual resources and sensitive viewers.

Representative mitigation measures that could be used to mitigate for long-term visual impacts include:

- Refine the design of ramps and overhead structures to match the scale and character of the existing surrounding environment as practicable.
- Develop the pedestrian circulation network to provide safe and identifiable connections,
- Retain buildings where practicable.
- Use landscaping, berms or fencing to provide a buffer between the project improvements and the neighborhoods where appropriate.
- Implement neighborhood plan recommendations with respect to visual elements and the selected alternative.
- Infill of adjacent land.

Visual Impact mitigation measures will be specifically defined in the FEIS for the LPA.

3.8 Hazardous Materials

Many common industrial and commercial activities use hazardous materials and generate hazardous wastes. They can be products containing hazardous materials that are damaged during shipment, discontinued supplies, products with an expired shelf life, discarded paints, spent solvents, waste degreasers, cleaning compounds, or by-products of chemical processes. For example, a typical commercial automobile maintenance business generates waste oil, heavy metals, battery acids, solvents, and petroleum fuels (e.g., gasoline and diesel fuel). Residential activities may also generate hazardous waste, such as paints containing lead, asbestos insulation, and heating oil tanks. The improper use, storage, or disposal of hazardous wastes can adversely impact the environment.

3.8.1 Federal and State Environmental Databases

The definition of hazardous waste can be found in *40 Code of Federal Regulation (CFR) 261.3*. By definition, wastes are hazardous if: 1) they are listed (specifically named); or 2) they exhibit any of four hazardous waste characteristics (ignitability, corrosivity, reactivity, and toxicity). Federal and state environmental databases were researched for site specific environmental assessment. These databases are discussed below.

3.8.1.1 Environmental Protection Agency Databases

The EPA compiles several lists and databases regarding hazardous materials. These include: 1) properties or facilities that EPA has investigated, or is currently investigating, for a release or threatened release of hazardous substance; 2) identification and tracking of hazardous waste from point of generation to point of disposal; and 3) facility identification, addresses, and parent company.

- **Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS).** CERCLIS is the official repository for site-specific and non-site specific data to support the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). It contains information on hazardous waste site assessment/remediation from 1983 to the present. CERCLIS information is compiled by EPA and used to report official Superfund sites. It helps EPA Regional managers evaluate cleanup actions and track Superfund site plan activities and budgets.

- **Resource Conservation and Recovery Information System (RCRIS).** Small and large quantity generators, transporters, treaters, storers, and disposers of hazardous waste are required to provide information concerning their activities to state environmental agencies. These agencies in turn provide the information to regional and national EPA offices in accordance with the Resource Conservation and Recovery Act (RCRA). The system is primarily used to track handler permit or closure status, compliance with federal/state regulations, and waste handler inventories. It also tracks corrective action, regulation enforcement, and facility management and environmental program progress assessment. Small Quantity Generators (SQG) are facilities that generate less than 2,200 pounds of hazardous waste per month. Large Quantity Generators (LQG) are facilities that generate more than 2,200 pounds of hazardous waste per month.

3.8.1.2 Oregon Department of Environmental Quality Database

DEQ publishes the following environmental listings with information on site names, addresses, environmental site cleanups, and cleanups that have received DEQ approval for no further action.

- **Environmental Cleanup Site Information (ECSI).** The ECSI list contains sites that are, or may be, contaminated and may require cleanup. DEQ adds these sites to the Confirmed Release List (CRL) and the Confirmed Release List Inventory (CRLI) when it determines they meet the respective criteria for listing.

- **Leaking Underground Storage Tank (LUST).** The LUST list is a compilation of site names and addresses for sites that contain reported leaking underground storage tanks.

- **Underground Storage Tank (UST).** The UST list is a compilation of site names, addresses, and tank information on USTs registered with DEQ. This database does not indicate whether a spill or release has occurred.

3.8.2 Affected Hazardous Materials Environment

This section provides a list of identified hazardous material sites within 500 feet of the Project alternatives based on a review of the federal and state databases. The sites were identified as having a potential to impact the Project alternatives. Table 3.8-1 shows the number and type of known hazardous material sites and facilities within 500 feet of the alternatives by segment. A detailed list

Table 3.8-1
Hazardous Material Sites in the South Corridor Affected Environment[6]

Segment	CERCLIS[1]	ECSI[2]	RCRIS[3]	LUST[4]	UST[5]
Portland to Milwaukie	1	26	82	142	101
Milwaukie to Clackamas	0	13	28	36	33
Milwaukie to Oregon City	0	11	25	74	70
Gateway to Clackamas	0	1	6	31	19
LRT Expansion Facility	0	1	4	4	5
Total	**1**	**52**	**145**	**287**	**228**

Source: Environmental Data Resources, April 2002 and the *South Corridor Project Hazardous Materials Impacts Results Report* (Metro and URS, November 2002)
[1] CERCLIS = Comprehensive Environmental Response, Compensation and Liability Information System
[2] ESCI = Environmental Clean-up Site Inventory
[3] RCRIS = Resource Conservation and Recovery Information System
[4] LUST = Leaking Underground Storage Tanks
[5] UST = Underground Storage Tank
[6] Affected Environment is defined as hazardous material sites located within 500 feet of the Project alternatives.

of the identified sites is included in the *South Corridor Project Hazardous Materials Impacts Results Report* (Metro and URS, November 2002). General locations of the hazardous materials sites identified in the corridor are shown on Figure 3.8-1.

3.8.2.1 Portland to Milwaukie Segment

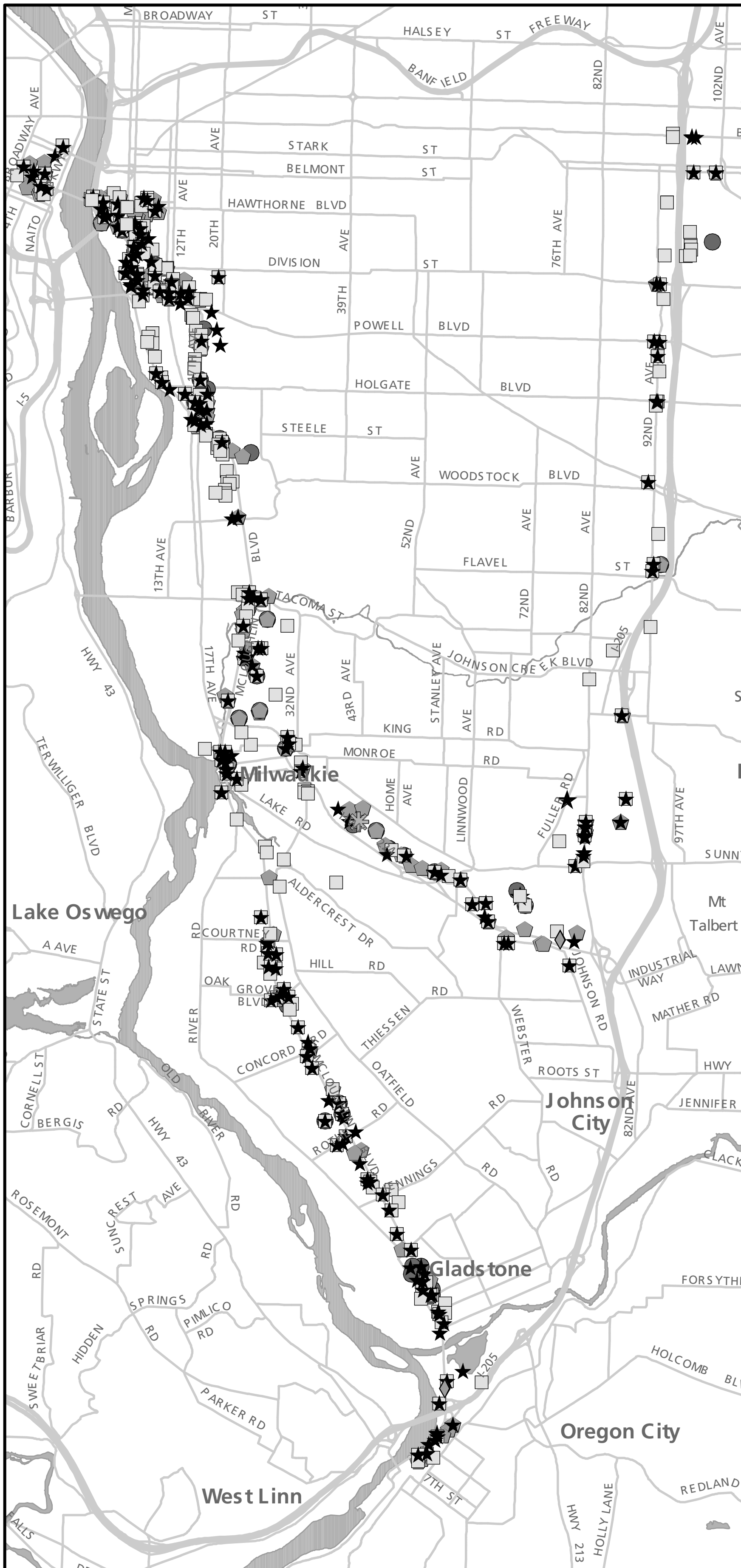
Several hazardous material sites are located in the downtown Portland area, primarily related to retail gasoline USTs and past industrial practices. Many of these sites have already completed remediation activities and will not impact the Project alternatives. The CEID is an area of concentrated light industrial/warehouse uses where current and past practices include the use of hazardous materials. Identified hazardous material sites in this area reflect these industrial uses. Concerns in this area are primarily ECSI sites and UST sites used for retail gasoline sales. Residential, industrial, and retail uses along the freight railroad and Highway 99E have resulted in heating oil tanks associated with the residential uses and contamination associated with past practices and spills at industrial and railroad sites. One identified CERCLIS and ECSI site (PECO) is located in the Portland to Milwaukie segment.

In the Portland to Milwaukie segment, 26 identified ECSI sites are in proximity to the Project alternatives. These sites include maintenance and manufacturing facilities and the Brooklyn rail yard. Groundwater and soil contamination consists of chlorinated and petroleum-based solvents, petroleum products, and polychlorinated biphenyls (PCBs). Of 82 identified RCRIS sites in proximity to the Project alternatives in the Portland to Milwaukie segment, 10 are listed as LQGs. Examples include plating and anodizing facilities and a paint manufacturing facility. Of 142 identified LUST sites in proximity to the Project alternatives in the Portland to Milwaukie segment, 34 are listed as being associated with heating oil tank releases. The remainder are associated with gasoline and diesel USTs at service stations and manufacturing and industrial facilities.

3.8.2.2 Milwaukie to Clackamas Segment

Hazardous materials sites in the Milwaukie to Clackamas Segment are related to industrial manufacturing facilities and service stations. Along Highway 224, land use is primarily commercial and light industrial, surrounded by single-family residences. Industrial use is concentrated along International Way, north of Highway 224 near the SE Freeman Way intersection. Land use along Harmony Road is predominantly single-family residences and undeveloped. Land use along SE 82nd Avenue near Clackamas Town Center is concentrated retail commercial. Along Monterey Avenue, land use is multi-family residential to the north and commercial/parking to the south. Near the New Hope shared-use park-and-ride lot, land use is predominantly single-family residential and institutional.

In the Milwaukie to Clackamas Segment, no CERCLIS sites are identified in proximity to the Project alternatives. The 13 identified ECSI sites in proximity to the Project alternatives include service stations, a car wash, and industrial facilities. Groundwater and soil contamination consists of chlorinated solvents, petroleum hydrocarbons, and metals. Of 28 identified RCRIS sites in proximity to the Project alternatives, the majority SQGs, including service stations, manufacturing facilities, and a department store. There are 36 identified LUST sites in proximity to the Project alternatives in the Milwaukie to Clackamas Segment. Eight of the 36 LUST sites are associated with heating oil tank releases. The remaining sites are associated with gasoline and diesel fuel USTs at service stations, government buildings, and commercial and industrial facilities.



South Corridor Project

Hazardous Waste Sites

Figure 3.8-1

Hazardous Materials*

- ▲ CERCLIS
- ● ECSI
- □ LUST
- ⬟ RCRIS
- ★ UST
- ✳ LQG
- ◊ SQG

*Inventory was conducted for areas within 500' of South Corridor alternatives and options

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

0 1 2
Miles

December 2002

3.8.2.3 Milwaukie to Oregon City Segment

Land use in the Milwaukie to Oregon City Segment is primarily commercial, light industrial, and residential. Hazardous materials sites in this segment are typically state-listed hazardous waste sites and USTs for retail gasoline sales and residential heating oil.

No CERCLIS sites are in proximity to the Project alternatives in this segment. The 11 identified ECSI sites in proximity to the Project alternatives include dry cleaners, automobile dealerships, and other commercial facilities. Groundwater and soil contaminants consist of chlorinated and petroleum solvents, formaldehyde, petroleum hydrocarbons, and metals. There are 25 identified RCRIS sites in proximity to the Project alternatives. The majority of these sites are listed as SQGs and include dry cleaners, auto repair facilities, service stations, automobile dealers, and other industrial facilities. Of the 74 identified LUST sites in proximity to the Project alternatives, the majority are associated with gasoline and diesel USTs at service stations, automobile repair facilities, automobile dealerships, a sewage treatment plant, a department store, and a fire station. Ten of the 74 sites are listed as being associated with heating oil tank releases. There are 70 identified UST sites in proximity to the Project alternatives; the majority of these are listed as decommissioned.

3.8.2.4 Gateway to Clackamas Segment

Hazardous material sites in the Gateway to Clackamas Segment related primarily to heating oil tanks and USTs. There are some light industrial uses in the vicinity of I-205. When I-205 was constructed, hazardous material sites were not regulated and a number of residences and other structures were displaced. As a result, there may be unrecorded sites in the I-205 right-of-way.

No identified CERCLIS sites are in proximity to the Project alternatives. Apollo Metal Finishing Inc. is the only identified ECSI site, and there are six identified RCRIS sites. None of these is listed as a LQG. The RCRIS sites include a service station, retail properties, and three industrial facilities. Of the 31 identified LUST sites in proximity to the Project alternatives, 9 are listed as heating oil tank (HOT) release sites. The remaining LUST sites are retail properties, gasoline and diesel service stations, and maintenance facilities. There are 19 identified UST sites, including industrial facilities, gasoline and diesel service stations, and maintenance facilities.

3.8.2.5 Light Rail Operations and Maintenance Facility Expansion

Construction of any of the LRT Alternatives would require an expanded light rail operations and storage facility at TriMet's Ruby Junction facility for between 33 and 46 additional light rail vehicles, depending on the alternative selected. Up to 15 properties along NW Eleven Mile Avenue could be displaced by construction of the expanded facility. The existing land use on these properties is primarily industrial and storage. In anticipation of expanding the Ruby Junction facility, TriMet has purchased these properties as they have become available. TriMet would generally perform a Phase I Environmental Site Assessment if hazardous materials were thought to be on the sites.

No identified CERCLIS sites are located in the vicinity of Ruby Junction. One ECSI site is located approximately 400 feet north of the expansion area. Four RCRIS sites are located near the facility, but none of these would be displaced by the expansion. Four LUST sites in proximity to this site have received letters of No Further Action (NFA) from DEQ; all of these sites could be displaced by the facility expansion. None of the five identified UST sites identified near the facility would be displaced.

3.8.3 Hazardous Materials Environmental Consequences

This section presents the analysis of potential effects associated with identified hazardous material sites. Construction and operation of a given alternative could increase the risk of adverse environmental impacts and liability associated with any hazardous materials. The potential for impacts was assessed based on the types of hazardous materials present, or potentially present, and their location with respect to the proposed alternatives. The potential long- and short-term impacts associated with each alternative are discussed in the following sections. The analysis identifies sites that could be displaced by or are located near the Project alternatives. "Displaced" refers to sites that would be completely or partially removed by (or acquired for) an alternative, and "near" refers to sites within 500 feet of an alternative. Table 3.8-2 shows the relative number of hazardous material sites that could be affected by the Project alternatives by type of hazardous material site and by segment. Table 3.8-3 shows the number of hazardous material sites in the South Corridor by alternative, segment, and design option.

Table 3.8-2
Hazardous Material Sites in the South Corridor by Alternative and Segment

	CERCLIS[1]		ECSI[2]		RCRIS[3]		LUST[4]		UST[5]	
Alternative/Segment	Displaced	Near	Displaced	Near	Displaced	Near	Displaced	Near	Displaced	Near
Bus Rapid Transit		**1**	**6**	**30**	**8**	**88**	**36**	**147**	**36**	**115**
Portland to Milwaukie		1		12	1	52	2	80	3	56
Milwaukie to Clackamas				13		19	2	27	1	21
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
Busway	**1**		**11**	**31**	**15**	**94**	**47**	**145**	**47**	**107**
Portland to Milwaukie	1		5	14	6	58	10	85	11	51
Milwaukie to Clackamas				12	2	19	5	20	4	18
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
Milwaukie Light Rail	**1**		**13**	**35**	**15**	**93**	**44**	**152**	**44**	**110**
Portland to Milwaukie	1		7	17	8	57	10	85	11	51
Milwaukie to Clackamas				13		19	2	27	1	21
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
I-205 Light Rail		**1**	**6**	**18**	**8**	**75**	**36**	**149**	**36**	**112**
Portland to Milwaukie		1		12	1	52	2	80	3	56
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
Gateway to Clackamas				1		6	2	29	1	18
Combined Light Rail	**1**		**13**	**23**	**15**	**80**	**44**	**154**	**44**	**107**
Portland to Milwaukie	1		7	17	8	57	10	85	11	51
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
Gateway to Clackamas				1		6	2	29	1	18

Source: Environmental Data Resources, April 2002, and *Hazardous Materials Impacts Results Report*, June, 2002
Notes: Displaced = sites that would be acquired, at least in part, for the alternative, Near = site within 500 feet of, but not displaced by, the alternative.
[1] CERCLIS = Comprehensive Environmental Response, Compensation and Liability Information System.
[2] ESCI = Environmental Clean-up Site Inventory.
[3] RCRIS = Resource Conservation and Recovery Information System.
[4] LUST = Leaking Underground Storage Tanks.
[5] UST = Underground Storage Tanks.

3.8.3.1 No Build Alternative

The No-Build Alternative would not increase the risk associated with known hazardous materials as a result of improvements in the project corridors. Displacements of buildings and removal of soil associated with new construction would not occur; therefore, there would be no project-related impacts to hazardous materials sites. However, any existing impacts associated with hazardous waste, such as leaking underground storage tanks and other contaminated sites, would continue.

Table 3.8-3
Hazardous Material Sites in the South Corridor by Alternative, Segment and Design Option

Alternative/*Segment*/Option	CERCLIS[1]		ECSI[2]		RCRIS[3]		LUST[4]		UST[5]	
	Displaced	Near	Displaced	Near	Displaced	Near	Displaced	Near	Displaced	Near
Bus Rapid Transit	**0**	**1**	**6**	**30**	**8**	**88**	**36**	**147**	**36**	**115**
Portland to Milwaukie		1		12	1	52	2	80	3	56
Milwaukie to Clackamas				13		19	2	27	1	21
Linwood P&R Lot DO				5		12	2	12	1	14
Johnson Rd P&R Lot DO				4	1	14	1	15	2	12
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
Busway	**1**	**0**	**11**	**31**	**15**	**94**	**47**	**145**	**47**	**107**
Portland to Milwaukie	1		5	14	6	58	10	85	11	51
Water Avenue DO				3		13	1	16	1	15
7th Avenue DO				3		15		24		20
At-Grade Station DO			1		3	9	4	17	3	9
Above-Grade Station DO			1		3	9	4	17	3	9
17th Avenue DO	1		4	6	2	11	4	24	6	9
W of Brooklyn Yard DO		1	5	5	9	4	6	21	6	10
Milwaukie to Clackamas				12	2	19	5	20	4	18
Linwood P&R Lot DO				4	2	11	5	8	4	11
Johnson Rd P&R Lot DO				4	1	14	1	15	1	16
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
Milwaukie Light Rail	**1**	**0**	**13**	**35**	**15**	**93**	**44**	**152**	**44**	**110**
Portland to Milwaukie	1		7	17	8	57	10	85	11	51
17th Avenue DO	1		4	6	2	11	4	24	6	9
W of Brooklyn Yard DO		1	5	5	9	4	6	21	6	10
SG Crossover DO			2	6	2	16	1	7	2	7
Tillamook BL DO				3		12		9		6
Lake Road TO						1		6		5
MMS TO						0		1		
Milwaukie to Clackamas				13		19	2	27	1	21
Linwood P&R Lot DO				5		12	2	12	1	14
Johnson Rd P&R Lot DO				4	1	14	1	15	2	12
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
I-205 Light Rail	**0**	**1**	**6**	**18**	**8**	**75**	**36**	**149**	**36**	**112**
Portland to Milwaukie		1		12	1	52	2	80	3	56
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
Gateway to Clackamas				1		6	2	29	1	18
East of CTC TO						1				1
North of CTC TO					1				1	
Combined Light Rail	**1**	**0**	**13**	**23**	**15**	**80**	**44**	**154**	**44**	**107**
Portland to Milwaukie	1		7	17	8	57	10	85	11	51
17th Avenue DO	1		4	6	2	11	4	24	6	9
W of Brooklyn Yard DO		1	5	5	9	4	6	21	6	10
SG Crossover DO			2	6	2	16	1	7	2	7
Tillamook BL DO				3		12		9		6
Lake Road TO						1		6		5
MMS TO								1		
Milwaukie to Oregon City			6	5	7	17	32	40	32	38
Gateway to Clackamas				1		6	2	29	1	18
East of CTC TO						1				1
North of CTC TO					1				1	

Source: Environmental Data Resources, April 2002, and *Hazardous Materials Impacts Results Report*, July 2002.
Notes: Displaced = sites that will be displaced by or acquired for the alternative. Near = site within 500 feet of the potential alternative but not displaced by the alternative. W = west; DO = design option; w/ = with; TO = terminus option; SG = Southgate; MMS = Milwaukie Middle School; BL = branch line; LRT = light rail transit; CTC = Clackamas Town Center.
[1] CERCLIS = Comprehensive Environmental Response, Compensation and Liability Information System.
[2] ESCI = Environmental Clean-up Site Inventory.
[3] RCRIS = Resource Conservation and Recovery Information System.
[4] LUST = Leaking Underground Storage Tanks.
[5] UST = Underground Storage Tanks.

3.8.3.2 BRT Alternative

Portland to Milwaukie Segment

One CERCLIS site (PECO) would be located adjacent to the BRT Alternative. Chlorinated solvent contamination was detected in the groundwater in the vicinity of the facility. This site poses the potential for long-term impacts; further assessment is warranted. Twelve identified ECSI sites are in proximity to the BRT Alternative; however, none of the ECSI sites would be displaced. Eight ECSI sites adjacent to the BRT have not received letters of No Further Action (NFA) from DEQ. Further assessment may be warranted. The four remaining sites are some distance from the Project alternatives. Fifty-three identified RCRIS sites are in proximity to the BRT Alternative; one site would be displaced. This displaced site is designated a SQG, and should pose no long-term impacts.

Eighty-two LUST sites are in proximity to the BRT Alternative; two would be displaced. Further assessments of these sites may be warranted. There are 31 LUST sites adjacent to this alternative; nine do not have NFA letters from DEQ. Due to their location and open regulatory status, these sites may also pose a potential long-term concern to the project; further assessment could be warranted. Even though the remaining 51 LUST sites have a closed cleanup status or are located a significant distance from the proposed BRT improvements, further assessment could be warranted. Sixty identified UST sites are in proximity to the BRT Alternative; three are likely to be displaced. Of the three displaced sites, only two have registered active tanks. The other is listed as decommissioned.

Milwaukie to Clackamas Segment

The BRT Alternative in the Milwaukie to Clackamas Segment includes two park-and-ride design options located at Linwood and Johnson Creek Roads. No CERCLIS sites are in proximity to the BRT Alternative. Thirteen identified ECSI sites are in proximity to this alternative; none would be displaced. Nineteen identified RCRIS sites are in proximity to this alternative; none would be displaced. Twenty-nine identified LUST sites are in proximity to this alternative; two would be displaced. One of these two sites has open cleanup status and could require additional investigation. Twenty-two identified UST sites are in proximity to this alternative; one would be displaced. This site is listed as decommissioned with no active tanks.

A. Linwood Park-and-Ride Lot Design Option. Five identified ECSI sites are in proximity to this design option; none would be displaced. Three sites are in proximity to this alternative and have open regulatory status. The remaining two sites will not impact this design option. Twelve identified RCRIS sites are in proximity to this design option; none would be displaced. Fourteen identified LUST sites are in proximity to this design option. Of these sites, one has open cleanup status. Further information would be required. Four LUST sites are located adjacent to this design option. They would require further assessment. Fifteen identified UST sites are in proximity to the BRT Alternative. Only one of the 15 UST sites would be displaced. The displaced site has three decommissioned tanks and no registered active tanks. The remaining UST sites are not likely to have long-term impacts.

B. Johnson Road Park-and-Ride Lot Design Option. Four identified ECSI sites are in proximity to this design option; none would be displaced. Three of the ECSI sites may be of potential concern due to their open status and close proximity. The remaining two ECSI sites are not likely to have a long-term impact. Fifteen identified RCRIS sites are in proximity to this design option; one would be displaced. The displaced RCRIS site is an SQG, and is not likely to have a long-term impact with this design option. Sixteen identified LUST sites are in proximity to this design option; one would be displaced. Of these sites, one has open cleanup status. Further information would be required. Four LUST sites are located adjacent to this design option and may require further assessment. Fourteen identified UST sites are in proximity to this design option; two would be displaced. Both displaced sites have decommissioned tanks with no registered active tanks. They are not likely to have long-term impacts. The remaining UST sites are not likely to have long-term impacts.

Milwaukie to Oregon City Segment

Eleven identified ECSI sites are in proximity to this alternative; six would be displaced. Of these six sites, three have an NFA status and should not have long-term impacts. The remaining three displaced sites would require additional information.

Twenty-four identified RCRIS sites are in proximity to the BRT Alternative and would be displaced. The displaced RCRIS sites are all SQGs and are not likely to have a long-term impact on the BRT Alternative. Seventy-two identified LUST sites are in proximity to this alternative; 32 are likely to be displaced. Of these, 21 have closed cleanup status and should not have a long-term impact. The other 11 sites would require additional information because they have an open cleanup status.

Seventy identified UST sites are in proximity to this alternative; 32 are likely be displaced. Seven of the 32 displaced sites are listed as having active tanks, which would have to be decommissioned. The remaining UST sites are not likely to have a long-term impact.

3.8.3.3 Busway Alternative

Portland to Milwaukie Segment

The Busway Alternative in the Portland to Milwaukie Segment includes the Water Avenue, At-Grade Station, and the 17th Avenue Design Options. The Busway Alternative would likely displace one CERCLIS site. Further assessment would be warranted. Nineteen identified ECSI sites are in proximity to the Busway Alternative; five would be displaced. Investigations are still ongoing at these sites. Due to their likely displacement and open regulatory status, the sites could pose a long-term concern to the project. Further assessment would be warranted. Five sites are of particular concern due to their proximity to the Busway Alternative and open regulatory status. Further assessment would be warranted. Of the remaining nine adjacent sites, seven have not received NFA letters from DEQ. However, they are located a significant distance from proposed improvements and should not have a long-term impact on this alternative.

Sixty-four identified RCRIS sites are in proximity to the Busway Alternative; six would be displaced. One of the six sites is a LQG. As a result, it may have the potential for a long-term impact on this alternative. Further assessment would be warranted. The remaining six displaced RCRIS sites are SQGs, and are not likely to have a long-term impact on this alternative. Ninety-five LUST sites are in proximity to the Busway Alternative. Of these sites, ten have not received NFA letters. These two sites are of concern, due to their likely displacement and open regulatory status. Further assessment would be warranted. Further assessment may be warranted for the remaining eighty-five LUST sites. Sixty-two identified UST sites are in proximity to the Busway Alternative; eleven are likely to be displaced. One of the displaced UST sites has registered active tanks. The other displaced sites are listed as having decommissioned tanks and are not likely to have a long-term impact on the Busway Alternative.

A. Water Avenue Design Option. There are three identified ECSI sites are in proximity to this design option; none would be displaced. Two sites are located near this design option. Both are a potential concern due to their close proximity. Further assessment would be warranted. Thirteen identified RCRIS sites are in proximity to this design option; none would be displaced. Seventeen identified LUST sites are in proximity to this design option; one would be displaced. This site has received an NFA letter. Even though the remaining LUST sites may not have a closed status or are located a significant distance from the alternative, further assessment may still be warranted for some of the sites. Sixteen identified UST sites are in proximity to this design option; one would be displaced. The displaced site has commissioned one tank, with no registered active tanks.

B. 7th Avenue Design Option. Three identified ECSI sites are in proximity to this design option. Although there are no displacements, one site is adjacent to the improvements and has not received a NFA letter. The other two properties are located a significant distance from this design option. Fifteen identified RCRIS sites are in proximity to this design option; none would be displaced. Twenty-four identified LUST sites are in proximity to this design option; none would be displaced. Twelve of the twenty-four are adjacent and could pose potential long-term impacts. However, all but two sites have received NFA letters. Further investigation could be warranted for the remaining two sites. The remaining 12 LUST sites are located a significant distance from the alternative but have open status and may require additional assessment. Twenty identified UST sites are in proximity to this design option; none will be displaced.

C. At-Grade Station Design Option. One listed ECSI site would be displaced by this design option. The site has not received an NFA letter from DEQ. Based on the open status of the site and its likely displacement, it has the potential for a long-term impact. Further assessment would be warranted. Twelve identified RCRIS sites are in proximity to this design option; three would be displaced. The three displaced RCRIS sites are SQGs and are not likely to have a long-term impact on this design option.

Twenty-one identified LUST sites are in proximity to the At-Grade Station Design Option; four would be displaced. Of the four displaced sites, only one has not received an NFA letter from DEQ. This site could present the most significant potential long-term concern for this design option. Further assessment would be warranted. Of the remaining seventeen sites, one is located adjacent to this design option. This site has received an NFA letter from DEQ; however, it could have potential long-term impacts on this design option. Further investigation could be warranted for this site. The remaining 15 LUST sites are located a significant distance from the design option. Twelve identified UST sites are in proximity to this design option; three are likely be displaced. The displaced sites are listed as having decommissioned tanks and are not likely to have a long-term impact on this design option.

D. Above-Grade Design Option. The impacts associated with this design option are identical to the impacts posed by the At-Grade Design Option. One listed ECSI site would be displaced by this design option. Further investigation may be required.

E. 17th Avenue Design Option. One CERCLIS site is located near this design option, and it would be displaced. Due to chlorinated solvent contamination in the groundwater in the vicinity of the facility, the site has a significant potential to impact this design option. Further assessment would be warranted. There are ten identified ECSI sites; four could be displaced by this design option. NFA letters have not been received for these four sites. Due to their likely displacement and the open regulatory status of these four ECSI sites, the sites would pose a potential long-term concern to this design option. As a result, further assessment would be warranted. The remaining sites have not received NFAs from DEQ. They are located a significant distance from this design option and would not likely have a long-term impact. Thirteen identified RCRIS sites are in proximity to this design option; two would be displaced. One of the sites is a LQG and has the potential to have a significant long-term impact on this design option. Further assessment would be warranted. The other potentially displaced RCRIS site is a SQG. It would not likely have a long-term impact on this design option. Twenty-eight identified LUST sites are in proximity to this design option; four would be displaced. One site has not received a NFA letter from DEQ. This site could present the most significant potential long-term impact to this design option. Further assessment would be warranted. Of the remaining 24 sites, four are located adjacent to the design option and could have potential long-term impacts. One adjacent LUST site has not received a NFA letter from DEQ. Further investigation would be warranted for this site. The remaining 20 sites are located a significant distance from the option. If these sites do not have a closed status, further assessment may still be warranted. Fifteen identified UST sites are in proximity to this design; six are likely to be displaced. One of the displaced sites has registered active tanks. The remaining UST sites would not likely have a long-term impact.

F. West of Brooklyn Yard Design Option. One CERCLIS site is located adjacent to this design option. Due to chlorinated solvent contamination in the groundwater in the vicinity of the facility, the site has a significant potential to impact this design option. Further assessment would be warranted. This design option could displace five of ten identified ECSI sites. NFA letters have not been received for these five sites. Due to their likely displacement and the open regulatory status of five ECSI sites, the sites would pose a potential long-term concern to this design option. Further assessment would be warranted. One ECSI site is located 50 feet west of this design option and it has not received an NFA letter from DEQ. Due to the location of the facility and the open regulatory status, the site would also pose a potential long-term concern to this design option. Further assessment would be warranted. The remaining four sites are located at a significant distance from this design option and would not likely have a long-term impact. Thirteen identified RCRIS sites are in proximity to this design option; nine would be displaced. One of the nine displaced sites is a LQG and may have the potential to have a long-term impact on this design option. Further assessment would be warranted. The remaining displaced RCRIS sites are SQGs and would not likely have a long-term impact on this design option.

Twenty-seven identified LUST sites are in proximity to this design option; six would be displaced. Two sites could present the most significant potential long-term impact to this design option. Further assessment would be warranted. Of the remaining 21 sites, only one is located adjacent to this design option and has not received a NFA letter from DEQ. The site could have potential long-term impacts on this design option. Further investigation would be warranted for this site. The remaining 20 sites are located a significant distance from the option. They may not have a closed status. Further assessment may still be warranted for some of the sites. Sixteen identified UST sites are located in proximity to the West of Brooklyn Yard Design Option; six sites are likely to be displaced. Two of the six displaced sites have registered active tanks. The other displaced sites are listed as having decommissioned tanks and would not likely have a long-term impact on this design option.

Milwaukie to Clackamas Segment

The Busway Alternative in the Milwaukie to Clackamas segment includes the Linwood Park-and-Ride Design Option. Twelve identified ECSI sites are in proximity to the Busway Alternative; none would be displaced. Four ECSI sites may be of potential concern due to their proximity to the Busway Alternative and their open regulatory status. Twenty-one identified RCRIS sites are in proximity to the Busway Alternative; two could be displaced. The two displaced RCRIS sites are SQGs and are not likely to have a long-term impact on the Busway Alternative. Twenty-five identified LUST sites are in proximity to the Busway Alternative; five would be displaced. Of the five sites to be displaced, three will require additional information, as they have an open cleanup status. Twenty-two identified UST sites are in proximity to the Busway Alternative; four would be displaced. Of the four sites to be displaced, only one has a registered active tank. The other three displaced sites are listed as having decommissioned tanks and are not likely to have a long-term impact.

A. Linwood Park-and-Ride Lot Design Option. Five identified ECSI sites are in proximity to this design option; none would be displaced. Three of the ECSI sites are in proximity and have open regulatory status. They may warrant further investigation. The remaining two ECSI sites are not likely to have a long-term impact. Twelve identified RCRIS sites are in proximity to this design option; none would be displaced. Fourteen identified LUST sites are in proximity to this design option; two would be displaced. Of the two sites to be displaced, one would require obtaining additional information as it has an open cleanup status. Four LUST sites are located adjacent to this design option. They may require further assessment. Fifteen identified UST sites are in proximity to this option; one would be displaced. The displaced site has decommissioned three tanks and has no registered active tanks

B. Johnson Road Park-and-Ride Lot Design Option. Four identified ECSI sites are in proximity to this design option; none would be displaced. Three of the ECSI sites may be of potential concern due to proximity to the option and their open regulatory status. The remaining ECSI sites are not likely to have a long-term impact on this design option. Fifteen identified RCRIS sites are in proximity to this design option; one could be displaced. The displaced RCRIS site is an SQG, and is not likely to have a long-term impact on the on the option. Sixteen identified LUST sites are in proximity to the design option; one could be displaced. The displaced site would require additional information because it has an open cleanup status. Four LUST sites are located adjacent to this design option, and may require further assessment. Fourteen identified UST sites are in proximity to this design option; two would be displaced. The displaced sites have decommissioned tanks with no registered active tanks and are not likely to have long-term impacts on the option.

Milwaukie to Oregon City Segment

The improvements associated with the Busway Alternative in this Segment are the same as the BRT improvements in this segment. The impacts would be as described for the BRT Alternative above.

3.8.3.4 Milwaukie Light Rail Alternative

Portland to Milwaukie Segment

The Milwaukie LRT Alternative in the Portland to Milwaukie Segment includes the 17^{th} Avenue, West of Brooklyn Yard, and Southgate Crossover Design Options and the Lake Road Terminus

Options. One CERCLIS site would likely be displaced by the alternative. Due to chlorinated solvent contamination in the groundwater in the vicinity of the facility, the site could have a high potential to impact this alternative. Further assessment could be warranted. Twenty-four identified ECSI sites are in proximity to this alternative; seven could be displaced. NFA letters have not been received for six of these sites. Due to their likely displacement, the sites may pose a potential long-term concern to this alternative. Further assessment would be warranted. Six ECSI sites are located adjacent to this alternative; only one has received an NFA letter. Due to their location, the sites may pose a potential long-term concern to this alternative. Further assessment would be warranted. The remaining nine sites are not likely to have a long-term impact. Sixty-five identified RCRIS sites are in proximity to this alternative; eight could be displaced. Two sites are LQGs and may have the potential to have a long-term impact. Further assessment would be warranted. The remaining six displaced RCRIS sites are SQGs and are not expected to have a long-term impact. Ninety-five identified LUST sites are in proximity to this alternative; ten could be displaced. Of the ten sites to be displaced, three sites have not received NFA letters. These three sites would be of concern due to their likely displacement and open regulatory status. Further assessment would be warranted. Of the remaining eighty-five sites, eight are located adjacent to the alternative and could have potential long-term impacts. Two of the eight sites have not received NFA letters. Even though the remaining LUST sites are located a significant distance from the alternative, they may not have a closed status. Further assessment may still be warranted for some of the sites. Sixty-two identified UST sites are in proximity to this alternative; eleven are likely to be displaced. Of the displaced sites, only one site is listed as having registered active tanks. The other displaced sites are listed as having decommissioned tanks and would not likely have a long-term impact on the alternative.

A. 17th Avenue Design Option. One CERCLIS site would be displaced by the 17th Avenue Design Option. Due to chlorinated solvent contamination in the groundwater in the vicinity of the facility, the PECO, Inc. site could have a high potential to impact this design option. Further assessment would be warranted. Four of ten identified ECSI sites could be displaced by this design option. NFA letters have not been received for these four sites. Due to their likely displacement and the open regulatory status of these four ECSI sites, the sites may pose a potential long-term concern to this design option. Further assessment could be warranted. Three sites are adjacent to this design option and have not received NFA letters. Due to their location and the open regulatory status, these three sites may also pose a potential long-term concern to this design option. Further assessment would be warranted. The remaining three sites are located at a significant distance from this design option and would not likely have a long-term impact. Thirteen identified RCRIS sites are in proximity to this design option; two may be displaced. One of the sites is a LQG and may have the potential to have a long-term impact. Further assessment would be warranted. The other displaced RCRIS site is a SQG and would not likely have a long-term impact. Twenty-eight identified LUST sites are in proximity to this design option; four could be displaced. Of the four sites, only one has not received a NFA letter. This site has the potential to have a long-term impact. Further assessment would be warranted. Of the remaining twenty four sites, four are located adjacent to this design option and could have potential long-term impacts. Fifteen identified UST sites are in proximity to this design option; six are likely to be displaced. One of the displaced sites has registered active tanks. The remaining UST sites would not likely have a long-term impact.

B. West of Brooklyn Yard Design Option. One CERCLIS site is located 50 feet to the west of this design option. Due to chlorinated solvent contamination in the groundwater in the vicinity of the facility, the PECO, Inc. site could have the potential to impact this design option. Further assessment would be warranted. Five of ten identified ECSI sites would be displaced. NFA letters have not been received for these five sites. Due to their likely displacement and the open regulatory status, the sites may pose a potential long-term concern to this design option. Further assessment would be warranted. One site is located 50 feet west of this design option and has not received an NFA letter. Due to the location of the facility and the open regulatory status, the site may also pose a potential long-term concern. Further assessment would be warranted. The remaining four sites are located at a significant distance from this design option and would not likely have a long-term impact. Thirteen identified RCRIS sites are in proximity to this design option; nine would be displaced. One of the nine displaced sites is a LQG and has the potential to have a long-term impact on this design option. Further assessment would be warranted. The remaining displaced RCRIS sites are not likely to have a long-term impact on this design option. Twenty-seven identified LUST sites are in proximity to this design option; six would be displaced. Two sites have not received an NFA letter from DEQ. These two sites could present the most significant potential long-term impact to this design option. Further assessment would be warranted. Of the remaining twenty-one sites, one is located adjacent to this design option and has not received an NFA letter. The site could have potential long-term impacts on this design option. Further investigation could be warranted for this site. Sixteen identified UST sites are in proximity to this design option; six are likely to be displaced. Two of the six displaced sites have registered active tanks. The other displaced sites are listed as having decommissioned tanks. They are not likely to have a long-term impact.

C. Southgate Crossover Design Option. This design option could displace two of the eight identified ECSI sites. The two sites have received NFA letters. Due to their likely displacement, the sites would pose a long-term concern to this design option. Further assessment would be warranted. The remaining six ECSI sites should not pose a long-term threat. Eighteen identified RCRIS sites are in proximity to this design option; two could be displaced. The two displaced RCRIS sites are SQGs and are not likely to have a long-term impact on this design option. Eight identified LUST sites are in proximity to this design option; one could be displaced. The site has not received an NFA letter. The site could have a potential long-term impact on this design option. Further investigation could be warranted for this site. Nine identified UST sites are in proximity to this design option; two are likely to be displaced. Neither of the sites has active tanks, and they are not likely to have long-term impacts.

D. Tillamook Branch Design Option. None of the nine identified ECSI sites would be displaced by this design option. One is located adjacent to this design option and has not received an NFA letter from DEQ. Due to its close proximity, this site may pose a potential long-term concern and further assessment would be warranted. The remaining eight sites pose no long-term impacts. Twelve identified RCRIS sites are in proximity to this design option; none would be displaced. Nine identified LUST sites are in proximity to this design option; none of the sites would be displaced. Two of the nine sites are located adjacent to this design option and both sites have received NFA letters. Six identified UST sites are in proximity to this design option; none are likely to be displaced.

E. Lake Road Terminus Option. One identified RCRIS site is in proximity to the Lake Road Terminus Option, and it would not be displaced. None of the six identified LUST sites in proximity to this option would be displaced. One site is located adjacent to the option and has not received an NFA letter. The site may pose a potential long-term concern. Five identified UST sites are in proximity to this option; none would be displaced.

F. Milwaukie Middle School Terminus Option. Only one identified LUST site is in proximity to the terminus option. The site is located 50 feet to the west of the option and has not received an NFA letter. Due to its open status, the site would pose a potential long-term concern and further assessment would be warranted.

Milwaukie to Clackamas, and Milwaukie to Oregon City Segments

These two segments would include BRT improvements. The impacts would be the same as described for the BRT Alternative.

3.8.3.5 I-205 Light Rail Alternative

Portland to Milwaukie, and Milwaukie to Oregon City Segments

These two segments would include BRT improvements. The impacts would be the same as described for the BRT Alternative.

Gateway to Clackamas Segment

The Gateway to Clackamas Segment includes the I-205 LRT Alternative with two terminus options: East of Clackamas Town Center and the North of Clackamas Town Center. The I-205 LRT Alternative could be impacted by one ECSI site. The site is located 50 feet to the west of the proposed improvements, and was issued an NFA letter. The site would not be displaced by the alternative and, therefore, it is not likely to have a long-term impact on this alternative. Six RCRIS, SQGs are located along this alternative. The East of Clackamas Town Center Terminus Option would displace one site; however, due to the SQG status, it should present a significant impact for the project. The remaining five sites should have no long-term impacts on this alternative. Thirty-one LUST sites are located along this alternative; two could be displaced. Although the listings have received NFAs, without further assessment it is impossible to conclude if the likely displacement may present long-term impacts on this alternative. Two USTs were previously decommissioned along this alignment. Unless additional unidentified tanks are present, no long-term impacts would be expected due to the presence of USTs.

3.8.3.6 Light Rail Operations and Maintenance Facility Expansion

Fifteen properties along NW Eleven Mile Avenue would be displaced by the construction of the expanded Ruby Junction Operations and Maintenance Facility. One is listed as a HOT release site on the LUST list. According to DEQ, after cleanup of the impacted soil was completed, the site received an NFA from DEQ in 1992. Due to the status of the listing, the potential impact of the release on the maintenance facility expansion is low.

3.8.4 Short-Term Impacts of Construction on Hazardous Materials Sites

The potential effects of the hazardous material sites on construction activities could include:

- Delays to allow for negotiations with responsible parties and regulatory agencies.
- Possible action by regulatory agencies.
- Remediation activities.

- Possible exposure of construction workers or the public to hazardous materials.
- Increased costs for disposal and replacement of contaminated soil and regulatory interaction.
- Possible releases of hazardous materials into previously unaffected areas.
- Design and implementation of measures to prevent the exacerbation of impacts to soil and/or groundwater.

Further investigation of known or potential hazardous materials sites and facilities, as well as early interaction with regulatory agencies during the Preliminary Engineering phase, could avoid or reduce these risks. Also, potential impacts of construction activities could vary with the different listed sites depending on which database the site is listed:

- CERCLIS and ECSI sites that would be displaced or are located near the selected alternative may present the greatest impacts during construction activities. File reviews at DEQ may be required for the listed sites. Subsurface investigations may be required to determine the extent and magnitude of contamination. Remedial activities may be required at listed sites that could be displaced.

- RCRIS sites are unlikely to impact construction activities. If a RCRIS site was to be displaced by the LPA, then hazardous waste stored on the property would need to be properly removed and disposed of at approved hazardous waste disposal facility.

- LUST sites are listed as having an open or closed cleanup status. In order to evaluate impacts to construction activities, displaced LUST sites would require further assessment to determine the extent of soil and groundwater contamination. Adjoining LUST sites may also require further assessment as contaminated groundwater may migrate past the property boundaries. Additional assessment may include file reviews at DEQ and/or subsurface investigations. Heating oil tank releases may also present concerns to construction activities if the property is to be displaced or is located adjacent to the chosen alternative. Due to the physical nature of heating oil, it is unlikely that releases on distant properties could impact construction activities.

- UST sites are unlikely to impact construction activities unless the sites were to be displaced by the chosen alternative. USTs could require decommissioning prior to construction activities.

- Construction could discover or reveal released contaminants to the environment and, therefore, could be a benefit because the released material may need to be characterized and/or remediated.

3.8.5 Cumulative Impacts

The cumulative and secondary impacts of the project on hazardous materials sites could include: 1) site cleanup related to development of the project could increase the cumulative demand for contaminated soil disposal facilities; and 2) during construction, workers could be exposed to hazardous materials. However, the level of exposure to construction workers could be minimized with proper training and the use of appropriate protective equipment. Over time, however, development of the project could decrease the likelihood of exposure to the general public to hazardous materials, since any contamination is likely to be remediated.

3.8.6 Potential Hazardous Materials Mitigation

This section identifies potential measures to mitigate impacts of the Project alternatives on identified hazardous materials sites.

3.8.6.1 Long-Term Impacts

Long-term impacts are impacts that would occur after construction has been completed. Emergency response procedures, consistent with existing laws and regulations, should be developed for use by light rail personnel in the unlikely event of a major hazardous materials release close to the selected alternative. Typical activities covered in such procedures include accidents, reporting of suspicious dumping or releases along the alternative, and monitoring of RCRA permit applications, hazardous materials spill reports, and DEQ sampling results for the vicinity of the LPA. Federal, state, and local government agencies have developed contingency plans in the event of an accidental release or spill of hazardous materials.

Controls and measures should be planned, designed and implemented to avoid further exacerbation of impacted sites and plans and procedures should be prepared to prevent future releases or spills.

3.8.6.2 Short-Term Impacts

Pre-Construction

The acquisition of land containing hazardous waste could incur risk of financial liability if contamination requiring characterization, removal or disposal were to be discovered. To reduce liability risks, the data compiled in this report should be reviewed and evaluated to identify parcels where hazardous materials are known to exist or may be present. Sites that would be acquired, or are in proximity to the LPA, should be evaluated in more depth during Preliminary Engineering. This could include file reviews, reviewing permits, conducting geophysical surveys, and/or conducting subsurface assessments. Prior to acquisition, contact with appropriate regulatory agencies is advised to determine whether more recent information is available, and whether further assessment of the parcels is scheduled. The information obtained would be provided to TriMet so appropriate steps can be taken to evaluate sites for acquisition and to decrease the agency's risk of liability.

Entering into an agreement with a regulatory agency, such as a Perspective Purchase Agreement, may lessen future liabilities resulting from purchasing contaminated properties. A limited sampling and analysis program, coordinated in conjunction with geotechnical investigations, could be developed and implemented on sites with known contamination. Conducting geophysical surveys at sites with suspected USTs, or where UST locations are unknown, could reduce the risk of encountering buried USTs, product pipelines, or other anomalies such as utility lines that could adversely impact construction activities.

Construction

Mitigation for each site would vary based on the different site conditions and/or levels of contamination or suspected contamination within the soil and/or groundwater. With some of the sites, no mitigation may be necessary; other sites may require extensive onsite mitigation.

Adverse impacts to construction workers from contamination can be minimized or avoided. A work plan would be designed for each site that would include actions to be implemented if construction activities encounter impacted soil and/or groundwater. Sites that have the potential for contaminated groundwater to be encountered may include recommended actions for de-watering the groundwater table, and treatment and disposal plans for the groundwater generated. In cases where construction could encounter impacted soils, actions may include excavation and the proper disposal of impacted soils. Other actions could include modifications to the alternative design. For sites that have impacted soils or groundwater, grading alternatives could be considered to avoid encountering groundwater during construction activities.

Depending on the selected alternative and the potential severity of hazardous materials exposure associated with it, a Health and Safety Plan should be developed for all construction activities consistent with applicable laws. A qualified health and safety specialist, such as a Certified Industrial Hygienist (CIH) or Certified Safety Professional (CSP), should assist in preparing the plan based on the evaluation of the proposed construction activities. Additionally, an occupational medicine monitoring program is required to be in place. The plan would prescribe safe work practices, personal protective equipment (i.e., tyvek suits, respiratory protection, emergency response, safety training), and requirement for all construction workers. The need for construction site monitoring for detection of toxic or explosive conditions would also be addressed.

3.9 Historic, Archaeological and Cultural Resources

This section presents an inventory of identified historic and cultural resources and a preliminary assessment of Project on those resources. More detailed information can be found in the *South Corridor Project Historic, Archaeological and Cultural Resources Impacts Results Report* (Metro and AINW, November 2002). Where historic issues are related to the "Section 4(f)" analysis, the analysis is documented in Section 3.10, Parklands. A description of identified historic and cultural resources, a preliminary evaluation of the expected effects, and a brief discussion of mitigation measures that may be used to reduce the effects follow.

This section addresses the requirements of Section 106 of the National Historic Preservation Act of 1966 as it relates to the Project. Section 106 requires that federally assisted projects include consideration of project effects on historic districts, sites, structures or objects, and archaeological sites listed in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Procedures for meeting Section 106 requirements are defined in *36 CFR Part 800 – Protection of Historic Properties*. Federal agencies must consult with the applicable State Historic Preservation Officer (SHPO) before undertaking projects that would adversely affect significant historic or cultural resources.

This discussion of potential effects on historic, archaeological, and cultural resources is preliminary. Following selection of the LPA the potentially affected resources will be reevaluated. If formal "determinations of eligibility" have not been previously completed for all resources within the APE, of the LPA, they will be completed during the FEIS phase. The LPA will be reevaluated to eliminate or reduce adverse effects to identified historic and cultural resources, where possible. After the LPA design is reevaluated, the effects of the LPA on the affected resources will be documented and "level of effect" forms will be prepared as needed. If it is not possible to eliminate or significantly reduce the effects of the LPA on historic and cultural resources, a Memorandum of Agreement (MOA) will be developed and executed between FTA, FHWA, the SHPO, Metro, TriMet, and other affected parties to document the impacts of the LPA and the agreed on mitigation.

3.9.1 Affected Historic and Cultural Resources

The records review and fieldwork resulted in identification of 73 possible historic resources and no known archaeological sites within the area of potential effect (APE). Several sources were used to identify potential historic and cultural resources in the APE, including previous South/North Corridor reports, state agency and local jurisdiction historic resource inventories, SHPO files, Oregon Historical Society resources and files, and field research. Potentially interested Native American Tribal groups were also contacted and invited to provide cultural resource data. The APE was determined in consultation with the Oregon SHPO: in the downtown areas of Portland and Milwaukie the APE was defined as ½ block (approximately 100 feet) on each side of the alternative centerline. Outside the more urbanized areas, the APE was defined as 150 feet on each side of the alternative centerline.

After further analysis and consultation with the SHPO, 45 historic resources were identified within the APE of the study alternatives: 7 are currently listed, 17 have been previously determined eligible for listing, and 21 have been identified as potentially eligible for listing in the NRHP. Resource forms were prepared for all of the identified resources and submitted to the SHPO for review. No known archaeological sites occur in the South Corridor APE. Five locations have been identified as having a high probability that significant archaeological resources associated with American Indian use and occupation may be discovered during construction of Project Alternatives.

Table 3.9-1 lists the number of identified historic resources and potential archaeological sites by segment. Table 3.9-2 lists the identified resources by name, address, type of resource, and NRHP status. The general locations of the identified historic resources are shown on Figure 3.9-1.

Table 3.9-1
Historic and Archaeological Resource Sites Identified in the South Corridor Area of Potential Effect by Segment

Segment	NRHP[1]	DOE[2]	Potentially Eligible[3]	Total Historic	Potential Archaeological Sites[4]
Portland to Milwaukie	7	13	16	**36**	2
Milwaukie to Clackamas	0	2	0	**2**	1
Milwaukie to Oregon City	0	2	4	**6**	1
Gateway to Clackamas	0	0	1	**1**	1
LRT Maintenance Facility	0	0	0	**0**	0
Total	**7**	**17**	**21**	**45**	**5**

Source: Historic, Archaeological and Cultural Impacts Results Report, (Metro and AINW, November 2002).
[1] NRHP = Historic resource currently listed on the National Register of Historic Places.
[2] DOE = Historic resource previously determined eligible for the National Register of Historic Places.
[3] Potentially Eligible = Historic resource that has been identified as potentially eligible for the National Register of Historic Places (formal determinations have not yet been made by the SHPO).
[4] Potential Archaeological Sites = Identified sites that have a high probability of finding significant archaeological resources.
Area of Potential Effect = Areas within approximately 150 feet of the alternatives.

Table 3.9-2
Identified Historic Properties in the Area of Potential Effect of the South Corridor Alternatives

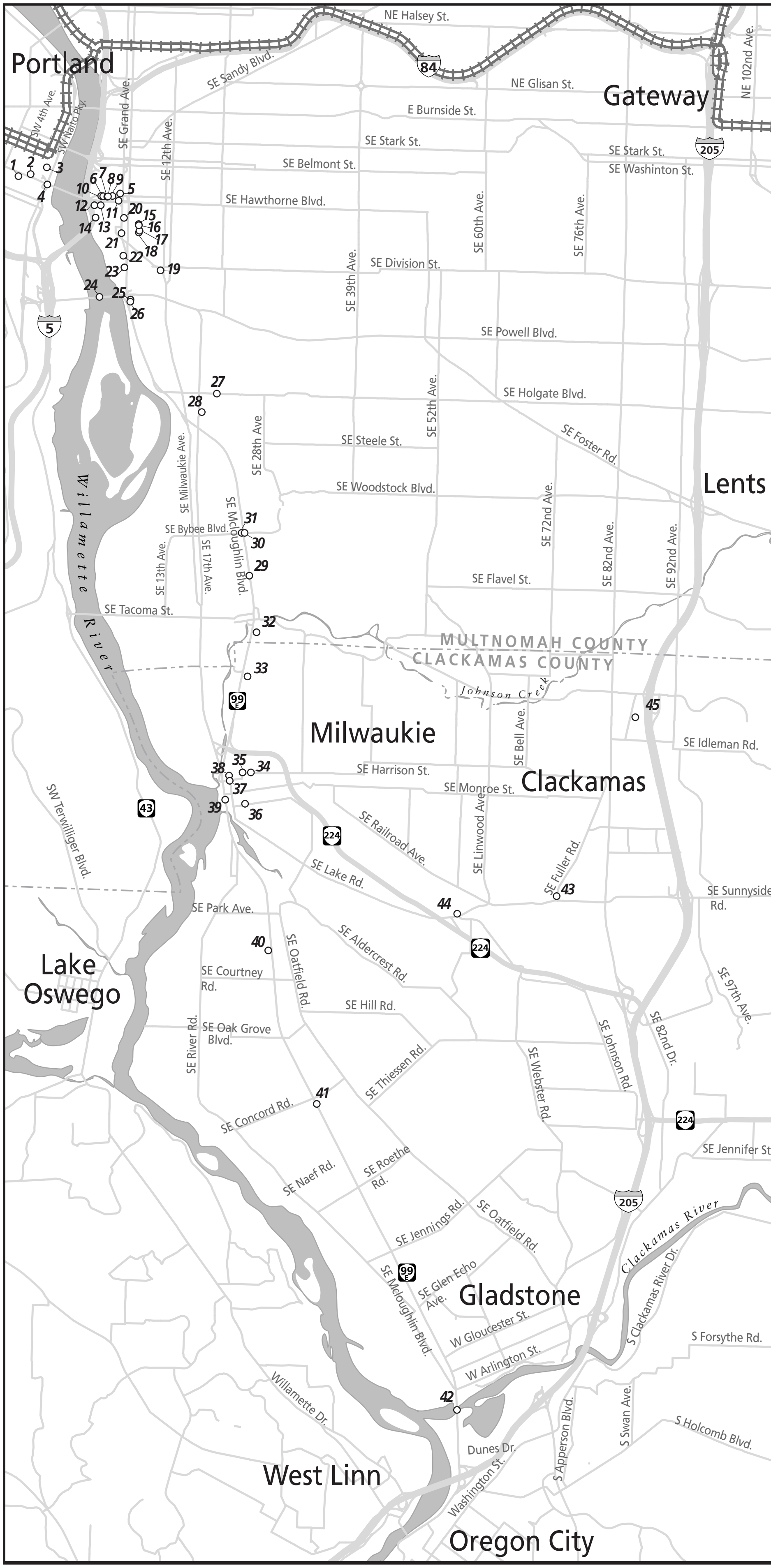
Map Reference	Resource Name, Address	Resource Type	National Register Status
1	Portland City Hall, 1220 SW 5th Avenue	Public offices	NRHP
2	Chapman Square, 1121 SW 3rd Avenue	Public park	DOE
3	Portland Yamhill Historic District, SW 1st Avenue between SW Morrison and SW Salmon Streets	Offices & Retail	NRHP
4	Hawthorne Bridge, 1200 SW Naito Parkway	Street Bridge	DOE
5	Italian Gardener's & Ranchers Market Building, 1305-1337 SE Martin Luther King Jr. Boulevard	Produce Market	NRHP
6	McDowell Bag Company Building, 80 SE Madison Street	Manufacturing	Potentially eligible
7	Oregon Portland Cement Building, 111 SE Madison Street	Office	NRHP
8	Wholesale Grocery Warehouse, 133 SE Madison Street	Warehouse	Potentially eligible
9	American Can Company Building, 210 SE Madison Street	Manufacturing	Potentially eligible
10	Buildings Material Warehouse, 315 SE Madison Street	Warehouse	Potentially eligible
11	Howard Cooper Building, 307 SE Hawthorne Boulevard	Warehouse	Potentially eligible
12	Holman Transfer Company Warehouse, 49 SE Clay Street	Warehouse	Potentially eligible
13	PGE Hawthorne Shops, 1510 SE Water Avenue	Warehouse & office	Potentially eligible
14	PEPCO Garage, 1701 SE Water Avenue	Utility Co. garage	DOE
15	Commercial Building, 1807-1817 SE 7th Avenue	Manufacturing	Potentially eligible
16	Residence, 1825 SE 7th Avenue	Residence	Potentially eligible
17	Portland Fire Department Engine No.23 Building, 1917 SE 7th Avenue	Fire Station	NRHP
18	George Lent Investment Properties, 621, 627, 637 SE Harrison St. & 1921, 1927 SE 7th Avenue	Residences	NRHP
19	Ford Motor Assembly Plant, 2505 SE 11th Avenue	Manufacturing	DOE
20	Portland Laundry Company Building, 1740 SE MLK Jr. Blvd.	Commercial laundry	Potentially eligible
21	Martin Luther King Jr. Viaduct, 1900 SE MLK Jr. Boulevard	Highway overpass	DOE
22	Inman-Poulsen Lumber Mill Office, 2339 SE Grand Avenue	Office	DOE
23	Inman-Poulsen Lumber Co. Garage, 2505 SE Grand Avenue	Lumber Co. garage	DOE
24	Ross Island Bridge, 600 SE Powell Boulevard	Highway bridge	DOE
25	Johan Poulsen House, 3040 SE McLoughlin Boulevard	Residence	NRHP
26	Residence, 3100 SE McLoughlin Boulevard	Residence	Potentially eligible
27	Brooklyn Yard, 2001 SE Holgate Boulevard	Rail yard	DOE
28	Iron Fireman Building (PECO), 4784 SE 17th Avenue	Manufacturing	Potentially eligible
29	Westmoreland Park, 7605 SE McLoughlin Boulevard	Public park	Potentially eligible
30	Eastmoreland Golf Course, 2425 SE Bybee Boulevard	Public golf course	Potentially eligible
31	Bybee Boulevard Bridge, Bybee Blvd at McLoughlin Boulevard	Street overpass	DOE
32	Oregon Worsted Company, 8300 SE McLoughlin Boulevard	Manufacturing	DOE
33	State Highway Division Office, 9200 SE McLoughlin Boulevard	ODOT offices	DOE
34	Residence, 2405 SE Harrison Street, Milwaukie	Residence	Potentially eligible
35	Milwaukie Middle School, 2300 SE Harrison St., Milwaukie	Middle school	DOE
36	R. Derwey House, 2206 SE Washington Street, Milwaukie	Residence	Potentially eligible
37	Masonic Lodge, 10636 SE Main Street, Milwaukie	Fraternal lodge	DOE
38	Milwaukie City Hall, 10722 SE Main Street, Milwaukie	Public offices	DOE
39	Father DeSmet Plaque, SE McLoughlin Boulevard at SE Jefferson Street, Milwaukie	Commemorative marker	Potentially eligible
40	The Bomber, 13515 SE McLoughlin Boulevard	Roadside attraction	Potentially eligible
41	McLoughlin Tourist Cabins, 15915 SE McLoughlin Boulevard	Motel	Potentially eligible
42	Clackamas River Bridge, McLoughlin Blvd./Pacific Highway E.	Highway bridge	DOE
43	Harmony Elementary School, 12451 SE Fuller Road	School	DOE
44	Residence, 5831 SE Harmony Road	Residence	Potentially eligible
45	Orren Battin House 8606 SE Battin Road	Residence	Potentially eligible

Source: *Historic, Archaeological and Cultural Impacts Results Report*, (Metro and AINW, November 2002).
Notes: Map Reference is to Figure 3.9-1, which illustrates general locations of the identified historic resources.
National Register Status is defined as: NRHP = Historic Resources currently listed on the National Register of Historic Places, DOE = Resource previously determined eligible for the NRHP, Potentially Eligible = Resource that has been identified as potentially eligible for the NRHP (formal determinations have not yet been made by the SHPO). Area of Potential Effect (APE) = Areas within approximately 150 feet of the various alternatives.

South Corridor Project

Identified Historic and Cultural Resources in the South Corridor

Figure 3.9-1



1. Portland City Hall
2. Chapman Square
3. Portland Yamhill Historic District
4. Hawthorne Bridge
5. Italian Gardener's & Ranchers Market
6. McDowell Bag Company Building
7. Oregon Portland Cement Building
8. Wholesale Grocery Warehouse
9. American Can Company Building
10. Buildings Material Warehouse
11. Howard Cooper Building
12. Holman Transfer Company Warehouse
13. PGE Hawthorne Shops
14. PEPCO Garage
15. Commercial Building
16. 1825 SE 7th Avenue
17. Portland Fire Department No.23
18. George Lent Investment Properties
19. Ford Motor Assembly Plant
20. Portland Laundry Company Building
21. Martin Luther King Jr. Viaduct
22. Inman-Poulsen Lumber Mill Office
23. Inman-Poulsen Lumber Co. Garage
24. Ross Island Bridge
25. Johan Poulsen House
26. 3100 SE McLoughlin Boulevard
27. Brooklyn Yard
28. Iron Fireman Building (PECO)
29. Westmoreland Park
30. Eastmoreland Golf Course
31. Bybee Boulevard Bridge
32. Oregon Worsted Company
33. State Highway Division Office
34. 2405 SE Harrison Street
35. Milwaukie Junior High School
36. R. Derwey House
37. Masonic Lodge
38. Milwaukie City Hall
39. Father DeSmet Plaque
40. The Bomber
41. McLoughlin Tourist Cabins
42. Clackamas River Bridge
43. Harmony Elementary School
44. 5831 SE Harmony Road
45. Orren Battin House

SOUTH CORRIDOR PROJECT Transportation Alternatives

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3.9.2 Impacts to Historic and Archaeological Resources

3.9.2.1 Long-Term Impacts

The preliminary evaluation of effects of the project alternatives on identified historic and archaeological resources was based on an assessment of the potential adverse effects as defined in 36 CFR Part 800.5. The criteria of effect states: *"an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association…"* The determinations of effect will be preliminary until after the LPA is selected and concurrence with the evaluation of effect is made by the SHPO. The final determinations of effect will be completed in conjunction with the FEIS and mitigation commitments will be documented in a Memorandum of Understanding (MOU).

Project effects on historic and archaeological resources would vary by alternative and design option. Table 3.9-3 presents a summary of the preliminary evaluation of adverse effects to identified historic and archaeological resources by alternative.

Table 3.9-3
Preliminary Evaluation of Adverse Effect of the South Corridor Alternatives on Identified Historic and Archaeological Resources

Segment	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Historic Resources Adversely Effected	**0**	**2**	**5**	**1**	**6**
Portland to Milwaukie	0	2	5	0	5
Milwaukie to Clackamas	0	0	0	n/a	n/a
Milwaukie to Oregon City	0	0	0	0	0
Gateway to Clackamas	n/a	n/a	n/a	1	1
Affected Potential Archaeological Sites	**1**	**4**	**2**	**1**	**3**

Source: *Historic, Archaeological and Cultural Impacts Results Report*, (Metro and AINW, November 2002).
n/a = not applicable – no improvements are proposed in these segments with these alternatives

The BRT Alternative would not affect any historic resources, but would adversely affect one potential archaeologically sensitive location. The Busway Alternative would adversely affect two historic resources and four potential archaeologically sensitive locations. The Milwaukie LRT Alternative would have an adverse effect on five historic resources and two potential archaeologically sensitive locations. The I-205 LRT Alternative would have adverse effects on one historic resource and one potential archaeologically sensitive location. The Combined LRT Alternative would adversely affect six historic resources, and has the potential to adversely affect three potential archaeologically sensitive locations. More specific detail about the preliminary evaluation of effects of the alternatives and design options is presented in Table 3.9-4 and the following narrative.

A. No-Build Alternative

The No-Build Alternative is not expected to result in adverse effects to identified resources.

B. Bus Rapid Transit Alternative

There are 33 identified historic resources within the APE of the BRT Alternative, most of which (25) are in the Portland to Milwaukie Segment. Four of these resources are listed in the NRHP, 14 have

Table 3.9-4
Number of Adverse Effects to Historic and Archaeological Resources by Alternative, Segment and Design Option

Alternative/Segment/Option	Identified Historic Resources	Potential Archaeological Sites
Bus Rapid Transit Alternative		1
Portland to Milwaukie Segment		
Milwaukie to Clackamas Segment		
Linwood P&R Lot Design Option		
Johnson Rd P&R Lot Design Option		
Milwaukie to Oregon City Segment		1
Busway Alternative	2	4
Portland to Milwaukie Segment	2	2
Water Avenue Design Option		
7th Avenue Design Option		
At-Grade Station Design Option		
Above-Grade Station Design Option		
17th Avenue Design Option		
W of Brooklyn Yard Design Option		
Milwaukie to Clackamas Segment		1
Linwood P&R Lot Design Option		
Johnson Rd P&R Lot Design Option		
Milwaukie to Oregon City Segment		1
Milwaukie Light Rail Alternative	5	2
Portland to Milwaukie Segment	5	2
17th Avenue Design Option	1	
W of Brooklyn Yard Design Option	1	
SG Crossover Design Option	1	
Tillamook Branch Line Design Option	2	
Lake Road Terminus Option	1	
MMS Terminus Option	1	
Milwaukie to Clackamas Segment		
Linwood P&R Lot Design Option		
Johnson Rd P&R Lot Design Option		
Milwaukie to Oregon City Segment		1
I-205 Light Rail Alternative	1	1
Portland to Milwaukie Segment		
Milwaukie to Oregon City Segment		1
Gateway to Clackamas Segment	1	1
East of CTC Terminus Option		
North of CTC Terminus Option		
Combined Light Rail Alternative	6	3
Portland to Milwaukie Segment	5	2
17th Avenue Design Option	1	
W of Brooklyn Yard Design Option	1	
SG Crossover Design Option	1	
Tillamook Branch Line Design Option	2	
Lake Road Terminus Option	1	
MMS Terminus Option	1	
Milwaukie to Oregon City Segment		1
Gateway to Clackamas Segment	1	1
East of CTC Terminus Option		
North of CTC Terminus Option		

Source: *Historic, Archaeological and Cultural Impacts Results Report*, (Metro and AINW, November 2002)

been previously determined eligible for listing, and the remaining 15 have been identified as potentially eligible. There is one high-probability site for archaeological resources in the Milwaukie to Oregon City Segment. The BRT Alternative would have no adverse effects on historic resources; however, there is potential for an adverse effect to one archaeological high-probability location.

C. Busway Alternative

There are 32 identified historic resources in the APE of the Busway Alternative, 24 in the Portland to Milwaukie Segment and 6 in the Milwaukie to Oregon City Segment. Five of these resources are listed in the NRHP, 12 have been previously determined to be eligible for listing, and seven have been identified as potentially eligible. There are four sites with a high-probability for archaeological resources in the APE for the Busway Alternative—two in the Portland to Milwaukie Segment and one each in the Milwaukie to Oregon City and Milwaukie to Clackamas Segments. The Busway Alternative would adversely affect two historic resources: the Bybee Boulevard Bridge and the Oregon Worsted Company building, both in the Portland to Milwaukie Segment and both properties that have been previously determined eligible for listing in the NHRP. The Busway Alternative also has the potential to adversely affect the four high-probability archaeological sites mentioned above.

D. Milwaukie Light Rail Alternative

Within the Milwaukie LRT Alternative APE, 16 historic resources have been identified: one NRHP district, nine resources previously determined eligible for listing, and six resources that have been identified as potentially eligible. All are located in the Portland to Milwaukie Segment. The Milwaukie LRT Alternative would adversely affect five historic properties—the Hawthorne Bridge, the Bybee Boulevard Bridge, the Oregon Worsted Company, the State Highway Division Office, and the Milwaukie Middle School. Adverse effects to the State Highway Division Office would occur only under the Southgate Crossover Line Design Option; the remainder would occur regardless of the design option. This alternative also would affect two high-probability archaeological sites.

E. I-205 Light Rail Alternative

One historic resource in the APE of the I-205 LRT Alternative, the Orren Battin House, has been identified as potentially eligible for listing in the NRHP. This historic resource would be adversely affected by the I-205 LRT Alternative. There is also potential for an adverse effect to an archaeological high-probability location.

F. Combined Light Rail Alternative

The Combined LRT Alternative would have impacts similar to the combined impacts of the Milwaukie and I-205 LRT Alternatives. The Combined LRT Alternative would have an adverse effect on six historic properties and three archaeological high-probability areas.

3.9.2.2 Short-Term Impacts

Noise, dust, and temporary limitations to access could cause construction-related impacts to historic resources. However, because most of the LRT construction would occur within public right-of-way, these impacts would be limited and could likely be mitigated.

3.9.2.3 Cumulative Impacts

Cumulative impacts to historic resources within the South Corridor Project area would result primarily from increased urbanization. This could result in adverse impacts if development or redevelopment pressure results in the loss of or encroachment of development on historic, archaeological, or cultural resources. Conversely, rehabilitation and reuse of historical resources or preservation of resources as part of an overall community plan could create a beneficial impact on resources.

3.9.3 Potential Mitigation

The Project could adversely affect up to six historic properties, depending on the alternative chosen as the LPA. If an LPA is selected that would have an adverse affect on any identified historic or cultural resource, then consultation with the SHPO would be initiated. Project staff would initiate a review of the project design in the area of the affected resource, to re-examine if the project could avoid or reduce the impact to the historic resource. If after an extensive review of the project design, the impacts could not be avoided, then staff would consult with the SHPO regarding potential mitigation.

Mitigation could include design treatments and minimization of construction impacts such as noise, dust, visual and access impacts, and vibration. Mitigation for long-term impacts such as visual effects could include use of complementary materials or landscape architectural design to minimize those effects. Where adverse effects cannot be mitigated through design treatments, recordation of buildings or structures prior to any actions that would affect the resource may be appropriate. Recordation and salvage of building elements may be used to mitigate for buildings that may be demolished.

Monitoring during construction by a professional archaeologist at any high-probability sites in the APE of the selected alternative would allow identification of any significant resources. Response to any archaeological discoveries could be defined in advance through an agreement with the SHPO and appropriate Tribes

To address short-term construction impacts, temporary access limitations may be minimized by limiting construction activities during important seasonal events that may occur at the historic or cultural resources and providing alternative, temporary access where necessary. Dust and noise impacts may be mitigated through standard specifications in contract documents.

3.10 Parklands and Recreation Areas

This section presents an inventory of “Section 4(f)” resources and a preliminary assessment of the impacts of the alternatives on identified resources. This Section 4(f) analysis is preliminary and focuses on comparing the alternatives. Additional Section 4(f) analysis and the Draft and Final Section 4(f) Documents will be prepared after the LPA is selected, in conjunction with the FEIS. More detailed information can be found in the *Parklands, Recreation Areas, Wildlife and Waterfowl Refuges (Section 4(f)) Results Report* (Metro, November 2002).

The federal regulations known as “Section 4(f)” refer to a portion of the *U.S. Department of Transportation (USDOT) Act of 1966*. In 1983, Section 4(f) of the DOT Act was amended and codified in 49 USC, Section 303. The 1983 amended version is still referred to as “Section 4(f)” and states in part, that *"It is the policy of the United States Government that special effort be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites.”* These regulations require that USDOT agencies, including FTA and FHWA *“…not approve the use of land from a significant publicly owned park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that: 1) there is no feasible and prudent alternative to the use of the land: and 2) the action includes all possible planning to minimize harm to the property resulting from such use.”*

In the context of Section 4(f) the term "use" means taking or acquiring a resource (or a portion of the resource) for construction and/or permanent use (or use during construction) by a transportation facility, or substantially impairing the intended use of the resource through the construction of a transportation facility (i.e. from a significant noise or visual impact) which is known as "constructive use." Section 4(f) resources include publicly owned parks, recreation areas, wildlife and waterfowl refuges and historic sites. Historic properties are also protected under "Section 106" of the National Historic Preservation Act and are addressed in Section 3.9 of this SDEIS.

Section 6(f)(3) resources are those parklands that have acquired funding through the Land & Water Conservation Fund Act of 1965 (Public Law 88-578). Because 6(f) funds have been used to purchase or enhance these resources, they are afforded extra protection by federal law, and sometimes require the approval of the Secretary of the Interior before changes can be made to property purchased or improved with these funds. If Section 6(f) properties are required for a transportation project, the project must provide functional replacement of the park land. The Section 4(f) resources require special review in relation to the various potential project-related effects. The approval for use of these resources in transportation projects can only be made if there are no prudent and feasible alternatives, and if all possible planning efforts have been made to minimize the harm to these resources. Likewise, Section 6(f)(3) resources are also protected by federal law and require special approval before their use as parklands can be altered.

3.10.1 Affected Parkland and Recreation Area Environment

Section 4(f) resources have been identified within 150 feet of the Project alternatives and design options. Table 3.10-1 shows the number of Section 4(f) resources that have been identified by segment and by type of resource.

Table 3.10-1
Identified Section 4(f) Resource Sites Within 150 feet of the Alternatives

Segment	Public Parklands and Recreation Areas[1]	Historic Resources[2]	Potential Archaeological Sites[3]	Total
Portland to Milwaukie	14	5	2	**21**
Milwaukie to Clackamas	1	0	1	**2**
Milwaukie to Oregon City	6	0	1	**7**
Gateway to Clackamas	3	1	1	**5**
LRT Maintenance Facility	0	0	0	**0**
Total	**24**	**6**	**5**	**35**

Source: *Parklands, Recreation Areas, Wildlife and Waterfowl Refuges (Section 4(f) Results Report* and *Historic, Archaeological and Cultural Impacts Results Report* (Metro and AINW, November 2002).
[1] Public parklands and recreation areas that are Section 4(f) resources.
[2] Historic resources that could be used by one or more of the alternatives.
[3] Potential Archaeological Sites include identified sites that have a high probability of finding significant archaeological resources.

A. Identification of Parkland Resources.

The identification of publicly owned parks, recreation areas, and wildlife and waterfowl refuges in the South Corridor was done based on a review of existing published information, field inspection, and discussions with various public agency representatives. Maps were reviewed and potential parks, recreation areas, and refuges were noted. A field inspection of the project area was conducted and potential Section 4(f) resources were identified. Public agency representatives were contacted, and the Internet was used to obtain additional information about the status of several of the potential Section 4(f) resources within the vicinity of the study alternatives.

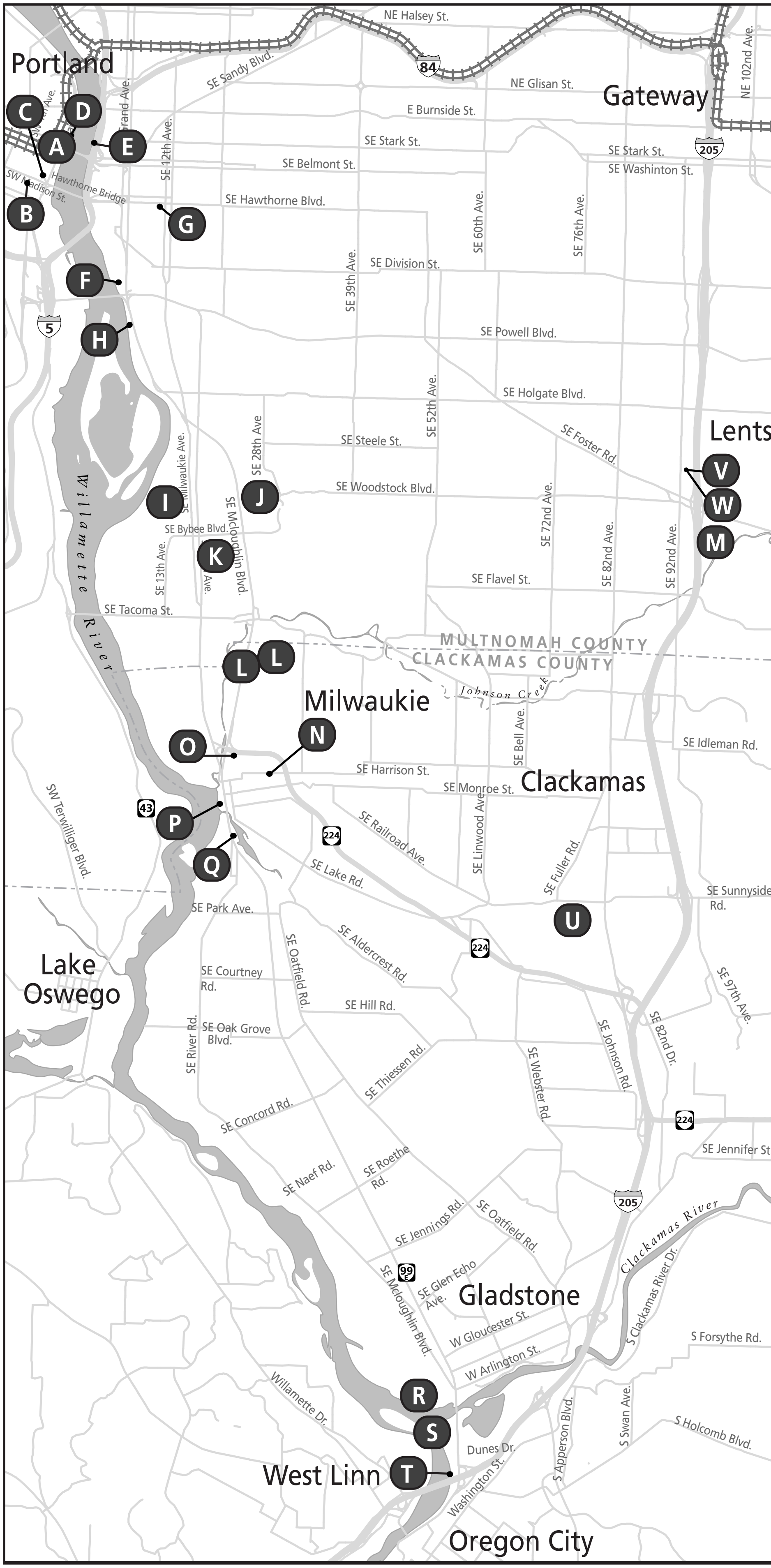
The study area for identification of parklands, recreation areas, and wildlife and waterfowl refuges included an area approximately 100 feet on each side of the centerline of Project alternatives and design options. The parks and open spaces that were evaluated as potential Section 4(f) resources included both developed parks and undeveloped areas (informal parks) that were indicated as parks on city maps and in *the 2001 Thomas Guide for the Portland Metro Area*. A field inspection of the project area was conducted and potential Section 4(f) resources were identified. Public agency representatives were contacted, and the Internet was used to obtain additional information about the status of several of the potential Section 4(f) resources within the vicinity of the Project alternatives.

Information about resources that qualify as Section 6(f) resources was obtained from the Oregon Parks and Recreation Department (OPRD). OPRD manages the program for the state and maintains records of those parklands that have obtained funding through this program throughout the state. Table 3.10-2 lists the Section 4(f) Resources that have been identified in the South Corridor. Figure 3.10-1 shows the locations of the parks that are referenced in the first column of the table.

Table 3.10-2
Identified Parkland, Recreation Areas, Wildlife and Waterfowl Refuges
Within 150 feet of the South Corridor Project Alternatives

Map Reference	Resource Name, General Location	Resource Type	Resource Features
A	Chapman Park	Park	Landscaping, benches
B	Schrunk Plaza	Park	Landscaping, amphitheater seating area, benches
C	Open space/informal park, West end of the Hawthorne Bridge	Park	Open space, landscaping
D	Govenor Tom McCall Waterfront Park*, along the West Bank of the Willamette River in downtown Portland	Park	Open space, trail, benches monuments, landscaping
E	Esplanade, East bank of the Willamette River in downtown Portland	Trail	Trail, viewing areas, benches, sculptures
F	OMSI to Springwater Trail, east bank of the Willamette River	Existing and proposed trail	Trail, viewing areas, benches
G	Open space/informal park, East end of the Hawthorne Bridge	Park	Limited access, landscaping
H	Riverside Park, East bank of the Willamette River	Park	Boat Access
I	Oaks Bottom Wildlife Refuge, East bank of the Willamette River	Wildlife Refuge	Pedestrian trail, wildlife sanctuary, wildlife viewing
J	Eastmoreland Park and Golf Course, East of McLoughlin Boulevard	Park & Golf Course	Golf, landscaping, open space
K	Westmoreland Park, West of McLoughlin Boulevard	Park	Baseball stadium and fields, tennis, basketball pond, lawn bowling, open space, landscaping
L & M	Springwater Trail, east/west trail extending through the study area	Trail	Trail, (L= crossing at McLoughlin Boulevard) and (M = crossing at I-205)
N	Milwaukie Middle School	Recreation area	Baseball, basketball, swimming pool, open space
O	Milwaukie City Hall Grounds	Park	City offices, open space, landscaping
P	Jefferson Street Boat Ramp & Park	Park	Boat ramp, parking, open space
Q	Dogwood Park	Park	Open space, picnic tables, viewing area
R	Dahl Park	Park	Open space, baseball, community garden
S	Clackamette Park and Boat Ramp	Park	Open space, boat ramp, play equipment, picnic tables and shelters, skateboarding, horseshoe pits
T	Public Boat Ramp	Boat ramp	Boat ramp and parking area
U	Oregon Institute of Technology	Recreation area	Gym, indoor recreational facilities
V	Wattle's Boys and Girls Club	Recreation area	Gym, recreational facilities and educational facilities
W	Lents Little League Fields	Recreational Fields	Baseball Diamond

Source: *Parklands, Recreation Areas, Wildlife and Waterfowl Refuges (Section 4(f)) Results Report* (Metro & AINW Inc, 2002)
* Section 6(f) funds were used in this park



South Corridor Project

Parkland Resources

Figure 3.10-1

- A Chapman Square
- B Schrunk Plaza
- C Open Space/Informal park
- D Gov. Tom McCall Waterfront park
- E Eastbank Esplanade
- F OMSI to Springwater Trail
- G Open Space/Informal park
- H Riverside park
- I Oaks Bottom Wildlife Refuge
- J Eastmoreland Golf Course
- K Westmoreland Park
- LM Springwater Trail
- N Milwaukie Middle School
- O Milwaukie City Hall Grounds
- P Jefferson Street Boat ramp/park
- Q Dogwood Park
- R Dahl Park
- S Clackamette Park
- T Public Boat Ramp
- U Oregon Institute of Technology
- V Wattle's Boys and Girls Club
- W Lents Little League Fields

SOUTH CORRIDOR PROJECT
Transportation Alternatives

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Several municipal and county agencies were contacted for information about potential Section 4(f) resources within the study area. The Metro Parks and Greenspaces Department, the North Clackamas Parks and Recreation District, the City of Milwaukie Parks Program, the Clackamas County Parks Department, Clackamas County Planning, the City of Portland Parks and Recreation Bureau, Portland Development Commission, and the Portland Planning Bureau were contacted for information about potential Section 4(f) resources. Individuals knowledgeable about bicycle trails, parks, and planned recreational trails were contacted and provided useful information about specific locations. The Lents Little League and Wattle's Boys and Girls Club were also contacted, as was the property owner, the Portland Development Commission. The initial identification of potential Section 4(f) resources included some parks and recreation areas that were later determined to not be eligible as Section 4(f) resources because they were either constructed as transportation corridors that are also used for recreation purposes, such as the bike path along I-205 and the Clackamas Neighborhood Playground along SE Harmony Road, or were privately owned recreation facilities.

B. Identification of Historic Properties

Historic properties may also qualify for protection under the Section 4(f) regulations. Historic and cultural resources and related potential impacts are discussed in Section 3.9. In total, 45 historic resources and five sites with a high probability of having archaeological resources have been identified. A more detailed discussion of the historic and cultural resources can be found in the *South Corridor Project Historic, Archaeological and Cultural Resources Results Report*. Historic and cultural resources that would be used by the Project alternatives also qualify for Section 4(f) review and are identified in Table 3.10-3.

Table 3.10-3
Historic and Cultural Properties that would be "Used" by Project Alternatives

Map Reference	Resource Name, National Register of Historic Places Status	Alternatives that would use the resource and type of use
4	Hawthorne Bridge, Eligible for the NRHP	With the Milwaukie and Combined LRT Alternatives light rail tracks would be added to the bridge.
31	Bybee Blvd. Bridge, Eligible for the NRHP	With the Milwaukie and Combined LRT Alternatives the LRT would cross under the viaduct.
32	Oregon Worsted Co., Eligible for the NHRP	With the Busway, Milwaukie, and Combined LRT Alternatives, this property would be acquired and the structure would be removed.
33	ODOT Building, Eligible for the NHRP	With the Busway, Milwaukie, and Combined LRT Alternatives, a portion of the front of this property would be acquired.
35	Milwaukie Middle School, Eligible for NHRP	With the Milwaukie and Combined LRT Alternatives a portion of the rear of this property would be acquired for the LRT station and tracks.
45	Orren Battin House, Potentially Eligible for the NRHP	With the I-205 and Combined LRT Alternatives, a portion on the east side of this property would be acquired.
Not shown on the map	Sites identified as having a High Probability of finding significant Archaeological Resources	All the alternatives could use one or more of the identified potential archaeological sites.

Source: *Historic and Cultural Resources Impacts Results Report* (Metro and AINW, November 2002)
Notes: Section 4(f) regulates the "use" of public parks and historic properties. Historic and cultural properties that could be used by one or more of the Alternatives have been identified. Map reference is to Figure 3.9-1.

3.10.2 Parkland and Recreation Area Environmental Impacts

3.10.2.1 Long-Term Impacts

The potential effects on the identified Section 4(f) parklands and historic properties were evaluated in relation to the various Project alternatives to determine if there would be a "use" of identified Section 4(f) resources. The evaluation of impacts took into account the qualities of the Section 4(f) resources and assessed the extent of impairment that would likely occur to the protected activities, features, or attributes of the resource. In addition to Section 4(f) impacts to historic properties, parklands, recreation areas, and wildlife and waterfowl refuges, Section 6(f) impacts were also considered for those parklands that would result in use by the proposed alternatives of a property that had received funding through the Land & Water Conservation Fund Act.

The number and type of resources that would experience a "use" or a "constructive use" are listed by alternative in Table 3.10-4 and by resource in Table 3.10-5. Areas considered to be high-probability archaeological sites are also listed. These high-probability areas will require field investigations to determine if significant archaeological sites are present that might qualify as Section 4(f) resources, should the particular segments or alternatives be selected.

Table 3.10-4
Section 4(f) Resource Sites Used by the South Corridor Alternatives

Segment	Public Parklands and Recreation Areas[1]	Historic Resources[2]	Potential Archaeological Sites[3]	Total
No-Build Alternative	0	0	0	**0**
Bus Rapid Transit Alternative	0	0	1	**1**
Busway Alternative	1	2	4	**7**
Milwaukie Light Rail Alternative	3	5	2	**10**
I-205 Light Rail Alternative	1	1	1	**3**
Combined Light Rail Alternative	4	6	3	**13**

Source: *Parklands, Recreation Areas, Wildlife and Waterfowl Refuges (Section 4(f)) Results Report* and *Historic, Archaeological and Cultural Impacts Results Report* (Metro and AINW Inc.: November 2002).
[1] Public parklands and recreation areas that are Section 4(f) resources.
[2] Historic resources that could be used by one or more of the alternatives.
[3] Potential Archaeological Sites include identified sites that have a high probability of finding significant archaeological resources.

3.10.2.2 Short-Term Impacts

Temporary impacts to parklands could occur from construction easements on park land, access impacts, dust, noise, and visual changes. None of the potential short-term impacts would be expected to constitute a "use" as defined in Section 4(f) regulations.

3.10.2.3 Cumulative Impacts

Cumulative impacts to parklands could include improved public access to some parks (such as the Spring Water Trail) due to increased access from transit improvements from the South Corridor Project and other projects in the RTP. However, no cumulative impacts that would constitute a "use" or "constructive use" as defined in Section 4(f) are anticipated.

3.10.3 Potential Parkland and Recreation Area Mitigation

After selection of the Locally Preferred Alternative, the Project staff will reexamine all potential impacts to Section 4(f) resources. A significant effort, including the project designers, will be undertaken to avoid the use of any Section 4(f) resource. If it is not possible to avoid the use of such resources, then the Project staff will proceed with a Draft Section 4(f) Statement, including the analysis of prudent and feasible alternatives. Final Section 4(f) documentation will be prepared in conjunction with the South Corridor Project FEIS.

Table 3.10-5
Preliminary Assessment of "Use" of Individual Section 4(f) Resources by Project Alternatives

Map Reference	Resource Name	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Parkland Resources						
A	Chapman Park,	--	--	--	--	--
B	Schrunk Plaza,	--	--	--		
C	Open space/informal park, West end of the Hawthorne Bridge	--	--	use	--	use
D	Govenor Tom McCall Waterfront Park*, along the West Bank of the Willamette River in downtown Portland	--	--	--	--	--
E	Esplanade, East bank of the Willamette River in downtown Portland	--	--	--	--	--
F	OMSI to Springwater Trail, east bank of the Willamette River	--	--	--	--	--
G	Open space/informal park, East end of the Hawthorne Bridge	--	--	--	--	--
H	Riverside Park, East bank of the Willamette River	--	--	--	--	--
I	Oaks Bottom Wildlife Refuge, East bank of the Willamette River	--	--	--	--	--
J	Eastmoreland Park and Golf Course, East of McLoughlin Boulevard	--	--	--	--	--
K	Westmoreland Park, West of McLoughlin Boulevard	--	--	--	--	--
L & M	Springwater Trail, east/west trail extending through the study area	--	use	use	use	use
N	Milwaukie Middle School	--	--	use	--	use
0	Milwaukie City Hall Grounds	--	--	--	--	--
P	Jefferson Street Boat Ramp & Park	--	--	--	--	--
Q	Dogwood Park	--	--	--	--	--
R	Dahl Park	--	--	--	--	--
S	Clackamette Park and Boat Ramp	--	--	--	--	--
T	Public Boat Ramp					
U	Oregon Institute of Technology	--	--	--	--	--
V	Wattle's Boys and Girls Club	--	--	--	--	--
W	Lents Little League Field	--	--	--	--	--
Historic and Cultural Resources						
4	Hawthorne Bridge	--	--	use	--	use
31	Bybee Blvd. Bridge	--	use	use	--	use
32	Oregon Worsted Co.	--	use	use	--	use
33	ODOT Building	--	--	use	--	use
35	Milwaukie Middle School	--	--	use	--	use
45	Orren Battin House	--	--	--	use	--
n/a	Sites identified as having a High Probability of finding significant Archaeological Resources	use	use	use	use	use

Source: *Parklands, Recreation Areas, Wildlife and Waterfowl Refuges (Section 4(f)) Results Report* and *Historic, Archaeological and Cultural Resources Results Report* (Metro & AINW inc, 2002)

Depending on the type of resource and the type of project-related impacts, mitigation measures could include a wide range of options. For those Section 4(f) parkland resources where there may be an impact through use or constructive use, potential design modifications would be evaluated to determine if the impact could be avoided or minimized. For those historic properties where there would be a Section 4(f) use or constructive use (or in some cases and adverse effect to the historic property), the impacts may be mitigated through a variety of measures following the provisions of Section 106 of the National Historic Preservation Act and Section 4(f), in consultation between the federal agency and the SHPO. Mitigation measures could range from minimizing indirect impacts such as noise and vibration through the use of sound walls and landscaped features, to mitigation of loss by demolition through resource recordation, removal, reuse and salvage. The most appropriate mitigation measures would need to be developed once the preferred alternative and design options have been selected and the specific types of impacts have been identified.

3.11 Ecosystems

The purpose of this section is to provide a detailed analysis of the wetlands, vegetation, wildlife, fisheries, and threatened, endangered, and sensitive (TES) species affected by the South Corridor Project Alternatives. Further analyses and detail can be found in the *South Corridor Ecosystems Results Report* (Metro and URS, November 2002).

The South Corridor Project will be subject to federal, state, and local regulations concerning potential impacts to biological resources. Consequently, the ecosystems study provides documentation that will be incorporated into permit decisions for the project following the Record of Decision (ROD) on the FEIS. All studies and analyses will be completed in sufficient detail to ensure compliance with the appropriate permit requirements. The principal regulations, ordinances, and permit actions that could apply to the selected alternative are summarized in Table 3.11-1.

3.11.1 Affected Environment

The South Corridor Project would affect existing biological resources in the project vicinity, including wetlands, vegetation, wildlife, fisheries, and TES species. Summaries of the affected environment for each resource follow.

3.11.1.1 Wetlands and Waterways

Wetland determinations were conducted to identify approximate boundaries of "Waters of the United States" and "Waters of the State" categorized as either "wetlands" or "non-wetland waterways" within the study corridor. The study corridor extends 100 feet from the centerline of each linear alternative and to within approximately 50 feet of non-linear components (e.g., park-and-ride and maintenance facilities). Wetlands are those areas that satisfy the wetland criteria defined in the *1987 U.S. Army Corps of Engineers* (Corps) *Manual for Identifying and Delineating Wetlands* (Environmental Laboratory, 1987). Non-wetland waterways are water bodies or aquatic sites that are within the regulatory authority of the Corps under Section 404 of the Clean Water Act or the Oregon Division of State Lands (DSL) under the Oregon Removal-Fill Law, but that do not satisfy jurisdictional wetland criteria because they lack hydrophytic vegetation or hydric soils (e.g., an unvegetated stream channel).

Wetland specialists studied only those wetland, waterway, and hydric soil areas that were located in the study area and shown on at least one of the following sources:

- Previous South/North Corridor DEIS documents (*Ecosystems Impacts Results Report*–Metro, February 1998 and *Wetland Determination and Delineation Report*– Metro, February 1998)
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps
- Local Wetland Inventory (LWI) maps
- Natural Resources Conservation Service (NRCS) Multnomah County and Clackamas County Area Soil Surveys (USDA, 1983 and 1985)

A full wetland delineation to more accurately delineate all of the wetlands and waterways will be conducted for the FEIS once a preferred alternative is selected.

Table 3.11-1
Summary of Potential Natural Resource Permit Requirements

Regulation/ Permit	Responsible Agency	Resource Studies	Regulated Resources
Federal			
National Environmental Policy Act (NEPA)	Federal Transit Administration (FTA)	NEPA EIS addressing natural resource conditions, impacts and mitigation	All
Clean Water Act (CWA) Section 404 Individual Permit; Section 10 (Rivers and Harbors Act)	US Army Corps of Engineers (Corps)	Alternatives analysis; wetland delineation study; wetland functional assessment and impact analysis; mitigation plan	Waters of the U.S., including wetlands
Endangered Species Act (ESA)	National Marine Fisheries Service (NMFS); US Fish and Wildlife Service (USFWS)	Biological Assessment addressing project impacts to listed species, species proposed for listing and candidate species	Vegetation, wildlife, fisheries
Fish and Wildlife Coordination Act	USFWS; NMFS; Oregon Department of Fish and Wildlife (ODFW)	Agency consultation; identify impacts to fish and wildlife resources; recommend mitigation	Vegetation, wildlife, fisheries
Magnuson-Stevens Act	NMFS	Identify potential impacts to Essential Fish Habitat	Commercially significant fisheries
Federal Migratory Bird Treaty Act	USFWS	Identify impacts to migratory birds	Wildlife
Executive Order 11990	FTA, and FHWA	Ensure protection of wetlands	Wetlands
State			
Oregon Removal – Fill Permit	OR Division of State Lands (DSL)	Alternatives analysis; wetland delineation study; wetland functional assessment and impact analysis; mitigation plan	Waters of the state, including wetlands
Oregon State ESA	ODFW; OR Department of Agriculture	Identify project impact to state-listed and candidate species	Vegetation, wildlife, fisheries
CWA Section 401 Water Quality Certification	OR Department of Environmental Quality (ODEQ); US Environmental Protection Agency (EPA)	Assess project compliance with state water quality standards; implement mitigation measures	Rivers, streams, other bodies of water
Local			
Portland Greenway Permit	City of Portland	Evaluation of impacts to native vegetation; mitigation or preservation of native vegetation	Vegetation, wildlife, fisheries
Environment Zone Overlay	City of Portland	Identification of adverse impacts; mitigation plan	Vegetation, wildlife, fisheries
City of Milwaukie Natural Resource Overlay Zone	City of Milwaukie	Protection of natural resources and areas of public value	All
Metro Functional Plan – Title 3	Metro	Evaluation of impacts on water quality, flood management and fish and wildlife	Wildlife and fisheries
Setback Requirements	Clackamas County	Protection of river and stream corridors	Rivers and streams

Source: URS, 2002.

Waterways within the study corridor include the Willamette river, Clackamas river, crystal springs creek, Johnson creek, crystal creek and tributary, spring creek, Courtney springs creek, Abernethy creek, Minthorn creek, Mt. Scott creek, Phillips creek, and several drainage ditches and swales. The Willamette river, Clackamas river, and Abernethy creek were not studied because they would be crossed on existing bridges for which in-water work is not anticipated. Ten potential wetland areas were located within the study corridor. These areas were classified as riverine, depressional, or slope/flats wetlands using the judgmental method of the hydrogeomorphic (hgm)-based assessment method developed by DSL (Adamus and field, 2001).

The potential riverine wetlands were located in topographic valleys such as floodplains and riparian corridors and received their hydrology from the creeks listed above. The potential depressional wetlands were located in topographic depressions and fed primarily by overland flow (runoff) and interflow from surrounding uplands. The potential slope wetlands occurred as seepage areas at the toe of steep slopes and had dominant hydrology source of groundwater inputs. The potential flats wetlands were fed primarily by direct precipitation, secondarily by lateral subsurface flow or surface runoff and are located in shallow basins situated on broad flat terraces. Characteristics of the potential wetlands and waterways within the project area are listed in Table 3.11-2. Locations of the potential wetlands and waterways, with study site numbers and wetland letter designations, are shown in Figure 3.11-1.

The HGM method was also used to evaluate the following 13 wetland functions: Water Storage and Delay, Sediment Stabilization and Phosphorus Retention, Nitrogen Removal, Primary Production, Thermoregulation, Resident Fish Habitat Support, Anadromous Fish Habitat Support, Invertebrate Habitat Support, Amphibian and Turtle Habitat, Breeding Waterbird Support, Wintering and Migratory Waterbird Support, Songbird Habitat Support, and Support of Characteristic Vegetation. The method is based on a series of questions that have been developed for each function, and which serve to guide the user through the process of assigning importance to the function. The method evaluates the extent to which a given function is an important component of a wetland, and assigns a numerical rating based on this evaluation. The numerical ratings are based on a scale of 0 to 1.0, with "0" being minimal capacity and "1.0" being highest capacity. A summary of the HGM functional scores for each wetland area is provided in Table 3.11-3.

3.11.1.2 Vegetation

Field evaluations for vegetation were conducted in the vicinity of all study alternatives. A preliminary vegetation map of the potentially affected area was prepared using aerial photograph interpretation, NWI maps, maps from previously prepared vegetation studies, and field surveys. Vegetation polygons were classified by cover type using accepted classification systems for upland habitats. Upland vegetation cover types were classified based on descriptions of vegetation associations in Franklin and Dyrness (1988), where appropriate. Field maps included approximate vegetation cover type boundaries along with documented sensitive plant associations, potentially important wildlife habitat, and other key ecological features necessary to evaluate the alternatives.

Vegetation boundaries and classifications were verified in the field and refined as necessary during reconnaissance-level field surveys. Areas identified as requiring more detailed surveys (e.g., wetland determinations, TES species surveys) were surveyed on foot, during which time plant species composition, habitat quality, and structure of vegetation communities were noted. Habitat quality was assessed using such factors as native species composition, past disturbance, edge effect, and degree of fragmentation and isolation. All plant species encountered were recorded and identified to a level sufficient to determine their state or federal status, if any.

Five vegetation cover types occur within the alignment--grassland, scrub-shrub, riparian scrub-shrub, upland forest, and riparian forest. Areas of open water and developed lands were also mapped. The most common cover type within the study area is grassland. Native vegetation is generally limited to forested communities, which usually occur as scattered patches throughout the study area. Riparian scrub-shrub is rare within the study corridor.

Table 3.11-2
Summary of Wetlands and Waterways within the Study Corridor[1]

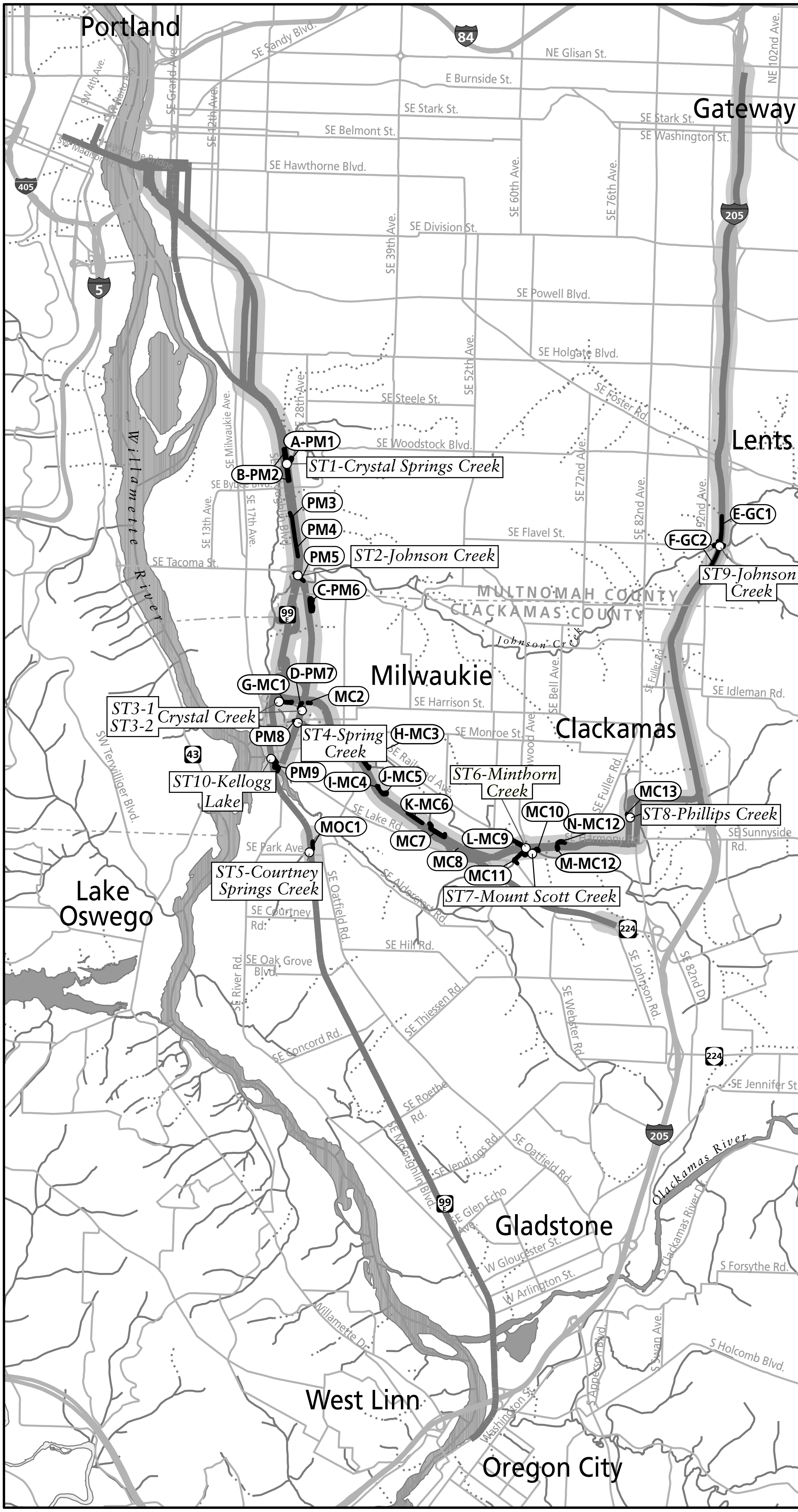
Site/ Wetland[2]	Project Segment	Waterway	Wetland Class[3]	Wetland Determination	Comments
PM1/A	Portland to Milwaukie	Crystal Springs Creek	RFT	Wetland	Perennial stream bounded by emergent and scrub-shrub wetland
				Non-wetland waterway	Unvegetated portion of Crystal Springs Creek
PM2/B	Portland to Milwaukie	NA	S/F	Wetland	Union Pacific Railroad (UPRR) Brooklyn Yard wetland mitigation site
PM3	Portland to Milwaukie	Unnamed drainage ditch	NA	Upland	Relic wetland that has been filled and trenched since the South/North Study
				Non-wetland waterway	Unvegetated drainage ditch
PM4	Portland to Milwaukie	Unnamed drainage ditch	NA	Upland	Relic wetland that has been filled since the South/North Study
				Non-wetland waterway	Unvegetated drainage ditch
PM5	Portland to Milwaukie	Johnson Creek	NA	Non-wetland waterway	Channelized perennial stream bounded by bio-engineered slopes with upland deciduous forest
PM6/C	Portland to Milwaukie	NA	DEP	Wetland	City of Milwaukie Roswell retention facility supporting emergent, scrub-shrub, and forested wetland
PM7/D	Portland to Milwaukie	Crystal Creek and tributary	RFT	Wetland	Perennial stream and intermittent tributary supporting emergent, scrub-shrub, and forested wetland
PM8	Portland to Milwaukie	Spring Creek	NA	Non-wetland waterway	Man-made pond inline with perennial stream
PM9	Portland to Milwaukie	Kellogg Lake	NA	Non-wetland waterway	Man-made lake with steep slopes and outfall/dam structure to the Willamette River
MOC1	Milwaukie to Oregon City	Courtney Springs Creek	NA	Non-wetland waterway	Deeply entrenched perennial stream bounded by deciduous forest
MC1/G	Milwaukie to Clackamas	Crystal Creek	RFT	Wetland	Perennial stream supporting emergent, scrub-shrub, and forested wetland
MC2	Milwaukie to Clackamas	Unnamed drainage swale	NA	Non-wetland waterway	Drainage swale in area of hydric soils
MC3/H	Milwaukie to Clackamas	Unnamed pond	RI	Wetland	Milwaukie Marketplace mitigation site at headwater of Minthorn Creek
				Non-wetland waterway	Unvegetated portion of open water at Milwaukie Marketplace mitigation site
MC4/I	Milwaukie to Clackamas	NA	DEP	Wetland	Stormwater/sedimentation basin constructed in prior wetland area
MC5/J	Milwaukie to Clackamas	NA	DEP	Wetland	Wetland mitigation site
MC6/K	Milwaukie to Clackamas	Unnamed drainage ditch	DEP	Wetland	East end of drainage channel supporting emergent wetland
				Non-wetland waterway	Drainage channel constructed for stormwater management in prior upland area.
MC7	Milwaukie to Clackamas	Unnamed drainage ditch	NA	Non-wetland waterway	Drainage channel constructed for stormwater management in prior upland area.
MC10	Milwaukie to Clackamas	Minthorn Creek	NA	Non-wetland waterway	Channelized perennial stream with sparse emergent vegetation
MC11	Milwaukie to Clackamas	Mt. Scott Creek	NA	Non-wetland waterway	Perennial stream bounded by mixed coniferous/deciduous forest
MC12/ M and N	Milwaukie to Clackamas	Unnamed waterway	RI, RFT	Wetland	Intermittent stream supporting emergent vegetation
				Non-wetland waterway	Small man-made impoundment along intermittent stream.
MC13	Milwaukie to Clackamas	Phillips Creek	NA	Non-wetland waterway	Channelized perennial stream bounded by bio-engineered slopes with upland deciduous forest.
GC1/E	Gateway to Clackamas	Unnamed drainage ditches	RFT	Wetland	Portions of two drainage ditches in area of hydric soils supporting emergent vegetation.
				Non-wetland waterway	Concrete lined drainage ditch.
GC2/F	Gateway to Clackamas	Johnson Creek	RFT	Wetland	Scrub-shrub wetland area on man-made platform floodway along perennial stream.
				Non-wetland waterway	Channelized perennial stream bounded by man-made cement slopes.

Source: URS, April 2002.
Notes: NA = not applicable; RFT = riverine flow-through; RI = riverine impounding; S/F = slope/flat; DEP = depressional.
[1] The Willamette River, Clackamas River, and Abernethy Creek are not addressed in this table. Although they all lie within the project area, they are not in the vicinity of project impacts and, therefore, were not studied.
[2] Sites MC8, MC9/L, and MC14 are not addressed in this table. Although they were all studied, they either lie just outside the study corridor, or no wetlands or waterways were identified at these sites.
[3] DSL Hydrogeomorphic Classification.

South Corridor Project

Wetland/Waterway Site Locations

Figure 3.11-1



Alignment Alternatives

Wetland/Waterway Study Area*

Wetland/Waterway Site

Stream Crossing

Stream

Piped Stream

*The Wetland/Waterway Study Area reflects the area where impacts to wetlands and waterways may potentially occur as a result of the South Corridor Project. Wetlands and waterways were not studied outside of the study area along portions of the Portland to Milwaukie and Milwaukie to Oregon City segments where construction and improvements will be limited to existing roadways.

SOUTH CORRIDOR PROJECT
Transportation Alternatives

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Miles

December 2002

Table 3.11-3
Functional Assessment of Wetlands in the South Corridor[1]

Wetland	A	B	C	D	E	F	G	H	I	J	K	L	M	N
HGM Class	RFT	S/F	DEP	RFT	RFT	RFT	RFT	RI	DEP	DEP	DEP	RFT	RI	RFT
Wetland Functional Score[2]														
Water Storage & Delay	0.2	0.6	0.6	0.2	0.4	0.6	0.2	0.2	0.8	0.8	0.4	0.2	0.4	0.4
Sediment Stabilization & Phosphorus Retention	0.4	0.4	1.0	0.6	0.5	0.4	0.8	0.2	0.8	0.8	0.4	0.2	0.6	0.6
Nitrogen Removal	0.2	0.3	0.9	0.6	0.2	0.2	0.8	0.2	0.6	0.8	0.2	0.2	0.8	0.5
Thermoregulation	0.4	0.3	0.8	0.8	0.4	0.3	0.8	0.4	0.6	0.8	0.2	0.3	0.6	0.6
Primary Production	0.2	NA	NA	NA	NA	0.2	0.6	NA	NA	NA	NA	0.2	0.4	0.4
Resident Fish Habitat Support	0.7	NA	NA	NA	NA	0.4	0.5	NA	NA	NA	NA	NA	NA	NA
Anadromous Fish Habitat Support	0.7	NA	NA	NA	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA
Invertebrate Habitat Support	0.2	0.2	0.8	0.6	0.2	0.2	0.8	0.4	0.2	0.6	0.1	0.4	0.7	0.6
Amphibian & Turtle Habitat	0.2	0.2	0.8	0.7	0	0.2	0.6	0.2	0.2	0.2	0	0.1	0.8	0.4
Breeding Waterbird Support	0.4	0.2	0.8	0.2	0	0	0.2	0.4	0	0	0	0	0.6	0.2
Wintering & Migratory Waterbird Support	0.4	0.5	0.8	0.2	0	0.2	0.2	0.4	0	0	0	0.2	0.7	0.2
Songbird Habitat Support	0.2	0.2	0.6	0.8	0	0.2	0.8	0	0.2	0.6	0	0	0.6	0.4
Support of Characteristic Vegetation	0.2	0.4	0.7	0.6	0.1	0.3	0.8	0.2	0.2	0.8	0.2	0	0.6	0.3

Source: URS, April 2002.
Note: DEP = depressional; RFT = riverine flow-through; RI = riverine impounding; S/F = slope/flat.
[1] Refer to the Wetland Determination Report for details of the functional assessment.
[2] The functional scores are based on a scale of 0 to 1.0 with "0" being minimal capacity and "1.0" being highest capacity.

3.11.1.3 Wildlife

Wildlife surveys were conducted concurrently with vegetation classification. The purpose of these surveys was to identify all prominent wildlife species in the vicinity of the alternatives, their relative abundance, location, and use of vegetation types. The relative function of each plant community in providing a habitat for wildlife was assessed based on field evaluations, literature review, professional opinion and agency consultation. Observed and expected wildlife species are listed in Table 3.11-4.

Table 3.11-4
Wildlife Species Observed or Known to Occur in the South Corridor

Common Name	Scientific Name	Habitat(s) Used
Birds		
Great blue heron	*Ardea herodias*	Open Water
Canada goose	*Brantus canadensis*	Open Water
Mallard	Anas platyrhynchos	Open Water
Rufous hummingbird	*Selasphorous rufus*	Developed
Northern flicker	*Colaptes auratus*	Developed
American crow	*Corvus brachrhynchos*	Developed
Scrub jay	*Aphelocoma coerulescens*	Developed
House wren	*Trogolodytes aedon*	Upland Scrub-shrub
American robin	*Turdus migratorius*	Developed and grasslands
Black-capped chickadee	*Parus atricapilus*	Upland forest
Spotted towhee	*Pipilo erythrophthalmus*	Riparian forest and upland scrub-shrub
Song sparrow	*Melodius melospiza*	Upland scrub-shrub
Mammals		
Douglas' squirrel	*Tamiasciurus douglasii*	Developed
Racoon	Procyon lotor	Developed and riparian forest

Source: Csuti, B. et al. 1997. Atlas of Oregon Wildlife. Oregon State University Press, Corvallis, Oregon.

Wildlife species that occur within the 200-foot-wide study corridor include many species commonly found in urban habitats. These species are generally adapted to life in urbanized areas, often occurring in edge habitats that exist along the boundaries of disturbed areas. Some of these common species are non-native such as the bullfrog, European starling and English sparrow.

The study area was delineated into five vegetated and two non-vegetated cover types (see section 3.11.2.2). Of these cover types, forested habitats generally provide the highest wildlife habitat values because of the comparatively greater supply of food, cover and nesting structure in these areas.

However, much of the forested habitat within the study corridor occurs as scattered patches, limiting its suitability to species with limited home ranges and high tolerances, and highly mobile species such as songbirds. Other habitat types that may provide many of the requisites for wildlife include scrub-shrub and open water habitats.

3.11.1.4 Fisheries

Existing conditions and fish distribution were assessed for all watercourses intersected or within the immediate vicinity of the Project Alternatives and Options. Existing information provided documentation of known fish distribution and stream conditions. Field reconnaissance activities were used to supplement the existing information and provide site-specific stream condition assessment. Despite the degraded and altered condition of most of these waterways, most support populations of resident as well as TES fish species. Native and non-native fish species, including TES species, known or believed to be present in the study corridor for South Corridor Project alternatives and design options are listed in Table 3.11-5. Non-native fishes, representing taxa from all over the world, were released as elements of angling enhancement programs of fish and wildlife authorities and as illegal introductions, both intentional and accidental. Nine bodies of water would be crossed by or are in the immediate vicinity of the project corridor: Crystal Springs Creek, Johnson Creek, Crystal Creek, Spring Creek, Kellogg Lake, Courtney Springs Creek, Minthorn Creek, Mt. Scott Creek, and the Phillips Creek. Each of the water bodies is described below and the associated stream crossings are shown in Figure 3.11-1. Three other bodies of water, the Willamette and Clackamas Rivers and Abernethy Creek, are crossed but no in-water work is anticipated at these locations.

Crystal Springs Creek flows through the Portland to Milwaukie Segment. The creek originates east of Reed Lake and west of Woodstock in the Crystal Springs Rhododendron Gardens. The creek flows west and then south for 2.5 miles, passing through both Reed Lake and Crystal Springs Lake at Eastmoreland Golf Course, before its confluence with Johnson Creek. The low-gradient channelized creek is characterized by low banks, silt and gravel substrate, and non-native herbaceous riparian vegetation. No barriers to fish passage are present in this reach. A number of resident and TES fish species have been documented in Crystal Springs Creek.

Johnson Creek flows through both the Portland to Milwaukie and Gateway to Clackamas Segments. The creek is 25 miles long, originating near the town of Cottrell. The western portion of the creek flows primarily through urbanized habitat, whereas the eastern portion of the creek flows through undeveloped open space and agricultural land. In the 1930s, the Federal Works Progress Administration cleared and lined about 90% of Johnson Creek between its mouth and SE 158th Avenue. The channel was excavated to a depth of 6 to 10 feet with a bottom width of 25 to 50 feet. The banks were graded to have 1:1 side slopes and were lined with hand-placed stone. The channel has not been maintained; in many reaches sediment has been deposited, and shrubs and trees grow in the sediment (Bureau of Environmental Services: Clean Rivers Web site, accessed May 2002). The creek has been channelized and rerouted in some areas to accommodate urban development. In the Portland to Milwaukie Segment, Johnson Creek is restricted by commercial-residential land use adjacent to the site. The creek is characterized by moderately graded banks with young sapling trees, gravel and cobble substrate, and pools that provide moderate instream cover. In the Gateway to Clackamas Segment, Johnson Creek is characterized by banks of concrete and/or riprap; substrate of concrete, riprap and silt; and little riparian vegetation. No barriers to fish passage are present in either location. A number of resident as well as TES fish species have been documented throughout Johnson Creek.

Table 3.11-5
Fish Species Known to Occur in the Waterways Crossed by the South Corridor Alternatives

Common Name	Scientific Name	Crystal Springs Creek	Johnson Creek	Crystal Creek	Spring Creek	Kellogg Lake	Courtney Springs Creek	Minthorn Creek	Mt. Scott Creek	Phillips Creek
Threatened , Endangered, and Sensitive Species										
Coho salmon	*Oncorhynchus kisutch*	X	X			X			X	X
Fall chinook	*O. tshawytscha*	X	X			X				
Winter steelhead[1]	*O. mykiss*	X	X			X			X	X
Summer steelhead[1]	*O. mykiss*								X	X
Other Fish Species										
Banded killifish	*Fundulus diaphanus*									X
Bluegill	*Lepomis macrochirus*	X				X				
Brook trout	*Salvelinus fontinalis*					X				
Brown bullhead	*Ictalurus nebulosus*									X
Chiselmouth	*Acrocheilus alutaceus*		X							
Common carp	*Cyprinus carpio*							X		
Cutthroat trout	*O. clarki clarki*	X	X			X	X		X	X
Goldfish	*Carassius auratus*									X
Green sunfish	*Lepomis cyanellus*		X							
Lamprey spp.	*Lampetra spp.*	X								
Largemouth bass	*Micropterus salmoides*	X	X	X		X			X	X
Largescale sucker	*Catostomus macrocheilus*	X	X			X				
Mosquitofish	*Gambusia affinis*									X
Northern pikeminnow	*Ptychocheilus oregonensis*	X								
Pacific lamprey	*Lampetra tridentatus*	X	X			X			X	X
Peamouth chub	*Mylocheilus caurinus*		X							
Prickly sculpin	*Cottus asper*					X	X	X	X	
Pumpkinseed	*Lepomis gibbosus*					X				
Rainbow trout[2]	*O. mykiss*		X			X			X	X*
Redside shiner	*Richardsonius balteatus*	X	X			X			X	X
Reticulate sculpin	*Cottus perplexus*	X	X			X	X	X	X	X
Smallmouth bass	*Micropterus dolomieui*									
Speckled dace	*Rhinichthys osculus*	X	X			X			X	X
Sucker spp.	*Catostomus spp.*	X								
Three-spine stickleback	*Gasterosteus aculeatus*	X								
Western brook lamprey	*Lampetra richardsoni*		X							X
Yellow bullhead	*Ictalurus natalis*		X							

Sources: MWH, 2001; Metro, February 1998; ODFW, 2002; NMFS, 2002; Freizen and Zimmerman, 1999.
[1] Rainbow trout is the resident form of steelhead trout. Winter and summer steelhead are listed species, while rainbow trout have no federal designation. Young rainbow trout are visibly indistinguishable from steelhead, and may be falsely identified as steelhead trout. Locations where the presence of rainbow trout has been confirmed are assumed to be occupied by steelhead, as is the case with Phillips Creek.

Crystal Creek originates from Crystal Lake, flowing east through residential areas just south of Highway 224 before entering Johnson Creek. Fish distribution information regarding Crystal Creek is limited; largemouth bass are the only known species present. The creek flows through a steep ravine approximately 30-40 feet deep. The active channel width is less than 3 feet with vegetated banks of deciduous trees, thickets of Himalayan blackberry and other non-native species. A wooden gazebo and several connected boardwalks are built around an artificial dam that impounds the creek in 2 locations, creating shallow ponds with little to no vegetative cover. An impassable culvert exists on Crystal Creek near SE 23rd Avenue, however, the location of the outlet could not be identified.

Spring Creek flows through the Portland to Milwaukie Segment. Spring Creek originates from an underground spring near SE 30th Avenue. The creek is ponded upstream of the Southern Pacific Railroad line, and is surrounded by an apartment complex and young deciduous riparian vegetation. The creek flows west through an artificial concrete-lined channel passing through several silted ponds, culverts, and artificial falls on the Milwaukie Middle School grounds. The creek then flows through the SE Harrison Street culvert into a wide, controlled-outlet open water pond in Scott Park that is surrounded by residential homes and parking lots. From Scott Park the creek is culverted for approximately 500 feet to its confluence with Johnson Creek, less than 0.5 mile from its headwater springs. No fish species are known to occur in Spring Creek.

Kellogg Creek/Mt Scott Creek. Kellogg Creek is located in the Milwaukie to Oregon City Segment. Kellogg Lake is a 12-acre lake artificially impounded at the mouth of Kellogg Creek. The lake is characterized by steep banks with non-native vegetation and turbid water and extends 0.75 mile through commercial and residential areas. Kellogg Creek flows through a concrete, water-impounding box culvert fitted with a fish ladder under SE McLoughlin Boulevard. The ladder structure has been classified a temporal barrier to fish passage (MWH, 2001) due to its non-standard design. In spite of this, a number of resident and TES fish species have been documented in Kellogg Creek (Freisen and Zimmerman, 1999). **Mt. Scott Creek** flows through the Milwaukie to Clackamas Segment and into Kellogg Creek. The Mt. Scott Creek originates in Happy Valley and flows south and west for about 6 miles to its confluence with Kellogg Creek at the North Clackamas Regional Stormwater Facility. Moderately graded banks with mixed-forested vegetation, boulder/gravel substrate, and moderate instream cover characterize the creek. No barriers to fish passage are present in this reach. A number of resident species, including TES fish species, are known to occur in Mt. Scott Creek. The fish ladder on Kellogg Creek can be barrier to fish passage to Mt Scott Creek.

Courtney Springs Creek flows through the Milwaukie to Oregon City Segment. The creek originates from groundwater springs near SE Courtney Road, east of SE River Road, and flows northeast through commercial and residential areas for less than 1 mile to its confluence with Kellogg Creek, just upstream of Kellogg Lake. The small creek is characterized by steep vegetated banks and cobble/gravel substrate. The creek flows through a concrete box culvert under SE McLoughlin Boulevard that is likely a passage barrier because of its length. Limited fish species have been documented to occur, but include cutthroat trout.

Minthorn Creek originates at springs southeast of 37th Avenue and flows through the Milwaukie to Clackamas Segment. The creek is an intermittent (grading into perennial), 1.5-mile-long creek that flows through business and commercial properties, and enters Mt. Scott Creek southeast of SE Linwood Avenue. The channelized creek parallels railroad tracks and is characterized by heavily reinforced banks of ballast and no riparian vegetation, but moderately good water quality. The creek flows through two culverts under a parking lot for approximately 300 feet before entering Mt. Scott Creek. These culverts likely block fish passage. A small number of resident fish species are known to occur in Minthorn Creek (Metro, February 1998).

Phillips Creek flows through the Milwaukie to Clackamas Segment. The creek is a mile-long, intermittent (grading into perennial) creek originating south of Harmony Point and terminating at its confluence with Mt. Scott Creek. Phillips Creek is an urbanized, rerouted, channelized creek with a low-gradient riffle-type habitat. The creek has moderately graded banks that are heavily reinforced at road crossings, primarily non-native riparian vegetation, gravel/sand substrate, and limited instream fish cover. Low summer flow may impede fish passage at the crossing location; the culvert under

82nd Avenue downstream may present a barrier to fish passage; and ODFW detected a 10-foot waterfall upstream of the crossing location. Despite these conditions, ODFW stream surveys (1999) found coho salmon and rainbow trout within the stream reach crossed by the Milwaukie to Clackamas Segment. As rainbow trout are the resident form of anadromous steelhead trout, they are visually indistinguishable; consequently, where rainbow trout are verified to be present (as in Phillips Creek) it is assumed that steelhead trout occupy the stream.

The **Willamette River** flows through the Portland to Milwaukie Segment, and the **Clackamas River** and **Abernethy Creek** flows through the Milwaukie to Oregon City Segment. All of these are crossed on existing structures, which will receive minor upgrades to accommodate the proposed project elements. No in-water work is expected to occur at either crossing under any of the alternatives. These rivers will not be discussed further, and are not included in project impact analyses because no impacts are expected to result from any of the proposed project alternatives.

3.11.1.5 Threatened, Endangered, and Sensitive Species

T&E species include those species state or federally listed as threatened or endangered; proposed for listing or identified as candidates; federal species of concern; or state sensitive species. For this investigation, species with local significance are also considered TES species. Figure 3.11-2 shows TES plant and wildlife species documented to occur within 5 miles of the project features and Figure 3.11-3 indicates where TES fish species have been documented. These figures identify species as federal or state listed (threatened or endangered), species of concern/sensitive, and locally important. TES plant and wildlife species are mapped according to their highest protection status (e.g., a species classified as a federal species of concern and state threatened is mapped as “federal or state listed”).

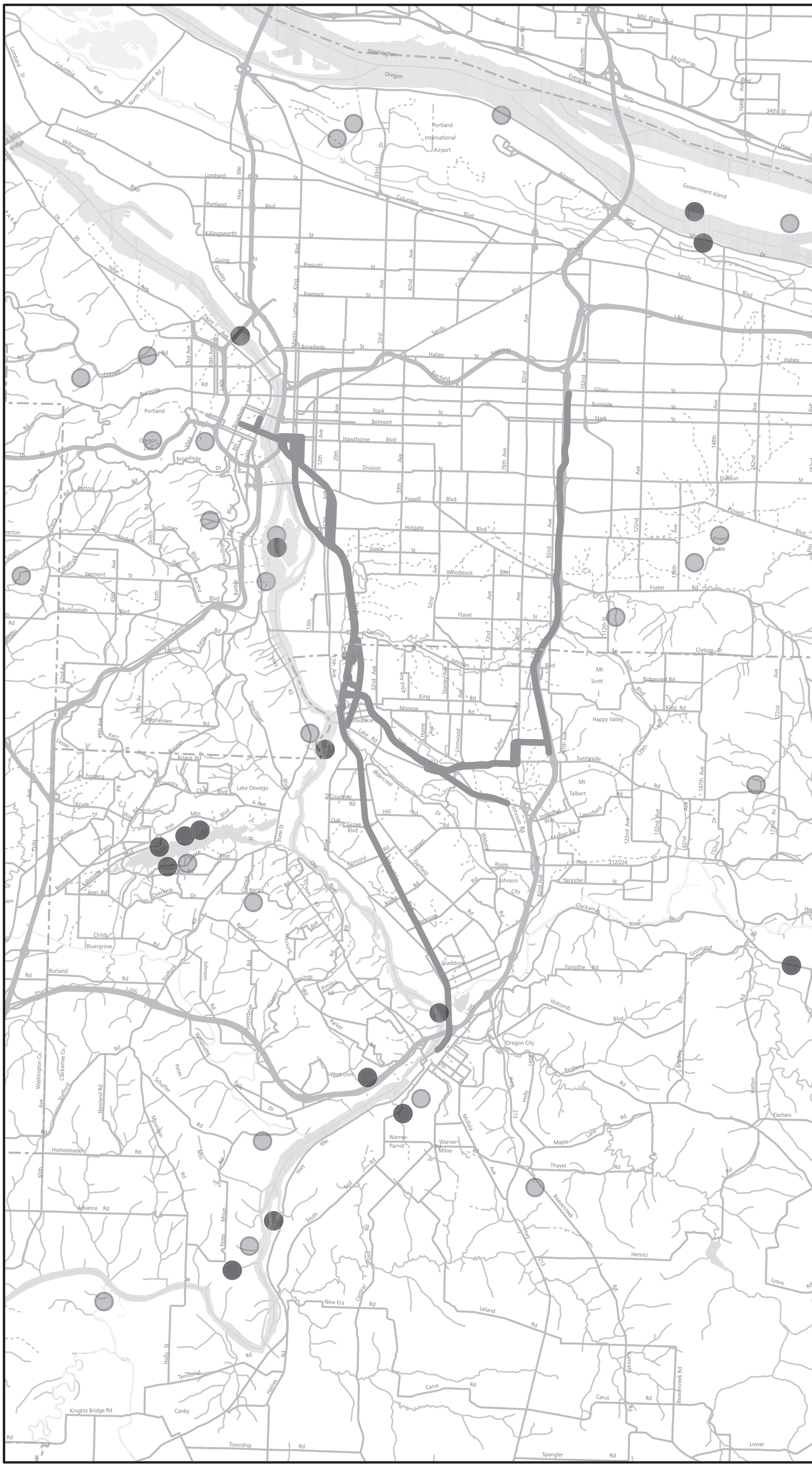
USFWS identified nine threatened and three endangered fish and wildlife species with potential to occur within the project vicinity. USFWS also listed one fish proposed for federal listing as threatened (since receiving this letter, the proposed species has been withdrawn from consideration), and two birds, one amphibian and one fish as candidates for federal listing. In addition, USFWS identified 23 species of concern with potential to occur in the study area. The Oregon Natural Heritage Program (ONHP) database provided 80 records of 22 state and federal TES species within a 5-mile search area of the project (ONHP, 2002). NMFS was also contacted regarding listed anadromous fish in the project area. In a letter dated June 10, 2002 the NMFS identified four threatened or endangered anadromous fish species and one candidate fish species as potentially present. Written correspondence relating to TES species is provided in Appendix A, Agency Correspondence.

Federal consultation, as required by Section 7 of the ESA, will be required during the FEIS phase of the project to assess potential impacts on listed fish and their habitats. The consultation would be conducted through a Biological Assessment (BA) of the LPA, which would include an effects determination. The BA would also include an assessment of potential effects to Essential Fish Habitat (EFH). EFH is habitat designated by the Magnuson-Stevens Act (Act) as essential for the health and viability of commercially significant fish species. In the project area, coho and chinook salmon are managed by the Act. If the project is determined by the FTA, USFWS, or NMFS to have a “may affect, and is likely to adversely affect listed species” designation, formal consultation is initiated. Under formal consultation NMFS and/or USFWS would respond with a Biological Opinion (BO) concurring with the effects determination, and would present required conservation measures to be implemented as a condition of the agreement. The BO would also include a consultation on effects to EFH and suggest Conservation Recommendations as required by the Act. If the project is deemed to have “no effect”, or “may affect, but is not likely to adversely affect listed

South Corridor Project

Threatened, Endangered, and Sensitive Wildlife Species Occurences

Figure 3.11-2



TES Species Classification

- Federal/State Listed
- Federal/State Sensitive

Stream

Piped Stream

South Corridor Alternatives

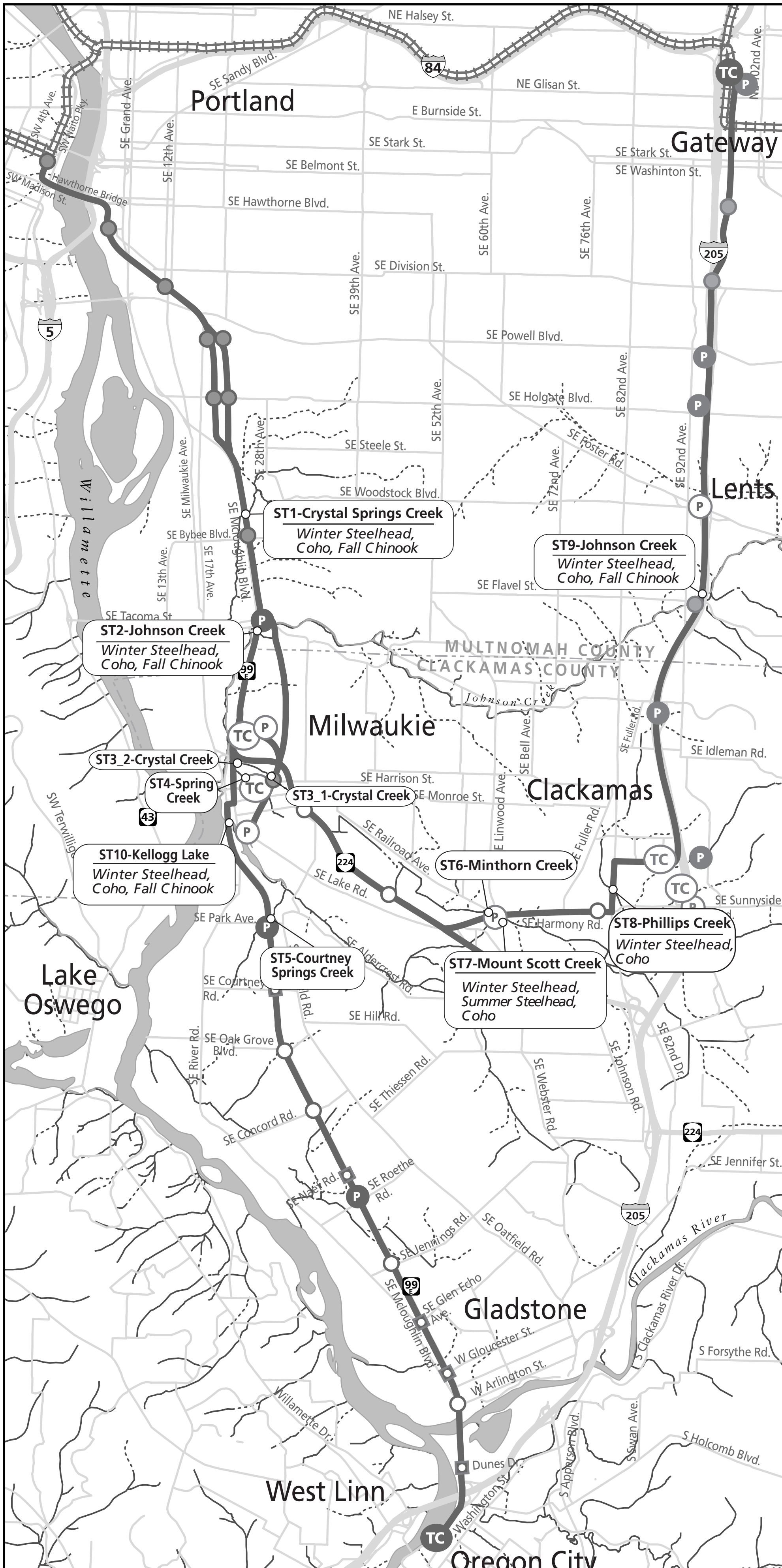
Note: TES = Threatened and Endangered Species

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

0 1 2 N 4
Miles

December 2002



South Corridor Project

Stream Crossing Locations and Threatened and Endangered Fish Species Distribution in the South Corridor

Figure 3.11-3

Site #/Stream Name
TES Fish Presence

Alignment Alternative and station

Stream

Piped Stream

Existing Light Rail

TC Transit Center — TC Option

P Park & Ride — P Option

Local bus stop improvements

County Line

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

0 1 2
Miles

December 2002

species," then the services would respond with a concurrence statement and the Section 7 consultation is complete.

A. Threatened, Endangered, and Sensitive Fish

TES fish species are prominent in the project area, and constitute a major factor in the consideration of alternatives and design options (refer to Table 3.11-5 for distribution of TES fish by waterway). Most waterways within the project area have been documented to support populations of TES fish, including Crystal Springs Creek, Johnson Creek, Kellogg Lake, Mt. Scott Creek, and Phillips Creek. The four TES fish species known to be present within the South Corridor study corridor are all members of the Lower Columbia River Evolutionarily Significant Unit (ESU) or Upper Willamette River ESU. The species include coho salmon (Candidate, also State Endangered), fall chinook salmon (NMFS Threatened), spring chinook salmon (NMFS Threatened), summer steelhead trout (NMFS Threatened), and winter steelhead trout (NMFS Threatened). These species migrate, spawn, and rear in streams throughout the Project area.

B. Threatened, Endangered, and Sensitive Wildlife and Plants

This investigation evaluated the proximity of TES plants and animals to the project alternatives. Surveys for TES wildlife and plant species were conducted in conjunction with vegetation mapping. Surveys for plants were conducted during the time of year when they could be most readily identified, usually during their flowering period. Potentially suitable habitats for TES plants that potentially occur within the project vicinity were surveyed. Focused surveys for TES wildlife species were not conducted. Surveys instead focused on habitat evaluation to predict the likelihood that TES species would occur in the potentially affected area. Results of these surveys were used to supplement information obtained from the resource agencies and existing reports. Surveys for nesting TES birds will be conducted during the spring breeding season in conjunction with wildlife habitat assessment surveys. In general, raptor nests can be readily located, especially early in the breeding season.

No TES wildlife or plant species were identified within the 200-foot-wide study corridor and little or no potentially suitable habitat for any TES wildlife or plant species was observed.

3.11.2 Environmental Impacts

The environmental consequences that could result from the South Corridor Project include long-term, short-term, and cumulative impacts to biological resources. Long-term impacts are generally associated with the placement of facilities and operation of the project alternatives and may include irreversible removal, disturbance, or destruction of biological resources. Short-term impacts are temporary impacts generally associated with construction activities that have generally reversible effects on biological resources. Short-term impacts may include the removal of vegetation in construction staging, storage, and access areas; impacts to water quality from soil erosion and spills of toxic materials (e.g., equipment fuel); and increased noise, lighting, and human activity during project construction. Cumulative impacts are "those additive impacts from the incremental effects of a proposed action when placed in context with other past, present, and reasonably foreseeable future actions" (CEQ regulation, 40 CFR 1508.7). A list of past, present, and reasonably foreseeable projects that may affect biological resources in the South Corridor are listed in Chapter 4 of the *South Corridor Ecosystems Results Report* (Metro, November 2002). Secondary impacts are indirect impacts associated with project construction that may affect biological resources, such as degraded water quality caused by an increase in runoff from impervious areas (e.g., roadways, platforms) built adjacent to wetlands or waterways. These impacts may be temporary or permanent, but are usually of long duration.

The long-term impacts to biological resources (e.g., wetlands, vegetation, wildlife, fisheries, and threatened and endangered species) are summarized by alternative in Table 3.11-6. There would be no long-term impacts to TES wildlife or plants. Long-term, short-term, and cumulative impacts associated with each of the alternatives are discussed below by biological resource. Long-term impacts of the various design options are also summarized.

Table 3.11-6
Summary of Long-Term Impacts to Biological Resources

Alternative	Wetlands[1] (Fill / Span)	Waterways[2] (Fill / Span)	Vegetation[3]	Streams and Fish Habitat[4]	TES Species	
					Fish[4]	Wildlife and Plants[5]
Bus Rapid Transit	0.01 / 0	0.02 / 0	1.20	32.3	0	None
Busway	0.39 / 0	0.02 / 0.20	6.65	164.0	131.7	None
Milwaukie Light Rail	0.57 / 0	0.27 / 0.04	5.58	103.7	58.4	None
I-205 Light Rail	0.03 / 0.07	0.39 / 0.03	27.48	87.5	55.2	None
Combined Light Rail	0.59 / 0.07	0.64 / 0.07	33.14	158.9	113.6	None

Source: Metro, August 2002.
Note: TES = Threatened and endangered species.
[1] Values are acres of wetlands filled and spanned by the project.
[2] Values are acres of waterways filled and spanned by the project.
[3] Values are acres of vegetation removed by the project.
[4] Values are lineal feet of stream/TES bearing stream that would be impacted by the project.
[5] No TES wildlife or plant species have been identified within the study corridor.

3.11.2.1 Wetlands and Waterways

Potential long-term impacts to wetlands and waterways as a result of the project alternatives may include direct losses (e.g., Filling) and spanning (e.g., Construction of a bridge, trestle, or other similar structure above a wetland or waterway), which may impact wetlands by increasing shade and inhibiting vegetation growth. Long-term impacts along linear features were assumed to occur within a 30-foot-wide corridor where the footprint of the project would be located. Long-term impacts of non-linear features (e.g., Park-and-ride and maintenance facilities) were determined from the feature footprint.

The BRT Alternative would have the least long-term impact on wetlands and waterways, with less than 0.1 acre of impact. Wetland K, which has low functional value, is the only wetland area impacted by the BRT Alternative (see Table 3.11-2). The Combined LRT Alternative would have the greatest impact on wetlands and waterways with 1.4 acres of impact. Wetlands impacted by the Combined LRT Alternative include Wetlands A, B, D, E, and F, which have low to moderate functional value. The Busway, Milwaukie LRT, and I-205 LRT Alternatives would have intermediate impacts, with 0.5, 0.9, and 0.5 acres of impact, respectively. Wetlands impacted by the Busway Alternative include Wetlands A, B, K, and M. Wetlands A, B, and K have low to moderate functional value, and Wetland M has moderate to high functional value. Wetlands impacted by the Milwaukie LRT Alternative include Wetlands A, B, D, and K, which have low to moderate functional value. Wetlands impacted by the I-205 LRT Alternative include Wetlands A, B, D, E, and F, which have low to moderate functional value. Operations and maintenance facilities would have no long-term impacts. It should be noted that construction of non-linear features next to wetlands would be avoided to reduce long-term impacts.

There would be no difference in long-term impacts between the alignment selected for comparison of the alternatives (see Table 2.2-3) and the design options associated with the BRT, Busway, and I-205 LRT Alternatives.

With the Milwaukie LRT Alternative, the Southgate Crossover Design Option and the Tillamook Branch Line Design Option would both result in 0.9 acres of total long-term impact to wetlands and waterways. Although there would be additional fill of the waterway at Spring Creek with the Tillamook Branch Line Design Option, the area filled would be less than 0.1 acres, resulting in essentially no difference in impacts between the two design options.

Within the Combined LRT Alternative, the Southgate Crossover Design Option and the Tillamook Branch Line Design Option would both result in 1.4 acres of total long-term impact to wetlands and waterways. As with the Milwaukie LRT Alternative, the waterway area filled with the Tillamook Branch Line Design Option would be less than 0.1 acres, resulting in essentially no difference in impacts between the two design options.

Potential **short-term impacts** to wetlands and waterways may include soil compaction, impacts to water quality from soil erosion and spills of toxic materials (e.g., equipment fuel), and loss of vegetation as a result of heavy equipment use during construction. Short-term impacts along linear features were determined on a site-by-site basis, but generally expected to occur within a 15-foot buffer on each side of the long term impact area. In some sensitive areas (i.e. wetlands and river crossings), the area of construction would be further minimized to protect the resources. Short-term impacts along non-linear features (e.g., park-and-ride and maintenance facilities) were expected to occur within 50 feet of these features.

Cumulative impacts to wetlands and waterways include direct and indirect impacts associated with other projects that may cause impacts to wetlands within the South Corridor Project area. Direct cumulative impacts include the filling and/or spanning of wetlands associated with other projects within the South Corridor Project area. For instance, the planned expansion of SE Harmony Road from 3 lanes to 5 lanes by Clackamas County would increase the cumulative impacts on Mt. Scott and Minthorn Creeks without the consideration of mitigation. Indirect cumulative impacts include increased sediment and pollutant load levels in wetlands and/or waterways and/or hydrology sources located within the South Corridor Project area as a result of other projects within the same watersheds. These projects could include residential and commercial development within the watershed. Secondary impacts include altering a hydrology source to a wetland and/or waterway by filling of an area adjacent to the feature. Another secondary impact may be increased runoff from impervious areas (e.g., roadways, platforms) built adjacent to wetlands and/or waterways, which may result in degraded water quality. Increased runoff may also result in destabilization of stream channels, causing erosion and downcutting. A potential positive secondary impact may be a reduction in the VMT with the build alternatives compared to the No-Build Alternative, which could equate to less non-point pollution.

3.11.2.2 Vegetation

Potential **long-term impacts** to vegetation may include permanent removal of vegetation to accommodate project facilities. The impacts would be limited because most of the impact area has been previously disturbed and little or no native vegetation is present. A summary of the vegetation impacts by alternative is provided in Table 3.11-7.

The BRT Alternative would permanently remove 1.2 acres, the smallest quantity among the alternatives. The Milwaukie LRT Alternative would permanently remove 5.6 acres of vegetation, most of which is grassland (3.5 acres). The Busway Alternative would result in long-term impacts to

Table 3.11-7
Summary of Long-Term Impacts to Vegetation by Alternative

Alternative	Habitat[1]					Total[1]
	Grass-land	Scrub-shrub	Upland Forest	Riparian Forest	Riparian Shrub	
Bus Rapid Transit	0.90	0.03	0.23	0.04	0.00	1.2
Busway	4.22	0.60	1.13	0.56	1.14	7.7
Milwaukie LRT[2]	3.46	0.50	0.86	0.52	0.24	5.6
I-205 LRT[3]	25.80	1.68	0	0	0	27.5
Combined LRT[4]	29.26	2.26	0.86	0.52	0.24	33.1

Source: Metro, August 2002.

[1] Values are acres of vegetation removed by the project alternatives.

[2] This alternative contains one design option, that would result in impacts different than those identified above. The Tillamook Branch Line DO would result in more overall impacts (5.76 acres), greater impacts to scrub-shrub (0.73 acre) and fewer impacts to upland forest (0.81 acre).

[3] This alternative contains one design option that would result in impacts different than those above. The North of Clackamas Town Center Terminus Option would result in fewer overall impacts (26.51 acres), greater impacts to upland forest (0.14 acre), and fewer impacts to grassland (24.69 acres).

[4] This alternative includes two design options with impacts different than those above. The Tillamook Branch Line Design Option would result in greater overall impacts (5.76 acres), greater impacts to scrub-shrub (0.73 acres) and fewer impacts to upland forest (0.81 acre). The North of CTC Terminus Option would result in fewer overall impacts (26.51 acres), higher upland forest impacts (0.14 acre) and fewer grassland impacts (24.69 acres).

approximately 7.7 acres of vegetation, mostly grassland cover (4.2 acres). The greatest impacts to vegetation would result from the I-205 and Combined LRT Alternatives. The I-205 LRT Alternative would permanently remove 27.5 acres of vegetation, most of which is grassland planted by ODOT within the existing freeway right-of-way and therefore of limited quality as wildlife habitat. The Combined LRT Alternative would remove an estimated 33.1 acres, which is almost entirely within the grassland cover type.

The BRT Alternative would permanently remove 1.2 acres, the smallest quantity among the alternatives. The Milwaukie LRT Alternative would permanently remove 5.6 acres of vegetation, most of which is grassland (3.5 acres). The Busway Alternative would result in long-term impacts to approximately 7.7 acres of vegetation, mostly grassland cover (4.2 acres). The greatest impacts to vegetation would result from the I-205 and Combined LRT Alternatives. The I-205 LRT Alternative would permanently remove 27.5 acres of vegetation, most of which is grassland planted by ODOT within the existing freeway right-of-way and therefore of limited quality as wildlife habitat. The Combined LRT Alternative would remove an estimated 33.1 acres, which is almost entirely within the grassland cover type.

Short-term impacts may result from removal of vegetation during construction. These temporary impacts are expected to occur with all of the alternatives and were calculated by adding an additional 30 feet to the project footprint. The most extensive removal of vegetation during construction will occur within the I-205 and Combined LRT Alternatives. These alternatives will temporarily impact 84.4 acres and 67.7 acres, respectively. The Milwaukie LRT Alternative would have short-term impacts for approximately 21.2 acres of vegetation. The Busway and BRT Alternatives would have the lowest short-term impacts to vegetation, removing only 18.9 acres and 1.9 acres, respectively.

Cumulative impacts to vegetation include direct and indirect impacts related to other projects that may impact vegetation within the South Corridor Project area. Direct cumulative impacts include permanent vegetation removal to accommodate facilities, residences, or other structures. Indirect cumulative impacts include temporary vegetation removal as a result of construction; modification of soils, hydrology, or other existing growing conditions; and weedy invasion due to disturbance.

3.11.2.3 Wildlife

Potential **long-term impacts** to wildlife resulting from the project may include permanent alteration of habitat components—including vegetation, food, and cover—to accommodate project facilities, and the possibility of occasional fatalities from being struck by trains or buses. These impacts would be low to moderate because of the previously disturbed nature of much of the study corridor. Removal of high-quality vegetative cover, such as upland and riparian forest and upland and riparian scrub-shrub, ranges from 1.7 acres within the I-205 LRT Alternative to 4.3 acres with the Combined LRT Alternative.

Within the Portland to Milwaukie Segment, the Busway Alternative's 7th Avenue, Above-Grade Station, and West of Brooklyn Yard Design Options would have no habitat impacts. The North Milwaukie Design Options associated with the Milwaukie and Combined LRT Alternatives would result in permanent impacts to habitat, specifically removing less than 0.1 acre of forested habitat with the Southgate Crossover Design Option and 0.2 acre of upland scrub-shrub habitat with the Tillamook Branch Line Design Option. The Milwaukie Terminus Options would result in less than 0.1 acre of impact to upland forest habitat with the Lake Road Terminus Option and no habitat impacts with the Milwaukie Middle School Terminus Option.

Within the Milwaukie to Clackamas Segment, the Linwood Park-and-Ride Lot Design Option would result in long-term habitat impacts removing less than 0.1 acres of upland forest habitat; the Johnson Road Park and Ride Lot Design Option would not remove any habitat.

In the Gateway to Clackamas Segment, the East of CTC Terminus Option would result in long-term impacts to wildlife resulting from removal of approximately 1.1 acres of grassland habitat. The North of CTC Terminus Option would result in long-term habitat impacts to 0.1 acre of upland forest.

Short-term impacts may include visual and auditory disturbance and removal of vegetation during construction. Short-term impacts are expected to occur within an additional 15-feet on both sides of the proposed project footprint. Any birds protected by the MBTA, nesting in areas cleared or graded during construction, could be adversely affected. These impacts could be avoided by several methods, including scheduling the clearing activity for the non-nesting season.

These temporary impacts would be greatest along the Busway and Milwaukie LRT alternatives due to the relatively higher quantity of native woodland vegetation in the vicinity of Mt. Scott Creek within the Milwaukie to Clackamas Segment.

Cumulative impacts to vegetation include direct and indirect impacts related to other projects that may impact vegetation within the South Corridor Project area. Direct cumulative impacts include increased transportation-related disturbance, increased habitat fragmentation, increased incidence of wildlife mortality, and permanent vegetation removal to accommodate facilities, residences, or other structures. Indirect cumulative impacts include temporary vegetation removal due to construction, and modification of soils, hydrology or other existing growing conditions from other projects like the potential expansion of SE Harmony Road by others. Secondary impacts to vegetation may include gradual loss of vegetated areas as areas served by light rail stations are redeveloped.

3.11.2.4 Fisheries

Potential impacts to fisheries resources include both short- and long-term impacts to the stream and adjacent riparian zone. Such impacts may include disturbance or loss of riparian vegetation, increased sedimentation, reduction of spawning and rearing habitat, and increased impervious surface runoff into the stream. Table 3.11-8 is a summary by alternative of the permanent and temporary impacts in lineal feet to streams. Fish use in the Corridor is shown in Table 3.11-5.

Table 3.11-8
Summary of Potential Impacts to Streams and Fish Habitat by Alternative[1]

Alternative	Lineal Feet of Permanent Impact[2]	Lineal Feet of Temporary Impact[3]	Total	Lineal Feet of Permanent Impact to TES Streams[4]
Bus Rapid Transit[5]	32.30	28.75	61.05	0
Busway[5]	163.97	61.75	225.72	131.67
Milwaukie Light Rail[5]	103.67	175.75	279.42	58.35
I-205 Light Rail	87.54	33.75	121.29	55.24
Combined Light Rail	158.91	180.75	339.66	113.59

Source: Metro and Tri-Met, August 2002.

Note: TES = Threatened and endangered species.

[1] Impacts are based on the alternative selected for comparative analysis, as described in Table 2.2-3. Other Design Options could affect these totals.

[2] Permanent impacts would be created by the project footprint .

[3] Temporary impacts are potentially the result of construction related activities.

[4] TES species (winter steelhead, summer steelhead, coho salmon, fall chinook) present at, or immediately downstream of the stream reach in question.

[5] Includes Clackamas County road improvements to Harmony Road. Impacts to streams are limited to Minthorn Creek.

Long-term impacts may include the irreversible removal, disturbance, or destruction of biological resources from the construction of new stream crossings or new impervious surface within the riparian zone. The BRT Alternative would result in the least amount of long-term impacts, with 32.3 lineal feet of stream filled or spanned, and 28.75 feet of stream riparian area removed or degraded. Of these effects, no streams supporting TES fish would be adversely affected.

Short-term impacts may include the removal or disturbance of riparian vegetation in construction staging, storage, and access areas, impacts to water quality from soil erosion and spills of toxic materials (e.g., equipment fuel), and increased noise, lighting, and human activity during project construction. Potential short-term or temporary impacts to streams are described in more detail in the *South Corridor Ecosystems Results Report* (Metro and URS, November 2002).

Cumulative impacts include filling or spanning of streams and associated riparian areas from projects outside the South Corridor area, but within the watersheds of streams affected by the Project. Secondary impacts include hydrologic alteration from increased impervious surface resulting from other projects in the basin.

A discussion of the potential impacts to fish habitat follows. The No-Build Alternative would impact only Minthorn Creek. Currently, Clackamas County is planning to build a bridge connecting SE Harmony Rd with SE Lake Rd over the UPRR tracks. A total of 162.1 lineal feet of Minthorn Creek would be permanently impacted by the No-Build Alternative. No temporary impacts are expected.

The **BRT Alternative** would have the least amount of long-term impacts to fisheries resources, permanently impacting 32.30 lineal feet of stream and 1.0 acres of riparian area at Courtney Springs Creek. An additional 28.75 lineal feet of stream and riparian area would be temporarily impacted at this location as well as Crystal Creek. The streams impacted by the **Busway Alternative** include Courtney Springs Creek, Johnson Creek at the SE McLoughlin Boulevard overpass, Crystal Creek, Mt. Scott Creek, and Phillips Creek. A total of 163.97 lineal feet of stream and 1.7 acres of riparian area would be permanently impacted at these locations; an additional 61.75 lineal feet of stream and riparian area would be temporarily impacted.

The streams impacted by the **Milwaukie LRT Alternative** include Johnson Creek at the SE McLoughlin Boulevard overpass, Crystal Creek, Courtney Springs Creek, and Kellogg Lake. A total of 103.67 lineal feet of stream and 0.8 acres of riparian area would be permanently impacted; an additional 175.75 lineal feet of stream and riparian area would be temporarily impacted. The **I-205 LRT Alternative** would impact Courtney Springs Creek and Johnson Creek at the I-205 overpass. A total of 87.54 lineal feet of stream would be permanently impacted, and an additional 33.75 lineal feet of stream and riparian area would be temporarily impacted. No permanent impacts to the riparian zone impacts are expected. The **Combined LRT Alternative** would impact Johnson Creek at the SE McLoughlin Boulevard overpass, Crystal Creek, Kellogg Lake, Courtney Springs Creek, and Johnson Creek at the I-205 overpass. A total of 158.91 lineal feet of stream and 0.8 acres of riparian area would be permanently impacted, and an additional 180.75 lineal feet of stream and riparian area would be temporarily impacted.

None of the Design Options within the BRT Alternative, the Busway Alternative, or the 1-205 LRT Alternative would result in a change in impacts to fisheries resources. The Tillamook Branch Line Design Option within the Milwaukie LRT and the Combined LRT Alternatives would result in an increase of 89.50 lineal feet of permanent impact and 15.00 lineal feet of temporary impact to Spring Creek near the Milwaukie Middle School where a Transit Center would be located. In addition, the Milwaukie Middle School Terminus Option would result in 15.0 fewer linear feet of temporary impact at Kellogg Lake compared with the Lake Road terminus for the Milwaukie LRT Alternative.

3.11.2.5 Threatened, Endangered, and Sensitive Species

A. Threatened, Endangered, and Sensitive Fish

Habitat for several TES fish species is present in each of the five alternatives, although, presence of TES fish may be restricted in some of these streams due to impassable culverts or other barriers. Potential impacts to TES fish habitat would be similar to those impacts described above in Section 3.11.2.4. Table 3.11-8 includes a summary of the lineal feet of impacted TES stream by alternative. TES species are further protected from detrimental effects or direct impacts through federal legislation. The length of TES fish-bearing stream that would be impacted by each alternative is discussed below. The **BRT Alternative** would result in no impacts to TES fish-bearing streams. The **Busway Alternative** would permanently impact a total of 131.67 lineal feet of TES fish bearing stream and temporarily impact an additional 33.00 lineal feet of stream at Johnson Creek at the SE McLoughlin Boulevard overpass, Mt. Scott Creek, and Phillips Creek. The Busway Alternative has the greatest amount of impact to TES fish-bearing streams.

The **Milwaukie LRT Alternative** would permanently impact a total of 58.35 lineal feet of TES fish bearing stream and temporarily impact an additional 132.00 lineal feet of stream at Johnson Creek at the SE McLoughlin Boulevard overpass, Crystal Creek, Courtney Springs Creek, and Kellogg Lake. The **I-205 LRT Alternative** would permanently impact a total of 55.24 lineal feet of TES fish-bearing stream Johnson Creek at the I-205 overpass, the only TES fish-bearing stream within this alternative. An additional 30.0 lineal feet of TES fish-bearing stream would be temporarily impacted at this location. The **Combined LRT Alternative** would permanently impact 113.59 lineal feet of TES fish bearing stream and temporarily impact an additional 147.00 lineal feet of stream at Johnson Creek at the SE McLoughlin Boulevard overpass, Johnson Creek at the I-205 overpass, and Kellogg Lake. A total of 113.6 lineal feet of TES fish-bearing stream and riparian zone would be permanently impacted, and an additional 48.0 lineal feet of TES fish-bearing stream and riparian zone would be temporarily impacted.

None of the Design Options in any of the alternatives would have long-term impacts on TES fish-bearing streams.

B. Threatened, Endangered, and Sensitive Wildlife and Plants

Ten TES wildlife and plant species were identified within 5 miles, but outside of the study corridor (see Figure 3.11-2). These species are bald eagle, peregrine falcon, great blue heron, purple martin, red-legged frog, northwestern pond turtle, painted turtle, white rock larkspur, tall bugbane, and Oregon sullivantia. Because these species occur within an existing urbanized environment and outside the study corridor, no **long- or short-term impacts** to these species or their habitats are expected as a result of the Project. In addition, no **cumulative impacts** or indirect impacts are expected to affect TES wildlife species or their associated habitats.

3.11.3 Potential Mitigation Measures

The project designs will continue to be revised to avoid or minimize impacts to the natural environment. Best Management Practices (BMPs) would be implemented to further minimize impacts during construction and operations. Federal, state, and local jurisdictions would likely require compensation for impacts to biological resources in the form of mitigation and/or conservation measures. These mitigation and/or conservation measures are discussed below by type of biological resource.

3.11.3.1 Wetlands and Waterways Mitigation

Unavoidable impacts to wetlands must be mitigated through restoration, creation, or enhancement to replace the functions and values lost through a permitted wetland alteration. Restoration reestablishes wetland conditions (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology) in areas that were historically wetland. With creation, a wetland is constructed in an area that did not historically support wetlands. Enhancement improves an existing but degraded wetland by correcting the degrading conditions. Minimum ratios of compensatory mitigation, as established by the DSL, follow:

- Restoration ratio is 1:1 (1 acre restored for every 1 acre lost)
- Creation ratio is 1.5:1 (1.5 acres created for every 1 acre lost)
- Enhancement ratio is 3:1 (3 acres enhanced for every 1 acre lost)

Compensatory mitigation ratios are typically doubled for impacts to existing wetland mitigation sites (e.g., 2 acres restored for every 1 acre of mitigation site lost). In addition, the DSL and the US Army

Corps of Engineers require functional replacement as part of compensatory wetland mitigation plans. Metro will use the HGM method to compare functional losses at impacted sites with functional gains at potential mitigation sites once a preferred alternative is selected.

Compensatory wetland mitigation should be conducted onsite unless the DSL determines that on-site mitigation would be impracticable, on-site mitigation would not adequately replace lost functions or values, or off-site mitigation would be environmentally preferable considering the type of wetland to be impacted and the historic loss of wetland types and functions in the watershed. A list of potential wetland mitigation sites is provided in Chapter 5 of the *South Corridor Ecosystems Results Report* (Metro, November 2002).

3.11.3.2 Vegetation Mitigation

The following mitigation measures may be used to avoid or reduce potentially adverse impacts to vegetation: Whenever practicable, avoid removal of mature native vegetation; if vegetation removal is unavoidable, replant with approved native vegetation.

3.11.3.3 Wildlife Mitigation

The following mitigation measures may be implemented to avoid or reduce potentially adverse impacts to wildlife: Avoid removal of native vegetation, where native vegetation removal is unavoidable leave cut trees and large shrubs onsite to provide cover for small mammals, ground-nesting birds and herpetofauna; retain snags and downed woody material; use BMPs to control erosion.

3.11.3.4 Fisheries Mitigation

Mitigation for impacts to fisheries resources is not specifically required under state and federal law. Potential impacts to waterways and wetlands must be mitigated under the CWA and state Removal-Fill laws. Lost wetland function is to be mitigated or avoided as described in Section 3.11.3.1. While impacts to fish are not specifically identified as requiring compensation, detrimental effects to their habitats, in both quality and quantity, are generally mitigated under these same regulations. Clackamas County, the Cities of Portland and Milwaukie, and Metro each have regulatory mechanisms to protect environmentally sensitive areas such as riparian buffers. Individual consultation with the municipalities on compensatory mitigation issues will be required in the permitting phase of the Project.

Mitigation measures for the South Corridor Project are designed to first avoid, and then minimize and compensate for, all unavoidable impacts. Many potential impacts to fisheries, and other resources, may be avoided or minimized through the use of conservation measures designed into the project construction plan, use of TriMet BMPs, adherence to ODFW-recommended in-water work windows, and appropriate design and siting of facilities.

Unavoidable impacts are typically mitigated for at, or close to, the area of impact. Where sufficient reason can be demonstrated, mitigation can occur off-site but in the basin within which the effects take place. This mitigation may include riparian or fish habitat enhancement, and could range from simple riparian plantings to engineered wetland and stream restoration. A more detailed account of potential water quality impacts may be found in Section 3.12, Water Quality.

3.11.3.5 Threatened, Endangered, and Sensitive Species Mitigation

A. Threatened, Endangered, and Sensitive Fish

As required by Section 7 of the ESA, consultation with NMFS and USFWS would continue by identifying listed threatened or endangered species or their habitat that could be affected by the Locally Preferred Alternative during the Final Environmental Impact Statement phase. It is anticipated that habitats for several listed fish species could be negatively affected by proposed crossings of Johnson Creek, Crystal Spring Creek, Mt. Scott Creek and Kellogg Creek. Adherence to ODFW in-water work periods, and the use of approved BMPs and conservation measures would minimize the chances for direct take of any listed fish. A BA will likely be required because of the potential for impacts to the listed species and their habitats. After review of the BA, the FTA and South Corridor Project staffs will continue to consult with NMFS and USFWS for concurrence on potential effects to listed species. Specific conservation measures may be implemented as a condition of the approval. Negotiations with these agencies will be required to determine specific mitigation or compensation measures, if needed.

3.12 Water Quality and Hydrology

This section is a summary of the relevant water quality, quantity, and hydrological issues related to the South Corridor Project alternatives and provides a description of the agencies' roles and the regulations involved. Additional water quality and hydrological detail can be found in the *South Corridor Project Water Quality and Hydrology Results Report* (Metro and URS, November 2002).

3.12.1 Regulatory Setting for Water Quality and Hydrology

The proposed project alternatives could affect water resources in the project area by altering stormwater quality and quantity or modifying floodplain function; therefore, effects of the proposed project must be judged in light of applicable federal, state, and local regulations. This section describes the federal, state, and local regulations and roles.

Water quality is regulated by the CWA. DEQ implements the CWA in Oregon, reviews the water quality status of streams in the project area, and issues discharge permits that apply to wastewater and stormwater discharges from municipal and industrial sources. As part of their municipal stormwater permits, the Cities of Portland, Gresham, Milwaukie, Gladstone, and Oregon City as well as Clackamas County have adopted ordinances that set performance standards or provide specific guidance regarding the use of BMPs to control the quality and quantity of stormwater discharges to surface water bodies. In most cases, both new and redeveloped impervious surface areas must be accounted for when determining whether stormwater BMPs are required. The City of Portland requires that stormwater management for redeveloped impervious surfaces reduce peak stormwater discharge rates from sites to a portion of the predevelopment peak discharge rates for large storms (e.g., prior to alteration by Anglo-American settlers) to mitigate for the effects of past development built without stormwater management. DEQ issues stormwater discharge permits to control the water quality effects of construction. All of the local jurisdictions have some form of drainage ordinance to protect streams from runoff. The Cities of Portland and Gresham and Clackamas County also have erosion control ordinances designed to protect instream water quality.

Metro has a regional regulation, Title 3, aimed at preserving the beneficial uses of stream corridors (including both habitat-related and hydrology-related uses) by prohibiting additional development in either the FEMA-designated 100-year floodplain or in areas inundated by the February 1996 flood, except in cases where the developments mitigate through balanced cut and fill. The municipal ordinances and the Federal Flood Insurance Program are aimed at preserving the water conveyance and storage functions of floodplains while reducing economic loss to those already situated in floodplains. Executive Order 11988 also provides protection of floodplains by directing that Federal agencies reduce the risk of flooding and flood impact and to to preserve the natural beneficial values served by floodplains.

Local ordinances are consistent with Metro's Title 3 provisions to protect the habitat values of watercourses. The Cities of Portland and Milwaukie and Clackamas County's Water Environment Services have adopted sensitive-area setbacks and buffers to protect riparian areas that provide water quality protection as well as in-stream and near-stream habitat functions. Protecting water quality and habitat is critical to the survival of native salmonids, for example, that have been listed as threatened under the ESA. The project area is within designated critical habitat for ESUs of a number of listed fish species. Threatened and endangered species issues are addressed in the Section 3.11 and in the *South Corridor Project Ecosystems Results Report* (Metro and URS, November 2002), in addition to wetlands and wildlife habitat issues.

3.12.2 Affected Environment

The South Corridor Project alternatives would cross or intersect major and minor watercourses and floodplains within the lower Columbia and Willamette River watersheds. Rivers and streams that would be affected by the proposed alternatives include the Willamette River, Johnson Creek, Crystal Springs Creek, Spring Creek, Crystal Creek, Kellogg Creek, Courtney Springs Creek, Mt. Scott Creek, Minthorn Creek, Phillips Creek, the Clackamas River, Abernethy Creek, and Fairview Creek.

Based on estimates calculated from Metro zoning information, more than 1/3 of the project area is covered with impervious surfaces such as streets and roofs. In hydrologic analyses, it is typically estimated that more than 95 percent of the annual precipitation runs off these impervious surfaces. Much of the remaining pervious land surface has been graded and, while vegetated, produces runoff in excess of rates characteristic of the undisturbed lowland coniferous forests and grasslands that characterized the project area before Anglo-Europeans arrived. Such alterations of the land have produced alterations in channel hydrology, habitat value, and water quality.

Changes in channel hydrology have resulted in stream channel degradation and reduced instream habitat quality. Clearing of streamside vegetation has led to increases in summer water temperatures beyond those tolerated by native fish. Increases in bacteria in streams are typically attributed to combined sewer overflows, failing septic systems, and the waste from urban wildlife and pets. Construction in floodplains has reduced both the flood storage and conveyance capacity of natural watercourses, resulting in economic losses from flooding, and has provided the justification for local channel and near-stream modifications designed to increase conveyance. Modifications designed to increase conveyance often result in increased flow velocity that can erode and scour stream channels and degrade in-stream habitat.

There are no sole source aquifers located in the Portland area as designated by the Environmental Protection Agency. Flooding and water quality conditions of the waterways potentially affected by the project alternatives are described below. Rivers, floodplains and watersheds boundaries in the South Corridor Project area are shown in Figure 3.12-1.

The **Willamette River**, which is tidally influenced downstream of Willamette Falls in Oregon City, flows north through Portland to its confluence with the Columbia River. The Willamette River has been listed under Section 303(d) of the CWA and is classified as a major source of pollutants to the Lower Columbia River due to its suspended sediment and total phosphorus and bacterial concentrations. Water temperature in the lower Willamette River is higher than regional interim water quality criteria recently proposed by the EPA to protect endangered salmonids. Fish listed under the ESA have been found in this water body and NMFS and USFWS have determined that the Willamette River and its tributaries, including all of the rivers and creeks described below, are critical habitat for fish listed as threatened or endangered.

Pollutant sources include municipal and industrial wastewater and stormwater discharges. The river is also listed as not meeting water quality standards because of skeletal deformities in fish, elevated mercury concentrations in fish tissue, and arsenic and pentachlorophenol concentrations in sediment, although the sources of these pollutants appear to be upstream from the Portland metropolitan area.

Suspended sediment, total phosphorus, and bacteria sources are located both upstream from and within the Portland metropolitan area. Average daily stream flow is approximately 32,000 cubic feet per second (cfs), whereas the 100-year flood flow is estimated to be 400,000 cfs in downtown Portland. The 100-year flood is expected to be contained within the channel banks in downtown Portland in the project corridor, with minor overbank flooding possible in industrial areas downstream of downtown Portland. The Willamette River is regulated by reservoirs on tributaries and upper reaches of the river. These reservoirs are operated by the Corps to prevent flooding; however, flooding within the corridor can occur as a result of backwater effects on the Columbia River or localized flooding along tributaries.

Johnson Creek flows west from central Multnomah and Clackamas Counties before discharging to the Willamette River in Milwaukie. It is listed under Section 303(d) of the CWA for not attaining water quality standards for bacteria and temperature, and for elevated dieldrin and DDT concentrations. The main sources of these pollutants are stormwater runoff and historic horticultural operations upstream of the project area. Fish listed under the ESA have been found in this water body.

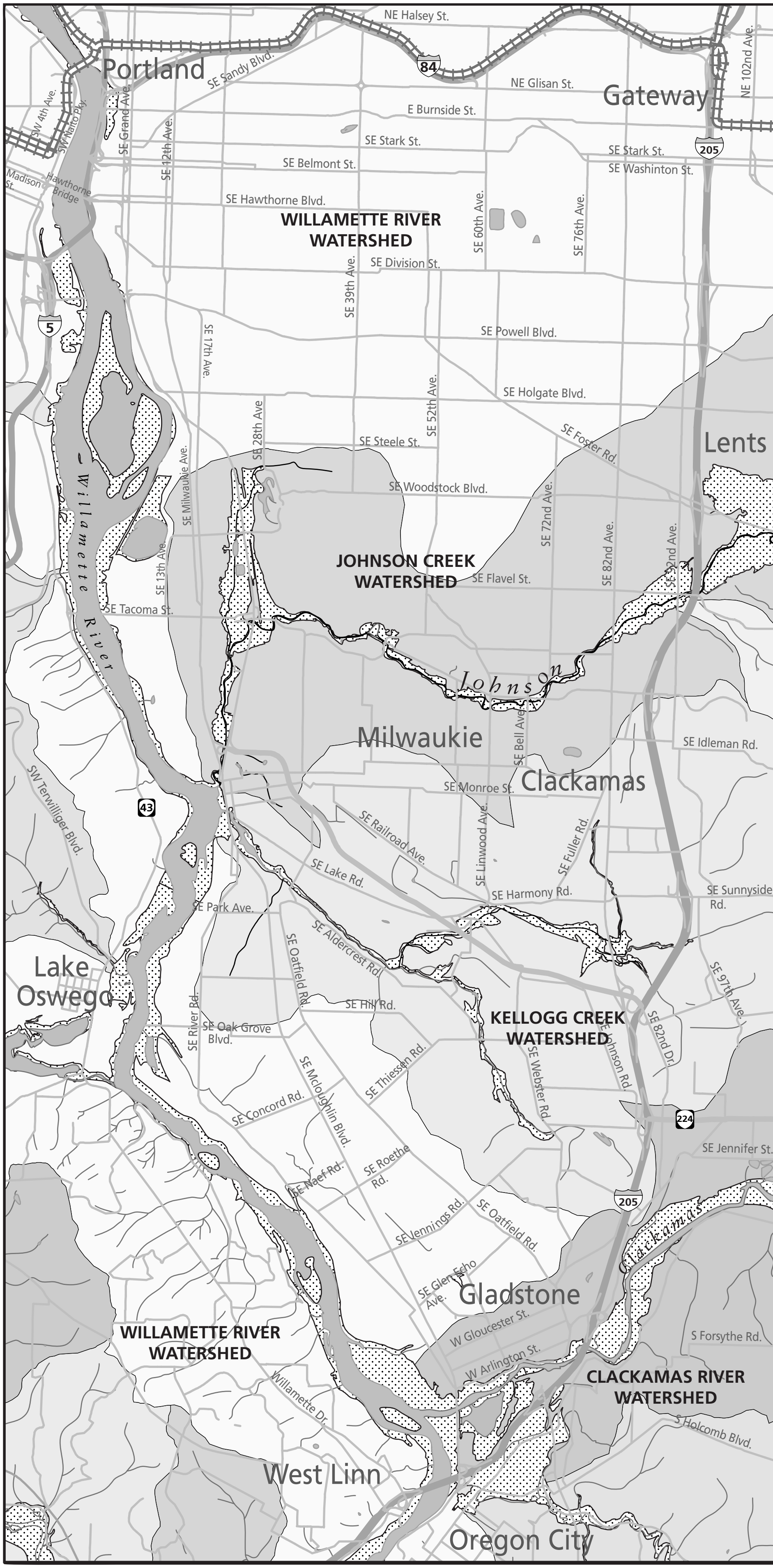
Metro zoning information indicates that impervious surface covers approximately 39 percent of the basin in the project area. Existing bridge crossings restrict creek flow and localized flooding is common, particularly in the low-gradient reach upstream of SE 82nd Avenue. Portions of Johnson Creek were channelized in the 1930s, reducing the hydraulic connection between the creek and the floodplain. In many areas, the channelized section has not been maintained, and sediment and vegetation have reduced the capacity of the creek to convey floodwaters.

Crystal Springs Creek originates from a spring in Reed Lake. Most of the creek flow comes from springs at the lake and the nearby Eastmoreland Golf Course. This spring flow keeps water temperatures cool, water quality relatively high, and flow fluctuations low. Consequently, the creek has high-quality salmonid habitat and ESA-listed fish have been found in it. Fertilizers and pesticides applied to landscaping at Reed College, Eastmoreland Golf Course, and Crystal Springs Rhododendron Gardens are the primary water quality concerns. Flooding has historically been infrequent and shallow, although it has increased in frequency and extent in recent years.

SOUTH CORRIDOR PROJECT

South Corridor Watersheds and Floodplains

Figure 3.12-1



LEGEND

100-year FEMA FIRM Mapped Floodplain

Watershed Boundaries

Stream or Creek

Note: FEMA = Federal Emergency Management Agency
FIRM = Flood Insurance Rate Maps

SOUTH CORRIDOR PROJECT
Transportation Alternatives

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Spring Creek is a small spring-fed creek in Milwaukie that flows into a large pond in Scott Park where water levels are regulated and flow through a culvert to Johnson Creek. No flooding or water quality problems are known to exist along the creek.

Crystal Creek is another small, intermittent creek in Milwaukie fed primarily by groundwater seepage. Flow in the creek moves westerly in a swale between the Highway 224 embankment and homes that front SE 23rd Avenue. No flooding or water quality problems are known to exist.

Kellogg Creek flows west from central Clackamas County into Kellogg Lake after merging with Mt. Scott Creek. Kellogg Lake discharges into the Willamette River south of downtown Milwaukie. The impervious surface area in the Kellogg Creek basin is estimated to be slightly less than 40 percent of the overall basin area; therefore, flow and pollutant loading in the creek are typical of stormwater-dominated systems. Elevated concentrations of total dissolved solids have been reported. Future local flooding is predicted along Kellogg Creek, although no existing substantial flooding problems have been recorded. ESA-listed fish have been found in this water body.

Courtney Springs Creek, a small tributary of lower Kellogg Creek, is partially enclosed in culverts under SE McLoughlin Boulevard. Water quality and streamflow have not been monitored on this creek. No substantial flooding concerns have been recorded.

Mt. Scott Creek flows west from the Happy Valley area and joins Kellogg Creek. It has had historical flooding problems, particularly between SE Harmony Road and the UPRR line east of SE Linwood, at the intersection of SE Lake and SE Rusk roads, and between the UPRR crossing and SE Lake Road. The impervious surface area in this basin is estimated to be 46 percent of the overall basin area. Water quality in Mt. Scott Creek is generally good, with only a few recent summertime exceedances of bacteria standards. ESA-listed fish have been found in this water body.

Minthorn Creek is a small, spring-fed tributary of Mt. Scott Creek that drains northeast Milwaukie. Water quality conditions are not monitored. No flooding problems are known, but minor flooding may occur in the channel downstream of the intersection of SE Harmony Road and SE Railroad Avenue.

Phillips Creek, another tributary of Mt. Scott Creek, is a small creek that flows in culverts for much of its length. Runoff from adjacent commercial and industrial areas degrades water quality and recent water quality monitoring by Clackamas County has shown elevated bacteria concentrations. Flood flows are generally confined within the existing channel, although flooding problems have been recorded as a result of undersized culverts that have accumulated sediments at the intersection of SE 80th Avenue and SE McBride Street, and SE 82nd Avenue. Cutthroat trout have been found in the creek.

The **Clackamas River** is a major drinking water supply for northwestern Clackamas County. The river joins the Willamette River at Oregon City immediately upstream of the proposed project corridor. Water supply intakes are located a considerable distance upstream of the proposed project corridor. Within the project area, impervious surface covers an estimated 31 percent of the basin. The Clackamas River does not meet instream water temperature standards, and approximately 1/4 of recent monitoring samples have exceeded water quality standards for bacteria. Water quality is otherwise good. No substantial flooding problems exist on the Clackamas River within the proposed project corridor. Flooding occurs on the Clackamas River as a result of backwater from Willamette River flooding. ESA-listed fish are in this water body.

Abernethy Creek is a tributary of the Willamette River north of downtown Oregon City. Streamflow and water quality information for the creek are limited. Flow measured during water quality monitoring has been reported to range between 150 and 441 cfs, with the 100-year flow estimated at 4,560 cfs. No substantial flooding problems exist on Abernethy Creek within the proposed project corridor. Flooding occurs on Abernethy Creek as a result of backwater from Willamette River flooding.

Fairview Creek is a tributary of the Columbia River that drains central Gresham and discharges into the Columbia Slough. It is listed under Section 303(d) of the CWA as not attaining bacteria, phosphorus, or pH water quality standards. Upstream portions of the creek are subject to local flooding.

3.12.3 Water Quality, Hydrologic, and Floodplain Environmental Impacts

Water quality impacts were assessed qualitatively, based on the amount of impervious surface, type of vehicle used on the surface, and proximity of proposed facilities to receiving water bodies. Primary areas of concern related to the impacts of vehicle operation and impervious surfaces are temperature, oil and grease, total suspended solids (TSS), metals (including zinc, copper, and lead), and litter. The net increase in impervious surfaces was calculated by totaling newly created impervious areas either on existing open space or on areas redeveloped from existing impervious surface minus newly created pervious area. This definition was used because City of Portland regulations require stormwater management for redeveloped impervious surfaces to reduce peak stormwater discharge rates to the predevelopment peak discharge rates for large storms (e.g., prior to alteration by Anglo-American settlers), to mitigate the effects of past development implemented without stormwater management. This calculation method is a more conservative approach for calculating impervious area.

Water quality impacts were estimated by comparing new impervious area to existing impervious area and examining the increases in relation to specific tributary basins. Impacts were determined to be “detectable” or “detectable and substantial” at either the local level or the basin level. An impact could be detectable at a local level, but not deemed to be substantial, if it were not likely to change water quality, hydrology, or the stream channel. To be detectable at the basin level, the impact would need to be large enough to noticeably decrease water quality or alter hydrologic conditions in the watershed basin. Hydrology impacts were estimated by measuring the potential for the alternatives to have localized effects on specific stream channel segments. Floodplain impacts were determined by calculating the amount of fill expected in the 100-year floodplain based on the footprint for the alternatives.

Two vehicles types could be used for the Project alternatives: light rail trains and buses. The light rail trains used in the LRT alternatives are expected to contribute less to the stormwater pollutant loading of area streams because propulsion is from electric power rather than internal combustion engines. In addition, light rail trains commonly run on embankments of pervious ballast rail beds (i.e., coarse crushed rock) rather than pavement, limiting the rate of stormwater runoff and pollutant transport to surface water bodies. In comparison, buses run on paved surfaces. Buses have the potential to leak lubricants and coolants, although these quantities are expected to be small for a well-maintained bus fleet. In addition, metal-rich particles are deposited on roadways from the normal operation of bus brakes and tires. Buses also produce soot, which contributes to the region-wide particulate load that is deposited on all surfaces. The Project would use diesel- electric hybrid vehicles that would substantially reduce soot emissions over TriMet’s existing bus fleet.

Without appropriate mitigation, long-term water quality, hydrology, and flooding impacts would be primarily related to creation of impervious surface, floodplain encroachment, and vehicle operation. Table 3.12-1 is a summary of unmitigated project impacts considered detectable and substantial at a local level and detectable at a basin level. Other easily mitigated impacts would be anticipated at a number of water bodies. See the *South Corridor Project Water Quality and Hydrology Results Report* for more details. Mitigation would be required as a part of the state and local permitting process.

Table 3.12-1
Summary of Unmitigated Water Quality and Floodplain Impacts

Alternative	Estimated Existing Impervious Area[1] (acres)	Net Impervious[2] (acres)	Number of Water Quality[3] Impacts	Number of Hydrology[3] Impacts	Floodplain Fill[4] (cubic yards)
BRT	123,176	24.4			
Busway	123,176	51.2	1	1	9,500 to 38,000
Milwaukie LRT	123,176	38.7			9,200 to 32,600
I-205 LRT	123,176	38.8			200
Combined LRT	123,176	51.7			9,400 to 32,800

[1] Sum of all the estimated impervious area in the basins crossed by the project, including Willamette River, Crystal Springs Creek, Johnson Creek, Kellogg Creek, Mt. Scott Creek, Clackamas River, Abernethy Creek and Fairview Creek. Only the portions of the Willamette River and Clackamas River basins in the Tri-County Metropolitan Area were included in this estimate.
[2] Net impervious area is calculated as the sum of new impervious areas created by the project improvements and redeveloped existing impervious surface used by the project improvements minus the areas converted from impervious to pervious by project improvements.
[3] These are the number of water quality and hydrology impacts that are considered "substantial and detectable" at a local level and "detectable" at the basin level. These are reported as unmitigated. There are a number of less substantial impacts that are not reported here, but are described in the *Water Quality and Hydrology Results Report* (Metro, November 2002). These smaller impacts could easily be mitigated, which would be required through local and state permitting processes.
[4] Two estimates are provided. The higher estimate is based on the existing 100-year Floodplain as described on the FEMA Flood Insurance Rate Maps (FIRM), and the lower estimate is based on an expected modification to the FIRM maps. The higher estimate is based on the 100-year flood elevation of 57 feet (NGVD) reported in *Letter of Map Revision to the Flood Insurance Study for the City of Portland, Oregon* (FEMA, 2000) for Johnson Creek upstream of SE McLoughlin Boulevard. The lower estimate is based on the 100-year flood elevation of 52.2 feet (NGVD) as reported in the *Crystal Springs Creek Flooded Area Update* (Corps, Portland District, March 2001).
[5] The values for the No-Build Alternative represent the area related to planned improvements to SE Harmony Road, to be designed and constructed by Clackamas County. SE Harmony Road is expected to be developed to five lanes regardless of whether this project goes forward. Therefore, the addition of this impervious surface acreage is considered different from the existing conditions and characteristic of the No-Build Alternative.

Under the No-Build Alternative, SE Harmony Road would be expanded by Clackamas County from three to five lanes. It could create a locally detectable and substantial impact on Mt. Scott Creek due to the location of the improvement in relation to the creek and the increased impervious area.

The BRT Alternative would result in less than half the net increase in impervious area than the Busway Alternative. The net increase in impervious area created by the BRT Alternative would be associated with new park-and-ride lots at Linwood, Park Avenue, and Southgate along with smaller areas at intersections. The BRT Alternative would create no new floodplain fill.

The Busway Alternative would result in the largest unmitigated water quality and 100-year Floodplain impacts. Hydrologic impacts would result from new pavement between Portland and Milwaukie and potential fill in the Crystal Springs Creek and Johnson Creek Floodplains. The Busway Alternative would be close to Mt. Scott Creek in the Milwaukie to Clackamas Segment, where Busway improvements south of the expanded SE Harmony Road would result in detectable and substantial impacts on a local level and detectable impacts at the Mt. Scott Basin.

The Milwaukie LRT Alternative would create 38.7 acres of net increase in impervious surface and would have an amount of floodplain fill similar to the Busway Alternative. The net new impervious surface would be associated with the redevelopment of areas along SE 17th Avenue, Southgate Transit Center, and park-and-ride lots located at Linwood and Park Avenue.

The I-205 LRT Alternative would increase impervious surface by 38.8 acres and require 200 cubic yards of floodplain fill. The increased impervious surface is related to new park-and-ride lots located at SE Powell, SE Holgate, SE Linwood, Southgate, and the Clackamas Town Center. The floodplain fill is related to the Johnson Creek crossing and would affect a much smaller area than the Milwaukie LRT Alternative at Johnson Creek near SE Tacoma Boulevard.

The Combined LRT Alternative would result in the greatest increase in net impervious area (51.7 acres). However, although the total acres of net impervious area would be slightly higher than the total for the Busway Alternative, the impacts would be over a more dispersed area and less sensitive locations. Potential fill in the floodplain would be largely associated with the Milwaukie LRT Alternative. Table 3.12-2 provides data on the unmitigated water quality, hydrology, and floodplain impacts by alternative and by segment.

3.12.3.1 Portland to Milwaukie Segment

Water quality impacts that would occur within this segment are shown in Table 3.12-2. Within the Portland to Milwaukie Segment, the BRT Alternative would result in a net increase in impervious area associated with redevelopment of the Southgate Cinemas site to a transit center and smaller improvements at SE Holgate Boulevard and SE 17th Avenue. The I-205 and Combined LRT Alternatives would have identical impacts because they include BRT on SE McLoughlin Boulevard.

The Busway Alternative would result in net increase 20.2 acres of impervious area related to construction of a new roadway and development of the Tacoma Park-and-Ride and Southgate Transit Center. Approximately 9,500 to 38,000 cubic yards of fill[9] could potentially be placed in the 100-year floodplain. These impacts would occur in near Crystal Springs Creek and Johnson Creek. The Busway Alternative would parallel Crystal Springs Creek and require a new bridge over Johnson Creek. The 7th Avenue Design Option would increase the net impervious area by 2.1 acres and the West of Brooklyn Design Option would decrease the net impervious area in this segment by 4.4 acres.

Improvements associated with the Milwaukie LRT Alternative would increase net impervious area by 16.4 acres along SE 17th Avenue and at the SE Tacoma Park-and-Ride and the Southgate Transit Center. This alternative would require a new bridge over Johnson Creek. Fill in the floodplain would be required in areas between Crystal Springs Creek and the Tacoma Park-and-Ride. The unmitigated fill would cause detectable and substantial changes at the local level. The West of Brooklyn Yard Design Option would decrease impervious surface by 6.2 acres over the 17th Avenue Design Option The Tillamook Branch Line Design Option would decrease net impervious area by 2.5 acres compared to the Southgate Crossover Design Option. The Milwaukie Middle School Terminus Option would decrease the net impervious area by 0.6 acre. The Tillamook Branch Line Design Option with a terminus at the Milwaukie Middle School would create a new locally substantial impact at Spring Creek, where the entrance to the transit center would require a bridge over the

[9] Range in floodplain fill depends on assumed elevation of 100-year flood on Johnson Creek. See note 3 on Table 3.12-1 for more information.

creek. Finally, the Lake Road structured Park-and-Ride lot could potentially create a water quality impact to Kellogg Creek as a result of pollutant runoff (e.g., hydrocarbons and floatables) associated with autos.

Table 3.12-2
Summary of Unmitigated Water Quality and Floodplain Impacts by Alternative and by Segment

Alternative by Segment	Net Impervious[1] (acres)	Number of Water Quality Impacts[2]	Number of Hydrology Impacts	Floodplain Fill (Cubic yards)
Bus Rapid Transit				
Portland to Milwaukie	3.5			
Milwaukie to Clackamas	10.2			
Milwaukie to Oregon City	10.8			
Gateway to Clackamas				
Busway				
Portland to Milwaukie	20.2		1	9,500 to 38,000
Milwaukie to Clackamas	20.2	1		
Milwaukie to Oregon City	10.8			
Gateway to Clackamas				
Ruby Junction expansion	1.4			
Milwaukie LRT				
Portland to Milwaukie	16.4			9,200 to 32,600
Milwaukie to Clackamas	10.2			
Milwaukie to Oregon City	10.8			
Gateway to Clackamas				
Ruby Junction expansion	1.4			
I-205 LRT				
Portland to Milwaukie	3.5			
Milwaukie to Clackamas	0			
Milwaukie to Oregon City	10.8			
Gateway to Clackamas	23.2			200
Ruby Junction expansion	1.4			
Combined LRT				
Portland to Milwaukie	16.4			9,200 to 32,600
Milwaukie to Clackamas				
Milwaukie to Oregon City	10.8			
Gateway to Clackamas	23.2			200
Ruby Junction expansion	1.4			

[1]Net impervious area is calculated as the sum of new impervious areas created by the project improvements and redeveloped existing impervious surface used by the project improvements minus the areas converted from impervious to pervious by project improvements.
[2]These are the number of impacts that are "detectable and substantial" at a local level and "detectable" at a basin level prior to the application of mitigation. Other impacts would occur at water bodies, but these would be easily addressed through mitigation. See the *Water Quality and Hydrology Impacts Results Report* (Metro and URS, November 2002) for more details.

In this segment the I-205 LRT Alternative would include improvements identical to those described under the BRT Alternative. The Combined LRT Alternative would include improvements identical to Milwaukie LRT in the Portland to Milwaukie Segment.

3.12.3.2 Milwaukie to Clackamas Segment

The No-Build Alternative includes an expansion of SE Harmony Road from three to five lanes by Clackamas County. Because this improvement is located directly adjacent to South Corridor Project improvements and would affect the location of project improvements, the impacts have been listed here. The unmitigated modifications to SE Harmony Road would create 6.5 acres of net impervious area and would create water quality and hydrological impacts that are detectable and substantial at the local level and detectable at the basin level. These impacts would result from the amount of new pavement and the proximity of the roadway improvements to Mt. Scott Creek.

BRT improvements that would affect water quality in this segment include transit-only ramps from SE Main Street to the Highway 224 shoulders, expansion of the Highway 224shoulders, park-and-ride lots at SE Johnson Road or SE Linwood Road, and the redeveloped CTC Transit Center. The ramps could impact Crystal Creek, located to the south of Highway 224 in Milwaukie, and the park-and-ride at Linwood could impact Mt. Scott Creek. The BRT Alternative would create 10.2 acres of net impervious area. The Johnson Road Park-and-Ride Design Option would result in 3.3 acres of net impervious area. No fill in the 100-year floodplain would occur with this alternative.

The Busway Alternative would include improvements similar to the BRT Alternative, but also includes a separate guideway between SE Freeman Way and SE 82nd Avenue. These improvements would result in 20.2 acres of net impervious area and would create a locally substantial impact to Mt Scott, Phillips, and Crystal Creeks that would be detectable at the basin level. These impacts would be the result of new pavement located near creeks that would result in increased runoff rates and pollutants. The Johnson Road Park-and-Ride Lot Design Option would increase the impervious area by 3.3 acres. The Busway Alternative would not create fill in the 100-year floodplain.

The Milwaukie LRT Alternative would include identical improvements to the BRT Alternative in this segment. The Combined LRT Alternative would not include any transit improvements in this segment.

3.12.3.3 Milwaukie to Oregon City Segment

The BRT improvements in this segment would include expanded roadway at BRT and local stations and a new 150-space surface park-and-ride lot at SE Park Avenue. These improvements would create 10.8 acres of net impervious area. Courtney Creek crosses under SE McLoughlin Boulevard at SE Park Avenue where BRT station improvements would be located. The new impervious area at the Park Avenue BRT Station could result in a locally detectable change in water quality. No floodplain fill or substantial water quality or hydrological impacts are anticipated due to these improvements. There are no Design Options in this segment. The Busway Alternative and the Milwaukie, I-205, and Combined LRT alternatives would all include identical improvements in this segment.

3.12.3.4 Gateway to Clackamas Segment

The I-205 and Combined LRT Alternatives would include LRT tracks on rock ballast with other improvements, including structured park-and-ride lots at SE Powell Boulevard, SE Holgate Boulevard, SE Foster Road, SE Johnson Road, and Clackamas Town Center. These Alternatives include a redeveloped transit center at Clackamas Town Center and a bridge over Johnson Creek. There would be 23.2 acres of net impervious area created as a result of the park-and-ride lots and transit center. The improvements at Johnson Creek would create a locally substantial impact to water quality and hydrology as a result of potential increased runoff rates and the resulting discharge into Johnson Creek. Approximately 200 cubic yards of fill would be placed in the Johnson Creek 100-year floodplain. Although this is a minor amount of fill, the Johnson Creek area has experienced flooding on a regular basis and much effort has been undertaken by local jurisdictions, volunteers, and the Johnson Creek Watershed Council to reduce these occurrences. The North of CTC Transit

Center Design Option would reduce the amount of net pervious area by 1.4 acres over the East of CTC Transit Center Design Option.

3.12.3.5 Operations and Maintenance Facility

TriMet's Ruby Junction Operations and Maintenance Facility would need to be expanded with the Milwaukie, I-205, or Combined LRT Alternatives. This expansion would create 1.4 acres of net increase in impervious area. The Ruby Junction expansion would not place any fill in the Fairview Creek 100-year floodplain. The runoff from new and redeveloped areas could be detectable at Fairview Creek and the increase in peak runoff could create a detectable impact on Fairview Creek. Wastewater from the operation of Maintenance facility could include washing of vehicles and other industrial operations. This wastewater would be treated in Gresham sanitary sewer system that has the capacity to accommodate this increase.

3.12.4 Short-Term Impacts

Short-term impacts would be related to construction of the project improvements. Short-term impacts on water quality and hydrology related to the construction of the proposed alternatives include erosion, sedimentation in receiving waters, increased turbidity or increased TSS in streams, and increased stormwater discharge to streams. Erosion impacts from any site are generally proportional to the actual area of unprotected soil at any given time. The erosion potential can be estimated by knowing the slope, length of slope and erodability or type of soils on the slope. Construction on or near stream banks is the most problematic because of the bank steepness and proximity to the receiving waters.

Short-term impacts are more likely to occur near stream crossings where construction would be in proximity to the receiving water, and in areas of more extensive construction such as at park-and-ride lots, stations and transit centers. Construction vehicles near streams could also be a potential source of fuel/chemical spills.

Without mitigation, short-term impacts would be expected at Crystal Springs Creek and Johnson Creek with the Milwaukie LRT, Combined LRT, and Busway Alternatives because of construction activities, including a new bridge over Johnson Creek. Construction impacts could also be expected at Kellogg Creek related to construction of a new park-and-ride lot and at Spring Creek with the Milwaukie and Combined LRT Alternatives.

The BRT, Busway, and Milwaukie LRT Alternatives could have a short-term impact on Crystal Creek during construction of the transit only ramps from SE Main Street to the shoulders of Highway 224. These alternatives would also impact Mt Scott Creek during construction of the Linwood park-and-ride lot. The Busway Alternative would have a greater construction impact because of steep slopes in the Alternative area and proximity to Mt Scott Creek. The Busway would also require a culvert extension or replacement where it crosses Phillips Creek on SE 80th Avenue.

Construction of the BRT improvements would likely have only minor short-term impacts because no new stream crossings would be required and few improvements would be located in proximity to receiving waters.

The I-205 and Combined LRT Alternatives would result in short-term impacts to Johnson Creek where a new bridge and station would be constructed near SE Flavel Street.

Local regulations control construction BMPs in a manner that reduces and tries to eliminate runoff. Some of these required control measures include the use of straw, plastic, or other coverings of exposed ground, protecting large trees and other components of vegetation buffers, restricting vegetation clearing activities and site grading to dry weather periods, and installing geomembranes to prevent soil from eroding. Other practices include sediment detention basins, barrier berms and silt fencing. Regulations also prevent in-stream work while migrating fish are present.

3.12.5 Cumulative Impacts

Cumulative impacts to water quality, hydrology, and floodplains build over time. In the basins affected by the proposed project alternatives, destabilization of stream channels began with past actions such as logging and has continued with the development of agricultural and urban areas. Because much of the development has already taken place in the urban areas of the basins affected by the proposed alternatives, most of the development-related hydrologic change and pollutant loading, and thus damage to streams, has already occurred.

After mitigation, the project alternatives are not expected contribute detectable and substantial cumulative or secondary impacts to the receiving water bodies based on the urban nature of the affected basins. Redevelopment of existing impervious surface area would occur with any of the alternatives at varying levels. Redevelopment of existing impervious surface area would trigger stormwater management requirements for areas that may have previously not had treatment for stormwater quality or quantity. In this way, mitigation for a portion of the impacts associated with existing urbanization is provided by the Project.

The Project is intended to reduce VMT in the South Corridor, which could have positive cumulative impacts on water quality and hydrology. The Combined LRT Alternative would reduce the system-wide VMT in the corridor by 71,000 miles per day compared to the No-Build Alternative.

Future development near proposed stations and park-and-ride facilities may create cumulative impacts to water quality and hydrology. However, this development is expected to occur in a manner that is consistent with regional growth plans, density goals, and natural resource protection standards. Required mitigation measures to reduce the impacts of all future new development as required by local, state, and federal regulations would also be applied, further reducing the cumulative impacts associated with the South Corridor Project.

3.12.6 Potential Mitigation

With mitigation, no water quality or hydrology impacts associated with the South Corridor Project would be substantial and no impacts would be detectable at a basin level. All of the jurisdictions in the Project area would require BMPs during project design to mitigate for the effects of the proposed project alternatives on water quality, stormwater volume, and floodplain function. The jurisdictions in the Project area require that the quantity and quality of stormwater runoff from new impervious surfaces and, in some cases, redeveloped impervious surfaces be managed to protect streams. The details for each project segment would be worked out with the affected jurisdiction in compliance with their permitting application process. General mitigation approaches are summarized in the following discussion.

Mitigation for hydrologic and water quality impacts resulting from the creation of new impervious surface would require a two-fold approach. First, the effective amount of imperviousness in the project area would need to be reduced to the maximum extent practicable. This could be done by reducing the footprint of impervious surface areas, by using BMPs designed to infiltrate or transpire stormwater runoff (e.g., stormwater planters), or by using innovative design practices such as inclusion of pervious pavement or eco-roofs that allow infiltration or transpiration from previously impervious surfaces. Second, once imperviousness is reduced as much as possible, stormwater generated from remaining impervious surfaces would need to be treated for water quality and detained for release at a lower peak flow rate for hydrologic control.

Treatment of these waters would require the use of BMPs that remove pollutants. These BMPs include swales, constructed wetlands, properly situated planters, detention facilities with suitable capacity, or proprietary devices that selectively adsorb, filter, or float pollutants. All of these BMPs would require inspection and maintenance to remain effective over the design life of the Project. In addition to the use of BMPs, in locations where project features would encroach on stream corridors, compliance with local jurisdictions' stream setbacks or buffer requirements would help protect riparian vegetation that provides water quality and habitat functions.

Mitigation for controlling hydrologic change resulting from the project may require that the peak rate of discharge from the 2-year storm following development be detained and released at a rate equivalent to 1/2 of the 2-year discharge from undeveloped land of an equivalent area. Peak rates of discharges from larger storms must be equivalent between undeveloped and post-development site conditions.

Stormwater detention for water quality improvement or hydrologic control could be provided by constructing surface impoundments or subsurface vaults. Subsurface vaults could include designs such as large-diameter pipes and concrete holding structures with restricted exits that reduce discharge volumes. Subsurface vaults could be empty chambers that simply hold water to let pollutants settle out, or they could be designed to include proprietary stormwater treatment filtration systems that provide additional pollutant removal beyond settling. Surface detention would likely be designed for pollutant settling only, with restricted exits that reduce discharge volumes. Surface detention could result in warming of the detained water during summer months, which could exacerbate high temperature conditions in many creeks and elevate instream temperature above water quality standards in the remaining otherwise cool water creeks. This could be mitigated by providing a quantity of subsurface detention to detain water at cooler underground temperatures during warm weather.

Mitigation for floodplain fill requires that the loss in conveyance and storage capacity of floodplains resulting from the placement of embankments or structures must be balanced by removing an equal volume of material from the floodplain. The balanced "cut" should be performed at a location and in a manner that can be demonstrated to produce no net rise, or no more than 1/10 foot of rise (depending on local regulations) in the 100-year flood elevation. For embankments proposed to be placed in floodplains (e.g., adjacent to Johnson Creek or Crystal Springs Creek near SE McLoughlin Boulevard), water quality and hydrologic impacts could be mitigated through excavation of a linear swale of proper dimensions. The swales could be used for stormwater quality treatment and conveyance on a daily basis, and for floodwater conveyance and holding capacity during large storm events[10]. Similarly, park-and-ride structures sited in floodplains can be mitigated through local excavation of floodplain sediments.

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[10] Mitigation for floodplain and stormwater impacts can be combined, and mitigation for floodplain and wetland impacts can be combined, but mitigation for stormwater and wetlands impacts cannot, as a rule, be combined.

With mitigation, no long-term water quality, hydrologic, or floodplain impacts would be substantial. Few mitigated impacts would be detectable at the local scale, and no mitigated impacts would be detectable at the basin scale.

3.13 Geology, Soils, and Seismic Impacts

This section summarizes the existing environment and effects of the project alternatives on the geology, soils and seismic environment within the study area. For more detailed information see the *South Corridor Project Geology, Soils, and Seismic Impacts Result Report* (Metro and URS, November 2002).

3.13.1 Affected Geologic, Soils, and Seismic Environment

The South Corridor lies within the Portland Basin, the northernmost portion of the Willamette Valley. The Portland Basin is bounded on the west by the Portland Hills and on the east by the western Cascades. The topography of the basin is characterized by terraces and channels created by Pleistocene flooding and modified by Holocene river and stream activity. Small streams and lakes commonly occupy the Pleistocene flood channels. Small volcanic buttes are common throughout the Portland Basin.

The Willamette River flows northward through the basin to its confluence with the Columbia River. The Clackamas River flows northwest, intersecting the Willamette River north of Oregon City. The Project alternatives cross several smaller tributaries, including Crystal Springs Creek, Johnson Creek, Kellogg Creek and Mt. Scott Creek.

The South Corridor is underlain by rocks from Eocene to Pleistocene age and unconsolidated quaternary age sediments. The rock units include basalt of the Eocene Basalt of Waverly Heights, several members of the Miocene Columbia River Basalt Group, conglomerate and associated deposits of the Plio-Pleistocene age Troutdale Formation, and basalt and associated pyroclastic deposits of the Plio-Pleistocene Boring Lava. Unconsolidated units include gravels, sands, and finer sediments related to Pleistocene catastrophic flooding and recent alluvium deposited along the rivers and streams.

Soils. Most of the soils within the South Corridor Project area developed on flood and alluvial deposits, with smaller areas derived from volcanic rocks. In many areas these soils are classified as urban land, where original soils have been extensively modified by cuts, fills, and grading associated with development. Where undisturbed, soils in the project area consist of sandy to clayey loam and are well to poorly drained. Shallow groundwater may be encountered within several sections of the corridor. These include areas underlain by Quaternary river channel deposits in the Clackamas/Mt. Scott area and from Milwaukie to Oregon City. Other areas of shallow groundwater may exist locally, controlled by local variations in soil type and drainage.

The *Farmland Protection Policy Act* (FPPA) is intended to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that—to the extent possible—Federal programs are administered to be compatible with state, local units of government, and private programs and policies to protect farmland. Because all of the South Corridor Project Alternatives are within the regional UGB, and the land inside the UGB is designated for urban development, the project would be consistent with the FPPA.

Earthquake Hazards. The Pacific Northwest has four types of seismic sources related to the presence of the Cascadia subduction zone. These sources include (1) the subduction zone megathrust, which represents the boundary (interface) between the downgoing Juan de Fuca plate and the overriding North American plate; (2) faults located within the Juan de Fuca plate (referred to as the intraplate or intraslab region); (3) crustal faults principally in the North American plate; and (4) volcanic sources beneath the Cascade Range (Wong and Silva, 1998).

There are several crustal Quaternary faults in the vicinity of the South Corridor Project area that may be active. Figure 3.13-1 illustrates the relative earthquake hazards in the South Corridor Project area. The Portland Hills Fault and East Bank Fault are two Quaternary faults that cross several segments.

The Portland Hills Fault is crossed along the Portland to Milwaukie Segment south of SE Tacoma Street and along the Milwaukie to Clackamas Segment west of SE Freeman Way. Studies completed at the Rowe Middle School (Wong et al., 2001) and North Clackamas Park (Hemphill-Haley et al., 2001) in Clackamas County have documented movement along the Portland Hills Fault since the latest Pleistocene. These sites are located approximately 2 miles southeast of the South Corridor Project area southern terminus. The results of these studies indicate that surface rupture is a potential seismic hazard with the project area.

The presence of the Cascadia subduction zone and potentially active Quaternary faults within the project area result in significant seismic hazards. Several earthquake hazard maps have been published that include the South Corridor Project area (Mabey et al., 1993; Mabey et al., 1995a; Mabey et al., 1995b; Mabey et al., 1995c; Wong et al., 2000). These publications include hazard maps for liquifaction, ground motion amplification, slope instability, and combined seismic hazards. Review of the slope instability map indicates that the various alternatives would not cross areas mapped as high hazard for seismically induced slope instability. Varying amounts of each segment have areas where potential for liquifaction and ground motion amplification hazards are high.

Landslides. The potential for major landslides within the South Corridor is limited. The topography within the project area is relatively gentle and the geologic conditions are generally favorable.

Volcanic Activity. Volcanic hazards are limited in the South Corridor Project area. The primary volcanic hazards include ashfall or flooding associated with eruptions from nearby Cascade volcanoes such as Mt. Hood and Mt. Saint Helens.

Soil and Rock Resources. Economic minerals were not identified within the South Corridor Project area. Ross Island Sand and Gravel (located on Ross Island) and Willamette Sand and Gravel (on the Clackamas River) are the nearest quarry sites and are approximately ½ mile from the South Corridor Project area.

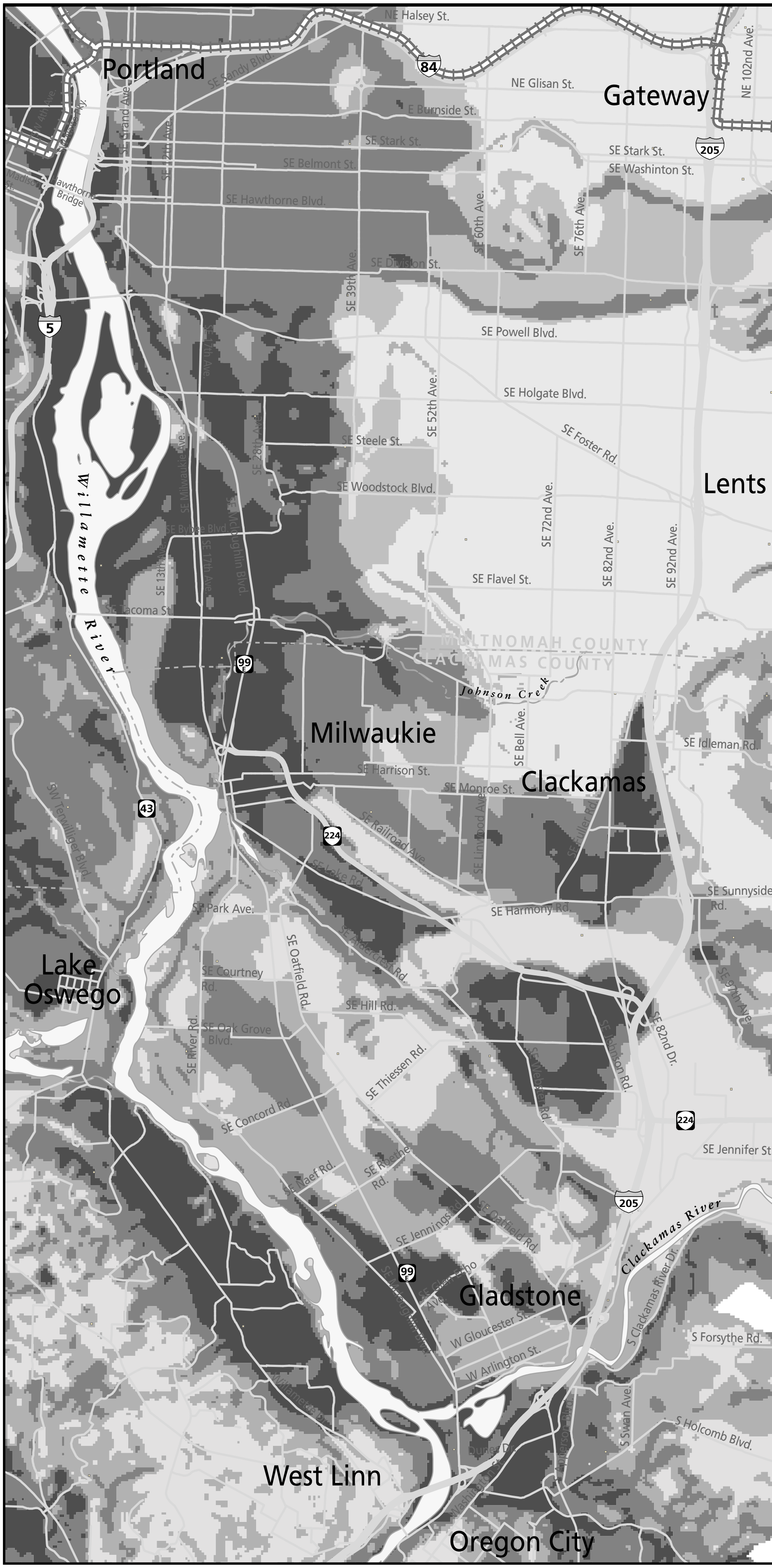
3.13.2 Geology, Soils, and Seismic Environmental Impacts

The South Corridor Project alternatives generally cross land that is already urbanized. Long-term impacts to the geologic environment would consist of relatively minor changes in topography and drainage patterns, minor settlement of near-surface materials, increased erosion, and potential changes in slope stability. These types of impacts would be common to all Project alternatives and

South Corridor Project

Relative Earthquake Hazard

Figure 3.13-1



A Highest Hazard

B

C

D Lowest Hazard

This map shows relative areas having the greatest tendency to experience damage due to any combination of liquefaction, amplification of ground shaking or slope instability hazard. For every point on the map, the zone rating for each individual hazard was squared, and the resulting numbers were added together. The square root of this sum was calculated and rounded to the nearest whole number. Results of 4 or 5 is assigned to category A, 3 is asigned to category B, 2 is assigned to category C, and 1 or 0 is assigned to category D.

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would occur as a result of excavation, placement of structures and fills, and clearing and grading. More site-specific geotechnical investigations will be performed during preliminary engineering and final design for the selected alternative. The current investigations have identified problem areas, and future engineering and designs can be developed to mitigate any adverse effects.

3.13.2.1 Long-Term Impacts

The difference in long-term impacts on the geologic environment of each alternative would vary in important ways in some cases. The BRT Alternative would primarily use existing roadways and most new facilities would be limited to station additions. Portions of the Busway Alternative would have a greater impact as new roads would be constructed. The long-term impacts from the various LRT Alternatives are the most significant because they would involve the most earthwork.

3.13.2.2 Short-Term Impacts

The majority of transit improvements associated with the No-Build Alternative would have limited short-term impacts on the geologic environment because they would involve modifications to an existing transportation system in an urbanized area.

Short-term impacts related to construction of the Project alternatives would be limited to stability of partially constructed slopes, temporary changes to drainage, and erosion and resultant sedimentation. The potential for short-term impacts is the lowest for the BRT Alternative as it involves the least amount of new development. The Busway Alternative would have greater potential short-term impacts because it would use a combination of existing roadway and construction of new roadway. The two LRT Alternatives would have the greatest potential short-term impacts because both alternatives require significant amounts of earthwork. The I-205 LRT Alternative includes more cuts and fills, which would result in a greater potential for short-term impacts, both as a stand-alone alternative and as part of the Combined LRT Alternative.

The Ruby Junction facility and Powell Garage expansions would have minimal short-term impact on the geology and soils because the extent of earthwork would be limited and existing topograpy is fairly flat.

A. No-Build Alternative

The majority of transit improvements associated with the No-Build Alternative would have no impact on the geologic environment because they would involve modifications to the existing transportation system in an already urbanized area. One exception is the proposed park-and-ride lot near SE McLoughlin and Roethe Road where shallow groundwater and high shrink swell soils are likely to be present. A subsurface investigation should be completed prior to further design of this facility.

B. Bus Rapid Transit Alternative

The transit improvements proposed for the Portland to Milwaukie segment with the BRT Alternative would have minimal impacts on the geology and soils because the improvements would involve relatively minor changes to existing roadways. The proposed Southgate Transit Center would be located in an area with shallow groundwater, high liquefaction hazards, and ground motion amplification hazards. The proposed parking structure at the Milwaukie Southgate Transit Center would be a four-story structure. Under the 1997 Uniform Building Code (UBC), which includes seismic provisions, a parking structure that is four stories or higher requires a site-specific seismic hazard analysis.

The potential impacts to geology and soils of the BRT Alternative in the Milwaukie to Oregon City Segment would be minimal because most transit improvements would be within the existing urban infrastructure. The Concord Station would be located within an area with a high seasonal water table. Several of the proposed station stops at the southern end of this segment are underlain by soils with high ground motion amplification hazards.

A bus-only ramp is proposed for access from SE Main Street onto Highway 224. The eastern portion of these proposed ramps is underlain by organic soils. These soils may result in settlement of the fill if not appropriately designed. The proposed Linwood/Harmony Station site is underlain by high shrink-swell soils, which may cause settlement of structures if not properly engineered prior to construction. Several seismic hazards are present along the proposed BRT Alternative improvements in this segment. The proposed Oak Street station would be located within a high ground motion amplification and liquefaction hazard area. The surface trace of the Portland Hills Fault is mapped near the proposed Freeman Way Station and could potentially cause surface rupture at the station. The segment is within areas mapped with moderate to high liquefaction and ground motion amplification hazards from the Linwood/Harmony Station to the Clackamas Transit Center. These hazards should be considered further during preliminary engineering of these stations. The potential impacts to geology and soils associated with the Johnson Road Park-and-Ride Design Option would be minimal because most transit improvements would be within existing urban infrastructure. Impacts with this option are related to the shrink-swell potential of the soils.

C. Busway Alternative

The transit improvements associated with the Portland to Milwaukie Segment of the Busway Alternative would have modest impacts on the geology and soils because the improvements would involve development of new roadways. Considerable fill material may be encountered along the Water Avenue Design Option on the east side of the Hawthorne Bridge and through to SE Powell Boulevard. This fill may include highly variable soil types with inconsistent soil strengths. Shallow groundwater and soft soil conditions are present along SE McLoughlin Boulevard, including near the proposed Tacoma Station. Much of this segment lies within mapped high seismic hazard areas. Liquefaction hazards are high near the Willamette River and from approximately SE Powell Boulevard southward. Ground motion amplification is high from the crossing of Crystal Springs Creek southward. The proposed Southgate Transit Center would be located in an area with shallow groundwater and high liquefaction and ground motion amplification hazards. In addition, the Busway Alternative in this segment would cross the surface trace of the Portland Hills Fault approximately 500 feet south of the Tacoma Station, where a four-story parking structure is proposed. The proposed parking structures at the Tacoma Station and Southgate Transit Center would be four-story structures. These structures would require a site-specific seismic hazard analysis during preliminary engineering. The Busway Alternative in this segment would follow the same general alignment as the BRT Alternative from Milwaukie to the Freeman Way Station. The issues along this portion of the busway alignment are discussed in the corresponding BRT section and would generally include settlement resulting from organic soils, shallow groundwater, high liquefaction hazards, and ground motion amplification hazards. From the Freeman Way Station to the Clackamas Town Center Transit Center the Busway Alternative would leave the existing roadway. High shrink-swell soils are mapped in the vicinity of the Linwood/Harmony station from

Highway 224 to Harmony Road. These soils may cause settlement of the proposed parking garage and support structures for above grade roads (with or without the parking structure) if not designed to account for the soil types in this area. Shallow groundwater is present in the vicinity of the eastern terminus of the Busway Alternative, which could complicate construction of the underpass beneath SE 82nd Avenue.

The potential impacts to geology and soils in the vicinity of the Seventh Avenue Design Option would be minimal because most transit improvements would be within the existing urbanized infrastructure. The Clinton Street Above-Grade Design Option would include considerable support structures. The potential for seismic vulnerability and settlement need to be factored into the design. The potential impacts to geology and soils in the vicinity of the Brooklyn Yard Design Options and the geologic hazards would be similar for both. These include high liquefaction hazards, shallow groundwater, and soft soils. The potential impacts to geology and soils associated with the Johnson Road Station Design Option would be minimal because most transit improvements would be within existing urban infrastructure. Impacts with this option are related to the shrink-swell potential of the soils.

D. Light Rail Alternatives

The light rail transit improvements proposed for the LRT Alternatives in the Portland to Milwaukie Segment would have moderate impacts on the geology and soils. The improvements within this segment would involve the development of railways. Considerable fill material may be encountered east of the Hawthorne Bridge through the OMSI Station and occasionally from the OMSI Station to SE Powell Boulevard. This fill may include highly variable soil types with inconsistent soil strengths. In addition, considerable woody debris such as sawdust may be encountered. Shallow groundwater and soft soil conditions are present along SE McLoughlin Boulevard. Such conditions should be considered further during preliminary engineering of the railways, Holgate Station, Bybee Boulevard Station, and Tacoma Street Station. Organic soils are mapped in the area where this alternative would cross beneath Highway 224. The extent of these soils should be assessed prior to further design of the light rail improvements and properly mitigated.

Many of the LRT improvements in the Portland to Milwaukie Segment would lie within mapped high seismic hazard areas. Liquefaction hazards are high near the Willamette River and from approximately SE Powell Boulevard southward. Risk from ground motion amplification is high from the crossing of Crystal Springs Creek southward. The proposed Southgate Transit Center would be located in an area with shallow groundwater and high liquefaction and ground motion amplification hazards. In addition, the LRT alignment would cross the surface trace of the Portland Hills Fault approximately 500 feet south of the Tacoma Station, where a four-story parking structure is proposed. There is the potential for surface rupture along this fault. The proposed parking structures at the Tacoma Station and Southgate Transit Center would be four-story structures. These structures would require a site-specific seismic hazard analysis during preliminary engineering.

The potential impacts to geology and soils and the geologic hazards would be similar for both Brooklyn Yard Design Options. These include high liquefaction hazards, shallow groundwater, and soft soils. More than 75 percent of the Tillamook Branch Design Option from the Tacoma Station to beyond the Highway 224 crossing involves crossing organic soils. In addition, nearly the entire option would be within mapped high liquefaction and ground motion amplification hazard areas. These geologic constraints should be further assessed during preliminary engineering. There are no additional adverse impacts to the geology and soils associated with Milwaukie Middle School Terminus Option that result from shortening the alignment. Both segments from Milwaukie to Oregon City and from Milwaukie to Clackamas have improvements and impacts similar to the BRT Alternative for this segment.

The proposed light rail transit improvements within the Gateway to Clackamas Segment would have moderate impacts on the geology and soils. The improvements primarily involve the development of railways along the existing I-205 freeway alignment in this segment. There would be several overpasses associated with construction of this Alternative, including over SE Powell Boulevard, SE Harold Street, SE Foster Road, SE Woodstock Boulevard, Crystal Springs Boulevard, and Johnson Creek Boulevard. Although soils in this segment are not particularly susceptible to settlement, site-specific geotechnical investigations should be completed prior to further design of these overpasses. Most of the I-205 LRT Alternative improvements would not be within mapped high seismic hazard areas. The two exceptions are an area of moderate to high ground motion amplification hazard south of the SE Main Street Station and at the southern terminus. The south end of the alignment is mapped as being within a high liquefaction and ground motion amplification hazard area. The surface trace of the East Bank Fault has been inferred to cross the alignment just north of the Flavel Street Station. Although the potential for surface rupture along this fault is not well understood, the potential for surface rupture and strong ground shaking motions should be addressed during preliminary engineering of this station and associated overpass.

Shallow groundwater underlies the proposed improvements south of the Johnson Creek Station. Shallow bedrock capped with clayey soils is present beneath the majority of this alignment reach. Much of the alignment south of the Johnson Creek Station would traverse moderately steep slopes (up to 15% grade). Proper drainage systems should be evaluated in conjunction with preliminary engineering of this alternative to prevent buildup of pore-water pressures, which could destabilize the slopes. There are two four-story parking structures proposed along this alignment: one at the Fuller Road Station and a second at the East of Clackamas Town Center Terminus Option. These structures will require a site-specific seismic hazard analysis during preliminary engineering.

There would be minimal impacts related to the Clackamas Town Center Terminus Design Options. Shallow ground water may be encountered in portions of the alignment along SE Monterey Avenue. This condition should be given appropriate consideration during design.

E. Operations and Maintenance Facilities

Operations and maintenance facilities for the South Corridor Project alternatives would include an expansion of the existing Ruby Junction facility at SE 199th Avenue for the LRT Alternatives and an expansion of the Powell Garage facility for the Busway and BRT Alternatives. The Powell Garage expansion is planned to occur regardless of the South Corridor Project. These expansions would have a minimal impact on the geology and soils surrounding the sites.

3.13.2.3 Cumulative Geologic, Soils, or Seismic Impacts

No cumulative effects to soils, geology or seismic risk are expected. Neither construction nor operation of the project alternatives, either by themselves or in conjunction with other projects in the corridor, is expected to have any cumulative impact on the soils, geology, or seismic risk in the corridor.

3.13.3 Potential Geologic, Soils, or Seismic Mitigation

The potential for erosion along many sections of the alternatives would be minimal due to the gentle topography along the alignments and because several of the transit improvements would take place within existing urbanized infrastructure. However, there would be significant cuts and fills associated with the I-205 LRT Alternative and the Milwaukie to Clackamas Segment of the Busway Alternative. Designing slopes to minimize the effect of surface run-off could control erosion in these areas. Collection and routing of surface water away from cut-and-fill slopes could limit erosion damage. Exposed soil can be seeded to control erosion and prevent sediment-laden run-off from reaching streams. Stream banks at bridges can be reinforced to prevent erosion and undercutting. Additional precautions should be taken when working near stream crossings.

Slopes within the South Corridor Project area are generally stable. In areas where instabilities may exist or are identified during the preliminary engineering geotechnical investigation, the slopes could be re-graded or mechanically stabilized and properly drained to minimize slope failure potential. The southern portion of the I-205 LRT Alternative is one area that would require further investigation. Areas where new slopes or cuts are planned would also be investigated for stability and would be properly graded or mechanically stabilized. Where shallow groundwater is encountered, drains would be installed to increase slope stability as necessary.

Significant portions of the South Corridor Project area are underlain by fine-grained soils that would be susceptible to settlement. Mitigation will depend on several issues, including extent of the compressible soils, the presence of groundwater and the depth to a load-bearing soil or bedrock. Where the unstable soils are limited in extent, they can be over excavated and replaced with engineered fill, matt foundations, deep foundations, piles, or other forms of mechanical foundation support.

Seismic hazards within the South Corridor Project area are significant and include liquefaction, amplification of ground motions and earth rupture. All three could lead to significant structural damage due to settlement, shaking or earth displacement. Generalization of mitigation alternatives is difficult until site-specific information is gathered regarding subsurface conditions. Liquefaction can be mitigated by stabilizing the soils or supporting the structures on non-liquefiable soil or bedrock. Ground motion amplification can be reduced through foundation design and proper structural design. The potential for earth rupture along the various alternatives is limited but may impact the Tacoma Station, Freeman Way Station and the Flavel Street Station. Consideration of specific design modifications for these stations would be necessary during the preliminary engineering phase.

3.14 Safety and Security

3.14.1 Crime Prevention and Passenger Safety

Members of the community have expressed concerns about the safety and security of the TriMet system and the effect of increased transit on South Corridor neighborhoods. Neighborhood concerns have focused on personal safety at transit stations, theft from vehicles at park-and-ride lots and increased property crimes in neighborhoods adjacent to transit stations. TriMet has developed strategies for addressing crime at transit stations and park-and-rides over the course of the more than 15 years of operating light rail in the region and the lessons learned through light rail operation could be applied to any of the high capacity transit modes under consideration in the South Corridor.

Crime occurs at varying levels throughout the region and is likely to be found at higher rates in areas where people congregate such as transit stations, shopping malls and parks, but TriMet continually works to increase passenger and community safety throughout their service area.

To create a safe transit environment, TriMet's Transit Security Division, including sworn law enforcement officers from jurisdictions throughout the service area, patrols trains, buses and park-and-ride lots. TriMet would coordinate with local jurisdictions to effectively patrol any new facilities constructed in the South Corridor. In addition to these officers, TriMet contracts with a private security firm to provide additional patrols and with Multnomah County for a full-time Deputy District Attorney to prosecute transit-related crimes.

TriMet has developed and adopted a system-wide *Transit Security Plan* that calls for the application of community policing goals and techniques to transit security. Elements of the plan would be incorporated into the design and operation of any of the South Corridor alternatives. These would likely include:

- In-house training of transit district employees to increase awareness of and prevent criminal activities;
- Coordination with local law enforcement agencies and personnel;
- Improved facility design and operations standards that would improve visibility at transit stations and increase security enforcement levels; and
- Investment in new tracking and surveillance technology.

In 1995, TriMet established the South/North Safety and Security Advisory Committee to bring law enforcement expertise into the planning and design of the South/North Project. TriMet's Security Director chaired the South/North committee, which included law enforcement personnel from local jurisdictions along the proposed South/North alignment. In May 1998, the committee completed a report of recommended safety and security guidelines for preliminary engineering of the South/North Light Rail Project. The safety and security guidelines integrate security design concepts with the experiences of constructing and operating the Blue Line (east-west) and now are enriched by the experience of operating the Red Line (airport) and would be applied to the design of new transit facilities in the South Corridor.

Additional transit service helps to create a safe environment in neighborhoods. TriMet provides extra eyes-on-the-street every day through its drivers and other employees. TriMet operators are able to request medical or police assistance for passengers and the general public. TriMet is also training employees to recognize and evaluate suspicious activity, people or objects.

Given the region's experience with high capacity transit, it is unlikely that any one of the South Corridor alternatives would significantly affect safety and security in the corridor more than any other alternative.

3.14.2 Emergency Response

The terrorist attacks on September 11, 2001 heightened the Federal Transit Administration and TriMet's awareness of security risks to public transit facilities and highlighted the importance of public transit in aiding other agencies in emergency responses. Soon after the attacks, TriMet and FTA assessed the transit system for security risks and revised the emergency response plans to ensure a quick and proactive response to emergency situations. TriMet already had developed plans in accordance with the FTA's *Recommended Emergency Preparedness Guidelines for Rail Transit Systems* (Federal Transit Administration: March 1985) and *Recommended Emergency Preparedness Guidelines for Urban, Rural, and Specialized Transit System* (Federal Transit Administration: January 1991). These emergency response plans, including responses to terrorist attacks, would be revised to specifically include all transit facilities in the South Corridor to ensure a secure transit system.

Immediate changes to TriMet's safety and security policies after the terrorist attacks included:

- Creating a Critical Information Officer position,
- Posting a permanent security guard at the airport terminus to monitor activity,
- Assessing other security risks on the newly opened Airport MAX line, and
- Temporarily stationing a security guard at both ends of the Bill Robertson Tunnel through the West Hills on the Westside line.

Airport MAX was used to evacuate passengers from the airport after the attacks and has been a convenient and safe way for passengers to access the airport given heightened airport security and new parking restrictions.

TriMet and FTA completed a security assessment of TriMet facilities that began in September 2001 that identified potential security improvements for the transit system. Improvements identified during the assessment included minor design and lighting changes on MAX lines and at bus stops, changes to light rail station platforms and security improvements near vital structures. TriMet is also considering installing a monitoring system for the Bill Robertson Tunnel through Portland's West Hills. Many of the recommendations identified in the security evaluation relate to security measures TriMet was already implementing such as installing additional security cameras in all transit vehicles and expanding the number of monitored security cameras on light rail trains, at stations and at park-and-rides.

TriMet has also re-evaluated and improved standard responses to emergency situations since September 2001. TriMet's security response procedures include strategies for assisting in evacuations or other emergency responses and reacting to an emergency involving the transit system. As transit agencies from New York and Washington, D.C. reported, the most important aspect of any emergency response is planning and practice. This response must include key responders from agencies throughout the transit system service area. TriMet has held training sessions with bomb squads, hostage teams, fire fighters and police officers to ensure that emergency personnel are familiar with the transit system, vehicles and emergency procedures.

TriMet and FTA are taking the appropriate steps to ensure that the entire transit system is designed and operated in a way that will not encourage terrorist activities. TriMet has developed procedures to ensure a quick and effective response to any emergency or catastrophic event. These policies and procedures would be applied to any improvements in the South Corridor.

3.14.3 Operational Safety Considerations

BRT Alternative safety considerations would not differ from the No-Build Alternative. The Busway and Light Rail alternatives could create potential conflicts between pedestrians, bicyclists and cars crossing the busway or light rail alignments. For these fixed-guideway alternatives, safety considerations would primarily focus on the number of at-grade crossings, because, while they would meet stringent design and safety standards, they would slightly increase the risk of light rail vehicle or bus conflicts with other vehicles, pedestrians or bicyclists. The designs of these alternatives would conform to adopted local and industry-wide safety standards and would employ TriMet's proven techniques for preventing conflicts such as gated crossings and pedestrian "z crossings."

4. TRANSPORTATION FACILITIES, SERVICES AND IMPACTS

This chapter presents the impacts that the South Corridor Alternatives would have on the transit system, traffic movements, and freight movement in the project area. This chapter provides an overview of the affected transportation environment, followed by a summary of the transit and highway and street impacts that would result from the alternatives under consideration for the Corridor.

Transit impacts are assessed by using various measures of service level, travel time, reliability, and ridership. Highway and street impacts are assessed by using various measures of congestion on streets, freeways, and intersections and by assessing impacts to parking supply and utilization. In addition impacts to pedestrian and bicycle travel are assessed through qualitative discussions. For more detailed information on transportation impacts refer to the *Transit Impacts and Travel Demand Forecasting Results Report* (Metro, November 2002); and *Local and Systemwide Traffic Impacts Results Report* (Metro and DKS, November 2002).

4.1 Affected Environment

This section summarizes characteristics of the existing transportation system and behavior within the region and corridor, highlighting travel behavior; the public transportation, highway, and pedestrian and bicycle infrastructures and networks; regional and local parking policies and supplies; regional and local transportation plans; and freight movements.

4.1.1 Travel Behavior

The basic unit of measure used to describe travel behavior is the "person trip," which is a trip made by one person from a point of origin to a destination via any travel mode. Several trip variables, including origin, destination, mode, and purpose of the trip, further describe travel behavior. Data on existing and forecast transit ridership are reported in two ways: "linked" trips (also known as originating rides) and "unlinked" trips (also known as boarding rides). Linked transit trips are also person trips and represent the full origin-to-destination transit trip, regardless of how many separate transit vehicle boardings (or transfers) are required to complete the trip. Unlinked trips (or boarding rides) count each time a person boards a transit vehicle. A linked transit trip that requires a transfer will include at least two transit vehicle boardings.

In 2000, the base year for this Supplemental Draft Environmental Impact Statement (SDEIS), the transportation facilities in the South Corridor accommodated a total of 2,186,200 person trips (both automobile and transit) on an average weekday. Of these, approximately 96,600 were on the transit system. The South Corridor accounted for approximately 33% of all daily person trips and 37% of all daily transit trips in the Portland metropolitan region. Daily work trips in the Corridor totaled 486,200 in 2000, of which 50% (242,000) remained within the South Corridor. Of the Corridor's average weekday transit work trips in 2000, 13% (63,100) occurred between locations within in the South Corridor and the Portland Central City, which includes downtown Portland, the Lloyd District, and the Central Eastside Industrial District (CEID).

Transit is a significant mode for work trips to downtown Portland. In 2000, there were 149,000 total daily work trips to downtown Portland. Of those, 61,000 trips were made via the transit system (41 percent). In the South Corridor, there were 38,060 daily work trips to downtown Portland; of those, 15,300 (40%) were on transit.

4.1.2 Public Transportation

The existing South Corridor transit system (see Figure 1.2-1) includes a portion of the grid-oriented transit system that serves much of southeast Portland. The grid network of radial and cross-town bus lines provides for multi-destinational travel, often through transfers between bus lines providing frequent service. The Corridor's transit network also includes a suburban, timed-transfer system serving transit centers in Clackamas County. The suburban, timed-transfer system is designed to serve both intra-suburban trips and suburb-to-downtown Portland (or other major regional destination) trips. The intra-suburban trips are served by feeder bus lines that connect suburban residential neighborhoods with transit centers in Milwaukie, Oregon City, and Clackamas Town Center in Clackamas County and Gateway in Multnomah County. These transit centers are linked to downtown Portland with high-capacity, high-frequency trunk line bus service. The Clackamas County trunk lines generally operate on SE McLoughlin Boulevard and Highway 224. Schedules for the trunk lines and feeder lines are defined so that buses arrive and depart from the major transit centers at the same time. This "pulse" allows for short, convenient, and predictable transfer times. The grid and timed-transfer service plans have led to strong growth in both urban and suburban transit travel, with most suburban ridership concentrated on trunk lines.

Transit service in the South Corridor is primarily provided by fixed-route, fixed-schedule buses operating in mixed traffic on freeways, highways, arterials, and local streets. As noted in Section 1.5 of this SDEIS, transit service in the South Corridor is hampered by slowing speeds and reliability problems. Decreasing bus speeds and deteriorating reliability have been caused, in large part, by increased traffic congestion within and surrounding the Corridor.

An analysis of the proximity of employment sites to existing transit service determined that the transit coverage of the employment sites (defined as a transit stop within ¼ mile of a job site) is 78% in the South Corridor. Transit coverage of residential areas within the corridor is 61%. These coverage rates compare with 80% employment center coverage and 61% residential area coverage for the region as a whole.

4.1.2.1 Public Transportation Providers

The Tri-County Metropolitan Transportation District of Oregon (TriMet) is the largest mass transit operating agency for the Oregon portion of the Portland/Vancouver metropolitan area, and the fifth largest on the West Coast. Under Oregon law (ORS 267), TriMet is a non-profit, municipal corporation operating in the urbanized portion of three Oregon counties; Multnomah, Clackamas and Washington. Its operating area covers approximately 590 square miles and it serves a population of approximately 1.3 million (2001). The Clark County Public Transportation Benefit Area Authority (C-TRAN) provides transit services throughout Clark County, Washington, and into downtown Portland. The South Metro Area Rapid Transit (SMART), a department of the City of Wilsonville, Oregon, operates transit services in Wilsonville and surrounding areas.

4.1.2.2 Transit Lines and Operations

TriMet currently operates 701 buses and 78 light rail vehicles (LRVs), including spares. TriMet's weekday operations run from approximately 5:00 a.m. to 1:00 a.m. Weekday service is generally divided between a.m. and p.m. peak period service (approximately 7:00 a.m. to 9:00 a.m. and 4:30 p.m. to 6:30 p.m., respectively). Midday service is generally from approximately 9:00 a.m. to 4:30

p.m. and evening service is from approximately 6:30 p.m. to 9:30 p.m. The remaining early morning and late night service operates at lower frequencies. During the p.m. peak period, 565 buses and 65 LRVs are in service. Cumulatively, buses in the TriMet system travel a total of approximately 27 million miles annually, with LRVs, traveling an additional 2.6 million miles annually. Total annual revenue hours (total number of hours transit vehicles are in revenue service) are 1.5 million for buses and 123,000 for light rail vehicles. Systemwide average speed is about 16 mph for buses and about 21 mph for LRVs, (average speeds include dwell times at bus stops and light rail stations).

Urban grid bus lines operate approximately every 15 minutes during the midday period, with more frequent service during the a.m. and p.m. peak periods, as demand warrants. Suburban trunk lines operate about every 30 minutes during the midday period and about every 15 minutes during the a.m. and p.m. peak periods. Buses on feeder lines typically run every 30 minutes during the midday period and about every 20 to 30 minutes during the a.m. and p.m. peak periods.

During the p.m. peak hour, 18 TriMet trunk line buses depart downtown Portland for the South Corridor. During the midday period, line 33 provides four trunk line trips per hour in each direction between downtown Portland and the South Corridor. Within the City of Portland, radial and cross-town bus lines provide transit service paralleling and intersecting these trunk lines.

TriMet's light rail system, or Metropolitan Area Express (MAX), currently comprises an east-west line from Gresham to Hillsboro (the Blue Line) and a line connecting downtown Portland with the Portland International Airport (the Red Line). The current system includes 54 light rail passenger stations, 6,710 park-and-ride spaces adjacent to light rail stations, and two light rail operating and maintenance facilities – Ruby Junction on the east side of the Blue Line and Elmonica on the west side of the Blue Line. As of January 2002, system-wide average weekday light rail ridership was 78,700 boarding rides, average Saturday ridership was 55,700, and average Sunday ridership was 36,600.

The Blue Line is a 33-mile east-west light rail line with service between Gresham to the east and Hillsboro to the west via downtown Portland. Currently, the Blue Line operates approximately every 10 minutes during the midday period, with shorter headways during the a.m. and p.m. peak periods adjusted to meet demand and to comply with adopted loading standards.

The Red Line, which opened September 2001, includes a 5.5-mile extension on the eastside connecting Gateway Regional Center to Portland International Airport. Red Line trains operate between downtown Portland and airport on both an older portion of the Blue line (between downtown Portland and the Gateway Transit Center (TC) and on the newer portion of tracks, between the Gateway TC and the airport. North of the Gateway TC, the Red Line includes four stations and one park-and-ride lot, with capacity for 180 parking spaces. Current operations include daily service every 15 minutes with through-routed service between downtown Portland and PDX. As of January 2002, patronage on the Red Line from downtown Portland to Portland International Airport averaged approximately 11,000 boarding rides per weekday; on the segment between Gateway Transit Center and the airport, the Red Line averaged about 3,500 boardings each weekday.

TriMet is currently constructing a 5.8-mile light rail extension north from the Rose Quarter Transit Center to the Portland Metropolitan Exposition (Expo) Center: **the Yellow Line**. The Yellow Line will operate between the Expo Center and downtown Portland and is scheduled to open in 2004. The Yellow Line will include 10 new light rail stations and two new park-and-ride facilities, with a total of 600 parking spaces.

In addition to the transit service provided by TriMet, the 2.5-mile **Central City Streetcar** operates between the intersection of NW 23rd Avenue and NW Northrup Street and Portland State University (PSU) in downtown Portland. The City of Portland manages the streetcar operation and contracts with TriMet to provide operators for the system. Streetcars run every 15 minutes during most of the day and less frequently in the evening and weekends, based on demand. Streetcar fares are fully integrated with TriMet and TriMet passes; tickets and transfers are accepted. There is no charge to riders who travel entirely within Fareless Square. In 2002, the Streetcar carried an average of 4,500 riders each weekday.

4.1.2.3 Passenger Facilities

TriMet currently maintains approximately 8,100 bus stops, 54 light rail stations, 1,000 bus shelters (41 of which are on the downtown Portland transit mall), 59 park-and-ride lots, and 16 transit centers. TriMet also provides special services for the elderly and the handicapped through the LIFT Program. TriMet operates a Customer Assistance Center in downtown Portland and provides sales and assistance outlets and ticket vending machines at light rail stations and along the transit mall in Fareless Square (i.e., a free-ride zone in downtown Portland and Lloyd District). TriMet also offers the option of bringing bicycles on-board all LRVs or placing them on external racks on all buses.

4.1.2.4 Current Ridership, Operating Revenue, and Operating Expenses

From 1981 to 1986, average daily ridership on TriMet's fixed-route transit network (bus and light rail service) declined from 130,600 boardings to 115,600, reflecting a statewide and regional economic recession. However, by fiscal year (FY) 1994, the state and regional economies were experiencing strong growth, and average daily ridership had recovered to a new high of 198,400, primarily as a result of increases in employment, population, parking costs, and transit service. Average daily ridership has exceeded 250,000 boardings since early 1999, with the introduction of Westside light rail service and new feeder bus service as key factors in ridership growth. By January 2002, with full implementation of the Blue Line and Red Line and continued increases in bus service, weekday boarding rides (bus and light rail) averaged approximately 298,900, Saturday ridership averaged 183,600, and Sunday ridership averaged 121,700.

TriMet's fares are established on the basis of zones. As of September 2002, TriMet fares for adults are $1.25 for two-zone trips and $1.55 for trips longer than two zones. Monthly passes are available for $45.00 for two-zone trips and $56.00 for longer trips. Discounted ticket prices are available to senior citizens, the disabled, and school-aged children. Trips taken wholly within downtown Portland and the Lloyd District fareless square areas are free. TriMet also provides a variety of group fare purchase options throughout the region.

Between fiscal year 1987 and fiscal year 2001, TriMet's annual systemwide farebox revenues increased from $19.5 million to $51.2 million. Costs for operations and maintenance during this period increased from $58.4 million to $156.7 million annually. Fare revenue as a percentage of the cost of operation and maintenance declined from 33.4% to 32.6% and operations cost per boarding ride increased from $1.22 to $1.84, reflecting inflation and service expansion to lower ridership areas and time periods.

As of 2002, there were approximately 96,600 average weekday transit rides in the South Corridor. Full-time employed riders in the corridor tend to use transit for household trips and work-related transportation. Approximately three-quarters of TriMet's customers are classifies as "choice" customers, meaning they either have a car available but choose to use transit, or they do not choose to own a car, but rather to rely on transit. The other one-quarter of TriMet's customers are transit-dependent.

4.1.2.5 Accessible Service

Each of TriMet's light rail and bus lines is fully wheelchair accessible. TriMet operates North America's first low-floor LRVs on the Blue Line and Red Line. All TriMet bus lines are wheelchair accessible via lifts or low-floor buses with ramps. Additional accessible service in the corridor is provided by LIFT. LIFT is a special transportation program providing more than 782,000 (fiscal year 2001) door-to-door trips annually to individuals who cannot use regular TriMet buses because of a physical or mental disability. LIFT also provides a reliable, lower-cost resource for agencies wishing to purchase pre-scheduled door-to-door service for their clients.

TriMet works with local jurisdictions to provide access to the transit system. The transit agency coordinates with cities and counties to plan service and capital improvements such as improved frequency, bus stops, park-and-ride lots, and transit stations with a goal of full accessibility of fixed-route services. All alternatives proposed for the South Corridor Project would provide fully accessible service.

4.1.3 Roadways

The South Corridor is served by a network of roads under the jurisdiction of the Oregon Department of Transportation (ODOT), Clackamas and Multnomah Counties, and the City of Portland. Significant congestion currently occurs on the Corridor's regional highways, local streets, and arterials.

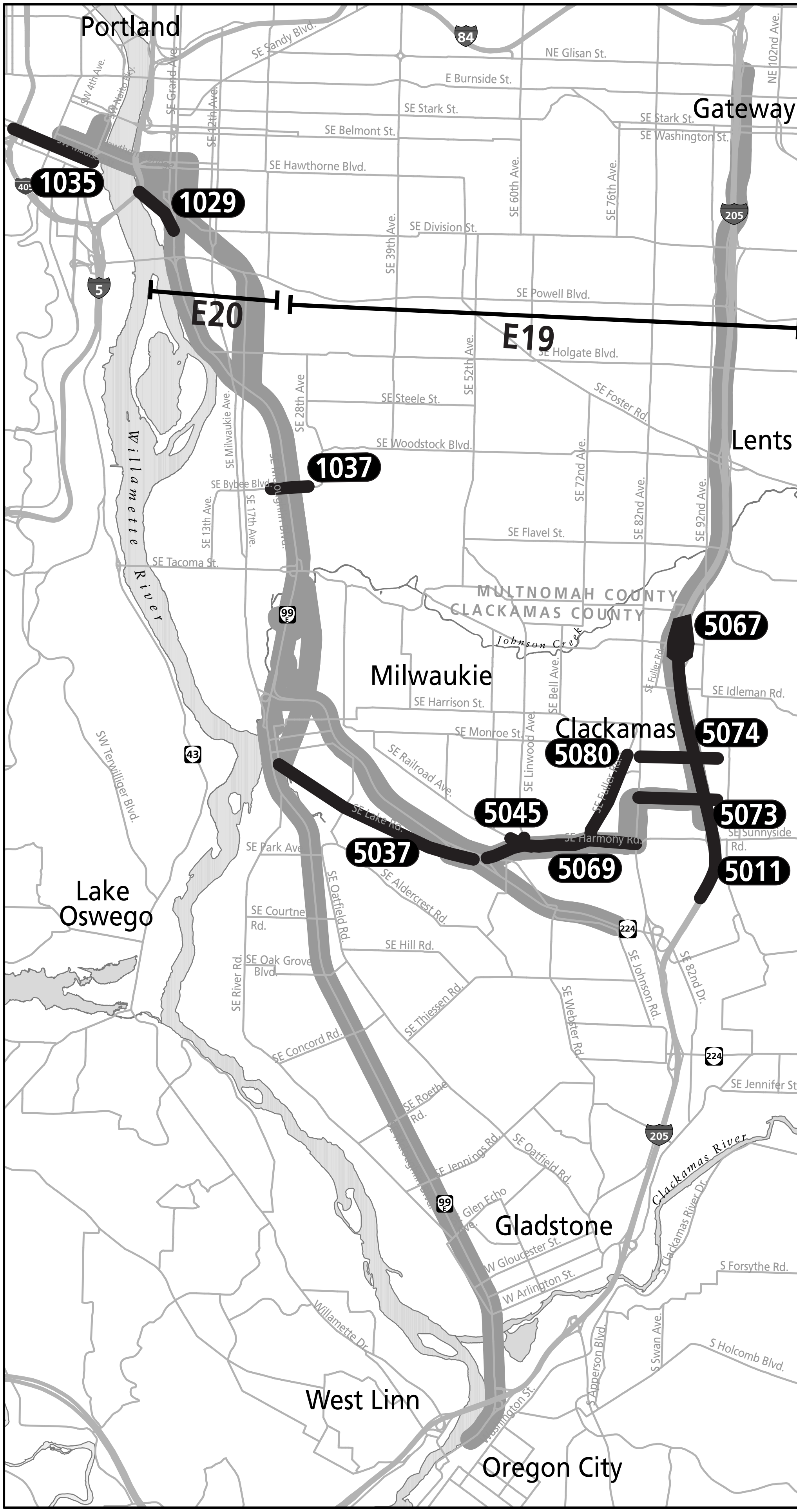
4.1.3.1 Regional Highway Network

Many of the region's freeways and highways serve at least a portion of the South Corridor. The regional facilities include I-205, Highway 224, and SE McLoughlin Boulevard (Highway 99E). These roadways form the core of the road network in the South Corridor Project area and are shown in Figure 4.1-1.

Regional and local transportation plans identify a number of highway and street improvements (as well as non-motorized improvements) that could affect the South Corridor Project area. These improvements are listed and briefly described in Table 4.1-1 and shown on Figure 4.1-1. Notable projects include the proposed widening of SE Harmony Road to a five-lane cross section, and the proposed realignment of the I-205 southbound off-ramp at SE Johnson Creek Boulevard to SE Fuller Road.

Local Street Network

A wide range of conditions exists on the local street network within the South Corridor, depending on travel demand and the capacity of existing roadways. Local streets potentially affected by the South Corridor Project were identified and the existing levels of service (LOS) on those streets were calculated.



SOUTH CORRIDOR PROJECT

Regional Transportation Plan Projects in the South Corridor

Figure 4.1-1

RTP Project

Alignment Alternatives

Traffic Cutline

1037 Bybee Boulevard Over-crossing
Replace existing bridge with a 4-lane bridge with standard clearance. (2006-2010)

1035 SW Columbia Street Reconstruction
Rebuild street to improve access to central city by all modes. (2000-2005)

1029 Water Avenue Extension
Construct new two-lane extension of street with sidewalks, bicycle lanes and landscaping to improve access to the Willamette River Greenway. (2000-2005)

5011 I-205 North Auxiliary Lane Improvements
Complete construction of auxiliary lanes north of Sunnyside Road to the interchange at Johnson Creek Boulevard and south of Sunnyside Road to the interchange at Sunnybrook Road. (2000-2005)

5037 Lake Road Improvements
Reconstruct the street to narrow travel lanes and add sidewalks, landscaped median and bikelanes. (2000-2005)

5045 Linwood/Harmony/Lake Road Improvements
Modify the intersection to include turn lanes on Harmony and Linwood roads. This project also grade separates UPRR. (2000-2005)

5067 Johnson Creek Boulevard Interchange Improvements
Upgrade the interchange at I-205 and Johnson Creek Boulevard to include a loop ramp, new northbound on-ramp and realign the southbound off-ramp. (2006-2010)

5069 Harmony Road Improvements
Widen the street to five lanes from Sunnyside Road to Highway 224. (2006-2010)

5073 Monterey Improvements
Widen street to five lanes from 82nd Avenue to new overcrossing of I-205. This project will include sidewalks and bike lanes. (2000-2005)

5074 Causey Avenue Extension
Construct a three-lane extension of the street over I-205 to new frontage road east of freeway to improve east-west circulation. This project includes sidewalks and bike facilities. (2006-2010)

5080 Fuller Road Improvements
Widen the street to three lanes from Harmony Road to Monroe Road to improve north-south circulation in the regional center area. This project includes removing auto access to King Road. (2006-2010)

5132 Main Street Extension
Extend Main Street to 99E with bike lanes. (2006-2010)

SOUTH CORRIDOR PROJECT
Transportation Alternatives

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METRO

Table 4.1-1
Metro Regional Transportation Plan Projects

RTP Project #	Affected Street	RTP Project Description
1029	SE Water Avenue	Construct new two-lane extension of street with sidewalks, bicycle lanes and landscaping to improve access to the Willamette River Greenway.
1035	SW Columbia Street	Rebuild street to improve access to central city by all modes.
1037	SE Bybee Boulevard	Replace existing overcrossing with a 4-lane bridge with standard clearance.
5011	I-205	Complete construction of auxiliary lanes north of SE Sunnyside Road to the interchange at SE Johnson Creek Boulevard and south of SE Sunnyside Road to the interchange at SE Sunnybrook Road.
5037	SE Lake Road	Reconstruct the street to narrow travel lanes and add sidewalks, landscaped median and bike lanes.
5045	SE Linwood Road/SE Harmony Road/SE Lake Road	Modify the intersection to include turn lanes on SE Harmony Road and SE Linwood Road. This project would also grade separate Union Pacific Railroad.
5067	SE Johnson Creek Boulevard	Upgrade the interchange at I-205 and SE Johnson Creek Boulevard to include a loop ramp, new northbound on-ramp and realign the southbound off-ramp.
5069	SE Harmony Road	Widen the street to five lanes from SE 82nd Avenue to Highway 224 with sidewalks and bike lanes.
5073	SE Monterey Road	Widen street to five lanes, from SE 82nd Avenue to the recently constructed overcrossing of I-205. This project will include sidewalks and bike lanes.
5074	SE Causey Avenue	Construct a three-lane extension of the street over I-205 to SE Bob Schumacher Road to improve east-west circulation. This project includes sidewalks and bike facilities.
5080	SE Fuller Road	Widen the street to three lanes between SE Harmony Road and SE Monroe Street, to improve north-south circulation in the regional center area. This project includes removing auto access to SE King Road.
5132	SE Main Street	Extend SE Main Street to SE McLoughlin Boulevard with bike lanes.

Source: 2000 RTP (Metro, August 2000).
Note: RTP = Regional Transportation Plan.

Traffic conditions on local streets generally are characterized by levels of service at intersections, and intersections are categorized as either signalized (i.e., controlled by a traffic signal) or unsignalized (i.e., controlled by stop and/or yield signs or un-signed). Level of service for local streets is based on an assessment of delay for existing or forecast traffic volumes, consistent with the *Highway Capacity Manual*. Delay is used to define the level of service at intersections, which is a measure of operational conditions and how those conditions are perceived by motorists. Delay at a signalized intersection depends on two factors: the capacity of the intersection (as defined by the number of lanes and lane widths) and signal timing. For unsignalized intersections, delay is also determined using two factors: street capacity and the type of stop or yield sign used to control the intersection. Level of service for an intersection is classified into ratings that range from “A” to “F,” where “A” represents the least congested operation and “F” the most congested operation.

Existing p.m. peak-hour traffic counts were conducted in spring 2002 at 130 study area intersections in the South Corridor. Following is a summary of the traffic operating conditions for intersections in the corridor by segment. For a more detailed analysis of existing transportation operating conditions see the *Local and Systemwide Traffic Impact Results Report* (Metro and DKS, November 2002).

Portland to Milwaukie Segment

Major roadway facilities in the Portland to Milwaukie Segment include the Hawthorne Bridge, SE Martin Luther King Jr. Boulevard, SE Grand Avenue, and SE McLoughlin Boulevard. A summary of existing p.m. peak-period traffic operations for the Portland to Milwaukie Segment follows.

- All of the signalized intersections in the Portland to Milwaukie Segment operate at LOS D or better.
- Several unsignalized intersections (i.e., SE Mill Street at SE Martin Luther King Jr. Boulevard; SE Market Street at SE Martin Luther King Jr. Boulevard; SE Clinton Street at SE 11th Avenue; and SE Bybee Boulevard at SE 27th Avenue) operate with LOS F for the minor street (i.e., the street with the stop sign) movement.
- One intersection with an all-way stop (i.e., SE 32nd Avenue at SE Johnson Creek Boulevard) operates at LOS F.

Gateway to Clackamas Segment

The major roadway facilities in the Gateway to Clackamas Segment include I-205, SE Powell Boulevard, SE Foster Road, SE Woodstock Boulevard, and SE Johnson Creek Boulevard. A summary of existing p.m. peak-period traffic operations in the Gateway to Clackamas Segment follows:

- The intersection of SE Johnson Creek Boulevard at the I-205 southbound ramps operates at LOS F.
- The intersection of SE Johnson Creek Boulevard at SE 82nd Avenue operates at LOS E.
- All other signalized intersections in this segment operate at LOS D or better.
- The unsignalized intersections studied in this segment operate at LOS D or better.

Milwaukie to Clackamas Segment

Major roadway facilities in the Milwaukie to Clackamas Segment include Highway 224, SE Harrison and Oak Streets, and SE Lake, Harmony, and Sunnyside Roads. A summary of the existing p.m. peak period traffic operations for the Milwaukie to Clackamas Segment follows:

- All of the signalized intersections in this segment operate at LOS D or better.
- The unsignalized intersection at SE Lake Road and the Highway 224 westbound on-ramp operates at LOS F.

Milwaukie to Oregon City Segment

Major roadway facilities in the Milwaukie to Oregon City Segment include SE McLoughlin Boulevard, SE Oak Grove Boulevard, and I-205. A summary of the existing p.m. peak-period traffic operations for the Milwaukie to Oregon City Segment follows.

- The intersection of SE McLoughlin Boulevard at I-205 northbound on-ramp operates at LOS F.
- All other signalized and unsignalized intersections in the segment operate at LOS D or better.

4.1.4 Bicycle Activities

As part of the transportation data collection effort for the study area intersections, bicycle trips taken through those intersections were counted and compiled for the p.m. peak hour, which coincides with the motor vehicle p.m. peak hour. Similar to pedestrian count data, bicycle counts were the highest in downtown Portland and across the Hawthorne Bridge. Intersections further away from downtown Portland tended to have fewer bicycle trips than those closer to downtown Portland. For a more detailed analysis of bicycle facilities and activity please refer to the *Local and Systemwide Traffic Impact Results Report*. A summary of the bicycle activity within the South Corridor follows.

- **Portland Central City.** P.M. peak hour bicycle activity within downtown Portland generally ranges from 20 to 100 trips per hour through project area intersections, with more than 250 users crossing the Hawthorne Bridge (approximately 225 eastbound and 35 westbound) during the p.m. peak hour. Bicyclists on the Hawthorne Bridge typically travel along SE Hawthorne Boulevard and SE Madison Street east of the Willamette River. Fewer bicycle trips occur in the Hosford-Abernethy neighborhood.

- **Southeast Portland.** The intersections in the vicinity of SE 11th and 12th Avenues and SE Clinton Street experience a limited number of bicycle trips during the p.m. peak period, with counts of 20 or fewer bicycle trips per hour. Bicycle counts at intersections along SE 17th Avenue in the Brooklyn Neighborhood generally show fewer than 10 bicycle trips per hour at surveyed intersections. The intersection of SE Milwaukie Avenue at SE Holgate Boulevard experiences approximately 20 bicycle trips in the peak hour. SE McLoughlin Boulevard has only limited bicycle activity along its full length.

- **Highway 224 and Clackamas Town Center.** Bicycle counts along Highway 224 indicate that fewer than five bicycle trips per hour are taken through the observed intersections during the p.m. peak period. A similar level of bicycle activity was observed on major roadways in the Clackamas Town Center area.

- **I-205. A**long I-205, fewer than five bicycle trips per hour were taken through the observed intersections during the p.m. peak period. Many bicycle trips in the vicinity of I-205 travel on the I-205 multiple-use path, which runs parallel to I-205 and connects to the Springwater Corridor, which extends west and east to Milwaukie and Gresham, respectively. The Springwater Corridor connects to the I-205 multiple-use path in the vicinity of SE Flavel Street.

4.1.5 Pedestrian Activities

As part of the transportation data collection effort for the project area intersections, pedestrian trips taken through those intersections were counted and compiled for the p.m. peak hour, which coincides with the motor vehicle p.m. peak hour. Similar to bicycle count data, pedestrian counts were the highest in downtown Portland and across the Hawthorne Bridge and within other activity centers in the Corridor. Intersections further away from downtown areas tended to have fewer pedestrians trips than those closer to downtown areas. For a more detailed analysis of pedestrian facilities and activity please refer to the *Local and Systemwide Traffic Impact Results Report*. A summary of pedestrian activity within of the South Corridor follows.

- **Downtown Portland.** Downtown Portland has the highest level of pedestrian activity occurring at the surveyed intersections during the p.m. peak hour, with approximately 100 to 500 pedestrians per hour travelling through each intersection. Fewer pedestrian trips are taken through intersections located east of the Willamette River. Intersections in the Hosford-Abernethy neighborhood experience a range of approximately 10 to 100 trips per hour in the p.m. peak period – 10 to 25 pedestrian trips per hour are taken through intersections in the vicinity of SE 11th and 12th Avenues and SE Clinton Street.

- **SE Portland.** Fewer than 10 pedestrian trips per hour generally occur at the intersections along SE 17th Avenue in the Brooklyn Neighborhood during the p.m. peak hour, with the exception of

SE 17th Avenue at SE Center Street, at which approximately 40 pedestrian trips occur per hour (SE Center Street is a primary bus stop along SE 17th Avenue and provides the access to TriMet's administrative headquarters).

- **SE McLoughlin Boulevard and Downtown Milwaukie.** Fewer than 20 pedestrian trips per hour occurred during the p.m. peak hour at surveyed intersections along SE McLoughlin Boulevard. Of those, intersections located south of the downtown Milwaukie area (i.e., at SE Naef Road, SE Glen Echo Avenue, and SE Oak Grove Boulevard) had the greatest number of pedestrian trips.

- **Highway 224 and Clackamas Regional Center.** Intersections along Highway 224, SE Lake Road, and SE Harmony Road have limited pedestrian activity during the p.m. peak hour, with fewer than 10 pedestrian trips per hour taken through a majority of the observed intersections. Approximately 15 pedestrian trips per hour occur at the intersection of SE Harmony Road at SE Linwood Road. The intersections adjacent to the Clackamas Town Center have limited pedestrian activity during the p.m. peak hour, with fewer than 10 pedestrian trips per hour taken through a majority of the observed intersections. Locations where pedestrian activity tends to occur are localized along the I-205 multiple-use path, on SE Monterey Avenue, and along SE Sunnyside Road, all in the vicinity of the Clackamas Town Center TC. Approximately 10 to 20 pedestrian trips occur at intersections in this area during the p.m. peak hour. Project area intersections adjacent to I-205 have limited pedestrian activity during the p.m. peak hour, with fewer than 20 pedestrian trips being taken through a majority of the observed intersections.

4.1.6 Parking

This section provides an inventory of on-street and off-street parking spaces within the general vicinity of the capital improvements included within the South Corridor alternatives.

Numerous on-street parking spaces are located on the roadways that would parallel and intersect the proposed alignments for the various alternatives being considered. In downtown Portland, on-street parking is almost exclusively metered and priced at approximately $1 per hour. Some of the on-street parking outside the downtown Portland has time restrictions, but the on-street spaces are generally not priced (e.g., on-street parking near OMSI is within a Zone G permit parking area). Many of the proposed transit station locations have adjacent on-street parking, some of which has time restrictions and some of which allows unrestricted use. Table 4.1-2 lists the number of existing on-street parking spaces that would be within approximately 500 feet of a proposed transit station.

Off-street parking in the South Corridor is generally privately owned and typically serves adjacent commercial activity. In general, off-street parking spaces in downtown Portland are priced or are provided for the exclusive use of one or more adjacent businesses. Almost all of the existing off-street parking lots in the project corridor outside of downtown Portland are not priced. On SE McLoughlin Boulevard, significant numbers of off-street parking spaces are devoted to automobile sales and dealerships.

The area of potential parking impact near major transit stations was evaluated for existing light rail stations along the east portion of the Blue Line. Three stations were surveyed during August 2001: the Hollywood Transit Center (which has no park-and-ride spaces), the Gateway Transit Center (which has more than 800 park-and-ride spaces), and the Burnside/122nd Park-and-Ride Lot (which has more than 400 spaces). Survey information indicates that, within a radius of about 500 feet from the station locations (about two blocks), on-street parking is highly utilized (75% or higher). Within a radius of approximately 500 to 1,000 feet from a station, on-street parking use diminishes. Outside the 1,000-foot radius, on-street demand falls quickly.

Table 4.1-2
Existing Fixed-Guideway Station Area On-Street Parking Spaces and Use

Station	Alternative	Spaces Within 500 Feet[1]	Utilization (%) Within 500 Feet[2]	Spaces Within 1,000 Feet[1]	Utilization (%) Within 1,000 Feet[2]
SW Main	LRT	36[3]	81%	60[3]	82%
OMSI	LRT, Busway	0	N/A	30[3]	50%
Clinton Street	LRT, Busway	64[3]	52%	64[3]	52%
Rhine Street	LRT, Busway	136	43%	159	45%
Holgate Boulevard	LRT, Busway	33	55%	124	52%
Bybee Boulevard	LRT, Busway	0	N/A	130	22%
Tacoma Street	LRT, Busway	0	N/A	0	N/A
Milwaukie Southgate TC	LRT, Busway	9	50%	34	60%
Harrison Street	LRT	33	25%	250	35%
Lake Road	LRT	140[3]	40%	294[3]	50%
Freeman Way	Busway	0	N/A	60	10%
Linwood/Harmony	Busway	5	10%	10	10%
OIT Station	Busway	10	0%	100	10%
Clackamas Town Center	LRT, Busway	0	N/A	30	10%
SE Main Street	LRT	19	0%	40	0%
Division Street	LRT	48	5%	94	12%
Powell Boulevard	LRT	42	12%	90	14%
Holgate Boulevard	LRT	81	5%	245	12%
Foster Road	LRT	24	38%	105	29%
Flavel Street	LRT	34	0%	119	4%
Fuller Road	LRT	10	0%	24	0%

Source: DKS Associates, August 2002.
Note: LRT = light rail transit; TC = transit center; N/A = Not applicable.
1 Approximate number of on-street spaces near proposed station location.
2 Weekday, midday estimate of utilization, August 2002.
3 A majority of these parking has time restrictions or limits.

These surveys of parking space use around existing light rail stations were conducted to help determine an approximate parking-impact area for proposed station areas in the South Corridor, based on trips destined to a station that would start as a motor vehicle trip (i.e., park-and-ride trips). The average walking distance for park-and-ride trips (between an automobile and the transit station) is different than it is for walk-access trips (i.e., trips between a point of origin or destination and the transit station). The typical walk distance for a walk-access trip is approximately ¼ to ½ mile. In contrast, the average walk distance for a park-and-ride trip (from a parked automobile to the transit station) would be much less because of the travel time sensitivity of park-and-ride lot users.

4.1.7 Freight Facilities

Movement of freight and goods throughout the project area is vital for the economic vitality of the region. Freight movement within the project area comprises two modes: railroad and truck. Details about truck activity can be found in the *Local and Systemwide Traffic Impact Results Report* (Metro and DKS, November, 2002).

The primary railroad facility within the study area is UPRR's Brooklyn Yard, located east of SE 17th Avenue between SE Powell Boulevard and SE Harold Street. The existing railroad lines within the project area are owned by UPRR, East Portland Traction Company, and Portland and Western Railroad Company.

While peak-periods of truck activity typically occur during the midday, when total traffic levels are lower, the p.m. peak-hour was selected for this analysis because it tends to be the most congested period of the day. A summary of truck movements in the South Corridor follows.

- **Portland Central City.** Truck trips through intersections within downtown Portland and the Hosford-Abernethy neighborhood make up approximately 2 to 5% of all vehicular trips during the p.m. peak period. Truck activity is slightly greater (approximately 3 to 10 percent) in the vicinity of SE 11th and 12thAvenues and SE Clinton Street, because of surrounding industrial land uses. Within the Brooklyn neighborhood (i.e., along SE 17th Avenue) truck trips make up 2 to 8% of all trips through the surveyed intersections during the p.m. peak period.
- **SE McLoughlin Boulevard.** The truck activity along SE McLoughlin Boulevard generally makes up 1 to 3% of all trips from the Sellwood/Moreland neighborhood, through downtown Milwaukie, to Oregon City. This level of truck activity is fairly consistent throughout the Corridor.
- **Highway 224.** Highway 224 has truck activity during the p.m. peak period of approximately 1 to 5%, with the higher truck activity occurring farther east along the corridor.
- **Clackamas Town Center.** Within the Clackamas Town Center area, truck trips make up approximately 1 to 3% of all trips taken through intersections during the p.m. peak hour.
- **I-205.** The intersections in the vicinity of I-205 have truck activity similar to other study area locations during the p.m. peak hour, ranging from 1 to 5 percent.

4.1.8 Navigable Waterways

All of the South Corridor Project alternatives cross the Willamette River on the existing Hawthorne Bridge is used to cross the Willamette River with bus and/or light rail service.

4.2 Transit Impacts

The following discussion of transit impacts focuses on two areas of concern: service characteristics and ridership. Cost and other financial considerations are further discussed in the following sections: Section 2.3: Capital Costs; Section 2.4: Operations and Maintenance Costs; and Section 5.1: Financial Analysis.

4.2.1 Service Characteristics

Transit service considerations in this section include the amount of transit service and transit service coverage, transit travel times, reliability, and downtown Portland light rail operations. The No-Build Alternative was developed to be consistent with the transit service characteristics of the financially constrained network developed for the *2000 Regional Transportation Plan* (RTP) (Metro, August 2000) (see the *Detailed Definition of Alternatives Report* and Section 2.2.1). The South Corridor Project alternatives were built up from the No-Build Alternative transit network. The build alternatives include Bus Rapid Transit (BRT); Busway; and the Milwaukie, I-205, and Combined LRT Alternatives. Each alternative would result in different configurations of transit service in the South Corridor. See Section 2.2 for a more detailed description of those alternatives. Transit service considerations in this section include the amount of transit service and transit service coverage, transit travel times, reliability, and downtown Portland light rail operations.

4.2.1.1 Amount and Coverage of Service

The amount of transit service provided is measured by daily transit vehicle hours traveled (VHT), daily transit vehicle miles traveled (VMT), and daily place-miles of service. Daily vehicle hours are the cumulative time that transit vehicles are in operation, and daily vehicle miles are the distance they travel, independent of vehicle size. "Daily" is defined as an average weekday in 2020. In addition to providing an overview of transit service level, these statistics are inputs into the operations and maintenance cost model. Place-miles refers to the total carrying capacity (seated and standing) of each bus or train type; it is calculated by multiplying vehicle capacity of each bus or LRV by the number of service miles traveled each day by each vehicle type. Place-miles highlights differences in overall transit passenger-carrying capacity that would result from the different mix of vehicles and levels of service called for under each alternative. Table 4.2-1 summarizes the major transit characteristics for the South Corridor Alternatives.

Amount of Service

Service growth under the No-Build Alternative would be constrained by currently available revenue sources, consistent with the financially constrained transit network in Metro's 2000 RTP. Normal annual growth in service would occur over the next 20 years at an estimated rate of 1.5% per year. The No-Build Alternative in 2020 would result in a 38% increase in average weekday corridor transit vehicle miles and a 49% increase in transit VHT. The greater percentage increase in VHT compared to VMT indicates that transit speeds in the corridor would slow relative to existing conditions, due to increasingly congested and slowing traffic on local streets, arterials and highways.

Table 4.2-1
Average Weekday Corridor Transit Service Characteristics, by Existing Conditions and South Corridor Project Alternatives

Attribute	Existing	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Transit VMT[1] (Weekday)							
Bus	20,700	28,530	32,410	32,730	28,450	29,180	26,820
LRV	0	0	0	0	1,680	2,670	3,180
Total	20,700	28,530	32,410	32,730	30,130	31,850	30,000
% Change[2]	N/A	37.8%	+13.6%	+14.7%	+5.6%	+11.6%	+5.2%
Transit Revenue VHT (Weekday)							
Bus	1,310	1,964	2,147	2,167	1,886	1,979	1,823
LRV	0	0	0	0	68	112	136
Total	1,310	1,964	2,147	2,167	1,954	2,091	1,959
% Change[2]	N/A	49.9%	+9.3%	+10.3%	-0.5%	+6.5%	-0.3%
Primary Trunkline Service							
Headway[6]							
Bus[4]	6.7	4.6	3.3	3.3	N/A	6.7	N/A
LRV[5]	N/A	N/A	N/A	N/A	7.5	7.5	7.5
Capacity							
Bus[4]	65	65	110	110	N/A	110	N/A
LRV[5]	N/A	N/A	N/A	N/A	266	266	266
Place Miles[3] (Weekday)							
Bus	1,365,200	1,833,240	2,418,640	2,453,920	2,033,810	2,071,480	1,853,800
LRV	0	0	0	0	446,880	710,220	844,550
Total	1,365,200	1,833,240	2,418,640	2,453,920	2,480,690	2,781,700	2,698,350
% Change[2]	N/A	34.3%	28.4%	30.3%	31.7%	47.7%	43.3%

Source: *Detailed Definition of Alternative Report* (Metro: April 2002).
Note: BRT = bus rapid transit; LRT = light rail transit; LRV = light rail vehicle; VMT = vehicle miles traveled; N/A = not applicable.
1 For LRVs, *transit VMT* is measured in train miles, rather than car miles.
2 For the No-Build Alternative, the % change is from existing; for all other alternatives, the% change is from the No Build Alternative.
3 Place miles = *transit vehicle capacity* (seated and standing) for each vehicle type multiplied by *VMT for each vehicle type.*
4 Articulated buses.
5 Assumes two-car train sets.
6 Between Milwaukie and downtown Portland.

The growth in transit service from existing conditions to 2020 under all of the build alternatives reveals two consistent characteristics (see Table 4.2-1). First, compared to the No-Build Alternative, the percentage increase in transit VMT would be greater than the percentage increase in transit VHT, indicating that average transit speeds throughout the Corridor would increase with the build alternatives. Second, compared to the No-Build Alternative, the percentage increase in transit place-miles (defined as transit vehicle capacity multiplied by vehicle miles) would be greater than the percentage increase in vehicle hours with each of the build alternatives. This increased transit capacity without a proportional increase in vehicle hours would be the result of increases in the passenger-carrying capacity of the transit vehicle types associated with each alternative. For example, a standard 40-foot bus has a capacity (seated and standing) of 65 people, while an articulated bus has the capacity to carry 110 people, and a two-car light rail train can carry 266 people (133 per car). Consequently, one hour of light rail service can provides more than four times the passenger-carrying capacity of a standard bus, and more than twice the capacity of an articulated bus. A summary of the transit service levels and capital components associated with each of the build alternatives and their relationship to transit service characteristics follows.

The BRT Alternative would include a variety of BRT facility improvements (e.g., BRT stations and queue bypass lanes for BRT bus routes), which would generally be located on SE McLoughlin Boulevard between the Hawthorne Bridge and Oregon City, and generally along Highway 224 and SE Harmony Road between Milwaukie and Clackamas. The BRT facility improvements would be designed to improve the speed and reliability of trunkline bus service in the corridor. In the weekday peak hour in 2020, articulated buses would operate every 3.3 minutes on average between downtown Portland and Milwaukie and every 6.7 minutes between Milwaukie and Clackamas and between Milwaukie and Oregon City. Local service would continue east from the Clackamas Town Center TC to Damascus and south from the Oregon City TC to Clackamas Community College (CCC) at 20-minute frequency (see Section 2.2 of this SDEIS for more detail). The BRT Alternative would provide a greater number of place miles, total transit VHT and total transit VMT than the No-Build Alternative. Compared to the No-Build Alternative, total corridor place miles (bus and light rail) for the BRT Alternative would increase by 28.4 percent, transit VHT would increase by 9.3 percent, and transit VMT would increase by 13.6 percent. As previously noted, a greater percentage increase in VMT than in VHT indicates that average transit speeds in the corridor would be faster with the BRT Alternative than they would be under the No-Build Alternative. Further, a 28.4% increase in place-miles coupled with a 9.3% increase in vehicle hours would be a result of the operation of articulated buses, which would have a greater passenger-carrying capacity than standard buses.

The Busway Alternative would include a separated guideway for transit buses, which would generally be located parallel to SE McLoughlin Boulevard, between the Hawthorne Bridge and SE Ochoco Street and between SE Freeman Way and the Clackamas Town Center (see Section 2.2 of this SDEIS for more detail). In addition, the Busway Alternative would include BRT improvements south of Milwaukie on SE McLoughlin Boulevard between Milwaukie and Oregon City, and east of Milwaukie along Highway 224 between Milwaukie and SE Freeman Way. In the peak hour in 2020, articulated buses would operate every 3.3 minutes between downtown Portland and Milwaukie and every 6.7 minutes between Milwaukie and Clackamas and between Milwaukie and Oregon City. Local service would continue east from Clackamas Town Center TC to Damascus and south from Oregon City TC to CCC at 20-minute frequency. The Busway Alternative would result in a greater number of place miles, total transit VHT, and total transit VMT than the No-Build Alternative. Compared to the No-Build Alternative, total corridor place miles (bus and light rail) for the Busway Alternative would increase by 30.3 percent, transit VHT would increase by 10.3 percent, and transit

VMT would increase by 14.7 percent. Again, a greater percentage increase in VMT than in VHT indicates that transit service in the corridor would operate at somewhat higher speeds with the Busway Alternative than it would with the No-Build Alternative. Further, a 30.3% increase in place-miles coupled with a 10.3% increase in vehicle hours with the Busway Alternative would result from the operation of articulated buses, which would have a greater passenger-carrying capacity than standard buses.

The Milwaukie LRT Alternative would include a 6.5-mile southern extension of the Yellow Line generally be located parallel to and east of SE McLoughlin Boulevard, that would connect downtown Portland and downtown Milwaukie. In addition, the Milwaukie LRT Alternative would include BRT improvements south of Milwaukie, to be located on SE McLoughlin Boulevard between Milwaukie and Oregon City and on Highway 224 and SE Harmony Rd between Milwaukie and Clackamas. In the peak hour in 2020, two-car light rail trains would operate every 7.5 minutes on average between downtown Portland and Milwaukie. South and east of Milwaukie, articulated buses would operate every 6.7 minutes on average between Milwaukie and Clackamas and between Milwaukie and Oregon City. Local service would continue east from Clackamas Town Center TC to Damascus and south from Oregon City TC to CCC at 20-minute intervals (see Section 2.2 of this SDEIS for more detail). The Milwaukie LRT Alternative would result in a greater number of place miles and total transit VMT than the No-Build Alternative. Compared to the No-Build Alternative, total corridor place miles (bus and light rail) for the Milwaukie LRT Alternative would increase by 31.7% and transit VMT would increase by 5.6%. Total transit VHT would remain approximately equal to the No-Build Alternative, with the reduction in bus VHT equaling the addition of light rail VHT. With a slight decrease in vehicle hours (-0.5%) compared to the No-Build Alternative and a 5.6% increase in vehicle miles, transit vehicles under the Milwaukie LRT Alternative would operate, on average, somewhat faster than with the No-Build Alternative. A 31.7% increase in place-miles over the No-Build Alternative, compared to the slight decrease in vehicle hours, indicates that the Milwaukie LRT Alternative would have greater passenger-carrying capacity than the No-Build Alternative.

The I-205 LRT Alternative would include a 6.7-mile light rail extension that would generally parallel I-205 and connect the existing Gateway TC with the Clackamas Town Center TC. Yellow Line light rail trains would be through-routed between the Clackamas Town Center TC and downtown Portland. In addition, the I-205 LRT Alternative would include BRT improvements on SE McLoughlin Boulevard between downtown Milwaukie and Oregon City. In the peak hour in 2020, two-car trains would operate every 7.5 minutes on average between Clackamas and downtown Portland. Along SE McLoughlin Boulevard, articulated buses would operate every 6.7 minutes between downtown Portland and Oregon City. Local service would continue south from the Oregon City TC to CCC at 20-minute intervals (see Section 2.2 of this SDEIS for more detail). The I-205 LRT Alternative would result in a greater number of place miles, total transit VHT, and total transit VMT than the No-Build Alternative. Compared to the No-Build Alternative, total corridor place miles (bus and light rail) for the I-205 LRT Alternative would increase by 47.7%, transit VHT would increase by 6.5%, and transit VMT would increase by 11.6 percent. Again, the introduction of signal improvements and the operation of articulated buses and light rail trains that would operate in exclusive right-of-way would result in a greater percentage increase in VMT than in VHT due, which indicates that, on average, transit speeds with the I-205 LRT Alternative would be faster than with the No-Build Alternative. Further, a 47.7% increase in place-miles, compared to a 6.5% increase in transit vehicle hours, would be the result of operating LRVs, and articulated buses, which have a greater transit-passenger carrying capacity than standard buses.

The Combined Light Rail Alternative would include both the 6.5-mile extension of the Yellow Line from downtown Portland to downtown Milwaukie and the 6.7-mile Green Line from the Gateway TC to the Clackamas Town Center TC. In addition, the Combined LRT Alternative would include BRT improvements on SE McLoughlin Boulevard between Milwaukie and Oregon City. In the peak hour in 2020, two-car trains would operate every 10 minutes on average between Clackamas and downtown Portland along I-205, and every 10 minutes between Milwaukie and downtown Portland along SE McLoughlin Boulevard. South of Milwaukie, articulated buses would operate between Milwaukie and Oregon City at an average frequency of 6.7 minutes. Local bus service would continue to operate south from the Oregon City TC to CCC at an average frequency of 20 minutes (see Section 2.2 of this SDEIS for more detail). The Combined LRT Alternative would result in a substantial increase in place miles, with a relatively small increase in total transit VMT, compared to the No-Build Alternative. These differences would be the result of operating relatively high-capacity LRVs, in the Corridor, which would replace lower capacity bus service (i.e., the local bus route that would connect the Parkrose, Gateway, and Clackamas Town Center TCs under the No-Build Alternative). With the Combined LRT Alternative, total corridor place miles (bus and light rail) would increase by 43.3% compared to the No-Build Alternative. Transit VHT would remain approximately equal to the No-Build Alternative and transit VMT would increase by 5.2%, indicating that the Combined LRT Alternative would result in significant improvements in passenger-carrying capacity and average transit speeds.

Transit Coverage

Transit coverage is a measure that can be used to indicate how well households and employment would be served by alternative transit systems. Table 4.2-2 shows the percentage of people in the South Corridor that would work and live within a ¼-mile radius of a station or bus stop. Existing (2000) transit coverage in the South Corridor is 61% for households and 78% for employment. A portion of the South Corridor is located in areas that lie outside of the TriMet service area boundary. All of the alternatives within the South Corridor would make similar improvements to existing transit coverage. With the No-Build Alternative, transit coverage in the South Corridor would increase over existing levels to 70% for households and 8% for employment. This increase would be due to the expansion of transit service called for in the 2000 RTP, which forms the basis for the No-Build Alternative. The increased coverage would also result, in part, from growth in population and employment inside the region's urban growth boundary (UGB). Forecasts of population and employment growth used for this SDEIS are consistent with the Region 2040 Concept Plan, which is based on local and regional comprehensive plans that emphasize concentrating growth in regional centers and town centers served by transit.

Table 4.2-2
Transit Coverage[1]: Percentage of Corridor[2] Population and Employment Within ¼-Mile of a Transit Stop, by Existing Conditions and South Corridor Project Alternatives

Attribute	Existing	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Households	61%	70%	70%	70%	70%	70%	70%
Employment	78%	83%	83%	83%	83%	83%	83%

Source: Metro, 2002.
BRT = bus rapid transit; LRT = light rail transit.
1 The percentage of the corridor's population or employment that would be located within a ¼-mile of either a bus stop or a light rail station (see Figure 1.2-1 for an illustration of the South Corridor).
2 The South Corridor study area includes population and employment that lie outside of TriMet's service area.

The percentage of households and employment within ¼-mile radius of a transit stop would be approximately 70% and 83%, respectively, for all of the South Corridor Alternatives. These comparable levels of transit coverage are attributable to the similar transit networks among the alternatives, which would not measurably affect transit coverage. The identical percentage of transit coverage across all alternatives indicates a fair comparison among the alternatives.

4.2.1.2 Transit Travel Time

Transit and auto travel time are assessed using in-vehicle time and total travel time, as shown in Tables 4.2-3 and 4.2-4, respectively. These tables summarize the p.m. peak-hour in-vehicle and total travel time for transit and automobiles for each of the South Corridor Project alternatives. The travel time data are shown between selected locations in the corridor (i.e., the Milwaukie Southgate TC, the Clackamas Town Center, Oregon City and Lents) and selected locations in the Portland Central City (i.e., Pioneer Square, PSU, and the Rose Quarter).

Table 4.2-3
Transit and Auto P.M. Peak Hour, In-Vehicle Travel Times to Selected Corridor Locations From Selected Portland CBD Locations, By Alternative – Year 2020

Origin/Destination	**No-Build**		**BRT**		**Busway**		**Milwaukie LRT**		**I-205 LRT**		**Combined LRT**	
	Auto	**Transit**	**Auto**	**Transit**	**Auto**	**Transit**	**Auto**	**Transit**	**Auto**	**Transit**	**Auto**	**Transit**
To Milwaukie Southgate TC from:												
Pioneer Square	19	25	19	25	19	23	19	14	19	25	19	14
PSU	18	20	18	22[2]	18	20	18	19	18	22[2]	18	19
Rose Quarter	19	30	18	32[2]	18	30	18	20	18	32[2]	18	20
To Clackamas TC from:												
Pioneer Square	33	47	32	38	32	34	32	27	32	37	32	37
PSU	32	49	31	35	31	32	31	35	31	42	31	42
Rose Quarter	32	41	32	41	32	41	32	36	32	29	31	29
To Oregon City TC from:												
Pioneer Square	44	52	43	46	43	44	43	36	43	46	43	36
PSU	43	58	42	44	43	42	42	41	42	44	42	41
Rose Quarter	43	60	43	54	43	52	43	42	43	54	43	42
To Lents from:												
Pioneer Square	26	35	26	35	25	35	25	35	25	30	25	30
PSU	25	33	24	33	24	33	24	33	24	31	24	31
Rose Quarter	25	35	25	35	25	35	25	35	25	22	25	22

Source: Metro, 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; TC = transit center.
1 In minutes for travel in the PM peak period. In-vehicle time is only the time that a passenger would spend within a public transit vehicle or automobile.
2 Compared to the No-Build Alternative, the BRT Alternative would include additional bus stops (i.e., BRT stations) in the Portland to Milwaukie Segment. Although the additional stops would increase the average travel time for buses in the segment, they would also improve reliability and access.

In-vehicle transit travel time includes only the amount of time it takes for a vehicle to travel between an origin and destination. For buses operating in mixed traffic, this measure reflects roadway speed limits, congestion, and stop dwell time. In-vehicle travel time for alternatives operating in exclusive right-of-way (busway and light rail) includes acceleration to and deceleration from the maximum operating speed that accounts for the local operating environment, alignment design, wheel-rail traction (if applicable), and braking performance in both uphill and downhill operations. Total transit travel time includes time spent walking to transit, initial wait time, transfer wait time (if any), in-vehicle time, and time walking from transit to the destination. Total auto travel time includes time getting to and from the auto at both the trip origin and trip destination.

Table 4.2-4
Transit and Auto P.M. Peak Hour, Total Travel Times to Selected Corridor Locations From Selected Central City Locations, By Alternative – Year 2020

Origin/ Destination	No-Build		BRT		Busway		Milwaukie LRT		I-205 LRT		Combined LRT	
	Auto	Transit	Auto	Transit	Auto	Transit	Auto	Transit	Auto	Transit	Auto	Transit
To Milwaukie Southgate TC from:												
Pioneer Square	24	31	24	32[2]	24	30	24	30	24	32[2]	24	31
PSU	23	28	23	30[2]	23	28	23	32	23	30[2]	23	32
Rose Quarter	24	40	23	41[2]	23	39	23	29	23	42[2]	23	31
To Clackamas TC from:												
Pioneer Square	38	55	37	46	37	42	37	47	37	46	37	47
PSU	37	58	36	45	36	41	36	51	36	52	36	52
Rose Quarter	37	53	37	53	37	53	37	46	36	38	36	38
To Oregon City TC from:												
Pioneer Square	49	63	48	54	48	50	48	55	48	54	48	55
PSU	48	70	47	52	47	50	47	54	47	52	47	54
Rose Quarter	48	76	48	63	48	61	48	51	48	63	48	54
To Lents from:												
Pioneer Square	31	44	31	44	30	44	30	44	30	38	30	41
PSU	29	45	29	45	29	45	29	45	29	45	29	46
Rose Quarter	30	51	30	51	30	51	30	51	30	31	30	33

Source: Metro, 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; TC = transit center.
1 In minutes for travel in the PM peak period. Total time is the sum of in-vehicle time and all other time related to completing the trip, including walking and waiting time.
2 Compared to the No-Build Alternative, the BRT Alternative would include additional bus stops (i.e., BRT stations) in the Portland to Milwaukie Segment, Although the additional stops would increase the average travel time for buses in the segment, they would also improve reliability and access.

Milwaukie Southgate TC. Peak-hour, in-vehicle transit travel time from Pioneer Square to the Milwaukie Southgate TC would be 25 minutes with the No-Build Alternative, and would range from 25 minutes with the BRT and the I-205 LRT Alternatives to 14 minutes with the Milwaukie Light Rail and the Combined LRT Alternative s, 44% decreases. There would be similar relationships in in-vehicle travel times among the alternatives between PSU and the Rose Quarter and the Milwaukie Southgate TC – for example, with the Milwaukie Light Rail and the Combined LRT Alternatives in-vehicle transit travel times from the Rose Quarter would be 20 minutes, compared to 30 minutes with the No-Build Alternative, a reduction of 33%.

In general, these relationships in in-vehicle travel times would also hold true for total transit travel times (although the scale of the % changes would be reduced). For example, from the Rose Quarter, total transit travel times to the Milwaukie Southgate TC would be 29 minutes with the Milwaukie and Combined LRT Alternatives, compared to 40 minutes with the No-Build Alternative, a reduction of 28 percent. One exception with total transit travel times would be an increase in times from PSU to the Milwaukie Southgate TC with the Milwaukie Light Rail and the Combined LRT Alternatives, increasing from 28 minutes with the No-Build Alternative to 32 minutes, a 14% increase, which would primarily be the result of less-frequent light rail trains with the Milwaukie LRT Alternative, compared to more-frequent buses under the No-Build Alternative.

With the Milwaukie LRT and the Combined LRT Alternatives, the in-vehicle transit travel times would be 5 minutes faster using transit to travel from Pioneer Square to the Milwaukie Southgate TC in the p.m. peak hour than using an automobile, a savings of 26 percent.

Clackamas Town Center Transit Center. Peak-hour, in-vehicle transit travel time from Pioneer Square to the Clackamas Town Center TC would be 47 minutes with the No-Build Alternative, and would range from 27 minutes with Milwaukie LRT Alternative to 38 minutes with the BRT Alternative. With the Milwaukie LRT Alternative, the trip between Pioneer Square and the Clackamas Town Center TC would be made up two distinct segments: the trip between the light rail station at SW 1st Avenue and SW Main Street would be taken on the Yellow Line and would take 14 minutes; the second trip segment would be between the Milwaukie Southgate TC and the Clackamas Town Center TC, which would be taken on a BRT bus line and take 13 minutes. The I-205 LRT Alternative would provide the fastest in-vehicle travel times between the Rose Quarter and Clackamas Town Center TC (29 minutes with the I-205 LRT Alternative, compared to 41 minutes with the No-Build Alternative). With the I-205 LRT Alternative, the Yellow Line would be through-routed from Clackamas Town Center TC to downtown Portland and would provide the fastest in-vehicle travel times between the Rose Quarter and the Clackamas Regional Center.

Comparing total transit times, the relationships would change somewhat: the Busway Alternative would provide the fastest total transit travel time between Pioneer Square and Clackamas Town Center TC. Under the Milwaukie LRT Alternative transit patrons would incur additional out-of-vehicle time due to a required walk from Pioneer Square to the SW Main Street Station to access the Yellow Line and additional transfer time at the Milwaukie Southgate TC. As a result of this out-of-vehicle time, the Milwaukie LRT Alternative and the Combined LRT Alternative would have a greater total transit travel time (47 minutes) than the other build alternatives for travel between Pioneer Square and Clackamas Town Center TC (compared to 42 minutes with the Busway Alternative and 46 minutes with the I-205 LRT Alternative and the BRT Alternative). The I-205 LRT Alternative would improve the total transit travel time for trips between Rose Quarter and Clackamas Town Center TC by 13 minutes, compared with the No-Build Alternative, a reduction of 28 percent.

With the I-205 and Combined LRT Alternatives, the in-vehicle transit travel times would be 2 to 3 minutes faster than the in-vehicle auto time from Rose Quarter to all of the identified South Corridor destinations, a time savings of 6 to 9 percent.

Oregon City Transit Center. P.M. peak hour transit in-vehicle times from Pioneer Square to the Oregon City TC would be 52 minutes with the No-Build Alternative, and would range from 36 minutes with Milwaukie LRT Alternative to 46 minutes with the BRT and the I-205 LRT Alternatives. These transit in-vehicle time improvements would be the result of the transit capital improvements associated with each alternative (i.e. separated busway guideway, separated light rail guideway, and/or queue-bypass/signal priority treatments at intersections).

As with the transit times to Clackamas Town Center TC, the relationship between in-vehicle and total transit time would change somewhat due to a required transfer at the Milwaukie Southgate TC with the Milwaukie LRT Alternative. As a result of the additional out-of-vehicle time, the Milwaukie and Combined LRT Alternatives would have a higher total transit time between Pioneer Square and Oregon City TC than the other build alternatives (55 minutes, compared to 50 minutes with the Busway Alternative and 54 minutes with the I-205 Light Rail and BRT Alternatives). These relationships would generally hold true for trips originating in other parts of central Portland as well.

The Busway Alternative and the Milwaukie and Combined LRT Alternatives all have in-vehicle times from locations in central Portland that would be slightly faster than auto in-vehicle times.

Lents. With the No-Build, BRT, Busway and Milwaukie LRT Alternatives, transit patrons would use line 14, Hawthorne, for travel between downtown Portland and Lents. Each of these alternatives would have similar in-vehicle and total transit travel times for that origin and destination pair. Compared to these alternatives, the I-205 and Combined LRT Alternatives would save 5 minutes of transit in-vehicle time and 3 to 6 minutes of total transit time between Pioneer Square and Lents. The transit travel time savings between Rose Quarter and Lents would be even greater, with a savings of 13 minutes of transit in-vehicle time and 18 to 20 minutes of total transit travel time. With the I-205 and Combined LRT Alternatives, the transit in-vehicle time between Rose Quarter and Lents would be 3 minutes less than a similar trip using an automobile.

4.2.1.3 Reliability

Table 4.2-5 summarizes transit reliability measures for the No-Build and South Corridor Project Build Alternatives. Reliability measures include the number of miles of reserved or separated right-of-way, the percentage of passenger-miles in reserved or separated right-of-way, and the number of protected intersections. Another indicator of the relative service reliability among the alternatives is the relative priority that would be given to the transit trunk lines at major intersections. The alternatives with reserved right-of-way would provide the greatest amount of separation from the adjacent automobile traffic. This separation generally provides for a higher level of reliability than an alternative operating in mixed traffic, which would provide fewer preempted signals and more interactions with autos in mixed traffic operations.

Table 4.2-5
South Corridor Reliability Measures
by South Corridor Project Alternative, Average Weekday Year 2020

Reliability Measures	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Miles of Reserved or Separated ROW	N/A	0.2	6.7	6.7[2]	6.7[2]	13.2[2]
Passenger-miles in ROW	N/A	0[1]	119,760[1]	102,820[1]	104,540	182,690
% of Total Corridor Passenger-miles in ROW	N/A	0%	20%	18%	18%	31%
Total Intersections	N/A	92	99	105	60	73
Protected Intersections[3]						
Grade Separated	N/A	20	21	17	30	27
Signal Pre-emption with or without Gates	N/A	0	0	26	0	26
Priority Treatment with Separate ROW	N/A	1	19	0	1	0
Priority Treatment with Queue Bypass	N/A	18	14	16	13	11
Priority Treatment without Queue Bypass	N/A	10	8	9	8	7
Total Protected Intersections	N/A	49	62	68	52	71
% of Intersections Protected	N/A	53%	63%	65%	87%	97%

Source: Metro, 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; ROW = right-of-way.
1 Excludes passenger miles on bus-only ramps that would connect SE Main Street and Highway 224. Because of their short length (i.e., 0.2 mile), the bus-only ramps would result in a negligible increase in passenger miles on reserved or separated ROW.
2 Includes the new portion of light rail alignment that would be added with that alternative. The Milwaukie LRT Alternative would include bus-only ramps that would connect SE Main Street and Highway 224.
3 Excludes timed signals in the Portland CBD, except on SW First Avenue, between SW Main and Taylor streets, and on SW Main and Madison streets, between SW First and Fifth avenues.

As a result of its proximity to tour boat moorage and to its relatively low clearance height in the closed position (49 feet Columbia River Datum), the Hawthorne Bridge tends to open more frequently than the other Willamette River bridges. On an average weekday, the Hawthorne Bridge opens eight times per day, with each occurrence lasting approximately 9 minutes; however, no bridge openings are permitted between 7:00 a.m. and 9:00 a.m. or 4:00 p.m. and 6:00 p.m. Due to the limits on bridge openings during the a.m. and p.m. peak hours, boats tend to request lifts immediately after 9:00 a.m. and after 6:00 p.m. All of the alternatives that would use the Hawthorne Bridge (i.e., the BRT, Busway, and the Milwaukie and Combined LRT Alternatives) would be subject to bridge lifts in the non-peak periods, and those bridge lift events would reduce bus or light rail reliability and increase average transit travel times.

With the I-205 LRT Alternative, the East of Clackamas Town Center TC Terminus Option would require buses to travel on shopping center access roads. During the peak-shopping season in late November and December, bus access to and egress from the transit center could be delayed by conflicts with shopping center traffic. Shopping center traffic could also delay buses that would serve the North of Clackamas Town Center TC; however, the delay would likely not be as severe as the delay that would be associated with the East of Clackamas Town Center TC.

4.2.1.4 Downtown Portland Light Rail Operations

Each of the three light rail alternatives would substantially increase the number of LRVs serving the downtown Portland alignment during the peak service hours. The current configuration of track, train signals, and traffic signals were developed to serve the existing Blue Line. In 2020, with the I-205 LRT Alternative, the system would have 33 trains per hour traveling in the peak direction between SW 11th Avenue and Rose Quarter, compared to 20 trains per hour with the opening of the Yellow Line in 2004 and 29 trains per hour with the No-Build Alternative. With the BRT, Busway, and Milwaukie LRT Alternatives, the No-Build levels of trains per hour would be maintained on the segment (with the Milwaukie LRT Alternative, Yellow Line trains would not operate between SW First and 11th Avenues).

Concurrent with this SDEIS, TriMet is conducting a downtown Portland light rail capacity analysis to evaluate the operating characteristics of each South Corridor Light Rail Alternative and to identify potential mitigation options that could be implemented if the analysis indicates that light rail operations would be unable to operate reliably given the project light rail vehicle volumes. Using micro-simulation transit and traffic modeling, each alternative will be tested and evaluated and effective mitigation measures will be identified.

4.2.2 Transit Ridership

This section provides an analysis of transit ridership in the corridor and usage of stations. Within this section, several types of transit ridership are evaluated: total corridor transit ridership; transit trip productions; work and non-work transit trips and mode share; BRT bus line, busway bus line and light rail line ridership; light rail ridership; station activities; and a qualitative assessment of differences in transit ridership between design and terminus options.

4.2.2.1 Corridor Total Transit Ridership

Table 4.2-6 summarizes total 2002 and 2020 average weekday transit ridership for all bus and light rail trips produced in or attracted to the South Corridor for all alternatives. The BRT Alternative would generate 5,800 more total weekday corridor transit trips than the No-Build Alternative, a 3% increase. The Busway Alternative would generate 7,700 more total weekday corridor transit trips than the No-Build Alternative, a 4% increase. The Milwaukie LRT Alternative would generate 6,000 more total weekday corridor transit trips than the No-Build Alternative, a 3% increase. The I-205 LRT Alternative would generate 14,300 more total weekday corridor transit trips than the No-Build Alternative, an 8% increase. The Combined LRT Alternative would generate the highest total corridor transit ridership with 16,900 more total weekday corridor transit trips than the No-Build Alternative, a 9% increase.

Table 4.2-6
Total Systemwide and South Corridor Transit Trips[1],
by Existing and South Corridor Project Alternatives, Average Weekday – Year 2020

	Existing (2000)	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Total Corridor Transit Trips (originating rides)	96,600	184,700	190,500	192,400	190,700	199,000	201,600
% Change from Existing	N/A	+91%	+97%	+99%	+97%	+106%	+109%
% Change from No-Build	N/A	N/A	+3%	+4%	+3%	+8%	+9%
Total Systemwide Transit Trips	259,300	475,000	480,400	482,900	479,800	488,700	491,100

Source: Metro, 2002.
Note: BRT = bus rapid transit; LRT – light rail transit.
1 Transit trips are one-way linked trips from an origin (e.g., home) to a destination (e.g., place of work or school), independent of whether the trip requires a transfer or not. A person traveling from home to work and back counts as two trips. Total corridor transit trips include all light rail and bus trips produced in or attracted to the South Corridor.

There would be several key reasons for these differences in total corridor transit ridership. First, total corridor transit ridership would experience the largest increase over the No-Build with the Combined LRT Alternative due to reduced travel times within the South Corridor and between the corridor and Gateway, downtown Portland, the Lloyd District, and the Central Eastside. Also, the Combined LRT Alternative would provide the greatest level of corridor park-and-ride lot capacity. The Busway Alternative would result in fewer corridor rides than the I-205 and Combined LRT Alternatives, because it would result in the smaller improvements to travel time in the corridor.

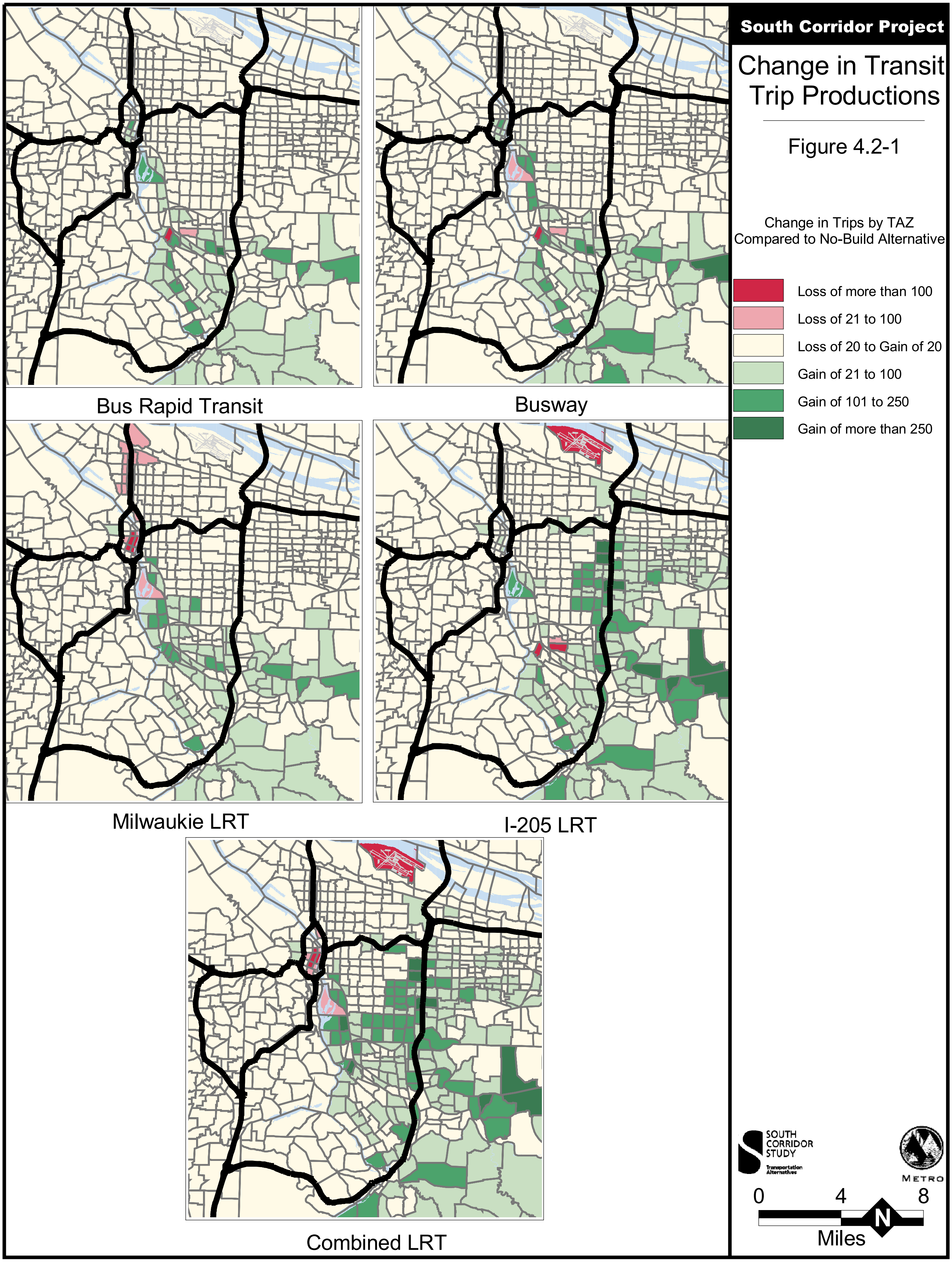
The Milwaukie LRT Alternative would result in fewer average weekday corridor transit rides than the Busway, I-205 LRT, or Combined LRT Alternatives, primarily because trips from the south (e.g., Oregon City) and east (e.g., Clackamas Town Center and Damascus) would be required to transfer at the Milwaukie Southgate TC to continue through to central Portland. In addition, with the Milwaukie and Combined LRT Alternatives, patrons that would use the Yellow Line to travel to downtown Portland transit mall would need to walk from a light rail station on SW 1st Avenue to the transit mall to complete their trip, which would increase overall travel time compared to other alternatives.

The BRT Alternative would have the fewest corridor transit rides, primarily due to limited improvements in transit travel times (and, in some instances, travel times would increase relative to the No-Build Alternative) and fewer park-and-ride spaces, compared to the other build alternatives.

4.2.2.2 Transit Trip Productions

Figure 4.2-1 illustrates the change in transit trip productions (i.e., where trips would originate) for each build alternative, compared with the No-Build Alternative. These maps highlight the areas within the South Corridor that would experience an increase in transit ridership under each of the alternatives under study and, conversely, the maps highlight the areas that would experience a loss in transit ridership production as a result of the alternatives.

The I-205 and Combined LRT Alternatives would have the largest area with an increased number of transit productions. In contrast, with the BRT and Busway Alternatives the area east of downtown Milwaukie (i.e., along SE King Road) would have fewer transit productions because those areas would receive a small decrease in bus service frequency (as a result of the re-orientation of trunkline bus service onto Highway 224). Another example of decreased transit productions would occur near


South Corridor Project
Change in Transit Trip Productions
Figure 4.2-1
Change in Trips by TAZ Compared to No-Build Alternative
Loss of more than 100
Loss of 21 to 100
Loss of 20 to Gain of 20
Gain of 21 to 100
Gain of 101 to 250
Gain of more than 250
Bus Rapid Transit
Busway
Milwaukie LRT
I-205 LRT
Combined LRT
SOUTH CORRIDOR STUDY
METRO
0
4
8
Miles
N

Portland International Airport with the I-205 LRT and Combined LRT Alternatives. The decrease in transit trip productions in zones near the airport would occur because, with the I-205 LRT and Combined LRT Alternatives, the Red Line would operate as a shuttle between the airport and the Gateway TC, requiring Red Line patrons to transfer at the Gateway TC to complete a trip between the airport and downtown Portland (based on the light rail service plan developed for this SDEIS). The Red Line would be through-routed between the airport and downtown Portland with all other alternatives.

4.2.2.3 Work and Non-Work Transit Trips and Mode Share

Table 4.2-7 summarizes corridor transit trips and transit mode share for trips produced in the South Corridor destined to the Portland Central City for work and non-work purposes (the Portland Central City includes the Lloyd District, the CEID, downtown Portland, North Macadam, Goose Hollow, and Northwest Portland). The table demonstrates that all of the build alternatives would result in similar transit mode shares and, compared to the No-Build Alternative, all of the build alternatives would result in higher transit mode shares for both home-based work and non-work trips in the South Corridor destined to the central city.

Table 4.2-7
Work and Non-Work Corridor Transit Trips and Transit Mode Share to Central City[1], by Existing and South Corridor Project Alternatives[1], Average Weekday – Year 2020

	Existing (2000)	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Home-Based Work[2]							
Transit	16,990	38,090	40,310	41,485	40,830	41,530	42,010
Total Person	63,150	89,830	89,830	89,830	89,830	89,830	89,830
Mode Split	27%	42%	45%	46%	45%	46%	47%
Non-Work[3]							
Transit	15,890	30,320	31,755	31,950	31,260	32,180	32,615
Total Person	108,550	143,070	143,070	143,070	143,070	143,070	143,070
Mode Split	15%	21%	22%	22%	22%	22%	23%
Total							
Transit	32,880	68,410	72,065	73,435	72,090	73,710	74,625
Total Person	171,700	232,900	232,900	232,900	232,900	232,900	232,900
Mode Split	19%	29%	31%	32%	31%	32%	32%

Source: Metro, 2002.
[1] Central City includes Lloyd District, Central Eastside Industrial District, downtown Portland, North Macadam, Goose Hollow and Northwest Portland. Excludes intra-Portland CBD trips.
[2] Home-based work trips are defined as trips taken directly between one's home to one's place of work.
[3] Non-work trips are defined as all trips that are not home-based work trips.

4.2.2.4 South Corridor BRT Bus Line, Busway Bus Line, and Light Rail Line Ridership

Table 4.2-8 summarizes the average weekday 2020 boarding rides by segment for the primary high-capacity transit modes (BRT bus line, busway bus line, and light rail line boarding rides). With several of the alternatives, the BRT bus lines and busway bus lines would serve more than one segment. In these instances, the boarding rides are reported for the group of segments that would be served by the common mode. Further, with the Milwaukie and Combined LRT Alternatives, approximately 50% of the BRT bus boarding rides would transfer to the Yellow Line at the Milwaukie Southgate TC. The Combined LRT Alternative would have the greatest number of average weekday BRT bus line and light rail line boarding rides (60,060), while the BRT Alternative would have the lowest number of boarding rides (24,760).

Table 4.2-8
BRT Bus Line, Busway Bus Line and Light Rail Line
2020 Average Weekday Boarding Rides[1], by Segment[2] and Alternative

Segment	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Portland to Milwaukie	0	24,760[3]	30,600[4]	25,330[5]	13,7503	20,950[5]
Milwaukie to Oregon City	0			15,360[3]		6,810[3]
Milwaukie to Clackamas	0				0	0
Gateway to Clackamas	0	0	0	0	33,270[5]	32,300[5]
Total	**0**	**24,760**	**30,600**	**40,690**[6]	**47,020**	**60,060**[7]

Source: Metro: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. Note that there would be other boarding rides in the corridor under each alternative, which would be provided by local bus routes.
1 Boarding rides are defined as anytime a passenger would board a transit vehicle, independent of whether the boarding would be the result of a transfer from another transit vehicle or not (i.e., unlinked).
2 With several alternatives, the BRT or busway bus lines would span two or more segments and the boarding rides for those lines are grouped together, as illustrated in the table.
3 BRT bus lines – see Section 2.2 for a more detailed description of BRT bus lines.
4 Busway bus lines – see Section 2.2 for a more detailed description of busway bus lines.
5 Light rail line – see Section 2.2 for a more detailed description of light rail lines.
6 Total includes approximately 7,400 boarding rides that transfer between BRT buses and Milwaukie LRT.
7 Total includes approximately 3,500 boarding rides that transfer between BRT buses and Milwaukie LRT.

4.2.2.5 Light Rail Ridership

Table 4.2-9 summarizes projected average weekday 2020 systemwide light rail ridership and the peak load point ridership for all alternatives, by light rail line. Only the Milwaukie, I-205. and

Table 4.2-9
LRT Ridership, by No-Build and South Corridor Project Alternatives, Year 2020

	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Average Weekday Riderhip[1]						
South Corridor LRT Lines						
Milwaukie LRT (Yellow Line South)	N/A	N/A	N/A	25,330	N/A	20,950
I-205 LRT South of Gateway (Green Line)[2]	N/A	N/A	N/A	N/A	33,270	32,300
I-205 LRT West of Gateway (Green Line)[3]	N/A	N/A	N/A	N/A	10,840	10,300
Other LRT Lines						
Blue Line (East-West MAX)	106,970	106,950	107,450	108,120	106,830	108,110
Yellow Line North (Interstate MAX)	38,630	38,750	39,180	36,080	38,890	35,320
Red Line (Airport MAX)	22,750	22,730	22,860	23,230	10,770	10,830
Total System LRT Boarding Rides	**168,350**	**168,430**	**169,490**	**192,760**	**200,600**	**217,810**
P.M. Peak-Hour, Peak-Direction, Peak-Load Point[4]						
South Corridor LRT Lines						
Milwaukie LRT South (Yellow Line)	N/A	N/A	N/A	2,450	N/A	1,890
I-205 LRT South of Gateway (Green Line) [2]	N/A	N/A	N/A	N/A	2,200	2,060
I-205 LRT West of Gateway (Green Line)[3]	N/A	N/A	N/A	N/A	1,920	1,760
Other LRT Lines						
Blue Line – East	3,390	3,360	3,370	3,420	3,200	3,340
Blue Line – West	2,890	2,870	2,890	2,900	2,900	2,900
Yellow Line – North	2,850	2,810	2,850	2,700	2,850	2,840
Red Line (North of Gateway TC)	1,040	1,030	1,040	1,070	450	450
Red Line (West of Gateway TC)	1,190	1,090	1,090	1,130	N/A	N/A

Source: Metro, 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; N/A = not applicable; TC = transit center.
1 LRT ridership is boarding rides per line. Linked trips are counted twice if they transfer from one LRT line to another LRT line.
2 I-205 LRT South of Gateway ridership consists of trips that would board or deboard the Green Line at a station south of the Gateway TC.
3 I-205 LRT West of Gateway ridership includes trips on the Green line that would not travel south of the Gateway TC.
4 The peak-load points for each line would be in the following locations: Blue Line East – east of Lloyd Center; Blue Line West – west of Goose Hollow; Yellow Line North – north of Rose Quarter; Yellow Line South – south of OMSI; Red Line North – north of Gateway; Red Line West – east of Lloyd Center; Green Line South – south of Gateway; Green Line West – east of Lloyd Center.

Combined LRT Alternatives would include a light rail line within the South Corridor. Because the light rail lines would operate as an integrated element of TriMet's overall transit system, ridership on each light rail line would be susceptible to changes in the configuration of transit service and facilities in the South Corridor. This interrelationship of ridership between the light rail lines is demonstrated throughout Table 4.2-8. For example, ridership on the Blue Line would be slightly different on the existing Blue and Red Lines under each alternative. The Combined LRT Alternative would result in the greatest total light rail system ridership, with 217,810 average weekday boarding rides (2020), followed by the I-205 LRT Alternative with 200,600 rides and Milwaukie LRT Alternative with 192,760 rides. The No-Build and BRT Alternatives would have similar light rail ridership, approximately 168,000 boarding rides, and the Busway Alternative would result in 169,490 systemwide light rail boarding rides.

4.2.2.6 Station Activities

This section focuses on the mode that transit patrons would use to access the BRT bus lines, busway bus lines, and light rail lines at BRT, busway, and light rail stations (average weekday, 2020). Mode of access is defined as the mode of transportation that a transit patron would use to travel from their home to the identified station, where the patron would board the transit vehicle – patrons that travel through the station on the same transit vehicle are not reported as a station activity. Table 4.2-10 summarizes average weekday 2020 mode of access to BRT and busway bus lines or a light rail line for the Project alternatives. With all the alternatives, the greatest number of riders would access BRT and busway bus lines or a light rail line by transferring from buses, ranging from 50% for the Busway, I-205 LRT, and Combined LRT Alternatives to 56% with the Milwaukie LRT Alternative. Park-and-ride lot access to BRT and busway bus lines or a LRT line would be 17% for all the alternatives except the I-205 and Combined LRT Alternatives, which would have 20 % accessing LRT by auto. Walk access would account for 27 to 33% of all trips with the various alternatives.

Table 4.2-10
Mode of Access, by South Corridor Project Alternatives
Average Weekday – Year 2020

Mode of Access to Transit	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Walk	31%	33%	27%	30%	30%
Bus Transfers	52%	50%	56%	50%	50%
Auto (Park-and-Ride Lot)	17%	17%	17%	20%	20%

Source: Metro, 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.

4.2.2.7 Design Option Ridership

The purpose of this section is to provide a qualitative assessment of the difference in transit ridership between the design options under study. The transit ridership forecasts included in Sections 4.2.2.1 and 4.2.2.2 of this SDEIS are based on the set of design options used in this SDEIS for the analyses of alternatives, as defined in Table 2.2-3. In some instances, different design options would result in a different set of stations and different station activities. Separate modeling was not prepared for each design option. Instead, the following section provides a qualitative description of the potential ridership impacts of all of the design options. See Section 2.2 of this SDEIS for a more detailed description of each set of design options.

A. BRT Alternative Design Options

The BRT Alternative has one set of design options: the **Clackamas Park-and-Ride Lot Design Options**. The **Linwood Park-and-Ride Lot Design Option**, which the previous analysis of transit impacts for the BRT Alternative was based on, would include a 600-space park-and-ride lot in the vicinity of SE Lake Road and SE Linwood Avenue. The **Johnson Road Park-and-Ride Lot Design Option** would replace the 600-space Linwood Park-and-Ride Lot with a 270-space park-and-ride lot located on SE Johnson Road north of Highway 224. The reduced number of park-and-ride spaces and less direct bus service to the Clackamas Town Center TC associated with the Johnson Road Park-and-Ride Lot Design Option would result in fewer corridor transit riders and fewer boarding rides than the Linwood Park-and-Ride Lot Design Option.

B. Busway Alternative Design Options

The Busway Alternative includes four sets of Design Options: the East Hawthorne Bridge Design Options; the Clinton Street Station Design Options; the Brooklyn Yard Design Options; and the Clackamas Park-and-Ride Design Options.

East Hawthorne Bridge Design Options. The **Water Avenue Design Option**, which the previous analysis of the transit impacts for the Busway Alternative was based on, would route the busway from SE Water Avenue to the Clinton Street Station, parallel to and south of SE Division Street. In contrast, with the **7th Avenue Design Option,** busway bus routes would operate in mixed traffic on SE 7th Avenue between SE Madison Street, SE Hawthorne Boulevard, and SE Lincoln Street, where the busway would begin. The busway would extend from SE Lincoln Street on SE 7th Avenue, across SE Division Street, to the Clinton Street Station. The 7th Avenue Design Option would not provide direct service to the Oregon Museum of Science and Industry (OMSI) and would include a longer portion of mixed-traffic operation for buses than the Water Avenue Design Option. Due to the lack of OMSI service and generally slower operating speeds, the 7th Avenue Design Option would be expected to have slightly less ridership than the Water Avenue Design Option.

Clinton Street Station Design Options. With the **At-Grade Station Design Option**, which the previous analysis of the transit impacts for the Busway Alternative was based on, the Clinton Street Station and segments of the busway approaching the station would generally be located at the current and future street and sidewalk levels. In contrast, with the **Above-Grade Station Design Option**, the Clinton Street Station and portions of the busway approaching the station would be elevated above the current street and sidewalk level, which would allow buses to travel through the area without affecting or being affected by cross traffic. Because the Above-Grade Station Design option would likely enable busway buses to operate slightly faster than the At-Grade Station Design Option, the Above-Grade Design Option would likely have slightly higher transit ridership.

Brooklyn Yard Design Options. With the **17th Avenue Design Option**, which the previous analysis of the transit impacts for the Busway Alternative was based on, the busway would be located adjacent and parallel to SE 17th Avenue, generally between SE Powell and McLoughlin Boulevards. In contrast, with the **West Brooklyn Yard Design Option**, the busway would be located directly west of the Brooklyn Yard, generally between SE Powell and McLoughlin Boulevard, approximately 330 feet east of the 17th Avenue Design Option alignment. The station locations would be similar; therefore, no significant difference in transit ridership would be anticipated.

Clackamas Park-and Ride Lot Design Options. The conclusions described above for **Linwood Park and Ride Lot Design Option** and the **Johnson Road Park-and-Ride Lot Design Option** under the BRT Alternative would also apply to the same design options under the Busway Alternative.

C. Milwaukie Light Rail and Combined Light Rail Alternatives Design Options

The Milwaukie LRT Alternative includes four sets of design options, three of which are also included with the Combined LRT Alternative: Brooklyn Yard Design Options; North Milwaukie Design Options; Milwaukie Terminus Options; and Clackamas Park-and-Ride Design Options (Milwaukie LRT Alternative only).

Brooklyn Yard Design Options. With the **17th Avenue Design Option**, which the previous analysis of the transit impacts for the Milwaukie LRT and Combined LRT Alternatives was based on, the light rail alignment would be located adjacent and parallel to SE 17th Avenue, generally between SE Powell and McLoughlin Boulevards. In contrast, with the **West of Brooklyn Yard Design Option**, the light rail alignment would be located directly west of the Brooklyn Yard, generally between SE Powell and McLoughlin Boulevard, approximately 330 feet east of the 17th Avenue Design Option alignment. The station locations would be similar and, therefore, no significant difference in transit ridership would be anticipated.

North Milwaukie Design Options. With the **Southgate Crossover Design Option,** which the previous analysis of the transit impacts for the Milwaukie LRT and Combined LRT Alternatives was based on, the light rail alignment would generally be located adjacent and parallel to SE McLoughlin Boulevard, between the Tacoma Street Station and Highway 224, and it would also include the Milwaukie Southgate Station, Transit Center, and Park-and-Ride Lot. In contrast, with the **Tillamook Branch Line Design Option**, the light rail alignment would generally be adjacent and parallel to the Tillamook Branch Line, between the Tacoma Street Station and Highway 224. Further, the Tillamook Branch Line Design Option would not include the Milwaukie Southgate Station and Park-and-Ride Lot, and the transit center function would be relocated to the Milwaukie Middle School TC. Because it would have less park-and-ride capacity and one less station, the Tillamook Branch Line Design Option would be expected to have significantly lower transit ridership than the Southgate Crossover Design Option.

Milwaukie Terminus Options. With the **Lake Road Terminus Option**, which the previous analysis of the transit impacts for the Milwaukie LRT and Combined LRT Alternatives was based on, the light rail alignment would extend from the Harrison Street Station to the Lake Road Station and 275-space park-and-ride lot. In contrast, with the **Milwaukie Middle School Terminus Option**, the light rail alignment would terminate at the Harrison Street Station – there would be no Lake Road Station and there would be 275 fewer park-and-ride spaces. Because it would have fewer park-and-ride spaces and one less station, the Milwaukie Middle School Terminus Option would be expected to have lower transit ridership than the Lake Road Terminus Option.

Clackamas Park-and Ride Lot Design Options. The conclusions described above for **Linwood Park and Ride Lot Design Option** and the **Johnson Road Park-and-Ride Lot Design Option** under the BRT Alternative would also apply to the same design options under the Milwaukie LRT Alternative.

I-205 Light Rail and Combined Light Rail Alternatives Design Options

The I-205 LRT Alternative includes one set of design options, which is also included within the Combined LRT Alternative: **Clackamas Town Center Design Options**. With the **East of Clackamas Town Center Terminus Option,** which the previous analysis of the transit impacts for the Milwaukie LRT and Combined LRT Alternatives was based on, the Clackamas Town Center Station, Park-and-Ride Lot and Transit Center would be located between the east Clackamas Town Center parking lot and I-205. In contrast, with the **North of Clackamas Town Center Terminus Option**, the Clackamas Town Center Station and Transit Center would be located and modified at the transit center's current location – there would be no park-and-ride lot (a loss of 500 spaces, compared to the East of Clackamas Town Center Terminus Options). Because it would have fewer park-and-ride spaces, the North of Clackamas Town Center Transit Center Terminus Option would be expected to have somewhat lower transit ridership than the East of Clackamas Town Center Terminus Option, in spite of somewhat improved access to residential areas north of SE Monterey Avenue.

4.3 Highway and Street Impacts

The purpose of this section is to evaluate the impacts to the highway and street network based on the South Corridor Project alternatives and design options. Impacts to the highway and street system have been separated into systemwide and local impacts. Transit improvements in the South Corridor could affect traffic operations and congestion in two basic ways. First, these improvements could divert trips from automobiles to transit, resulting in reduced systemwide vehicular travel, as discussed in Section 4.3.1. Second, transit facilities could also affect localized traffic operations on highways and streets in the project area. These localized effects are discussed by segment and alternative in Section 4.3.2.

4.3.1 Systemwide (Cumulative) Impacts

The traffic analysis is based on regional travel forecasting models. The regional model networks include roadway and transit improvements throughout the Portland metropolitan area, including Clackamas, Multnomah, and Washington Counties in Oregon and Clark County in Washington. Systemwide traffic impacts could result from transit alternatives that substantially affect the way transportation choices are made. Three systemwide traffic measures, roadway VMT, roadway VHT, and vehicle hours of delay are summarized, by alternative, in Table 4.3-1 and changes in traffic across selected screenlines are presented in Table 4.3-1 and 4.3-2, respectively.

Table 4.3-1
2020 Average Weekday Regional Roadway Data

Measure	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Average Weekday VMT[2]	36,248,000	36,222,100	36,214,700	36,228,000	36,181,400	36,176,800
Change from No-Build[1]	N/A	-25,900	-33,300	-20,000	-66,600	-71,200
Average VHT[2]	1,344,800	1,343,600	1,342,940	1,344,060	1,340,820	1,340,790
Change in from No-Build[1]	N/A	-1,200	-1,860	-740	-3,980	-4,010
Vehicle Hours of Delay[2, 3]	51,280	51,260	51,180	51,280	50,710	50,560
Change in from No-Build[1]	N/A	-20	-100	0	-570	-720

Source: Metro, 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; N/A = not applicable.
1 The change in all measures is based on the No-Build Alternative.
2 Based on average weekday conditions in 2020.
3 Based on p.m. peak-hour conditions in 2020 on freeways, major and minor arterials and collector streets.

Table 4.3-2
2020 Average Weekday PM-Peak Vehicle Volumes at Select Corridor Screenlines, by Alternative

Vehicle Volumes	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
E-19: I-205 & Parallel Streets at SE Powell Blvd. [1]	56,300	55,900	55,900	55,800	55,400	55,400
E-20: SE McLoughlin Blvd. and Parallel Streets at SE Powell Blvd. [2]	20,700	20,500	20,300	20,400	20,400	20,300

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
1 Cutline E-19 comprises the following roadways: SE 26th, 39th, 52nd, 72nd, 82nd, 112th, 122nd and 136th Avenues, SE Foster Road and I-205.
2 Cutline E-20 comprises the following roadways: SE McLoughlin Boulevard, SE Milwaukie Street and SE 17th Avenue.

In summary, all of the alternatives would help to reduce congestion and related problems, when compared to the No-Build Alternative. For all measures, the Combined LRT Alternative would do the most to reduce VMT, VHT, and vehicle hours of delay in 2020: VMT would be reduced by more than 71,000 miles, VHT would be reduced by more than 4,000 hours, and vehicle delay would be reduced by 720 hours per average weekday as compared to the No-Build Alternative. While the congestion relief would be somewhat less with the I-205 LRT Alternative than it would be with the Combined LRT Alternative, the reductions in VMT, VHT, and vehicle hours of delay would be more than three times greater with the I-205 LRT Alternative than it would be with the BRT, Busway, and Milwaukie LRT Alternatives. For example, the I-205 LRT Alternative would result in a reduction of more than 66,000 VMT, compared to reductions of 25,900, 33,300 and 20,000 miles with the BRT, Busway, and Milwaukie LRT Alternatives, respectively. The BRT and Busway Alternatives would provide similar levels of congestion relief – for example, the Busway Alternative would result in a reduction of more than 33,000 VMT, compared to a reduction of 25,900 with the BRT Alternative.

Table 4.3-2 shows the total 2020 traffic volumes forecast at two locations in the vicinity of SE Powell Boulevard in the South Corridor. The build alternatives all show a small decrease in p.m. peak 2-hour vehicle volumes at these screenlines, with the alternatives that carry the highest transit ridership (I-205 LRT and Combined LRT) showing the greatest reduction in traffic volumes.

4.3.2 Local Impacts

This section evaluates impacts of the South Corridor alternatives on the local highway and street network. This section also summarizes impacts to bicycle and pedestrian activities and facilities. Impacts to the highway and street network are measured in terms of measures of congestion, as well as changes in accessibility on the corridor roadway system, specific impacts on adjacent roadway facilities associated with the transit stations and park-and-ride lots and as changes in parking supplies and demand.

This section describes the impacts that the South Corridor Project alternatives would have on local traffic operations. Local traffic impacts are measured by impacts to intersection level-of-service, delay, queuing, and safety (a detailed description of the local traffic impact criteria can be found in the *Local and Systemwide Traffic Impacts Results Report).* Local traffic impacts that would require the development of conceptual mitigation strategies are determined by the following:

- Metro and ODOT have adopted level-of-service criteria for the Portland metropolitan area that allow for a poorer level-of-service (LOS) during the peak one hour compared with the secondary peak (shoulder) hour. For purposes of this SDEIS, if the build alternatives degrade an intersection's performance from an acceptable LOS in the No-Build to an unacceptable LOS with a build alternative, the project will work with the operating jurisdiction to develop a cost-effective solution to mitigate the intersection performance to a minimum of the peak hour standard or to a maximum of the secondary hour standard.

- If an intersection would operate at an unacceptable LOS (typically LOS E or LOS F) with both the No-Build and a build alternative, development of conceptual mitigation would be required if a build alternative would cause an increase in intersection delay of 10 seconds or more or an increase of 0.05 or more to the demand-to-capacity ratio, compared with the No-Build Alternative.

- If queuing with a build alternative would block adjacent signalized intersections, the build alternative would be mitigated to the no-build non-blocking conditions. If queuing blockage occurs with both the No-Build Alternative and the build alternative, then the build alternative would be mitigated to no-build conditions.

- If the No-Build Alternative does not meet warrants or safety criteria (e.g., traffic signal warrants, access spacing criteria), but a build alternative does, the build alternative would be mitigated to address the warrants or safety impacts.

This section evaluates the local traffic impacts and potential mitigation by segment and by type of impact: level of service at intersections, traffic impacts related to proposed park-and-ride lots, parking supply and facilities, bicycle operations and facilities, and pedestrian activities and facilities.

4.3.2.1 Portland to Milwaukie Segment

The Portland to Milwaukie Segment generally extends from the downtown Portland transit mall and to downtown Milwaukie. This section summarizes the following local traffic impacts and potential mitigation that would result from the alternatives and design options under study: level of service at intersections, localized traffic impacts related to proposed park-and-ride lots, parking supply and facilities, bicycle operations and facilities, and pedestrian activities and facilities.

A. Level of Service at Intersections

This section describes the level of service for p.m. peak hour in 2020 that would result at intersections within the Portland to Milwaukie Segment from the alternatives and design options under consideration. Because numerous intersections were evaluated for this segment, the segment has been broken down into smaller sub-areas that focus on similar geographic areas.

Downtown Portland and Hosford-Abernethy Neighborhoods

The downtown Portland area includes the area west of the Hawthorne Bridge. The Hosford-Abernethy area is defined as the area east of the Hawthorne Bridge south to SE Mill Street. All study area intersections within downtown Portland and the Hosford-Abernethy neighborhoods were evaluated to identify project-related impacts to local traffic. Table 4.3-3 summarizes the level-of-service operations for this segment and identifies those intersections where project-related traffic impacts would occur.

Table 4.3-3
2020 P.M. Peak-Hour Intersection Level of Service, by Alternative:
Portland to Milwaukie Segment – Downtown Portland/Hosford-Abernethy Neighborhood

Intersection		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
SW 1st Avenue	SW Taylor Street	B	B	B	B	B	B
SW 1st Avenue	SW Salmon Street	B	B	B	C	B	C
SW 4th Avenue	SW Main Street	A	A	A	A	A	A
SW 3rd Avenue	SW Main Street	B	B	B	B	B	B
SW 2nd Avenue	SW Main Street	A	A	A	A	A	A
SW 1st Avenue	SW Main Street	C	C	C	**F**[1]	C	**F**[1]
SW 5th Avenue	SW Madison Street	A	A	A	A	A	A
SW 4th Avenue	SW Madison Street	E	E	E	E	E	E
SW 3rd Avenue	SW Madison Street	D	D	C	D	D	D
SW 2nd Avenue	SW Madison Street	F	C	C	F	C	F
SW 1st Avenue	SW Madison Street	F	F	F	F	F	F
SE Water Avenue	Hawthorne Bridge	A/C	A/C	A/C	A/C	A/C	A/C
SE 7th Avenue	SE Madison Street	C	C	C	C	C	C
SE Grand Avenue	SE Madison Street	B	B	B	B	B	B
SE Water Avenue	SE Hawthorne Blvd	A/C	A/C	A/C	A/C	A/C	A/C
SE Grand Avenue	SE Hawthorne Blvd	B	B	B	B	B	B
SE 7th Avenue	SE Hawthorne Blvd	B	B	B	B	B	B
SE Water Avenue	SE Clay Street	A	A	A	A	A	A
SE MLK Jr. Blvd	SE Clay Street	B	B	B	B	B	B
SE Grand Avenue	SE Clay Street	B	B	B	B	B	B
SE MLK Jr. Blvd	SE Market Street	A/E	A/E	A/E	A/E	A/E	A/E
SE MLK Jr. Blvd	SE Mill Street	A/F	A/F	A/F	A/F	A/F	A/F

Source: DKS Associates and URS/BRW: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. For a signalized intersection, X = level of service; for an unsignalized Intersection, X/X = major street movement/minor street movement; for an all-way stop intersection, X = average approach level of service. Bolded LOS ratings indicate locations that would meet project mitigation criteria.
[1] Indicates intersection with a delay impact greater than 10 seconds and a demand-to-capacity ratio change greater than 0.05.

Impacts

As shown in Table 4.3-3, with the Milwaukie LRT and Combined LRT Alternatives, the level-of-service at the intersection of SW 1st Avenue/SW Main Street would degrade from LOS C to LOS F. The introduction of traffic signal priority with light rail service in the vicinity of this intersection would increase the intersection delay and the demand-to-capacity ratio.

In-depth simulation analysis was conducted for traffic operations on the Hawthorne Bridge with the Milwaukie LRT and Combined LRT Alternatives. New traffic signals at both the east end and west end of the bridge would result in traffic stoppages and some queuing at both ends of the bridge, with the potential to increase auto travel times across the bridge for both the a.m. and p.m. peak periods by more than 1 minute. With both LRT Alternatives, the achievable westbound traffic throughput on the bridge in the a.m. peak hour would decrease from approximately 2,000 vehicles per hour with the No-Build Alternative to 1,790 vehicles per hour with the Milwaukie LRT and Combined LRT Alternatives, a reduction of 11 percent. A detailed description of this simulation analysis and the results can be found in the *Local and Systemwide Traffic Impacts Results Report*. None of the other intersections within this sub-area would require mitigation.

Potential Mitigation

Potential mitigation for the intersection of SW 1st Avenue/SW Main Street consists of signal timing optimization to allow for additional green time in the westbound direction (which would be the direction affected by light rail operation crossing the intersection). Based on the traffic simulation analysis, the additional travel time and reduced vehicle throughput across the Hawthorne Bridge could be partially mitigated by improvements at SW 1st Avenue and SW Main Street; however, some increase in travel time and decrease in vehicle throughput appears to be unavoidable.

SE 11th and 12th Avenues and SE Clinton Street Area

All project area intersections within the vicinity of the intersection of SE 11th and 12th Avenues and SE Clinton Street area were evaluated to identify project-related traffic impacts. Table 4.3-4 summarizes the level of service operations for this segment and identifies those intersections where project-related impacts to local traffic would occur.

Table 4.3-4
2020 P.M. Peak-Hour Intersection Level of Service, by Alternative:
Portland to Milwaukie Segment – SE 11th and 12th Avenues and SE Clinton Street Area

Intersection		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
SE 8th St	SE Division St	E	E	E	D	E	D
SE 9th St	SE Division St	A/A	A/A	A/A	A/A	A/A	A/A
SE 11th Ave	SE Division St	C	C	C	C	C	B
SE 12th Ave	SE Division St	B	B	B	B	B	B
SE 11th Ave	SE Clinton St[1]	A/F	A/F	--	A[2]	A/F	A[2]
SE 12th Ave	SE Clinton St[1]	A/D	A/D	--	A[2]	A/D	A[2]
SE 11th/12th Aves	SE Clinton St	--	--	E[2]	--	--	--
SE Milwaukie Ave	SE Gideon St[1]	A/B	A/B	B	A[2]	A/B	A[2]
SE Milwaukie Ave	SE Powell Blvd	E	E	E	E	E	E
SE 17th Ave	SE Pershing St[1]	A/C	A/C	A[3]	A/B	A/C	A/B
SE 17th Ave	SE Haig St	A/C	A/C	A/B	A/B	A/C	A/B
SE 17th Ave	SE Rhine St[1]	A/C	A/C	A[2]	A[2]	A/C	C[2]
SE 17th Ave	SE Lafayette St	A/C	A/C	A/B	A/B	A/C	A/B
SE 17th Ave	SE Rhone St	A/C	A/C	A/B	A/B	A/C	A/B
SE 17th Ave	SE Center St[1]	A/C	A/C	A[3]	A[3]	A/C	B[3]
SE 17th Ave	TriMet driveway	A/B	A/B	A/B	A/B	A/B	A/B
SE 17th Ave	SE Boise St north	A/C	A/C	A/B	A/B	A/C	A/B
SE 17th Ave	SE Boise St south[1]	--	A/C	A[2]	A[2]	A/C	A[2]
SE 17th Ave	SE Mall St	A/C	A/C	A/B	A/B	A/C	A/B
SE McLoughlin	SE Holgate Blvd	E	D	D	D	E	E
SE Milwaukie Ave	SE Holgate Blvd	C	C	C	C	C	C
SE 17th Ave	SE Holgate Blvd	C	C	C	**F**[3]	C	**F**[3]
SE 18th Ave	SE Holgate Blvd	A/C	A/D	A/D	A/C	A/D	A/C
SE 17th Ave	SE Pardee St	A/D	A/D	A/B	A/B	A/D	A/B
SE 17th Ave	SE Schiller St[1]	A/F	A/F	A[2]	B[2]	A/F	B[2]
SE 17th Ave	SE McLoughlin Blvd	E	E	E	E	E	E

Source: DKS Associates and URS/BRW: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. For a signalized intersection, X = level of service; for an unsignalized Intersection, X/X = major street movement/minor street movement; for an all-way stop intersection, X = average approach level of service. Bolded LOS ratings indicate locations that would meet project mitigation criteria.
[1] Indicates a change in intersection operation from unsignalized to signalized for specific alternative.
[2] Indicates a new signalized intersection.
[3] Indicates intersection with a delay impact greater than 10 seconds and a demand-to-capacity ratio change greater than 0.05.

Impacts

As Table 4.3-4 indicates, the intersection of SE 17th Avenue/SE Holgate Boulevard would be adversely impacted by the Milwaukie LRT and Combined LRT Alternatives. These alternatives would have a north/south center-running light rail alignment that would reduce the amount of green time available to serve the east/west movements on SE Holgate Boulevard and would result in project-related impacts. The alternatives would not significantly impact any other intersections along SE 17th Avenue (or other surrounding intersections in the area). Some additional intersections on SE

17th Avenue will be signalized as part of the Project. All of the new traffic signal-controlled intersections would operate in an acceptable manner during the 2020 p.m. peak hour.

With the Busway Alternative, two new signalized intersections would be created in the SE 11th and 12th Avenues and SE Clinton Street area. The new signalized intersections of SE 12th Avenue with SE Gideon Street would operate at an acceptable level of service, while the intersection of SE 12th Avenue with SE Clinton Street would operate at a deficient level of service (LOS E) as a result of the traffic signal priority required for Busway operations. However, during traffic signal cycles when signal priority was not used, operations of this intersection should be acceptable.

Under either the Milwaukie or the Combined LRT Alternative, the SE 11th/12th/Clinton intersection area, as configured in the SDEIS Alternatives plan set, would result in operational deficiencies as a result of capacity issues related to “back to back” preemption calls for light rail. As a transit arrival/departure occurs, queues develop southbound along SE 11th Avenue. After the transit arrival/departure occurs, the traffic queue along SE 11th Avenue would discharge southbound and proceed to SE Powell Boulevard. If there is a stop phase for the southbound vehicles at SE Powell Boulevard vehicle queues could extend back to block the light rail crossing. If another transit arrival/departure occurs shortly after the previous transit arrival/departure, there could be instances where the auto queues would block the light rail tracks.

Potential Mitigation

Potential mitigation under the light rail alternatives for the intersection of SE 17th Avenue and SE Holgate Boulevard could consist of signal timing optimization coupled with a longer cycle length. The longer cycle length would allow for additional green time to serve the east/west volumes, which would be the movements directly affected by the north/south light rail alignment.

Potential mitigation under the Busway Alternative for the intersection of SE 12th Avenue and SE Clinton Street could consist of coordinating the signal timing between the two new signalized intersections so they would operate as one signalized intersection, thereby reducing potential queuing and delay associated with the new signalized intersection geometry.

With the Milwaukie and Combined LRT Alternatives, the impacts related to a back-to-back transit priority could be mitigated through signal coordination between 11th/12th/Clinton and SE Powell Boulevard or transit operational management, which would not allow back-to-back priority calls at the 11th/12th/Clinton intersection area. Another potential mitigation measure would be to collapse the intersection operation from three signals to one signalized intersection at the transit/heavy rail crossing. This would still require signal coordination between 11th/12th/Clinton and SE Powell Boulevard.

A third potential mitigation option would be to retain the existing roadway geometry and modify the existing gated crossings or implement additional gated crossings (where necessary). Again, transit operational management would be necessary to eliminate the potential for back-to-back priority calls in the 11th/12th/Clinton area.

Sellwood and Downtown Milwaukie Area

The Sellwood and Downtown Milwaukie area is defined as the area along SE McLoughlin Boulevard from SE Harold Street to SE Washington Street (in downtown Milwaukie). There are some additional peripheral intersections not on SE McLoughlin Boulevard that are also included in this area for analysis. All project area intersections were evaluated to identify project-related impacts. Table 4.3-5 summarizes the level-of-service operations for this area and identifies those intersections where project-related impacts would occur.

Table 4.3-5
2020 P.M. Peak-Hour Intersection Level of Service, by Alternative:
Portland to Milwaukie Segment – Sellwood and Downtown Milwaukie Area

Intersection		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
SE McLoughlin Blvd	SE Harold St	A	A	A	A	A	A
SE 17th Avenue	SE Bybee Blvd	A/F	A/F	A/F	A/F	A/F	A/F
SE 28th Avenue	SE Woodstock Blvd	A/D	A/D	A/D	A/F	A/F	A/F
SE McLoughlin south	SE Tacoma St	A/D	A/D	B/D	A/D	A/D	A/D
SE McLoughlin north	SE Tacoma St	D	D	**E**[1]	**E**[2]	D	**D**[2]
SE 32nd Avenue	SE Johnson Creek Blvd	F	F	F	F	F	F
SE McLoughlin Blvd	SE Moores St	A/C	A/C	A/C	**A/F**	A/C	**A/F**
SE McLoughlin Blvd	SE Ochoco St	B	B	B	B	B	B
SE McLoughlin Blvd	SE Milport Rd	B	**D**[2]	**F**[1]	**F**[2]	**D**[2]	**F**[2]
SE Main St	SE Milport Rd	A/B	--	--	--	A/B	--
SE McLoughlin Blvd	17th Ave/Harrison	F	**F**[1]	**F**[1]	**F**[1]	**F**[1]	**F**[1]
SE Main St	SE Harrison St	D	E	E	E	E	E
SE McLoughlin Blvd	SE Jackson St	A/C	A/C	A/C	A/C	A/C	A/C
SE McLoughlin Blvd	SE Monroe St[3]	A	A	A	A	A	A
SE McLoughlin Blvd	SE Jefferson St[4]	A/E	A/E	A/E	A/E	A/E	A/E
SE McLoughlin Blvd	SE Washington St[3]	B	B	B	**C**[2]	B	**C**[2]

Source: DKS Associates and URS/BRW: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. For a signalized intersection, X = level of service; for an unsignalized Intersection, X/X = major street movement/minor street movement; for an all-way stop intersection, X = average approach level of service. Bolded LOS ratings indicate locations that would meet project mitigation criteria.
1 Indicates intersection with a delay impact greater than 10 seconds.
2 Indicates intersection with a delay impact greater than 10 seconds and a demand-to-capacity ratio change greater than 0.05.
3 Indicates a change in intersection operation from unsignalized to signalized for specific alternative.
4 Indicates a change in intersection operation from signalized to unsignalized.

Impacts

Table 4.3-5 identifies project-related impacts to traffic operations that would occur at four signalized intersections and one non-signalized intersection: SE Tacoma Street and the SE McLoughlin Boulevard northbound on-off ramp (for the Busway, Milwaukie LRT, and Combined LRT Alternatives); SE McLoughlin Boulevard and SE Milport Road (for all alternatives); SE McLoughlin Boulevard at SE 17th Avenue and SE Harrison Street (for all alternatives); SE McLoughlin Boulevard and SE Washington Street (for the Milwaukie LRT and Combined LRT Alternatives); and SE McLoughlin Boulevard and SE Moores Street (with the Milwaukie LRT and Combined LRT Alternatives). These project impacts would all be related to park-and-ride lot activity associated with the Tacoma Street, Southgate, and Lake Road Park-and-Ride Lots. The additional trips to the street network associated with the park-and-ride lots would increase vehicular volumes within these four intersections and would cause deterioration in their level of service compared to the No-Build Alternative.

Potential Mitigation

For the Busway, Milwaukie LRT, and Combined LRT Alternatives potential mitigation at the intersection of SE Tacoma Street and SE McLoughlin Boulevard at the northbound on-off ramp, could include protected northbound and southbound left-turn phases, coupled with a reconfiguration of the north and south lane geometry to accommodate new phasing and optimized signal timing.

Potential mitigation at the intersection of SE Milport Road/SE McLoughlin Boulevard for all alternatives could include signal timing optimization and additional turn lanes westbound on SE Milport Road to improve intersection performance and to resolve queuing issues.

Potential mitigation under the Milwaukie LRT and Combined LRT Alternatives at the intersection of SE Washington Street and SE McLoughlin Boulevard could include signal timing optimization and lane geometry modification in the westbound direction along SE Washington Street.

Design Options

The Busway, Milwaukie LRT, and Combined LRT Alternatives include one or more sets of design options within the Portland to Milwaukie Segment. The traffic impact analysis of alternatives is based on one set of design options for each alternative, which were used for the analyses of alternatives throughout this SDEIS (see Table 2.2-3). Different traffic impacts could result if a different set of design options were to be selected. This section describes how traffic impacts would vary by design option for each alternative within this segment.

- **Busway Alternative.** The Busway Alternative includes the East Hawthorne Bridge Design Options: the Water Avenue Design Option and the 7th Avenue Design Option. **The Water Avenue Design Option** was used for the traffic impact analysis within the previous sections. With the **7th Avenue Design Option**, the busway would be realigned to SE 7th Avenue from SE Division Street to SE Hawthorne Boulevard/SE Madison Street, thereby eliminating the OMSI Station and creating the need for the Busway alignment to cross over SE Division Street at SE 7th Avenue. The buses would operate in mixed traffic along SE 7th Avenue, which could create some minor vehicular delays at intersections along SE 7th Avenue caused by additional buses and bus stops. The Busway crossover of SE Division Street at SE 7th Avenue would operate via a grade-separated structure and, therefore, would not impact operations along SE Division Street.

  The Busway Alternative also includes the Clinton Street Station Design Options: the At-Grade Design Option and the Above-Grade Design Option. The **At-Grade Design Option** was used for the traffic impact analysis within the previous sections. With the **Above-Grade Design Option**, the traffic operations on SE 11th and SE 12th Avenues and SE Clinton and SE Gideon Streets would be the same as with the No-Build Alternative and there would be no traffic impacts in this location.

  The Busway Alternative also includes the Brooklyn Yard Design Options: the 17th Avenue Design Option and the West of Brooklyn Yard Design Option. The **17th Avenue Design Option** was used for the traffic analysis in the previous sections. With the **West of Brooklyn Yard Design Option** the busway alignment would be located just west of the Brooklyn Yard, rather than along SE 17th Avenue, thereby retaining the existing intersection configurations along SE 17th Avenue. Compared to the 17th Avenue Design Option, the West of Brooklyn Yard Design Option would include a gated crossing of SE Holgate Boulevard that would not be an element of the 17th Avenue Design Option. The Busway Alternative would include traffic signal priority rather than signal preemption, which should allow the busway crossing of SE Holgate Boulevard to function with minimal queuing impacts.

- **Milwaukie Light Rail and Combined Light Rail Alternative.** The Milwaukie LRT and Combined LRT Alternatives include two sets of design options within this segment: the Brooklyn Yard Design Options and the North Milwaukie Design Options. The Brooklyn Yard

Design Options include the **17^{th} Avenue Design Option**, which was used for the traffic analysis in the previous sections. With the **West of Brooklyn Yard Design Option** the light rail alignment would be located just west of the Brooklyn Yard, rather than along SE 17th Avenue, thereby retaining the existing intersection configurations along SE 17th Avenue. Light rail stations (i.e., the Rhine Street and SE Holgate Street Stations) would be located further east. Compared to the 17^{th} Avenue Design Option, the West of Brooklyn Yard Design Option would generally shift the impact of light rail to traffic operations to the east by approximately 330 feet. In addition, the West of Brooklyn Yard Design Option would include a gated crossing of SE Holgate Boulevard that would not be an element of the 17^{th} Avenue Design Option. With traffic signal preemption, this crossing could result in eastbound traffic queues potentially reaching SE 17^{th} Avenue and requiring additional mitigation.

Of the North Milwaukie Design Options, the **Southgate Crossover Design Option** was used for the traffic impact analysis in the previous sections. With the **Tillamook Branch Line Design Option**, the Milwaukie Southgate TC, Station, and Park-and-Ride Lot would be eliminated – the transit center function would be relocated to the Milwaukie Middle School TC. As a result, impacts to traffic operations at the intersection of SE Milport Road/SE McLoughlin Boulevard would be lessened, compared to the Southgate Crossover Design Option. The Tillamook Branch Line Design Option would require a gated light rail crossing of a low-volume driveway (SE Mailwell Drive) in the North Milwaukie industrial area.

B. Park-and-Ride Lot-Related Traffic Impacts and Potential Mitigation.

The following section describes the proposed park-and-ride lot locations and potential impacts associated with each lot. There would be up to three park-and-ride lots within the Portland to Milwaukie Segment: the Tacoma Street Park-and-Ride Lot, the Southgate Park-and-Ride Lot, and the Lake Road Park-and-Ride Lot. Not all park-and-ride lots would occur with each alternative, and there would be no park-and-ride lots within this segment with the BRT and I-205 LRT Alternatives. Each proposed park-and-ride lot and the transit alternative it is associated with are described below.

Impacts to Traffic

The **Tacoma Street Park-and-Ride Lot** would occur with the Busway, Milwaukie LRT, and Combined LRT Alternatives. The facility would consist of a 600-space parking structure. The lot would be located on the east side of SE McLoughlin Boulevard just south of the SE Tacoma Street on-and off-ramps. The park-and-ride lot would generate approximately 200 vehicle trips in the evening peak hour for the Busway Alternative and approximately 420 evening peak hour trips for the LRT Alternatives. Two vehicular access points would be provided into this park-and-ride lot (full access would be provided to and from SE Tacoma Street at a pre-existing signalized intersection, and right-in and right-out access to SE McLoughlin Boulevard would be provided in the vicinity of an existing right-in and right-out driveway). For the Busway Alternative, the SE McLoughlin Boulevard access point is 850 feet south of the ramps from SE Tacoma Street and 1,450 feet north of the SE Moores Street right in/right out intersection. For the light rail alternatives, the SE McLoughlin Boulevard access point is 1,350 feet south of the SE Tacoma Street ramps and 1,100 feet north of the SE Ochoco Street intersection (the intersection of SE Moores Street is removed in this alternative). The proposed access on SE McLoughlin Boulevard would not conform to ODOT's access spacing standards at this location (2,640 feet).

In the evening peak hour, the intersection of SE Tacoma Street with the SE McLoughlin Boulevard northbound on and off ramps access road to the park-and-ride lot would degrade to level of service E in 2020. With the light rail alternatives, there would be a gated light rail crossing of the at-grade right-in and right-out access to and from SE McLoughlin Boulevard.

The expansion of the **Milwaukie Southgate Park-and-Ride Lot** from 330 spaces in the No-Build Alternative to 600 spaces would occur with all of the build alternatives. The park-and-ride lot would include a 600-space park-and-ride lot structure located at the intersection of SE Main Street and SE Milport Road and SE McLoughlin Boulevard. The Milwaukie Southgate Park-and-Ride Lot would generate about 200 total trips during the p.m. peak hour for the Busway and BRT alternatives, and approximately 420 evening peak hour trips with the light rail alternatives. Two options for providing automobile access to the park-and-ride lot were evaluated at this site. Under the Milwaukie LRT and Combined LRT Alternatives, a station configuration that would retain the existing alignment of SE Main Street would provide four access points, and with the Busway Alternative, the park-and-ride lot would be configured with SE Main Street relocated to the east of the park-and-ride lot with four access points.

The Milwaukie LRT and Combined LRT Alternatives would have three access points from the Milwaukie Southgate Park-and-Ride Lot to SE Main Street, about 200 feet apart, which would not conform to the City of Milwaukie 300-foot access spacing standard for collectors. The Milwaukie LRT and Combined LRT Alternative would also have an at-grade light rail crossing of SE Main Street within 100 feet of SE McLoughlin Boulevard that would result in traffic queues extending west to SE McLoughlin Boulevard. The fourth access point under the Milwaukie LRT and Combined LRT Alternatives would be via SE Hanna-Harvester Drive for bus station access and would be a conforming access point. Peak queues on SE Main Street would impact access to the bus and vehicular parking areas, as well as access to SE McLoughlin Boulevard.

With the Busway and BRT alternatives, the southerly two access points would be spaced 300 to 400 feet between driveways, which would conform to the City of Milwaukie access spacing standard for collectors. The south parking lot access would be less than 100 feet from the bus station access on SE Main Street and the northerly access point for the bus station access would be 100 feet from the realigned SE Main Street/SE Milport Road intersection, which would not conform to the City's 300-foot access spacing on SE Main Street.

Additionally, a quick drop area that would be provided with the Busway Alternative would create non-conforming access spacing conditions on SE Main Street. Bus access to Milwaukie Southgate Park-and-Ride Lot would be accommodated primarily by stop sign controlled intersections with minor delays. The park-and-ride lot would significantly impact the SE McLoughlin Boulevard/SE Milport Road intersection (changing from level of service B in 2020 p.m. peak hour No-Build Alternative to level of service F with the station alternatives).

The **Lake Road Park-and-Ride Lot** would occur with the Milwaukie Light Rail and Combined LRT Alternatives. This park-and-ride lot would provide a 270-space lot at the corner of SE Washington Street and SE Main Street, just north of Kellogg Lake. The park-and-ride lot would generate about 200 vehicle trips in the p.m. peak hour. There would be one access point mid-block on SE Washington Street between SE McLoughlin Boulevard and SE Main Street (approximately 100 feet in each direction). Given the number of parking spaces, one access point would be adequate for the parking lot. The proposed access point would not conform to the City of Milwaukie's 300-

foot access spacing standard for collectors (which SE Washington Street is designated). Queues propagating back from SE McLoughlin Boulevard would potentially block access to and from the parking structure. Local bus service would likely use existing streets and curb space (SE 21st Avenue or SE Lake Road) for loading/unloading.

Potential Mitigation

The following section outlines potential types of mitigation associated with the park-and-ride station facilities described earlier.

- **Tacoma Street Park-and-Ride Lot.** To address the substandard access spacing, options should be considered to the direct (right-in/right-out) access to/from SE McLoughlin Boulevard. Options that would meet ODOT spacing standards include eliminating the access or providing a roadway connection to the south linking to SE Ochoco Street. Northbound right-turn deceleration and acceleration lanes would be required on SE McLoughlin Boulevard if the right in/right out access were retained. Level-of-service mitigation at the intersection of the park-and-ride lot access road with SE Tacoma Street may include protected northbound/southbound left-turning phases along with reconfiguring the north and south lane geometries to accommodate new phasing and optimized signal timing.

- **Milwaukie Southgate Park-and-Ride Lot.** For all transit alternatives, additional turn lanes westbound on SE Milport Road at SE McLoughlin Road need to be considered to improve intersection performance and queuing issues. Alternatives to the at-grade light rail crossing of SE Main Street near SE Milport Road and SE McLoughlin Boulevard could be considered, which could avoid queuing impacts, including relocating SE Main Street east of the station area. Studies of the stacking and sight distance requirements along SE Main Street will be necessary for any access that is not conforming to the City of Milwaukie's 300-foot access spacing standard. For example, vehicular access to the south parking lot may need to shift to the south. It may also be desirable to consider a roundabout design of the SE Milport Road/SE Main Street intersection to reduce queue impacts to nearby bus station access points.

- **Lake Road Park-and-Ride Lot.** Consideration of alternative garage access points for the Lake Road Station Park-and-Ride Lot could be evaluated, including access to SE Main Street, possibly opposite SE Adams Street, which would be conforming to City of Milwaukie access spacing standards. Bus loading areas for this station will need to be designated.

C. Parking Impacts and Potential Mitigation

Table 4.3-6 summarizes the parking impacts for this segment by alternative. The BRT Alternative would remove on-street parking on several streets in downtown Portland that are and would continue to be highly utilized.

The Busway Alternative would remove some on-street parking, with the most significant removals occurring on SE 17th Avenue and its side streets. Two significant off-street parking lots would be impacted at SE Water Avenue and SE Clay Street (near a Portland Community College campus) and SE 17th Avenue/SE Center Street (near TriMet's administration building and bus maintenance facility). The Milwaukie LRT and Combined LRT Alternatives would remove the largest number of on-street parking spaces within the Portland to Milwaukie Segment, with significant removals in downtown Portland on SW 1st Avenue, on SE 17th Avenue and its side streets and along SE Main

Street in Milwaukie in the north industrial area. The Milwaukie LRT and Combined LRT Alternatives would also remove off-street parking at the SE 17th Avenue/SE Center Street TriMet lot. Parking mitigation strategies that could be implemented include replacement of off-street and on-street parking, parking management strategies, and parking restrictions.

Table 4.3-6
Parking Removal: Portland to Milwaukie Segment

Street/Site	Type[1]	Location	Parking Spaces To Be Removed	Current Usage[2]
Milwaukie LRT and Combined LRT Alternatives				
SW 1st Ave	On	SW Yamhill to Madison Sts	40	83%
SE Water Ave	On	SE Madison to Clay Sts	21	90%
SE 8th Ave/SE 9th Ave	On	At SE Division St	18	50%
SE 11th/12th Aves	On	SE Ivon St to Decouple Point	22	41%
SE Clinton St	On	Near SE 11th SE 13th Aves	7	14%
SE Gideon St	On	SE Milwaukie to 13th Aves	5	100%
SE 17th Ave	On	SE Pershing St to SE McLoughlin Blvd	148	34%
SE 17th Ave side Sts	On	Pershing to SE McLoughlin Blvd	29	61%
TriMet Parking Lots	Off	SE Center St to SE Mall St	116	66%
SE Moores St	On	SE McLoughlin Blvd to SE Main St	6	14%
SE Main St	On	Beta to Milport	60	25%
SE Monroe St	On	At Railroad Crossing Point	12	45%[3]
SE Washington St	On	At Railroad Crossing Point	6	34%[3]
SE Adams St	On	At Railroad Crossing Point	10	64%[3]
SE 21st Ave	On	SE Adams St to SE Lake Rd	10	64%[3]
SE Lake Rd	On	SE 21st Ave to SE Adams St	6	64%[3]
Total			**539**	
Busway Alternative				
SW Main St	On	SE 1st to 5th Aves	2	100%
SW Madison St	On	SE 1st to 5th Aves	21	81%
PCC Building Lot	Off	SE Corner of SE Water Ave and SE Clay St	55	-
SE 8th Ave/SE 9th Ave	On	At SE Division St	18	50%
SE 11th/12th Aves	On	Ivon to Decouple Point	22	41%
SE Clinton St	On	Near 11th/12th	7	14%
SE Gideon St	On	Milwaukie to 13th	5	100%
SE 17th Ave	On	Pershing to SE McLoughlin Blvd	148	34%
SE 17th Ave Side Streets	On	Pershing to SE McLoughlin Blvd	52	61%
TriMet Parking Lots	Off	SE Center St to SE Mall St	116	66%
SE Moores St	On	SE McLoughlin Blvd to SE Main St	2	14%
SE Main St	On	SE Milport Rd	20	75%
Total			**468**	
BRT and I-205 LRT Alternatives				
SW Main St	On	SW 1st to 5th Aves	2	100%
SW Madison St	On	SW 1st to 5th Aves	21	81%
SE Main St	On	SE Milport Rd	20	75%
Total			**43**	

Source: DKS Associates, August 2002.
1 On = On-street parking; Off = Off-street parking.
2 Current usage is the daytime occupancy of the parking for that location based upon surveys conducted August 2002.
3 South/North Corridor Project: Local and Systemwide Traffic Impact Results Report, Metro, February 1998, page 5-59.

D. Bicycle Impacts and Potential Mitigation

Potential regional bicycle improvements have been identified in the Metro RTP as well as in local jurisdictions' transportation system plans. In the Portland to Milwaukie segment, there are existing or planned bicycle access routes to all station locations for all alternatives with the exception of the Milwaukie LRT and Combined LRT Alternatives for the Rhine Street Station. The Rhine Street Station would be located north of Center Street on SE 17th Avenue and would not have direct bikeway access, based on planned improvements in either the Metro RTP or the City of Portland *Transportation System Plan* (TSP). Bicycle access via a regional corridor on-street bikeway (Metro) and/or city bikeway (City of Portland) is planned along SE 17th Avenue to south of SE Center Street (approximately three blocks south of SE Rhine Street). Additionally, the Tacoma Street Station would be located near the Springwater Corridor, a major off-street bicycle route, which would likely increase the use of bicycles for access to this station.

Potential mitigation to the identified bicycle impacts could include the provision of direct bicycle access via the continuation of a bicycle facility along SE 17th Avenue north of SE Center Street to the Rhine Street or Lafayette Street Stations, depending on the design option selected. Additional bicycle lockers or storage may be necessary at the Tacoma Street Station to address the increased number of bicycles related to the regional access provided by the nearby Springwater Corridor. The responsible local jurisdictions should include planned bikeway improvements serving transit stations as priority projects for local implementation.

E. Pedestrian Impacts and Potential Mitigation

Table 4.3-7 summarizes the pedestrian facilities that would be in the vicinity of the proposed stations in the Portland to Milwaukie Segment. The table describes whether adequate pedestrian facilities exist within the immediate vicinity of the transit stations (primary) and in the area beyond the immediate vicinity of the station but within ¼ mile (secondary). The secondary access would be the responsibility of the local jurisdictions and would not be considered a project responsibility.
In general, the project plans for each station area include pedestrian facilities within the immediate station area. Secondary pedestrian access is typically the responsibility of the local jurisdiction. Pedestrian improvements that could be considered by the local jurisdictions in this segment include:

Harrison Street Station – Potential pedestrian mitigation could include providing sidewalks along sections of SE Harrison Street.

4.3.2.2 Gateway to Clackamas Segment

The Gateway to Clackamas Segment generally extends from the existing Gateway TC to the Clackamas Town Center TC. This section summarizes the local traffic impacts and potential mitigation that would result from the alternatives and design options under study, including level of service at intersections, localized traffic impacts related to proposed park-and-ride lots, parking supply and facilities, bicycle operations and facilities, and pedestrian activities and facilities.

A. Level of Service at Intersections

This section describes the level of service for p.m. peak hour in 2020 at intersections within the Gateway to Clackamas Segment that would result from the alternatives and design options under consideration. Because numerous intersections were evaluated for this segment, the segment has been broken down into smaller sub-areas.

Gateway to SE Flavel Street Area

The Gateway to SE Flavel Street area is defined as the intersections surrounding proposed light rail station locations from Gateway to SE Flavel Street along I-205. All intersections within this area were evaluated to determine potential project-related impacts. Table 4.3-8 summarizes the level-of-service operations for this segment and identifies those intersections where project-related impacts would occur.

Table 4.3-7
Existing Pedestrian Facilities in the Vicinity of Proposed Stations in the South Corridor Study Area, by Alternative and Segment

Segment/Station Location	**BRT**	**Busway**	**Milwaukie LRT**	**I-205 LRT**	**Combined LRT**
Portland to Milwaukie					
SW Main Street			P / S		P / S
Clay Street	P / S				
Hawthorne Boulevard	P / S			P / S	
OMSI		P / S	P / S		P / S
Clinton Street		P / S	P / S		P / S
Rhine Street		P / S	P / S		P / S
Holgate Boulevard	P / S			P / S	
17th Avenue	P / S			P / S	
Bybee Boulevard		P / S	P / S		P / S
Tacoma Street		P / S	P / S		P / S
Milwaukie Southgate	P / S	P / S	P / S	P / S	P / S
Harrison Street			P		P
Lake Road			P / S		P / S
Gateway to Clackamas Segment					
SE Main Street				P / S	P / S
Division Street				P / S	P / S
Powell Boulevard				P / S	P / S
Holgate Boulevard				P / S	P / S
Foster Road				P / S	P / S
Flavel Street				P / S	P / S
Fuller Road				P / S	P / S
Milwaukie to Clackamas Segment					
Oak Street	P	P	P		
Freeman Way	P / S	P / S	P / S		
Linwood/Harmony	P	P	P		
OIT	P	P	P		
Clackamas Town Center	P	P	P	P	P
New Hope Shared-Use	P / S	P / S	P / S		P / S
Milwaukie to Oregon City Segment					
Park Avenue	P	P	P	P	P
Oak Grove	P / S	P / S	P / S	P / S	P / S
Concord Road	P / S	P / S	P / S	P / S	P / S
Roethe Road	P / S	P / S	P / S	P / S	P / S
Jennings Road	P	P	P	P	P
Arlington Street	P / S	P / S	P / S	P / S	P / S

Source: DKS Associates and URS/BRW.
Note: BRT = bus rapid transit; LRT = light rail transit; P = primary sidewalk access available within 500 feet of the proposed station location; S = secondary sidewalk access available, between 500 feet and ¼-mile of the proposed station; blank cells = not applicable.

Impacts

As shown in Table 4.3-8, with the I-205 and Combined LRT Alternatives, the intersections of SE 92nd Avenue and SE Powell Boulevard and SE 92nd Avenue and SE Holgate Boulevard would meet project mitigation criteria for increase in delay. With the I-205 LRT Alternative, the intersections would also meet the Project's mitigation criteria based on the demand-to-capacity ratio. These impacts would result primarily from the introduction of the Powell Boulevard and Holgate Boulevard Park-and-Ride Lots. No intersection level-of-service impacts were identified in the vicinity of the Foster Road Park-and-Ride Lot, however, some traffic operations and access spacing issues were identified and are described in Section 4.3.2.2.

Table 4.3-8
2020 P.M. Peak-Hour Intersection Level of Service, by Alternative: Gateway to Clackamas Segment – Gateway to SE Flavel Street Area

Intersection		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
I-205 south ramp	SE Stark Street	B	B	B	B	B	B
I-205 north ramp	SE Stark Street	B	B	B	B	B	B
I-205 south ramp	SE Washington Street	C	C	C	C	C	C
I-205 north ramp	SE Washington Street	B	B	B	B	B	B
SE 96th Avenue	SE Main Street	A/F	A/F	A/F	A/F	A/F	A/F
SE 92nd Avenue	SE Powell Blvd	E	E	E	E	**F**[1]	**F**[2]
I-205 south ramp	SE Powell Blvd	B	B	B	B	B	B
I-205 north ramp	SE Powell Blvd	E	E	E	E	E	E
SE 92nd Avenue	SE 91st Place[3]	A/E	A/E	A/E	A/E	B	B
SE 92nd Avenue	SE Holgate Blvd	D	D	D	D	**E**	**E**
SE 92nd Avenue	SE Foster Road	F	F	F	F	F	F
I-205 south ramp	SE Foster Road	B	B	B	B	A	B
I-205 north ramp	SE Foster Road	A	A	A	A	B[4]	B[4]
SE 92nd Avenue	SE Woodstock Blvd	C	C	C	C	C	C
I-205 south ramp	SE Woodstock Blvd	B	B	B	B	B	B
I-205 north ramp	SE Woodstock Blvd	C	C	C	C	C	C
SE 92nd Avenue	SE Flavel Street	E	E	E	E	D	D

Source: DKS Associates and URS/BRW: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. For a signalized intersection, X = level of service; for an unsignalized Intersection, X/X = major street movement/minor street movement; for an all-way stop intersection, X = average approach level of service. Bolded LOS ratings indicate locations that would meet project mitigation criteria.
1 Indicates intersection with a delay impact greater than 10 seconds and a demand-to-capacity ratio change greater than 0.05.
2 Indicates intersection with a delay impact greater than 10 seconds.
3 Indicates a change in intersection operation from unsignalized to signalized for specific alternative.
4 Indicates a change in intersection operation from unsignalized to signalized for specific alternative.

Potential Mitigation

Potential mitigation for the intersection of SE 92nd Avenue/SE Powell Boulevard would consist of optimizing the signal cycle and timing to allow for additional green time for critical movements, and modifications to lane geometry in the northbound direction to change the northbound through/right lane to a right-only lane. In addition, overlapping all of the right-turn lanes at this intersection would help reduce the additional delay caused by the trips associated with the park-and-ride lots.

Johnson Creek Boulevard to William Otty Road Area

The Johnson Creek Boulevard to William Otty Road area is defined as the intersections surrounding the proposed light rail station locations from SE Johnson Creek Boulevard to Clackamas Town Center along I-205. All project area intersections within this sub-area were evaluated to determine potential project-related impacts. The 2020 traffic analysis in this vicinity included improvements to the SE Johnson Creek Boulevard interchange such as a new northbound on ramp to I-205 from westbound SE Johnson Creek Boulevard, and a new southbound off ramp from SE Johnson Creek Boulevard westbound to I-205. Table 4.3-9 summarizes the level-of-service operations for this segment and identifies those intersections where project-related impacts would occur.

Impacts

As Table 4.3-9 indicates, only the intersection of SE Johnson Creek Boulevard with SE Fuller Road and the I-205 southbound off-ramp would meet project criteria for mitigation in this segment. As part of the interchange improvement plan, this intersection would include the realignment of the I-205 southbound off-ramp with SE Fuller Road. This intersection would operate at LOS F as a result of increased intersection delays and increased demand-to-capacity ratios, compared to LOS D under the No-Build Alternative. The project-related impacts at this intersection would be related to additional trips from the Fuller Road Park-and-Ride Lot. The interchange design that was analyzed would not allow for a left turn from westbound SE Johnson Creek Boulevard to southbound SE Fuller Road. If this movement is not available, morning access to the park-and-ride site from I-205 northbound would be via SE 92nd Avenue to SE Otty Road to SE Fuller Road. The intersection of SE Fuller Road and SE Johnson Creek Boulevard with the I-205 southbound off-ramp would not meet ODOT access spacing standards and may not provide a safe operating environment for motorists.

Table 4.3-9
2020 P.M. Peak-Hour Intersection Level of Service, by Alternative:
Gateway to Clackamas Segment – Johnson Creek Boulevard to William Otty Road Area

Intersection		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
SE 82nd Ave	SE Johnson Cr Blvd	F	-	-	-	F	F
SE Fuller Road	SE Johnson Cr Blvd	D	-	-	-	**F**[1]	**F**[1]
I-205 SB On-Ramp	SE Johnson Cr Blvd	A	-	-	-	A	A
I-205 NB Ramp	SE Johnson Cr Blvd	B	-	-	-	B	B
SE 92nd Ave	SE Johnson Cr Blvd	D	-	-	-	D	D
SE 82nd Ave	SE William Otty Rd	C	-	-	-	D	D
SE Fuller Road	SE William Otty Rd	A/F	-	-	-	A/F	A/F
SE 92nd Ave	SE William Otty Rd	C	-	-	-	D	D

Source: DKS Associates and URS/BRW: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. For a signalized intersection, X = level of service; for an unsignalized Intersection, X/X = major street movement/minor street movement; for an all-way stop intersection, X = average approach level of service. Bolded LOS ratings indicate locations that would meet project mitigation criteria.
[1] Indicates intersection with a delay impact greater than 10 seconds and a demand-to-capacity ratio change greater than 0.05.

Potential Mitigation

Some potential mitigation for the poor level-of-service at the intersection of SE Johnson Creek Boulevard at SE Fuller Road and the I-205 southbound off-ramp could be achieved by optimizing the signal timing to allow for additional green time for critical movements, and modifications to lane geometry in the southbound direction to add an additional southbound left-turn lane. However, due to safety concerns, this intersection would not be allowed to operate with westbound left turns or through north-south movements. Mitigation for the safety concerns would require SE Fuller Road south of SE Johnson Creek Boulevard to operate with right in-right out access or with direct access to SE Johnson Creek Boulevard eliminated.

ODOT and Clackamas County have determined that a redesigned interchange may be required at SE Johnson Creek Boulevard at I-205. If the I-205 LRT Alternative is included as an element of the LPA, TriMet should work with ODOT and the county to develop an optimal interchange design that would minimize traffic impacts associated with a park-and-ride structure in this vicinity.

Clackamas Town Center Area

The Clackamas Town Center area is defined as SE Harmony Road, SE Sunnyside Road, SE 82nd Avenue, and SE Monterey Avenue. All project area intersections within this sub-area were evaluated to determine potential project-related impacts. Table 4.3-10 summarizes the level-of-service operations for this segment and identifies those intersections where project-related impacts would occur. The analysis of this project area for the BRT and Busway Alternatives can be found under the Milwaukie to Clackamas Segment.

Table 4.3-10
2020 P.M. Peak-Hour Intersection Level of Service, by Alternative:
Gateway to Clackamas Segment – Clackamas Town Center Area

Intersection		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
SE 82nd Ave	SE Monterey Ave	C	N/A	N/A	N/A	**E**[1]	**E**[1]
SE Bob Schumaker Rd	SE Monterey Ave	C	N/A	N/A	N/A	D	D
SE Fuller RD	SE Harmony Rd	B	N/A	N/A	N/A	B	B
SE 80th Ave	SE Harmony Rd[2]	B/E	N/A	N/A	N/A	A/E	A/E
SE 82nd Ave	SE Sunnyside Rd	F	N/A	N/A	N/A	**F**[3]	**F**[3]
Promenade Access Rd	SE Sunnyside Rd	C	N/A	N/A	N/A	C	C
CTC Access Road	SE Sunnyside Rd	D	N/A	N/A	N/A	D	D
SE 93rd Ave	SE Sunnyside Rd	C	N/A	N/A	N/A	C	C
I-205 SB Ramp	SE Sunnyside Rd	E	N/A	N/A	N/A	E	E
I-205 NB Ramp	SE Sunnyside Rd	C	N/A	N/A	N/A	C	C

Source: DKS Associates and URS/BRW: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; N/A = not applicable; CTC = Clackamas Town Center; SB = southbound; NB = northbound. For a signalized intersection, X = level of service; for an unsignalized Intersection, X/X = major street movement/minor street movement; for an all-way stop intersection, X = average approach level of service. Bolded LOS ratings indicate locations that would meet project mitigation criteria.
1 Indicates intersection with a delay impact greater than 10 seconds and a D/C ratio change greater than 0.05.
2 Indicates a change in intersection operation from unsignalized to signalized for specific alternative.
3 Indicates an intersection with a delay impact greater than 10 seconds

Impacts

As Table 4.3-10 indicates, under the I-205 and Combined LRT Alternatives, two intersections in the Clackamas Town Center area would meet project mitigation criteria: SE 82nd Avenue at SE Harmony Road and SE Sunnyside Road and SE 82nd Avenue at SE Monterey Avenue. The intersection of SE 82nd Avenue at SE Harmony Road and SE Sunnyside Road would be adversely affected by additional vehicular trips associated with the Clackamas Town Center Park-and-Ride Lot – which would lead to LOS E at the intersection, compared to LOS C under the No-Build Alternative. The intersection of SE 82nd Avenue and SE Monterey Avenue would be adversely affected by additional trips generated by the New Hope Shared-Use Park-and-Ride Lot – which would increase delay at the intersection by more than 10 seconds compared to the No-Build Alternative.

Potential Mitigation

The intersection of SE 82nd Avenue at SE Harmony Road and SE Sunnyside Road could be mitigated by optimizing signal timing and phasing, which would result in intersection operating conditions similar to those of the No-Build Alternative. The intersection of SE 82nd Avenue and SE Monterey Avenue could potentially be mitigated by adding a northbound right-turn lane to access SE Monterey Avenue. In addition, the intersection's signal timing and phasing could be optimized to improve operating conditions.

Transit Alternatives Design Options

The Gateway to Clackamas Segment includes one set of design options under the I-205 LRT and Combined LRT Alternative: the Clackamas Town Center Terminus Option. **The East of Clackamas Town Center Terminus Option** was used for the traffic impact analysis within the previous sections. With the **North of Clackamas Town Center Terminus Option** under the I-205 LRT and Combined LRT Alternatives, the Clackamas Town Center TC would be located and reconfigured at its existing location, compared to the more easterly location of the transit center that would occur with the East of Clackamas Town Center Terminus Option. As a result, the Clackamas Town Center East Transit Center

Station would require that two driveways that currently exit onto to SE Monterey Avenue be closed and it would require the relocation of two new signalized access points on SE Monterey Avenue, one 150 feet west of SE 90th Avenue and the second about 900 feet west opposite SE 85th Avenue (which is 750 feet east of SE 82nd Avenue). The proximity (within 50 feet) of the at-grade light rail crossing to SE Monterey Avenue would adversely impact the efficient operation, safety, and bus access of the easternmost driveway due to potentially long queues. To mitigate this impact, an alternative access point opposite SE 90th Avenue that would grade-separate the crossing could be necessary.

B. Park-and-Ride Lot Related Impacts and Potential Mitigation

The Gateway to Clackamas Segment could include up to six park-and-ride lots under the I-205 LRT and Combined LRT Alternatives: the Powell Boulevard, Holgate Boulevard, Foster Road, Fuller Road, New Hope Shared-Use, and Clackamas Town Center East Park-and-Ride Lots. The New Hope Shared-Use Park-and-Ride Lot would occur under all South Corridor Alternatives, while the remaining park-and-ride lots would only occur under the I-205 LRT and Combined LRT Alternatives. The site identified for the Foster Road Park-and-Ride lot does not meet ODOT and FHWA access spacing standards and FHWA would not approve an access break at this location.

Impacts

Powell Boulevard Park-and-Ride Lot would include 400 parking spaces and would generate about 280 vehicle trips in the p.m. peak hour. One access road to the park-and-ride lot would be provided and would be shared with the adjacent State of Oregon offices. The access road's intersection with SE 92nd Avenue would be signalized and would operate at LOS B in the 2020 p.m. peak hour. The proposed signalized intersection would be located approximately 50 feet north of SE 91st Place, which provides access to Marshall High School. This offset intersection would result in queue conflicts and pedestrian crossings at uncontrolled locations. Bus service to this park-and-ride lot would be via SE Powell Boulevard using curbside bus stops (in both directions), which would be accessed from the park-and-ride lot and light rail station via a relocated pedestrian and bicycle path.

Holgate Boulevard Park-and-Ride Lot would include 400 parking spaces in a structure that would be located north of SE Holgate Boulevard and west of I-205, and which would generate approximately 280 vehicle trips in the p.m. peak hour. Automobile access would be provided via a signalized intersection off SE Holgate Boulevard, approximately 450 feet west of SE 96th Avenue and 350 feet east of SE 92nd Avenue. Bus service to the station would be via curbside bus stops on SE Holgate Boulevard, and pedestrians would use the proposed traffic signal to cross SE Holgate Boulevard to access the bus stops. A supplemental parallel pedestrian and bicycle trail would be built east of the park-and-ride lot for the I-205 pedestrian and bicycle path.

Foster Road Park-and-Ride Lot was initially identified as a 150 space surface parking lot located underneath I-205 on a vacant parcel between SE Foster Road and SE Woodstock Boulevard. FHWA has determined that this site would not meet FHWA access control standards for Interstate interchanges and FHWA would not approve an interchange access break for a park-and-ride lot in this location. This park-and-ride lot would generate approximately 110 vehicle trips in the p.m. peak hour. Vehicle access to the park-and-ride lot would be provided through a left-in/left-out lane from SE Foster Road and SE Woodstock Boulevard, which would be located approximately 250 to 300 feet from the I-205 off-ramp intersections. These access points would have limited traffic conflicts and would operate at acceptable levels of service (LOS A/C) due to low access volumes.

Bus access to the station would be provided on the west I-205 frontage road, including a northbound contra-flow lane. For southbound buses, an exclusive bus traffic signal phase would be required to allow a southbound to eastbound bus movement, which was tested in the motor vehicle analysis. Impacts resulting from the exclusive bus traffic-signal phase would be within allowable design standards (every traffic signal cycle would clear in the eastbound direction at SE Woodstock Boulevard/I-205 southbound ramps intersection).

Columns for the light rail structures would need to be placed so as not to impair vehicle sight distance in the station area (the current design of column placements could impair sight distances). The proposed station design would grade-separate pedestrian flows, including the existing I-205 pathway, eliminating potential intersection conflicts.

Fuller Road Park-and-Ride Lot would provide 1,000 parking spaces in a structure that would be located east of SE Fuller Road and approximately 400 feet south of SE Johnson Creek Boulevard. This park-and-ride lot would generate approximately 700 vehicle trips in the p.m. peak hour.

Under the No-Build Alternative, the interchange area along Johnson Creek Boulevard near the Fuller Road Park-and-Ride Lot would be improved compared to existing conditions. These improvements under the No-Build Alternative would include the realignment of the I-205 southbound off-ramp with SE Fuller Road. In addition, a westbound to southbound loop ramp and a westbound to northbound on-ramp would be included within the No-Build Alternative, which would create a partial cloverleaf interchange of I-205 and SE Johnson Creek Boulevard.

With the I-205 LRT and Combined LRT Alternatives, there would be three vehicular access points to the park-and-ride lot from SE Fuller Road: SE Cleo Battin Road north (existing), a driveway directly into the parking structure (proposed), and SE Cleo Battin Road south (existing). The northerly access point at SE Cleo Battin Road and the other two access points on SE Fuller Road would be unsignalized. SE Cleo Battin Road north would be about 350 feet south of SE Johnson Creek Boulevard and slightly offset with the driveway to the former Home Base site to the west. The garage driveway entrance would be opposite another driveway to the former Home Base site and would be about 375 feet south of the SE Cleo Battin Road north access point. The SE Cleo Battin Road south access point would be 150 feet south of the garage access point. The Fuller Road Park-and-Ride Lot access points would operate at LOS A to LOS D in the 2020 p.m. peak hour.

Bus service would circulate in a loop on SE Cleo Battin Road and would have a traffic signal to control access onto SE Fuller Road. ODOT access spacing standards would not allow access within 1,350 feet of an interchange ramp. Based on the designs of the No-Build, I-205 LRT, and Combined LRT Alternatives, SE Fuller Road would be located opposite the southbound I-205 off-ramp. The proximity of the Fuller Road Park-and-Ride Lot to the potential improvements to the I-205 freeway interchange at SE Johnson Creek Boulevard would require further design work with ODOT and Clackamas County to determine the optimal configuration of the interchange area that would meet access spacing standards.

New Hope Shared-Use Park-and-Ride Lot would occur under all of the alternatives under consideration. The park-and-ride lot would consist of 300 surface parking spaces and would be located within the existing New Hope Church parking lot. Access to the park-and-ride lot would be located on the west leg of the signalized intersection of SE Monterey Avenue and SE Bob Schumacher Road (existing access that would not change). The New Hope Shared-Use Park-and-

Ride Lot would generate about 100 to 210 vehicle trips in the p.m. peak hour (depending on the transit alternative). During the 2020 p.m. peak hour, the intersection of SE Monterey Avenue and SE Bob Schumacher Road would operate at LOS C under the No-Build Alternative, LOS D with the Busway, I-205 LRT and Combined LRT Alternatives, and LOS C with the BRT Alternative (all acceptable under local standards). Transit vehicles would travel in mixed traffic on SE Monterey Avenue and SE Bob Schumacher Road.

Clackamas Town Center East Park-and-Ride Lot would have a 500-space parking structure located on the east side of the shopping center, coupled with the relocation of the Clackamas Town Center TC to a location between the eastern Clackamas Town Center parking lot and I-205. This would result in an increase in the number of spaces in the Clackamas Town Center's northern parking lot. The Clackamas Town Center East Park-and-Ride Lot would use existing shopping center access points onto surrounding streets. The 500-space park-and-ride lot would generate approximately 350 vehicle trips in the p.m. peak hour. During most times, the majority of these trips would be oriented to the south and east of the station area. However, during December or Saturday conditions, greater use of the northerly access would likely occur in response to traffic congestion around the Clackamas Town Center (December traffic can be 40% above average during the p.m. peak period). The conflicts between shopping mall trips, park-and-ride lot trips, and transit vehicles will require a more detailed circulation management plan for this area to more fully understand the potential impacts to traffic operations and identify potential mitigation measures that would address those impacts.

Mitigation

Under the I-205 LRT Alternative, the design of the Division Street, SE Powell Boulevard, SE Holgate Boulevard, SE Foster Road, and Fuller Road Stations has the potential to impact the existing I-205 multi-use path. The existing path would be realigned to provide access to the proposed station areas and would use grade separations in several locations. The re-aligned bicycle and pedestrian path would allow for a more direct through route or conflict-free path for bicycle and pedestrian use than the existing path. However, the re-alignment could create conflicts between through-users of the path and transit station users. The width of the I-205 pathway in the vicinity of the station could be re-assessed and widened to account for and accommodate the level of station activity and the potential for pedestrian and bicycle conflicts. Other specific mitigation is discussed below for each station location.

Powell Boulevard Park-and-Ride Lot: The signalized access point to the SE Powell Park-and-Ride Lot could be relocated to align with SE 91st Place.

Holgate Boulevard Park-and-Ride Lot: Further study of the width of the supplemental pathway between the parking structure and the light rail trackway should be conducted to address the pedestrian and bicycle needs for through movement, station access, and waiting.

Foster Road Park-and-Ride Lot: FHWA would not approve an access control break for a park-and-ride lot at this location. Mitigation strategies to be considered should include elimination of the park-and-ride in this vicinity or consideration of alternative park-and-ride sites. Refinements to the bus access and operations plan at this station should be considered to eliminate weaving conflicts in this interchange area. The relocation of light rail structure columns or relocation of park-and-ride driveway access may be necessary to ensure safe operations of auto traffic and buses through this area.

Fuller Road Park-and-Ride Lot: The garage access to SE Fuller Road could be relocated northward to provide equal spacing between the SE Cleo Battin Road north access and south access. This mitigation measure would require coordination of access with the site to the west (formerly housing Home Base) in order to properly align driveways. Options to the configuration of SE Fuller Road opposite the I-205 southbound off-ramp at SE Johnson Creek Boulevard should be evaluated to better meet ODOT's access spacing policy (such as right in/right out access or no access). If direct access were not available via SE Johnson Creek Boulevard, capacity would be available via SE 92nd Avenue and SE William Otty Road for access to the site from the south and east. Alternative park-and-ride sites between SE Johnson Creek Boulevard and SE William Otty Road could be considered that could reduce the park-and-ride traffic demand in the vicinity of the SE Johnson Creek Boulevard interchange. TriMet, Clackamas County, and ODOT should work cooperatively to develop an interchange design and grade separation plan to address each agency's needs while providing for the existing I-205 multi-use path.

Clackamas Town Center East Park-and-Ride Lot: Due to the large variation in traffic at the shopping mall (particularly December), a circulation management plan should be developed for mall access, bus circulation, and the park-and-ride lot to accommodate vehicle access to the mall and the park-and-ride lot. The design of this park-and-ride lot would impact the existing I-205 multi-use path. The existing path would be realigned to allow pedestrian and bicycle access to the transit station, which could create conflicts between through users of the path and transit station users. The width of the I-205 pathway in the vicinity of the station would need to be adequate to accommodate all users and provide for the safe flow of pedestrian and bicycle traffic.

C. Parking Impacts and Potential Mitigation

Table 4.3-11 summarizes the parking impacts for the Gateway to Clackamas Segment: only the I-205 LRT and the Combined LRT Alternatives would remove on-street parking in the Gateway to Clackamas Segment. The alternatives would remove 48 off-street parking spaces in the Lents district at the Copper Penny and 400 spaces at the Clackamas Town Center shopping mall. At the Clackamas Town Center mall, a portion of an existing lightly used parking lot would be removed for a park-and-ride lot structure and spaces currently used for park-and-ride near the existing transit center would be returned to mall use. Potential parking mitigation measures could include the replacement of off-street and/or on-street parking, parking management strategies and/or parking restrictions. Off-street replacements would need to be coordinated with property owners.

Table 4.3-11
Parking Removal: Gateway to Clackamas Town Center Segment for the I-205 and Combined Light Rail Alternatives

Street/Site	Type[1]	Location	Spaces Removed	Current Use[2]
SE Foster Road	Off	Copper Penny	48	N/A
SE Flavel Street	On	At Light Rail crossing	10	0%
SE Fuller Road	On	South of SE Johnson Creek Boulevard	20	0%
East of CTC TC	Off	North of SE Sunnyside Road, west of I-205	400	1%
Total			**430**	

Source: DKS Associates: August 2002.
Note: CTC = Clackamas Town Center; TC = transit center; N/A = not available.
1 On = On-street parking; Off = Off-street parking.
2 Current usage is the daytime occupancy of the parking for that location based upon surveys conducted August 2002.

D. Bicycle Impacts and Potential Mitigation

Bicycle access to station locations would be provided via the I-205 multi-use path, by the east-west Springwater Corridor pedestrian and bicycle path, and by the surrounding on-street bicycle network. The Flavel Street Station would be located near the junction of the I-205 multi-use path and the Springwater Corridor multi-use path, which would increase the need for bicycle facilities at this station.

Some gaps would exist in the planned bicycle network around station locations, for example SE 92nd Avenue near the SE Powell Boulevard and SE Holgate Boulevard Stations does not have on-street bicycle lanes. Other gaps in the planned bicycle network adjacent to proposed station areas include:

- **Holgate Boulevard Station** – bicycle facilities are not planned to the east of the proposed station.
- **Flavel Street Station** – The I-205 LRT alignment would require a re-alignment of the I-205 multi-use path in the vicinity of SE 92nd Avenue and SE Crystal Springs Boulevard. Bicycle facilities are not planned to the east and west of the proposed station.
- **Fuller Road Station –** bicycle facilities are not planned north and south of the proposed station.

Potential mitigation of impacts to and deficiencies in the bicycle network could include the provision of direct bicycle access, either via on-street bicycle facilities or as a shared roadway. In the vicinity of the Flavel Street Station, the City of Portland, ODOT, and TriMet should work to develop a plan to accommodate pedestrian and bicycle movements. This plan could include wider sidewalks along SE 92nd Avenue and enhanced pedestrian crossing treatments at SE Crystal Springs Boulevard. Additional bicycle lockers or storage could be provided at the SE Flavel Street Station to accommodate additional bicycles related to the regional access provided by the nearby Springwater Corridor and I-205 multi-use paths. The responsible local jurisdictions could include planned bikeway improvements serving transit stations as priority projects for local implementation.

E. Pedestrian Impacts and Potential Mitigation

Table 4.3-7 summarizes the pedestrian facilities that would be in the vicinity of the proposed stations within the Gateway to Clackamas Segment. The table describes whether adequate pedestrian facilities exist within the immediate vicinity of the transit stations (primary) and in the area beyond the immediate vicinity of the station but within ¼ mile (secondary). The secondary access would be the responsibility of the local jurisdictions and would not be considered a project responsibility. In general, the project plans for each station area include pedestrian facilities within the immediate station area. Secondary pedestrian access is typically the responsibility of the local jurisdiction.

4.3.2.3 Milwaukie To Clackamas Segment

The Milwaukie to Clackamas Segment generally extends from downtown Milwaukie to the Clackamas Town Center. This section summarizes the following local traffic impacts and potential mitigation that would result from the alternatives and design options under study: level of service at intersections, localized traffic impacts related to proposed park-and-ride lots, parking supply and facilities, bicycle operations and facilities, and pedestrian activities and facilities.

A. Level of Service at Intersections

This section describes the level of service for p.m. peak hour in 2020 at intersections within the Milwaukie to Clackamas Segment that would result from the alternatives and design options under consideration. Due to the numerous intersections evaluated for this segment, the segment has been broken down into smaller sub-areas.

Highway 224/Harmony Road Area

This area is defined as Highway 224 and SE Lake Road/SE Harmony Roads. All project area intersections within this sub-area were evaluated to determine potential project-related impacts. Table 4.3-12 summarizes the level-of-service operations for this segment and identifies those intersections where project-related impacts would occur.

Table 4.3-12
2020 P.M. Peak-Hour Intersection Level of Service, by Alternative:
Milwaukie to Clackamas Segment – Highway 224/Harmony Road Area

Intersection		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Highway 224	SE Harrison St	F	F	**F**[1]	**F**[1]	F	**F**[1]
Highway 224	SE Monroe St[2]	B/F	B/F	B/F	A/F	A/F	A/F
Highway 224	SE Oak St	F	F	**F**[1]	**F**[1]	F	**F**[1]
SE Washington St	SE Oak St	A/D	A/D	A/E	A/D	A/D	A/D
SE Edison St	SE Intl Way	A/B	A/B	A/B	A/B	A/B	A/B
Highway 224	SE 37th Ave	D	D	D	E	D	D
SE 37th Ave	SE Intl Way	A/B	A/B	A/B	A/B	A/B	A/B
SE Freeman Way	Highway 224	C	C	C	C	C	C
Highway 224 Ramp	SE Lake Rd	C	C	C	C	C	C
Highway 224 Ramp	SE Lake Rd	B/F	B/F	B/F	B/F	B/F	B/F
SE Harmony Rd	SE Lake Rd & SE International Way	**E**	**F**[1]	**F**[1]	**F**[1]	E	E
SE Linwood & Harmony Rds	SE Harmony Rd	F	F	F	F	F	F
SE Rusk Rd	Highway 224	E	**E**[3]	**E**[3]	**E**[1]	F	E
SE Lake Rd	Highway 224	F	F	F	F	B	F
SE Pheasant Court	Highway 224	A	A	A	A	A	A
SE Johnson Rd	Highway 224	F	F	F	F	F	F

Source: DKS Associates and URS/BRW: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. For a signalized intersection, X = level of service; for an unsignalized Intersection, X/X = major street movement/minor street movement; for an all-way stop intersection, X = average approach level of service. Bolded LOS ratings indicate locations that would meet project mitigation criteria.
1 Indicates intersection with a delay impact greater than 10 seconds and a demand-to-capacity ratio change greater than 0.05.
2 Indicates a change in intersection operation from signalized to unsignalized.
3 Indicates intersection with a demand-to-capacity ratio change greater than 0.05.

Impacts

As Table 4.3-12 indicates, several intersections would reach project mitigation criteria within this sub-area under all alternatives except the No-Build Alternative. These intersections would meet the criteria primarily as a result of increased vehicular volumes that would be generated by the proposed park-and-ride lots in the segment. The intersections of SE Harrison Street and SE Oak Street along Highway 224 would have additional delay under the Busway and Milwaukie LRT Alternatives caused by additional traffic from the Tacoma Street Park-and-Ride Lot, which would not be an element of the BRT, I-205 LRT, or Combined LRT Alternatives. The intersections of SE Harmony Road at SE Lake Road and SE International Way and Highway 224 and SE Rusk Road would experience additional delay and/or an increase in the demand-to-capacity ratio associated with the Linwood Park-and-Ride, which would occur with the BRT, Busway, and Milwaukie LRT Alternatives.

Potential Mitigation

The intersections of Highway 224 with SE Harrison Street and SE Oak Street could be mitigated by optimizing the signal's timing and phasing. Signal timing splits could also be optimized with an analysis of the No-Build Alternative to determine the potential effectiveness of the mitigation. Further, the intersection of SE Harmony Road at SE Lake Road and SE International Way could be mitigated by modifying the southbound lane geometry to include a dedicated southbound left-turn lane and a shared through and right turn-lane. Signal timing and phasing could be optimized and coordinated with surrounding signals to improve progression along SE Harmony Road and SE Lake Road. Finally, the impacts to the intersection of Highway 224 and SE Rusk Road could be mitigated by modifying the northbound and southbound lane geometry to include separate left-turn pockets (with permitted turns) and shared through and right-turn lanes. Signal timing and phasing could also be optimized and coordinated with surrounding signals to improve progression along Highway 224.

Clackamas Town Center Area

The Clackamas Town Center area is defined as SE Harmony Road, SE Sunnyside Road, SE 82nd Avenue and SE Monterey Avenue. All study area intersections within this sub-area were evaluated to determine potential project related impacts. Table 4.3-13 summarizes the level-of-service operations for this segment and identifies those intersections where project-related impacts would occur. For the I-205 LRT and Combined LRT Alternatives, intersections within this area are discussed under the Gateway to Clackamas Segment.

Table 4.3-13
2020 P.M. Peak-Hour Intersection Level of Service, by Alternative:
Milwaukie to Clackamas Segment – Clackamas Town Center Area

Intersection		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
SE 82nd Ave	SE Monterey Ave	C	D	D	D	N/A	N/A
SE Bob Schumaker Rd	SE Monterey Ave	C	C	C	C	N/A	N/A
SE Fuller Rd	SE Harmony Rd	B	B	B	B	N/A	N/A
SE 80th Ave	SE Harmony Rd[1]	B/E	B/E	A	A/E	N/A	N/A
SE 82nd Ave	SE Sunnyside Rd	F	**F**[2]	F	**F**[2]	N/A	N/A
Promenade Access Rd	SE Sunnyside Rd	C	C	C	C	N/A	N/A
CTC Access Road	SE Sunnyside Rd	D	D	D	D	N/A	N/A
SE 93rd Ave	SE Sunnyside Rd	C	C	C	C	N/A	N/A
I-205 SB Ramp	SE Sunnyside Rd	E	E	E	E	N/A	N/A
I-205 NB Ramp	SE Sunnyside Rd	C	C	C	C	N/A	N/A

Source: DKS Associates and URS/BRW: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; N/A = not applicable; CTC = Clackamas Town Center; SB = southbound; NB = northbound. For a signalized intersection, X = level of service; for an unsignalized Intersection, X/X = major street movement/minor street movement; for an all-way stop intersection, X = average approach level of service. Bolded LOS ratings indicate locations that would meet project mitigation criteria.
1 Indicates a change in intersection operation from unsignalized to signalized for specific alternative.
2 Indicates intersection with a delay impact greater than 10 seconds.

Impacts

As Table 4.3-13 indicates, only the intersection of SE 82nd Avenue at SE Harmony Road and SE Sunnyside Road meets project mitigation criteria for the BRT and Milwaukie LRT Alternatives. The intersection of SE 82nd Avenue at SE Harmony Road and SE Sunnyside Road is primarily affected by additional vehicular trips destined to the Linwood Park-and-Ride Lot.

Potential Mitigation

The intersection of SE 82nd Avenue at SE Harmony Road and SE Sunnyside Road could be mitigated through signal timing and phasing optimization. This mitigation could bring transportation operating conditions within no-build operating conditions.

B. Park-and-Ride Lot Impacts and Potential Mitigation

There would be one park-and-ride lot within this segment with the BRT, Busway, and Milwaukie LRT Alternatives: the Linwood/Harmony Park-and-Ride Station. The **Linwood/Harmony Park-and-Ride Lot** would provide 600 spaces and would be located on the east side of SE Harmony Road, south of the intersection of SE Harmony Road and SE Linwood Road. The Linwood Park-and-Ride Lot would generate approximately 200 vehicle trips during the p.m. peak hour. The intersection of the Linwood/Harmony Park-and-Ride Lot driveway with SE Lake Road would operate at LOS D with a delay of 34.8 seconds/vehicle as an unsignalized intersection (north/south stop controlled), and at LOS C with a delay of 21.3 seconds per vehicle as a signalized intersection during the 2020 p.m. peak hour. The Park-and-Ride access point would be located opposite SE Rusk Road, approximately 600 feet from the intersection of SE Harmony Road and SE Lake Road and SE International Way and 850 feet from the intersection of Highway 224 and SE Lake Road. Bus service would be provided via stops on SE Harmony Road and a pedestrian crossing and median that would provide access to the transit station and park-and-ride lot. An improved pedestrian crossing, which could include overhead flashers, in-roadway lights, advanced pedestrian detection, signs, or signals, could be provided across SE Harmony Road to the Linwood/Harmony Station,

C. Parking Impacts and Potential Mitigation

Table 4.3-14 summarizes the parking impacts for the Milwaukie to Clackamas Segment (for parking removal in the Clackamas Town Center area associated with the I-205 and Combined LRT Alternatives, see Section 4.3.2.2, Gateway to Clackamas Segment). Parking removal would occur in the Milwaukie to Clackamas Segment with the BRT, Busway, and Milwaukie LRT Alternatives. The BRT and Milwaukie Alternatives would result in the removal of 25 off-street spaces in the OIT campus parking lot, which would likely be impacted by the Clackamas County Harmony Road widening project with or without the BRT or Milwaukie LRT Alternatives. The Busway Alternative would result in the removal of on-street parking primarily on SE 80th Avenue and its side street (i.e.,

Table 4.3-14
Parking Removal: Milwaukie to Clackamas Town Center Segment, BRT, Busway and Milwaukie Light Rail Alternatives[1]

Street/Site	Type[2]	Location	Spaces Removed	Current Use[3]
BRT and Milwaukie Light Rail Alternative				
Toys R Us Parking Lot	Off	SW Corner of SE Harmony Rd and SE 82nd Ave	25	0%
Total			**25**	
Busway Alternative				
SE 80th Avenue	On	SE Harmony Road to SE McBride Street	31	33%
SE 80th Side Streets	On	SE Harmony Road to SE McBride Street	24	33%
CTC Parking Lot	Off	South of SE Monterey Ave, East of the CTC TC	120	0%
Total			**175**	

Source: DKS Associates: August 2002.
Note: BRT = bus rapid transit; OIT = Oregon Institute of Technology; CTC = Clackamas Town Center; TC = transit center.
1 See Section 4.3.2.2 and Table 4.3-11 for a summary of parking impacts in the Gateway to Clackamas Segment under the I-205 LRT and Combined LRT Alternatives.
2 On = On-street parking; Off = Off-street parking.
3 Current usage is the daytime occupancy of the parking for that location based upon surveys conducted August 2002.

55 on-street spaces would be removed) and at the Clackamas Town Center (i.e., approximately 120 off-street spaces would be removed). The off-street parking at the Clackamas Town Center would be removed for construction of the busway alignment parallel to and south of SE Monterey Avenue. Replacement of off-street and on-street parking, parking management strategies and parking restrictions could mitigate the impacts of each of the transit corridor alternatives. Off-street parking replacement would be coordinated with property owners.

D. Bicycle Impacts and Potential Mitigation

Bicycle access is included in local jurisdictional plans along the major highways and arterials within the corridor (e.g., Highway 224, SE Harmony Road, SE Sunnyside Road, SE Monterey Avenue and SE 82nd Avenue). However, some gaps would exist in the planned bicycle network around some proposed station locations, as shown below:

- **Oak Street Station** – No bicycle facilities are planned west of the station.
- **Freeman Way Station** – No bicycle facilities are planned east and west of the station.
- **Linwood/Harmony Station** – No bicycle facilities are planned south of the station.

As mitigation for these potential deficiencies in the bicycle network around proposed transit stations, responsible local jurisdictions should include bicycle facilities serving transit stations in as priority projects in updated plans.

E. Pedestrian Impacts and Potential Mitigation

Table 4.3-7 summarizes the pedestrian facilities in the vicinity of the proposed stations within the Milwaukie to Clackamas Segment. The table describes whether adequate pedestrian facilities exist within the immediate vicinity of the transit stations (primary) and in the area beyond the immediate vicinity of the station but within ¼ mile (secondary). The secondary access would be the responsibility of the local jurisdictions and would not be considered a project responsibility.

In general, the project plans for each station area include pedestrian facilities within the immediate station area. Secondary pedestrian access is typically the responsibility of the local jurisdiction. Pedestrian improvements that could be considered by the local jurisdictions in this segment include:

- **Oak Street Station** – Pedestrian improvements could include the installation of sidewalks along SE Oak Street and/or Highway 224 to and from the station location.
- **Linwood Station –** Pedestrian improvements could include the installation of sidewalks along SE Harmony Road in conjunction with the planned widening project.
- **Oregon Institute of Technology Station** – Pedestrian improvements could include the installation of sidewalks along SE Harmony Road and the development of an adequate pedestrian refuge space between the busway and SE Harmony Road.
- **Clackamas Town Center Station** – Pedestrian improvements could include filling in sidewalk gaps along SE Monterey Avenue to enhance pedestrian connectivity.

4.3.2.4 Milwaukie to Oregon City Segment

The Milwaukie to Oregon City Segment generally extends from downtown Milwaukie to Downtown Oregon City. This section summarizes the following local traffic impacts and potential mitigation that would result from the alternatives and design options under study: level of service at intersections, localized traffic impacts related to proposed park-and-ride lots, parking supply and facilities, bicycle operations and facilities, and pedestrian activities and facilities.

A. Level of Service at Intersections

This section describes the level of service for p.m. peak hour in 2020 at intersections within the Milwaukie to Oregon City Segment that would result from the alternatives and design options under consideration.

Milwaukie to Oregon City Segment

This area is defined as the SE McLoughlin Boulevard corridor from SE 22nd Avenue (just south of Downtown Milwaukie) south to the I-205 interchange near Oregon City. Table 4.3-15 summarizes the future transportation operating conditions and comparison of the various transit alternatives.

Table 4.3-15
2020 P.M. Peak-Hour Intersection Level of Service, by Alternative: Milwaukie to Oregon City Segment

Intersection		No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
SE McLoughlin Blvd	SE 22nd Ave	A/E	A/E	A/E	A/E	A/E	A/E
SE McLoughlin Blvd	SE River Rd	A	A	A	A	A	A
SE McLoughlin Blvd	SE Park Ave	C	C	C	C	C	C
SE McLoughlin Blvd	SE Courtney Rd	C	C	C	C	C	C
SE McLoughlin Blvd	SE Oak Grove	F	E	E	F	E	F
SE McLoughlin Blvd	SE Concord Rd	C	C	C	C	C	C
SE McLoughlin Blvd	SE Naef Rd	B	B	B	B	B	B
SE McLoughlin Blvd	SE Roethe Rd	B	B	B	B	B	B
SE McLoughlin Blvd	SE Jennings Ave	B	B	B	B	B	B
SE McLoughlin Blvd	SE Glen Echo Ave	B	B	B	B	B	B
SE McLoughlin Blvd	SE Gloucester St	B	B	B	B	B	B
SE McLoughlin Blvd	SE Arlington St	E	E	E	E	E	E
SE McLoughlin Blvd	SE Dunes Drive	B	B	B	B	B	C
SE McLoughlin Blvd	I-205 SB ramp	D	D	D	D	D	D
SE McLoughlin Blvd	I-205 NB ramp	E	D	D	D	D	E

Source: DKS Associates and URS/BRW: August 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; SB = southbound; NB = northbound. For a signalized intersection, X = level of service; for an unsignalized Intersection, X/X = major street movement/minor street movement; for an all-way stop intersection, X = average approach level of service.

Impacts

Except for the No-Build, all of the improvements within the Milwaukie to Oregon City Segment would be the same, and would consist of intersection, bus stop, and BRT station improvements related to the BRT bus routes that would operate along SE McLoughlin Boulevard (see Section 2.2.2.1 of this SDEIS for more detail). BRT signal improvements would include bus priority traffic signal treatments at 19 intersections along SE McLoughlin Boulevard that would give buses an “early green” or “green extension” if the bus was operating behind schedule. These types of signal modifications would provide additional green time for the northbound and southbound through movements along SE McLoughlin Boulevard, which would typically be the heaviest vehicular movements. The side streets and left-turning movements from SE McLoughlin Boulevard would be the only movements affected by the BRT signal modification. The bus priority treatments would result in additional delay for the minor movements. Level of service at an intersection is based on the average delay accrued by all movements at the intersection in conjunction with the amount of vehicular volumes for each movement. Therefore, any additional delay incurred for side streets and left turns would potentially be offset by the additional green time provided to the heavy north/south through movements.

Based on criteria set forth in the methodology for evaluation of project impacts, the various transit alternatives have no significant impacts to project area intersections in comparison to no-build conditions; therefore, no potential mitigation measures have been identified for traffic impacts in this segment.

B. Park-and-Ride Lot Related Impacts and Potential Mitigation

All of the build alternatives would include two park-and-ride lots in this segment: the Park Avenue Park-and-Ride Lot and the Roethe Road Park-and-Ride Lot.

The Park Avenue Park-and-Ride Lot would include 150 parking spaces that would generate approximately 110 vehicle trips in the p.m. peak hour. Parking would be divided between two lots: an 88-space lot with vehicular access from SE 27th Place located 180 feet south of SE Park Avenue, and a 62-space lot with vehicular access opposite SE 27th Place located about 100 feet west of SE McLoughlin Boulevard. A few additional parking spaces could result from relocating the south lot access southward about 150 feet. Because the proposed parking lots would not include driveway access onto SE McLoughlin Boulevard, two existing driveway accesses from the properties onto SE McLoughlin Boulevard would be closed. Bus access would be via SE McLoughlin Boulevard, with signalized pedestrian crossings at SE Park Avenue, including 8-foot pedestrian refuge medians. Traffic queues on eastbound Park Avenue could occasionally block access to the parking lots at peak times.

The Roethe Road Park-and-Ride Lot is included in the No-Build Alternative and all of the build alternatives. It would provide 150 parking spaces in the northeast corner of the SE McLoughlin and SE Roethe Road intersection. Approximately 110 vehicle trips in the p.m. peak hour would be generated by this park-and-ride lot. One vehicular access point would be provided onto SE Roethe Road, about 150 feet east of SE McLoughlin Boulevard. Traffic queues of on westbound Roethe Road could occasionally block access to the parking lots at peak times. The Rothe Road Park-and-Ride Lot would eliminate one existing driveway onto SE McLoughlin Boulevard. Bus access would be via SE McLoughlin Boulevard, with signalized pedestrian crossings at SE Roethe Road Avenue, including 8-foot pedestrian refuge medians.

Mitigation

This section outlines potential types of mitigation associated with the park-and-ride lots in the Milwaukie to Oregon City Segment.

Park Avenue Park-and-Ride Station. Because queues could occur along SE Park Avenue during peak periods, signs advising traffic not to block the intersection could be placed at the intersection of SE Park Avenue and SE 27th Place.

Roethe Road Park-and-Ride. The access point for the Roethe Road Park-and-Ride Lot could be relocated approximately 100 feet further east to address peak-period queuing that could extend back and block access.

C. Parking Impacts and Potential Mitigation

Table 4.3-16 lists the parking spaces that would be removed as a result of the BRT improvements, which would be included with all of the alternatives except the No-Build Alternative. The primary impact to parking spaces in this segment would be to automobile dealership vehicle storage. Nearly 400 off-street parking spaces would be removed to allow extended right-turn lanes and queue-bypass lanes along SE McLoughlin Boulevard.

Potential mitigation to the loss of off-street parking could include the replacement of off-street parking, reconfiguration of residual parking area, and/or parking management strategies.

Table 4.3-16
Parking Removal: The BRT, Busway, Milwaukie Light Rail, I-205 Light Rail and Combined Light Rail Alternatives in the Milwaukie to Oregon City Segment

Street/Site	Type[1]	Location	Spaces Removed
SE Park Avenue	Off	East side of SE McLoughlin Blvd	15
SE Courtney Road	Off	East and west side of SE McLoughlin Blvd	54
SE Oak Grove Boulevard	Off	East and west side of SE McLoughlin Blvd	18
SE Concord Avenue	Off	West side of SE McLoughlin Blvd	23
SE Naef Road	Off	East and west side of SE McLoughlin Blvd	30
SE Roethe Road	Off	West side of SE McLoughlin Blvd	40
SE Jennings Avenue	Off	East and west side of SE McLoughlin Blvd	48
SE Glen Echo Avenue	Off	East and west side of SE McLoughlin Blvd	28
SE Gloucester Street	Off	East and west side of SE McLoughlin Blvd	81
SE Arlington Street	Off	East and west side of SE McLoughlin Blvd	22
SE Dunes Drive	Off	East side of SE McLoughlin Blvd	33
Total			**392**

Source: DKS Associates: August 2002.
[1] On = On-street parking; Off = Off-street parking.

D. Bicycle Impacts and Potential Mitigation

The RTP identifies bicycle access along SE McLoughlin Boulevard via a Regional Corridor On-street Bikeway. East/West bicycle facilities serving transit stations are included in plans for all of the transit stations in this segment. The responsible local jurisdiction should include bicycle facilities serving transit stations in as priority projects for local implementation.

E. Pedestrian Impacts and Potential Mitigation

Table 4.3-7 summarizes the pedestrian facilities that would be in the vicinity of the proposed stations within the Milwaukie to Oregon City Segment. The table describes whether adequate pedestrian facilities exist within the immediate vicinity of the transit stations (primary) and in the area beyond the immediate vicinity of the station but within ¼ mile (secondary). The secondary access would be the responsibility of the local jurisdictions and would not be considered a project responsibility.

In general, the project plans for each station area include pedestrian facilities within the immediate station area. Secondary pedestrian access is typically the responsibility of the local jurisdiction. Pedestrian improvements that could be considered by the local jurisdictions in this segment include:

- **Park Avenue Station** – Pedestrian improvements could include the construction of sidewalks along SE Park Avenue from the station to the west of Highway 99E.

- **Jennings Road Station** – Pedestrian improvements could include sidewalks along SE Jennings Road to improve connectivity to commercial and residential areas.

4.3.3 Short-Term (Construction) Impacts

The construction of any of the South Corridor build alternatives would result in temporary short-term impacts to local and regional transportation operations. These impacts could potentially include temporary lane closures, temporary signals, detours, and disruption of traffic during peak and/or non-peak times. These impacts could result in temporary traffic intrusion into local neighborhoods as a result of congestion and/or detours, disruption of access by motorized and non-motorized modes to local businesses, and the temporary loss of on-street parking.

The following is a list of some potential construction mitigation measures. This list is not comprehensive, but represents a range of alternatives that could be implemented.

- During construction, impacted transit stops could be temporarily relocated to the nearest possible location on the same transit route without interfering with the construction process.
- During construction, temporary sidewalks and/or pathways could be provided to replace any sidewalks and/or trails adjacent to the project that are impacted by construction.
- To minimize the amount of truck excavation trips to/from the site, efforts should be made to recycle as much of the excavated earth from the project sites as possible.
- Construction truck trips could be monitored on a regular basis so that they minimize impacts to normal traffic operations.
- A comprehensive public outreach program could be developed to inform local residents and businesses of potential delays and impacts to the local street network due to temporary construction.
- To help minimize on-street parking impacts, temporary parking could be identified to mitigate the temporary loss of on-street parking due to construction.

5. FINANCIAL ANALYSIS AND EVALUATION OF ALTERNATIVES

This chapter presents the financial analysis and evaluation of the alternatives for the South Corridor Project. Section 5.1, Financial Analysis, provides information to assess the fiscal feasibility of building and operating the alternatives. Section 5.2, Evaluation of the Alternatives, synthesizes key findings of the other chapters of this Supplemental Draft Environmental Impact Statement (SDEIS) based on the following types of measures and considerations: measures of effectiveness of each alternative in meeting the Project's objectives (Section 5.2.2); equity considerations (Section 5.2.3); and the major tradeoffs between the alternatives (Section 5.2.4).

5.1 Financial Analysis

This section presents the analysis of financing scenarios for the South Corridor Project alternatives. The financial analysis is conducted in two parts, one for *project capital costs* and one for *system costs* because each part has a different financing plan. This method of analysis clearly differentiates between one-time project capital cost requirements and ongoing system fiscal results. Additional details of the Financial Analysis including the system cash-flow analyses are reported in the *South Corridor Project Financial Analysis Results Report* (Metro, November 2002).

Project Capital Funding Analysis: The Project Capital Funding Analysis focuses on whether there are adequate capital resources to construct each alternative and, if not, the options that will be considered during preliminary engineering (the next phase of project development) for resolving the capital shortfall. South Corridor Project capital costs are only those costs associated with constructing the South Corridor Project alternatives. Over the Project's 20-year planning period, The Tri-County Metropolitan Transportation District of Oregon (TriMet) will have other capital costs that are not associated with constructing the South Corridor Project. These other capital costs are considered *system capital costs* and, as such, are accounted for in the System Funding Analysis.

The Project Capital Funding Analysis is based on the following key elements:

- **Construction Schedule.** For all alternatives, estimates of capital costs in year-of-expenditure (YOE) dollars are based on a schedule under which civil construction and vehicle acquisition would occur between July 2005 and July 2008, with the initiation of revenue service in September 2008.

- **Construction Cost Inflation.** All construction costs are projected to inflate at 4.0% per year between March 2002 (the date of the capital cost estimate in current year dollars (i.e., un-inflated dollars)) and September 2008, when project construction would be complete and revenue operations would begin.

System Funding Analysis. The System Funding Analysis focuses on whether there are adequate resources to operate and maintain the entire transit system, including operations of the South Corridor Project, over the 20-year planning period and, if not, the options to be considered during preliminary engineering for resolving the system shortfall. System costs include all transit operating and maintenance costs and all transit capital expenditures to 2020, except for South Corridor Project capital costs. The System Funding Analysis is based on the following key elements:

A. **Annual Transit Service Increase.** Absent the South Corridor Project, transit service (as measured by revenue hours) would increase at 1.1% per year, beginning in fiscal year (FY) 2006 and continuing throughout the planning period. The baseline transit network incorporates the start-up and continuing operations of the Yellow Line from downtown Portland to the Expo Center in North Portland (currently under construction), the Wilsonville to Beaverton Commuter Rail line (proposed to enter final design in the near future), and the extension of the Yellow Line into Vancouver, Washington (which is included in the financially-constrained *Regional Transportation Plan* (RTP) and, therefore, in the No-Build Alternative). In addition, existing rail operations would be expanded on an ongoing basis in response to increasing demand. The South Corridor Project alternatives include these transit service improvements, plus additional bus and, when applicable, light rail service associated with the implementation of the alternative.

B. Operations Cost Inflation. For the period FY 2002 through FY 2022, agency personnel costs would inflate as follows: 1) union wages increase at 3.15% per year, and management salaries at 3.0% per year; 2) health benefits costs increase 12.0 to18.8% in FY 2003 through FY 2007 and 10% thereafter; 3) workers compensation expenses increase 3.1% per year throughout the forecast; and 4) materials and services increase 3.0% per year. In FY 2000, TriMet began its Productivity Improvement Program (PIP), which has already reduced continuing expenditures by $6.5 million without reducing service levels. The forecasts are based on a continuation of the PIP program, which would reduce operating expenses by an additional $11 million through efficiency improvements in such items as spare ratios, fleet mix, energy consumption, parts management, replacement cycles, attendance, facilities requirements, schedules, health care costs, staffing, and extra-board size.

C. System Capital Cost Inflation. System capital costs consist mostly of bus and rail vehicle procurement required for fleet replacement and expansion and is generally expected to inflate at a lower rate than light rail construction costs, which have substantial civil construction and specialized system component procurement costs. Consequently, the costs of all transit capital expenditures other than the South Corridor Project would inflate at 3% per year.

D. Tax Revenue Increases. Payroll tax revenues, self-employment tax revenues, and state in lieu of tax revenues are forecast based on the key elements documented in Section 5.1.2.2.

E. Fares. Fares would increase by 3% every year, except that in FY 2006 there would be a 6% fare increase, which would comply with TriMet's current financial plan.

5.1.1 Costs

This section examines both Project Capital Costs and Systems Costs for each of the alternatives. Costs are shown in 2002 dollars and YOE dollars. The 2002 dollars capital and operating costs are consistent with those shown in Chapter 2 of this SDEIS. YOE dollars were calculated by inflating 2002 dollars costs by the appropriate inflation index for that cost component.

5.1.1.1 South Corridor Project Costs

This section summarizes the South Corridor Project capital costs and the South Corridor Project Operations and Maintenance (O&M) costs.

A. South Corridor Project Capital Costs

This section summarizes the projected capital costs for the alternatives under consideration. The capital costs for each alternative are broken down in several ways. First, the capital costs are divided between bus rapid transit (BRT) improvements and fixed-guideway (i.e., busway and light rail) improvements (see Section 2.2 for a definition of BRT and fixed-guideway improvements). Second, capital costs are divided between capital costs that would be incurred before the project initiates operations (in September 2008) and capital costs that would be incurred between 2008 and 2020. Third, capital costs are presented in current dollars (i.e., 2002 dollars) and YOE dollars.

Table 5.1-1 shows the BRT capital costs and, where applicable, the fixed-guideway capital costs in 2002 dollars and YOE dollars for each alternative (see Table 2.2-3 and Section 2.3 of this SDEIS for more detail). The capital costs include all facility improvements, right-of-way costs, and vehicle purchases required by each project alternative, in excess of the already-committed capital costs associated with the No-Build Alternative. The capital costs shown for each alternative in Table 5.1-1 are divided into four categories:

- **Fixed-guideway opening day costs**, which include the initial construction costs of the busway or light rail line, as applicable, that would be included in a Full Funding Grant Agreement (FFGA) with the Federal Transit Administration (FTA).
- **Fixed-guideway 2008 to 2020 costs**, which include the costs of the vehicles and maintenance facilities that would need to be added after the project is complete to meet forecast 2020 service levels.
- **BRT opening day costs,** which include the initial bus acquisition and bus-related improvement capital costs associated with the alternative.
- **BRT 2008 to 2020 costs**, which include the capital costs of the additional buses that would need to be added beyond those in the initial project to meet forecast 2020 service levels.

The cumulative total of opening day costs and 2008 to 2020 costs represents the entire cost of the 2020 network.

As shown in Table 5.1-1, constructing and equipping the BRT Alternative would initially cost (Opening Day Cost), in 2002 dollars, $98.02 million, and an additional $11.88 million would be required over the year 2008 to 2020 period to meet projected year 2020 service levels. The $109.90 million (2002 dollars) total capital cost (Opening Day and 2008 to 2020 Costs) of the BRT equates to $131.15 million in year of expenditure dollars (YOE dollars), when inflation is taken into account.

The opening day cost of the Busway Alternative would be $281.73 million (YOE dollars), and another $15.14 million would be required for additional vehicles and light rail O&M facility expansion costs during the 2008 to 2020 period, for a total cost of $296.87 million.

The $489.95 million (YOE dollars) estimated total opening day cost of the Milwaukie LRT Alternative would include $417.65 million for the fixed-guideway element and $72.30 million in bus and bus-related capital costs in the Milwaukie to Oregon City and Milwaukie to Clackamas Segments. While the Milwaukie LRT Alternative would result in a $2.41 million (YOE dollars) reduction in bus purchase costs during the 2008 to 2020 period (compared to the No-Build Alternative), it would also require $30.43 million for additional light rail vehicles and expansion of TriMet's light rail O&M facilities during this period. As shown in Table 5.1-1, the total cost (i.e., bus and rail opening day and 2008 to 2020 costs) of the Milwaukie LRT Alternative would be $517.97 million (YOE dollars).

Table 5.1-1
South Corridor Project Capital Costs, by Alternative, Mode and Timeframe

Cost Category[1]	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Capital Costs in 2002 Dollars					
Fixed-Guideway Opening Day	$0.00	$236.10	$350.01	$292.52	$670.46
Fixed-Guideway 2008 to 2020	$0.00	$12.69	$25.50	$86.15	$47.51
BRT Opening Day	$98.02	$0.00	$60.59	$50.83	$18.67
Fixed Guideway 2008 to 2020	$11.89	$0.00	($2.02)	$2.00	($4.87)
Total Costs in 2002 Dollars					
Fixed-Guideway	$0.00	$248.79	$375.51	$378.67	$717.97
BRT	$109.91	$0.00	$58.57	$52.83	$13.81
Total	**$109.91**	**$248.79**	**$434.08**	**$431.50**	**$731.78**
Capital Costs in YOE Dollars					
Fixed-Guideway Opening Day	$0.00	$281.73	$417.65	$349.05	$800.03
Fixed-Guideway 2008 to 2020	$0.00	$15.14	$30.43	$102.80	$56.69
BRT Opening Day	$116.97	$0.00	$72.30	$60.66	$22.28
Fixed Guideway 2008 to 2020	$14.18	$0.00	($2.41)	$2.38	($5.80)
Total Costs in YOE Dollars					
Fixed-Guideway	$0.00	$296.87	$448.08	$451.85	$856.72
BRT	$131.15	$0.00	$69.89	$63.04	$16.48
Total	**$131.15**	**$296.87**	**$517.97**	**$514.89**	**$873.20**

Source: TriMet, November 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; YOE = year-of-expenditure.
[1] Opening day costs would be costs incurred for improvements that would be made prior to opening day (i.e. September 2008). 2008 to 2020 costs would be incurred for improvements that would be made between opening day and 2020.

While the total opening day and 2008 to 2020 YOE costs of the I-205 LRT Alternative, including BRT and fixed-guideway costs, would be slightly lower than the Milwaukie LRT Alternative ($514.89, compared to $489.95 million), the opening day cost of the I-205 LRT Alternative would be $80.23 million less than the Milwaukie LRT Alternative ($409.71 million, compared to $489.94 (YOE dollars)). The fixed-guideway element itself would be $68.60 million (YOE dollars) less than the fixed-guideway element of the Milwaukie LRT Alternative. However, the 2008 to 2020 cost of the I-205 LRT Alternative would be $77.15 million (YOE dollars) more than that of the Milwaukie LRT Alternative, because of the higher projected growth in ridership and the resultant need for additional vehicles and expansion of TriMet's light rail O&M facilities during that period.

The total cost of the Combined LRT Alternative would be $873.20 million (YOE dollars), with $856.72 million for fixed-guideway facilities and vehicles. Accounting for the savings in bus capital costs (compared to the No Build Alternative) during the 2008 to 2020 period, the BRT cost of the Combined LRT Alternative would be $16.48 million, $46.56 to $53.41 million less than the other light rail alternatives.

While the costs in Table 5.1-1 are based on a baseline design option for each alternative (see table 2.2-3), Table 5.1-2 illustrates the range of total capital costs (opening day and 2008 to 2020 costs for bus and rail) in 2002 dollars and YOE dollars that would result from the various design options for each alternative. The total capital cost of the BRT Alternative would range from $119.04 to $131.15 million (YOE dollars); the cost of the Busway Alternative would range from $268.09 to $299.29 million; the cost of the Milwaukie LRT Alternative would range from $466.80 to $517.97 million; the cost of the I-205 LRT Alternative would range from $507.39 to $514.90 million; and the cost of the Combined LRT Alternative would range from $826.63 to $873.21 million (YOE dollars).

Table 5.1-2
Summary of Project Capital and Operating Costs by Alternative in Millions of Dollars

	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Project Capital Costs (Total Opening Day and 2008 to 2020 Costs) in 2002 Dollars					
Total Cost: Lowest Cost Design Option	$ 99.76	$224.68	$391.22	$425.22	$692.78
Total Cost: Highest Cost Design Option	$109.91	$250.81	$434.09	$431.51	$731.79
Project Capital Costs (Total Opening Day and 2008 to 2020 Costs) in YOE Dollars					
Total Cost: Lowest Cost Design Option	$119.04	$268.09	$466.80	$507.39	$826.63
Total Cost: Highest Cost Design Option	$131.15	$299.29	$517.97	$514.90	$873.21
Year 2020 Corridor Annual Operating Costs (in 2002 Dollars)					
Bus Operations	$69.71	$70.75	$62.87	$65.16	$61.34
LRT Operations	$ 0.00	$ 0.00	$ 7.03	$ 9.28	$13.34
Total Operations	$69.71	$70.75	$69.90	$74.34	$74.68
Year 2020 Corridor Annual Operating Cost: Difference from No-Build Alternative (in 2002 Dollars)					
Bus Operations	$ 7.19	$8.24	$0.36	$ 2.65	($1.17)
LRT Operations	$ 0.00	$0.00	$7.03	$ 9.28	$13.34
Total Operations	$ 7.19	$8.24	$7.39	$11.92	$12.17

Source: TriMet, November 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; YOE = year-of-expenditure.

B. South Corridor Project Operating & Maintenance Costs

Table 5.1-2 also shows 2020 corridor O&M costs for each alternative. Corridor operating costs include the cost of operating and maintaining all transit lines within the geographic area defined as the South Corridor in Chapter 1. The estimates shown in Table 5.1-2 incorporate all bus O&M costs associated with the South Corridor, including the O&M cost of the South Corridor Project alternatives. As shown, 2020 corridor O&M costs range from a low of $69.71 million (2002 dollars) for the BRT Alternative to a high of $74.68 million for the Combined LRT Alternative. The O&M cost of the build alternatives would range from $7.19 to $12.17 million more than the No-Build Alternative. In general, there would be no range in O&M costs related to the Alternatives' design options, except that the Milwaukie Middle School Terminus Option of the Milwaukie LRT Alternative would cost slightly less to operate and maintain than the Lake Road Terminus Option.

5.1.1.2 System Costs

System costs include all capital and O&M expenditures by TriMet over the 20-year planning period, except the capital costs for the South Corridor Project. Total system cost is the aggregate of system operating costs and system capital costs.

System operating costs include all annual transit operating and maintenance costs, including the cost of operating and maintaining the existing transit system, customary increases in transit service hours throughout the system that are required to maintain headways and capacity, the applicable South Corridor Project alternative, and the expanded bus network in the South Corridor that would be required to support the project alternative.

Table 5.1-3 shows the cumulative system operating costs (shown in YOE dollars) covering the 20-year planning period for each alternative. These costs are based on the 2020 O&M costs shown in Table 5.1-1. Those costs were calculated for the interim years by extrapolating between the opening year costs and the 2020 costs and converting to YOE dollars by inflating the 2002 dollar costs by the applicable inflation rate. The resulting year-by-year costs were then summed to determine the cumulative totals shown in Table 5.1-3.

Table 5.1-3
Summary of Transit System Costs: Cumulative Total from FY 2002 to FY 2020
(In Millions of YOE Dollars)

	No Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
System Operating Costs	$ 9,742.3	$ 9,943.7	$ 9,967.4	$ 9,941.9	$10,067.8	$10,314.7
System Capital Costs[1]	$ 1,097.8	$ 1,097.8	$ 1,097.8	$ 1,097.8	$ 1,097.8	$ 1,097.8
Total System Costs	**$10,840.1**	**$11,041.5**	**$11,065.2**	**$11,039.7**	**$11,165.6**	**$11,412.5**

Source: TriMet, November 2002.
Note: FY = fiscal year; YOE = year-of-expenditure; BRT = bus rapid transit; LRT = light rail transit.
[1] System capital costs include the costs of all replacement and improvements during the 20-year planning period except for the initial construction of the South Corridor Project, which is why all values are the same.

Table 5.1-3 also shows the cumulative system capital costs of the alternatives over the 20-year planning period in YOE dollars. System capital costs include all currently-committed capital projects except the South Corridor Project, a regular schedule of vehicle replacement purchases, the purchase of additional vehicles that would be required by customary service increases, and the purchase of additional vehicles required to support the transit expansion in the South Corridor. The only capital costs not accounted for in the system capital costs are those capital costs incorporated into the South Corridor Project. As shown in Table 5.1-3, the cumulative system capital cost in YOE dollars among alternatives would be the same because there would be no need to upgrade any improvements associated with a South Corridor Project alternative prior to 2020. Consequently, all of the alternatives would require the same replacement and capital improvement program.

The total system cost of an alternative is the sum of system capital costs and system operating costs. Table 5.1-3 shows that the total system cost for the No Build Alternative in YOE dollars (covering the period FY 2002 through FY 2020) would be about $200 million to $572 million less than the total system cost for the project's build alternatives. The BRT, Busway, and Milwaukie LRT Alternatives would result in similar total system costs – about $100 to $126 million less than the I-205 LRT Alternative. The total system cost of the Combined LRT Alternative would be about $247 to $373 million higher than that of the other build alternatives.

5.1.2 Currently Available Resources

Two categories of available revenue resources are examined within this section: revenue resources reserved for South Corridor Project capital costs and revenue resources reserved for transit system costs.

5.1.2.1 Currently Available Transit Project Capital Revenues

The $69.4 million of revenues currently available for project capital costs consist of the following (not all sources or amounts are available for all alternatives):
$24.4 Million in Regional Surface Transportation Program (STP) Funds. The Transportation Efficiency Act for the 21st Century (TEA-21), the current federal transportation act, authorizes STP funds for road and transit projects. STP funds are allocated to the Oregon Department of Transportation (ODOT) on the basis of a federal formula. ODOT allocates a portion of its STP funds to metropolitan regions within Oregon by formula. STP funds that are allocated by formula to the Portland region are programmed to specific projects based on recommendations by the Joint Policy Advisory Committee on Transportation (JPACT) and the approval of the Metro Council, which is the region's Metropolitan Planning Organization (MPO). In January 1997, JPACT recommended and Metro approved Resolution No. 96-2442, which committed $55 million of STP funds to the earlier South/North Corridor Project. In June 1999, JPACT recommended and Metro approved Resolution No. 99-2806A, which amended Resolution No. 96-2442 by adding another $12.5 million of STP funds toward the "North Light Rail and South Corridor Transit Financing Strategy."

Combined, these actions by Metro created a commitment of STP funds consisting of $1.5 million in FY 1999 (which has been expended on planning for the South Corridor Project) and $6.0 million per year for the period FY 2000 through FY 2010. Of this total, $40 million has been allocated to construction of the Yellow Line (i.e., Interstate MAX) and related bus purchases. The remaining $2.0 million of STP funds in FY 2006 and $6.0 million per year in FY 2007 through FY 2010 are available for construction of the South Corridor Project. Because a portion of these funds become available after construction of the South Corridor Project is anticipated to be complete, the finance plan would use the final 2 years of STP funding to repay interim borrowing (principal and interest). As a result, the STP commitment for the South Corridor Project would have a value of approximately $24.4 million during the Project's construction period. These funds would be available to pay opening day costs for any of the South Corridor Project alternatives.

$30 Million in Clackamas County Tax Increment Funds. The Clackamas County Board of Commissioners, acting as the urban renewal agency for the county, established the Clackamas Town Center Urban Renewal District (CTC URD) and adopted the *Urban Renewal Plan* and budget for the planned improvements. In enacting Order 96-279, the Clackamas County Board of Commissioners programmed $12 million for the construction of a transitway project. The *Urban Renewal Plan* for the CTC URD includes funding for other improvements needed for the South Corridor Project, which could increase the amount of CTC URD tax increment funds available to the South Corridor Project to $30 million. These funds may only be used to pay the opening day costs of physical improvements within the CTC URD.

$15 Million in TriMet General Funds for Opening Day Costs. The $125 million general obligation (G.O.) bond passed by the voters in 1990, primarily to fund the local share of the now complete the Blue Line (i.e., the Westside Light Rail Project), authorized (but did not require) that $15 million of the proceeds could be used for a South Corridor Project. Because the South Corridor Project was not ready to use these funds at the time of the Westside Light Rail Project, TriMet committed to provide $15 million from its General Fund to the South Corridor Project in lieu of the bond proceeds. Consequently, TriMet was able to apply the $15 million of bond proceeds to the Westside Light Rail Project. TriMet has reserved its capacity to provide the $15 million to the South Corridor Project, when needed, through its annual budgeting and financial planning processes. These funds would be available to pay opening day costs for each of the South Corridor Project alternatives.

5.1.2.2 Available Transit System Revenues

System revenues are derived from a series of sources. As shown in Table 5.1-4, existing transit system revenue sources are projected to provide between $11.191 and $11.230 billion (YOE dollars) between FY 2002 and FY 2020, depending on the alternative. The difference between alternatives reflects differences in passenger revenues and interest earnings. The major sources of available system revenue and the key baseline assumptions follow.

Table 5.1-4
Summary of Currently Available Transit System Revenues Without a New Revenue Source: Cumulative Total from FY 2002 to FY 2020, by Alternative (in billions of YOE dollars)

	No Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
System O&M Revenues						
Passenger Revenues	$2.120	$2.141	$2.150	$2.174	$2.213	$2.239
Employer/Municipal Payroll Tax	$6.516	$6.516	$6.516	$6.516	$6.516	$6.516
Self-Employment Tax	$0.254	$0.254	$0.254	$0.254	$0.254	$0.254

State In-Lieu	$0.069	$0.069	$0.069	$0.069	$0.069	$0.069
Grants/Capital Reimbursement	$1.005	$1.005	$1.005	$1.005	$1.005	$1.005
Cigarette Tax	$0.089	$0.089	$0.089	$0.089	$0.089	$0.089
Interest	$0.142	$0.092	$0.127	$0.090	$0.126	$0.027
Other	$0.749	$0.749	$0.749	$0.749	$0.749	$0.749
Subtotal[1]	**$10.943**	**$10.914**	**$10.919**	**$10.945**	**$10.953**	**$10.948**
System Capital Revenues						
Grants: State or Federal[2]	$0.103	$0.103	$0.103	$0.103	$0.103	$0.103
Bond Proceeds	$0.174	$0.174	$0.174	$0.174	$0.174	$0.174
Subtotal	**$0.277**	**$0.277**	**$0.277**	**$0.277**	**$0.277**	**$0.277**
Total System Revenues	**$11.220**	**$11.191**	**$11.196**	**$11.222**	**$11.230**	**$11.225**

Source: TriMet, November 2002.
Note: FY = fiscal year; YOE = year-of-expenditure; BRT = bus rapid transit; LRT = light rail transit.
[1] System operations revenues not needed for operating costs would be available for system capital costs.
[2] General funds revenues that would be transferred to the capital fund are shown in the system operations subtotal.

Payroll Tax Revenues. TriMet currently levies a 0.6218% tax on the gross payrolls of private businesses and municipalities within its district. The tax is dedicated to TriMet and is TriMet's largest source of operating revenue, accounting for nearly 54% ($152 million) of its operating revenues in FY 2001. The employer/municipal payroll tax has been a growing revenue source since its inception about 30 years ago. During that time, there have been two recessions (in FY1983 and FY 2002) during which payroll tax receipts declined. While payroll tax proceeds exceeded historic and projected growth levels for most of the past decade, payroll tax receipts declined 3.5% in FY 2002.

Employer/municipal payroll tax revenues are projected to increase 1.1% in FY 2003, 7.1% in FY 2004, and 10.5% in FY 2005, based on short-term forecasts commissioned by TriMet. After FY 2005, the employer/municipal payroll tax is projected to grow at an average annual rate of 7.2%. This projected growth rate for private and municipal payrolls matches the actual growth rate during the 20-year period between FY 1979 and FY 1999, a period which included one recession (FY 1983) and one pronounced slowdown (FY 1992).

Self-Employment Tax Revenues. TriMet also levies a 0.6218% tax on the gross profits earned within its district by self-employed individuals. Over the period of FY 1986 to FY 2001, self-employment tax proceeds grew by 6.1% annually. In FY 2002, self-employment tax revenues increased 11.1%. Based on short-term forecasts commissioned by TriMet, self-employment tax revenues are projected to decrease by 5.0% in FY 2003, increase by 8.6% in FY 2004, and decrease by 1.1% in FY 2005. After FY 2005, self-employment tax proceeds are estimated to grow at the historical rate of 6.1% per year.

State In-Lieu Revenues. State of Oregon government offices located within TriMet's district boundaries are not subject to the municipal payroll tax. Instead, the offices make in-lieu of tax payments to TriMet. In FY 1989, state-in-lieu revenues totaled $1.5 million. From FY 1988 through FY 1995, state-in-lieu proceeds increased by 6.8% per year. In the next two fiscal years, these receipts decreased due to the conversion of Oregon Health and Sciences University (OHSU) from a state agency paying in-lieu of tax to a private employer paying payroll tax; however, state in lieu of tax revenues grew 15.9% in FY 2002. Based on short-term projections commissioned by TriMet, state in lieu of tax revenues are projected to increase 15.1% in FY 2003, 2.7% in FY 2004, and 4.5% in FY 2005. After FY 2005, state-in-lieu proceeds are projected to increase at 4.1% per year, the average annual rate of growth since 1984 (adjusting for the conversion of OHSU from state to private employer).

Grants and Capital Reimbursement. The forecast is based on a projection that TriMet will receive the Federal Section 5307 funds in FY 2003, as proposed by the Bush Administration, and that Section 5307 funds will grow thereafter by 3% per year.

The forecast is also based on a projection that TriMet will receive Rail Modernization funds in FY 2003, as proposed by the Bush Administration, and that Rail Modernization funds will grow by 2% per year thereafter. Further, the forecast is based on the projection that additional Rail Modernization funds would become available to TriMet as a result of rail projects that have opened since 1998 (i.e., Westside MAX, Interstate MAX, Airport MAX, and the Wilsonville to Beaverton County Commuter Rail projects) reaching the age requirement for Rail Modernization funds.

In addition, several different allocations of STP funds for TriMet's preventive maintenance program have been approved by JPACT and Metro and are included in the forecast. The forecast is also based on a continuation of regional Congestion Management Air Quality funds for the Travel Demand Management, Regional Transportation Management Association, and Region 2040 Programs. These revenues are projected to increase by 3.4% per year after FY 2003. Grants and capital reimbursement also includes a variety of existing, one-time-only funds.

Passenger Revenues. Passenger revenues are TriMet's second largest revenue source. In FY 2002, passenger revenues totaled $53.2 million, 19.4% of operating revenue. Passenger revenue forecasts are derived from forecasts of ridership and fares on LIFT, MAX, commuter rail and bus services.

In 1990, TriMet implemented a policy of biennial fare increases and the forecast is based on a continuation of this policy. TriMet also increases fares to fund special service increases. To that end, TriMet has implemented supplemental fare increases in September 1999 and September 2001. These fare increases have been enacted without ridership losses. Since FY 1989, passenger revenues have increased 140% while ridership has increased 76%. The revenue forecasts are based on a 3% per year increase in fares and a one-time supplemental fare increase of 3% in FY 2006.

5.1.3 Existing Revenue Shortfalls

This section discusses the amount of additional Project and System revenues that are needed to make each alternative fiscally feasible. In this study, an alternative is fiscally feasible if:

- Project capital revenues are sufficient to meet the capital cost of the alternative; and
- Ongoing revenues are sufficient to meet the estimated total System costs plus maintain a beginning-year working capital reserve sufficient to fund 2 months of operating costs.

5.1.3.1 Existing Project Capital Revenue Shortfalls

Table 5.1-5 summarizes the capital funding shortfalls (currently available capital revenues minus the capital costs of the alternative) for each alternative in YOE dollars. The capital costs shown include all capital costs (opening day and 2008 to 2020 costs for the BRT and, if applicable, fixed-guideway components) for an alternative.

Table 5.1-5
Summary of Project Capital Revenue Shortfalls: Total Opening Day and 2008 to 2020 BRT and Fixed-Guideway Costs, by Alternative (in millions of YOE dollars)

	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Low-Cost Design Option					
Project Capital Cost	$119.04	$268.09	$466.80	$507.39	$826.63
Available Capital Revenues	$39.40	$39.40	$39.40	$69.40	$69.40
Project Capital Shortfall	**$79.64**	**$228.69**	**$427.40**	**$437.99**	**$757.23**
High-Cost Design Option					
Project Capital Cost	$131.15	$299.29	$517.97	$514.90	$873.21
Available Capital Revenues	$39.40	$39.40	$39.40	$69.40	$69.40
Project Capital Shortfall	**$80.55**	**$259.89**	**$478.57**	**$445.50**	**$803.81**

Source: TriMet, November 2002.
Note: YOE = year-of-expenditure; BRT = bus rapid transit; LRT = light rail transit.

As shown in Table 5.1-5, project capital shortfalls would occur with all of the alternatives, ranging from $79.64 million for the low-cost BRT Alternative to $803.81 million for the high-cost Combined LRT Alternative (note that the low-cost alternative is based on selecting the lowest-cost design option in each instance and the high-cost alternative is based on selecting the highest-cost design option in each instance – see Table 5.1-2 for the low and high-cost range for each alternative, and see Sections 2.2 and 2.3 for a description of the various design options and the cost differences between the design options, respectively). Options for eliminating these shortfalls, including possible federal funds, are discussed in Section 5.1.4.

5.1.3.2 Existing System Revenue Shortfalls

System costs and revenues were projected on a year-by-year basis over the 20-year period based on the key elements of the fiscal analysis described in previous sections. Identical analyses were prepared for all alternatives. While there would be some variations in the results by alternative, depending on the design options selected, those differences would not have a material effect on the basic conclusions described below. Table 5.1-6 shows the year-by-year *beginning working capital* results expressed in *YOE dollars* and in *months of operations*. This table presumes no new transit operating funds. As mentioned previously, the fiscal condition of transit system operations is considered adequate if the beginning of year operating reserve (measured in months of operations) is maintained at 2 months.

As shown in Table 5.1-6, existing system revenues are insufficient for all alternatives to maintain beginning year operating reserves at the desired 2-month levels beginning in FY 2008 and continuing for 11 or more years, depending on the alternative. While existing revenues are sufficient to avoid negative operating results for the BRT, Busway, and Milwaukie LRT Alternatives, the I-205 LRT and Combined LRT Alternatives would begin to exhibit negative operating results in FY 2013 and FY 2011, respectively.

Table 5.1-6
System Fiscal Feasibility Analysis: No New System Revenues
Beginning Working Capital 2002-2022 in Millions of Year-of-Expenditure (YOE) Dollars

	BRT		Busway		Milwaukie LRT		I-205 LRT		Combined LRT	
FY	Beginning Working Capital	Months of Operating Expense	Beginning Working Capital	Months of Operating Expense	Beginning Working Capital	Months of Operating Expense	Beginning Working Capital	Months of Operating Expense	Beginning Working Capital	Months of Operating Expense
2002	$91.0	4.1	$91.0	4.1	$91.0	4.1	$91.0	4.1	$91.0	4.1
2003	$83.0	3.7	$83.0	3.7	$83.0	3.7	$83.0	3.7	$83.0	3.7
2004	$74.1	3.2	$74.1	3.2	$73.7	3.2	$73.7	3.2	$73.7	3.2
2005	$69.9	2.8	$69.9	2.8	$69.0	2.8	$69.0	2.8	$69.0	2.8
2006	$66.6	2.5	$66.6	2.5	$65.6	2.5	$65.5	2.5	$65.5	2.5
2007	$64.8	2.3	$62.9	2.3	$61.3	2.2	$61.0	2.2	$61.0	2.2
2008	$49.6	1.7	$49.5	1.7	$48.7	1.7	$47.4	1.6	$47.7	1.7
2009	$45.3	1.5	$44.8	1.4	$45.3	1.4	$42.7	1.3	$43.8	1.3
2010	$38.8	1.2	$30.0	0.9	$34.6	1.0	$24.4	0.7	$15.0	0.4
2011	$38.1	1.1	$28.3	0.8	$29.8	0.8	$13.5	0.4	($9.0)	(0.2)
2012	$36.8	1.0	$26.0	0.7	$24.8	0.7	$1.8	0.0	($34.3)	(0.9)
2013	$36.8	0.9	$24.8	0.6	$21.5	0.5	($9.0)	(0.2)	($58.1)	(1.4)
2014	$40.5	1.0	$27.2	0.7	$22.5	0.5	($15.9)	(0.4)	($78.0)	(1.8)
2015	$52.3	1.2	$37.6	0.9	$32.3	0.7	($14.3)	(0.3)	($89.6)	(2.0)
2016	$53.9	1.2	$37.7	0.8	$32.9	0.7	($23.2)	(0.5)	($111.6)	(2.3)
2017	$80.6	1.6	$62.6	1.3	$58.9	1.2	($8.4)	(0.2)	($111.8)	(2.1)
2018	$102.8	1.9	$82.8	1.6	$81.4	1.5	$0.9	0.0	($117.6)	(2.1)
2019	$121.3	2.2	$99.1	1.8	$101.8	1.8	$6.3	0.1	($127.3)	(2.2)
2020	$130.5	2.2	$105.8	1.8	$114.4	1.9	$2.4	0.0	($146.7)	(2.4)
2021	$154.3	2.4	$127.0	2.0	$143.6	2.3	$13.5	0.2	($150.5)	(2.3)
2022	$177.7	2.7	$147.4	2.2	$174.5	2.6	$24.4	0.4	($155.0)	(2.2)

Source: Tri-Met, September 2002
Notes: BRT = Bus Rapid Transit, LRT = Light Rail Transit, YOE = Year-of-expenditure.

5.1.4 Proposed Additional Revenues

This section discusses options for additional revenue that TriMet may seek to eliminate project capital and system revenue shortfalls.

5.1.4.1 Proposed Additional Transit Project Capital Revenue Options

All of the alternatives require additional capital revenues; potential sources that have been identified follow.

Section 5309 New Starts Funds. FTA Section 5309 New Starts grants are discretionary federal funds available for new fixed-guideway transit systems and extensions to existing fixed-guideway systems. Thus, both the fixed-guideway opening day costs and the fixed-guideway 2008 to 2020 costs would be eligible for Section 5309 New Starts funds. However, Section 5309 New Starts funds could not be used to pay the cost of the BRT Alternative or the BRT components of the fixed-guideway alternatives; instead a Section 5309 bus grant would be sought for these project elements, as discussed below.

Congress establishes the maximum amount of New Starts funds that can be made available nationally on a year-by-year basis in the federal transportation authorization act. A fixed-guideway project customarily obtains New Starts funds through a FFGA with FTA. The FFGA establishes the maximum amount of New Starts funds available to the project and the terms and conditions of receiving New Starts funds. While federal statutes allow up to 80% of project costs to be paid by Section 5309 New Starts funds, FTA and Congress may seek to limit the amount of New Starts funds in FFGAs to 50% to 60% of project costs.

Table 5.1-7 illustrates the potential amounts of Section 5309 New Starts funds that may be requested, based on a 50% and 60% federal New Starts share of fixed-guideway costs. Only the revenue requirements for the baseline design options are shown; the revenue requirements for each alternative would vary slightly depending on the design options selected.

Table 5.1-7
Range of Potential Section 5309 New Starts Funds, by Alternative (in millions of YOE dollars)

	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
50% Section 5309 New Starts Fund Share					
Fixed-Guideway Opening Day Costs	N/A	$140.9	$208.8	$174.5	$400.0
Fixed-Guideway 2008 to 2020 Costs	N/A	$7.6	$15.2	$51.4	$28.3
Total	**N/A**	**$148.5**	**$224.0**	**$225.9**	**$428.3**
60% Section 5309 New Starts Fund Share					
Fixed-Guideway Opening Day Costs	N/A	$169.0	$250.6	$209.4	$480.2
Fixed-Guideway 2008 to 2020 Costs	N/A	$9.1	$18.3	$61.7	$34.0
Total	**N/A**	**$178.1**	**$268.9**	**$271.1**	**$514.2**

Source: TriMet, November 2002.
Note: YOE = year of expenditure; BRT = bus rapid transit; LRT = light rail transit.

As shown in Table 5.1-7, $140.9 or $169.0 million of Section 5309 New Starts funds would be sought for the opening day costs for the fixed-guideway element of the Busway Alternative, based on a 50% and a 60% New Starts share, respectively. The total Section 5309 New Starts fund request for the Busway Alternative, including opening day costs and 2008 to 2020 costs, would be $148.5 or $178.1 million, based on a 50% and 60% New Starts share, respectively.

While the total Section 5309 New Starts funds proposed for the Milwaukie LRT Alternative ($224.0 or $268.9 million) and the I-205 LRT Alternative ($225.9-$271.1 million) would be similar, the opening day cost requirements of the I-205 LRT Alternative would be $34.4 or $41.2 million less than for the Milwaukie LRT Alternative, based on a 50% and 60% New Starts share, respectively. The Combined LRT Alternative would require $428.3 or $514.2 million of Section 5309 New Starts funds, in total, of which $400.0 or $480.2 million would be required for Opening Day Costs, based on a 50% and 60% New Starts share, respectively.

Section 5309 Bus Funds. FTA Section 5309 bus grants are discretionary federal funds available for bus acquisition and bus-related improvements, including BRT improvements. These funds can be used for new systems or expansions to existing systems. At this time, FTA does not issue FFGAs for

BRT improvements using Section 5309 Bus funds. Thus, it is necessary to secure annual appropriations of Section 5309 Bus funds from Congress without the benefit of a contract with FTA. By statute, Section 5309 Bus funds require 20% local matching funds. In total, up to $104.9 million of Section 5309 Bus funds could be requested for the BRT Alternative. Up to $55.9 million of Section 5309 Bus funds could be used for the BRT component of the Milwaukie LRT Alternative, $50.4 million for the BRT component of the I-205 LRT Alternative, and $13.2 million for the BRT component of the Combined LRT Alternative.

Other Local and Regional Funds. A variety of additional local and regional funding sources will be considered to fund the locally preferred alternative (LPA). Depending on the alternative selected, additional local funds totaling the amount shown in Table 5.1-8, below, would be requested from the City of Portland (possibly from tax increment funds, city general funds or other city funds), the City of Milwaukie, Clackamas County, Metro's MTIP, and ODOT's State Transportation Improvement Program (STIP). In addition, a possible increase to TriMet's payroll/self-employment tax is discussed in Section 5.1.4.2, below. If enacted, TriMet could employ a portion of the additional funds to pay the local share of BRT and Fixed Guideway 2008 to 2020 Costs.

For those alternatives exhibiting a larger funding gap than can be met with existing resources potentially available from local governments, a general obligation bond may be considered. If proposed, such a bond would require the approval of the voters within the TriMet district.

5.1.4.2 Proposed Additional System Revenue Options

As shown in Table 5.1-6 and discussed in Section 5.1.3.2, it is currently forecast that TriMet will not have sufficient system revenues to operate the South Corridor Project alternatives and maintain, at a minimum, a 2-month beginning working capital reserve each year. Consequently, it would be necessary to secure additional operating revenues for the South Corridor Project.

TriMet's enabling legislation limits the employer payroll and self-employment tax rates to 0.6%; with upward adjustments permitted to account for revenues lost when areas are withdrawn from the TriMet district (thus creating a tax rate of 0.6218%). As part of a larger transit expansion strategy, TriMet has been examining the possibility of increasing the pre-adjustment employer payroll and self-employment tax rates from 0.6% to 0.7% over a 10-year period in increments of 0.01% per year. This would require legislative approval of an amendment to TriMet's funding statute. If approved, a portion of the proceeds could be used for South Corridor Project capital costs.

5.1.5 Conclusions

A 20-year cash-flow analysis was prepared for each alternative, in which transit revenues (by source expenditures, transit expenditures, and line item) were projected on a year-by-year basis using the key elements of the fiscal analysis described in previous sections. Detailed results of this analysis are reported in the *Financial Analysis Results Report* (TriMet, 2002) and summarized above.

5.1.5.1 Project Capital Funding Conclusions

Preliminary concepts for providing the necessary capital funds for the alternatives are shown in Tables 5.1-8 and 5.1-9 and described below. The funding plans shown in Tables 5.1-8 and 5.1-9 are preliminary concepts and are shown for illustrative purposes. The funding amounts and sources identified in Tables 5.1-8 and 5.1-9 would be examined in detail during preliminary engineering and a proposed financial plan would be documented in the Project's Final Environmental Impact Statement (FEIS).

Tables 5.1-8 and 5.1-9 show capital funding concepts for the baseline design option for each alternative. Table 5.1-8 is based on a 50% share of costs of the fixed guideways paid with Section 5309 New Start funds and Table 5.1-9 is based on a 60% Section 5309 New Starts share. Because the Section 5309 New Starts share would not affect the BRT Alternative, the preliminary funding plans for the BRT Alternative are the same in Tables 5.1-8 and 5.1-9. With about a 61% ($80.51 million) contribution from Section 5309 bus funds, the BRT Alternative would be feasible with $11.23 million of to-be-identified other local and regional funds.

Based on a 50% share from Section 5309 New Starts funds, $140.9 million of New Starts funds would be proposed to pay opening day costs of the fixed-guideway element of the Busway Alternative. An additional $7.6 million of Section 5309 New Starts funds would be needed in the future to help fund the Busway Alternative's 2008 to 2020 costs. $101.5 million of other local and regional funds would be needed to complete the financing of opening day costs and 2008 to 2020 costs. With a 60% ($169.0 million for opening day costs and $7.6 million for 2008 to 2020 costs) share from Section 5309 New Starts funds, the amount of additional funds from other local and regional sources for opening day and 2008 to 2020 costs of the Busway Alternative would be reduced to $73.3 million and $6.1 million, respectively.

Based on a 50% share from Section 5309 New Starts funds, $208.8 million of New Starts funds would be proposed to pay opening day costs of the fixed-guideway element of the Milwaukie LRT Alternative. In addition, $55.9 million of Section 5309 Bus funds would be needed for the BRT component of the Milwaukie LRT Alternative and $15.2 million of Section 5309 New Starts funds would be needed in the future to fund, in part, the fixed-guideway element of the Milwaukie LRT Alternative's 2008 to 2020 costs. $169.4 million of other local and regional funds would be needed to complete the financing of opening day costs and 2008 to 2020 costs. With a 60% ($250.6 million for opening day costs and $18.3 million for 2008 to 2020 costs) share from Section 5309 New Starts funds, the amount of additional funds from other local and regional sources for opening day costs and 2008 to 2020 would be reduced to $127.7 million and $12.2 million, respectively.

Table 5.1-8
Capital Finance Plan: Illustrative Concept Plan
Assumes 50% New Starts Share for Fixed-Guideway Elements, Millions of YOE Dollars

		BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Fixed Guideway Opening Day Costs						
Cost in $YOE (without interim borrowing)		$0.00	$281.73	$417.65	$349.05	$800.03
Revenues						
U	Section 5309 New Starts Funds	$0.00	$140.87	$208.83	$174.53	$400.02
A	MTIP-STP Funds		$24.40	$24.40	$24.40	$24.40
A	Clackamas County Tax Increment Funds				$30.00	$30.00
A	TriMet Funds		$15.00	$15.00	$15.00	$15.00
U	Other Local and Regional Funds		$101.47	$169.43	$105.13	$330.62
	Total	**$0.00**	**$281.73**	**$417.65**	**$349.05**	**$800.03**
Fixed Guideway 2008 to 2020 Costs						
Cost in $YOE		$0.00	$15.14	$30.43	$102.80	$56.69
Revenues						
U	Section 5309 New Starts Funds	$0.00	$7.57	$15.22	$51.40	$28.35
U	TriMet Funds	$0.00	$7.57	$15.22	$51.40	$28.35
	Total	**$0.00**	**$15.14**	**$30.43**	**$102.80**	**$56.69**
BRT Costs						
Cost in $YOE		$131.14		$69.89	$63.04	$16.48
Revenues						
U	Section 5309 New Starts Funds	$80.51	$0.00	$55.91	$50.43	$13.18
A	MTIP-STP Funds	$24.40				
A	TriMet Funds	$15.00				
U	TriMet Funds	$11.23	$0.00	$13.98	$12.61	$3.30
	Total	**$131.14**	**$0.00**	**$69.89**	**$63.04**	**$16.48**
Grand Total: Opening Day, 2008 to 2020 Fixed Guideway Costs and BRT Costs						
Cost in $YOE		$131.14	$296.87	$517.97	$514.89	$873.20
Revenues						
U	Section 5309 New Starts Funds	$0.00	$148.44	$224.04	$225.93	$428.36
A	MTIP-STP Funds	$24.40	$24.40	$24.40	$24.40	$24.40
A	Clackamas County Tax Increment Funds	$0.00	$0.00	$0.00	$30.00	$30.00
A	TriMet Funds	$15.00	$15.00	$15.00	$15.00	$15.00
U	Other Local and Regional Funds (includes unavailable TriMet funds)	$11.23	$109.04	$198.62	$169.13	$362.26
U	Section 5309 New Starts Funds	$80.51	$0.00	$55.91	$50.43	$13.18
	Total	**$131.14**	**$296.87**	**$517.97**	**$514.89**	**$873.20**

Source: TriMet, November 2002
Notes: The funding plan shown is conceptual, subject to further examination during preliminary engineering. U = funds currently unavailable, A = funding source currently available, YOE = year-of-expenditure, BRT = Bus Rapid Transit, LRT = Light Rail Transit, MTIP = Metropolitan Transportation Improvement Program, STP = Surface Transportation Program.

Based on a 50% share from Section 5309 New Starts funds, $174.5 million of New Starts funds would be proposed to pay opening day costs of the fixed-guideway element of the I-205 LRT Alternative. In addition, $55.9 million of Section 5309 bus funds would be needed for the BRT component of the I-205 LRT Alternative and $51.4 million of Section 5309 New Starts funds would be needed in the future to fund, in part, the I-205 LRT Alternative’s 2008 to 2020 costs. $105.1 million of other local and regional funds would be needed to complete the financing of opening day costs and another $51.4 million would be needed for the 2008 to 2020 costs. With a 60% ($209.4 million for opening day costs and $61.7 million for 2008 to 2020 costs) share from Section 5309 New Starts funds, the amount of additional funds from other local and regional sources for opening day costs and 2008 to 2020 would be reduced to $70.2 million and $21.1 million, respectively.

Table 5.1-9
Capital Finance Plan: Illustrative Concept Plan
Assumes 60% New Starts Share for Fixed-Guideway Elements Millions of YOE Dollars

		BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Fixed Guideway Opening Day Costs						
Cost in $YOE (without interim borrowing)		$0.00	$281.73	$417.65	$349.05	$800.03
Revenues						
U	Section 5309 New Starts Funds	$0.00	$169.04	$250.59	$209.43	$480.02
A	MTIP-STP Funds		$24.40	$24.40	$24.40	$24.40
A	Clackamas County Tax Increment Funds				$30.00	$30.00
A	TriMet Funds		$15.00	$15.00	$15.00	$15.00
U	Other Local and Regional Funds		$73.29	$127.66	$70.22	$250.61
	Total	**$0.00**	**$281.73**	**$417.65**	**$349.05**	**$800.03**
Fixed Guideway 2008 to 2020 Costs						
Cost in $YOE		$0.00	$15.14	$30.43	$102.80	$56.69
Revenues						
U	Section 5309 New Starts Funds	$0.00	9.08	$18.26	$61.68	$34.01
U	TriMet Funds	$0.00	$6.06	$12.17	$41.12	$22.68
	Total	**$0.00**	**$15.14**	**$30.43**	**$102.80**	**$56.69**
BRT Costs						
Cost in $YOE		$131.14		$69.89	$63.04	$16.48
Revenues						
U	Section 5309 New Starts Funds	$80.51	$0.00	$55.91	$50.43	$13.18
A	MTIP-STP Funds	$24.40				
A	TriMet Funds	$26.23		$13.98	$12.61	$3.30
	Total	**$131.14**	**$0.00**	**$69.89**	**$63.04**	**$16.48**
Grand Total: Opening Day, 2008 to 2020 Fixed Guideway Costs, and BRT Costs						
Cost in $YOE		$131.14	$296.87	$517.97	$514.89	$873.20
Revenues						
U	Section 5309 New Starts Funds	$0.00	$178.12	$268.85	$271.11	$514.03
A	MTIP-STP Funds	$24.40	$24.40	$24.40	$24.40	$24.40
A	Clackamas County Tax Increment Funds	$0.00	$0.00	$0.00	$30.00	$30.00
A	TriMet Funds	$26.23	$21.06	$41.15	$68.73	40.97
U	Other Local and Regional Funds	$0.00	$73.29	$127.66	$70.22	$250.61
U	Section 5309 New Starts Funds	$80.51	$0.00	$55.91	$50.43	$13.18
	Total	**$131.14**	**$296.87**	**$517.97**	**$514.89**	**$873.20**

Source: TriMet, November 2002
Notes: The funding plan shown is conceptual, subject to further examination during preliminary engineering. U = funds currently unavailable, A = funding source currently available, YOE = year-of-expenditure, BRT = Bus Rapid Transit, LRT = Light Rail Transit, MTIP = Metropolitan Transportation Improvement Program, STP = Surface Transportation Program.

Based on a 50% share from Section 5309 New Starts funds, $400.0 million of New Starts funds would be proposed to pay opening day costs of the fixed-guideway element of the Combined LRT Alternative. In addition, $13.2 million of Section 5309 Bus funds would be needed for the BRT component of the Combined LRT Alternative and $28.4 million of Section 5309 New Starts funds would be needed in the future to fund, in part, the Combined LRT Alternative's 2008 to 2020 costs. $330.6 million of other local and regional funds would be needed to complete the financing of opening day costs of the Combined LRT Alternative and another $28.4 would be needed for the 2008 to 2020 costs. With a 60% ($480.0 million for opening day costs and $34.0 million for 2008 to 2020 costs) share from Section 5309 New Starts funds, the amount of additional funds from other local and regional sources for Opening Day Costs and 2008 to 2020 would be reduced to $250.6 million and $22.7 million, respectively.

Even with a FFGA, a project must have funds appropriated to it on an annual basis to actually receive such funds. The appropriation is subject to budget limits, the demand for appropriations from other projects, and other congressional dynamics. The amount of New Starts funds appropriated to a project in a given year may be less than the project requires that year. When fewer New Starts funds are allocated than are needed by the local project, the finance plan could use interim borrowing to maintain its optimum construction schedule. Interim-borrowed funds would be repaid with later appropriated New Starts funds, but the project would incur interest costs in the interim. An interim borrowing program for the South Corridor Project could be arranged in a manner similar to that used for the Westside/ Hillsboro Light Rail Project. Project revenues would likely secure the first tier of the program. For the Westside/Hillsboro Light Rail Project, two banks pledged to extend letters of credit (LOC) for up to $90 million in consideration of TriMet's pledge of project revenues to repay funds drawn under the LOC. The LOC would be used to secure short-term debt instruments called *commercial paper*. If needed, the commercial paper would be sold to produce revenue and would be repaid with funds from rolled-over commercial paper, future project revenues (such as future appropriated federal funds) or funds obtained from the LOC, depending on circumstances. If repaid with funds obtained from the LOC, future project revenues would repay the LOC.

5.1.5.2 System Fiscal Feasibility Conclusions

As explained in Section 5.1.3.2, all of the alternatives require additional system revenues to meet the minimum working capital standard in all years. The preliminary concept for funding the shortfall in system operations was discussed in Section 5.1.4.2. A detailed system-financing plan will be adopted after selection of the LPA and documented in the FEIS.

Table 5.1-10 shows the year-by-year beginning working capital results expressed in YOE dollars and months of operations, presuming that authority for the tax rate increase described in Section 5.1.4.2 would be passed by the Oregon Legislature and that the tax rate increase would be enacted by TriMet. As previously mentioned, the fiscal condition of transit system operations is considered adequate if the beginning of year operating reserve (in months of operations) is maintained at 2 months. As shown in Table 5.1-10, with the tax rate increase there would be sufficient system revenues to operate all of the Project alternatives, as well as implement substantial service increases in other portions of the system and still maintain beginning year operating reserves at desired levels.

5.1.5.3 Implementation of the Finance Plan

Implementation of the funding plan would depend on successfully obtaining:

- The required capital funding commitments from state, regional and local sources, including voter approval of required general obligation bonds, if any, to meet the capital cost requirements of the locally preferred alternative.
- FTA and Congressional authority to proceed to construction.
- Oregon State Legislative approval of a new or increased authority for operating revenues.
- TriMet Board enactment of a new or increased operating revenue source.
- A FFGA between TriMet and FTA, which would provide sufficient Section 5309 New Starts funds to finance opening day costs of the fixed-guideway component, if any, of the LPA.
- Sufficient appropriations of Section 5309 Bus funds by Congress to finance the BRT component, if any, of the LPA.

Table 5.1-10
System Fiscal Feasibility Analysis: Based on a 0.1% Payroll/Self-Employment Tax Increase
Beginning Working Capital 2002-2022 in Millions of Year of Expenditure (YOE) Dollars

	BRT		Busway		Milwaukie LRT		I-205 LRT		Combined LRT	
Fiscal Year	Beginning Working Capital	Months of Operating Expense	Beginning Working Capital	Months of Operating Expense	Beginning Working Capital	Months of Operating Expense	Beginning Working Capital	Months of Operating Expense	Beginning Working Capital	Months of Operating Expense
2002	$91.0	4.1	$91.0	4.1	$91.0	4.1	$91.0	4.1	$91.0	4.1
2003	$83.0	3.7	$83.0	3.7	$83.0	3.7	$83.0	3.7	$83.0	3.7
2004	$74.1	3.2	$74.1	3.2	$74.1	3.2	$73.7	3.2	$73.7	3.2
2005	$69.6	2.8	$69.0	2.8	$69.0	2.8	$69.0	2.8	$69.0	2.8
2006	$69.6	2.7	$69.6	2.7	$68.6	2.6	$68.5	2.6	$68.5	2.6
2007	$72.0	2.6	$72.3	2.6	$70.8	2.6	$70.4	2.5	$70.4	2.5
2008	$69.6	2.4	$69.5	2.4	$68.7	2.4	$67.4	2.3	$67.8	2.3
2009	$80.8	2.6	$80.3	2.6	$80.8	2.5	$78.2	2.4	$79.3	2.4
2010	$95.5	2.9	$86.6	2.6	$91.3	2.7	$81.1	2.4	$71.7	2.0
2011	$122.4	3.5	$112.7	3.2	$114.2	3.2	$97.9	2.7	$75.4	2.0
2012	$156.5	4.3	$145.7	3.9	$144.5	3.9	$121.4	3.2	$84.9	2.2
2013	$200.4	5.2	$188.5	4.9	$185.1	4.7	$154.7	3.9	$103.4	2.5
2014	$258.1	6.3	$244.9	6.0	$240.1	5.8	$201.3	4.8	$134.4	3.1
2015	$335.3	7.7	$320.6	7.4	$315.4	7.2	$267.4	6.0	$184.1	4.0
2016	$409.4	8.9	$393.2	8.5	$388.4	8.4	$330.3	7.0	$229.6	4.7
2017	$516.4	10.4	$498.3	10.1	$494.6	10.0	$424.0	8.4	$303.3	5.8
2018	$627.2	11.8	$607.2	11.4	$605.8	11.4	$521.4	9.6	$379.5	6.8
2019	$743.6	13.2	$721.3	12.8	$724.0	12.9	$624.5	10.9	$460.4	7.8
2020	$860.8	14.4	$835.9	14.0	$844.5	14.2	$728.2	12.0	$540.8	8.7
2021	$1,003.2	15.9	$975.7	15.4	$992.3	15.9	$857.7	13.4	$646.1	9.9
2022	$1,157.1	17.3	$1,126.5	16.8	$1,153.6	17.4	$910.8	13.4	$761.9	11.0

Notes: Assumes employer payroll and self-employment tax rate are increased by 0.1%; phased in over 10 years beginning in FY 2005. The revenues added by the tax rate increases would be used, in part, for transit service expansion outside of the South Corridor that is not addressed in this analysis. The cost of these service increases would result in reductions to beginning working capital from those shown above.

5.2 Evaluation of Alternatives

This section presents the effectiveness, equity, and major trade-off evaluations of the alternatives and design options under consideration for the South Corridor. It uses data and analyses included in previous chapters of this SDEIS.

5.2.1 Evaluation Methodology

Section 5.2.2 evaluates the effectiveness of each alternative in meeting the transportation, land use, and environmental objectives for the South Corridor Project that are listed in Section 1.8 of this SDEIS. A summary of the measures of effectiveness for each objective is provided in Table 5.2-1. Section 5.2.3 evaluates the social equity issues associated with project alternatives, focusing on the relationship of the costs and the benefits of the project to minority and low-income populations and disadvantaged business enterprises in the region. The major fiscal, effectiveness, and cost-effectiveness trade-offs of the alternatives and options are summarized in Section 5.2.4.

Table 5.2-1
Measures of Effectiveness

Objective/Criteria	Measure
Provide High Quality Transit Service	
Access to and from the Transit Network	• Change in the number of residents and jobs within fixed-guideway station areas (2020)[1] • Ability to provide park-and-ride access[1]
Transferability	• Ease of transfers[1]
Travel Times	• In-vehicle and total transit travel times between major origins and destinations in the corridor
Reliability	• Miles of exclusive right-of-way • Passenger miles and % of corridor passenger miles on fixed-guideway right-of-way • Level of priority for BRT, busway and LRT lines at intersections by corridor segment
Ridership	• Corridor transit ridership • BRT bus line, busway bus line and light rail line boarding rides • Transit mode share from major centers in the corridor
Ensure Effective Transit System Operations	
Operating Effectiveness	• Operational safety considerations[1] • Operating considerations[1]
Maximize the Ability of the Transit Network to Accommodate Future Growth in Travel Demand	
Future Expansion Capability	• Corridor transit network expansion capability[1]
Minimize Traffic Congestion and Traffic Infiltration through Neighborhoods	
Highway System Use	• PM peak two-hour vehicle volumes on parallel roadways at select corridor cut lines • Vehicle miles and hours traveled • Vehicle hours of delay
Local Traffic Impacts	• Adverse impacts to roadways that would be difficult and/or costly or unfeasible to mitigate[1]
Traffic Infiltration into Neighborhoods	• PM peak-hour transit ridership at select traffic cut lines in the corridor
Promote Desired Land Use Patterns and Development	
Support of Activity Centers	• Ability to provide high-quality transit connections between major activity centers[1] • Ability to be physically and functionally integrated into major activity centers • Ability of transit stations and access points to be pedestrian accessible and visible
Support of Land Use Policies	• Compatibility with state and regional land use plans and policies • Support of air quality plans
Access to Labor Force and Employment	• Ability to provide residential areas with good access to jobs • Change in short-term and long-term employment
Provide for a Fiscally Stable and Financially Efficient Transit System	
Other Cost-Effectiveness Measures	• Operating subsidy per ride • BRT bus line, busway bus line and light rail line boarding rides per revenue hour • Operating cost per ride • Incremental cost per new ride
Financial Feasibility	• Capital costs[1] • Operating and maintenance costs
Maximize the Efficiency and Environmental Sensitivity of the Engineering Design of the Proposed Project	
Displacements	• Number of residential units, businesses and public facilities displaced[1]
Noise and Vibration	• Number of receptors exposed to significant noise impacts without and with identified mitigation[1] • Number of structures exposed to significant vibration impacts without and with identified mitigation[1]
Wetlands and Parks	• Acres of impacted wetlands[1] • Cubic feet of fill in the 100-year floodplain[1] • Number of and acres of parks used[1]
Historic and Cultural Resources	• Number of historic resources adversely impacted[1] • Number of archaeologically sensitive areas potentially affected[1]
Significant Design Considerations	• Major engineering considerations[1]

Source: *Evaluation and Financial Analysis Methods Report* (Metro: November 2002).
Note: BRT = bus rapid transit; LRT = light rail transit.
[1] Measures that apply both to alternatives and options – all other measures apply only to alternatives.

5.2.2 Effectiveness in Meeting Corridor Objectives

The South Corridor Steering Committee, consisting of elected and appointed officials from each of the jurisdictions and agencies participating in the Project, established the following goal for the South Corridor Project: *To implement a major transit program in the South Corridor that maintains livability in the metropolitan region, supports land use goals, optimizes the transportation system, is environmentally sensitive, reflects community values and is fiscally responsive*. Based on this goal, and on the transportation needs and land use policies outlined in Chapter 1, seven objectives were established for the South Corridor Project. Table 5.2-1 outlines the criteria and measures that are associated with each objective and that are used to assess and compare the effectiveness of the alternatives and design options under study. Effectiveness is a measure of an alternative's ability to meet the adopted project objectives. The effectiveness evaluation methodology used in this section identifies two or more criteria for each objective and one or more measures for each criterion. The alternatives and options are evaluated based on the measures that are particularly relevant to the choices at hand. Some measures apply only to the alternatives, while other measures apply to both the alternative and the design options.

Most of the measures summarized in this section are based on the analyses documented in the Chapter 2 – Alternatives Considered; Chapter 3 – Affected Environment and Environmental Impacts; and Chapter 4 – Transportation Services, Facilities, and Impacts. In general, those chapters provide a more detailed description of the data and the methodologies used to develop the data referenced within this section. The text of this chapter references tables that summarize the relevant measures – tables that are located in either this chapter or in Chapters 2, 3 or 4.

5.2.2.1 Ability to Provide High Quality Transit Service

The effectiveness of the alternatives to provide high-quality transit service is evaluated on the basis of the following five criteria: access to and from the transit network, transferability, travel times, reliability, and transit ridership.

A. Access To and From the Transit Network

Access to and from the transit network is assessed using two measures: the change in the number of residents and jobs in 2020 that would be located within ¼ mile of a fixed-guideway transit station; and a qualitative assessment of the alternatives' and options' ability to provide park-and-ride access.

Change in Residential Units, Residents, and Employment with Access to Fixed-Guideway Stations

Table 5.2-2 summarizes the change in the number of residents and jobs in the South Corridor in 2020 that would be within ¼ mile of a proposed fixed-guideway station (either busway or light rail) for each alternative (similar data for 2000 are provided in the table for reference). The measure is the difference between what coverage would be with an alternative minus the coverage that would occur with the region's existing fixed-guideway system (including the addition of the Yellow Line, which is scheduled to begin operation to North Portland in September 2004). Coverage within ¼ mile of a fixed-guideway station measures the ability of the transit system to provide direct access to transit service within protected right-of-way for residential and employment sites, and to accommodate future growth within the region's adopted urban growth boundary (UGB) as envisioned by state, regional, and local land use plans. Under Metro's *Region 2040 Growth Concept*, many fixed-guideway stations would receive more intense and more broadly mixed uses. See Section 3.1 for additional information on the land use and economic development within the South Corridor.

Table 5.2-2
Coverage: Increase[1] in Year 2000 and 2020 Population and Employment Within ¼ Mile of Fixed-Guideway Stations, by Alternative[2]

Measure	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Population						
2000	0	0	5,720	5,590	6,300	11,890
2020	**0**	**0**	**7,990**	**9,350**	**8,290**	**19,910**
Employment						
2000	0	0	15,170	18,060	5,980	24,040
2020	**0**	**0**	**21,290**	**24,390**	**8,390**	**32,780**

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
[1] Increases are compared to the number of residents and employment that would be within ¼ mile of a fixed-guideway station that would be provided with the region's existing transit system and the addition of the Yellow Line.
[2] The analyses of alternatives is based on a common set of design options, as defined in Table 2.2-3 and described in Section 2.2 of this SDEIS – characteristics of an alternative may vary with other design options.

Among the alternatives, the Combined LRT Alternative would result in the largest increase in residents and employees who would be located within a ¼-mile radius of a fixed-guideway station, approximately the sum of the Milwaukie LRT and I-205 LRT Alternatives – in 2020, 19,910 residents and 32,780 employees would be located within ¼ mile of a fixed-guideway station with the Combined LRT Alternative. The Milwaukie LRT Alternative would provide ¼ -mile access to a fixed-guideway station to more than two times as many residents and employees than the I-205 LRT Alternative, primarily as a result of the light rail stations that would be located within the Portland Central City with the Milwaukie LRT Alternative (8,290 residents and 8,390 employees with the I-205 LRT Alternative, compared to 9,350 residents and 24,390 employees with the Milwaukie LRT Alternative). The Busway Alternative would provide ¼ -mile access to a fixed-guideway station to approximately 15 and 13% fewer residents and employees, respectively, than the Milwaukie LRT Alternative. Neither the No-Build Alternative nor the BRT Alternative would increase ¼ -mile access to fixed-guideway stations.

Several design options would result in a measurable change to the number of residents and employees located within ¼ mile of a fixed-guideway station. Table 5.2-3 summarizes the 2020 population and employment that would be located within a ¼-mile radius of a fixed-guideway station for the following design and terminus options (adjusted to reflect the presence of significant pedestrian barriers, such as a freeway, river, or fenced railroad right-of-way). Year 2000 data are provided for reference. The options are listed in the table by alternative. Other options under consideration are not compared in this section because they would provide substantially similar access to fixed-guideway stations.

- **East Hawthorne Bridge Design Options:** Under the Busway Alternative, the 7th Avenue Design Option would result in a greater increase in the number of residents and employees with ¼-mile access to a fixed-guideway station than the Water Avenue Design Option. Within the design option area, the 7th Avenue Design Options would provide ¼-mile access to a fixed-guideway station to more than six times as many residents in the design option area than the Water Avenue Design Option (800 residents in 2020, compared to 120), and to almost double the number of employees (3,480 employees in 2020, compared to 1,860).

Table 5.2-3
Coverage: Year 2020 Population and Employment Within a Quarter-Mile of New Fixed-Guideway Stations for Select Options[1] by Alternative

Alternative / *Study Area*	Design Option or Terminus Option	Population 2000	Population 2020	Employment 2000	Employment 2020
Busway Alternative					
East Hawthorne	Water Avenue DO	20	**120**	1,510	**1,860**
	7th Avenue DO	410	**800**	2,980	**3,480**
Brooklyn Yard	17th Avenue DO	1,180	**1,780**	5,020	**6,800**
	West of Brooklyn Yard Design Option	800	**1,420**	5,410	**7,460**
Milwaukie and Combined Light Rail Alternatives					
Brooklyn Yard	17th Avenue DO	1,180	**1,780**	5,020	**6,800**
	West of Brooklyn Yard Design Option	800	**1,420**	5,410	**7,460**
North Milwaukie	Southgate Crossover DO	650	**910**	1,890	**2,080**
	Tillamook Branch Line DO	650	**860**	570	**620**
Milwaukie Terminus Options	Lake Road TO	1,520	**3,570**	1,820	**3,310**
	Milwaukie Middle School TO	725	**1,820**	940	**1,875**
I-205 and Combined Light Rail Alternatives					
Clackamas Town Center	East of Clackamas Town Center TO	650	**830**	2,790	**4,030**
	North of Clackamas Town Center TO	780	**940**	3,660	**5,460**

Source: Metro, September 2002.
Note: DO = design option; TO = terminus option.
[1] Quantities are for the design option area only (which is defined as the area where the proposed alignment would be different between the two options). The quarter-mile radius totals have been hand adjusted to account for significant barriers to pedestrian access. Other options are not compared in this table because they would provide the same or substantially similar access to fixed-guideway stations.

- **Brooklyn Yard Design Options:** Under the Busway, Milwaukie LRT, and Combined LRT Alternatives, the 17th Avenue Design Option would result in 25% more residents in the design option segment with ¼-mile access to a fixed-guideway station than the West of Brooklyn Yard Design Option (1,780 residents in 2020, compared to 1,420). In contrast, the West of Brooklyn Yard Design Option would result in 8% more employees with ¼-mile access to a fixed-guideway in the design option area than the 17th Avenue Design Option (5,410 compared to 5,020 employees; and 7,460 compared to 6,800).

- **North Milwaukie Design Options:** Under the Milwaukie LRT and Combined LRT Alternatives, population coverage in the design option area would be similar for both design options. However, the Southgate Crossover Design Option would result in more than three times as many employees with ¼-mile access to a fixed-guideway station in the design option area than the Tillamook Branch Line Design Option (2,080 employees in 2020; compared to 620).

- **Milwaukie Terminus Design Options:** Under the Milwaukie LRT and Combined LRT Alternatives, the Lake Road Terminus Option would provide ¼-mile access to a fixed-guideway station to approximately twice as many residents in the design option area than the Milwaukie Middle School Terminus Option (3,570 residents in 2020, compared to 1,820; and 3,310 employees in 2020, compared to 1,875).

- **Clackamas Town Center Design Options:** Under the I-205 LRT and Combined LRT Alternatives, the number of residents and employees in the design option area with ¼-mile access to the Clackamas Town Center Station in 2020 would be 13% and 35% greater, respectively, with the North of Clackamas Town Center Design Option than with the East of Clackamas Town Center Design Option (940 residents in 2020, compared to 830; and 5,460 employees in 2020, compared to 4,030).

Ability to Provide Park-and-Ride Access

The ability to site park-and-ride lots for an alternative is demonstrated through the number of park-and-ride lots spaces that would occur under each alternative and a qualitative assessment of each alternative's and option's ability to provide adequate park-and-ride lot supply.

The supply of park-and-ride lot spaces is an important consideration in the South Corridor: first, because there would be a strong demand for park-an-ride lot access to transit in the corridor in 2020; second, because there are, and would continue to be, limited economical and efficient opportunities for new park-and-ride lots along major transit trunklines in the corridor; and third, because it is generally best to intercept park-and-ride trips close to their point of origin, thereby reducing vehicle miles traveled (VMT), which means that park-and-ride lots are usually sited at least 5 miles away from the Portland Central City, further limiting their availability.

The data for park-and-ride lots are differentiated between fixed-guideway and non-fixed-guideway lots, because fixed-guideway lots would provide users with more direct access to the transit lines that would use the fixed-guideway, compared to non-fixed-guideway lots, that would require users to take the first portion of their trips in mixed traffic. With the light rail alternatives, access from a non-fixed-guideway park-and-ride lot to the fixed-guideway transit service would require a transfer.

Table 5.2-4 summarizes the number of fixed-guideway and non-fixed-guideway park-and-ride lot spaces that would occur under each alternative. The Combined LRT Alternative would provide the greatest number of fixed-guideway park-and-ride spaces (3,925 spaces), equal to the sum of the Milwaukie LRT and I-205 LRT Alternatives (1,475 and 2,450 spaces, respectively); the I-205 LRT Alternative would provide almost two-thirds more park-and-ride spaces than the Milwaukie LRT

Table 5.2-4
Transit Access: Number of South Corridor Fixed-Guideway and Non-Fixed-Guideway Park-and-Ride Lots[1] and Spaces[2], by Alternative[3] (Year 2020)

Measure	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Fixed-Guideway Spaces	0	0	1,200	1,475	2,450	3,925
Other Spaces	880	1,900	1,300	1,300	1,300	700
Total Spaces	**880**	**1,900**	**2,500**	**2,775**	**3,750**	**4,625**

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
[1] Fixed-guideway lot = any park-and-ride lot that would be directly adjacent to a light rail line or a busway. Other lot = a park-and-ride lot within the corridor that would not be located directly adjacent to a fixed guideway. Does not include the existing Gateway park-and-ride Lot.
[2] Fixed-guideway spaces = spaces within any park-and-ride lots that would be directly adjacent to a light rail line or a busway. Other spaces = spaces within any park-and-ride lot that would not be located adjacent to a fixed guideway.
[3] The analyses of alternatives is based on a common set of design options, as defined in Table 2.2-3 and described in Section 2.2 of this SDEIS. Other design options would change the number of park-and-ride spaces associated with the alternatives. The minimum and maximum number of total park-and-ride spaces per alternative, depending on design option, would be as follows: No-Build Alternative – 880 minimum and maximum; BRT Alternative – 1,570 minimum and 1,900 maximum; Busway Alternative – 2,170 minimum and 2,500 maximum; Milwaukie LRT Alternative – 1,570 minimum and 2,775 maximum; I-205 LRT Alternative – 3,250 minimum and 3,750; and Combined LRT Alternative – 3,250 minimum and 4,625 maximum (see tables 2.2-1, 2.2.-2 and 2.2-4 for more detail).

Alternative because the supply of available and affordable land for park-and-ride lots is relatively limited in the Portland to Milwaukie Segment, compared to the Gateway to Clackamas Segment, and because greater-capacity park-and-ride lots would lead to more severe local traffic impacts in the Portland to Milwaukie Segment. The Busway Alternative would provide 1,200 fixed-guideway park-and-ride lot spaces. Finally, because there would be no fixed guideway in the South Corridor with either the No-Build or the BRT alternatives, neither alternative would provide fixed-guideway park-and-ride lot spaces, although the BRT Alternative would almost double the number of non-fixed-guideway stations in the corridor, compared to the No-Build Alternative.

The comparison of alternatives and the data shown in Table 5.2-4 are based on the design options used throughout this SDEIS for the analyses of alternatives, as summarized in Table 2.2-3. Some design and terminus options under study would change the number of fixed-guideway park-and-ride lot spaces that would occur with the alternatives, as summarized in Tables 2.2-1 and 2.2-5. The effects of the design options on the total corridor park-and-ride capacity for each alternative are summarized in footnote 3 of Table 5.2-4: the widest variation would occur with the Combined LRT Alternative (which varies by 1,375 spaces) and the Milwaukie LRT Alternative (which varies by 1,205 spaces). Following is a summary of how the various design options would affect fixed-guideway park-and-ride lot capacity in the South Corridor.

- The **Clackamas Park-and-Ride Lot Design Options** are common to the BRT, Busway, and Milwaukie LRT Alternatives. The Linwood Park-and-Ride Lot Design Option, which the previous analysis of alternatives is based on, would provide 600 spaces (which would be fixed-guideway spaces under the Busway and Milwaukie LRT Alternatives), compared to 270 non-fixed guideway spaces with the Johnson Road Park-and-Ride Lot Design Option.

- The **North Milwaukie Design Options** are included within the Milwaukie LRT and Combined LRT Alternatives. The Southgate Crossover Design Option, which the previous analysis of alternatives is based on, would include 600 more fixed-guideway spaces than the Tillamook Branch Line Design Option, which would not include the 600-space Milwaukie Southgate Park-and-Ride Lot Design Option.

- The **Milwaukie Terminus Options** are common to the Milwaukie LRT and Combined LRT Alternatives. By including the 275-space Lake Road Park-and-Ride Lot, the Lake Road Terminus Option, which the previous analysis of alternatives is based on, would provide 275 more fixed-guideway park-and-ride lot spaces than the Milwaukie Middle School Terminus Option, which would not include the 275-space terminus park-and-ride lot.

- The **Clackamas Town Center Terminus Options** are common to the I-205 LRT and the Combined LRT Alternatives. The East of Clackamas Town Center Terminus Option, which the previous analysis of alternatives is based on, would provide 500 more fixed-guideway park-and-ride lot spaces than the North of Clackamas Town Center Terminus Option, which would not include the 500-space terminus park-and-ride lot.

B. Transferability

The transferability criterion is assessed using one measure: a qualitative assessment of the ease of transfers facilitated by the alternatives and design options. Transfers are an important consideration in evaluating alternative transit networks for two reasons: well-timed and reliable transfer opportunities at well-designed transfer facilities can generally improve overall transit access and reduce overall transit travel times; a trip that includes a transfer generally takes longer than a trip that does not include a transfer (a trip without a transfer is often referred to as a *single-seat ride*) as a result of the additional time that a patron would spend waiting for the second transit vehicle.

Ease of Transfers

All of the alternatives and options, including the No-Build Alternative, would offer a transit service configuration that would depend on and facilitate transfers between transit routes. In the Portland portion of the Corridor, transit service would be configured to provide both grid and radial service on generally 15-minute or shorter headways during peak and midday periods. In suburban portions of the Corridor, transit service would be configured around hubs connected to each other and downtown Portland by transit trunklines, operating at 15-minute or shorter headways during the peak period and 30-minute, or shorter headways at other times. Both the grid and the hub system would depend on reliable transit operations and well-positioned transfer facilities for transfers to be successful. Following is a summary of the qualitative differences in transfers under each of the alternatives.

- **No-Build Alternative.** With the following exceptions, the No-Build Alternative would result in no change to existing (2002) ability of passengers to transfer from one transit vehicle to another to complete their trip: new bus routes would provide improved transit connections between the Clackamas and Milwaukie TCs, between the Oak Grove and Clackamas TCs, and connecting the Parkrose, Gateway and Clackamas TCs.

- **BRT Alternative.** Similar to the No-Build Alternative, the BRT Alternative would retain the ability of a majority of South Corridor transit users to transfer to other buses at the downtown Portland transit mall and at other secondary transfer facilities (i.e., the Milwaukie Southgate TC, which would be relocated from its existing location in downtown Milwaukie) and the Clackamas TC). The addition of BRT trunkline bus service on SE McLoughlin Boulevard and Highway 224 would generally help to reduce transfer wait times.

- **Busway Alternative.** Similar to the No-Build and BRT alternatives, the Busway Alternative would retain the ability of a majority of South Corridor transit users to transfer to other system buses within the downtown Portland transit mall and at other secondary transfer facilities: the Milwaukie Southgate TC (which would be relocated from its existing location in downtown Milwaukie) and the Clackamas TC. The addition of busway trunkline service on SE McLoughlin Boulevard and Highway 224 would generally help to reduce transfer wait times.

- **Milwaukie Light Rail Alternative.** With its proposed alignment in downtown Portland on SW First Avenue, the Milwaukie LRT Alternative would require an approximately four or five-block walk for transfers between the Yellow Line and bus lines serving the downtown Portland transit mall. This increased length of transfer would be required both for patrons that would arrive from south of downtown Portland and for Yellow Line patrons who would arrive from north of downtown Portland. In contrast, under all other alternatives except the Combined LRT Alternative, Yellow Line patrons who would arrive from north of downtown Portland would be provided with more convenient transfers to the downtown Portland transit mall via the light rail station on SW Yamhill Street at SW 6th Avenue. The Milwaukie LRT Alternative would provide for convenient transfers between light rail and South Corridor feeder buses at the Milwaukie Southgate TC or the Milwaukie Middle School TC. The addition of BRT trunkline bus service on SE McLoughlin Boulevard south of Milwaukie and on Highway 224 would generally help to reduce transfer wait times; however, all trips that would travel between those areas and the Portland Central City would be required to transfer at the Milwaukie Southgate TC or Milwaukie

Middle School TC in order to complete their trip.

- **I-205 Light Rail Alternative.** The I-205 LRT Alternative would provide Green Line patrons with convenient transfers at the Clackamas Town Center TC, the Gateway TC, and the downtown Portland transit mall. Trips between the light rail stations and the Portland Central City could be completed without a transfer. Transfers between connecting bus lines at the Holgate Boulevard, Foster Road, Powell Boulevard, and Division Street stations would be somewhat less convenient (i.e., they would require increased walk distances and time) with the I-205 LRT Alternative (via the I-205 multiple-use path) than transfers between the I-205 trunkline bus route and connecting bus lines under the No-Build, BRT, Busway, and Milwaukie LRT Alternatives (via sidewalks adjacent to streets). Similar to the No-Build, BRT, and Busway Alternatives, the I-205 LRT Alternative would retain the ability of transit users from along SE McLoughlin Boulevard to transfer to other system buses within the downtown Portland transit mall and at the Milwaukie Southgate TC or the Milwaukie Middle School TC (which would be relocated from its existing location in downtown Milwaukie). Under the I-205 Alternative, the addition of BRT bus lines on SE McLoughlin Boulevard would generally help to reduce transfer wait times. Compared to the BRT, Busway, and Milwaukie LRT Alternatives, transfers between the Milwaukie Southgate TC and the Clackamas Town Center TC would be less convenient with the I-205 LRT Alternative, because there would be no BRT or busway trunkline bus service connecting the two transit centers. In addition, under the proposed service configuration for the I-205 LRT and Combined LRT Alternatives, Red Line patrons originating from or destined to stations west of the Gateway TC would be required to transfer to the Blue Line or the Green Line to complete their trips. This transfer would be required because, with the I-205 LRT and Combined LRT Alternatives, the Red Line would shuttle between the Portland International Airport and the Gateway TC, rather than continuing into downtown Portland as it currently does and as it would under the No-Build, BRT, Busway, and Milwaukie LRT Alternatives. Note, however, that the configuration of Red Line service under the I-205 LRT Alternative will continue to be evaluated and may be modified.

- **Combined Light Rail Alternative.** The quality of transfers with the Combined LRT Alternative for patrons using the Yellow Line would be similar to the assessment provided for the Milwaukie LRT Alternative; and the quality of transfers for patrons of the Green Line would be similar to the I-205 LRT Alternative. In addition, similar to the I-205 LRT Alternative, transfers between the Milwaukie Southgate TC and the Clackamas Town Center TC would be less convenient with the I-205 LRT Alternative than with BRT, Busway, and Milwaukie LRT Alternatives, because there would be no BRT or busway trunkline bus service connecting the two transit centers.

- **Design Options.** Only one set of design options would noticeably affect transfers: the East Hawthorne Bridge Design Options with the Busway Alternative. With the Water Avenue Design Option and the Oregon Museum of Science and Industry (OMSI) Station, transfers between Busway bus routes and some local bus routes that would serve southeast Portland would be somewhat less convenient (i.e., they would require longer walk distances and times), compared to the 7th Avenue Design Option, which would include a local bus stop at approximately SE 7th Avenue and SE Hawthorne Boulevard for Busway bus routes.

C. Travel Times

Table 5.2-5 summarizes the average weekday, p.m. peak-hour, in-vehicle and total transit between two locations in the Portland Central City (Pioneer Square and the Rose Quarter) and four destinations in the South Corridor (Milwaukie Southgate TC, Clackamas Town Center TC, Oregon City TC and Lents) for 2020. In-vehicle time is the time spent traveling within a LRV or bus. Total transit travel time is the in-vehicle time plus time spent walking to and from the transit vehicle and time spent waiting for the transit vehicle (based on a common, representative point of origin or designation within the activity center). See Section 4.2.1.2 for a more detailed discussion of travel times in the corridor.

Table 5.2-5
Travel Times: Average Weekday 2020 In-Vehicle and Total Transit and In-Vehicle Automotive Travel Times[1] Between Major Origin and Destination Pairs, by Alternative

Measure/*Origin-Destination Pair*	**No-Build**	**BRT**		**Busway**		**Milwaukie LRT**		**I-205 LRT**		**Combined LRT**	
		Minutes	**%Δ[2]**	**Minutes**	**%Δ[2]**	**Minutes**	**%Δ[2]**	**Minutes**	**%Δ[2]**	**Minutes**	**%Δ[2]**
In-Vehicle Transit Travel Time											
To Milwaukie Southgate TC, From:											
Pioneer Square	25	25	0%	23	-8%	14	-44%	25	0%	14	-44%
Rose Quarter	30	32[3]	7%	30	0%	20	-33%	32	7%	20	-33%
To Clackamas TC, From:											
Pioneer Square	47	38	-19%	34	-28%	27	-43%	37	-21%	37	-21%
Rose Quarter	41	41	0%	41	0%	36	-12%	29	-29%	29	-29%
To Oregon City TC, From:											
Pioneer Square	52	46	-12%	44	-15%	36	-31%	46	-12%	36	-31%
Rose Quarter	60	54	-10%	52	-13%	42	-30%	54	-10%	42	-30%
To Lents, From:											
Pioneer Square	35	35	0%	35	0%	35	0%	30	-14%	30	-14%
Rose Quarter	35	35	0%	35	0%	35	0%	22	-37%	22	-37%
Total Transit Travel Time											
To Milwaukie Southgate TC, From:											
Pioneer Square	31	32[3]	3%	30	-3%	30	-3%	32	3%	31	0%
Rose Quarter	40	41[3]	3%	39	-3%	29	-28%	42	5%	31	-23%
To Clackamas TC, From:											
Pioneer Square	55	46	-18%	42	-24%	47	-15%	46	-18%	47	-15%
Rose Quarter	53	53	0%	53	0%	46	-13%	38	-28%	38	-28%
To Oregon City TC, From:											
Pioneer Square	63	54	-14%	50	-21%	55	-13%	54	-14%	55	-13%
Rose Quarter	76	63	-17%	61	-20%	51	-33%	63	-17%	54	-29%
To Lents, From:											
Pioneer Square	44	44	0%	44	0%	44	0%	38	-14%	41	-7%
Rose Quarter	51	51	0%	51	0%	51	0%	31	-40%	33	-43%

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; TC = transit center.
1 In minutes for travel in the PM peak period. In-vehicle time is only the time that a passenger would spend within a public transit vehicle. Total time is the sum of in-vehicle time and all other time related to completing the trip, including walking and waiting time.
2 % change from the No-Build Alternative – a positive number means that travel time for the alternative would be increased for that origin and destination pair relative to the No-Build Alternative, while a negative number means that travel time would decrease.
3 Compared to the No-Build Alternative, the BRT Alternative would include additional BRT stations in the Portland to Milwaukie Segment, that would increase the average travel time for buses in the segment, while improving reliability and transit accessibility.

Because of the relatively high number of possible origin and destination pairs represented in Table 5.2-5, which are compared across six alternatives for both in-vehicle and total transit travel times, broad generalizations concerning the forecast performance of the alternatives are difficult to make. One generalization can be made – with a few notable exceptions, the BRT, Busway, Milwaukie Light Rail, I-205 LRT, and Combined LRT alternatives would reduce or leave unchanged travel times between the Portland Central City and the selected destinations within the South Corridor; however, in many instances the level of travel time reduction would vary significantly by alternative. A discussion of the more noteworthy changes that would occur in travel times, categorized by the Portland Central City place of origin, follows.

Pioneer Square. From **Pioneer Square to the Milwaukie TC**, the Milwaukie LRT and the Combined LRT alternatives would provide significant in-vehicle travel time savings, compared to the No-Build Alternative (44% reduction), while the other alternatives would result in no change in in-vehicle travel times. However, in total transit travel time, where transfer time is also included, there would be only slight differences between the alternatives (3% increases or decreases, compared to the No-Build Alternative). From **Pioneer Square to the Clackamas TC**, each of the alternatives would reduce transit travel times, compared to the No-Build Alternative. The largest reduction in in-vehicle travel time would occur with the Milwaukie LRT Alternative, generally double the reduction of the other alternatives (43% reduction, compared to 19 to 28% reductions), although the total transit travel time reduction that would be provided by the Milwaukie LRT Alternative would be similar or slightly less than the other alternatives when compared to the No-Build Alternative (18% reductions compared to 15 to 24% reductions).

From **Pioneer Square to Oregon City TC**, all of the alternatives would reduce travel times, compared to the No-Build Alternative. Reductions in in-vehicle travel times under the Milwaukie LRT and Combined LRT Alternatives would be more than double those of the other alternatives (31% reduction, compared to 12 or 15% reductions). However, all of the alternatives would have similar total transit travel time reductions between Pioneer Square and Oregon City TC (21% reduction with the Busway Alternative and 13 or 14% reductions with the other alternatives). From **Pioneer Square to Lents**, the I-205 LRT and Combined LRT Alternatives would be the only alternatives with travel time reductions, compared to the No-Build Alternative (7 or 14% reductions).

Rose Quarter. From the **Rose Quarter to the Milwaukie TC**, the Milwaukie LRT and Combined LRT Alternatives would provide substantial travel time benefits, compared to the No-Build Alternative (23 to 33% reduction), while the other alternatives would provide a small reduction, no reduction, or a small increase. Similarly, from the **Rose Quarter to the Clackamas TC**, the I-205 LRT and Combined LRT Alternatives would result in the largest travel time savings (28 and 29% reductions), compared to the No-Build Alternative, generally double the savings that would result from the Milwaukie LRT Alternative (12 and 13% reductions). From the **Rose Quarter to Oregon City**, in-vehicle travel time savings would also be largest with the I-205 LRT and Combined LRT Alternatives, compared to the No-Build Alternative, almost three times the savings that would result from the other alternatives. Considering total transit travel times, the Milwaukie and Combined LRT Alternatives would result in savings of approximately one-third, while the other alternatives would result in savings of approximately one-fifth. From the **Rose Quarter to Lents**, the only travel time savings would come from the I-205 LRT and Combined LRT Alternatives (37 to 43% reductions).

D. Reliability

TriMet has found that the existing light rail lines, which use reserved or separated right-of-way, have exhibited greater percentages of on-time arrivals than trunkline and local buses operating in mixed traffic. Alternatives in the South Corridor that would include no or small amounts of reserved right-of-way would require transit service to operate in mixed traffic and would be subject to traffic congestion and delay. Within this section, transit reliability is measured in three ways: the number of miles of exclusive fixed-guideway right-of-way provided for transit vehicles within the corridor; the number and percentage of average weekday passenger miles in the Corridor in 2020 that would occur within a fixed-guideway right-of-way; and the average amount of transit priority provided for BRT, busway and light rail transit lines at intersections in the corridor.

Table 5.2-6 summarizes three measures of transit reliability for the South Corridor alternatives: miles of fixed-guideway right-of-way; the number of passenger miles that would occur on that fixed-guideway right-of-way; and the percentage of total corridor trips that would occur on the fixed-guideway right-of-way. The No-Build Alternative would provide no fixed-guideway facility in the corridor, so there would be no fixed-guideway passenger miles in the corridor. Similarly, the BRT Alternative would include a short section of bus-only ramps connecting Highway 224 with SE Main Street, which would result in a relatively negligible number of passenger miles on fixed-guideway right-of-way.

Table 5.2-6
Reliability: Miles of Fixed-Guideway[1] Right-of-Way and 2020 Average Weekday Passenger Miles on Fixed-Guideway[1] Right-of-Way in the South Corridor, by Alternative[2]

Measure	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Miles of Fixed-Guideway ROW	0	0.2[3]	6.7[3]	6.7[3,4]	6.7[4]	13.2[4]
Passenger Miles on Fixed-Guideway ROW	0	0[5]	119,760[5]	102,820[5]	104,540	182,690
Percent of Total Corridor Passenger Miles on Fixed-Guideway ROW	0%	0%	20%	18%	18%	31%

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; ROW = right-of-way.
1 A fixed-guideway provides an exclusive grade- and/or barrier-separated transit right-of-way (i.e., a busway or light rail alignment) – see Section 2.2 for more detail.
2 The analyses of alternatives are based on a common set of design options, as defined in Table 2.2-3 and described in Section 2.2 of this SDEIS – characteristics of an alternative may vary with other design options.
3 Note that the BRT, Busway and Milwaukie LRT Alternatives would rely on the Hawthorne Bridge for the routing of BRT or busway trunkline bus routes or the light rail line, and the reliability of these trunklines would be adversely affected by bridge lifts that would occur during off-peak time periods. The BRT, Busway and Milwaukie LRT Alternatives would all include 0.2-mile bus ramps from SE Main Street to Highway 224.
4 Includes only the new portion of light rail alignment that would be added with that alternative.
5 Excludes passenger miles on bus-only ramps between SE Main Street and Highway 224, which would result in a negligible increase in passenger miles on reserved or separated ROW due to their short length (i.e., 0.2 mile).

The Combined LRT Alternative would result in the greatest number of fixed-guideway miles (i.e., 13.2 miles), passenger miles on fixed-guideway right-of-way (i.e., 182,690 passenger miles), and percent of corridor miles on fixed-guideway right-of-way (i.e., almost one-third). The Busway, Milwaukie and I-205 LRT Alternatives would each include approximately 6.7 miles of fixed guideway, although under each alternative the fixed guideway could be in a different location or use a different technology. As a result of the differences among the three alternatives, the Busway Alternative would have the greatest number and percentage of corridor riders using a fixed-guideway facility: approximately 120,000 rides, representing 20% of corridor ridership. Both the Milwaukie and I-205 LRT Alternatives would result in the same percentage of corridor passenger miles on a fixed guideway (i.e., 18%), although the I-205 LRT Alternative would have a greater number of passenger miles using a fixed guideway (i.e., 104,540 compared to 102,820, respectively), due to greater overall ridership levels that would occur with the I-205 LRT Alternative.

Table 5.2-7 summarizes the average level of intersection protection for transit vehicles by segment and alternative. The average level of intersection protection was calculated by assigning a numerical value between 1 and 6 to each intersection along an alignment that represents the level of protection that would be afforded transit vehicles at a given intersection under each alternative – a value of 1 would be the highest level of protection (i.e., grade separated right-of-way), while a value of 6 would represent no protection allowed to transit vehicles. The Milwaukie to Oregon City Segment was excluded from this analysis because each alternative would provide the same level of transit priority within that segment.

Table 5.2-7
Reliability: Average Level of Protection[1] for Transit Vehicles at Major Intersections, by Segment and Alternative

Segment	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Portland to Milwaukie	3.52	3.07	1.76	3.02	1.76
Milwaukie to Clackamas	4.69	2.58	4.69	6.00	6.00
Gateway to Clackamas	5.17	5.17	5.17	1.06	1.06

Source: Metro: September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. The Milwaukie to Oregon City Segment is excluded from this analysis because the ratings would be the same with all of the alternatives.
[1] The relative amount of transit priority treatment at signalized intersections, ranked by level of reliability (with 1 being best and 6 being worst as follows: 1 = grade separated; 2 = transit pre-emption; 3 = separate ROW with transit signal priority; 4 = queue bypass with transit signal priority; 5 = transit signal priority without separate ROW or queue bypass; 6 = no treatment. The measure is reported as an average level of priority at intersections within the given segment.

In the Portland to Milwaukie Segment, the Milwaukie LRT and Combined LRT Alternatives would provide transit with the highest average level of protection at intersections (i.e., for the Yellow Line extension), while the BRT Alternative would provide the lowest level of protection (i.e., for BRT trunkline bus routes). In contrast, the I-205 LRT and Combined LRT Alternative would provide the greatest average level of protection at intersections within the Gateway to Clackamas Segment (i.e., for the Green Line), which would be a greater average level of protection than would be provided by the other alternatives in the Portland to Milwaukie Segment. All but one intersection for the Green Line within the segment would be grade separated. Within the Milwaukie to Clackamas Segment, the Busway Alternative would provided the greatest average level of protection for transit (i.e., for the busway trunkline bus routes), while the I-205 LRT and Combined LRT Alternatives would provide no priority treatment for transit at the segment's intersections (i.e., for local bus routes).

E. Ridership

This section uses three measures to assess transit ridership in the South Corridor: total 2020 average weekday corridor transit ridership; average 2020 weekday corridor transit trunkline ridership; and 2020 average weekday transit mode share to and from major centers in the South Corridor.

Average Weekday Total Transit Corridor Ridership

Table 5.2-8 summarizes total 2020 average weekday transit ridership (i.e., bus and light rail originating rides) in the South Corridor by alternative. The No-Build Alternative would have the lowest corridor transit ridership in 2020 – 184,700 on an average weekday. In contrast, the Combined LRT Alternative would result in the greatest average weekday corridor transit ridership, 201,600 rides, an approximately 9% increase over the No-Build Alternative. Similarly, the I-205 LRT Alternative would result in 199,000 transit rides, an approximately 8% increase over the No-Build Alternative. The Busway Alternative would result in approximately 4% more average weekday transit ridership than the No-Build Alternative (192,400 rides), and both the BRT and Milwaukie LRT Alternatives would result in approximately 3% more ridership than the No-Build Alternative (190,500 and 190,700 rides, respectively).

Table 5.2-8
Average Weekday 2020 South Corridor Originating Trips[1], by Alternative

Measure	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Originating Trips[1]	184,700	190,500	192,400	190,700	199,000	201,600

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
[1] An originating trip i.e., (linked) is defined as a one-way trip from an origin (e.g., one's home) to a destination (e.g., one's place of work), independent of whether the trip would require a transfer or not.

BRT Bus Line, Busway Bus Line, and Light Rail Line Boarding Rides

Table 5.2-9 illustrates average weekday boarding rides in 2020 that would occur on BRT bus lines, busway bus lines, and light rail lines for each alternative, by segment (each alternative would also result in differing levels of ridership on other local bus service, which is accounted for in the total transit ridership for the Corridor – see Table 5.2-8). Boarding rides are defined as anytime a person would board a transit vehicle, independent of whether that boarding was or was not the result of a transfer from another transit vehicle. The BRT alternative would only include BRT bus line ridership, and the Busway Alternative would only include busway bus line ridership. In contrast, the three light rail alternatives would include both light rail line ridership and BRT bus line ridership.

Table 5.2-9
BRT Bus Line, Busway Bus Line and Light Rail Line
2020 Average Weekday Boarding Rides[1], by Segment[2] and Alternative

<table>
<tr><th>Segment</th><th>No-Build</th><th>BRT</th><th>Busway</th><th>Milwaukie LRT</th><th>I-205 LRT</th><th>Combined LRT</th></tr>
<tr><td>Portland to Milwaukie</td><td>0</td><td rowspan="3">24,760[3]</td><td rowspan="3">30,600[4]</td><td>25,330[5]</td><td rowspan="2">13,750[3]</td><td>20,950[5]</td></tr>
<tr><td>Milwaukie to Oregon City</td><td>0</td><td rowspan="2">15,360[3]</td><td>6,810[3]</td></tr>
<tr><td>Milwaukie to Clackamas</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Gateway to Clackamas</td><td>0</td><td>0</td><td>0</td><td>0</td><td>33,270[5]</td><td>32,300[5]</td></tr>
<tr><td>Total</td><td>0</td><td>24,760</td><td>30,600</td><td>40,690[6]</td><td>47,020</td><td>60,060[7]</td></tr>
</table>

Source: Metro: September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit. There would be other boarding rides in the corridor under each alternative, which would be provided by local bus routes, including some local bus routes that would use the busway guideway under the Busway Alternative.
[1] Boarding rides are defined as anytime a passenger would board a transit vehicle, independent of whether the boarding would be the result of a transfer from another transit vehicle or not (i.e., unlinked).
[2] With several alternatives, the BRT or busway bus lines would span two or more segments and the boarding rides for those lines are grouped together, as illustrated in the table.
[3] BRT bus lines – see Section 2.2 for a more detailed description of BRT bus lines.
[4] Busway bus lines – see Section 2.2 for a more detailed description of busway bus lines.
[5] Light rail line – see Section 2.2 for a more detailed description of light rail lines.
[6] Total includes approximately 7,400 boarding rides that would transfer between BRT buses and Milwaukie LRT.
[7] Total includes approximately 3,500 boarding rides that would transfer between BRT buses and Milwaukie LRT.

The No-Build Alternative would have no BRT, busway bus lines, or light rail lines. In contrast, the Combined LRT Alternative would result in more than 60,000 BRT bus line and light rail line rides per average 2020 weekday, the highest of the alternatives under consideration. The I-205 LRT and Milwaukie LRT Alternatives would result in approximately 47,000 and 41,000 BRT bus line and light rail line boarding rides per average weekday in 2020, respectively. Of the total, more than 33,000 boarding rides would be on the light rail line with the I-205 LRT Alternative, and more than 25,000 would be light rail boarding rides with the Milwaukie LRT Alternative. The Busway Alternative would result in more than 30,000 busway bus line boarding rides, and the BRT Alternative would result in almost 25,000 BRT bus line boarding rides (2020 average weekday).

Transit Mode Share to Major Corridor Activity Centers

Table 5.2-10 summarizes the peak 2-hour transit mode share from the South Corridor to four major activity centers within the corridor: downtown Portland, Clackamas Regional Center, Gateway Regional Center, and Milwaukie Town Center. Transit mode share is defined as the percentage of all trips (all trips taken using any mode) that originate in the South Corridor and are destined to one of the six activity centers, and that would arrive via a transit vehicle (bus or light rail).

Table 5.2-10
Ridership: 2020 PM Peak Two-Hour Transit Mode Share[1]
From the South Corridor to Major South Corridor Activity Centers, by Alternative

Activity Center	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Downtown Portland	56%	60%	62%	56%	60%	57%
Clackamas Regional Center	3%	3%	3%	3%	5%	6%
Gateway Regional Center	9%	9%	9%	9%	12%	12%
Milwaukie Town Center	5%	5%	5%	6%	4%	6%

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
[1] Transit mode share is the percentage of all trips traveling from the activity center to the South Corridor during the PM peak two hours that would be taken on transit.

The resulting mode splits from the four activity centers would be similar under the No-Build, BRT, and Busway alternatives, except that with the BRT and Busway alternatives the transit mode split for p.m. peak-hour trips from downtown Portland destined to locations throughout the South Corridor would increase to 60% and 62%, respectively (compared to a 56% transit mode split with the No-Build Alternative). With the Milwaukie LRT Alternative, mode split from all destinations would remain unchanged compared to the No-Build Alternative, except from the Milwaukie Town Center, which would change from 5% with the No-Build Alternative to 6%. The I-205 LRT Alternative would result in a 4 percentage-point increase in mode split from downtown Portland, compared to the No-Build Alternative (changing from 56% with the No-Build Alternative to 60%), and mode splits from the Clackamas Regional Center and the Gateway Regional Center would increase from 3% to 5% and from 9% to 12%, respectively. However, with the I-205 LRT Alternative, the peak-hour transit mode split from the Milwaukie Town Center would be 4%, compared to 5% with the No-Build Alternative. The Combined LRT Alternative would result in a 1 percentage-point gain in mode split from downtown Portland (57%), a 3 percentage-point increase from the Clackamas Regional Center (6%), a 3 percentage-point increase from the Gateway Regional Center (12%) and a 1 percentage-point increase from the Milwaukie Town Center (6%).

5.2.2.2 Ability to Ensure Effective Transit System Operations

The relative effectiveness of the alternatives in providing effective transit system operations is assessed using two qualitative measures; operational safety and operating considerations.

A. Operational Safety Considerations

There would be few differences in safety considerations when comparing the alternatives and options under consideration. The designs of the alternatives and options would conform to adopted local and industry-wide design standards. For the fixed-guideway alternatives, safety considerations primarily focus on the number of at-grade crossings because, while they would meet stringent design and safety standards, they would slightly increase the risk of light rail conflicts with other vehicles, and the placement and exposure of stations as passenger waiting areas.

B. Operating Considerations

This section summarizes significant operating issues with the alternatives and options. For example, operations of an alternative could be adversely affected by a variety of design and external factors, such as steep grades, sharp turns, or interference from cross traffic that could hamper reliability.

- The **BRT and Busway Alternatives** would re-introduce the operation of articulated buses on the downtown Portland transit mall, which would create a somewhat more-complex operating environment. With the BRT Alternative, the articulated buses would also operate in mixed traffic within the Portland to Milwaukie Segment, which would also create a somewhat more-complex operating environment for both transit and automobile operators. Mixed traffic operations for articulated buses would also occur in the Milwaukie to Clackamas Segment under the BRT, Busway, and Milwaukie LRT Alternatives, and in the Milwaukie to Oregon City Segment under all of the build alternatives.

- With the **Milwaukie Light Rail** and **Combined Light Rail Alternatives**, the light rail alignment would have more than 20 at-grade street crossings in the Portland to Milwaukie Segment, which could increase the likelihood that the line would experience delays and reliability problems.

- With the **I-205 Light Rail** and **Combined LRT Alternatives**, the relatively high number of light rail trains per hour that would travel on the track segment between the Steel Bridge and SW 11^{th} Avenue (e.g., approximately 33 trains per hour with the I-205 alternative during weekday peak hours, 2020) could lead to peak-period delays and reliability problems for the Green, Yellow, and Blue lines.

5.2.2.3 Ability to Maximize the Transit Network's Ability to Accommodate Future Growth in Travel Demand

Federal guidelines require that the analysis shown in this SDEIS be based on a design year approximately 20 years in the future. In response to that requirement, the design of and operating plan for the alternatives is based on 2020 operating conditions and levels of demand. Based on the region's commitment to integrated transportation, land use, and growth management plans, an important consideration in evaluating the alternatives is how well the alternatives would accommodate travel demand resulting from forecast growth in population and employment through 2020. A related consideration is whether there would be additional capacity with an alternative to respond to additional demand beyond the forecast year.

One measure used to assess the ability of the transit network to accommodate future growth in travel demand is a qualitative assessment of corridor transit network expansion capability. This measure assesses how and the extent to which an alternative would impact the costs and the ability of the transportation system to expand in the future.

- **No-Build Alternative.** The No-Build Alternative would create neither physical constraints on nor opportunities for future expansion of the Corridor's transit network. However, the No-Build Alternative would place a significant operational constraint on the public transportation system in the South Corridor: the delivery of transit services into the future would be constrained by congestion on the general-purpose road network (as documented in Section 1.4). Roadways have and will continue to become more congested over time, leading to increased operational costs and travel time for the transit system, which would limit the ability of the No-Build Alternative to respond to future levels of increased travel demand.

- **BRT Alternative.** The BRT Alternative would mitigate some of the operational constraints to future transit network expansion that would occur with the No-Build Alternative. Even with these improvements, several intersections and segments of roadways would become or remain congested, which would adversely affect transit travel times and reliability. In general, the BRT stations and intersection improvements, which would be located along SE McLoughlin Boulevard and Highway 224, would have the capacity to accommodate additional BRT buses to respond to increases in transit demand over time. The downtown Portland transit mall would have the capacity to absorb increases in bus volumes required to accommodate demand through 2020. Sometime after 2020, the transit mall, as currently configured, would reach capacity and the accommodation of additional demand would lead to deteriorating operating conditions.

- **Busway Alternative.** Compared to the BRT Alternative, the Busway Alternative would provide transit vehicles with additional protection from the effects of increased traffic congestion in the South Corridor through the addition of a busway fixed-guideway. The busway facility would have the capacity to accommodate additional transit vehicles to respond to increases in transit demand over time. A significant limitation of the Busway Alternative would be the relative scarcity of fixed-guideway park-and-ride lot capacity in the South Corridor. The downtown Portland transit mall would have the capacity to absorb increases in bus volumes required to accommodate demand through 2020. Sometime after 2020, the transit mall, as currently configured, would reach capacity and the accommodation of additional demand would lead to deteriorating operating conditions.

- **Milwaukie Light Rail Alternative.** The Milwaukie LRT Alternative would provide transit vehicles with a high level of protection from adverse traffic congestion effects on the regional and local street network by creating a mostly separated and protected right-of-way for LRVs. The Yellow Line would operate at 7½-minute headways in 2020, less than one-third of the capacity of the light rail line, which would allow TriMet to expand service to respond to increased demand through the purchase and operation of additional LRVs. However, the segment including the Steel Bridge and First Avenue to SW Yamhill Street would be shared with the Blue, Red, and Yellow Lines, which could potentially constrain increases in Yellow Line frequency. The Milwaukie LRT Line could also be extended south to Oregon City and/or southeast to Clackamas to respond to increased demand and regional and local land use plans and objectives.

- **I-205 Light Rail Alternative.** The I-205 LRT Alternative would provide transit vehicles with an even greater level of protection from increasing congestion on the adjacent street network than the Milwaukie LRT Alternative (there would be only one at-grade street crossing in the 6.7-mile extension). Further, the Green Line could be extended south to Oregon City, although such an extension would likely be less costly with the East of Clackamas Town Center Terminus Option than with the North of Clackamas Town Center Terminus Option. The I-205 LRT Alternative's use of the existing light rail alignment between the Gateway TC and downtown Portland, via the Steel Bridge, would present an operational and physical constraint on the expansion of service on the Green Line, possibly before 2020 service levels are reached. The primary constraint would be the segment of existing light rail alignment in downtown Portland between the Steel Bridge and SW 11th Avenue, which would be used concurrently by the Blue, Yellow, and Green Lines (and possibly the Red Line, which would occur if the Red Line did not shuttle between the Gateway TC and the Portland International Airport and instead operated as is currently does, from downtown Portland to the airport). Further analysis of light rail operations and constraints within the downtown Portland area will assist in understanding what, if any, constraints the I-205 LRT Alternative would experience. Finally, the I-205 LRT Alternative was designed to generally allow for the possible future expansion of the I-205 freeway by one lane in each direction along the outside edges of the existing freeway. The downtown Portland transit mall would have the capacity to absorb increases in bus volumes required to accommodate demand through 2020. Sometime after 2020, the transit mall, as currently configured, would reach capacity and the accommodation of additional demand would lead to deteriorating operating conditions.

- **Combined Light Rail Alternative.** The Combined LRT Alternative would provide the highest level of protection to transit vehicles from the increasing congestion on the adjacent street network, through the construction of almost 14 miles of light rail alignment in the South Corridor. The Combined LRT Alternative would provide two possible alignments for an expansion south to Oregon City, generally parallel to either SE McLoughlin Boulevard or I-205. The operational constraints that would occur on the Steel Bridge and on First Avenue with the Milwaukie LRT and the I-205 LRT Alternatives would be similar with the Combined LRT Alternative. Finally, the Gateway to Clackamas Segment of the Combined LRT Alternative was designed to allow for the possible future expansion of the I-205 freeway by one lane in each direction, plus additional auxiliary lanes and interchange improvements as identified by ODOT.

5.2.2.4 Ability to Minimize Traffic Congestion and Traffic Infiltration Through Neighborhoods

The objective to minimize traffic congestion and traffic infiltration through neighborhoods is assessed by evaluating three criteria: highway system use; local traffic impacts; and reducing traffic infiltration into neighborhoods.

A. Highway System Use

Highway system use in this SDEIS is assessed using three measures: p.m. peak 2-hour weekday vehicle volumes in 2020 on parallel roadways, the change in vehicle hours and miles, and the change in vehicle hours of delay.

Vehicle Trips Across Cutlines

The first measure of highway system use is based on the number of vehicle trips that would cross two cutlines in the South Corridor, and by comparing the results to the vehicle volumes that would occur with the No-Build Alternative (a cutline is an imaginary line between two geographical points that captures a set of generally parallel roadways). The two cutlines used within this analysis are at the following locations (see Figure 4.1-1): across I-205 and parallel streets at SE Powell Boulevard (E-19) and across SE McLoughlin Boulevard and parallel streets at SE Powell Boulevard (E-20).

Table 5.2-11 summarizes average weekday peak 2-hour vehicle volumes at the two cut lines for each of the alternatives. In summary, all of the alternatives would reduce p.m. peak vehicle volumes at the cutlines on I-205 and SE McLoughlin Boulevard at SE Powell Boulevard because some automobile users under the No-Build Alternative would be attracted to transit in the Gateway to Clackamas Segment and/or the Portland to Milwaukie Segment as a result of reduced transit travel times and/or the increased availability of park-and-ride spaces. The largest reductions on I-205 and parallel streets would result from the I-205 LRT and Combined LRT Alternatives (1.6% reductions); and the largest reductions on SE McLoughlin Boulevard and adjacent parallel streets would occur with the Busway and Combined LRT Alternatives (1.9% reductions).

Table 5.2-11
Highway System Use: 2020 Average Weekday PM-Peak Vehicle Volumes[1] at Select Corridor Cutlines, by Alternative

Cutline Number and Location	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
E-19: I-205 & Parallel Streets at SE Powell Blvd.[2]	56,300	55,900	55,900	55,800	55,400	55,400
Change from the No-Build Alternative	N/A	-400	-400	-500	-900	-900
E-20: SE McLoughlin Blvd. and Parallel Streets at SE Powell Blvd.[3]	20,700	20,500	20,300	20,400	20,400	20,300
Change from the No-Build Alternative	N/A	-200	-400	-300	-300	-400

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
[1] The number of vehicles that would cross the cutline on the designated set of parallel streets in both directions within the two-hour p.m. peak period.
[2] Cutline E-19 is comprised of the following roadways: SE 26th, 39th, 52nd, 72nd, 82nd, 112th, 122nd and 136th avenues, SE Foster Road and I-205 – see Figure 4.1-1).
[3] Cutline E-20 is comprised of the following roadways: SE McLoughlin Boulevard, SE Milwaukie Street and SE 17th Avenue – see Figure 4.1-1).

Vehicle Miles and Hours Traveled and Vehicle Hours of Delay

Two additional measures are used to assess how the alternatives would affect the corridors highway system: the change in vehicle hours and miles and the change in vehicle hours of delay. Both measures use the No-Build Alternative as the basis for determining the level of change that would occur. See Section 4.3.1 for additional information on the methods used to prepare these measures and additional information on impacts that would occur to the corridor's highway network.

Table 5.2-12 summarizes the 2020 average weekday vehicle miles traveled (VMT), vehicle hours traveled (VHT), and vehicle hours of delay, by alternative. In summary, all of the alternatives would help to reduce congestion and related problems, compared to the No-Build Alternative. For all measures, the Combined LRT Alternative would do the most to reduce VMT, VHT, and vehicle hours of delay in 2020: VMT and VHT would be reduced by more than 71,000 miles and 4,000 hours per average weekday, and vehicle delay would be reduced by 720 hours, compared to the No-Build Alternative. While the congestion relief would be somewhat less with the I-205 LRT Alternative than it would be with the Combined LRT Alternative, the reductions in VMT, VHT, and vehicle hours of delay would be more than three times greater with the I-205 LRT Alternative than it would be with the BRT, Busway, and Milwaukie LRT Alternatives. For example, the I-205 LRT Alternative would result in a reduction of more than 66,000 VMT, compared to reductions of 25,900, 33,300 and 20,000 VMT with the BRT, Busway, and Milwaukie LRT Alternatives, respectively. The BRT and Busway Alternatives would provide similar levels of congestion relief; for example the Busway Alternative would result in a reduction of more than 33,000 VMT, compared to a reduction of 25,900 with the BRT Alternative. The Milwaukie LRT Alternative would result in the least congestion relief, by reducing VMT and VHT by 20,000 miles and 740 hours, compared to the No-Build Alternative; however, it would not reduce vehicle hours of delay.

Table 5.2-12
Highway System Use: 2020 Average Weekday Vehicle Miles and Hours Traveled and Vehicle Hours of Delay, by Alternative

Measure[1]	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Change in Vehicle Miles Traveled	-25,900	-33,300	-20,000	-66,600	-71,200
Change in Vehicle Hours Traveled[2]	-1,200	-1,860	-740	-3,980	-4,010
Change in Vehicle Hours of Delay[3]	-20	-100	0	-570	-720

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
1 The change in all measures is based on the No-Build Alternative – see Section 4.3.1 for additional detail on these measures and see Table 4.3-1 for the base data for the No-Build and other alternatives. Excludes transit vehicle miles traveled and transit vehicle hours traveled.
2 Based on average weekday conditions in 2020 compared to the No-Build Alternative.
3 Based on p.m. peak-hour conditions in 2020 on freeways, major and minor arterials and collector streets compared to the No-Build Alternative.

B. Local Traffic Impacts

Roadway congestion is measured by determining which adverse impacts to the South Corridor roadway network would be difficult, costly, or unfeasible to mitigate for each alternative. Section 4.3.2 of this SDEIS summarizes the impacts to local traffic operations and facilities that would result from the alternatives under study and which impacts would meet the project's criteria for mitigation. Following is a summary of the local traffic impacts that would be difficult, costly, or unfeasible to mitigate, by alternative.

- **Hawthorne Bridge.** With the Milwaukie LRT and Combined LRT Alternatives, light rail signal priority at the intersection of SW 1st Avenue and SW Main Street and the new traffic signals at the light rail crossovers from the outside lanes on both the east and west sides of the Hawthorne Bridge would result in vehicle queuing and additional automobile travel time that would be difficult and costly to fully mitigate.

- **SE 11th and 12th Avenues and SE Clinton Street.** With the Busway, Milwaukie LRT, and Combined LRT Alternatives, busway and light rail at-grade crossings of SE 11th and 12th avenues and SE Clinton Street would result in vehicle queuing and delays during peak periods that would be difficult and costly to fully mitigate.

- **SE 17th Avenue and SE Holgate Boulevard.** With the Milwaukie LRT and Combined LRT Alternatives and the Brooklyn Yard Design Option, the light rail at-grade crossing of SE Holgate Boulevard would result in vehicle queues that could occasionally block SE 17th Avenue during peak periods. The development of fully coordinated traffic signals incorporating both the SE 17th Avenue at SE Holgate Boulevard traffic signal and the light rail at-grade crossing would be difficult to design and implement and might not fully mitigate the traffic impacts.

- **SE McLoughlin Boulevard and SE Milport Road.** With all of the alternatives except the No-Build Alternative and the Milwaukie LRT and Combined LRT Alternatives with the Tillamook Branch Line Design Option, westbound vehicle queues would develop during the p.m. peak period on SE Milport Road and SE Main Street due to the Milwaukie Southgate Park-and-Ride Lot. The intersection design could be modified to allow for additional stacking room to accommodate the traffic queues; however, delays related to the queuing would be difficult and costly to fully mitigate.
- **SE Foster Road Park-and-Ride.** The Foster Road Park-and-Ride Lot access points would not conform to ODOT and FHWA access spacing standards and would require a break in the I-205 access control lines. It may be difficult for this park-and-ride facility to receive the required permits and approvals from both ODOT and FHWA.

- **Fuller Road Park-and-Ride Lot Access.** With the I-205 LRT and Combined LRT Alternatives, it would be difficult to fully mitigate traffic delay that would occur during the a.m. peak period at the intersection of SE Fuller Road and SE Johnson Creek Boulevard. This delay would result from vehicular trips accessing the Fuller Road Park-and-Ride Lot from the east and south via SE Johnson Creek Boulevard (the intersection would operate at LOS F, compared to D with the No-Build Alternative). In addition, ODOT has plans to improve the interchange at I-205 and SE Johnson Creek Boulevard. Although final interchange improvement plans have not been completed, initial interchange designs would eliminate certain turning movements at the intersection of SE Fuller Road with SE Johnson Creek Boulevard. Mitigation concepts that would address the restricted access to the park-and-ride lot could include moving the park-and-ride or realigning SE Fuller Road.

C. Reduce Traffic Infiltration into Neighborhoods

The ability to minimize traffic infiltration into neighborhoods is assessed by measuring the 2020 average weekday p.m. peak 2-hour transit ridership across two cut lines in the corridor for each alternative, and by comparing them to the transit ridership that would occur at those cutlines with the No-Build Alternative (see the previous section on highway use for a definition and description of the cutlines).

Table 5.2-13 summarizes 2020 average weekday peak 2-hour transit ridership across two cutlines for the alternatives under consideration: across I-205 and parallel streets at SE Powell Boulevard (E-19) and across SE McLoughlin Boulevard and parallel streets at SE Powell Boulevard (E-20). Compared to the No-Build Alternative, the I-205 LRT and the Combined LRT Alternatives would increase transit ridership across the I-205 and SE Powell Boulevard cutline (E-19) by over 60%, due, in large part, to the improvements in transit speed that would occur in the Gateway to Clackamas Segment under those alternatives. In contrast, transit ridership at the same cutline would decline slightly with the BRT, Busway, and Milwaukie LRT Alternatives as a result of transit improvements in the Portland to Milwaukie Segment that would attract some transit riders from the Gateway to Clackamas Segment to transit lines that would operate in the Portland to Milwaukie Segment.

Opposite changes in transit ridership would occur at the SE McLoughlin Boulevard and SE Powell Boulevard cutline (E-20): Transit ridership would increase, relative to the No-Build Alternative, by 13, 21, and 26 percent with the Milwaukie Light Rail, BRT, and Busway Alternatives, respectively, compared to a 7 and 10 percent reduction with the Combined LRT I-205 and LRT Alternatives, respectively.

Table 5.2-13
Reduce Traffic Infiltration into Neighborhoods: 2020 Average Weekday PM-Peak Two-Hour Transit Ridership Volumes[1] at Select Corridor Cutlines, by Alternative

Cutline Number and Location	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
E-19: I-205 & Parallel Streets at SE Powell Blvd. [2]	3,990	3,900	3,780	3,880	6,720	6,500
Change from the No-Build Alternative	N/A	-90	-210	-110	2,730	2,510
E-20: SE McLoughlin Blvd. and Parallel Streets at SE Powell Blvd. [3]	6,330	7,650	7,950	7,150	5,720	5,910
Change from the No-Build Alternative	N/A	1,320	1,620	820	-610	-420

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; N/A = not applicable.
[1] The number of transit riders that would cross the cutline on the designated set of parallel streets in both directions within the two-hour p.m. peak period.
[2] Cutline E-19 is comprised of the following roadways: SE 26th, 39th, 52nd, 72nd, 82nd, 112th, 122nd and 136th avenues, SE Foster Road and I-205 – see Figure 4.1-1).
[3] Cutline E-20 is comprised of the following roadways: SE McLoughlin Boulevard, SE Milwaukie Street and SE 17th Avenue – see Figure 4.1-1).

5.2.2.5 Ability to Promote Desired Land Use Patterns and Development

The evaluation of the ability of the alternatives to promote desired land use patterns and development focuses on three criteria: the ability of the alternatives to support activity centers, the ability of the alternatives to support land use policies, and the ability of the alternatives to provide access to jobs for the corridor's labor force. Consistent with FTA guidance, the analysis reported in this SDEIS holds the amount of regional and corridor growth constant among project alternatives. That is, the analysis does not incorporate any quantitative differences between the alternatives in the amount of development that is projected to occur within the region or the corridor.

A. Support of Activity Centers

The relative ability of the alternatives to serve corridor activity centers as defined in the *Region 2040 Growth Concept* is assessed based on: 1) evaluation of an alternative's relative ability to provide high quality transit connections between the Central City, Regional Centers, and Town Centers; 2) evaluation of an alternative's ability to be physically and functionally integrated into the activity centers; and, 3) evaluation of the ability of transit stations/access points to be pedestrian accessible and visible. Following is an assessment of the relative ability of the alternatives to serve the six major activity centers within the South Corridor, including the Portland Central City, the Milwaukie

Town Center, the Oregon City Regional Center, the Gateway Regional Center, the Lents Town Center, and the Clackamas Regional Center.

Ability of the Alternatives to Provide High-Quality Transit Connections between the Central City, Regional Centers, and Town Centers

The *Region 2040 Growth Concept* defines a hierarchy of mixed-use activity centers for the region, with access to the centers being a key component that defines the significance of the centers and the role that the centers are expected to play in accommodating future growth within the region. Within the *Region 2040 Growth Concept*, the Portland Central City serves as the major center in the region and it is expected to be accessible to millions of people. Regional Centers are the second level centers and are expected to be accessible to hundreds of thousands of people. Town centers make up the third level of activity centers and are planned to be accessible to tens of thousands of people.

The **No-Build**, **BRT** and **Busway** Alternatives would all improve transit service in the corridor to the Central City, the Milwaukie Town Center, the Oregon City Regional Center, and the Clackamas Regional Center. Comparatively, the quality of the transit service that would be provided with these bus alternatives would be better with the Busway Alternative than with the BRT Alternative, and the BRT Alternative would be better than the No-Build Alternative. However, the quality of the transit service connecting the activity centers with the bus alternatives would not be as high as with the Milwaukie Light Rail, I-205 LRT, and Combined LRT Alternatives.

The **Milwaukie Light Rail Alternative** would provide a new high-quality light rail transit connection of the Milwaukie Town Center with the Portland Central City and a lower quality transit connection to the Clackamas Regional Center and Oregon City Regional Center via BRT trunkline bus routes. Milwaukie would have new high-quality transit connections to several activity centers contained within the Portland Central City, including the Central Eastside Industrial District (CEID), the north downtown/Old Town area, the Rose Quarter/Convention Center area, and the Lloyd District.

The **I-205 LRT Alternative** would provide a new high-quality light rail transit connection of the Clackamas Regional Center and the Lents Town Center with existing high-quality light rail transit service between the Gateway Regional Center and the Portland Central City, along with lower quality transit connections (via BRT trunkline bus routes) between the Oregon City Regional Center, the Milwaukie Town Center, and the Portland Central City. This alternative would also provide new high-quality transit connections from the Clackamas Regional Center to the Gresham Regional Center and Airport because of the existing light rail connections at the Gateway Transit Center.

The **Combined LRT Alternative** would provide high-quality transit service connections between most of the major activity centers in the Corridor as described for the Milwaukie and I-205 LRT Alternatives above. The only exception is the Oregon City Regional Center, which would be connected via BRT trunkline bus routes to the Milwaukie Town Center.

Ability of the Alternatives to be Physically and Functionally Integrated into Activity Centers

The relative ability of the transit facilities associated with the alternatives to be effectively integrated into the mixed-use activity centers can significantly affect the success of the centers in achieving the land use and density objectives of the regional and local plans. The level of integration of the transit service into the centers can also be a significant factor in the amount of transit use, and therefore success, of the transit service. Following is a discussion of how the facilities associated with the alternatives would integrate into the major activity centers in the corridor.

Portland Central City. The No-Build, BRT, and Busway Alternatives would not significantly change the integration of transit within the Portland Central City. The BRT and Busway Alternatives would provide more bus transit service on the highly successful downtown Portland transit mall and improved transit connections between the CEID and downtown Portland. The Milwaukie LRT Alternative would connect with the Yellow Line on First Avenue within downtown Portland, which would eliminate Yellow Line service on SW Yamhill and Morrison Streets between SW 1st and 11th Avenues (i.e., the cross-mall alignment). The SW 1st Avenue light rail route would provide additional light rail service to the Portland Central City along the eastern edge of the downtown area. However, the SW 1st Avenue alignment would not integrate light rail into the heart of the downtown area, either along the downtown Portland transit mall or along the existing light rail cross-mall alignment. Either of these alignments would provide significantly better physical and functional integration and pedestrian connections in the Central City than the SW 1st Avenue alignment, but the SW 1st Avenue alignment could induce additional development along this high-quality transit spine. The Milwaukie LRT Alternative would also provide light rail access to and within the CEID. The I-205 Light Rail Alternative would provide new light rail transit within the Clackamas Regional Center. The proposed station locations (east or north of the mall) would bring light rail well into the regional center area. In the Lents Town Center, the light rail station would be located near to and east of the commercial center. The I-205 LRT Alternative would provide additional light rail service into the Gateway Regional Center and into the Portland Central City using the existing Blue Line light rail alignment, without any improvements to transit facilities or changes to the way that it is integrated into these activity centers. The Combined Light Rail Alternative would be integrated into the activity centers in the Corridor as described above for the Milwaukie and I-205 LRT Alternatives.

Milwaukie Town Center. Except for the No-Build Alternative, all of the alternatives would relocate the existing Milwaukie TC from the current on-street location in downtown Milwaukie to an off-street location near SE Main Street and SE Milport Road, which would be relatively distant from and would hamper pedestrian access and views of the retail and commercial activity center of downtown Milwaukie. With the Tillamook Branch Line Design Option under the Milwaukie LRT and Combined LRT Alternatives, the transit center would be relocated near the Milwaukie Middle School at SE Harrison Street. A Harrison Street station is also included under the Southgate Crossover Design Option. However, this location would also be distant from the downtown core of the Milwaukie Town Center and would provide limited opportunity for integration into or visibility from the primary activity center.

Oregon City Regional Center. Except for the No-Build Alternative, all of the alternatives would provide for an upgrade of the Oregon City TC to include the amenities of a BRT station, which would not significantly change its integration into the regional center.

Gateway Regional Center. The existing Gateway TC is an important transportation hub within the Gateway Regional Center. The No-Build, BRT, Busway, and Milwaukie LRT Alternatives would result in no change to transit operations or facilities at the Gateway TC. The I-205 LRT and Combined LRT Alternatives would not change the location or components of the Gateway TC, but would provide a new light rail connection south along I-205 to the Lents Town Center and the Clackamas Regional Center.

Lents Town Center. The No-Build, BRT, Busway, and Milwaukie LRT Alternatives would provide local bus stops within the Lents Town Center, which would be served by the bus route that would connect the Parkrose, Gateway, and Clackamas Town Center TCs. The bus stops would be at street level on the east side of I-205, relatively close to and visible from the town center's area of commercial and retail activity. With the I-205 LRT and Combined LRT Alternatives, the bus route would be replaced with light rail service and the local bus stops would be replaced by the Foster Road Station, which would also provide for transfers between the Green Line and buses. The Lents light rail station would be located adjacent to and west of I-205, and elevated above street and sidewalk levels. The light rail station's location on the edge of the Town Center area and its elevation above street-level would not be ideally integrated into the activity center, but would provide good access and integration into the transit center.

Clackamas Regional Center. In general, the No-Build Alternative would not significantly change transit facility integration within the Clackamas Regional Center. The BRT, Busway, and Milwaukie LRT Alternatives would add trunkline bus service connecting with the Milwaukie Town Center, and the existing Transit Center would be upgraded. With the I-205 LRT and the Combined LRT Alternatives, a new light rail transit station within the Clackamas Regional Center would be included, providing high quality transit connections between the Clackamas Regional Center, the Lents Town Center, the Gateway Regional Center and the Portland Central City. Either of the proposed transit center locations would provide a significant transit center and transit connection to the regional light rail system. With the East of Clackamas Town Center Terminus Option, the transit center would be relocated between the east parking lot of the Clackamas Town Center and I-205. With the North of Clackamas Town Center Terminus Option, the current location of the transit center north of the Clackamas Town Center Mall would be retained and the transit center would be upgraded. The existing transit center is near the north entrance to the mall and the high-density housing located across SE Monterey Avenue.

Ability of Transit Stations/Access Points to be Pedestrian Accessible and Visible

The relative ability of the transit stations or transit access points associated with the alternatives to be pedestrian accessible relates the location of the proposed stations relative to surrounding uses, including levels of activity, such as density of housing and employment surrounding the stations or transit access points. Existing and planned pedestrian facilities can play an important role in pedestrian accessibility. Visibility of stations or transit access points is important to transit user safety and security and public access to the transit service. Following is an evaluation of the alternatives general pedestrian accessibility and visibility.

Bus Rapid Transit Alternative. The BRT stations would generally be within proximity of busy roadways, because buses would operate in mixed traffic and the transit access points would be near the busy roadways, generally at significant intersections. BRT improvements would require the widening of the already auto-dominated roadway cross sections of SE McLoughlin Boulevard and Highway 224, which could degrade pedestrian crossings near BRT stations. Generally, visibility at BRT stations would be good as it relates to safety and security of transit riders, because of the high volumes of traffic that would pass the stations.

Busway Alternative. Busway and BRT stations associated with the Busway Alternative would generally be within proximity of busy roadways. The buses would operate in both separated roadways and mixed traffic and the transit stations would be located near the roadways. Transit improvements would make the roadways wider at station locations (to allow for bus bypass lanes and station pull-outs), but widening the roadway could detract from the pedestrian environment. Some busway stations would be in relatively isolated environments. Most BRT stations would be generally visible to roadway users. Visibility at stations would generally be good because of the high volume of traffic passing the stations.

Milwaukie Light Rail Alternative. Light rail stations associated with the Milwaukie LRT Alternative would have a wide variety of pedestrian environments, ranging from the highly urbanized, highly visible and pedestrian friendly environment of downtown Portland at the SW Main Street Station to the relatively less urbanized, more transportation infrastructure dominated station environments of the proposed Holgate Boulevard, Bybee Boulevard, and Tacoma Street stations. Most light rail stations would have relatively good visibility or connections between surrounding activities. Better pedestrian accessibility and visibility would be provided at the stations associated with the 17th Avenue Design Option, compared to the West of Brooklyn Yard Design Option. BRT stations associated with the Milwaukie LRT Alternative would generally be within proximity to busy roadways as described for the BRT Alternative above.

I-205 Light Rail Alternative. New light rail stations associated with the I-205 LRT Alternative would generally be located between the freeway environment of I-205 and the adjacent neighborhood and community land uses. The new light rail stations would generally be grade-separated from the adjacent land uses with pedestrian connections provided. The I-205 multiple-use path would connect to many of these proposed light rail stations. Generally, there would be good visibility of the light rail stations, but pedestrian access to the stations would require the use of a ramp. Both of the proposed light rail station and transit center locations within the Clackamas Regional Center would be relatively pedestrian accessible and visible from nearby activity centers. BRT stations associated with the I-205 LRT Alternative would generally be within proximity of busy roadways as described for the BRT Alternative above.

B. Support of Land Use Policies

This section assesses the relative ability of the alternatives to support significant land use and transportation policies using two measures: compatibility with state and regional land use plans and policies and support of regional air quality plans.

Compatibility with State and Regional Land Use Plans and Policies

This section first outlines the compatibility of the alternatives with statewide planning goals, and second, the compatibility of the alternatives with regional and local land use plans and policies.

Statewide Planning Goals. Oregon law mandates that statewide planning goals be implemented through state, regional, and local comprehensive plans. All of the build alternatives would be supportive of the *Statewide Planning Goals*. The build alternatives would provide improved transit service to lands within the region's UGB that are targeted to receive urban development, consistent with the emphasis of the *Statewide Planning Goals*, particularly Goal 11 – Public Facilities and Services, Goal 12 – Transportation and Goal 14 – Urbanization. The proposed transit improvements would not serve rural lands or result in pressure to convert rural lands to urban uses, consistent with the emphasis of Goal 3 – Agricultural Lands, Goal 4 – Forest Lands and Goals 11, 12 and 14.

The build alternatives have been designed to link and serve major regional employment, commercial and residential areas, such as: the Portland Central City; the Gateway, Clackamas and Oregon City Regional Centers; the Milwaukie and Lents Town Centers; and other activity centers such as OMSI, the Portland Adventist Medical Center, and Portland Community College facilities. Relative to the No-Build Alternative, all build alternatives would be supportive of the *Statewide Planning Goals*, through the provision of safe, convenient transportation systems that are designed to reduce reliance on the automobile and help achieve the state and regional goals of reducing per capita VMT. Compared to the No-Build Alternative, the BRT and Busway Alternatives would provide better bus service that would support many of the statewide goals, including making it more convenient for people to walk, bicycle, and use transit and to drive less. The light rail alternatives would further the *Statewide Planning Goals* because the light rail alternatives would provide the highest-quality transit service to support reductions in per capita VMT, thereby reducing reliance on individual automobiles and achieving the population and employment densities envisioned for the activity centers.

Regional Plans and Policies. Similar to the *Statewide Planning Goals*, regional plans and policies (including the *Regional Urban Growth Goals and Objectives* [RUGGOs], the *Regional 2040 Growth Concept,* the RTP*,* and the *Regional Framework Plan*) emphasize maintaining compact urban form by focusing new growth in specific mixed-use activity centers. The RTP supports targeting public investments, including transit improvements, to reinforce and support the goal of compact urban form. The *Region 2040 Growth Concept* directs most new development to mixed-use urban centers and along major transportation corridors. Adopted regional and local plans also support targeting transit investments to leverage higher-density development in the designated mixed-use centers. The regional plans envision that light rail and bus rapid transit will become the backbone of the transit system, connecting regional centers to each other and to the central city.

All of the alternatives, including the No-Build Alternative, have been defined to be highly supportive of the regionally adopted land use and transportation goals, policies, and plans. However, the differences between the alternatives in terms of their abilities to achieve the larger vision of *the Region 2040 Growth Concept* and RTP are significant. These differences primarily relate to which alternative would provide for the most effective implementation of these plans and policies.

Relative to the No-Build Alternative, the **BRT Alternative** would improve transit access to the key activity centers through improved speed and reliability of bus service. The BRT Alternative would provide a rapid bus connection between the Portland Central City, the Clackamas and Oregon City Regional Centers, and the Milwaukie Town Center. In addition to providing better transit connections between several centers, the BRT Alternative would serve the employment corridor along Highway 224, but it would not include a rapid bus connection between the Clackamas and Gateway Regional Centers. The **Busway Alternative** would provide the same transit link between centers called for in the *Region 2040 Growth Concept* as the BRT Alternative, specifically between the Portland Central City, the Clackamas and Oregon City Regional Centers, and the Milwaukie Town Center. While the *Region 2040 Growth Concept* and the RTP generally identify the Portland to Milwaukie and the Milwaukie to Clackamas Segments as appropriate corridors for light rail, the Busway Alternative would be generally compatible with adopted regional plans.

The **Milwaukie Light Rail Alternative** would support regional plans and policies. The *Region 2040 Growth Concept* reflects the South/North Project Land Use Final Order (LUFO), and shows light rail station communities along SE McLoughlin Boulevard, between the Portland Central City and the Milwaukie Town Center, and along Highway 224 between the Milwaukie Town Center and the Clackamas Regional Center. The RTP supports light rail transit in the long-term with rapid bus service along 99E and Highway 224, from the Portland Central City to the Clackamas Regional Center, until light rail service can be provided.

The **I-205 Light Rail Alternative** would support regional plan policies that call for high-capacity transit links between designated regional centers and town centers. This alternative would link the Clackamas Regional Center and the Lents Town Center with the major transit hub at the Gateway Regional Center. Bringing light rail transit to the Clackamas Regional Center would be an important transportation improvement that is essential to achieving the higher-density employment and residential development envisioned for this regional center.

The **Combined Light Rail Alternative** would be the most supportive of the regional plans and policies. Of all build alternatives, the Combined LRT Alternative would provide light rail connections between the greatest number of designated regional centers and town centers and it would provide the greatest opportunity to support envisioned development and the designated mixed-use centers.

Support of Air Quality Plans

The two major precursors to ozone are volatile organic compounds (VOC) and nitrogen oxides (NO_x), which are both addressed in this section. This section also addresses carbon monoxide (CO) emissions. All estimates for reductions in air quality emissions are based on 2020 service and demand levels, expressed in tons per year, and the estimates in reductions use the No-Build Alternative as the basis of comparison. See Section 3.5 for more detailed information on the definitions and methodologies used to forecast reductions in air quality emissions.

In 1997, the U.S. Environmental Protection Agency (EPA) approved the CO and ozone Air Quality Maintenance Plan (AQMP) for the Portland/Vancouver region. In January 2001, the U.S. Department of Transportation (USDOT) issued its determination of conformity for the Financially

Constrained System of the 2000 RTP, finding that the RTP supports the purpose of the region's State Implementation Plan (SIP). Consistency with the AQMP requires that CO and ozone levels be kept within federal and state standards.

The effects of the South Corridor's alternatives on CO, VOC, and NO_X, compared to the No-Build Alternative, are summarized in Table 5.2-14. Under all of the alternatives, federal and state air quality standards would be met. All of the alternatives would result in reductions in CO, VOC, and NO_X in 2020. The I-205 LRT and Combined LRT alternatives would result in the greatest reductions in each pollutant type, more than double the reductions that would occur with the other alternatives, while the Milwaukie LRT Alternative would result in the smallest reduction in emissions. In particular, the Combined LRT and the I-205 LRT Alternatives would result in 276 and 245 fewer tons per year of CO, respectively. In contrast, the Busway Alternative would result in 122 fewer tons per year of CO, followed by a reduction of 86 tons per year with the BRT Alternative and a reduction of 79 tons per year with the Milwaukie LRT Alternative.

Table 5.2-14
Support of Air Quality Maintenance Plan: Annual Reduction in CO, NO_X and VOC Emissions[1] from the No-Build Alternative, by Alternative (in Tons, Year 2020)

Measure	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Carbon Monoxide (CO)	86	122	79	245	276
Nitrogen Oxides (NO_X)	15	19	13	43	48
Volatile Organic Compounds (VOC)	11	15	10	31	35

B. Ability to Provide Residential Areas with Good Access to Jobs and Increase Long-Term Employment

This section summarizes two measures relating to employment: transit access to the labor force; and change in long-term regional employment.

Transit Access to the Labor Force

Access to the labor force is measured by the number of residents in 2020 that would be located within 45 minutes (in-vehicle, non-weighted time) of downtown Portland, the Lloyd District, the Gateway Regional Center, and the Clackamas Regional Center, as summarized in Table 5.2-15. Because this measure uses total transit travel time, it accounts for the time that would be spent both traveling on a transit vehicle and walking to and from a bus stop or transit station and the time that would be spent waiting for the transit vehicle.

Table 5.2-15 summarizes the number of residents that would be located within 45 minutes of key South Corridor employment centers, based on total unweighted transit travel times in the p.m. peak 2-hour period for an average 2020 weekday. With one exception, the build alternatives would increase the number of residents that would be located within 45 minutes of all of the employment centers, compared to the No-Build Alternative. The Combined LRT Alternative would result in the largest number of residents within 45 minutes of downtown Portland, 741,800 residents, a 5% increase over the No-Build Alternative, followed closely by the Milwaukie LRT Alternative, with 740,000 residents. The Combined LRT Alternative would also provide the Lloyd District with the greatest number of residents with 45-minute transit access, 605,200 residents, compared to 537,800 with the No-Build Alternative, followed closely by the I-205 LRT Alternative with 601,200 residents. In contrast, the BRT Alternative would result in a 1% loss in the number of residents with 45-minute transit access to the Lloyd District, compared to the No-Build Alternative (534,500 residents, compared to 537,800).

Table 5.2-15
Access to Labor Force: Number of Residents Within 45 Minutes[1] of Key Corridor Work Destinations Using Transit, by Alternative (2020)

Measure/Work Destination	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
45-Minute Transit Access to:						
Downtown Portland	704,400	706,800	718,400	740,000	717,400	741,800
Lloyd District	537,800	534,500	539,100	553,200	601,200	605,200
Central Eastside Industrial District	499,300	500,500	508,400	508,000	497,400	498,400
Gateway Regional Center	568,200	568,500	565,600	574,100	645,400	640,200
Clackamas Regional Center	351,900	413,900	400,800	384,300	463,200	438,900

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; RC = regional center.
[1] Total, un-weighted transit travel time during the p.m. peak period on an average weekday in 2020.

The Busway and Milwaukie LRT Alternatives would provide the CEID with the greatest number of residents with 45-minute transit access, approximately 508,000, a 2% increase over the No-Build Alternative. For the Gateway Regional Center, the I-205 LRT Alternative would provide 45-minute transit access to the greatest number of residents (645,400 residents, a 14% increase over the No-Build Alternative). Similarly, the I-205 LRT Alternative would increase the number of residents with 45-minute transit access to the Clackamas Regional Center by approximately one-third, compared to the No-Build Alternative (463,200 residents, compared to 351,900).

Changes in Short and Long-Term Employment

Changes in short-term employment would result from local construction-related expenditures associated with an alternative, expressed as the number of additional new person-year jobs and increases in personal income. Changes in long-term employment would result from increases in ongoing O&M expenses, compared to the No-Build Alternative, based on levels of service in 2020. See Section 3.1 of this SDEIS for more information on both long-term and short-term employment impacts. Table 5.2-16 summarizes the changes in short- and long-term employment levels that would result from the various build alternatives, based on 2020 service levels.

Table 5.2-16
Change in Employment: Changes[1] in Short-Term and Long-Term Employment and in Personal Income, by Alternative

Measure	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Short-Term Employment	710	1,480	3,610	3,090	7,260
Additional Personal Income (millions of dollars)	$27.9	$58.1	$142.4	$121.7	$285.7
Long-Term Employment	61	67	36	101	95

Source: *South Corridor Land Use and Economic Impacts Results Report* (Metro, Doorman, and Hovee, November 2002).
Note: BRT = bus rapid transit; LRT = light rail transit.
[1] Change is compared to the No-Build Alternative.

The Combined LRT Alternative would result in over 7,000 construction-related person-year jobs, more than double the number of jobs that would be created by the other alternatives, generating more than $285 million in additional personal income. Construction of both the I-205 LRT and Milwaukie LRT Alternatives would result in more than 3,000 new short-term person-year jobs and more than $120 million in additional personal income, compared to approximately 1,400 new construction jobs and more than $58 million in additional personal income with the Busway Alternative and more than 700 new jobs and almost $28 million in new personal income with the BRT Alternative.

The I-205 LRT Alternative would result in approximately 100 additional (long term) jobs per year, compared to the No-Build Alternative, followed by 95 additional long-term jobs with the Combined LRT Alternative. The BRT and Busway Alternatives would result in 61 and 67 new long-term jobs, respectively, followed by 36 added long-term jobs with the Milwaukie LRT Alternative.

5.2.2.6 Ability to Provide for a Fiscally Stable and Financially Efficient Transit System

The ability of the alternatives to provide for a fiscally stable and financially efficient transit system is measured within the SDEIS through two sets of measures: a range of cost-effectiveness measures and capital and O&M costs.

A. Cost-Effectiveness Measures

Cost-effectiveness analysis compares the benefits of each alternative with its costs. Four measures are used by the South Corridor Study to assess the cost-effectiveness of the alternatives: operating cost per originating ride, net operating subsidy per originating ride, boarding rides per revenue hour; and incremental cost per new ride. All measures are systemwide, except boarding rides per revenue hour, which are for the South Corridor only.

Methodologies

The **operating cost per originating ride** measure is the ratio of total annual transit rides in the system divided by the annual cost of operating the transit system. The **net future operating subsidy per originating ride** measure is calculated by dividing the net operating subsidy for the system by the number of future transit system originating rides. This measure offers a slightly different perspective than operating cost per ride in that light rail service tends to result in a greater average farebox recovery ratio than bus rides. This recovery ratio reflects a greater operating efficiency with light rail than with buses; therefore, the net operating subsidy per originating ride depends on the mix of light rail and bus rides served by an alternative. The **boarding rides per revenue hour** measure is the ratio of the annual number of corridor BRT bus line, busway bus line, and light rail line boarding rides divided by the amount of time those lines would be in operation over a year. Note that an *originating ride* is defined as a one-way person trip taken from a place of origin (e.g., one's home) to a destination (e.g., one's workplace), independent of whether that trip would require a transfer or not. A *boarding ride* is defined as any time a patron would board a transit vehicle, whether or not that boarding was the result of a transfer from another transit vehicle.

FTA has established an index that compares the **incremental cost per incremental (i.e., new) ride** as a standardized measure for comparing major transit investment projects throughout the country that are or will be applying for federal Section 5309 New Starts funding. The FTA index has become an important part of the agency's procedures for reviewing major transit projects. Under federal law, cost-effectiveness measures must be considered in the context of a comprehensive review of:

mobility improvements, environmental benefits, operating efficiencies, the degree of local financial commitment, and existing land use, transit land use policies and future patterns of development. While the FTA index is important, it does not account for many benefits, such as the reduction in public infrastructure costs, benefits to existing riders, or environmental benefits that would result from the more efficient land use patterns fostered by some of the alternatives. One of the reasons that these benefits are not incorporated into the index by FTA is that there are no generally accepted methodologies for establishing the monetary value of many of these benefits. Because of this limitation, FTA's current Section 5309 New Starts evaluation criteria, which include the incremental costs per incremental new ride, also include a broad spectrum of evaluation measures rather than relying on one or two summary evaluation indices, as was generally the practice before 2000.
The FTA index measures the incremental cost per incremental ride added to the system compared to the No-Build Alternative. Pursuant to FTA guidance, the FTA index is calculated as follows:

$$\textit{FTA index} = \frac{\Delta\ \$Capital + \Delta\ \$O\&M}{\Delta\ Rides}$$

Where the Δs represent changes in costs and benefits compared to the No-Build Alternative, and where:

Δ $Capital = the change in equivalent annualized capital costs;
Δ $O&M = the change in annual operating and maintenance costs; and
Δ Rides = the change in annual transit ridership.

For the South Corridor's computation of the FTA index, the systemwide change in rides is defined as the difference in the number of 2020 transit rides with the No-Build Alternative, compared to the Project's build alternatives. The forecast of ridership employs a 326-days-per-year annualization factor for light rail, which is used to convert average weekday ridership into annual ridership, and a 302-days-per-year annualization factor for the No-Build, BRT, and Busway Alternatives, reflecting TriMet's current experience on the Blue and Red light rail lines and their systemwide bus network. Light rail's relatively greater annualization factor reflects TriMet's finding that light rail lines tend to have more weekend ridership in proportion to weekday ridership than bus lines do.

Capital costs are annualized using FTA-approved discount rates and estimated economic life spans for various components of the alternatives. Key factors required for the computation of equivalent annual costs include the choice of discount rates and the effective useful lives of all major cost components. Following current FTA guidance, a discount rate of 7% is used. The effective useful lives of major components used in this calculation correspond to the economic lives of the major categories of capital costs: heavy construction items have an economic life of 30 years; buses have an economic life of 12 years; right-of-way has an economic life of 100 years; and the economic life of light rail vehicles is 25 years. The methods for calculating the capital costs and operating costs used in the FTA cost-effectiveness index are documented in those respective methodology reports.

Finally, it is also important to consider these measures in a context of the wide spectrum of evaluation measures, as laid out in Table 5.2-1. Cost-effectiveness does not address financial feasibility or the value of any benefit other than ridership. While cost-effectiveness is an important factor, these results should be considered in light of the relative benefits of the alternative, which are not given a monetary value or incorporated into the calculation of these measures. Further, the financial feasibility of the alternatives, summarized in the following section and in greater detail in Section 5.1 of this SDEIS, is a key factor in evaluating the alternatives.

Results

Table 5.2-17 summarizes the cost-effective measures for each of the alternatives (see the previous section and the *Evaluation and Financial Methods Report* (Metro, November 2002) for a description of the methods used to calculate the measures). It is important to note that all but one of the cost-effectiveness measures described in this section are based on systemwide measures, and that it takes a relatively large change in corridor costs and benefits to produce a measurable change in systemwide measures. Therefore, even significant changes at the project and corridor level may result in relatively minor changes in systemwide measures.

Operating Cost per Originating Ride. All of the alternatives would result in a slight increase in the systemwide annual operating cost per systemwide originating ride compared to the No-Build Alternative, except for the Combined LRT Alternative, which would leave the cost per ride unchanged.

Operating Subsidy per Originating Ride. Changes in the net annual operating subsidy per originating ride would be similar to the changes in the operating subsidy: with the Combined LRT Alternative the subsidy per ride would be slightly lower than with the No-Build Alternative ($1.19 compared to $1.21, respectively). The Milwaukie LRT and I-205 LRT alternatives would leave the measure unchanged, while the BRT and Busway alternatives would lead to slight increases in the measure ($1.24 and $1.23, respectively).

Table 5.2-17
Cost-Effectiveness Measures[1], by Alternative

Measure	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Annual Operating Cost Per Originating Ride	$1.94	$1.97	$1.96	$1.96	$1.95	$1.94
Net Annual Operating Subsidy Per Originating Ride	$1.21	$1.24	$1.23	$1.21	$1.21	$1.19
Annual Boarding Rides Per Revenue Hour[2]	N/A	70	81	171	159	258
Incremental Cost per New Originating Ride[3]	N/A	$10.21	$11.63	$20.48	$9.50	$11.85

Source: Metro, September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit.
1 It should be noted that all of these indicators do not include any dollar values for many benefits resulting from the alternatives, such as reduced infrastructure costs, travel time savings, etc. All costs are in 2002 dollars, and all measures are based on 2020 service levels and 2020 facility improvements (see section 2.2, 2.3 and 2.4 for more detail).
2 For South Corridor BRT bus lines, busway bus lines and light rail lines. Note that for light rail alternatives, revenue hours are based on trains rather than cars.
3 Incremental cost per new rider = the annualized capital and O&M costs (2002 dollars at 2020 service levels) of an alternative compared to the No-Build Alternative, divided by the difference in annual systemwide ridership between the alternative and the No-Build Alternative – see the text of this section for a more detailed description.

Annual Boarding Rides per Revenue Hour. Annual boarding rides per revenue hour is an indicator of operating efficiency, because a primary factor affecting the cost associated with operating a transit vehicle is the hours that the vehicle is operated (the other primary factor is vehicle mileage). This measure applies only to BRT bus lines, busway bus lines, and light rail lines. Because there would be no BRT bus lines, busway bus lines, or light rail lines within the South Corridor under the No-Build Alternative, the annual boarding rides per revenue hour cannot be calculated for that alternative. The lowest number of rides per hour would occur with the BRT and Busway Alternatives (70 and 81 rides per revenue hour, respectively). The light rail alternatives, with the greater passenger capacity available within a light rail train, would all lead to significant increase in this measure: the I-205 Alternative would have 159 passenger boardings per revenue hour on average, compared to 171 and 258 rides per hour with the Milwaukie LRT and Combined LRT Alternatives, respectively.

Incremental Cost per New Ride. Because the No-Build Alternative is the basis of this measure, the measure cannot be calculated for it. The I-205 LRT Alternative would result in the lowest incremental cost per new originating ride ($9.50 per new ride), followed by the BRT, Busway, and Combined LRT Alternatives ($10.21, $11.63 and $11.83 per new rides, respectively). The Milwaukie LRT Alternative would result in the greatest incremental cost per new ride ($20.48) – the relatively high incremental cost per new ride of the Milwaukie LRT Alternative results from its relatively high capital costs (compared to the BRT and Busway Alternatives) and its relatively low number of new transit riders (compared to the I-205 LRT and Combined LRT Alternatives).

B. Fiscal Measures

This SDEIS uses two fiscal measures to compare the alternatives; capital costs and annual operating and maintenance costs.

Capital Costs. Capital costs for the South Corridor Project are expressed in both current (2002) dollars and YOE dollars. See Section 2.4 of this SDEIS for a description of the methodology used to prepare the current year cost estimates and a more detailed breakdown of the base year cost estimates. Year-of-expenditure costs are based on the base year cost estimates, a draft construction schedule, projected inflation rates for right-of-way and construction costs, and estimated finance costs. A description of the methodology used to prepare the YOE cost estimates and a more detailed breakdown of those cost estimates is found in Section 5.1 of this SDEIS and the *Capital Cost Methods Report* (TriMet, November 2002). This section uses current (2002) dollar capital costs to compare the alternatives and options.

Table 2.3-1 summarizes the current year (2002) capital cost for each alternative, in excess of the No-Build Alternative based on 2020 service levels. In order of least to highest cost for the alternatives in 2020, the BRT Alternative would cost approximately $109.9 million; the Busway Alternative would cost approximately $248.8 million, the Milwaukie LRT Alternative would cost approximately $434.1 million, the I-205 LRT Alternative would cost approximately $431.5 million, and the Combined LRT Alternative would cost approximately $731.8 million (2002 dollars).

Note that the capital cost for any alternative, except for the No-Build Alternative, would depend on the design and terminus options selected. The cost for an alternative, as shown in Table 2.3-1, is based on a common set of design options for each alternative, as defined in Table 2.2-3. The comparative analysis design options shown in Table 2.2-3 are used for comparison throughout this

SDEIS. If a different set of design options were to be selected for an alternative, the capital cost for that alternative would change.

Table 2.3-2 summarizes the cost differences between the design options under study, by alternative, and Table 5.1-2 provides a summary of the range in capital costs for each alternative that would result from the selection of the highest- and lowest-cost design options. Of the Clackamas Park-and-Ride Lot Design Options for the BRT, Busway, and Milwaukie LRT Alternatives, the Johnson Road Park-and-Ride Lot Design Option would be the least expensive to construct. For the Busway Alternative, the least expensive of the East Hawthorne, Clinton Street and Brooklyn Yard Design Options, would be the Water Avenue Ramp, the Above-Grade Station (with the Water Avenue Ramp Design Option – with the 7th Avenue Design options, the At-Grade Station Design Option would be the less expensive option) and the West of Brooklyn Yard design options, respectively. For the Milwaukie LRT and Combined LRT Alternatives, the least expensive of the Brooklyn Yard, North Milwaukie, and Milwaukie Terminus Options would be the West of Brooklyn Yard and Tillamook Branch Line Design Options and the Milwaukie Middle School Terminus Option, respectively. For the I-205 LRT and Combined LRT Alternatives, the least expensive of the Clackamas Town Center Terminus Options would be the North of Clackamas Town Center Terminus Option.

Operating and Maintenance Costs. Operating and maintenance (O&M) costs for the South Corridor Project are based on ridership forecasts for 2020 and on the resulting transit operating plan that would accommodate that ridership demand, expressed in current year (2002) dollars. O&M costs for an alternative include all of the forecast costs that would be associated with operating the Portland/Vancouver area transit systems (i.e., TriMet, C-TRAN, Portland Streetcar, SMART and the Wilsonville to Beaverton Commuter Rail line) under that alternative. A more detailed description of the methodology used to prepare the O&M cost estimates and a more detailed breakdown of those cost estimates may be found in Section 2.5 of this SDEIS and the *Operating and Maintenance Costs Methods Report* (TriMet, November 2002).

Table 5.1-2 summarizes the South Corridor annual O&M costs for each alternative. Unlike capital costs, a range of estimates is not provided for the O&M costs because the design and terminus options under study would not result in a measurable difference in O&M costs for the alternatives (except for the Milwaukie Middle School Terminus Option, which would lead to slightly greater O&M costs than the Lake Road Terminus Option with the Milwaukie LRT and Combined LRT Alternatives). Operating costs would be least under the No-Build Alternative, at approximately $286.2 million per year (2002 dollars) for the entire Portland/ Vancouver metropolitan area's transit network. Operating costs would be greatest under the Combined LRT Alternative, at approximately $298.0 million per year (an increase of approximately $11.8 million), followed by the I-205 LRT Alternative, at approximately $297.7 million per year (an increase of approximately $11.5 million). The cost increases associated with the I-205 LRT and Combined LRT Alternatives would result primarily from substantial increases in LRV hours and miles, with only a slight increase or reduction in bus miles and hours, respectively. In contrast, the BRT Alternative would cost approximately $293.1 million per year to operate and maintain (an increase of approximately $6.9 million), and the Busway and Milwaukie LRT Alternatives would cost approximately $294.1 and $293.3 million (increases of approximately $7.9 million and $7.10 million), respectively (the Milwaukie LRT Alternative would cost less than the Busway Alternative because it would result in a large decrease in bus vehicle miles and hours, coupled with a much smaller increase in LRV miles and hours).

5.2.2.7 Ability to Maximize the Efficiency and Environmental Sensitivity of the Engineering Design of the Proposed Project

This SDEIS assesses a broad array of environmental impacts that would be associated with each of the alternatives under study, as required by the National Environmental Policy Act (NEPA). A detailed presentation of those environmental impacts may be found in Chapters 3 and 4 of this SDEIS. This section and Table 5.2-18 highlight several of those impacts as indicators of the efficiency and environmental sensitivity of the alternatives and options under study: displacements, noise and vibration impacts, impacts to wetlands and parklands, and impacts to historical and cultural resources. In addition, this section concludes with a qualitative discussion of significant design considerations associated with alternatives and options.

A. Displacements

Table 5.2-18 summarizes the potential displacements that would occur with each alternative under study. Note that these displacements would be associated with the design options used for the comparative analysis of alternatives, as described in Section 2.2 and summarized in Table 2.2-3. The displacements associated with an alternative would vary by some design options. Variations in displacements by design option are summarized in Table 3.2-2 and are discussed by design option area at the conclusion of this section.

Alternatives

The No-Build Alternative would result in no displacements, and the BRT Alternative would result in the fewest number of potential displacements of the build alternatives (six businesses). The Busway, Milwaukie LRT, and Combined LRT Alternatives would primarily result in the displacement of businesses (51 of 53, 41 of 43, and 38 of 53 total displacements, respectively). In contrast, 13 of 16 total potential displacements that would occur with the I-205 LRT Alternative would be of residential units (three potential business displacements).

Design Options

The analysis of the potential displacements that would occur by alternative is based on a common set of design options used throughout this SDEIS for the purpose of comparing alternatives, as described in Table 2.3-3. There would be some variation in the number of displacements that would occur if a different set of design options were to be selected (see Table 3.2-2). Within the **Clackamas Park-and-Ride Lot Design Options** area, included with the BRT, Busway, and Milwaukie LRT alternatives, the Linwood Park-and-Ride Lot Design Option, which was used for assessing the displacements by alternative, would result in two potential business displacements, compared to no business displacements with the Johnson Road Park-and-Ride Lot Design Option.

Within the **East Hawthorne Bridge Design Options** area under the Busway Alternative, the Water Avenue Design Option, which was used as the basis for assessing the displacements by alternative, would result in the potential displacement of one business, compared to no business displacements with the 7th Avenue Design Option. Within the **Clinton Street Station Design Options** areas, the At-Grade Station Design Option, which was for assessing the displacements by alternative, would result in the potential displacement of two businesses, compared to no business displacements with the Above-Grade Station Design Option. Within the **Brooklyn Yard Design Options** area, the 17th Avenue Design Option, which was used as the basis for assessing the displacements by alternative, would result in the potential displacement of 12 businesses and one institutional or public facility, compared to four potential business displacements and no displacements with the West of Brooklyn Yard Design Option.

Table 5.2-18
Environmental Sensitivity: Summary of Environmental Evaluation Criteria by Alternative[1]

Criteria\Measure	No-Build	BRT	Busway	Milwaukie LRT	I-205 LRT	Combined LRT
Displacements[1]						
Residential Units	0	0	1	1	13	14
Businesses	0	6	51	41	3	38
Public Facilities	0	0	1	1	0	1
Total	**0**	**6**	**53**	**43**	**16**	**53**
Noise and Vibration[2]						
Adverse Noise Impacts Without Mitigation	0	0	9	0	24	24
Adverse Noise Impacts With Mitigation	0	0	0	0	0	0
Adverse Vibration Impacts Without Mitigation	0	0	0	4	7	11
Adverse Vibration Impacts With Mitigation	0	0	0	0	0	0
Wetland, Flood plains, Parks and TES Fish						
Acres of Impacted Wetland	0	0.03	0.39	0.59	0.10	0.66
Cubic Yards of Fill in the 100-Year Floodplain[3]	0	0	9,500 / 38,000	9,200 / 32,600	200	9,400 / 32,800
Number of Acres of Parkland Used	0	1	7	10	3	13
Linear feet of Streams with Threatened or Endangered Fish Species	0	0	131	58	55	113
Historical and Cultural Resources						
Historic Resources Adversely Affected	0	0	2	5	1	6
Archaeologically-Sensitive Areas Potentially Affected	0	1	4	2	1	3

Source: Metro: September 2002.
Note: BRT = bus rapid transit; LRT = light rail transit; TES = Threatened or Endangered Species.
[1] The analyses of alternatives are based on a common set of design options, as defined in Table 2.2-3 and described in Section 2.2 of this SDEIS – characteristics of an alternative may vary with other design options.
[2] As defined by the Federal Highway Administration and the Federal Transit Administration criteria. The alternatives, except for the No-Build Alternative, would result in increased noise levels at some receivers to the point where noise abatement would be considered – see Section 3.4 of this SDEIS for more information.
[3] Two estimates are provided: the greater estimate is based on the existing 100-year Floodplain as described on the FEMA Flood Insurance Rate Maps (FIRM); and the lower estimate is based on an expected modification to the FIRM maps (see Section 3.12 of this SDEIS for more detail).

Within the **Brooklyn Yard Design Options** area under the Milwaukie LRT and Combined LRT Alternatives, the 17th Avenue Design Option, which was used as the basis for assessing the displacements by alternative, would result in the potential displacement of eight businesses and one institutional or public facility, compared to four potential business displacements and no institutional or public facility displacements with the West of Brooklyn Yard Design Option.

Within the **Milwaukie Terminus Options** area with the Milwaukie LRT and Combined LRT Alternatives, the Lake Road Terminus Option, which was used as the basis for assessing the displacements by alternative, would result in the potential displacement of three businesses, compared to no business displacements with the Milwaukie Middle School Terminus Option.

B. Noise and Vibration

Table 5.2-18 summarizes the number of adverse noise and vibration impacts (i.e., noise and vibration levels that would exceed federally adopted standards) that would occur under each alternative without and with identified mitigation measures. Section 3.9 of this SDEIS provides a detailed description of the methodology and Federal standards used to determine the number of impacts and a more detailed breakdown of what kind of impacts would occur, where they would occur and how they could be mitigated. Note that there would be noise and vibration impacts that are not categorized as adverse under each alternative, except the No-Build Alternative, and it would not be feasible to mitigate some of those impacts (again, see Section 3.9 for more detailed information).

Three of the alternatives would result in adverse noise impacts without mitigation; all of those impacts could be mitigated with the identified mitigation measures. The I-205 LRT and Combined LRT Alternatives would result in the greatest number of adverse noise impacts without mitigation (24). The Busway Alternative would result in nine noise impacts without mitigation.

Similarly, the I-205 LRT and Combined LRT Alternatives would result in the greatest number of adverse vibration impacts without mitigation (7 and 11, respectively), although the identified mitigation measures could effectively mitigate all of those impacts. Of the remaining alternatives, only the Milwaukie LRT Alternative would result in adverse vibration impacts without mitigation (four), but they, too, could be eliminated with the identified mitigation measures. There would be no variation in noise and vibration impacts by design option.

C. Impacts to Wetlands, Floodplains and Parklands

All of the conceptual designs of the alternatives have been developed with the objective to first avoid and then to minimize impacts to wetlands, floodplains and parklands. Table 5.2.18 summarizes the remaining impacts to wetlands, floodplains and parklands that would occur with each alternative under study. Section 3.11 provides a more detailed description of these impacts and the federal regulations concerning wetlands, floodplains and parklands. The No-Build Alternative would result in no impacts to wetlands, floodplains, or parklands. There would be no variation with any of the alternatives in the impacts to wetlands, floodplains, or parklands associated with the design options.

Wetlands. In general, most of the potential impacts to wetlands would be avoided through the current design, and the remaining impacts would be relatively small for potential projects of this scale. The Milwaukie LRT and Combined LRT Alternatives would result in the filling and spanning of less than two-thirds of an acre of wetlands, while the Busway Alternative would result in the filling of approximately one-third of an acre of wetlands. Only 0.03 acre of wetland would be filled under the BRT Alternative and 0.10 acre would be filled and spanned with the I-205 Alternative.

Floodplain. The Busway, Milwaukie LRT, and Combined LRT Alternatives would result in more than 9,000 and 30,000 cubic yards of fill within the 100-year floodplain (based on the existing 100-year floodplain maps and on the expected modifications to the maps, respectively – see Section 3.12 of this SDEIS for more information on floodplain definitions), compared to only 200 cubic yards with the I-205 LRT Alternative.

Parkland. Of the build alternatives, the BRT and I-205 LRT Alternatives would result in the fewest number of acres of parkland used (1 acre and 3 acres, respectively). The Busway Alternative would require the use of 7 acres of parkland, followed by the Milwaukie LRT and Combined LRT Alternatives, which would use 10 and 13 acres of parkland, respectively.

D. Impacts to Historical and Cultural Resources

Table 5.2-18 summarizes the impacts to historical and cultural resources that would occur with each alternative. Section 3.9 provides a more detailed description of these impacts and the federal regulations concerning historic and cultural resources. The No-Build Alternative would result in no adversely affected historic resources and no potential impacts to archaeologically sensitive areas. The BRT Alternative would have the potential to affect one archaeologically sensitive area, and the I-205 LRT Alternative would potentially affect one archaeologically sensitive area and adversely impact one historic resource. The Busway, Milwaukie LRT, and Combined LRT Alternatives would adversely impact two, five, and six historic resources, respectively, and would potentially affect four, two, and three archaeologically sensitive areas, respectively.

E. Significant Design Considerations

This section summarizes the significant differences in design considerations among the alternatives. Considerations that do not distinguish between the alternatives are not addressed in this section.

- With the **Milwaukie Light Rail** and the **Combined Light Rail** alternatives, the retrofit of the Hawthorne Bridge for light rail service would present a variety of engineering challenges, most notably the bridge's seismic retrofit requirements (and costs). Additional engineering and onsite studies of existing conditions would be required to address these concerns. Further, the proposed ramp that would connect the light rail alignment from the Hawthorne Bridge would require additional engineering to ensure that reasonable access for both light rail and general purpose traffic could be provided.

- With the **I-205 Light Rail** and **Combined Light Rail** alternatives the primary design consideration is the possibility that ODOT may someday expand I-205 to four lanes in each direction between Gateway and Clackamas. While the current design of the light rail alignment is intended to accommodate the potential expansion, the area in the vicinity of SE Johnson Creek Boulevard and the Fuller Road Station would require additional engineering to ensure that a freeway expansion could be accommodated.

5.2.3 Social Equity Considerations

Social equity is measured in this SDEIS by comparing the costs and benefits of the alternatives to ensure that they are not unfairly distributed across population sub-groups. In particular, this assessment focuses on the relationship between the distribution of project benefits (in the form of improved transit access) and project impacts (in the form of displacements and adverse noise and vibration impacts) that would not be able to be effectively mitigated. This analysis focuses on South Corridor neighborhoods that have a higher-than-average minority and/or low-income population (i.e., based on the Portland metropolitan area average). Definitions for minority (i.e., non-white and/or of Hispanic or Latino origin –referred to in this SDEIS as Hispanic) and low-income (below the federal poverty level) neighborhoods are based on US Census definitions and 2000 US Census data. Finally, this section assesses how the project alternatives may benefit DBEs.

Chapter 2 – Alternatives Considered; Section 3.3 - Displacements and Social and Neighborhood Impacts; and Section 3.4 – Noise and Vibration Impacts, provide more detailed information on the measures used in these social equity considerations.

5.2.3.1 Benefits and Impacts to Minority and Low-Income Neighborhoods

As summarized in Table 3.3-1, there are 25 identified neighborhoods within the South Corridor that would be within close proximity of the proposed transit improvements under at least one of the study alternatives. Almost one-third of these neighborhoods have minority and/or Hispanic populations greater than the regional average of 17.1% and 8.0%, respectively (2000 US Census)[1]. In alphabetical order, these neighborhoods are: Downtown Portland (23.7% minority); Hazelwood (22.7% minority and 8.6%Hispanic); Lents (23.5% minority and 10.4% Hispanic); Milwaukie Business-Industrial (23.5% minority and 15.7% Hispanic); Montavilla (25.0% minority); Powellhurst-Gilbert (22.0% minority and 8.6% Hispanic); and Southgate (17.6% minority and 11.8% Hispanic); West Mount Scott (20.5% minority). Of the 26 South Corridor neighborhoods, more than one-third have a percentage of low-income residents that is greater than the regional average of 8.7%: Ardenwald (13.9%); Brooklyn (11.9%); Downtown Portland (32.1%); Hazelwood (12.5%); Hosford-Abernethy (12.9%); Jennings Lodge (10.8%); Lents (15.0%); Montavilla (10.4%); Powellhurst-Gilbert (13.7%); and Sellwood-Moreland (10.8%). Unlike projects that would negatively impact minority and/or low-income neighborhoods without serving them (such as a freeway that would divide and adversely impact a neighborhood without providing an interchange to serve the neighborhood), the South Corridor Project is expressly aimed at providing many minority and/or low-income neighborhoods with new and/or improved transit service above the No-Build Alternative.

With the No-Build Alternative, the primary change to existing bus service would occur in the Hazelwood, Montavilla, Powellhurst-Gilbert, Lents, Southgate, and West Mount Scott neighborhoods with the addition of bus service connecting the Parkrose, Gateway, and Clackamas Town Center TCs. The bus route would serve one or more local bus stops in or near each of these neighborhoods. Following is a summary, by jurisdiction and neighborhood, of the transit access benefits and impacts that would occur in each minority and/or low-income neighborhood in the South Corridor as a result of the alternatives under consideration. None of the alternatives would result in adverse noise and vibration impacts that could not be effectively mitigated.

Portland

Within the **Brooklyn** neighborhood (11.9% low income), all of the alternatives would provide improved transit access, compared to the No-Build Alternative. With the BRT and the I-205 LRT Alternatives, the neighborhood would receive BRT trunkline bus service on SE McLoughlin Boulevard (which would be somewhat distant from many residential areas in the neighborhood), and there would be no displacements. With the Busway Alternative, busway trunkline bus routes would serve the Lafayette Street (or Rhine Street) and Holgate Street stations, and bus service would be re-routed from SE McLoughlin Boulevard onto the busway facility. There would be 12 to 21 displacements in the Brooklyn neighborhood due to the Busway Alternative. With the Milwaukie

[1] A complete list of neighborhood socioeconomic characteristics can be found in Chapter 3, Section 3.3. For the purposes of highlighting social equity considerations, only neighborhoods with concentrations of low-income, minority or Hispanic residents that exceed the regional averages are listed here.

LRT and Combined LRT Alternatives, the neighborhood would receive direct light rail service to Milwaukie and downtown Portland via the Yellow Line, with neighborhood access at the Lafayette Street (or Rhine Street) and Holgate Boulevard stations, and transit service to a wide variety of destinations via transfers at the Milwaukie Southgate TC and downtown Portland. In general, bus service would be removed from SE McLoughlin Boulevard through the neighborhood. There would be eight to 13 displacements in the Brooklyn neighborhood due to the Milwaukie LRT and Combined LRT Alternatives.

Within the **Downtown Portland** neighborhood (23.7% minority and 32.1% low income), all of the build alternatives would result in improved transit service with no displacements. The BRT and Busway Alternatives would include BRT or busway trunkline bus routes to Milwaukie, Oregon City, and Clackamas. The Milwaukie LRT Alternative would include an extension of the Yellow Line, south along SW First Avenue, with one additional light rail station within the neighborhood, which would provide direct light rail service to portions of southeast Portland and the Milwaukie Southgate TC, with transfer connections to areas of Clackamas County. The I-205 LRT Alternative would extend Green Line service into the neighborhood (although Red Line service would be removed), which would provide direct light rail service to Lents and the Clackamas Regional Center and would include BRT trunkline bus service to Milwaukie and Oregon City. The Combined LRT Alternative would include an extension of the Yellow line south along SW First Avenue, with one additional light rail station within the neighborhood, and would extend the Green Line into the neighborhood (although Red Line service would be removed).

Within the **Hazelwood** neighborhood (22.7% minority and 8.6% Hispanic), neither the BRT, Busway, nor Milwaukie LRT Alternative would result in any improvements to transit service or facilities, nor would there be any displacements or noises and vibration impacts. With the I-205 LRT and Combined LRT Alternatives, a direct light rail connection to the Clackamas Town Center would be provided via the Green Line (with neighborhood access at the Gateway TC and the SE Main Street and Division Street stations). However, the alternatives would result in the removal of the I-205 bus route, including service at four local bus stop pairs (northbound and southbound), which would be provided under the other alternatives. There would be no displacements in the neighborhood due to either the I-205 LRT or Combined LRT Alternatives.

Within the **Hosford-Abernethy** neighborhood (12.9% low income), all of the alternatives would provide improved transit access, compared to the No-Build Alternative. With the BRT and the I-205 LRT Alternatives, the neighborhood would receive BRT trunkline bus service on SE McLoughlin Boulevard (somewhat distant from many residential areas in the neighborhood), and there would be no displacements. With the Busway Alternative, busway trunkline bus routes would serve the OMSI and Clinton Street and bus service would be re-routed from SE McLoughlin Boulevard onto the busway facility. There would be 19 to 23 displacements in the Hosford-Abernethy neighborhood due to the Busway Alternative. With the Milwaukie LRT and the Combined LRT Alternatives, the neighborhood would receive direct light rail connections to Milwaukie and downtown Portland via the Yellow Line and connections to a wide variety of other destinations via a transfer in downtown Portland and at the Milwaukie Southgate TC, with neighborhood access to the Yellow Line at the OMSI and Clinton Street stations. In general, bus service would be removed from SE McLoughlin Boulevard through the neighborhood. There would be 19 potential displacements in the Hosford-Abernethy neighborhood due to the Milwaukie LRT and Combined LRT alternatives.

Within the **Lents** neighborhood (23.5% minority, 10.4% Hispanic, and 15.0% low income), neither the BRT, Busway, nor Milwaukie LRT Alternative would result in any improvements to transit service or facilities over the No-Build Alternative, nor would there be any displacements or noise and vibration impacts. With the I-205 LRT and Combined LRT Alternatives, a direct light rail connection to the Clackamas Town Center, Gateway, and downtown Portland would be provided via the Green Line, with transfers to other connecting transit lines (with neighborhood access to the Green Line at the Flavel Road, Foster Road, Holgate Boulevard and Powell Boulevard stations). However, the alternatives would result in the removal of the I-205 bus route, including service at two local bus stop pairs (northbound and southbound), which would be provided under the other alternatives. There would be four potential residential displacements in the neighborhood due to the I-205 LRT and Combined LRT Alternatives.

Within the **Montavilla** neighborhood (25.0% minority and 10.4% low income), neither the BRT, Busway, nor the Milwaukie LRT Alternative would result in any improvements to transit service or facilities, nor would there be any displacements or noises and vibration impacts. With the I-205 LRT and Combined LRT Alternatives, a direct light rail connection to the Clackamas Town Center, Gateway, and downtown Portland would be provided via the Green Line with transfers to a wide variety of other transit lines (with neighborhood access to the Green Line at the Gateway TC (limited access) and the SE Main Street and Division Street stations). However, the alternatives would result in the removal of the I-205 bus route, including service at four local bus stop pairs (northbound and southbound), which would be provided under the other alternatives. There would be no displacements in the neighborhood due to either the I-205 LRT or Combined LRT Alternatives.

Within the **Powellhurst-Gilbert** neighborhood (22.0% minority, 8.6% Hispanic, and 13.7% low income), neither the BRT, Busway, nor Milwaukie LRT Alternative would result in any improvements to transit service or facilities, nor would there be any displacements or noise and vibration impacts. With the I-205 LRT and Combined LRT Alternatives, a direct light rail connection to the Clackamas Town Center, Gateway, and downtown Portland would be provided via the Green Line with transfers to a wide variety of other transit lines (with neighborhood access to the Green Line at the Division Street and Powell Boulevard stations). However, the alternatives would result in the removal of the I-205 bus route, including service at two local bus stop pairs (northbound and southbound), which would be provided under the other alternatives. There would be no residential displacements in this neighborhood due to the I-205 LRT and Combined LRT Alternatives.

Within the **Sellwood-Moreland** neighborhood (10.8% low income), all of the alternatives would provide improved transit access compared to the No-Build Alternative. With the BRT and the I-205 LRT Alternatives, the neighborhood would receive BRT trunkline bus service on SE McLoughlin Boulevard (with limited access at the Holgate Boulevard Station), and there would be no displacements. With the Busway Alternative, busway trunkline bus routes would serve the Tacoma Street and Bybee Boulevard stations and bus service would be re-routed from SE McLoughlin Boulevard onto the busway facility. There would be no displacements in the Sellwood-Moreland neighborhood due to the Busway Alternative. With the Milwaukie LRT and the Combined LRT Alternatives, the neighborhood would receive direct light rail connections to Milwaukie and downtown Portland via the Yellow Line with transfers to a wide variety of other transit lines (with neighborhood access to the Yellow Line at the Tacoma Street and Bybee Boulevard stations). In general, bus service would be removed from SE McLoughlin Boulevard through the neighborhood. There would be no displacements in the Sellwood-Moreland Neighborhood due to the Milwaukie LRT and Combined LRT Alternatives.

Milwaukie

Within the **Ardenwald** Neighborhood (13.9% low income), all of the alternatives would provide improved transit access compared to the No-Build Alternative. With the BRT and the I-205 LRT Alternatives, neighborhood residents would be unable to access BRT trunkline bus service on SE McLoughlin Boulevard, and there would be no displacements in the neighborhood. With the Busway Alternative, busway trunkline bus routes would serve the Tacoma Street Station, which could be accessed by some neighborhood residents via the Springwater Corridor. There would be one displacement in the Ardenwald Neighborhood due to the Busway Alternative. With the Milwaukie LRT and the Combined LRT Alternatives, the neighborhood would receive direct light rail connections to Milwaukie and downtown Portland via the Yellow Line with transfers to a wide variety of other transit lines (with limited neighborhood access at the Tacoma Street Station via the Springwater Corridor). There would be one displacement in the Ardenwald neighborhood due to the Milwaukie LRT and Combined LRT Alternatives.

Within the **Milwaukie Business-Industrial** neighborhood (23.5% minority and 15.7% Hispanic), the I-205 LRT and Combined LRT Alternatives would leave transit services at the No-Build levels with no displacement or noise and vibration impacts. With the BRT and the Milwaukie LRT Alternatives, the neighborhood would receive BRT trunkline bus service on Highway 224 at the Freeman Way and Linwood/Harmony stations, and there would be one displacement. With the Busway Alternative, busway trunkline bus routes would serve the Freeman Way and Linwood/ Harmony stations. There would be one displacement in the Milwaukie Business-Industrial neighborhood due to the Busway Alternative.

Clackamas County

Within the **Jennings Lodge** neighborhood (10.8% low income), there would be two BRT stations that would provide portions of the neighborhood with access to BRT or busway trunkline bus routes. There would be no potential displacements and no noise and vibration impacts.

Within the **Southgate** neighborhood (17.6% minority, 11.8% Hispanic, and 10.4% low income), the BRT and Milwaukie LRT Alternatives would result in the addition of BRT trunkline bus service to the Clackamas Town Center TC and the Oregon Institute of Technology (OIT) Station, providing access to Milwaukie and downtown Portland. There would be no displacements. With the Busway Alternative, the Southgate neighborhood would receive busway trunkline bus service from the Clackamas Town Center TC and the OIT Station to Milwaukie and downtown Portland, with two potential displacements. With the I-205 and Combined LRT Alternatives, a direct light rail connection from the Clackamas Town Center to Gateway and downtown Portland would be provided via the Green Line with transfers to a wide variety of other transit lines. However, the alternatives would result in the removal of the I-205 bus route, including service at one local bus stop pair (northbound and southbound), which would be provided under the other alternatives. Ten potential displacements could occur with either the I-205 LRT or Combined LRT Alternatives.

Within the **West Mt. Scott** neighborhood (20.5% minority), neither the BRT, Busway, nor Milwaukie LRT Alternatives would result in any improvements to transit service or facilities, nor would there be any displacements or noises and vibration impacts. With the I-205 LRT and Combined LRT Alternatives, a direct light rail connection to the Clackamas Town Center would be provided via the Green Line with a wide variety of transfers to other transit lines (with limited neighborhood access to the Green Line at the Fuller Road Station). However, the alternatives would result in the removal of the I-205 bus route, including service at one local bus stop pair (northbound and southbound), which would be provided under the other alternatives. There would be no displacements in the neighborhood associated with either the I-205 or Combined LRT Alternatives.

5.2.3.2 Disadvantaged Business Enterprises (DBE)

TriMet has developed an extensive program to facilitate DBE involvement in the design and construction of the Westside/Hillsboro, Airport MAX, and Interstate MAX light rail projects. The Oregon Opportunity Advisory Committee was established by TriMet to assist project staff with the development and implementation of actions that afford contracting opportunities to socially and economically disadvantaged individuals and businesses. Each year, based in part on the work of the Advisory Committee, TriMet analyzes the availability and capabilities of DBEs with respect to upcoming contract opportunities, followed by the establishment of DBE goals for the following year.

TriMet administers a federal DBE program consistent with the policies and requirements set forth in 49 CFR Part 23. In accordance with the requirements regarding the use of federal grants, all bidders are required to make good faith efforts to achieve DBE goals set by TriMet, and, if not met, to show evidence of these efforts. Prior to a contract award, each DBE contractor identified in the bid must sign a letter of intent. In addition, TriMet has established outreach programs with other local governments to assist in the identification of qualified DBEs and DBE contracting opportunities. Furthermore, TriMet encourages contractors to use DBE sub-contractors and to satisfy DBE goals on all major contracts. These programs and procedures would be employed for any of the South Corridor alternatives under consideration.

5.2.4 Significant Trade-offs Between the Alternatives and Options

This section draws on the evaluations in the preceding sections to identify the major trade-offs that would be involved in the selection of the LPA from among the alternatives and options under study. All estimates of ridership, operating cost, coverage, and highway system use that follow are 2020 estimates, and the capital and O&M costs are based on 2020 service levels expressed in 2002 dollars. The tradeoffs between the alternatives are discussed in Section 5.2.4.1 in general and are based on the common set of design options used throughout this SDEIS for the analyses of alternatives, as summarized in Table 2.2-3 (the number of additional park-and-ride spaces for each alternative is expressed as a range, reflecting the range under the design options for each alternative). Tradeoffs between the design options are discussed in Section 4.2.4.2.

5.2.4.1 Significant Tradeoffs Between the Alternatives

The purpose of this section is to provide a summary of the significant tradeoffs between the alternatives under study for the South Corridor Project. First, the tradeoffs between the No-Build and build alternatives are discussed (build alternatives include all alternatives, except the No-Build Alternative – specifically, the BRT, Busway, Milwaukie LRT, I-205 LRT, and Combined LRT Alternatives). Second, each alternative is compared, one-by-one, with the other alternatives under consideration. This section compares the benefits (e.g., increased performance of the Corridor's transportation system, fewer or avoided adverse environmental impacts, or lower costs) of one alternative with benefits of another alternative.

The significant tradeoffs between the build alternatives and the No-Build would be as follows. The **build alternatives** would result in up to 19,910 additional residents and up to 32,780 additional employees with ¼-mile light rail access; 420 to 3,475 additional park-and-ride lot spaces; up to 44% reductions in total transit travel times within the corridor; up to 182,690 additional passenger miles on fixed-guideway right-of-way; 24,760 to 60,060 additional BRT bus line, busway bus line, or light rail line rides per average weekday; up to a 6 percentage point increase in downtown Portland transit mode split and 5,800 to 16,900 additional transit trips (linked trips); 708 to 7,257 short-term construction-related person-year jobs (which would produce approximately $28 million to $286 million in additional personal income); and 36 to 101 additional long-term jobs, compared to the No-Build Alternative. The **No-Build Alternative** would avoid up to 53 displacements, would avoid adversely impacting up to six historic resources, and would avoid between $109.9 million and $731.8 million in construction costs, and $6.9 million to $11.8 million in increased O&M costs that would occur under the build alternatives.

The significant tradeoffs between the **Busway** and the **BRT** alternatives include the following. The **Busway Alternative** would result in 7,990 more residents and 21,290 more employees within a ¼ mile of a fixed-guideway station; provide 600 more park-and-ride spaces in the corridor; reduce travel times between Pioneer Square or the Rose Quarter and the Milwaukie Town Center and the Clackamas Regional Center by 2 to 4 minutes; result in a 2 percentage-point greater p.m. peak hour transit mode split from downtown Portland; provide approximately 120,000 more passenger miles on a fixed guideway on an average weekday; and produce 5,840 more BRT or busway trunkline rides on an average weekday than the BRT Alternative. The **BRT Alternative** would result in 47 fewer displacements; would adversely impact two fewer (none) historic resources; and would cost approximately $138.9 million less to construct and $1.05 million less per year to operate than the Busway Alternative.

The significant tradeoffs between the **Milwaukie Light Rail** and the **BRT** alternatives follow. The **Milwaukie Light Rail Alternative** would result in 9,350 more residents and 24,390 more employees within ¼ mile of a fixed-guideway station; provide up to 875 more park-and-ride spaces in the corridor; would reduce travel times from the Rose Quarter to the Clackamas Regional Center and the Milwaukie Town Center by 7 to 12 minutes; result in a 1 percentage-point greater p.m. peak-hour transit mode split from the Milwaukie Town Center; provide approximately 102,820 more passenger miles on a fixed guideway on an average weekday; and produce 15,930 more BRT trunkline and/or light rail line rides on an average weekday than the BRT Alternative. The **BRT Alternative** would result in a 4 percentage point greater p.m. peak-hour transit mode split from downtown Portland; would result in 37 fewer displacements; would adversely impact five fewer historic resources (none); and would cost approximately $324.2 million less to construct and $210,800 less per year to operate than the Milwaukie LRT Alternative.

The significant tradeoffs between the **I-205 Light Rail** and the **BRT** alternatives follow. The **I-205 Light Rail Alternative** would result in 8,290 more residents and 8,390 more employees within a ¼ mile of a fixed-guideway station; provide up to 1,680 to 1,850 more park-and-ride spaces in the corridor; reduce travel times between the Rose Quarter and the Clackamas Regional Center by up to 15 minutes; provide approximately 104,540 more passenger miles on a fixed guideway on an average weekday; a 2 percentage-point greater p.m. peak-hour transit mode split from the Clackamas Regional Center and a 3 percentage-point greater mode split from the Gateway Center; and would produce 22,260 more BRT trunkline and/or light rail line rides on an average weekday than the BRT Alternative. The **BRT Alternative** would result in 10 fewer displacements; would adversely impact one less historic resource (none); would result in a 1 percentage-point greater p.m. peak-hour transit mode split from the Milwaukie Town Center; and would cost approximately $321.6 million less to construct and $4.69 million less per year to operate than the I-205 LRT Alternative.

The significant tradeoffs between the **Combined Light Rail** and the **BRT** alternatives follow. The **Combined Light Rail Alternative** would result in 19,910 more residents and 32,780 more employees within ¼ mile of a fixed-guideway station; provide up to 1,680 to 2,725 more park-and-ride spaces in the corridor; reduce travel times from the Rose Quarter to the Milwaukie Town Center and the Clackamas Regional Center by 10 to 15 minutes; provide approximately 182,690 more passenger miles on a fixed guideway on an average weekday; result in a 1 percentage-point-greater p.m. peak-hour transit mode split from the Milwaukie Town Center and a 3 percentage-point-greater mode split from the Clackamas and Gateway Regional Centers; and produce 35,300 more BRT trunkline and/or light rail line rides on an average weekday than the BRT Alternative. The **BRT Alternative** would result in a 3 percentage point greater transit mode split to downtown Portland; would result in 47 fewer displacements; would adversely impact six fewer (none) historic resources; and would cost approximately $621.9 million less to construct and $4.94 million less per year to operate than the Combined LRT Alternative.

The significant tradeoffs between the **Milwaukie Light Rail** and the **Busway** alternatives include: the **Milwaukie Light Rail Alternative** would result in 1,360 more residents and 3,100 more employees within ¼ mile of a fixed-guideway station; would reduce travel times from the Rose Quarter to the Clackamas Regional Center and the Milwaukie Town Center by 7 to 10 minutes; would result in a 1 percentage-point greater p.m. peak-hour transit mode split from the Milwaukie Town Center; would produce 10,090 more BRT trunkline and/or light rail line rides on an average weekday; would result in 10 fewer displacements; and cost approximately $838,700 less annually to operate than the Busway Alternative. The **Busway Alternative** would provide approximately 16,940 more passenger miles on a fixed guideway on an average weekday; would result in a 6 percentage-point greater p.m. peak hour transit mode split from downtown Portland; would adversely impact three fewer (two) historic resources; and would cost approximately $185.3 million less to construct than the Milwaukie LRT Alternative.

The significant tradeoffs between the **I-205 Light Rail** and the **Busway** alternatives follow. The **I-205 Light Rail Alternative** would provide 1,080 to 1,250 more park-and-ride spaces in the corridor; reduce travel times from the Rose Quarter to the Clackamas Regional Center by 15 minutes; produce 16,420 more BRT trunkline and/or light rail line rides on an average weekday; result in a 2 percentage-point-greater p.m. peak-hour transit mode split from the Clackamas Regional Center and a 3 percentage-point-greater mode transit mode split from the Gateway Regional Center; result in 37 fewer displacements; and would adversely impact one fewer historic resources (one) than the Busway Alternative. The **Busway Alternative** would result in 12,900 more residents within ¼ mile of a fixed-guideway station; reduce total transit travel times from Pioneer Square to the Clackamas Regional Center and the Milwaukie Town Center and from the Rose Quarter to the Milwaukie Town Center by 2 to 4 minutes; provide approximately 15,220 more passenger miles on a fixed guideway on an average weekday; result in a 2 percentage-point greater p.m. peak hour transit mode split from downtown Portland; result in a 1 percentage-point greater p.m. peak-hour transit mode split from the Milwaukie Town Center; and would cost approximately $182.7 million less to construct and $3.64 million less per year to operate than the I-205 LRT Alternative.

The significant tradeoffs between the **Combined Light Rail** and the **Busway** alternatives include: the **Combined Light Rail Alternative** would result in 11,920 more residents and 11,470 more employees within ¼ mile of a fixed-guideway station; provide 1,080 to 2,175 more park-and-ride spaces in the corridor; reduce travel times from the Rose Quarter to the Milwaukie Transit Center and Clackamas Regional Center 8 to 15 minutes; produce 29,460 more BRT trunkline and/or light rail line rides on an average weekday; would result in a 1% greater p.m. peak-hour transit mode split from the Milwaukie Town Center and a 3%greater mode split from the Clackamas and Gateway Regional Center than the Busway Alternative. The **Busway Alternative** would have a 1- to 5-minute greater reduction in total transit travel times from Pioneer Square to the Milwaukie Town Center and the Clackamas Regional; result in a 5% greater transit mode split to the downtown Portland; adversely impact four fewer historic resources (two); and would cost approximately $483.0 million less to construct and $3.89 million less per year to operate than the Combined LRT Alternative.

The significant tradeoffs between the **I-205 Light Rail** and the **Milwaukie Light Rail** alternatives follow. The **I-205 Light Rail Alternative** would provide 975 to 1,680 more park-and-ride spaces in the corridor; reduce travel times from the Rose Quarter to the Clackamas Regional Center by 8 minute; produce 6,330 more BRT trunkline and/or light rail line rides on an average weekday; provide approximately 1,720 more passenger miles on a fixed guideway on an average weekday; result in a 4, 3 and 2 percentage point greater transit mode splits from downtown Portland, the Gateway Regional Center, and the Clackamas Regional Center, respectively; result in 27 fewer displacements; cost approximately $2.6 million less to construct; and would adversely impact four fewer historic resources (one) than the Milwaukie LRT Alternative. The **Milwaukie Light Rail Alternative** would result in 1,060 more residents and 16,000 more employees within ¼ mile of a fixed-guideway station; reduce total transit travel times from the Rose Quarter to the Milwaukie Town Center by 13 minutes; and cost approximately $4.48 million less annually to operate than the I-205 LRT Alternative.

The significant tradeoffs between the **Milwaukie Light Rail** and the **Combined Light Rail** alternatives follow. The **Milwaukie Light Rail Alternative** would result in 10 fewer displacements; adversely impact one fewer (five) historic resource; and cost approximately $297.7 million less to construct and $4.72 million less per year to operate than the Combined LRT Alternative. The **Combined Light Rail Alternative** would result in 10,560 more residents and 8,390 more employees within ¼ mile of a fixed-guideway station; provide 1,680 to 1,850 more park-and-ride spaces in the corridor; reduce travel times from the Rose Quarter to the Clackamas Regional Center by 8 minutes; produce 79,870 more BRT trunkline and/or light rail line rides on an average weekday; provide approximately 1,720 more passenger miles on a fixed guideway on an average weekday; result in 1, 3, and 2 percentage points greater transit mode splits from downtown Portland, the Gateway Regional Center, and the Clackamas Regional Center, respectively, than the Milwaukie LRT Alternative.

The significant tradeoffs between the **I-205 Light Rail** and the **Combined Light Rail** alternatives follow. The **I-205 Light Rail Alternative** would result in 37 fewer displacements; adversely impact five fewer historic resources (one); produce a 3 percentage point greater p.m. peak-hour transit mode split from downtown Portland; and would cost approximately $300.3 million less to construct and $0.24 million less per year to operate than the Combined LRT Alternative. The **Combined Light Rail Alternative** would result in 11,620 more residents and 24,390 more employees within a ¼ mile of a fixed-guideway station; provide up to 875 more park-and-ride spaces in the corridor; reduce travel times from the Rose Quarter to the Milwaukie Town Center by 11 minutes; result in a 1 percentage-point greater p.m. peak-hour transit mode split from the Clackamas Regional Center and a 2 percentage-point increase in mode split from the Milwaukie Town Center; produce 13,040 more BRT trunkline and/or light rail line rides on an average weekday; and provide approximately 172,150 more passenger miles on a fixed guideway on an average weekday than the I-205 LRT Alternative.

5.2.4.1 Trade-Offs Between the Design Options for Each Alternative

The purpose of this section is to discuss the significant tradeoffs between the options under study. Each option is compared, one-by-one, with the other option under study (each design option area includes only two options). This section compares the benefits (e.g., increased performance of the corridor's transportation system, fewer or avoided adverse environmental impacts and/or lower costs) of one option with the benefits of the other option.

- With the **Clackamas Park-and-Ride Lot Design Options**, under the BRT, Busway, and Milwaukie LRT Alternatives, the significant tradeoffs would be: the **Linwood Park-and-Ride Lot Design Option** would have 330 additional park-and-ride lot spaces and would result in more corridor transit riders than the Johnson Road Park-and-Ride Lot Design Option; and the **Johnson Road Park-and-Ride Lot Design Option** would result in two fewer displacements and would cost approximately $9.31 million less to construct (approximately $10.15 million less under the Busway Alternative) than the Linwood Park-and-Ride Lot Design Option.

- With the **East Hawthorne Bridge Design Options** under the Busway Alternative, the significant tradeoffs would be: the **Water Avenue Design Option** would provide OMSI and the PCC campus with better access to the busway; would cost approximately $0.82 million to $4.73 million less to construct than the 7th Avenue Design Option; and the **7th Avenue Design Option** would result in one less displacement and would result in 680 more residents and 1,390 more employees located within ¼ mile of a fixed-guideway station than the Water Avenue Design Option.

- With the **Clinton Street Station Design Options**, under the Busway Alternative, the significant tradeoffs would be: the **At-Grade Station Design Option** would be more accessible from the street level than the Above-Grade Station Design Option; and the **Above-Grade Station Design Option** would result in one less displacement and cost approximately $2.71 million less to construct than the At-Grade Station Design Option (the capital cost difference is based on the cost of each design option with the Water Avenue Design Option – with the 7th Avenue Design Option, the At-Grade Station Design Option would cost approximately $1.20 million less to construct than the Above-Grade Station Design Option).

- With the **Brooklyn Yard Design Options** under the Busway Alternative, the significant tradeoffs would be: the **17th Avenue Design Option** would result in 370 more residents located within a ¼ mile of a fixed-guideway station and provide more visible locations for two busway stations than the Above-Grade Station Design Option; and the **West of Brooklyn Yard Design Option** would result in one less displacement, 560 more employees located within ¼ mile of a fixed-guideway station, and cost approximately $12.09 million less to construct than the At-Grade Station Design Option.

- With the **Brooklyn Yard Design Options** under the Milwaukie LRT and Combined LRT Alternatives, the significant tradeoffs would be: the **17^{th} Avenue Design Option** would result in 370 more residents located within ¼ mile of a fixed-guideway station and provide more visible locations for two light rail stations than the Above-Grade Station Design Option; and the **West of Brooklyn Yard Design Option** would result in four fewer displacements, 560 more employees located within ¼ mile of a fixed-guideway station, and cost approximately $2.74 million less to construct than the At-Grade Station Design Option.

- With the **North Milwaukie Design Options** under the Milwaukie LRT and Combined LRT Alternatives, the significant tradeoffs would be: the **Southgate Crossover Design Option**, would result in 50 more residents and 1,460 more employees located within ¼ mile of a fixed-guideway station, 600 more park-and-ride spaces, and more transit riders than the Tillamook Branch Line Design Option; and the **Tillamook Branch Line Design Option** would result in two fewer displacements and would cost approximately $12.74 to $13.70 million less to construct than the Southgate Crossover Design Option.

- With the **Milwaukie Terminus Options** under the Milwaukie LRT and Combined LRT Alternatives, the significant tradeoffs would be: the **Lake Road Terminus Option** would result in 1,710 more residents and 1,410 more employees located within ¼ mile of a fixed-guideway station, 275 more park-and-ride spaces, and more transit riders than the Milwaukie Middle School Terminus Option; and the **Milwaukie Middle School Terminus Option** would result in three fewer displacements and would cost approximately $16.28 to $17.23 million less to construct than the Lake Road Terminus Option.

- With the **Clackamas Town Center Terminus Options** under the I-205 LRT and Combined LRT Alternatives, the significant tradeoffs would be: the **East of Clackamas Town Center Terminus Option**, would result in 930 more residents and 1,490 more employees located within ¼ mile of a fixed-guideway station, 500 more park-and-ride spaces, and more transit riders than the North of Clackamas Town Center Terminus Option; and the **North of Clackamas Town Center Terminus Option** would cost approximately $6.29 million less to construct than the East of Clackamas Town Center Terminus Option.

6. COMMUNITY PARTICIPATION, AGENCY COORDINATION AND REQUIRED PERMITS

6.1 Community Participation

This section summarizes the community participation process for the South Corridor Project, describing past activities and elements that will be implemented as a part of public comment period for this Supplemental Draft Environmental Impact Statement (SDEIS) and selection of the Locally Preferred Alternative (LPA). Additional Information on community participation activities can be found in the Preface (Section P.5, Public Participation), Chapter 2, Alternatives Considered (Section 2.1, Screening and Selection Process), and Appendix B, Environmental Justice Compliance.

6.1.1 Goals of the Community Participation Program

The goal of the public involvement process is to support the selection and implementation of an LPA through participation of well-informed and involved communities and local governments. The community involvement process has been designed to ensure that community concerns and issues are identified early and addressed in the planning, engineering, environmental, economic, and financial efforts of the Project.

Public involvement and participation have been critical in the development of the South Corridor Project and its predecessor, the South/North Transit Corridor Study. Active public participation and involvement have been integral elements in all phases of the study, including:

- Proactive public involvement and education programs to provide comprehensive and understandable information
- Timely public notice
- Full public access and involvement in key actions and decisions
- Outreach to segments of community that typically do not become involved in transportation planning
- Support for early and continuing involvement of the public

6.1.2 General Elements of the Community Participation Program

This section outlines the general elements included within the community participation program for each phase of the South Corridor Project through to the adoption of the LPA.

A. Meetings and Presentations

Project staff has participated in many meetings with community organizations, businesses, neighborhoods and individuals since the beginning of the project and will continue to participate in these meetings through selection of the LPA.

- **Informational Meetings.** Informational meetings held at various project stages provide the public with descriptions of the alternatives, description of the methods used for analysis, summaries of analysis results, understanding of the screening and selection process, and opportunities for involvement in the project.

- **Neighborhood Meetings.** Project public involvement and technical staff members regularly attend meetings of formally recognized neighborhood groups to discuss the project. Neighborhood groups are long-standing participants in local land use and transportation planning processes and provide a strong communication link between the project and the community.

- **Civic and Community Groups.** Project public involvement and technical staff members regularly make presentations to civic organizations throughout the corridor and the region. Presentations to civic and community groups are an effort to reach a broader segment of the community than typically participate in transportation planning projects.

- **Community Events.** The project staff regularly provides information booths at community events such as neighborhood and county fairs. These events provide project staff with the opportunity to disseminate information to many community members and to invite community members to become engaged in the process.

- **Property Owners.** Public involvement and technical staff frequently meet with individual property owners to explain proposed designs, potential impacts, and the decision-making process. These meetings are especially important for owners of potentially displaced or significantly impacted property.

- **Door-to-Door Canvassing.** Public involvement staff canvassed neighborhoods adjacent to the alternatives to meet residents and business owners and to raise awareness about the project and opportunities to participate. Canvassing complements the efforts targeted at property owners by helping to contact renters within the corridor and is an important method of contacting citizens who would not normally participate in a transportation-planning project.

- **Media.** Members of the media are regularly briefed through news releases, telephone conversations and news conferences. Media representatives often attend project meetings.

- **Local Advisory Groups.** Local advisory groups are independent, flexible groups of community members that provide input to project staff on issues related directly to their communities. These groups are open and relatively informal; most groups meet monthly and work closely with staff.

- **Corridor-Wide Assemblies.** Corridor-Wide Assemblies are meetings of all of the Local Advisory Groups, held periodically throughout the study process to inform community members about the study and to facilitate discussion between community members from different areas of the Corridor.

- **Participating Jurisdictions.** Several of the Project's participating jurisdictions have implemented their own public involvement efforts to complement the project's program. Each participating jurisdiction will also provide public comment opportunities (typically a public hearing) prior to adopting resolutions and recommendations for the Project decisions.

- **Policy Committee.** The Project's Policy Committee is made up of elected officials from the participating local jurisdictions and representatives from the participating agencies. Meetings are advertised and open to the public and the media.

- **Public Comment.** Each decision phase of the project that narrows the alternatives includes a public comment period. Each comment period includes informational meetings (generally using an open house format) and meetings or hearings devoted to gathering public comment. Written comments via letter, e-mail or fax as well as comments recorded on Metro's transportation hotline are accepted and included in the project record. All comments received during the SDEIS public comment period will be included in a public comment report that is distributed to Policy Committee members, local government partners and interested agencies, prior to recommendations or decisions being made.

B. Documentation

A wide range of documentation has been developed and made available to the public throughout each project phase. Available documents include technical results and findings, easy to read fact sheets describing the project and newsletters providing an overview of each project phase.

- **Technical Reports.** The project's technical reports are available to the public for review and are listed in Appendix C, Supporting Documents.

- **SDEIS/FEIS.** The SDEIS, and subsequent Final Environmental Impact Statement (FEIS), are key public information documents that are available to all community members, stakeholders, agencies and other interested people. This SDEIS provides information about the alternatives under consideration as well as a comparison of the benefits, costs and impacts associated with each alternative. The Executive Summary of the SDEIS is available separately for public review.

- **Briefing Documents.** Technical findings are summarized within a briefing document, for use by community members and policy-makers. The briefing document compares the alternatives and highlights the relative advantages and disadvantages of each alternative.

- **Tech Facts.** Project staff compile easy to read, focused summaries of specific technical information evaluating alternatives for the public. Tech Facts typically focus on a single issue or segment of the project.

- **Public-Oriented Publications.** Project staff prepare flyers, meeting notices, and fact sheets for distribution to community members.

- **South Corridor Newsletters.** The project periodically publishes a newsletter that is distributed to approximately 5,500 individuals and businesses included on the South Corridor Project mailing list. Typically, newsletters are also distributed at libraries, at community centers, at meetings and by participating jurisdictions.

- **Web Page.** Project staff maintain web pages on Metro's web site dedicated to the South Corridor Project. Meeting information, a project overview, a project timeline, opportunities for public involvement, and opportunities to comment are continuously updated and available on the web pages. Technical findings during various stages of the project are also included.

- **Transportation Hotline.** Project staff maintain a mailbox on the Metro Transportation Hotline to provide callers with information about the project, upcoming meetings and an opportunity to request additional information or record comments.

- **Advertisements.** The project purchases advertising space in various regional, local, and neighborhood publications to inform the public about key opportunities to participate in the Project.

C. Notification

A range of techniques has been used to notify the public of project related meetings and decision points. Information about project meetings is included in Metro's agency-wide weekly meeting notices, posted on the South Corridor web page and recorded on the Transportation Hotline. Meetings are sometimes advertised in *The Oregonian* (general or zoned editions) or community newspapers. Open house or workshop invitations are often mailed to homes and businesses in a targeted geographic area. The project also employed unique notification methods such as coordinating with Portland Youth Builders to leaflet the Lents neighborhood prior to a community open house. Information about meetings is also distributed at neighborhood and business association meetings and through e-mail lists. Public comment periods, public comment hearings and other meetings related to a formal decision process are advertised in community newspapers, *The Oregonian*, and mailed to household and businesses on the South Corridor Project mailing list.

D. Environmental Justice Outreach and Compliance

Early in the South Corridor Study staff evaluated 1990 U.S. Census data and conducted site visits to identify concentrations of low-income, Hispanic, or minority residents. No significant concentrations of these groups were identified. However, given the age of the data, areas with potential concentrations of these groups were identified and targeted for door-to-door canvassing and other outreach, including coordination with local social service providers who work with disadvantaged populations in the Corridor. 2000 U.S. Census data on low-income, Hispanic, and minority populations were not available until late in the environmental analysis process. The 2000 Census data related to low income, minority, and Hispanic populations are provided in Section 3.3, Neighborhoods and Communities, and Appendix B, Environmental Justice.

6.1.3 Public Participation Efforts by Project Phase

The key public involvement activities undertaken within each of the South Corridor's major project phases are summarized below. Section 2.1, Screening and Selection Process, of this SDEIS, provides a project timeline and a more detailed description of these project phases.

A. South/North Project

The South Corridor Project was preceded by the South/North Corridor Project. A Draft Environmental Impact Statement (DEIS) was published in February 1998 that evaluated various LRT Alternatives in the South/North Corridor. The South/North Project LPA was revised when voters failed to re-approve local funding in 1998. The North Corridor Interstate MAX Project evolved with alternative sources of local funding in the North portion of the Corridor, and the South Corridor Project evolved from a reexamination of a variety of High-Capacity Transit Alternatives in the South Corridor. Community Participation during the South/North Project began in 1991 with preliminary alternatives analysis and is detailed in the *South/North Draft Environmental Impact Statement* (Metro 1998).

B. South Corridor Study

Public Involvement for the South Corridor Project has included the following activities:

- **Listening Posts.** South Corridor Project outreach began with a series of "listening posts" that followed the failure of local funding for the South/North Project in 1998. Elected officials held met with community members in different areas of the region to gather input about how transportation issues might be addressed. Staff also met with neighborhood leaders who had been active in transportation planning to gain insight into improved public involvement techniques. Three hundred and seventy-five people gave testimony at the listening posts.

- **Community Meetings.** Staff has met with community, neighborhood and business groups throughout the study to share information, gather input and raise awareness about the South Corridor Study. Notices were sent to households and businesses included on the South Corridor mailing list at key points throughout the study.

- **Scoping.** The scoping phase of the South Corridor Study concluded in May of 2000. The purpose of scoping is to ensure that all viable alternatives are considered in the study. Public involvement during the scoping phase included a range of activities including meetings with community and neighborhood groups, open houses and distribution of a newsletter. Advertising space was purchased in community and regional newspapers to notify the public about key decision points. In addition, citizen working groups were established for each segment of the corridor to recommend which alternatives ought to be included in the initial study phase.

- **Survey.** A scientific survey of 900 residents in the Corridor was completed. Three hundred residents from each segment were asked to participate in a phone survey designed to glean information about the preferences and priorities of corridor residents.

- **Stop, Swap, and Shop.** Clackamas County sponsored the "Stop, Swap (ideas) and Shop" series. Public involvement team members talked with community members at grocery stores and transit centers in an effort to increase awareness about the Project in Clackamas County.

- **Public Comments.** A formal public comment period that included meetings with community groups, open houses and formal scoping meetings was held between March 10, 2000 and May 10, 2000. Information about the public comment period was featured in advertisements in several newspapers and mailed to 5,300 households and businesses in the South Corridor.

- **Narrowing of Study Alternatives.** The goals of public involvement during the narrowing phase of the South Corridor Study were to share technical information about each alternative with stakeholders and community members, to develop criteria for evaluating alternatives and to gather public input about each alternative. Ultimately, the public involvement process informed the narrowing decisions made by the Policy Committee. During the narrowing phase, staff made many presentations to neighborhood associations and groups, business organizations, community groups and civic organizations. Fliers announcing open house and comment period dates were distributed at these meetings. Approximately 35 displays were placed at businesses and other public locations throughout the corridor, and about 15 information tables were staffed throughout the corridor. Staff also provided information tables at community events to raise awareness about the study. Citizen working groups continued to meet during the narrowing phase. They reviewed technical information and public comments and, eventually, created working papers to guide the Policy Committee as they selected alternatives to advance in the corridor.

- **Additional Public Comments.** A formal public comment period was held between October 16 and November 17, 2000. Letters were sent to more than 40 neighborhood association chairs, CPO chairs and chairs of other community organizations announcing the opportunity for public comment and the open houses. A letter reminding recipients that the public comment period would close followed. The public comment period was advertised in *The Oregonian, The Clackamas Review, The Lake Oswego Review* and *The Oregon City News*.

- **Open Houses.** Open houses were held in Milwaukie, Oregon City, and Portland to provide information about the evaluation of alternatives and hear public comment. Open houses were also held in Gateway, Lents, Hosford-Abernethy and Brooklyn to review design options in each neighborhood.

C. Preparation of the SDEIS

Project staff prepared the SDEIS and conducted extensive public involvement between September 2001 and November 2002. Local advisory groups met regularly in Milwaukie, inner Southeast Portland, Downtown Portland, Gateway, and outer Southeast Portland. Local advisory groups worked closely with staff to learn about the alternatives and identify areas of community concern as well as working to build community consensus about the alternatives under consideration.

Staff organized corridor-wide assemblies as opportunities for representatives from local advisory groups, neighborhoods and communities throughout the corridor to learn about the alternatives and engage in discussions about the alternatives. Staff also organized segment assemblies, or meetings of local advisory groups within each segment, to discuss issues related to the alternatives within each segment of the corridor.

A newsletter detailing the alternatives and explaining the environmental process was prepared early in the SDEIS process. Another newsletter, to be published when this SDEIS is complete, will provide results from the SDEIS and begin to engage people in the LPA selection process.

Staffs met with numerous neighborhood, community and civic groups (i.e., Chambers of Commerce, and other business groups) to discuss the project, share preliminary results and engage community members to participate in the selection of a locally preferred alternative. Many articles or stories about the South Corridor Project were included in various publications including *The Oregonian, The Bee, The Good Neighbor News, The East County News, The Milwaukie Pilot,* and other community newsletters and newspapers.

During the SDEIS preparation, staff regularly updated the South Corridor web site and hotline to include project updates, findings and meeting information. Interested people could add their name to the mailing list, request additional information, or record a comment on either the web site or the hotline.

In potentially impacted areas, staff canvassed to inform residents about the study and hosted targeted open houses and meetings. Staff also met individually with potentially impacted property and business owners.

6.1.4 SDEIS Public Comment Period and Adoption of the LPA

The publication of this SDEIS initiates a public comment period that will last a minimum of 45 days. At the conclusion of the public comment period, the Project will begin a process aimed at selecting the LPA. Key public involvement activities during the formal SDEIS public comment period include:

- **SDEIS.** This SDEIS and the Executive Summary will be distributed to a wide range of public resources (including libraries, local governments and agencies), interested people and groups including neighborhood organizations, community groups and local advisory group members. This complete SDEIS will be available to the public on request and will be provided to a wide range of interested persons and agencies (see Appendix G, List of Recipients). Other supporting documents for this SDEIS will be available to the public (see Appendix C, Supporting Documents).

- **Tech Facts and Other Summary Materials.** A variety of summary materials and Tech Fact Sheets will be available. Summary materials will help community members to understand the results of the SDEIS.

- **Briefing Document.** A briefing document that summarizes the results of the SDEIS analysis and provides a comparison of the alternatives will be provided to the Policy Committee, governing boards of participating jurisdictions and to interested community members to assist in the selection of the LPA.

- **Notification.** Advertisements will be placed in local newspapers to announce the availability of this SDEIS, the public comment period, opportunities to learn more about the results of the SDEIS and who to contact for additional information. Notification of public hearings will be sent to the project's mailing list and to property owners located adjacent to the study alternatives. More detailed information about the public comment period and related meetings will be listed on the project web page and on the transportation hotline.

- **Media Briefings.** Members of the media will have an opportunity to preview the SDEIS findings prior to open houses. Individual briefings with reporters or editorial boards may also be scheduled.

- **Neighborhood Meetings.** Staff will attend neighborhood meetings throughout the corridor to discuss the results of the SDEIS. These briefings will provide Neighborhood Associations and Community Planning Organizations with an opportunity to understand the SDEIS results prior to making formal comments on the SDEIS.

- **Open Houses.** The project will host a series of open houses early in the SDEIS public comment period. Open houses will provide community members with an opportunity to learn about the findings, ask questions of staff and talk with other community members about the project. Staff will provide opportunities for comment at each open house.

- **Public Hearings.** After the SDEIS is published, the Policy Committee will host public hearings to hear comments from community members. Testimony from the public hearings will be transcribed and summarized along with all public comments in the Public Comment Document.

- **Documentation of Public Comments.** Project staff will compile all comments made during the SDEIS comment period into the Public Comment Document. All comments, regardless of medium, will be included in the document. It will be distributed to the public, staff, elected officials and participating jurisdictions. Responses to the comments will be included in the FEIS.

- **Local Advisory Groups.** Project staff will work closely with local advisory groups to ensure that members understand the SDEIS findings and methods for comments.

At the conclusion of the formal public comment period, the policy committee will make a formal recommendation on the LPA. Each involved jurisdiction and agency will then review and formulate their own recommendation on the LPA. In most cases, a public hearing will be held prior to a decision being made by the governing body. The LPA will also need to be presented to the Joint Policy Advisory Committee on Transportation (JPACT) and the Metro Council. The Metro Council will also hold a public hearing to taking action final action on the LPA.

6.2 Agency Coordination

Federal, State and local agency coordination has played an important role throughout the entire study process. Most agencies listed in Table 6.2-1 have been contacted during the development of analysis methods, data collection, resource identification and/or determination of regulatory compliance requirements. Agencies have provided valuable information and, on occasion additional evaluation or comments throughout the analysis. Consultation regarding compliance with specific regulatory issues with the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Marine Fisheries Service, the Oregon Division of State Lands and the Oregon State Historic Preservation Office is reflected in letters from these agencies, included in Appendix A, Agency Correspondence and Coordination. A summary of the coordination activities with the natural resource agencies is also included in Appendix A.

Table 6.2-1
Federal, State and Local Agency Coordination

Type of Agency	Agencies	Topic
Federal	U.S. Army Corps of Engineers	Wetlands; Hydrology/Water Quality; Geology/Soils
	Federal Highway Administration	Hydrology/Water Quality; Wetlands; Traffic; Air Quality; Energy Displacements/Relocation; Highway Improvement Plans; Historic Resources; Noise and Vibration; Capital Cost Estimates
	Federal Emergency Management Agency	Hydrology/Water Quality; Floodplains
	U.S. Department of Energy	Energy
	U.S. Department of the Interior, Geological Survey	Hydrology/Water Quality; Geology/Soils; Visual Impact Assessment
	U.S. Department of the Interior, Park Service	Parklands
	Advisory Council on Historic Preservation	Historic/Cultural Resources
	U.S. Environmental Protection Agency	Wetlands; Air Quality; Hazardous Materials; Noise; Environmental Justice
	U.S. Fish and Wildlife Service	Threatened and Endangered Species
	U.S. Soil Conservation Service	Wetlands; Geology/Soils
	Bonneville Power Administration	Energy
	National Marine Fisheries Service	Threatened and Endangered Species
	Northwest Power Planning Council	Energy
State of Oregon	Division of State Lands	Hydrology/Water Quality; Wetlands
	Department of Fish and Wildlife	Wetlands; Threatened and Endangered Species; Wildlife/habitat
	Department of Energy	Energy
	Department of Environmental Quality	Hydrology/Water Quality; Wetlands; Air Quality; Energy; Hazardous Materials; Noise and Vibration
	Department of Transportation	Hydrology/Water Quality; Wetlands; Traffic; Hazardous Materials; ;Air Quality; Energy; Geology/Soils; Displacements/Relocations; Highway Improvement Plans; Historic Resources; Noise and Vibration; Capital Cost Estimates
	State Historic Preservation Office	Historic and Archaeological Resources
	Department of Geology and Mineral Industries	Geology/soils; Seismic/earthquakes
Regional and Local	City of Portland, City of Milwaukie, City of Oregon City, City of Gladstone and Clackamas County	Wetlands; Hydrology/Water Quality; Fish and Wildlife; Land Use and Economic Development; Historic Resources; Displacements/Relocations; Transportation Plans and Traffic; Noise and Vibration; Visual Resources; Historic and Archaeological Resources; Neighborhoods; Hazardous Materials
	Metro	Land Use; Flood Plain; Hydrology/Water Quality; Wildlife; Habitat; Threatened and Endangered Species; Traffic; Transit; Seismic/earthquakes; Wetlands
	Pacific Northwest Utilities Conference Committee	Energy
	TriMet	Capital Costs; Operations and Maintenance Costs; Transit Operating Plans; Transit Facility Design; Facility and Operation Guidelines
Tribal	Columbia River Inter-Tribal Fish Commission	Cultural Resources; Fisheries
	Grand Ronde Tribe	Cultural Resources
	Siletz Tribe	Cultural Resources
	Warm Springs Tribe	Cultural Resources

Source: Metro and TriMet: July 2002.

6.3 Project Permits and Approvals

Following is a list of the major Federal, state and local permits and approvals that the South Corridor Project may need. The project will seek intergovernmental agreements to consolidate, simplify and contain costs of the local permitting process to the extent possible.

Federal and State Permits/Approvals:

- Section 404 Permit - Corps of Engineers.
- State Wetlands Removal and Fill permit - Oregon Division of State Lands (ODSL).
- Section 401/Water Quality Certification - Oregon Department of Environmental Quality (ODEQ)
- Federal Endangered Species Act Review - National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS).
- Section 106 - Oregon State Historic Preservation Office (SHPO).
- Section 4(f) - Department of the Interior.
- Indirect Source Permit - Oregon Department of Environmental Quality (ODEQ).
- Oregon Endangered Species Act - Oregon Department of Fish and Wildlife (ODFW).
- NPDES Permit - Oregon Department of Environmental Quality (ODEQ).
- Public Utilities Commission (PUC) Permits - Oregon PUC.

Local Permits/Approvals:

- Land use design review, conditional use, subdivision and environmental review permits - City of Portland, City of Milwaukie, City of Oregon City, City of Gladstone and Clackamas County.
- Greenway Permit and Environmental Zone review - City of Portland.
- Building, demolition, blasting, grading, tree removal and erosion control permits.
- Electrical/mechanical/plumbing permits.
- Utility relocations.
- Right-of-way permits.

APPENDIX A. AGENCY COORDINATION AND CORRESPONDENCE

February 7, 2001 – Natural Resources Agency Review of South Corridor
Attendees: US Army Corps of Engineers, US Fish and Wildlife Service, US Environmental Protection Agency, Oregon Department of Environmental Quality

Review of alternatives being considered for the South Corridor. These alternatives included high occupancy toll lanes, high occupancy vehicle lanes, bus rapid transit, Busway, river transit and commuter rail. During the meeting the study history and the evaluation report were reviewed. Special attention to environmental areas was described. The evaluations of alternatives were described and attendees were asked if there was any new information or issues needed with description and evaluation of the alternatives. No comments were provided on the alternatives, methodology or results. Agencies staff were asked if the project should be considering other alternatives. None were suggested.

March 13, 2002 – Agencies Orientation Meeting
Attendees: Federal Transit Administration, Federal Highway Administration, US Environmental Protection Agency, US Fish and Wildlife Service, US Army Corps of Engineers, National Marine Fisheries Service, Oregon Department of State Lands.

This meeting included a review of the alternatives being studied during the SDEIS. Participants were offered project plan and profile drawings sets. The presentation included a discussion of the project purpose and need and the alternatives that had been considered and that had been discarded. The presentation included discussion of environmentally sensitive areas that could be affected by the project alternatives. Avoidance measures and mitigation strategies were also discussed at this meeting. Participants were asked to voice concerns related to the alternatives and potential impacts to environmental sensitive areas. Comments indicated that South Corridor Project staff were aware of environmentally sensitive areas and had accurately described potential project impacts. Participants were asked to voice, “fatal flaws’ related to the alternatives and potential impacts. Meeting participants identified no fatal flaws.

April 16, 2002 – South Corridor Natural Resource Tour
Attendees: Federal Transit Administration, National Marine Fisheries Service, US Army Corps of Engineers, Oregon Division of State Lands, and Oregon Department of Fish and Wildlife.

This tour included stops at environmentally sensitive areas that could be potentially impacted by project alternatives. Tour participants were provided with project plan and profile drawings for each site. Agency staffs were able to explore issues related to the specific design in relationship to the natural environment. Specifically at I-205 and Johnson Creek comments were raised about the study methodology related to upland habitat, concerns about impacts to the 100-year floodplain, and ensuring adequate treatment of the riparian habitat. At Phillips creek, Oregon Department of Fish and Wildlife suggested downstream mitigation and consideration of replacing an existing culvert with a bridge. The potential alignments near Mt Scott Creek would impact forested uplands and riparian habitat that would require significant mitigation. Agency staff noted that a good mitigation site could be located on the Linwood Park-and-Ride site.
At Crystal Springs Creek, it was noted that the Union Pacific had located a new wetland mitigation site adjacent to where the proposed Busway, Milwaukie and Combined LRT alignments would be.

This would require a doubling of mitigation ratios based on Oregon Division of State Lands regulations. ODFW inquired if a bridge could replace the existing culvert.

April 16, 2002 – Collaborative Environmental and Transportation Agreement on Streamlining (CETAS) Monthly Coordination Meeting
Attendees: National Marine Fisheries Service, US Army Corps of Engineers, US Fish and Wildlife Service, US Environmental Protection Agency, Oregon Department of Fish and Wildlife Service, Oregon Division of State Lands, Oregon Department of Environmental Quality, and Federal Highways Administration.

This briefing included a description of the study history, alternatives considered and not forwarded for further study, SDEIS alternatives and likely potential impacts to the natural environment. Participants at the meeting raised no significant issues.

May 6, 2002 – Distribution of Study Analysis Methods
Mailing of the Ecosystem and Water Quality Study Methodologies distributed to National Marine Fisheries Service, US Army Corps of Engineers, US Fish and Wildlife Service, US Environmental Protection Agency, Oregon Department of Fish and Wildlife Service, Oregon Division of State Lands, Oregon Department of Environmental Quality, and Federal Highways Administration.

Staffs were asked to read and comment on the proposed methodologies by May 16, 2002. Analysis Methods were provided to staffs during the April 16th tour. No comments were received on these documents. These documents included the proposed methods locating and analyzing potential impacts to wetlands, vegetation, fisheries, wildlife and water quality related to project alternatives.

May 7, 2002 – South Corridor Natural Resource Tour
Attendees: US Fish and Wildlife Service and US Environmental Protection Agency.

This second tour was held to accommodate staff members not unable to make the tour on April 16th.

October 17, 2002 – South Corridor Ecosystem and Water Quality Results Meeting
Attendees: US Fish and Wildlife Service, National Marine Fisheries, US Army Corps of Engineers, Federal Transit Administration, and Federal Highway Administration.

Materials and meeting summary were mailed to US Environmental Protection Agency, Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife and Oregon Division of State Lands.

Participants were provided with the draft Water Quality and Ecosystem section of the SDEIS and were asked to review and comment by October 27th. Participants were briefed on the contents of the sections and were asked if there were any concerns with the alternatives, methods or results. Meeting participants identified alternative mitigation sites and strategies.

APPENDIX B. ENVIRONMENTAL JUSTICE COMPLIANCE

This appendix describes the South Corridor Project's compliance with Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations* and the U.S. Department of Transportation (DOT), *Order to Address Environmental Justice in Minority Populations and Low-Income Populations*. The U.S. DOT offers the following definition of Environmental Justice:

"The term environmental justice was created by people concerned that everyone within the United States deserves equal protection under the country's laws. Executive Order 12898, issued in 1994, responded to this concern by organizing and explaining in detail the Federal government's commitment to promote environmental justice. Each Federal agency was directed to review its procedures and to make environmental justice part of its mission by identifying and addressing the impacts of all programs, policies, and activities on minority populations and low-income populations. The U.S. Department of Transportation (DOT) issued its DOT Order to Address Environmental Justice in Minority Populations and Low-Income Populations in 1997. The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) have been working with their State and local transportation partners to make sure that the principles of environmental justice are integrated into every aspect of their transportation mission. Principles of Environmental Justice are to:

- *Ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.*
- *Avoid, mitigate, or minimize disproportionately high and adverse human health and environmental impacts, including social and economic impacts, on minority and low-income populations.*
- *Prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations."*

B.1 Public Involvement and Decision-Making Processes

This section summarizes the South Corridor Project's Public Involvement and decision-making processes addressing the project's efforts to ensure "full and fair participation by all potentially affected communities." For additional information, refer to *Chapter 6, Public Participation*.

B.1.1 Public Involvement and Outreach Program

Including potentially impacted minority and low-income populations in meaningful public involvement activities has been an important consideration throughout evolution of the South Corridor Project. Identifying and involving minority and low-income populations was especially important in conducting outreach to support the completion of the SDEIS and will continue through the selection of a Locally Preferred Alternative, the preparation of the Final Environmental Impact Statement, Preliminary Engineering and construction. Throughout the project development process, staff refined public involvement plans to better include and involve low-income and minority populations by reviewing available demographic data to identify potentially affected minority or low-income populations throughout the corridor.

Targeted outreach was conducted in areas thought to have a concentration of low-income or minority residents. Outreach activities in these areas included:

- Local advisory groups included representatives from communities and neighborhoods with concentrations of low-income residents. Potentially impacted residents were also invited to attend local advisory group meetings to share concerns and learn about the project.

- Staff met with social service providers in the corridor during the study. One group of service providers, Outer Southeast Caring Communities, meets monthly. Staff discussed the project with that group early in the process and contacted them again to share the results of the analysis.

- Information tables were staffed at community events in targeted communities during the SDEIS process. Information related to the study was provided along with an opportunity to talk with staff.

- Project staff canvassed neighborhoods near proposed improvements that were thought to have concentrations of low-income or minority residents. Public involvement staff used these door-to-door visits to explain the project, discuss concerns, invite further involvement and note concentrations of people who would require further specialized outreach such as non-English speakers. These visits were also used as an opportunity to expand the project mailing list to ensure that residents would continue to be informed. Newsletters or information about upcoming meetings as well as staff contact information were left for residents who were not at home.

2000 U.S. Census income data were not available to help staff to identify low-income communities during outreach and public process efforts for the SDEIS. Income data were not released until August 2002 as the SDEIS outreach was nearing completion. Staff used available resources including 1990 Census data and observations to identify communities likely to have concentrations of low-income residents. These communities were targeted for additional outreach throughout the process though the demographic profiles were not confirmed until late summer 2002. Once data were available, staff confirmed that outreach efforts had targeted the necessary communities. 2000 US Census data on race and ethnicity were available in early 2001, enabling staff to assess the presence of minority or Hispanic populations in the corridor earlier in the process.

B.1.2 Decision-Making Process

Policy recommendations related to the South Corridor Project will continue to be provided by the South Corridor Policy Committee that is comprised of elected officials and executive staff from affected jurisdictions and agencies. The public involvement activities described in Section B.1.1 will support community involvement in the decision making process. After the SDEIS publication, a public comment period will be held in compliance with NEPA regulations and Metro public involvement standards. During the public comment period, staff will continue to meet with community groups, distribute project information and use other methods for encouraging community participation.

After the public comment period concludes, the Policy Committee will review public comments and technical information before recommending a Locally Preferred Alternative (LPA). Each partner jurisdiction and agency will have an opportunity to make a recommendation related to the proposed LPA. The Metro Council, after hearing public comment on the LPA, will adopt the final LPA.

B.2 Analysis of Project Impacts on Low-Income and Minority Populations

This section summarizes the analysis of impacts on low-income and minority populations that could occur with the South Corridor Project alternatives. The discussion begins with definition of terms and thresholds used for the analysis, followed by findings of impacts and benefits of the alternatives. This section concludes by identifying potential mitigation measures that could minimize impacts to low-income and minority populations.

B.2.1 Analysis Methods

The analysis methods used in this South Corridor SDEIS environmental justice analysis follow. These are based on guidelines for effective practices outlined by the U.S. DOT through the Federal Highway Administration and Federal Transit Administration.

These guidelines do not specify the thresholds that should be used to determine the location of minority, Hispanic, or low-income populations or communities, but do recommend using census data especially if it represents the most up-to-date data available. In terms of size of population or community the following guidance is given:

> "While the minority or low-income population in an area may be small, this does not eliminate the possibility of a disproportionately high and adverse effect of a proposed action. Environmental Justice determinations are made based on effects, not population size. It is important to consider the comparative impact of an action among different population groups."
>
> "The threshold of *disproportionately high and adverse impacts* requires impacts to be greater in magnitude or appreciably more severe for a low-income or minority community than those suffered by non-low-income or non-minority populations/communities."

Potential minority and Hispanic populations or communities for this project were identified by comparing the 2000 Census minority or Hispanic proportion of the population of each census block group with the minority or Hispanic proportion of the population for all census tracts within the Metro Urban Growth Boundary (UGB). Similarly, potential low-income populations or communities were identified by comparing the 2000 Census proportion of households below poverty level of each census block group with proportion of households below the poverty level within the Metro Urban Growth Boundary (UGB).

In addition, the same 2000 Census data were used to estimate the probable number of minority, Hispanic, and low-income displacements and the characteristics of potential rider populations receiving improved transit service. Additional information about the demographic characteristics of neighborhoods within the corridor can be found in Section 3.3, Social and Neighborhood Impacts, of this SDEIS.

B.2.2 Findings

According to the 2000 US Census, 18.7 percent of residents within the Metro UGB are members of a minority group compared to 17.1 percent within the Tri-County Region and 13.9 percent in the South Corridor. Residents of Hispanic origin comprise only 8.3 percent of the population within the Metro UGB population, 8.0 percent in the Tri-County Region and 5.7 percent in the South Corridor.

A higher proportion of households within the South Corridor (11.3 percent) had incomes below the federally defined poverty level[1] in 1999 than the proportion in either the Metro UGB (9.4 percent) or the Tri-County Region (8.7 percent). This information is summarized in Table B-1.

Table B-1
Characteristics of Comparison Geographies

Area	Population	Households	% Minority	% Hispanic	% Poverty
South Corridor	475,477	196,842	13.9%	5.7%	11.3%
Metro UGB	1,190,993	538,415	18.7%	8.3%	9.4%
Tri-County Region	1,444,219	569,461	17.1%	8.0%	8.7%

Source: Metro, U.S. Census 2000, and E.D. Hovee & Company.
Note: Percent minority and percent Hispanic refer to proportion of populations, whereas percent poverty indicates the proportion of households below the poverty level.

Neighborhoods with a higher proportion of minority residents than average for the Metro UGB include Downtown Portland in the Portland to Milwaukie Segment, Milwaukie Business-Industrial in the Milwaukie to Clackamas Segment, and Hazelwood, Lents, Montavilla, Powellhurst-Gilbert, and West Mt. Scott in the Gateway to Clackamas Segment. Neighborhoods with a higher concentration of Hispanic residents than average for the Metro UGB include Milwaukie Business-Industrial in the Milwaukie to Clackamas Segment, and Hazelwood, Lents, Powellhurst-Gilbert and Southgate in the Gateway to Clackamas Segment. Downtown Portland, Brooklyn, Hosford-Abernethy, Sellwood-Moreland and Ardenwald neighborhoods in the Portland to Milwaukie Segment; Jennings Lodge neighborhood in the Milwaukie to Oregon City Segment; and Hazelwood, Lents, Montavilla, Powellhurst-Gilbert and Southgate neighborhoods in the Gateway to Clackamas Segment have higher proportion of low-income residents than the Metro UGB average.

This section addresses potential project impacts and benefits that could occur with each South Corridor alternative including displacements, neighborhood impacts, visual impacts, noise and vibration impacts, and improved transit service

B.2.3.1 Residential Displacements

An assessment of environmental justice issues related to residential displacement impacts is necessary because residential displacements could affect the community environment. Each residential displacement would be mitigated by relocation assistance under the Uniform Housing and Relocation Assistance Act.

To determine if residential displacements disproportionately affect minority, Hispanic, or low-income populations, the probability of impacting residents in each of these categories was calculated[2]. Probable minority, Hispanic, and low-income residential displacements are shown in Table B-2 by Alternative.

Only the I-205 Light Rail and Combined Light Rail alternatives are likely to displace housing units occupied by minority, Hispanic, or low-income residents. Based on the probability analysis, both these alternatives would be expected to impact two housing units occupied by minority residents,

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[1] The census compares household income to federal standards based on household size and composition in developing statistics to describe poverty rates by census tract (U.S. Census Bureau: 2000, Summary File 3 Technical Documentation).
[2] For example, if a potential displacement is located within a census block group where 30 percent of the residents are minorities; there is a 30 percent probability that a minority resident occupies the unit.

one housing unit occupied by Hispanic residents, and one housing unit occupied by low-income residents.

Table B-2
Residential Displacements of Minority and Low-Income Populations by Alternative

Alternative	Total Number of Displace-ments	Minority Households		Hispanic Households		Low Income Households	
		Probable Displace-ments	Percent of Total	Probable Displace-ments	Percent of Total	Probable Displace-ments	Percent of Total
BRT	0	0	0	0	0	0	0
Busway	1	0	0	0	0	0	0
Milwaukie Light Rail	1	0	0	0	0	0	0
I-205 Light Rail	13	2	15.4%	1	7.7%	1	7.7%
Combined Light Rail	14	2	14.3%	1	7.1%	1	7.7%

Source: Metro, 2000 U.S. Census, and E.D. Hovee & Company
Notes: Metro UGB=17.1% Minority, 8.3% Hispanic and 9.4% Low-Income (Table B-1)

Minority, Hispanic or low-income households would not be displaced at a higher rate than represented within the population of the Metro UGB and the impacts would *not* be greater in magnitude or appreciably more severe for the minority population/community than those experienced by non-minority populations/communities. As a result, these displacements would not constitute disproportionately high and adverse effects on the minority community.

B.2.3.2 Non-Residential Displacements

Section 3.2 of this SDEIS also discusses the number of displaced businesses and other buildings by alternative. Determination of minority or Hispanic business ownership is not easily quantified or estimated without a survey of impacted businesses. As a result no quantitative estimate has been made. However, no predominantly minority or Hispanic business districts are impacted by the project alternatives.

B.2.3.3 Neighborhood Impacts and Benefits

The Social and Neighborhood Impacts Results Report (Metro, Nov 2002) identifies neighborhood cohesion and livability impacts of the South Corridor Project alternatives. This section summarizes these impacts to neighborhoods with notable minority, Hispanic and/or low-income concentrations by alternative.

Bus Rapid Transit. No neighborhood cohesion or livability impacts specific to neighborhoods with notable minority, Hispanic and/or low-income concentrations have been identified.

Busway. Increased traffic on the Tacoma Street off-ramp from SE McLoughlin Boulevard associated with the Tacoma Street Park-and-Ride Lot (in the Ardenwald neighborhood) could affect travel to and from the Ardenwald and Sellwood-Moreland neighborhoods. Changes to the street pattern near SE 11th and 12th Avenues and Clinton Street associated with the At-Grade Clinton Design Option would improve auto, pedestrian and bike access in the Hosford-Abernathy neighborhood. The Busway Alternative would improve transit access for residents in the Portland to Milwaukie, Milwaukie to Clackamas and Milwaukie to Oregon City segments. Many stations would be located in neighborhoods with concentrations of low-income, minority or Hispanic residents such as the Downtown, Hosford-Abernethy, Brooklyn, Sellwood-Moreland, Ardenwald, Milwaukie Business-Industrial, Jennings Lodge and Southgate neighborhoods.

Milwaukie Light Rail. Increased traffic on the Tacoma Street off-ramp from SE McLoughlin Boulevard associated with the Tacoma Street Park-and-Ride Lot (in Ardenwald) could affect travel to and from the Ardenwald and Sellwood-Moreland Neighborhoods. Transit access would be improved at many stations located in neighborhoods with concentrations of low-income, minority or Hispanic residents such as the Downtown, Hosford-Abernethy, Brooklyn, Sellwood-Moreland, Ardenwald, Milwaukie Business-Industrial, Jennings Lodge and Southgate neighborhoods.

I-205 Light Rail. The proposed park-and-ride lot and street circulation improvements at the Fuller Road Station could significantly alter the character of a portion of the Southgate Neighborhood. Currently the area is characterized by a pocket of single family homes and unimproved streets surrounded by retail, commercial and light industrial development. Under this alternative, six existing single family homes would be replaced with a large park-and-ride garage and unimproved streets would be replaced with an improved access road with sidewalks, lighting and curbs. The remaining homes and a church would experience intensification of surrounding use and activity due to the park-and-ride lot and station. The Fuller Road Park & Ride facility could cause additional delay at the intersection of SE Fuller Road and SE Johnson Creek Boulevard impacting access to I-205 from the Southgate neighborhood. The intersection at SE 92nd and SE Powell Boulevard would be impacted by traffic associated with the Powell Boulevard Park-and-Ride Lot. This increased traffic could affect travel to and from the Lents neighborhood. Transit access would be improved at many stations located in neighborhoods with concentrations of low-income, minority or Hispanic residents such as the Montavilla, Hazelwood, Powellhurst-Gilbert, Lents, West Mt. Scott and Southgate.

Combined Light Rail. The impacts and benefits associated with the Combined Light Rail Alternative would be similar to the Milwaukie and I-205 Light Rail Alternatives described above.

B.2.3.4 Visual, Noise & Vibration Impacts

Section 3.4, Noise and Vibration Impacts and Section 3.7, Visual Impacts of this SDEIS describe the likely impacts of new park-and-ride lots, traffic, light rail vehicles and buses. In general, all of the South Corridor Project alternatives would include further traffic noise abatement. Each of the alternatives would have traffic related noise impacts that could require mitigation. Vibration impacts that could require mitigation have also been identified for all three light rail alternatives. The following section addresses visual, noise and vibration impacts to neighborhoods with notable minority, Hispanic or low-income concentrations. No adverse noise or vibration impacts without feasible mitigation have been identified anywhere in the corridor therefore none of the noise or vibration impacts could disproportionately affect minority, low-income or Hispanic populations. Noise impacts that approach abatement criteria with and without feasible mitigation and adverse noise or vibration impacts are noted in the following comparison of alternatives.

The **BRT Alternative** would be expected to cause one noise impact with feasible mitigation in the Southgate neighborhood. There would also be four unmitigated traffic related noise impacts in the Southgate neighborhood near SE Harmony Road. In the Brooklyn neighborhood, the BRT Alternative would be expected to cause four unmitigated traffic noise impacts and two mitigated traffic noise impacts.

The **Busway Alternative** would be expected to cause one noise impact without feasible mitigation in the Brooklyn neighborhood with the 17th Avenue Design Option. In the Southgate neighborhood, the Busway Alternative would be expected to cause nine noise impacts with feasible mitigation, and four unmitigated traffic related noise impacts.

The **Milwaukie Light Rail Alternative** would be expected to cause four unmitigated traffic related noise impacts in the Southgate neighborhood near SE Harmony Road.

I-205 Light Rail would cause similar impacts to the BRT Alternative in the Brooklyn neighborhood. In addition, noise impacts associated with the I-205 and Combined Light Rail alternatives have been identified for 27 homes in the southern portion of the Lents Neighborhood and seven homes in the Southgate neighborhood. All of these noise impacts could be mitigated. The I-205 and Combined Light Rail Alternatives could cause vibration impacts to two homes on SE Flavel Street in the Lents neighborhood. The I-205 Light Rail Alternatives could affect four homes in the Southgate neighborhood. Mitigation for all of these impacts would be feasible. An elevated station at SE Foster Road would change the view of the Lents Neighborhood from I-205 and has been identified as a community concern.

The Lents Neighborhood has notable concentrations of minority, Hispanic, and low-income residents. The Southgate Neighborhood has notable concentrations of Hispanic and low-income residents. The Brooklyn neighborhood has notable concentrations of low-income residents.

B.2.3.5 Improved Transit Services

An analysis of probable racial, ethnic origin and income characteristics of individuals living within a quarter-mile radius of stations was performed for the South Corridor Alternatives to identify characteristics of potential riders. These characteristics of potential riders were evaluated to determine who would benefit from each of the South Corridor alternatives and the results are summarized in Table B-3. Although South Corridor transit riders could live anywhere, those residing within walking distance (one-quarter mile of stations) are commonly considered to receive improved access to transit services.

Table B-3
Characteristics of Potential Rider Populations by Alternative

Alternative	Population within ¼-Mile Radius of Stations	Probable Percent Minority	Probable Percent Hispanic	Probable Percent Low-Income
Bus Rapid Transit	9,784	6.9%	4.1%	9.3%
Busway	12,427	11.2%	6.2%	10.1%
Milwaukie Light Rail	13,959	10.6%	5.8%	9.6%
I-205 Light Rail	13,191	16.4%	7.8%	11.4%
Combined Light Rail	17,366	15.1%	6.9%	11.2%
Metro UGB	1,190,993	18.7%	8.3%	9.4%

Source: Metro, U.S. Census 2000, and E.D. Hovee & Company.
Note: In order to determine the exact proportion of minority, Hispanic, or persons below poverty level a survey of all residents within the station areas would be necessary. In lieu of a survey, an estimate of the probable proportion of residents within a quarter mile radius of alternative stations has been made. This has been done by taking a weighted average of representation of these groups within the census block groups that intersect the quarter mile radius, applying it to the estimated population within the radius, summing results for stations by alternative, and dividing it by total population within alternative station radii.

The **Busway, Milwaukie Light Rail, I-205 Light Rail** and **Combined Light Rail Alternatives** would provide a direct transit benefit to low-income populations. The proportion of low-income households within one-quarter mile of a station area for each of these alternatives is higher than the average within the Metro UGB. While each of these alternatives would serve many minority and Hispanic people, none of the alternatives under consideration would provide a direct transit benefit to areas with a higher concentration of minority or Hispanic residents than the average concentration within the Metro UGB.

B.2.3.6 Conclusion

In evaluating if the South Corridor Project alternatives would result in disproportionate adverse impacts to low-income, minority and Hispanic populations, guidelines indicate that offsetting benefits, mitigation and enhancement measures, design, comparative impacts, and the number of similar existing system elements in non-minority and non low-income areas may be taken into account. According to the definition established in Executive Order 12898, the South Corridor Project alternatives are not likely to result in disproportionately high and adverse human health, environmental, social and/or economic impacts on minority, Hispanic, and/or low-income populations.

Adverse impacts such as unmitigated noise impacts, traffic impact, visual impacts and displacements do not fall disproportionately on minority, Hispanic or low-income communities. In addition, the **Busway, Bus Rapid Transit, Milwaukie Light Rail, I-205 Light Rail** and **Combined Light Rail Alternatives** provide a direct transit service to station areas[3] with concentrations of low-income households that exceed the average concentration of low-income households in the corridor. Each of the alternatives also provides better access to transit to many minority and Hispanic residents even though the average concentration of minority or Hispanic residents in a station area is lower than the average concentration of minority or Hispanic residents in the region.

A final evaluation of the impacts of the South Corridor Project on minority, Hispanic, and/or low-income populations will be made after the Locally Preferred Alternative is identified in the FEIS. If the I-205 Light Rail or Combined Light Rail alternative is selected, mitigation and enhancements measures not identified during the SDEIS process could be necessary and continued outreach to low-income, minority and Hispanic communities would be done.

B.2.4 Mitigation and Enhancements

Potential impact-specific mitigation measures for the alternatives and design options are discussed in detail in Chapters 3 and 4 of this SDEIS and in the *Social and Neighborhoods Impacts Results Report*, *Visual and Aesthetics Resources Impacts Results Report*, *Noise and Vibration Impacts Results Report*, and the *Traffic Impacts Results Report*. Following selection of the Locally Preferred Alternative, further impact analysis will be conducted and mitigation and enhancement measures will be developed as part of the Final Environmental Impact Statement.

[3] Station area is defined as ¼ mile radius of stations.

APPENDIX C. SUPPORTING DOCUMENTS

The following supporting documents are available for review at Metro, FTA and FHWA offices.

1. South Corridor Project Supplemental Draft Environmental Impact Statement, December 2002
   - Executive Summary

2. South Corridor Project Results Reports, November 2002
   - Air Quality Analysis Results Report
   - Capital Costs Analysis Results Report
   - Community Impact Assessment Results Report
   - Downtown Light Rail Systems Analysis
   - Ecosystems Impacts Results Report
     - Appendix C to the Ecosystem Results Report, Wetland Determination Report
   - Energy Impacts Results Report
   - Financial Analysis Results Report
   - Geology, Soils and Seismic Impacts Results Report
   - Historic, Archaeological and Cultural Impacts Results Report
   - Hazardous Materials Impacts Results Report
   - Land Use and Economic Activity Results Report
   - Noise and Vibration Results Report
   - Operations and Maintenance Costs Results Report
   - Parklands, Recreation Areas, Wildlife and Waterfowl Refuges (Section 4(f)) Results Report
   - Local Traffic Impacts Results Report
   - Travel Forecasting and Transit Analysis Results Report
   - Visual Quality and Aesthetics Results Report
   - Water Quality and Hydrology Results Report

3. South Corridor Project Methods Reports, November 2002
   - Evaluation and Financial Methods Report, April 2002
   - Transportation Analysis Methods Report, February 15, 2002
   - Social, Economic and Environmental Methods Report, February 15, 2002
   - Historic, Archaeological and Cultural Impact Analysis Methods Report
   - Capital Cost Methods Report, April 2002
   - Operating and Maintenance Cost Methods Report, February 15, 2002
   - Approach to Threatened and Endangered Species

4. South Corridor Project Detailed Definition of Alternatives Report, April 2002
   - Light Rail Plan and Profile Drawings
   - BRT and Busway Plan and Profile Drawings
   - Detailed Definition of Alternatives Report

5. South Corridor Transportation Alternatives Study, October 2002
   - Capital Cost Report Refinement Study
   - Public Comments Report
   - South Corridor Evaluation Report, October 16, 2000

- South Corridor Evaluation Summary, October 16, 2000
- Wide Range of Alternatives Report
- South Corridor Background Report, January 2000

6. North Corridor Final Environmental Impact Statement, October 1999
   - North Corridor Public Comment Report

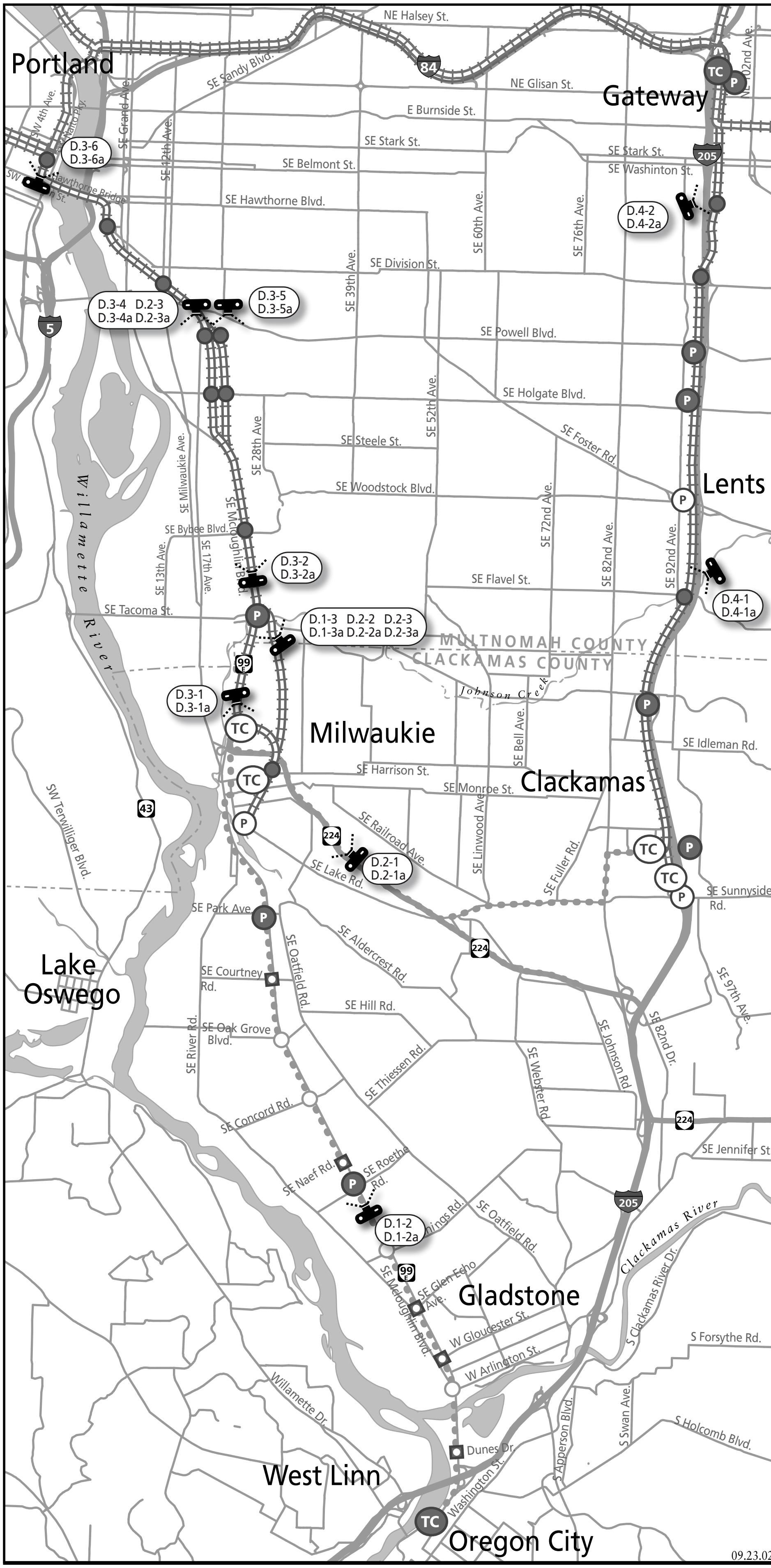
8. North Corridor Supplemental Draft Environmental Impact Statement, April 1999

9. South/North Draft Environmental Impact Statement, February 1998
   - Results Reports
   - Methods Reports
   - Definition of Alternatives

SOUTH CORRIDOR PROJECT

Visual Simulation Locations

Figure D.1-1



LEGEND

Simulation Field of View

Figures	Location
D.1-2, D.1-2a	SE Roethe Road
D.1-3, D.1-3a	SE Tacoma/McLoughlin
D.2-1, D.2-1a	Hwy 224 @ SE Oak St.
D.2-2, D.2-2a	SE Tacoma/McLoughlin
D.2-3, D.2-3a	SE Rhine Street
D.3-1, D.3-1a	SE Washington Street
D.3-2, D.3-2a	O.D.O.T. Building
D.3-3, D.3-3a	SE Tacoma/McLoughlin
D.3-4, D.3-4a	SE Rhine Street
D.3-5, D.3-5a	SE Lafayette Street
D.3-6, D.3-6a	SW Main Street
D.4-1, D.4-1a	SE Flavel Street
D.4-2, D.4-2a	SE Main Street

Light Rail and station

Bus Rapid Transit and station

Existing Light Rail

Transit Center — Option

Park & Ride — Option

Local bus stop improvements

County Line

SOUTH CORRIDOR PROJECT Transportation Alternatives

0 1 2 Miles

METRO

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

Visual Simulations

Bus Rapid Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.1-2
Existing Condition - Roethe Road
- View to the North for Roethe Road and McLoughlin Pedestrian Crossing

Figure D.1-2a
Roethe Road Park and Ride/Bus Rapid Transit
- View to the North for Roethe Road and McLoughlin Pedestrian Crossing

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

Visual Simulations

Bus Rapid Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.1-3
Existing Condition -Tacoma/McLoughlin Blvd.
- Aerial view to the North

Figure D.1-3a
Tacoma/McLoughlin Blvd. - Bus Rapid Transit
- Aerial view to the North

Visual Simulations

Busway

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.2-1
Existing Condition – Hwy 224 @ SE Oak Street
- View to the NE from Hwy 224 @ SE Oak Street

Figure D.2-1a
Hwy 224 @ SE Oak Street/Busway
- View to the NE from Hwy 224 @ SE Oak Street

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

Visual Simulations

Busway

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.2.2
Existing Condition - Tacoma/McLoughlin Blvd.
- Aerial view to the North

Figure D.2-2a
Tacoma/McLoughlin Blvd. - Busway
- Aerial view to the North

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.2-3
Existing Condition – Rhine Street
- View to the Northwest from SE 17th Avenue

Figure D.2-3a
Rhine Street Station - Busway
- View to the Northwest from SE 17th Avenue

Visual Simulations

Portland to Milwaukie Light Rail Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.3.1
Existing Condition – Washington Street
- View to the South from SE Main Street

Figure D.3-1a
Washington Street Park and Ride/Light Rail Transit
- View to the South from SE Main Street

Visual Simulations
Portland to Milwaukie
Light Rail Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.3-2
Existing Condition – ODOT Building
- View to the North from ODOT Parking Lot

Figure D.3-2a
ODOT Building/Light Rail Transit
- View to the North from ODOT Parking Lot

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

Visual Simulations
Portland to Milwaukie Light Rail Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.3-3
Existing Condition – Tacoma/McLoughlin Blvd.
- Aerial view to the Northwest

Figure D.3-3a
Tacoma/McLoughlin Blvd./Light Rail Transit Station and Parking
- Aerial view to the Northwest

Visual Simulations
Portland to Milwaukie
Light Rail Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.3-4
Existing Condition – Rhine Street
- View to the Northwest from SE 17th Avenue

Figure D.3-4a
Rhine Street Station/Light Rail Transit
- View to the Northwest from SE 17th Avenue

Visual Simulations

Portland to Milwaukie
Light Rail Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.3-5
Existing Condition – Lafayette St. Station
- View to the Southeast from SE Rhine Street

Figure D.3-5a
Lafayette Street Station/Light Rail Transit
- View to the Southeast from SE Rhine Street

SOUTH CORRIDOR PROJECT
Transportation Alternatives

METRO

Visual Simulations
Portland to Milwaukie Light Rail Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.3-6
Existing Condition – SW Main Street
- View from SW First Avenue looking to the North.

Figure D.3-6a
Main Street Station/Light Rail Transit
- View from SW First Avenue looking to the North.

Visual Simulations

I - 205
Light Rail Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.4-1
Existing Condition – SE Flavel Street
- Aerial View from the Northeast

Figure D.4-1a
SE Flavel Street Station/Light Rail Transit
- Aerial View from the Southeast

Visual Simulations
I - 205
Light Rail Transit

Note: These simulations have been prepared to illustrate alignment alternatives for the Supplemental Draft Environmental Impact Statement (SDEIS). These illustrations are based on a preliminary level of design (approximately 5%) and are subject to change. See Section 3.7 of this SDEIS for a description of the proposed alternatives illustrated in these simulations

Figure D.4-2
Existing Condition – Main Street
- View to the Northeast to the Gateway Town Center

Figure D.4-2a
Main Street Station/Light Rail Transit
- View to the Northeast to the Gateway Town Center

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Councilor Brian Newman, City of Milwaukie
Mayor John F. Williams Jr., City of Oregon City
Commissioner Bill Kennemer, Clackamas County
Commissioner Maria Rojo de Steffey, Multnomah County
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Alonzo Wertz, TriMet

APPENDIX F. LIST OF RECIPIENTS

F.1 Federal Agencies

Department of the Army, Corps of Engineers
Federal Emergency Management Administration
Federal Highway Administration
Federal Railroad Administration
Federal Transit Administration
Interstate Commerce Commission
National Marine Fisheries Service
US Coast Guard
US Department of Agriculture
US Department of Commerce
US Department of Energy
US Department of Interior
US Environmental Protection Agency
US Fish and Wildlife Service

F.2 Native American Tribes

Confederated Tribes of the Grand Ronde
Confederated Tribes of the Warm Springs
Confederated Tribes of Siletz
Columbia Inter-Tribal Fish Commission

F.3 Oregon State Agencies

Office of the Governor
Department of Energy
Department of Environmental Quality
Department of Fish and Wildlife
Department of Geology and Mineral Industries
Department of Land Conservation and Development
Department of Transportation
Department of Water Resources
Division of State Lands
Economic Development Department
Department of Geology & Mineral Industries
Public Utilities Commission
State Historic Preservation Office
State Parks and Recreation Department

F.4 Regional and Local Agencies

City of Gladstone
City of Milwaukie
City of Oregon City
City of Portland
City of West Linn
City of Lake Oswego
City of Happy Valley
Clackamas County
Multnomah County
TriMet

F.5 Libraries

Clackamas County Library
Multnomah County Library
Portland State University Library
Milwaukie Ledding Library

F.6 Neighborhood Associations

Ardenwald
Brooklyn
Downtown Community Association
Eastmoreland
Gladstone
Hazelwood
Historic Milwaukie
Hosford-Abernethy
Island Station
Jennings Lodge
Lake Road
Lents
Lewelling
Linwood
McLoughlin Industrial
Milwaukie Business Industrial
Montavilla
North Clackamas
Oak Lodge
Oregon City
Powellhurst-Gilbert
Sellwood-Moreland
Southgate
Sunnyside
West Mt. Scott

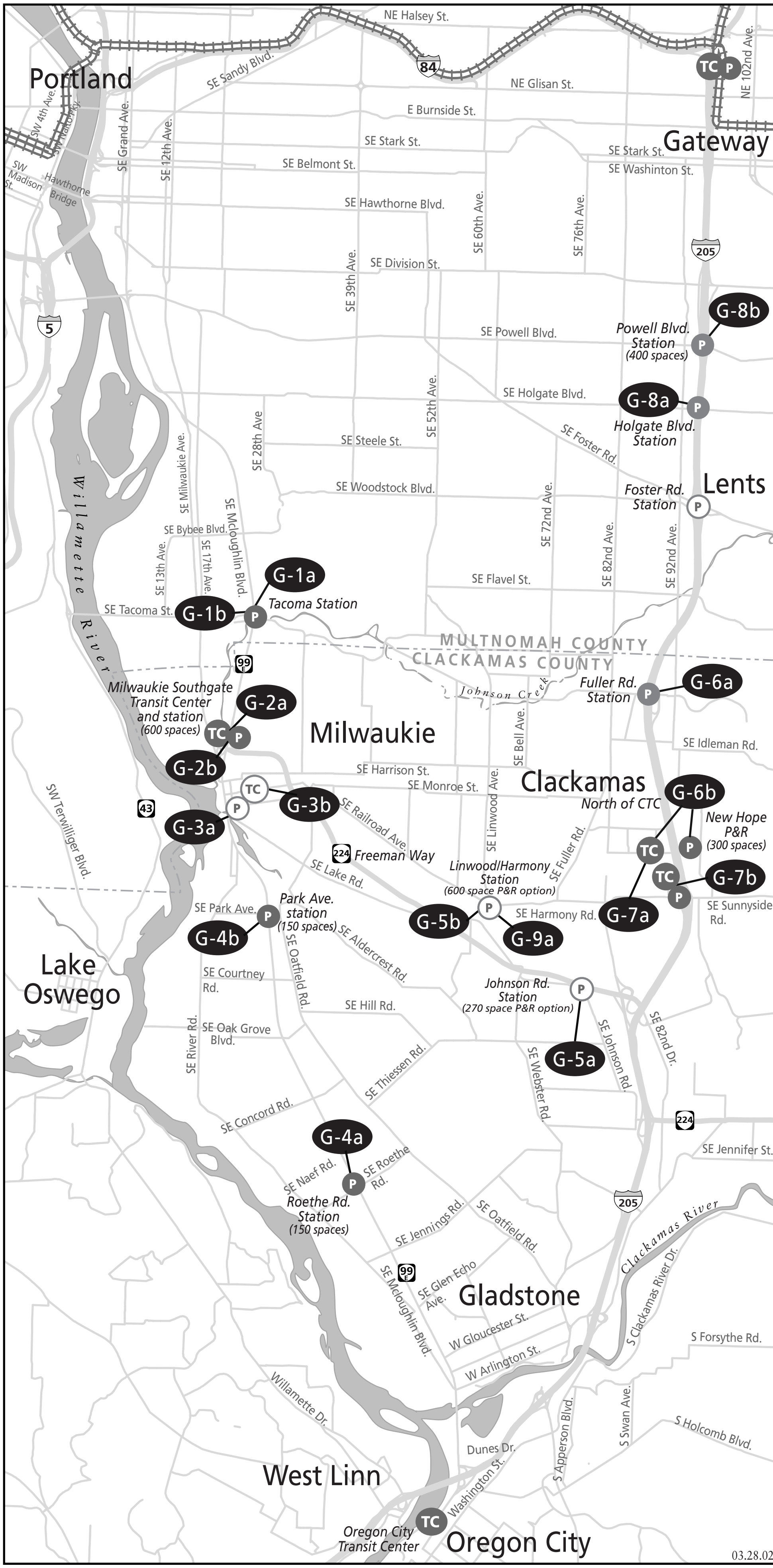
F.7 Miscellaneous

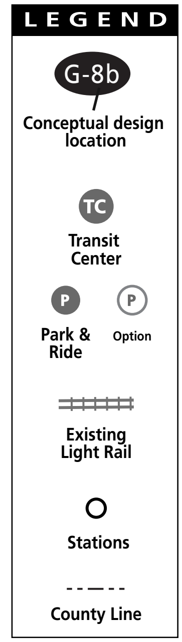
Alliance of Portland Neighborhoods
Central Eastside Industrial Council
Clackamas Community College
Clackamas County Historical Society
Clackamas Town Center
East Portland Chamer of Commerce
Foster/82nd Business Association
Inner Foster Study Citizen Advisory Committee
Lents Urban Renewal Public Advisory Committee
Macadam Business Association
Milwaukie to Portland Light Rail Coalition
Milwaukie Neighborhood Development Association
North Clackamas Chamber of Commerce
North Macadam Development Council
Opportunity Gateway Public Advisory Committee
Outer Southeast Light Rail Coalition
Oregon City Chamber of Commerce
Oregon Historical Society
Oregon Institute of Technology
Oregon League of Women Voters
Oregon Water Resource Council
Portland Business Alliance
Portland Development Commission
Portland Metropolitan Chamber of Commerce
Portland State University

SOUTH CORRIDOR PROJECT

Conceptual Designs for Transit Center and Park-and-Ride Locations

Figure G-1

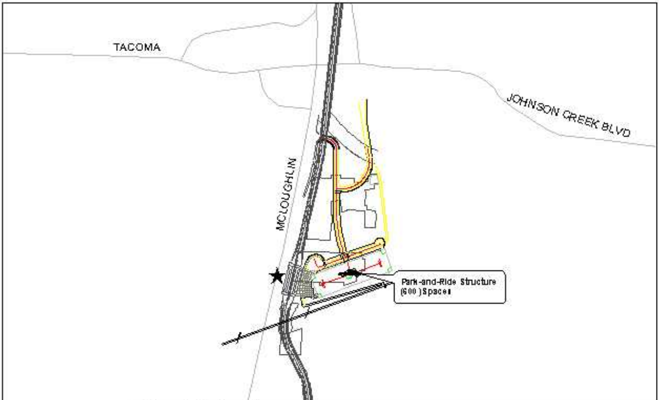




SOUTH CORRIDOR PROJECT
Transportation Alternatives

0 1 2
Miles
N

METRO



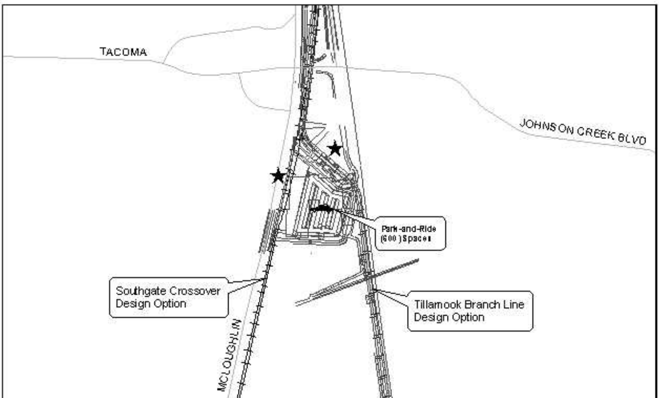
South Corridor Project *Conceptual Designs*

Figure G-1a

Tacoma Park-and-Ride (600 spaces)
Busway Alternative

Busway Alignment
Busway Station
Park-and-Ride

0 350 700
Feet



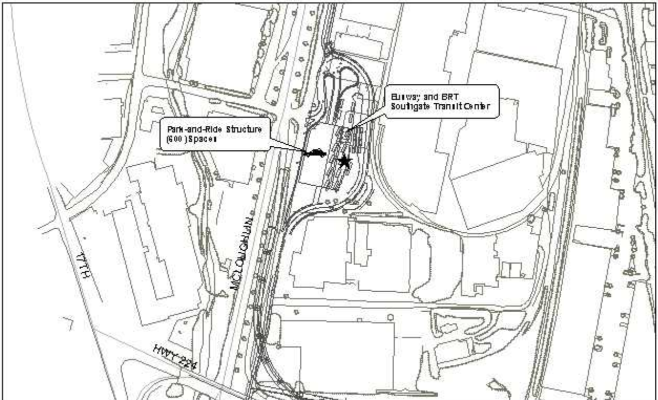
South Corridor Project *Conceptual Designs*

Figure G-1b

Tacoma Park-and-Ride (600 spaces)
Milwaukie LRT Alternative

Milwaukie LRT Alignment
Milwaukie LRT Station
Park-and-Ride

0 350 700
Feet



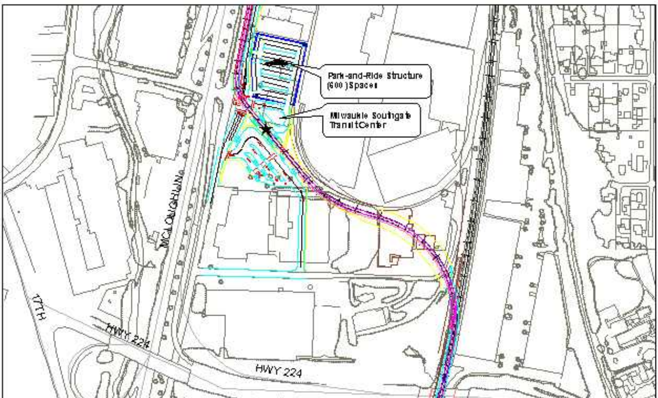
South Corridor Project *Conceptual Designs*

Figure G-2a

Southgate Transit Center & Park-and-Ride (600 Spaces) Busway and BRT Alternative

- - - - Busway and BRT Alignment
★ Busway and BRT Station
Park-and-Ride

0 250 500
Feet



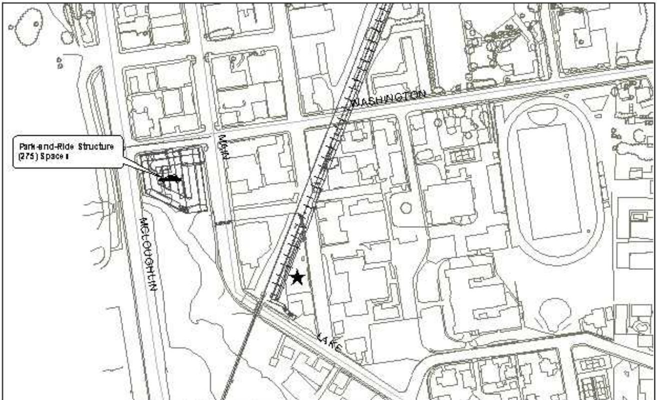
South Corridor Project *Conceptual Designs*

Figure G-2b

Southgate Transit Center & Park-and-Ride (600 Spaces) Milwaukie LRT Alternative Southgate Crossover Design Option

Milwaukie LRT Alignment
★ Milwaukie LRT Station
Park-and-Ride

0 250 500
Feet



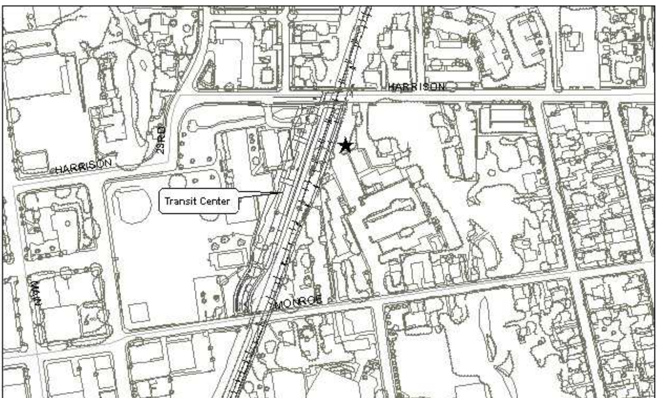
South Corridor Project *Conceptual Designs*

Figure G-3a

Lake Road Terminus Option Park-and-Ride (275 spaces) Milwaukie LRT Alternative

Milwaukie LRT Alignment
Milwaukie LRT Station
Park-and-Ride

0 200 400
Feet



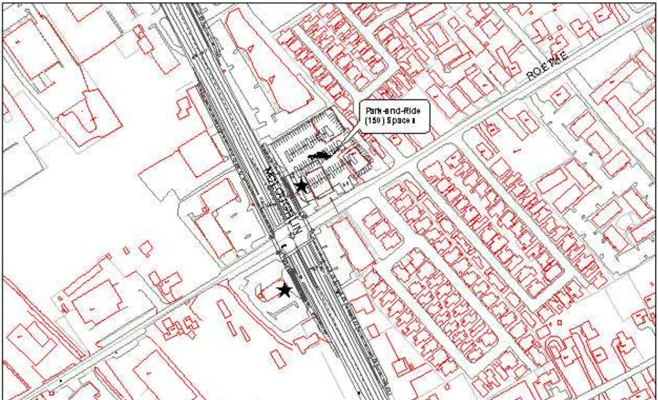
South Corridor Project *Conceptual Designs*

Figure G-3b

Milwaukie LRT Transit Center with the Tillamook Branch Line

Milwaukie LRT Alignment
Milwaukie LRT Station

0 200 400
Feet



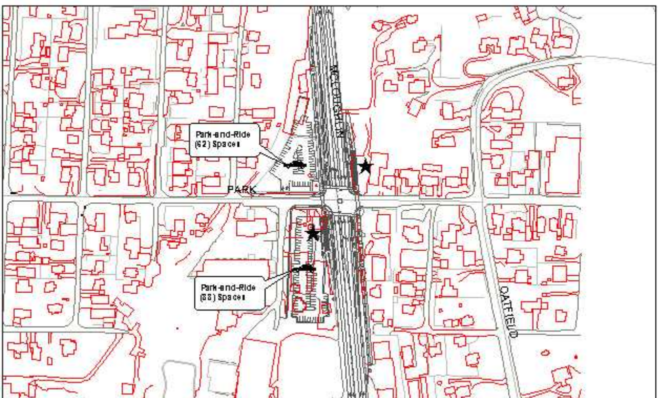
South Corridor Project *Conceptual Designs*

Figure G-4a

Roethe Road Park-and-Ride (150 Spaces)
BRT Alternative

BRT Alignment
BRT Stations
Park-and-Ride

0 200 400
Feet



South Corridor Project *Conceptual Designs*

Figure G-4b

Park Avenue Park-and-Ride (150 Spaces)
BRT Alternative

BRT Alignment
BRT Stations
Park-and-Ride

0 200 400
Feet

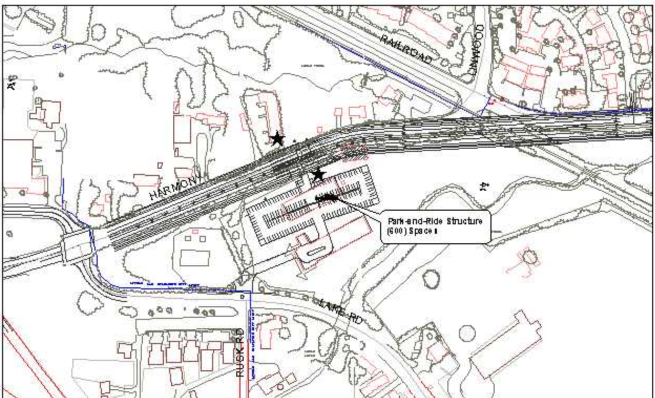
South Corridor Project *Conceptual Designs*

Figure G-5a

Johnson Road Park-and-Ride (270 Spaces)
BRT Alternative

BRT Alignment
BRT Stations
Park-and-Ride

0 200 400
Feet



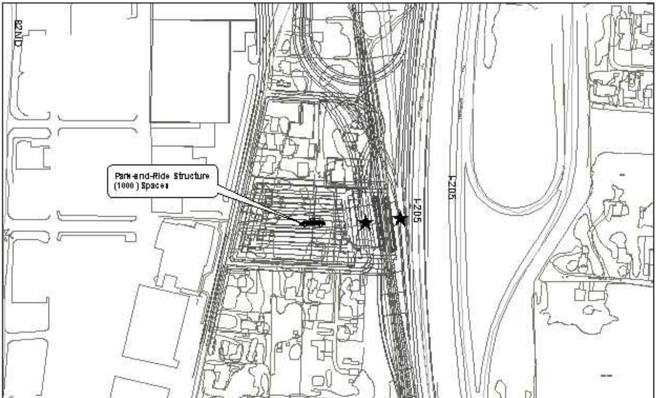
South Corridor Project *Conceptual Designs*

Figure G-5b

Linwood Avenue Park-and-Ride (600 Spaces)
BRT Alternative

BRT Alignment
BRT Stations
Park-and-Ride

0 190 380
Feet



South Corridor Project *Conceptual Designs*

Figure G-6a

Fuller Road Park-and-Ride (1000 Spaces)
I-205 Alternative

I-205 LRT Alignment
I-205 LRT Stations
Park and Ride

0 200 400
Feet

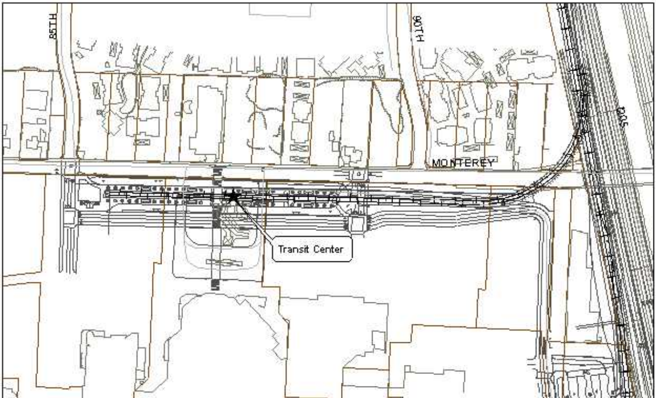
South Corridor Project *Conceptual Designs*

Figure G-6b

Clackamas Town Center Park-and-Ride
(300 Spaces) Busway Alternative

Busway Alignment
Busway Stations
Park-and-Ride

0 200 400
Feet



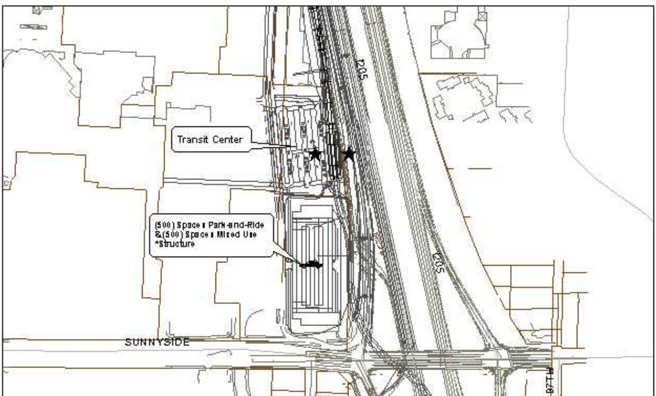
South Corridor Project *Conceptual Designs*

Figure G-7a

North of Clackamas Town Center Transit Center
I-205 Alternative

I-205 LRT Alignment
I-205 LRT Transit Center

0 200 400
Feet



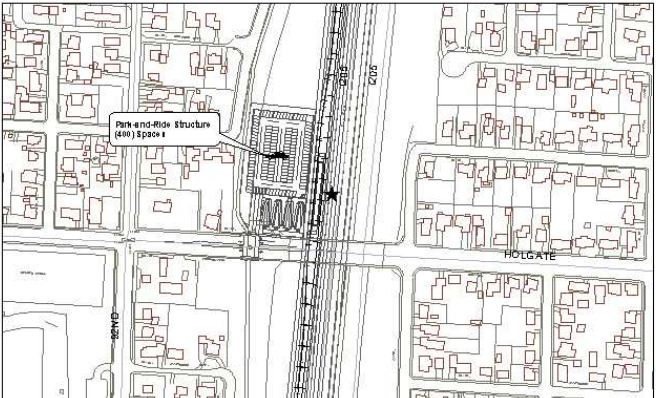
South Corridor Project *Conceptual Designs*

Figure G-7b

East of Clackamas Town Center Park-and-Ride
(1000 Spaces) and Transit Center
I-205 Alternative

I-205 LRT Alignment
I-205 LRT Stations
Park-and-Ride

0 250 500
Feet



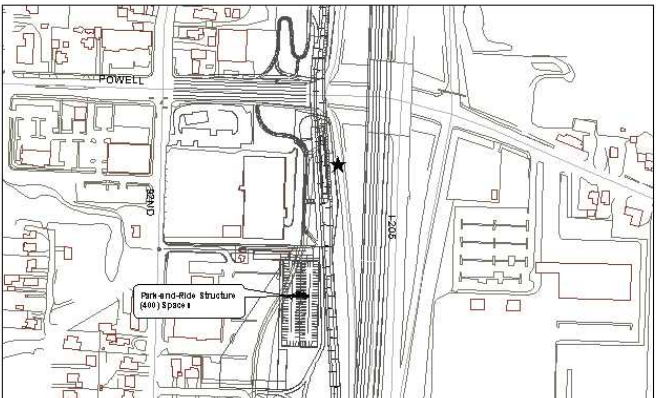
South Corridor Project | *Conceptual Designs*

Figure G-8a

Holgate Boulevard Park-and-Ride (400 Spaces)
I-205 Alternative

I-205 LRT Alignment
I-205 LRT Station
Park-and-Ride

0 200 400
Feet



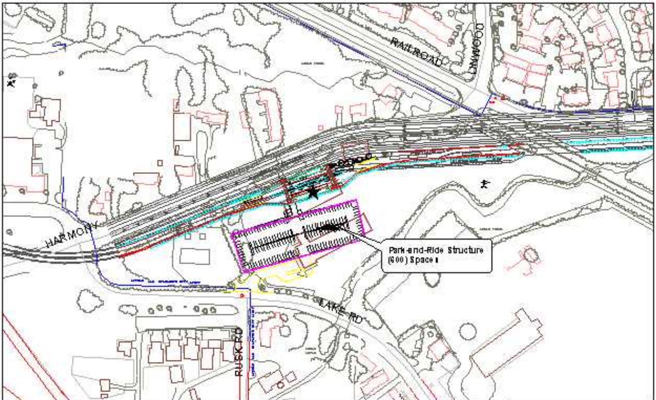
South Corridor Project | *Conceptual Designs*

Figure G-8b

Powell Boulevard Park-and-Ride (400 Spaces)
I-205 Alternative

I-205 LRT Alignment
I-205 LRT Station
Park-and-Ride

0 200 400
Feet



South Corridor Project | *Conceptual Designs*

Figure G-9a

Linwood Avenue Park-and-Ride (600 Spaces)
Busway Alternative

----- Busway Alignment
★ Busway Station
Park-and-Ride

0 200 400
Feet

Transportation Choices for the South Corridor

Milwaukie, Oregon City, Portland and Clackamas County

You are invited to review the findings and the results of the South Corridor Supplemental Draft Environmental Impact Statement (SDEIS), a report that outlines the benefits, costs and impacts of proposed bus rapid transit, busway, light-rail and no-build options. Decision-makers and community members will use the report to assess which alternatives can best serve South Corridor communities.

A brief look at the choices

The SDEIS summarizes the range of environmental impacts and benefits that would result from the alternatives. Benefits would include increased transit ridership in the corridor, improved transit and automobile travel times, reduced air pollution and energy use, and support of local and regional land-use plans. Alternatives include the following:

No-build. This option illustrates the likely changes in the transit and roadway system in the region without any major projects and is used as a baseline for comparison.

Bus rapid transit. This is an improved bus system where buses operate primarily in mixed traffic but use signal technology and bypass lanes to help them operate more quickly and reliably. Under consideration between Portland and Milwaukie, Milwaukie and Clackamas and Milwaukie and Oregon City.

Busway. This is a roadway for the exclusive use of transit buses that provides faster and more reliable bus service. Under consideration between Portland and Milwaukie and Milwaukie and the Clackamas regional center.

Light rail. Light rail or MAX would operate in a separate right-of-way offering reliable, fast, comfortable transit service that connects easily to the regional MAX system. Under consideration between Portland and Milwaukie and Gateway and the Clackamas regional center.

Each option has different benefits and impacts. It is important for residents to learn more and let policy-makers know which options can best serve the South Corridor.

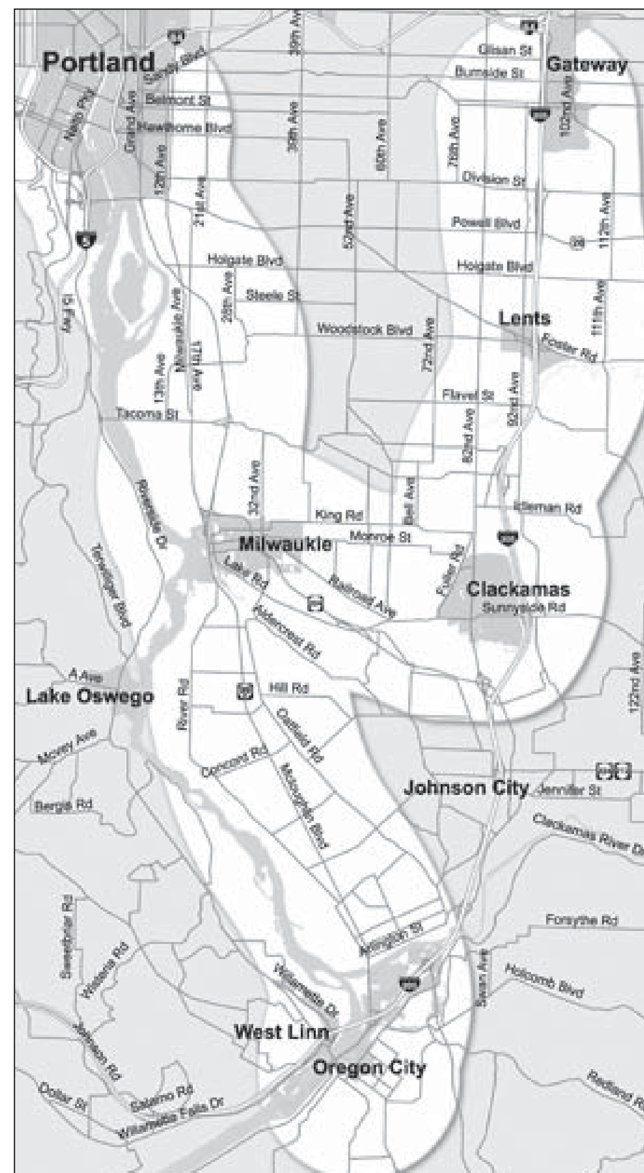
Public open houses

Learn about each transportation option at the open houses in December. Maps and other materials can be reviewed. You also can ask questions about the project and request a copy of the SDEIS.

5 p.m. Monday, Dec. 9, St. Johns Episcopal Church, 2036 SE Jefferson, Milwaukie

5 p.m. Tuesday, Dec. 10, New Hope Community Church, 11731 SE Stevens Rd. (at 1-205 and Sunnyside Road), Clackamas

5 p.m. Wednesday, Dec. 11, OMSI, 1945 SE Water Ave., Portland



SOUTH CORRIDOR PROJECT AREA

Public comment period – to be held for a minimum of 45 days in December 2002 and January 2003.

Public open houses – Dec. 9, 10 and 11

Public hearings – January 2003

Your comments count

Make comments on the transportation options that you prefer during the comment period. Hearings will be held in mid-January. Check the Metro web site (**www.metro-region.org**) or call the transportation hotline for dates.

For more information, to receive a copy of the SDEIS or to make comments:

Phone message – transportation hotline, (503) 797-1900 option 5

Call staff – (503)797-1759 or TDD (503)797-1804

E-mail – trans@metro.dst.or.us

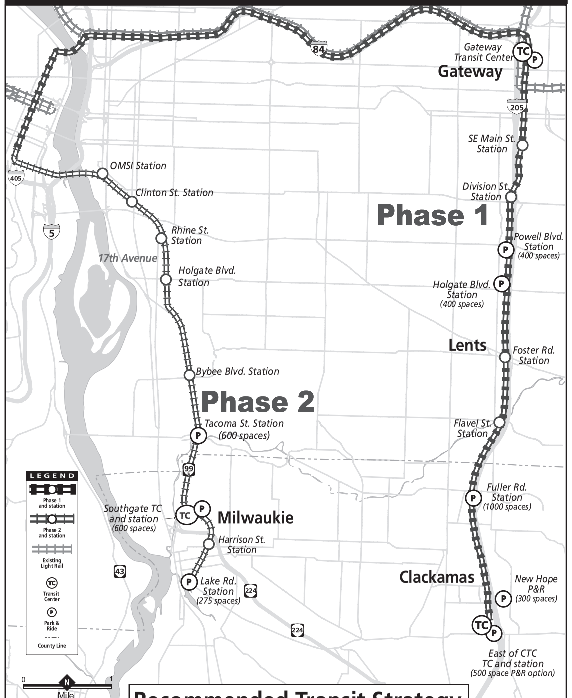
FAX – (503) 797-1929

Mail – South Corridor Project, Metro, 600 NE Grand Ave., Portland, OR 97232

SOUTH CORRIDOR PROJECT
Transportation Alternatives

The South Corridor Project is a cooperative effort of City of Milwaukie, City of Oregon City, City of Portland, Clackamas County, Oregon Department of Transportation, Metro and TriMet

SOUTH CORRIDOR PROJECT



Recommended Transit Strategy

At its Feb. 13, 2003 meeting, the South Corridor Policy Committee recommended a two-phased strategy for implementing both the I-205 and Milwaukie to Portland light rail projects.

The new transit options would meet the needs of those who live in the southeastern portion of the metro area and would serve the larger community by connecting neighborhoods throughout the region.

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South Corridor Policy Committee advances transit recommendations

Public comment period

More than 300 comments reflecting the views of community groups, businesses, individuals and agencies were received during the 61-day local public comment period that ended on Feb. 7, 2003. Participants had an opportunity to review and comment on South Corridor environmental work.

The comment period was the culmination of two years of collaboration between community members, elected officials and staff members on this phase of the project and initiated the decision-making process.

Comments on the transit alternatives showed significant support for both Milwaukie and I-205 light rail and little support for busway and bus rapid transit options.

Neighbors along I-205 commented on safety , noise and livability issues as well as station and park-and-ride location and design. Southeast Portland residents voiced concerns about existing traffic and future congestion particularly along McLoughlin Boulevard and asked the Policy Committee to recommend light rail expansion to relieve these pressures.

Representatives from downtown Portland identified construction of the light rail on the Portland Mall (Southwest Fifth and Sixth avenues) as a priority and suggested the construction of a new Caruthers Bridge as part of the Milwaukie to Portland light rail project.

Strategy recommended

At its Feb. 13, 2003 meeting, the South Corridor Policy Committee, made up of officials from participating jurisdictions, recommended a two-phased strategy for implementing both the I-205 and Milwaukie to Portland light rail projects.

The committee recommended that both I-205 and Milwaukie light rail projects should be regional priorities and that the I-205 light rail should move ahead first followed by the Milwaukie to Portland light rail. The committee also recommended that TriMet construct the Southgate Park-and-Ride lot in Milwaukie and undertake steps to relocate the current on-street transit center to the Southgate area during the first phase of the project.

Before the transit center is constructed, staff and community members will work to resolve environmental and design issues, including traffic and truck access.

The committee recommended that TriMet consider implementing some bus rapid transit elements between Milwaukie and Oregon City through their Transportation Investment Plan process. Local bus service would be maintained between Milwaukie and Clackamas. Specifically, the preferred options include:

I-205 Light Rail

- A transit center would be located east of Clackamas Town Center with a potential park-and-ride garage.
- A new light rail alignment would be constructed on the Portland Mall (Southwest Fifth and Sixth avenues) between the Steel Bridge and Portland State University in downtown Portland.
- During phase I, the Milwaukie Southgate park-and-ride would be constructed and the existing Milwaukie Transit Center would be relocated to the Southgate area.

Milwaukie to Portland Light Rail

- The terminus of the line would be located at Lake Road in Milwaukie.
- A light rail station, but no bus transfer facility, would be built at the Portland Waldorf School in Milwaukie.
- A park-and-ride and transit center would be designed for the North Milwaukie Industrial Area.
- The 17th Avenue design option would be refined and constructed in the Brooklyn Neighborhood.
- A new Caruthers Bridge over the Willamette River would be built from just south of OMSI to Southwest River Parkway.
- The line would be connected from the proposed Caruthers Bridge to the Portland Mall on Southwest Lincoln Street.

Next Steps

Public comment opportunities will continue as each jurisdiction considers the Policy Committee's recommendation. The jurisdictions are scheduled to discuss the recommended strategies on the following dates:

- Clackamas County on March 19, 2003
- Multnomah County on March 20, 2003
- City of Portland on March 19, 2003
- City of Milwaukie on April 1, 2003
- City of Oregon City on March 19, 2003
- TriMet on March 26, 2003

The Metro Council is scheduled to review comments and adopt a strategy for moving forward on April 17, 2003.

For more information about how to participate or to confirm meeting dates, call Kristin Hull at (503) 797-1864.

SOUTH CORRIDOR PROJECT
Transportation Alternatives

Imagine
two new light rail lines

Imagine two new light rail lines to serve the South Corridor: one line connecting areas between downtown Portland, Gateway and Clackamas and one line connecting Milwaukie, Southeast Portland and downtown Portland.

On April 17, the Metro Council selected a two-phased light rail project for the South Corridor that includes I-205 light rail with a new light rail route in downtown Portland and Milwaukie to Portland light rail. Construction of light rail from Milwaukie to Portland would follow completion of the I-205 light rail project.

Adoption of a preferred strategy by the Metro Council is the culmination of four years of collaboration between community members, Metro, TriMet, Oregon Department of Transportation, the cities of Portland, Milwaukie and Oregon City, and Clackamas and Multnomah counties on the South Corridor Project.

Work will continue on both projects as community members begin to envision how light rail can best fit their communities.

SOUTH
CORRIDOR
PROJECT

Transportation Alternatives

The South Corridor Project is a cooperative effort of Metro, City of Milwaukie, City of Oregon City, City of Portland, Clackamas County, Multnomah County, Oregon Department of Transportation and TriMet

I-205 Light Rail Project

Contacts:
Kristin Hull,
(503) 797-1864
and
TriMet,
(503) 962-2150

The I-205 light rail project would link to the region's light rail system providing vital connections between Clackamas, Lents, Gateway, the airport, downtown Portland and beyond.

By 2020, more than 30,000 riders are expected to use I-205 light rail each day to reach work, shopping, school or other destinations. I-205 light rail trains would offer service between Clackamas and Gateway continuing into downtown Portland.

Between the Gateway district and the Clackamas Town Center, trains would operate in the freeway right of way. Stations would serve the Hazelwood, Montavilla, Lents and Powellhurst-Gilbert neighborhoods in Portland and the Sunnyside, Southgate and West Mt. Scott neighborhoods in Clackamas County. To connect I-205 light rail to Union Station, Portland State University and the heart of the central city, the Metro Council recommended that a new route on the Portland Mall (Southwest Fifth and Sixth avenues) should be constructed.

Additional engineering, design and environmental work will begin immediately on I-205 light rail. During this time, community members and staff will work together to finalize station and park-and-ride locations, refine designs to avoid identified impacts and develop mitigation plans for unavoidable impacts.

I-205 and Downtown Light Rail Timeline

2003

- I-205 light rail with the Portland Mall is adopted as the first phase of the South Corridor Project by the Metro Council.
- Environmental work to update the Portland Mall alignment to connect I-205 light rail to downtown Portland begins.
- Steering Committee and Citizens Advisory Committee to guide I-205 light rail established.
- Station locations, park-and-ride designs and other issues are resolved.
- Additional environmental work for downtown Portland is completed and a public comment period is held.
- Locally Preferred Alternative for downtown Portland is selected.
- Final environmental work and preliminary engineering for I-205, including the Portland Mall begins.

2004

- Final Environmental Impact Statement addressing concerns raised during the public comment period and detailing mitigation plans for the project is published.
- Detailed financing plan is completed.
- Final design for I-205 and downtown Portland is completed.
- Environmental work to relocate the Milwaukie Transit Center begins.

2005

- Construction of the I-205 light rail project from Clackamas to Gateway and in downtown Portland begins.

2008

- Start up of light rail along I-205 and on the Portland Mall.

Downtown Light Rail Project

Contact:
TriMet,
(503) 962-2150

The I-205 light rail project, with the recommended route between Union Station and Portland State University on the Portland Mall, would improve access to the heart of downtown Portland.

After extensive analysis and public debate, the Portland Mall was selected as the preferred light rail route in downtown Portland for the South/North light rail project. As a low-cost alternative, the South Corridor Project initially evaluated using existing light rail tracks in downtown Portland.

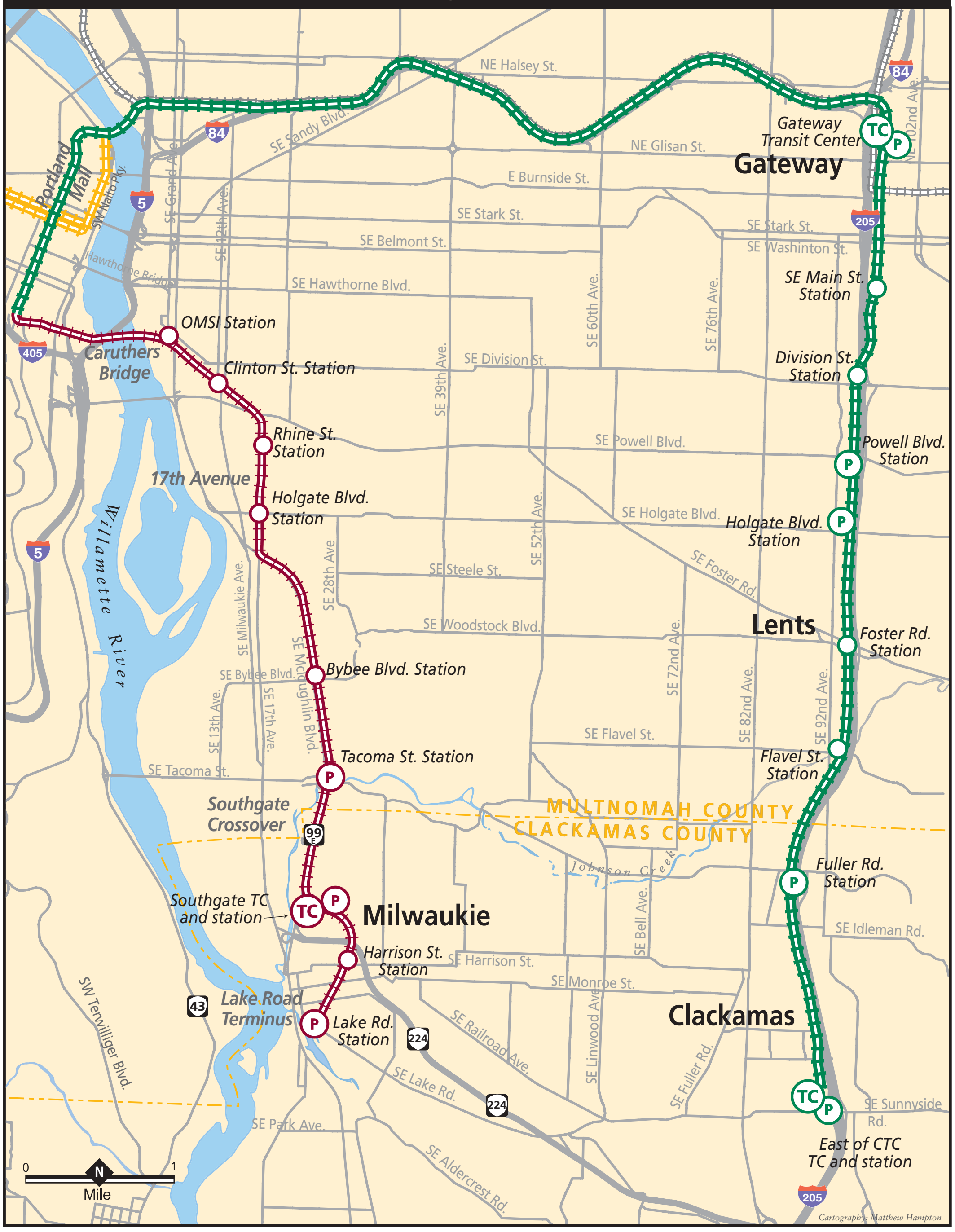
During the South Corridor Project, the downtown business community asked the project to reconsider the Portland Mall alignment as it could better serve key downtown destinations such as Portland State University and Union Station. It would also provide improved reliability for the light rail system. Ultimately, the South Corridor Policy Committee, each local jurisdiction and the Metro Council endorsed the Portland Mall as the preferred alternative for downtown Portland.

Since the original environmental analysis on the Portland Mall was completed nearly five years ago, it needs some updating. The analysis of the Portland Mall will be revisited through preparation of a Downtown Amendment to the South Corridor SDEIS this summer.

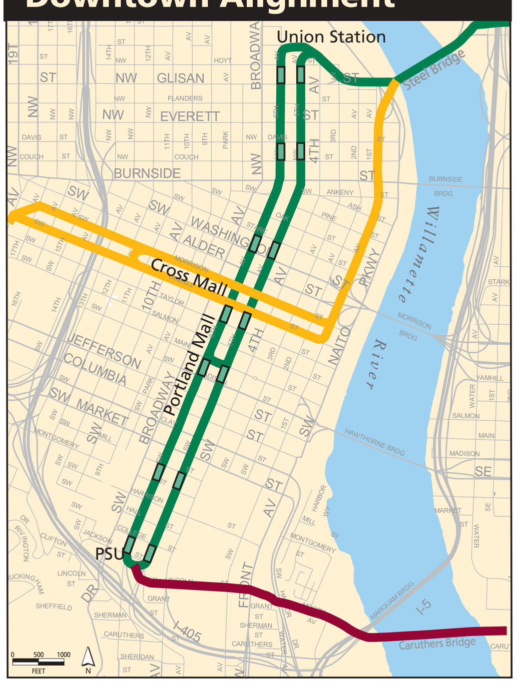
After the Downtown Amendment is complete and public comment is received, the South Corridor Policy Committee will finalize the recommended strategy for moving forward in downtown Portland.

Two new rail lines would meet the needs of those who live in the southeastern portion of the metro area and serve the larger community by connecting neighborhoods throughout the region.

South Corridor Preferred Alignment

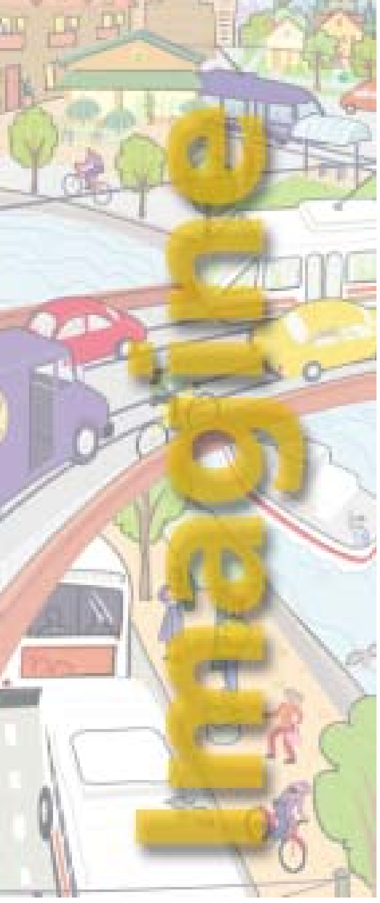


Downtown Alignment



"When these light rail routes are constructed, the people to thank will be the community members and local elected officials who guided this process to a conclusion that will benefit our region for generations."

Brian Newman
Metro Councilor, District 2
Chair, South Corridor Policy Committee



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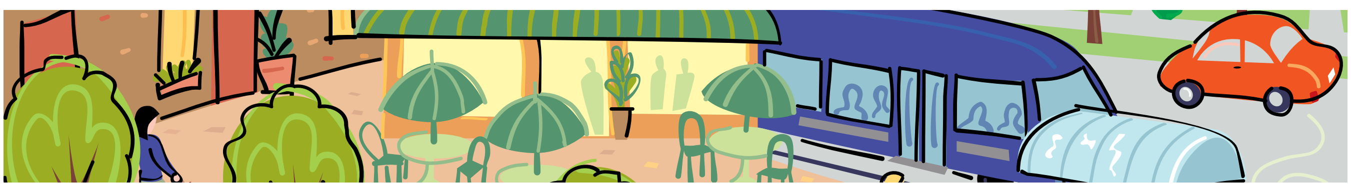


Milwaukie to Portland Light Rail Project

Contact:
Kristin Hull,
(503) 797-1864

The Milwaukie to Portland light rail project would connect neighborhoods in Milwaukie and Southeast Portland to downtown Portland and other places along the regional light rail system. The route would have a terminus at Lake Road and Southeast 21st Avenue in downtown Milwaukie, serve a transit center and park-and-ride in the North Milwaukie industrial area and operate on Southeast 17th Avenue in the Brooklyn neighborhood. It would cross the Willamette River on a Caruthers Bridge and connect to the Portland Mall. Construction would begin after I-205 light rail is complete.

To prepare for the eventual light rail route and serve existing bus riders, the Metro Council called for relocation of the on-street Milwaukie Transit Center to the North Milwaukie industrial area in tandem with the I-205 work. A process to refine the design and address issues raised by property owners will begin this summer.

TriMet recently completed documentation for construction of a 400-space surface park-and-ride lot at the Southgate Theater site. TriMet would add artistic elements, landscaping and other improvements to the park-and-ride site during the next year.

Milwaukie Light Rail Timeline

2003
- Two-phased project to build both I-205 and Milwaukie to Portland light rail adopted by the Metro Council.
- Design for Milwaukie Southgate Transit Center and Park-and-Ride is refined with help from business owners, property owners and residents.
- Construction of Milwaukie Southgate Park-and-Ride begins.

2004
- Environmental work begins and design work continues on the Milwaukie Transit Center.
- Finance plan for Milwaukie light rail is identified.

2005-2008
- Construction of Southgate Transit Center complete.
- Environmental work for Caruthers Bridge begins.
- Final environmental work, preliminary engineering and final design for Milwaukie to Portland light rail complete.

2009-2010
- Construction of Milwaukie to Portland light rail begins.

2013
- Start up of Milwaukie light rail.

Imagine
transportation options in your neighborhood

Imagine your neighborhood or the region as it might look in 20 years. Is it the same as it is today? How do people get around? Do they have more transit, roadway, bike and pedestrian choices than they do today?

Throughout the region, elected officials and community members have been thinking about growth and how we can meet demands for additional housing and employment during the next 20 years. A big part of that discussion is about transportation. Just as the region must plan for additional jobs and housing, we must plan for how people will travel between home and destinations throughout the region for work, school, shopping and recreation.

The South Corridor Supplemental Draft Environmental Impact Statement (SDEIS), published in December 2002, compares no-build, bus rapid transit, busway and light rail alternatives. The public comment period for the SDEIS will end on Feb. 7, 2003. After the public comment period ends, elected officials will begin to weigh technical findings, financial feasibility and all of the public comments to develop a recommendation about how the region should move forward to provide improved transit service in the South Corridor.

SOUTH
CORRIDOR
PROJECT

Transportation Alternatives

The South Corridor Study is a cooperative effort of
City of Milwaukie, City of Oregon City, City of Portland, Clackamas County, Multnomah County, Oregon Department of Transportation, Metro, TriMet

Working together
to find convenient and efficient transit choices

Between 2000 and 2020, the southeastern portion of the region is expected to add nearly 50 percent more households and 35 percent more jobs. Traffic has already increased. On McLoughlin Boulevard at Highway 224, traffic increased by about two-thirds between 1985 and 1998. During that same time, traffic nearly doubled on I-205 at Foster Road. Adding highway capacity alone cannot address these congestion issues while protecting the livability of neighborhoods along the way.

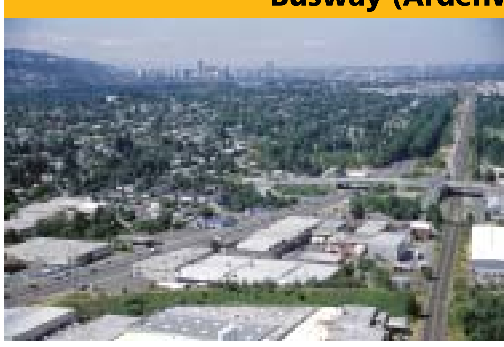
The South Corridor Project is part of the region's effort to keep people moving between Portland, Milwaukie, Oregon City and the Clackamas regional center, along McLoughlin Boulevard and I-205.

Improvements in this area have been on the region's radar screen for more than a decade.

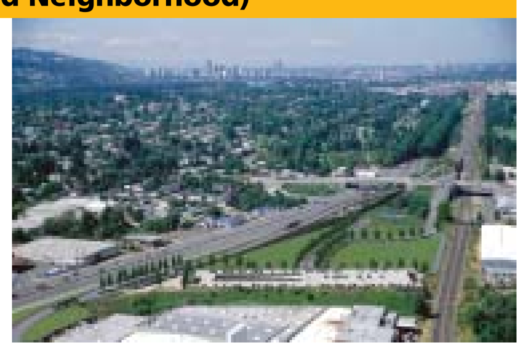
In 1998, these efforts were halted when voters rejected local funding for the South/North Light Rail Project. In the wake of this vote, community pressure resulted in a redesign for the Interstate MAX light rail line, now under construction. While non-light rail alternatives became the focus of a renewed South Corridor Study, community members soon demanded that light rail options to Milwaukie and the Clackamas Town Center via I-205 join the mix of alternatives being evaluated in the southern portions of this well-traveled corridor.

Imagine how the transit options might look

Busway (Ardenwald Neighborhood)



Now – Tacoma at McLoughlin



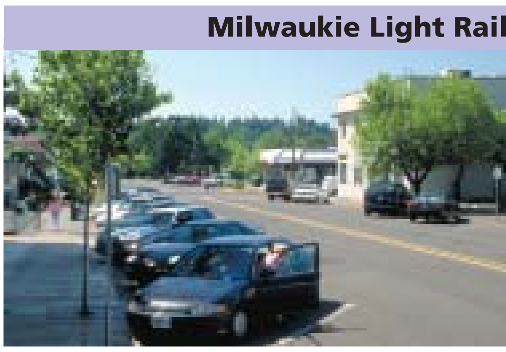
With busway – Tacoma Street Station

I – 205 Light Rail (Gateway)

Now – 96th Avenue at Main Street

With light rail – Main Street Station

Milwaukie Light Rail (Downtown Milwaukie)



Now – Main Street near Washington

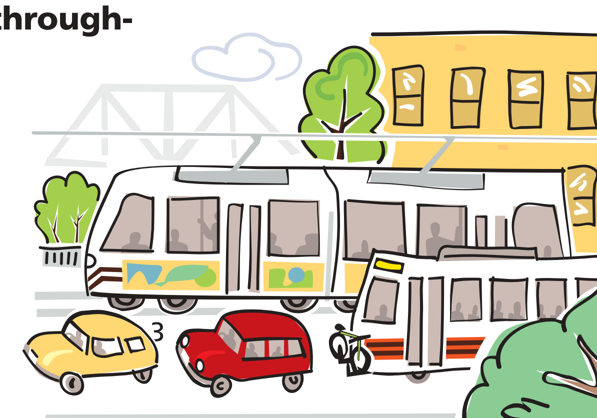
With park-and-ride – Main Street with park-and-ride

SOUTH CORRIDOR PROJECT AREA

Public transportation has been an increasingly important component of our transportation system during the past 25 years. In the next 20 years, public transportation will play an even more important role in linking people and activity centers throughout the region and getting them around their local communities.

In the South Corridor, transit options such as light rail, busway and bus rapid transit can effectively link regional centers (Gateway, Clackamas and Oregon City) and town centers (Lents and Milwaukie) with the central city and each other.

New transit options would meet the needs of those who live in the southeastern portion of the metro area and would serve the larger community by connecting neighborhoods throughout the region.



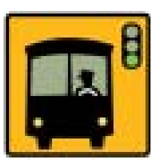
South Corridor Transit Alternatives:

A mix-and-match approach to serving diverse communities with transit solutions

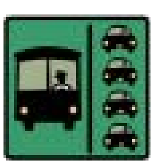
The South Corridor Project includes elements of many compatible types of transit. A one-size-fits-all solution can't address the varying needs of the corridor, so the study has focused on tailoring options to suit the needs of individual communities. Descriptions and maps of the alternatives will help you identify the choices and options in each area.

Remember, the busway, Milwaukie light rail, I-205 light rail and combined light rail alternatives also include bus rapid transit connections in some areas.

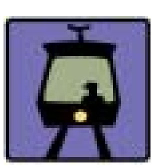
Transit options under study



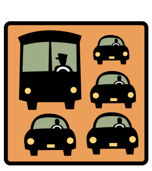
Bus rapid transit (BRT) – BRT is an improved bus system where buses operate primarily in mixed-traffic but use signal technology and bypass lanes to help them operate more quickly and reliably. However, buses could still be slowed by congestion. BRT buses offer express, or limited stop service, and distinctive stations and buses.



Busway – A busway is a roadway exclusively for the use of transit buses. Since buses operate in their own lanes, they are faster and more reliable than BRT. Busways stop at stations ranging from enhanced shelters to large, attractive transit centers. Busways could use special buses that carry more passengers.



Light rail – Light rail (or MAX) would operate in a separate right of way and stop at light rail stations. It offers reliable, convenient service that would connect to the regional MAX system providing access to Hillsboro, Beaverton, Gresham, downtown Portland, the airport and North Portland.



No-build – A no-build alternative is an alternative that simulates likely changes in the transit and transportation system if no major projects were undertaken in the corridor. This option gives us something to measure the effects of the proposed transit alternatives against and is required for federal environmental analysis.

Measures – Descriptions

Cost – Cost in 2006 dollars, the expected mid-year of construction

Park-and-ride spaces – Includes new and existing park-and-ride spaces. Park-and-ride capacity is only one component of ridership

Travel time – Time savings compared to the other alternatives

Milwaukie to Rose Quarter – Time saved compared to the no-build bus in 2020

Milwaukie to Pioneer Square – Time saved compared to the no-build bus in 2020

Clackamas to Rose Quarter – Time saved compared to the no-build bus in 2020

Clackamas to Pioneer Square – Time saved compared to the no-build bus in 2020

Ridership – Boardings on an average weekday in 2020 on major bus routes and light rail

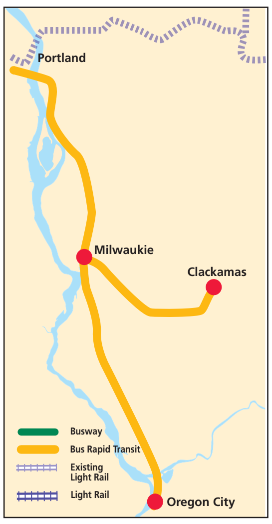
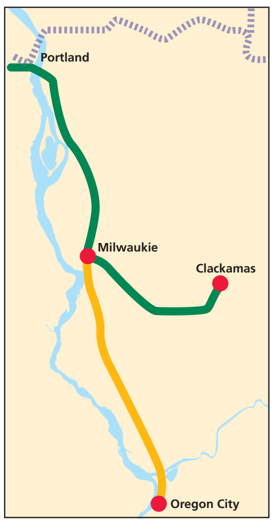
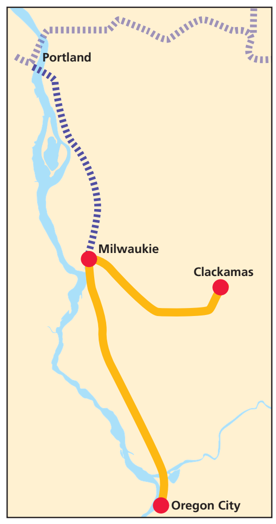
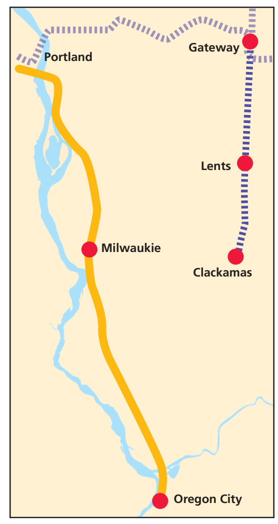
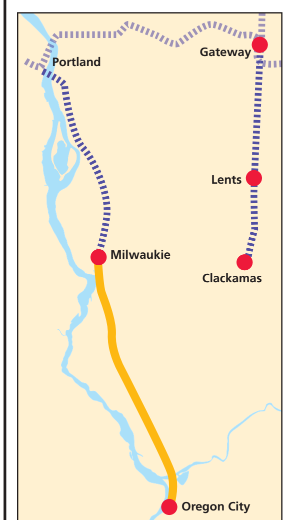
Land use connection – Support for local and regional land use plans

Jobs – Created during construction

Potential displacements – Homes, businesses and public or institutional buildings that may need to be acquired

Potential noise and vibration impacts – Measured increase in noise or vibration that cannot be relieved with noise wall or other barriers

Level of environmental sensitivity – Measures such as new impervious surface, floodplain fill and air quality impacts (high = more sensitive)

Bus Rapid Transit (BRT)	Busway	Milwaukie Light Rail	I-205 Light Rail	Combined Light Rail
BRT is included between Portland and Milwaukie, Milwaukie and Oregon City and Milwaukie and Clackamas.	A busway would be constructed from Portland to Milwaukie and from Milwaukie to Clackamas. BRT improvements would be included from Milwaukie to Oregon City.	Light rail would be constructed from Portland to Milwaukie. BRT improvements would provide connections to light rail from the south and the east.	Light rail would be constructed between Gateway and Clackamas. The segment between Portland, Milwaukie and Oregon City would be served with BRT improvements.	Light rail would be constructed between Portland and Milwaukie and between Gateway and Clackamas. BRT improvements from Milwaukie to Oregon City would feed into light rail.
				
$116 million for buses, signal and intersection improvements and bus-only ramps	$281 million for 6.7 miles of separate busway and BRT improvements	$417 million for light rail improvements and an additional $72 million for bus improvements	$349 million for light rail improvements and an additional $60 million for bus improvements	$800 million for light rail improvements and an additional $22 million of bus improvements
1,900	2,500	2,775	3,750	4,625
Least savings; modest improvements, bus shares lanes with traffic	Better travel time savings than BRT; less than light rail	Best travel time savings from Milwaukie	Best travel time savings from Clackamas	Best travel time savings from both Clackamas and Milwaukie
It would take 1 minute longer because the BRT bus stops more often	Saves 1 minute	Saves 11 minutes	Service provided by BRT in this segment	Saves 9 minutes
It would take 1 minute longer because the BRT bus stops more often	Saves 1 minute	Saves 7 minutes to downtown Portland, but only saves 1 minute to Pioneer Square due to walk	Service provided by BRT in this segment	Saves 7 minutes to downtown Portland, but only saves 1 minute to Pioneer Square due to walk
Same travel time	Same travel time	Saves 7 minutes	Saves 15 minutes	Saves 15 minutes
Saves 9 minutes	Saves 13 minutes	Saves 8 minutes	Saves 9 minutes	Saves 8 minutes
24,760	30,600	25,330 on light rail and 15,360 on BRT (40,660)	33,270 on light rail and 13,750 on BRT (47,020)	53,250 on light rail and 6,810 on BRT (60,060)
Least supportive	Somewhat supportive	Very supportive	Very supportive	Very supportive
710 construction jobs	1,480 construction jobs	3,610 construction jobs	3,090 construction jobs	7,260 construction jobs
6 businesses 0 residences 0 public/institution	51 businesses 1 residence 1 public/institution	41 businesses 1 residence 1 public/institution	3 businesses 13 residences 0 public/institution	38 businesses 14 residences 1 public/institution
0	0	0	0	0
High, but fewer improvements	Low, more improvements	Medium, more improvements	Medium, more improvements	Medium, more improvements

Bus Rapid Transit (BRT)

Your input will help us develop and select the best possible transit improvements in the South Corridor.

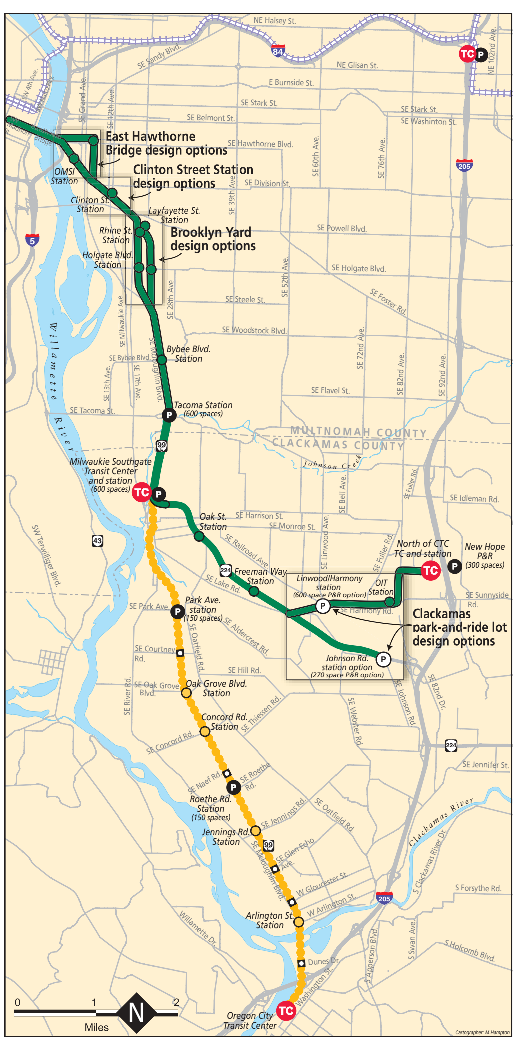
Park-and-Ride options in the Milwaukie to Clackamas segment

A park-and-ride lot could be located near the intersection of Linwood and Harmony roads or could be located on Johnson Road.

The Johnson Road Park-and-Ride option would require that some buses be routed from the Clackamas Town Center to serve Johnson Road.

The Linwood/Harmony Park-and-Ride would create some neighborhood traffic problems.

Busway



Options in the Portland to Milwaukie segment:

A) East Hawthorne Bridge option. The Seventh Avenue option would provide better connections to eastside buses but would not serve OMSI as well as the Water Avenue option.

B) Clinton Street option. An alignment that crosses over the intersection of 11th/12th/Clinton would avoid traffic conflicts at this congested intersection, but would cost more than an at-grade crossing.

C) Brooklyn Yard option. The 17th Avenue option would better serve residential areas, but would impact traffic. The West of Brooklyn Yard option would have fewer traffic impacts and business displacements but stations would have less convenient locations.

Option in the Milwaukie to Clackamas segment: A park-and-ride could be located near Linwood and Harmony roads or on Johnson Road. The Johnson Road option would require that some buses be diverted from Clackamas to Johnson Road. The Linwood/Harmony option could create some traffic problems.

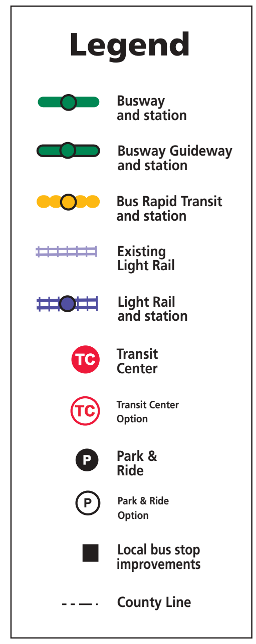
Milwaukie Light Rail

Options in the Portland to Milwaukie segment:

A) Brooklyn Yard option. The 17th Avenue option would better serve the residential area to the west, but would impact traffic on 17th Avenue. The West of Brooklyn Yard option would have fewer traffic impacts and business displacements but would be further from the neighborhood with less-attractive station locations.

B) North Milwaukie options. The Tillamook Branch Line option would have fewer traffic and business impacts than the Southgate Crossover option. The Southgate Crossover option would serve the Southgate Park-and-Ride and provide space for a relocated Milwaukie Transit Center.

C) Milwaukie terminus options. The Harrison Street terminus option would be less expensive because it is shorter than the Lake Road terminus option. It also would not serve the south end of downtown Milwaukie or the Lake Road Park-and-Ride near McLoughlin Boulevard.

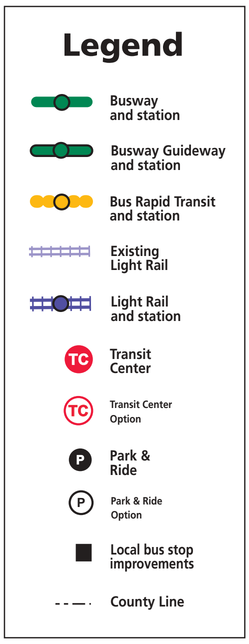


I – 205 Light Rail

One design option in the Gateway to Clackamas segment

The terminus north of Clackamas Town Center would better serve the residential areas north of the mall while the terminus option east of the mall would allow for a park-and-ride and a possible future light rail extension.

Combined Light Rail



The design options are the same as the Milwaukie to Portland segment of the Milwaukie light rail alternative and the I-205 light rail alternative.

Notes

Contemplating transit options for downtown Portland

In addition to the alternatives that have been studied in the South Corridor Supplemental Draft Environmental Impact Statement, the South Corridor Policy Committee directed staff to evaluate potential light rail river crossing options and alignments into downtown Portland.

Staff also was asked to develop a better understanding of future light rail operations in downtown Portland and on the transit mall. The Downtown Light Rail System Study will begin to develop a comprehensive transportation plan for downtown Portland. It will be available for review and comment during the SDEIS public comment period. If the Policy Committee determines that further consideration of any of the alternatives is warranted, a extensive public process will accompany technical and environmental work.

Downtown capacity

The study complements work TriMet has done to evaluate how many trains could ultimately operate on the current downtown “cross mall” on Southwest Yamhill and Morrison streets without impacting service quality. The cross mall could accommodate up to 30 trains per hour without changes, but would become increasingly vulnerable to delays as the number of trains approaches that capacity. Given these long-term concerns about operating additional light rail service on the cross mall, policymakers may want to consider providing additional light rail capacity in downtown Portland on the transit mall.

Milwaukie light rail potential river crossings and downtown alignments

Hawthorne Bridge. In the SDEIS, Milwaukie light rail trains would operate in the outside lanes of the Hawthorne Bridge and would link with Interstate MAX on the existing Southwest First Avenue alignment. Technical analysis showed that the outside lanes worked better than the inside lanes and that there are additional ways to reach the heart of downtown from the bridge.

- **Main/Madison to the transit mall.** Light rail trains could continue on Southwest Main and Madison to the transit mall, where the alignment would turn and operate on Southwest Fifth and Sixth avenues.

- **Southwest First Avenue to Southwest Yamhill/Southwest Morrison.** Light rail trains could turn from Southwest First Avenue on to the “cross mall” alignment where light rail operates today. This alignment would be constrained by the number of trains that can operate on the cross mall.

Caruthers Bridge. A new Caruthers Bridge was selected as the preferred alternative during the previous South/North project. The decision process showed that a light rail bridge that would cross over the Willamette River from OMSI to RiverPlace would best serve Southeast Portland, the Central Eastside industrial area, OMSI, North Macadam, Portland State University and downtown Portland. A Caruthers Bridge alignment could connect to the transit mall using Lincoln or Harrison streets and would be coordinated with plans to extend streetcar service to North Macadam.

Ross Island Bridge crossings. Preliminary analysis showed that a light rail bridge in the vicinity of the Ross Island Bridge would not adequately serve Southeast Portland neighborhoods or the Central Eastside industrial area.

I-205 Transit Mall Alignments

In the SDEIS, the I-205 light rail alternative would connect to existing east-west light rail tracks at Gateway Transit Center and continue across the Steel Bridge and into downtown Portland. The study includes other options that would link I-205 light rail to the transit mall on Southwest Fifth and Sixth avenues. The new alignment would serve Union Station before turning on to the north end of the transit mall. This alignment was selected as part of the South/North Project’s preferred alternative in 1998. It could extend to Portland State University. These alignments would increase the number of light rail trains that could operate in downtown Portland by adding a new alignment to the constrained “cross mall” on Yamhill and Morrison. These alignments would add between $100 million and $150 million to the current I-205 cost estimate.

To request a copy of the Downtown Light Rail System Study, call Metro at (503) 797-1756.

South Corridor Project Timeline

1999

- South Corridor Study begins to look at non-light rail alternatives in the southern portion of the South/North corridor.
- Citizen working groups begin to examine alternatives.
- Policy Committee determines that a range of alternatives, from high occupancy vehicle lanes to commuter rail and river transit, should be considered.

2000

- Technical work on alternatives begins.
- Policy Committee narrows the alternatives to include busway, bus rapid transit and high occupancy vehicle lanes.
- High occupancy vehicle lanes are removed from further study.

2001

- Milwaukie to Portland light rail alternative added by Policy Committee at the request of Milwaukie and Portland neighborhoods.
- Hawthorne Bridge is selected as a low-cost river-crossing alternative.
- I-205 light rail added at the request of Clackamas County and Milwaukie.
- Staff begins work on the South Corridor Supplemental Draft Environmental Impact Statement.
- Citizen-led local advisory groups begin meeting throughout the corridor.

2002

- Policy Committee responds to concerns about the Hawthorne Bridge/ Southwest First Avenue alignment from the downtown Portland community by asking staff to evaluate the feasibility of other river crossing and downtown alignment alternatives.
- Local advisory groups continue to meet and provide feedback about the alternatives under consideration.
- TriMet begins an evaluation of light rail capacity in downtown Portland.
- Supplemental Draft Environmental Impact Statement is completed and public comment period begins.
- Open houses and community meetings about the Supplemental Draft Environmental Impact Statement are held.

2003

- Public hearings and additional community meetings about the Supplemental Draft Environmental Impact Statement are held.
- Public comment period ends.
- Metro Council selects Locally Preferred Alternative and Land Use Final Order.
- Preliminary engineering and Final Environmental Impact Statement completed.
- Community develops station area plans and design concepts.
- Interstate MAX begins service.

2004 – 2008

- If funding is secured, construction of selected alternative is expected to begin in 2004 with a 2008 opening day.

How do we get there from here?

The South Corridor process may seem long and confusing, but there are some key steps in the decision-making process:

1 Public comment period. Between now and Feb. 7, 2003 community members will have the opportunity to comment on the SDEIS. Comments received are very important to the decision-making process. They will be compiled and distributed to elected officials and others to assist them in their deliberations. Every comment received will be addressed in the Final Environmental Impact Statement.

2 Policy Committee recommendation. The South Corridor Policy Committee will consider technical information and public comment in determining which alternatives should move forward. By late February, the committee will forward a recommendation, called a Locally Preferred Alternative, to local jurisdictions for consideration.

3 Jurisdiction adoption. The participating jurisdictions, including the cities of Portland, Milwaukie and Oregon City; Multnomah and Clackamas counties; ODOT and TriMet, will consider the Policy Committee recommendation.

4 Metro Council adoption. The Metro Council will consider the local jurisdiction recommendations and additional public comment to determine what will ultimately be included in the Locally Preferred Alternative.

5 Further environmental, design and engineering work. After an alternative is selected, preliminary engineering work begins and a Final Environmental Impact Statement is prepared. During this next level of analysis, further design work and station area planning will continue.

Make your voice heard!

Public comment will be accepted until Feb. 7, 2003

The South Corridor Policy Committee wants to know what you think about the project alternatives before members weigh all of the public comments and technical findings to recommend a Locally Preferred Alternative. Public comment is an important component of any decision-making process, but it only works if you participate.

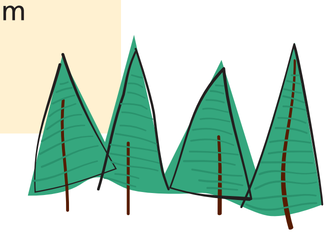
You can make your voice heard by:

- writing a letter and sending it to the South Corridor Project, 600 NE Grand Ave., Portland, OR 97232
- sending e-mail to trans@metro.dst.or.us
- recording comments on the Metro Transportation Hotline by calling (503) 797-1900, option 5
- attending an open house and filling out a comment card
- providing testimony at a public hearing

Public hearings

6 p.m. Wednesday, Jan. 29
Lents Masonic Lodge
5811 SE 92nd Ave., Portland

6 p.m. Tuesday, Feb. 4
Multnomah County
Commissioner's Boardroom
501 SE Hawthorne Blvd.
Portland



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South Corridor Community Members:

I would like to encourage you to participate in the upcoming South Corridor Project decision-making process.

The project is the region's top priority for a new high-capacity transit improvement. Learning about the alternatives and participating in the public comment period is an important way for you to help shape the region's transit investments and our future.

This month, the Metro Council determined where and by how much to expand the urban growth boundary. The decision about the urban growth boundary may seem removed from decisions about transit improvements in the South Corridor, but, in truth, transportation planning can help to shape how growth occurs and how it impacts the region. Communities with good access, both roads and transit, are poised to attract new employers and compete more favorably for business investment than other areas in the region and throughout the country. Transit can help keep communities healthy and livable as new jobs and employment opportunities are realized.

The South Corridor Project has focused on designing transit options to reflect community values and needs. The alternatives under consideration are the result of extensive collaboration between community members, elected officials and Metro and local jurisdiction staff members. Their goal has been to find creative solutions that preserve community while balancing regional and local needs. Technical reports identify different costs, benefits and impacts for each alternative. How you view this information depends greatly upon your perspective. I urge you to consider the benefits and impacts from all sides and to seek out a balance of solutions.

The South Corridor is important to the region and how we manage growth, but it also is important that transit options that are implemented reflect the needs and preferences of those who live and work in the corridor. Please take time to learn about the alternatives and let us know what you think.

Sincerely,

David Bragdon, Metro President-elect