Transportation System Plan Update

City of Forest Grove, Oregon

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TSP Update

Project Information

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1. EXECUTIVE SUMMARY

The City of Forest Grove Transportation System Plan (TSP) was updated largely to reflect recent land use and transportation planning efforts within the City and the region. The major outcomes of the TSP Update include the following changes, which have been incorporated into this plan:

- Extends the planning horizon to 2035
- Evaluates the transportation implications of several land use alternatives (including a Preferred Alternative) that were considered as part of the City's land use Periodic Review process.
- Identifies the most valuable transportation system improvements that can be reasonably funded over the next 20 to 25 years.
- Identifies any changes to the TSP needed to be responsive to the 2035 Regional Transportation Plan (RTP) and Regional Transportation Functional Plan (RTFP).

This TSP Update largely focuses on assessing changes to the City's Roadway Network Plan with changes to the Transit Plan (including Chapters 4, 7 and 8). Changes to these chapters reflect the results of planning efforts that have been undertaken since the adoption of the 2010 TSP. Only minor edits were made to the Existing Conditions chapter, while the Financing/Implementation chapter included an update to the project list, cost estimates and revenue projections. No substantive changes were made to the chapters presenting Goals and Policies, the Pedestrian System Plan, the Bicycle System Plan, and Other Modes.

Several public meetings and work sessions were held during the development of the 2010 TSP Update to share findings and collect input to the plan update process. The venues for public involvement included City Council and Planning Commission work sessions, Project Advisory Committee, and Technical Advisory Committee meetings. For the 2013 Update, community outreach was conducted at the local Farmer's Market and was supplemented through Planning Commission and City Council work sessions.

1.1 Transportation Needs

1.1.1 Existing Conditions

The review of current travel and safety conditions around the city conducted for the 2010 TSP Update identified several issues that were carried into the plan update process:

- Pedestrian volumes were highest along Pacific Avenue and B Street.
- Bicycle activity was highest along Pacific Avenue, Main Street, and Willamina Avenues.
- The non-motorized vehicle system is most fragmented in the northeast corner of the city.
- Transit ridership data shows the highest demand at bus stops near 19th Avenue / B Street and 19th Avenue / Main Street.
- Over the past decade, the largest change in traffic volumes have resulted from construction of the Highway 47 bypass, which shifted traffic away from Sunset Drive. Volumes on Highway 47 and the Pacific Avenue / 19th Avenue couplet are generally similar to 15 years ago, with some locations showing minor increases and others showing minor decreases.
- Two intersections (Highway 47 / Maple Street and Yew Street / Adair Street) were found to be deficient according to operational standards, with traffic volumes already at capacity during the PM peak hour. Vehicles attempting to turn onto the mainline from the stop-controlled side street face significant delay during the PM peak hour.

- The intersection of B Street / 23rd Avenue was the only intersection with a collision rate that indicates a safety issue is present based on an accident rate of 1.2 collisions per million vehicles. This is the only intersection with a rate over 1.0.

1.1.2 Future City Growth

Land use is a key factor in developing a functional transportation system. The amount of land that is planned to be developed, the type of land uses, and how the land uses are mixed together have a direct relationship to expected demands on the transportation system. The expected growth within Forest Grove is summarized in Table 1-1. These projections were used to forecast future travel volumes and determine future needs within the city.

Table 1-1. Forest Grove TSP Study Area Land Use Summary

Land Use	2010	2035	Increase	% Increase
Households	8,039	11,159	3,120	39%
Retail/Service Employees	3,141	5,368	2,227	71%
Other Employees	2,789	5,480	2,691	96%

Source: Metro and City of Forest Grove, 2012.

1.1.3 Future Transportation Needs

Streets and Roadways

Future growth on the street and highway system was assessed for a Preferred Land Use Alternative This alternative includes development consistent with the 2035 Metro Gamma household and employment forecast, and reflects changes to the City's existing Comprehensive Land Use Plan to encourage more nodal mixed use development.

Based on the analysis of this land use scenario, a majority of the study intersections would meet applicable performance standards. The minor (unsignalized) approach at eight intersections is expected not to meet these standards, with volume-to-capacity ratios exceeding ODOT's standard of $\geq$ 0.99 or levels of service exceeding the City's standard of LOS D. Typically the most congested movement would be for vehicles attempting to make left turns across major street traffic.

The greatest street system problem areas are summarized below:

- Side-street vehicle turns onto Highway 47 at unsignalized intersections – Porter Road/Oak Street, Martin Way, 24th Avenue, Maple Street, and Elm Street are expected to have very long delays during 2035 peak travel hours in excess of adopted performance standards.
- Side-street vehicle turns onto TV Highway at Yew Street – Vehicles attempting to turn from Yew Street onto Adair Street and Baseline Street face significant delay at unsignalized intersections in 2035 during peak hours.
- Side-street vehicle turns at the intersection of Gales Creek Road with Thatcher Road, and at the four-way stop intersection of 19th Avenue with B Street would exceed the applicable performance standards during the 2035 PM peak hour.
- One signalized intersection would exceed applicable operational standards – Pacific Avenue at Quince Street (Highway 8 at Highway 47). The existing RTP includes improvements at this intersection which are anticipated to be constructed over the next year or two.

- Connectivity – Out-of direction travel increases travel time and can cause increased congestion on roadways and at intersections. David Hill Road, 23rd Avenue, E Street, Heather Street, 19th Street, and others have been identified as locations where connectivity should be improved.

Pedestrians and Bicyclists

The capacity deficiencies in the City indicate the need to not only invest in roadway operations and capacity enhancements at key locations, but also to add local street connections to improve circulation within Forest Grove and to provide improved connectivity for pedestrians, bicyclists, and motor vehicles.

Connectivity and pedestrian linkages are generally good on the arterial and collector street system in the downtown area. Although sidewalk availability on the arterial and collector street system is limited, some residential streets have sidewalks, especially in areas developed within the past ten to fifteen years. In addition to paved sidewalks, Forest Grove has a multi-use path located along the west side of Highway 47 between Pacific Avenue and B Street.

Major streets with significant sidewalks deficiencies include:

- Thatcher Road north of Gales Creek Road.
- Willamina Avenue from Gales Creek Road to Sunset Drive.
- 24th Avenue from Quince Street to Yew Street.
- 19th Avenue from Highway 47 to Mountain View Lane.

The arterial and collector roadway system within the study area has fairly continuous bicycle facilities. Bicyclist are able to utilize bike lanes to cross the City east-west on Gales Creek Road, E Street, Pacific Avenue / 19th Avenue and Highway 8. Bicyclists are able to utilize bike lanes to cross the northeast portion of the City on Highway 47 north of Highway 8

Transit

The quality of transit service and the identification of future needed improvements within Forest Grove can be characterized by the following indicators:

- Transit route coverage
- Frequency
- Reliability
- User amenities

The transit coverage area for existing service in Forest Grove generally lies between 16th and 23rd Avenues along Pacific Avenue and 19th Avenue (illustrated in figure 7-1). Less than half of the city is within a ¼-mile distance from existing transit stops. However, most land uses that provide density that supports fixed-route transit service are contained within the current service area.

The future demand for transit service in Forest Grove is expected to increase with expected future development. As the residential areas to the north and west of the city center are developed, demand for transit services to those portions of the city will increase. As recognized by the 2009 Transit Enhancement Study, some parts of Forest Grove are underserved by transit, including Forest Grove High School. However, TriMet analyzed several options for extending existing line 57 fixed-route service to Forest Grove High School in conjunction with the City's Transit Enhancement Study, and found that they did not meet TriMet's criteria for service expansion.

Transit route frequency is an important measure of transit quality of service and mode attractiveness. Route frequency is determined by headway - the length of time between two vehicle arrivals at a single

stop. Route 57 is a frequent service bus providing 17-minute headways between 6 a.m. and 9 p.m. and 30 to 60 minute headways in the early morning and late evening.

Transit service reliability is a key performance characteristic for retaining riders. Congested roadways, bottlenecks and traffic signals can delay transit vehicles and cause transit vehicles to arrive off schedule and close together. In the future, the Pacific Avenue and 19th Avenue transit corridors will be faced with increased congestion and traffic signal control delays. Improving overall signal timing and implementing transit signal priority as traffic signals are upgraded or replaced is one option for reducing traffic delay to transit vehicles.

User amenities include such items as bus stops, transit shelters, transit centers, illumination, safe pedestrian access and many other features. Many of the bus stops within the study area today have bus shelters or other amenities due to the high volume of passengers and TriMet's continuing construction of access improvements along line 57. Further improvements were implemented along the route in 2009 via TriMet's TIP implementation of expanded frequent service.

1.1.4 Transportation Plan

Roadway Plan

The Preferred Roadway Plan as presented in Chapter 8 identifies many needed improvement projects throughout the city. However, there are several locations where the complexity and interconnection of transportation issues in various corridors and sub-areas has precluded identifying acceptable solutions during the TSP planning process. Accordingly, several locations in the city have been identified for future Refinement Plan studies to further develop appropriate long-term solutions. The proposed Refinement Plan Study areas would include:

- Addressing existing and potential future congestion at the intersections of Yew Street with Adair Street, Yew Street with Baseline Street, and Mountain View Lane with Pacific Avenue. Potential improvements could focus on these intersections specifically or could be expanded to address additional street connections between Yew Street and Mountain View Lane to east/west roadways including OR 8 (Pacific Avenue), 24th Avenue, and Holladay Street.
- Highway 47 access between approximately Hawthorne Street on the north and 19th Avenue on the south. This area would include the challenging highway intersections with Martin Road and 24th Avenue along with the proposed extensions of 23rd Avenue (east to intersect with Highway 47) and Holladay Street (west to intersect with Highway 47).
- Development of a local street plan to guide future development of the David Hill area in the northwestern portion of the City. Existing challenges relate both to the long-term need to improve David Hill Road to an urban section (portions of this road are currently narrow and winding with minimal shoulders), to connect David Hill Road to Highway 47, and to provide a system of local streets serving the expected residential and mixed use development in this area. Topography and the need to preserve vegetative corridors must also be considered.
- Development of a street connectivity plan to provide access to the City's northern urban reserve, as well as circulation within the urban reserve area. The intent of this refinement plan is to ensure that potential improvements within the existing UGB do not preclude creation of a logical and context-sensitive street system when the urban reserve is ultimately developed.

The solutions in these areas proposed in the Preferred Roadway Plan are considered to be preliminary, and may be modified upon completion of the future Refinement Plan Studies.

Pedestrian and Bicycle Plans

There is also a need to balance investment with other modes of travel to provide improved travel choices and reduce the demand on the system. Significant gaps in pedestrian and bicycle connectivity exist, as detailed in the Pedestrian Plan (Chapter 5) and Bicycle Plan (Chapter 6). Key pedestrian and bicycle projects proposed include:

- Highway 47 crossings north and south of Pacific Avenue, particularly in the vicinity of Mountain View Lane.
- Sidewalks and bicycle lanes connecting Fern Hill Road, Poplar Street and Heather Street.
- Sidewalks and bicycle facilities on Willamina Avenue, B Street, Thatcher Road.
- Bicycle lanes on Maple Street, Hawthorne Street, and B Street.
- Bicycle Boulevard treatments on 18th Avenue, Goff Road, B Street and Cedar Street.
- Sidewalks on Pacific Avenue east of Highway 47.
- Multi-use paths along the north and west UGB.

Transit Plan

As detailed in the Transit Plan (Chapter 7), the City, in conjunction with Ride Connection, will initiate enhanced local transit service to augment the existing Line 57 operated by TriMet, Line 33 operated by Yamhill County Transit, and existing Ride Connection that links Forest Grove with the surrounding rural areas. Bus service (see Figure 7-1) will be a deviated fixed-route with options for flex service. It would serve specified fixed stops at or between published time points, but would be able to flex or deviate off the route between time points to pick up passengers who live beyond walking distance of fixed stops or are unable to access the stops. The service would be structured into two one-way loop routes, one focused on the eastern portion of the city (operating in a counter-clockwise direction) and the other focused on the western portion of the city (operating in a clockwise direction). The western portion of the city currently lacks transit service and this route would connect residential areas throughout the city to Forest Grove High School and Neil Armstrong Middle School, Pacific University, and key retail destinations and activity centers. The eastern portion of the route follows a portion of the Line 57 corridor to serve as a feeder and to connect residents to activity centers along this corridor, but also deviates to provide greater coverage in residential areas, particularly south of 19th Avenue. Peak hour service would include runs serving shift times at key employers. This service would be supported by user amenities such as bus stops and shelters (at selected locations).

1.2 Developing a Financially Constrained Transportation Plan

1.2.1 Transportation Funding

Through previous planning efforts, transportation studies, and updates to the City's TSP, numerous transportation improvement projects have been identified to address future needs. While this broad set of system solutions remains applicable to existing and future needs of the transportation system, the large set of projects was not developed with current fiscal constraints and totals over $100 million. This level of transportation investment, even with support from other agencies, cannot be reasonably funded with anticipated City transportation revenues of approximately $58.4 million through 2035, particularly with approximately $27 million in estimated costs for operations, maintenance programs, and various set aside programs (e.g., schools safety, neighborhood traffic control, and bicycle/pedestrian path maintenance).

The costs of identified transportation projects to achieve the desired transportation network (Preferred Plan) exceed the reasonably expected funding levels. Since funding is not available for the entire set of identified projects, a subset of projects that can be reasonably funded (Financially-Constrained Plan) must be selected for prioritization and implementation. One purpose of the TSP is to determine the projects and programs that provide the greatest benefit to the transportation system through the available funding resources.

Projects that were identified for the Financially-Constrained Plan project list not only addressed an identified need for the transportation system, but also need to be reasonably likely to be funded. The projects included were selected based on the following criteria:

- Consensus – projects previously identified in coordination with other jurisdictions (i.e. Metro RTP and Washington County Major Streets Transportation Improvement Program or MSTIP).
- Existing Need – projects that address an existing need as opposed to a projected future deficiency.
- Demonstrated Need – projects that are consistently needed to address deficiencies across multiple alternatives.
- Cost Effectiveness – projects that fit within available funding.

All other identified projects continue to be recognized as Preferred Plan projects, meaning if unanticipated funding sources become available, they may still be pursued for implementation.

1.2.2 Revenue Forecast Scenario Projects

Based on the prioritization of investment in transportation facilities, a Financially-Constrained Plan was developed. The Plan projects include a mix of operational, capacity, and connectivity improvements for all modes of travel on City, County, and ODOT facilities. Table 1-2 identifies the plan projects and summarizes the estimated total cost of the projects, as well as the estimated cost to the City. As listed, the planned City of Forest Grove funding amount (approximately $31.4 Million) is significantly less than the unconstrained Preferred Plan project list and is reasonable to achieve over the next 20 to 25 years. Plan priorities and funding recommendations for other agencies are recommendations from Forest Grove on how best to invest limited resources to serve future travel needs within the City. Project priorities are based on anticipated project timing.

Table 1-2. Forest Grove *Financially-Constrained* Plan Projects (2014 Dollars in Millions)

#	Name	Description	Jurisdiction Owner/ Operator	Metro Project ID	RTP Financially Constrained	Total Cost	Non-City Funds	City Funds	Project Timing
1	David Hill Road Extension	Construct new 2-lane collector with bicycle lanes, sidewalks and street lights from existing terminus to Highway 47	City	10772	Add	$13.61 **	$13.61	$0.0	0-5 years
2	Local Transit Improvements – Short Term	Vehicular acquisition and installation of amenities	Ride Connection /City	NA	Add	$0.255	$0.229	$0.026	0-5 Years
3	Overnight Truck Parking	Location to be determined	City	NA	No	$0.11	$0.0	$0.11	0-5 Years
4	Highway 47 / Fern Hill-Maple Street Intersection Improvements*	Construct pedestrian improvements in short term and vehicle improvements (e.g. traffic signal) at Highway 47 intersection with Maple Street / Fern Hill Road, including interconnect with rail crossing in longer term.	ODOT	10780d	Add	$5.0 **	$4.5	$0.50	0-5 years
5	Highway 47 / Pacific Avenue Intersection Improvements*	Additional channelization, crosswalk, and traffic signal modification at intersection. Specific improvements may be modified at a future date.	ODOT	10780a	Yes	$1.3 **	$0.8	$0.5	0-5 years
6	Thatcher Road Realignment	Realign intersection at Thatcher Road at Gales Creek Road and add traffic signal	City & County	10773	Yes	$3.71 ***	$0.0	$3.71	0-5 years
7	Bike Lanes and Sidewalks	Thatcher (Gales Ck-David Hill), Willamina (Gales Ck-Sunset), B Street (26th-Willamina) Ped & BIke Improvements	City	10782	Yes	$4.47 **/***	$2.47	$2.00	0-5 years
8	E Street / Pacific Avenue-19th Avenue Intersection	Extend 19th Avenue west and connect to E Street and Pacific Avenue with round-about.	City	10775	Yes	$4.94 ***	$1.74	$3.2	0-5 years

#	Name	Description	Jurisdiction Owner/ Operator	Metro Project ID	RTP Financially Constrained	Total Cost	Non-City Funds	City Funds	Project Timing
9	B Street Extension	Construct 2-lane local roadway between Hartford Drive and David Hill Road Extension	City	NA	No	$6.1 ***	$3.76	$2.34	0-5 Years
10	Gales Way , E Street to 23rd Avenue	Reconstruct and widen pavement with curbs, gutters and sidewalks	City	NA	No	$0.457	$0.0	$0.457	0-5 Years
11	26th Avenue	Improve 26th Avenue to City standards	City	NA	No	$9.8	$8.4	$1.4	0 – 5 Years
12	Highway 47 / Martin Road Intersection Improvements*	Construct improvements (e.g. roundabout) at Highway 47 intersection with Holladay Street Extension, Martin Road, and 23rd Avenue Extension	ODOT	10780b	Add	$1.56 **	$1.46	<$0.10	6-10 years
13	Highway 47 / B Street Intersection Improvements*	Construct safety improvements	ODOT	10780c	Add	$1.79 **	$1.69	<$0.10	6-10 years
14	Highway 8 / Pacific Avenue-19th Avenue Improvements *	Retrofit street with boulevard design from B Street to Cornelius City Limits	City & ODOT	10779	Yes	$9.63 **/***	$7.23	$2.4	6-10 years
15	Council Creek Trail	16-mile multi-use trail from Hillsboro to Banks. Multi-use trail from the end of the Westside MAX in Hillsboro, thru Washington County, & Cities of Cornelius, Forest Grove, & Banks, connecting to Banks-Vernonia State Trail, with added short trail south to Tualatin River.	TBD	10806	Yes	$5.20 **	$4.1	$1.10	6-10 years

#	Name	Description	Jurisdiction Owner/ Operator	Metro Project ID	RTP Financially Constrained	Total Cost	Non-City Funds	City Funds	Project Timing
16	Highway 47 / Purdin Road Intersection Improvements*	Construct improvements at Highway 47 (e.g. roundabout) to connect Purdin Road and Verboort Rd.	ODOT	10780f	No	$3.32 **	$3.32	$0.0	6-10 Years
17	Heather Industrial Connector	Construct new 2-lane industrial collector from west terminus of Heather to Poplar Streets	City & County	10778	Yes	$1.73 **	$1.73	$0.0	6-10 Years
18	Highway 47 / Elm Street Intersection Improvements*	Construct improvements (e.g. traffic signal.)	ODOT	NA	No	$0.52 **	$0.52	$0.0	6-10 Years
19	Yew Street / Adair Street Intersection Improvements*	Construct improvements (e.g. traffic signal)	ODOT	NA	No	$2.6 ***	$0.0	$2.6	6-10 Years
20	Main Street Extension	Construct 2-lane local roadway between Hartford Drive and David Hill Road Extension	City	NA	No	$2.34 ***	$0.0	$2.34	6-10 Years
21	Vista Drive Extension	Construct 2-lane local roadway between Watercrest and Thatcher Roads	City	NA	No	$1.12 ***	$0.75	$0.37	6-10 Years
22	Talisman Lane Extension	Construct 2-lane local roadway between Gales Creek Road and Thatcher Road	City	NA	No	$0.63 ***	$0.42	$0.21	6-10 Years
23	19th Avenue/ Strasburg Drive Extension	Construct 2-lane collector between southern terminus of Strasburg Drive and E Street at 19th Avenue	City	NA	No	$4.38 ***	$1.45	$2.93	6-10 Years
24	Hawthorne Street Extension	Construct 2-lane collector between Willamina Street and 26th Avenue	City	NA	No	$1.30 ***	$0.43	$0.87	6-10 Years
25	25th Avenue	Construct 2-lane local roadway between Cedar and Hawthorne Streets	City	NA	No	$1.55 ***	$0.51	$1.04	6-10 Years

#	Name	Description	Jurisdiction Owner/ Operator	Metro Project ID	RTP Financially Constrained	Total Cost	Non-City Funds	City Funds	Project Timing
26	26th Avenue Extension	Construct 2-lane collector between Boyd Lane and Oak Street	City	NA	No	$2.14 ***	$0.71	$1.43	6-10 Years
27	Taylor Way Extension (West)*	Construct 2-lane industrial road between Elm Street and western terminus of Taylor Street	City	NA	No	$7.84 ***	$7.84	$0.0	6-10 Years
28	Local Transit Improvements – Long Term	Vehicular acquisition and installation of amenities	Ride Connection /City	NA	Add	$0.695	$0.624	$0.071	6-20 Years
29	Willamina Avenue	Improve Willamina Avenue to City standards	City	NA	No	$1.4	$0.0	$1.4	6 – 10 Years
30	23rd Avenue Extension	Extend from Hawthorne Avenue east to Highway 47.	City	10774	Yes	$4.26 **/***	$2.86	$1.4	11-20 years
31	High Capacity Transit Expansion	Analysis for proposed extension of light rail service from Hillsboro to Forest Grove.	ODOT/ TriMet	10771	Yes	$2.29 **	$2.29	$0.0	11-20 Years
32	Holladay Street Extension (Cornelius to Quince St.)	Construct new roadway to city standards	City	NA	Yes	$12.08**/***	$9.08	$3.0	11-20 Years
						TOTAL:		**$35.64M**	

Source: City of Forest Grove. Estimated share of city cost provided by City of Forest Grove.
Notes: **PROJECT PRIORITIES ARE BASED ON ANTICIPATED PROJECT TIMING**

***Project will require ODOT approval. Inclusion of a project on an ODOT facility in this table does not obligate or imply the obligation of funds for any specific project.**

**Partially or fully funded by jurisdictional agency (i.e. TriMet, ODOT, Washington County, Metro or other).
***Partially or fully funded by private development exactions.

2. GOALS, POLICIES AND PERFORMANCE MEASURES

2.1 Overview

The transportation goals and policies form the vision for how the local transportation system will be developed and maintained over the next 20 years. Goals and policies were initially adopted as part of the Forest Grove TSP in 1999, and were updated in 2011 to reflect changes to state and regional transportation plan policies and regulations (see Appendix A for a summary of relevant plans and policies). The key updates to the TSP goals and policies between 1999 and 2011 include Metro street connectivity spacing standards, Metro and ODOT mobility standards and Metro 2040 vehicle occupancy goals to reduce single-occupant vehicle trips.

This chapter also provides guidance on how Forest Grove can address and contribute to meeting regional transportation plan performance measures.

2.2 Goals and Policies

The following transportation goals and policies were developed with input from the Project Advisory Committee and city staff in 2011. The policy framework of the plan was organized as follows:

Goal - A statement that describes an ideal condition that the City desires to attain over time for various aspects of the transportation system.

Policy - One or more statements that are intended to outline specific measures that will be taken to achieve a goal.

Actions - Discrete steps to be completed that support or enact a specific policy statement.

The following section lists the recommended goals, policies and actions for the Forest Grove updated TSP.

Goal 1:	**Develop and maintain a balanced transportation system that provides travel choices and reduces the number of trips by single occupant vehicles.**

Policy a. Provide a citywide network of safe and convenient walkways and bikeways that are integrated with other transportation modes and regional destinations.

- *Action: The City will develop new and improved pedestrian routes with ultimate goal of a complete 'pedestrian grid' in Forest Grove.*
- *Action: Sidewalk standards shall be developed to define various widths, as necessary, for City street types.*

Policy b. Collaborate with the Tri-County Metropolitan Transportation District of Oregon (TriMet) and other transit providers to provide convenient and accessible public transit service.

- *Action: The City will identify key segments of pedestrian network to be constructed or improved to enhance transit access in under-served areas of the City.*
- *Action: The City will identify key improvements to street crossings to enhance safety and reliability of access to transit.*
- *Action: The City will provide their specific needs to TriMet as part of their annual system review.*

- *Action: The City will work with TriMet to confirm and adjust major transit stops in anticipation of the next RTP update.*
- *Action: The City will consult TriMet in identifying opportunities for major transit stop improvements as adjoining development occurs or grant funding becomes available, whichever occurs first.*

Policy c. Support travel options that allow individuals to reduce single-occupant vehicle trips.

Policy d. Establish local non-Single Occupant Vehicle (SOV) modal targets, subject to new data and methodology made available to local governments, for all relevant design types identified in the Regional Transportation Plan. Targets must meet or exceed the regional modal targets for 2040 Growth Concept land use design types as illustrated in the following table:

2040 Regional Metro Target Non-Single Occupant Vehicle

2040 Design Type	Modal Target
Regional centers, town centers, main streets, station communities, corridors	45 to 55 percent non-single occupant vehicle
Industrial areas, employment areas, inner neighborhoods, outer neighborhoods	40 to 45 percent non-single occupant vehicle

Policy e. Encourage local employment and commercial opportunities to reduce the number of locally generated regional work and shopping trips.

Goal 2: Develop and maintain a transportation system that reduces the length of travel and limits congestion.

Policy a. Enhance street system connectivity wherever practical and feasible.

- *Action: Establish design criteria and implementing ordinances to enable the connection of streets identified on the plan as funds are available and new development or redevelopment opportunities arise. Exceptions will be given where connections are prevented by topography, barriers such as railroads, expressway or pre-existing development, or environmental constraints.*
- *Action: The City will develop a local and neighborhood street system with a preferred spacing of no more than 530 feet, between elements of the City street network.*
- *Action: The City will develop a walkway route system with a preferred spacing of no more than 330 feet, between elements of the City pedestrian network.*

Policy b. Maintain traffic flow and mobility on arterial and collector roadways.

- *Action: The City will work with ODOT and Washington County to preserve access control standards to reduce conflicts among vehicles and trucks, as well as conflicts between vehicles and pedestrians.*
- *Action: Prepare a complete transportation plan for Highway 8 and Highway 47 intersections.*

Policy c. Work with Washington County, Metro and ODOT to develop, operate and maintain intelligent transportation systems, including traffic signal coordination.

Goal 3:	Develop and maintain a transportation system that is safe.

Policy a. Safe and secure pedestrian and bicycle ways shall be designed between parks and other activity centers in Forest Grove.

Policy b. Safe and secure routes to schools shall be designated for each school and any new residential project shall identify the safe path to school for children.

Policy c. All transportation-related improvements will be designed and constructed to meet City standards developed in the City's Design Standards, the Americans with Disabilities Act (ADA), and to encourage provisions for bicycling, walking and transit use.

Policy d. Access control and spacing standards should be developed for all streets to improve safety and promote efficient through street movement. Access control measures shall be generally consistent with Washington County access guidelines to ensure consistency on city and county roads.

- *Action: The City will adopt and implement access control and spacing standards for all street classifications in Forest Grove. For roadway reconstruction, existing driveways shall be compared with the standards and a reasonable attempt shall be made to comply.*

Policy e. Generally favor granting property access from the street with the lowest functional classification.

Policy f. Establish a City monitoring system that regularly evaluates, prioritizes and mitigates high accident locations within the City.

- *Action: Review traffic accident information regularly to systematically identify, prioritize and remedy safety problems. Working with the County, develop a list of project necessary to eliminate safety problems. Require development applications to identify and mitigate for high collision locations if they generate 10% increase to existing traffic at an intersection.*

Policy g. New roadways shall meet Illuminating Engineers Society Lighting Standards. Existing roadways within the City shall be systematically retrofitted with roadway lighting as roadway reconstruction and fronting property redevelopment opportunities occur.

- *Action: Priority locations for roadway lighting shall include schools, parks and town center. The City shall coordinate with the City's Light and Power district.*

Goal 4:	Design and construct transportation facilities in a manner that enhances the livability of Forest Grove.

Policy a. Maintain the livability of Forest Grove through proper location and design of transportation facilities.

- *Action: Design streets and highways to respect the characteristics of the surrounding land uses, natural features and other community amenities.*

Policy b. Increase the health and physical well-being of citizens by providing safe and convenient opportunities for walking and bicycling.

Policy c. Protect residential neighborhoods from excessive through traffic and travel speeds while providing reasonable access to and from residential areas.

- *Action: Allow for neighborhood traffic management on appropriate roadways.*

Policy d. Provide a seamless and coordinated transportation system that is barrier-free, provides affordable and equitable access to travel choices and serve the needs of all people and businesses, including people with low income, children, seniors and people with disabilities.

- *Action: Pedestrian crossing spacing, traffic signal spacing and landscape standards for arterials in Forest Grove shall be developed in conjunction with Washington County, ODOT and Metro.*
- *Action: Construct new transportation facilities and rebuild existing facilities to fully comply with the Americans with Disabilities Act.*

Goal 5:	**Promote the development of Forest Grove, the state, and the national economy through the efficient movement of people, goods, services, and information in a safe manner.**

Policy a. Ensure a safe and efficient freight system that facilitates the movement of goods to, from, and through Forest Grove and through the region while minimizing conflicts with other travel modes.

Policy b. Require safe routing of hazardous materials consistent with federal and state guidelines.

Policy c. Grade separation or gate control should be considered for all railroad crossings.

- *Action: Support the upgrading of railroad grade crossings to current design standards.*

Policy d. Provide transportation facilities that support land development that is consistent with the Comprehensive Plan.

- *Action: City will pursue development of plans for overnight truck parking.*

Policy e. Evaluate land development projects to determine possible adverse traffic impacts.

Policy f. Ensure that all new development contributes a fair share toward on-site and off-site transportation system improvement remedies.

- *Action: Require dedication of land for future streets when development is approved.*
- *Action: The property developer shall be required to make street improvements for their portion of the street commensurate with the proportional benefit that the improvement provides the development.*

Goal 6:	**Establish and maintain a context sensitive set of transportation design and development regulations.**

Policy a. Streets should be designed to support their intended users.

- *Action: A street functional class system shall be developed for Forest Grove, which meets the City's needs and respects the needs of other agencies (Washington County, ODOT, Metro). Appropriate design standards for these roadways shall be developed by the appropriate jurisdictions.*

- *Action: A primary emergency response route system shall be developed for roadways within Forest Grove in coordination with the local Fire District. Appropriate traffic calming guidelines for these routes shall be developed in coordination with the local Fire District and other local emergency service providers.*

Policy b. Integrate bicycle and pedestrian facilities into all planning, design, construction and maintenance activities.

Policy c. Require developers to include pedestrian, bicycle, and transit-supportive improvements within proposed developments and to adjacent right-of way in accordance with adopted policies and standards.

- *Action: The City will adopt transit-oriented design standards that require new retail, office and institutional buildings that are near a RTP designated major transit stops or located along transit routes to meet RTP design requirements.*

Policy d. Promote context-sensitive transportation facility design, which fits the physical context, responds to environmental resources, and maintains safety and mobility.

- *Action: Amend their street design standards to allow for design exceptions for various street elements (e.g., reduced lane width, methods and materials for provisions of sidewalks, etc.) to fit constrained settings, or unusual applications. Design exceptions would be subject to the review and approval of the City Engineer.*
- *Action: Amend their street design standards to allow for options related to storm drainage design on city facilities. These 'green street' design options would be subject to the review and approval of the City Engineer.*

Goal 7:	**Provide a transportation system that meets present needs without compromising the ability of future generations to meet their needs.**

Policy a. Encourage an energy efficient transportation system.

Policy b. Increase the use of walking and bicycling for all travel purposes.

Policy c. Improve and enhance the livability of Forest Grove residents by decreasing reliance on the automobile and increasing the use of other modes to minimize transportation system impacts on the environment.

Policy d. Practice stewardship of air, water, land, wildlife, and botanical resources. Take into account the natural environments in the planning, design, construction and maintenance of the transportation system.

Goal 8:	**Provide transportation performance measures set and maintained by the City.**

Policy a. A minimum intersection level of service standard shall be set for the City of Forest Grove. All public facilities under the city's jurisdiction shall be designed to meet this standard.

- *Action: Level of service D shall be the City's mobility standard to balance provision of roadway capacity with level of service and funding.*

Policy b. Parking minimum and maximum ratios shall be set to provide adequate parking, while providing an incentive to limit the use of the single occupant vehicle. DEQ encourages

lower parking ratios to encourage use of alternative modes (walking, biking, transit, carpooling, etc.).

- *Action: Parking standards shall be included in the City development code.*

Goal 9:	**Develop a transportation system that is consistent with the City's Comprehensive Plan and adopted state and regional plans.**

Policy a. Coordinate and cooperate with adjacent jurisdictions and other transportation agencies to develop transportation projects that benefit the City of Forest Grove and the region as a whole.

- *Action: Work with Metro in developing travel forecasts for the City that are used to assess future regional travel needs. Housing and employment forecasts for Forest Grove should be consistent with the Metro forecasts in the latest adopted Regional Transportation Plan.*

Policy b. Work collaboratively with other jurisdictions and agencies so the transportation system can function as one system.

- *Action: City will consider the State adopted mobility standards for all state facilities, based on the Oregon Highway Plan.*

Policy c. Coordinate with other jurisdictions and community organizations to develop and distribute transportation-related information.

Policy d. Review City transportation standards periodically to ensure consistency with regional, State and federal standards.

Policy e. Coordinate with TriMet and adjacent jurisdictions to identify existing and future transit related needs.

- *Action: The City will coordinate with TriMet to provide additional rider amenities (shelters, lighting, trash cans, route information) at transit stops within the City that are consistent with TriMet guidelines.*
- *Action: Work with TriMet and ODOT to plan a dedicated higher speed transit route on the existing ODOT rail right-of-way.*
- *Action: Provide good circulation with idea of transit routes.*

Policy f. Coordinate with local railroad companies and the Oregon Public Utilities Commission to provide an efficient and accessible commercial railroad system in and through Forest Grove.

Policy g. Coordinate with ODOT to address improvements to State highways within Forest Grove that will benefit all modes of transportation.

Goal 10:	**Efficiently use funding sources to implement transportation system improvement projects recommended in the TSP.**

Policy a. Provide a cost-effective transportation system where the public, land use development and users pay their respective share of the system's costs proportional to their respective demands placed upon the multimodal system.

Policy b. Identify and develop diverse and stable funding sources to implement recommended projects in a timely fashion.

Policy c. Ensure maintenance of the transportation system as a priority.

Policy d. Identify local street improvement projects that can be funded by the State of Oregon to improve the state highway system.

- *Action: The City will identify local street system improvements that are cost-effective in improving state facility conditions. These projects could be candidates for State financial assistance.*

Policy e. Provide funding for local match share of joint funded capital projects with other public partners.

Policy f. Funding should be prioritized to enable projects and programs that are most effective at meeting the goals and policies of the transportation system plan.

- *Action: The City will develop and apply outcome-based funding strategies for crucial transportation investments in the community.*

Policy g. Ensure permanent continuous sidewalks on at least one side of the street at a minimum for collector and local streets.

2.3 Performance Measures

The 2035 Regional Transportation Plan (RTP) includes a variety of performance measures that will be used to track the region's progress in developing an integrated and multimodal transportation system. To support progress toward achieving regional goals, the RTP requires that the Forest Grove TSP incorporate performance measures that can be used to evaluate and monitor local activities and accomplishments. This will help ensure that local efforts help achieve regional objectives. Relevant regional performance measures contained in the RTP that will be addressed in the TSP include:

- Safety
- Congestion
- Freight Reliability
- Walking, bicycling, transit and non-SOV modes
- Climate Change

Table 2-1 focuses on these performance measurement categories, identifies specific performance measures for the Forest Grove TSP, and discusses applicable system deficiencies and associated TSP projects that help to address the deficiencies and, thus, help meet the performance measures.

Table 2-1. Forest Grove TSP Performance Measures

Metro's 2035 Performance Metrics	Forest Grove Performance Measure	Forest Grove System Deficiencies	Forest Grove TSP Projects that Address the Deficiencies
Safety			
By 2035, reduce the number of pedestrian, bicyclist, and motor vehicle occupant fatalities plus serious injuries each by 50% as compared to 2005	Reduce fatalities for drivers, walkers, and bikers from existing conditions Address known deficiencies and high-crash areas as high-priority projects Reduce the number of County and State SPIS sites within the City.	Only one intersection has a crash rate exceeding 1.00 collisions/MEV - B Street/ 23rd Avenue. Three locations are included on Washington County's SPIS list: • Highway 47/Maple Street-Fern Hill Road) • Oregon Highway 47 / B Street (65) • 1st Avenue / Baseline Street (192)	A safety improvement project has been identified in the TSP for the intersection of B Street with 23rd Avenue. Improvements were also identified to address both congestion and safety issues at the intersections of Highway 47 with both Maple Street/Fern Hill Road and B Street.
Congestion			
By 2035, reduce vehicle hours of delay (VHD) per person by 10 percent as compared to 2005	On Washington County and ODOT-owned roads the v/c is less than or equal to 0.99 On City roads, LOS D In downtown Forest Grove (a Metro-designated Town Center) – 2 hour peak hour standards: • First peak hour v/c < 1.1 • Second peak hour v/c < 0.99	Analysis shows that two intersections are currently not meeting standards (Highway 47/Maple Street, and Adair Street/Yew Street) This increases to nine intersections by 2035	Roadway capacity and intersection optimization projects help improve traffic flow and maintain future congestion within the existing standards. Additionally, the TDM/TSM programs, increased transit, and more complete bicycle and pedestrian network will help reduce vehicle demand on roads within Forest Grove. The preferred system of transportation improvements meet existing standards
Freight Reliability			
By 2035, reduce vehicle hours of delay by truck trip by 10% as compared to 2005	Reduce delays for truck trips on state highways in Forest Grove Develop truck routing system for city streets within Forest Grove Develop overnight truck parking	With the exception of the state highway system (OR 8 and OR 47) there are currently no designated truck/freight routes in Forest Grove. Travel times on state highways are not predictable and can vary from day to day, increasing costs for businesses that rely on shipping.	The TSP identifies several refinement planning areas along OR 47 to address access to/from industrial/ employment centers within Forest Grove. These refinement plans should be prepared and adopted to provide the necessary direction to serving freight mobility needs. The TSP also identifies the need for signalization, signal optimization and intersection improvements at other locations along the state

highway system.

Table 2-1 Continued. Forest Grove TSP Performance Measures

Metro's 2035 Performance Metrics	Forest Grove Performance Measure	Forest Grove System Deficiencies	Forest Grove TSP Projects that Address the Deficiencies
Walking, Biking, Transit and Non-SOV			
By 2035, triple walking, biking, and transit mode share compared to 2005 Town Center mode share is 45-55% non-drive alone modal target for downtown Forest Grove, and 40-45% for industrial, employment and neighborhood areas	Implement policies and projects to move towards the regional non-SOV mode share as appropriate for the City Work towards achieving the RTP non-SOV mode share targets of 44-55% for Downtown Forest Grove, and 40-45% for other areas of the City.	There are a number of gaps in the sidewalk, bike lane, and multi-use path systems in Forest Grove. There are also few wayfinding signs to direct pedestrians and bicyclists to use the existing multi-use paths. Current mode share for those traveling to work who live in Forest Grove is 70.4% drive alone, 10.9% carpool, 5.8% take transit, 7.6% walk, 1.2% bicycle/other mode, and 4.1% telecommute.	The TDM/TSM programs focused on providing more local transit service and connectivity, and completing the pedestrian and bicycle network will help to increase the percentage of local residents in Forest Grove who walk, bicycle, take transit and carpool in the downtown core, to other city destinations and to destinations in the remainder of the region.
Climate Change			
By 2035, reduce transportation-related carbon dioxide emissions by 40% below 1990 levels	Strive to reduce VMT per capita by 10 percent compared to 2010.	Forest Grove is located at the edge of the metropolitan area with a large daily commute to jobs elsewhere in the region (e.g., more than 80% of Forest Grove workers are employed outside of the city). 48% travel less than 10 miles to work, 41 % 10 to 24 miles and 11% over 24 miles. This contributes to the existing level of VMT per capita.	The TDM/TSM programs, increased transit, and more complete bicycle and pedestrian networks will help to decrease per capita VMT and the associated transportation-related emissions to meet this performance metric.

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3. EXISTING CONDITIONS

This chapter presents detailed information about what transportation facilities and services are built within the City of Forest Grove, and how well these facilities operate today. The process used to describe the existing conditions of the transportation system involves a comprehensive mapping and assessment of all types of travel facilities, observations about how and when they are being used, and an analytical evaluation that determines how safe and efficient the system is for current users. This is a foundational step in the TSP update process to better understand what parts of the current system need immediate attention, what parts work well and are consistent with applicable standards, and where there are opportunities and constraints for future changes that might be required to serve long-term growth.

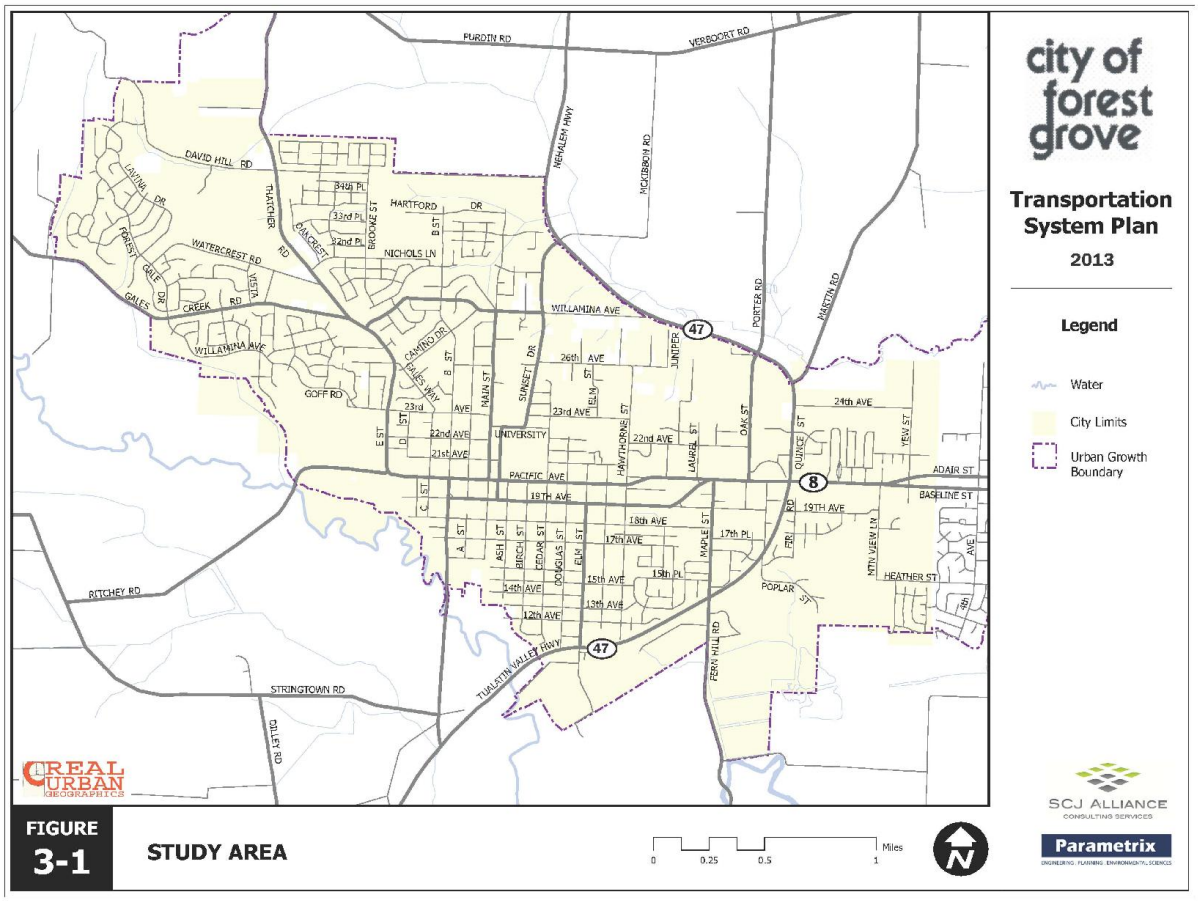
Substantial background data was available from the adopted 2011 City of Forest Grove TSP, the Washington County TSP, and the Metro Regional Transportation Plan and related Metro transportation databases (Regional Land Information System). The composite of transportation related data was developed in GIS format for the use in this TSP update. The resulting data set and maps generated through this effort will be transferred to the city for their on-going application.

An analysis of current operating conditions provides an understanding of service and performance for motor vehicle traffic, transit, pedestrian and bicycle modes. For most facilities, agencies have established level of service standards to gauge how well a facility is operating compared to its intended use. In Forest Grove, each roadway jurisdiction has different standards for their particular facilities (city, county and state) and these are reviewed in the following sections to determine where current conditions are close to or below the minimum allowable levels of service. Locations with existing operational or safety deficiencies are a critical concern. In making the service assessment, traffic activity was observed just before the end of the 2007 school year at 28 major intersections around the city. This recent traffic count data supplements historical data that has been collected by the city, county and ODOT within the greater Forest Grove study area over the years. Figure 3-1 illustrates the major transportation facilities within the study area.

Other activity data was compiled for pedestrian, bicycle and transit usage, but most of these facilities do not have strict technical standards for Level of Service. The subsequent analysis highlights which facilities are more heavily used on a typical weekday to draw attention to the locations were additional services or facilities are required to maximize non-motor vehicle safety, such as supplemental pedestrian crossings, better transit access facilities or other amenities, etc.

The information collected for the existing conditions review is an important basis of comparison when reviewing long-range forecasted conditions developed in subsequent chapters. Current transportation usage levels, operating conditions, deficiencies and needed improvements are a separate class of needs from those that are required to support planned growth. This distinction will be considered in choosing the priority and type of funding to be applied to appropriate solutions. Furthermore, the comparison of existing traffic levels with future forecasted levels helps to explain where growth will be minimal and where it is expected to be significant. Much of the existing conditions mapping and infrastructure related data will be re-used in the assessment of future conditions in later chapters of this TSP.

Figure 3-1. Study Area



3.1 Pedestrians

The recent inventory of pedestrian facilities considered sidewalks, trails and any enhanced pedestrian crossings to major streets or highways within Forest Grove. Local street inventories were not included, and are not typically an element specifically addressed in a citywide Transportation System Plan. It was found that several arterial and collector streets in Forest Grove do not have sidewalks on either side of the street, as shown in Figure 3-2. A summary of the existing pedestrian facilities on arterials and collectors are provided in Table 3-1.

Table 3-1. Summary of Pedestrian Facilities on Major Streets

Facility Class	Total Length of Streets (mi)	Portion with No Sidewalks (mi)	Portion with Sidewalks on One Side Only (mi)	Portion with Sidewalks o Sides (mi)
State Highways	7.5	0.5	3.0*	4.0
Arterial Roads	3.0	2.0	-	1.0
Collector Roads	18.5	6.0	1.0	11.5

* A 10 foot wide multi-use path provides pedestrian access along the west side of Highway 47 between Pacific Avenue and B Street.

Connectivity and pedestrian linkages are generally good on the arterial and collector street system in the downtown area. Although sidewalk availability on the arterial and collector street system is limited, some residential streets have sidewalks, especially in areas developed within the past ten to fifteen years. In addition to paved sidewalks, Forest Grove has a multi-use path located along the west side of Highway 47 between Pacific Avenue and B Street.

Major streets with significant sidewalks deficiencies include:

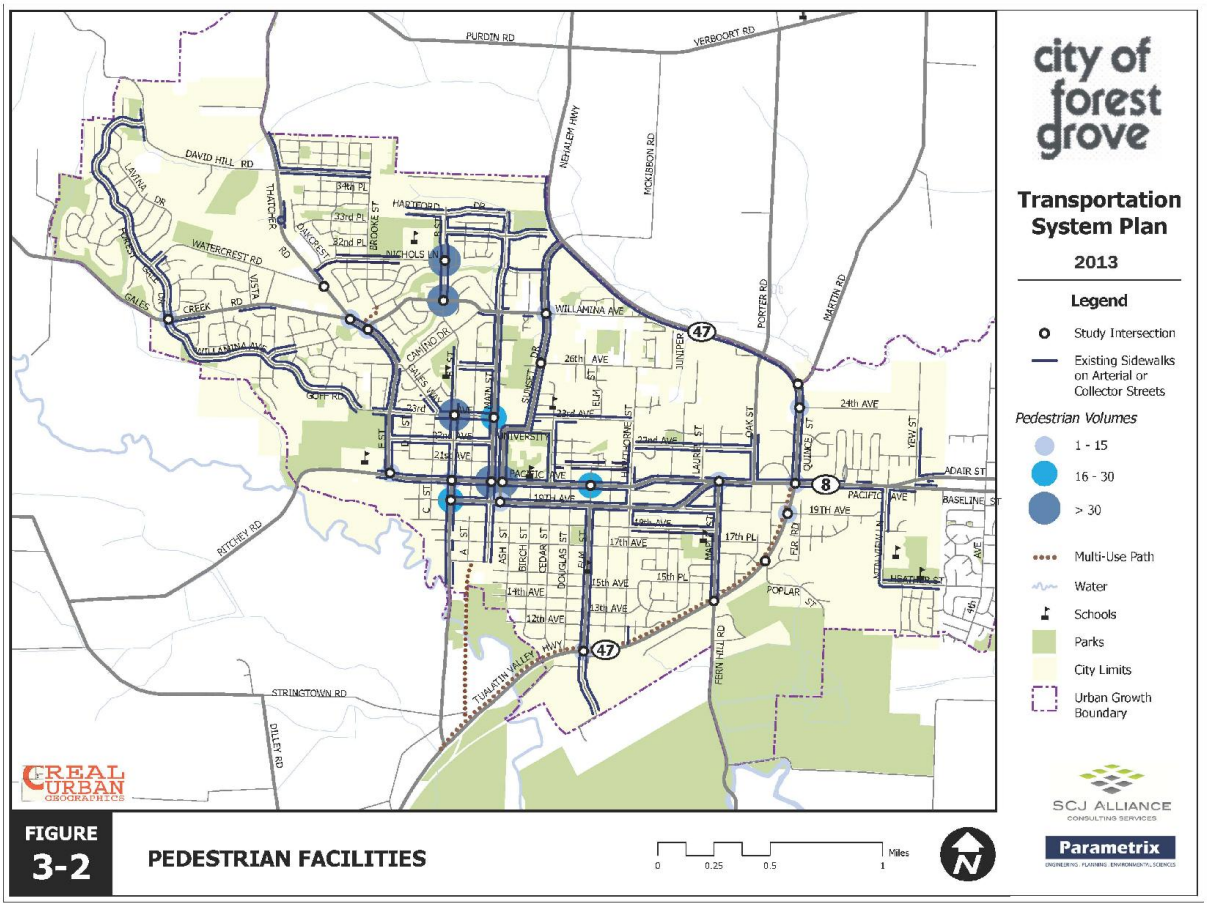
- Thatcher Road north of Gales Creek Road.
- Willamina Avenue from Gales Creek Road to Sunset Drive.
- 24th Avenue from Quince Street to Yew Street.
- 19th Avenue from Highway 47 to Mountain View Lane.

Pedestrian counts were conducted in June 2007 during the evening peak period (3:00 to 6:00 p.m.) at the study intersections. As shown on Figure 3-2, the pedestrian volumes were grouped into three categories:

- Low (0 to 15 pedestrians observed per hour).
- Medium (15 to 30 pedestrians observed per hour).
- High (over 30 pedestrians observed per hour).

Most of the study intersection had less than 15 pedestrians travel through during the evening peak hour. This level of pedestrian activity is considered to be light usage. Three study intersection located close to major schools experienced moderate pedestrian volumes during the evening peak hour: B Street / Willamina Avenue, Main Street / 23rd Avenue, and B Street / Bonnie Lane. The highest pedestrian volumes during the evening peak hour were observed was at B Street / 23rd Avenue with more than 60 people per hour.

Figure 3-2. Pedestrian Facilities



3.2 Bicycles

The arterial and collector roadway system within the study area has fairly continuous bicycle facilities. Bicyclist are able to utilize bike lanes to cross the City east-west on Gales Creek Road, E Street, Pacific Avenue / 19th Avenue and Highway 8. Bicyclists are able to utilize bike lanes to cross the northeast portion of the City on Highway 47 north of Highway 8. In addition to designated bike lanes, Forest Grove has a multi-use path located along the west side of Highway 47 between Pacific Avenue and B Street. Existing bike lanes and off-street multi-use paths are shown in Figure 3-3.

Except for Highway 47, bicycles are permitted on all roadways in Forest Grove. A summary of the existing bicycle facilities on arterials and collectors are provided in Table 3-2. Approximately two-thirds of the state highway system in the City provides bike lanes. Approximately half of the arterial roadway system in the City provides bike lanes. The majority of the collector roadway system in the City does not provide bike lanes on either side of the street.

Table 3-2. Summary of Bicycle Facilities on Major Streets

Facility Class	Total Length of Streets (mi)	Portion with No Bike Lanes (mi)	Portion with Bike Lane Provided for One Direction Only (mi)	Portion with Bike Lanes Provided for Both Directions (mi)
State Highways	7.5	2.5*	-	5.0
Arterial Roads	3.0	1.0	0.5	1.5
Collector Roads	18.5	18.0	0.5	-

Bicycle counts were conducted in June 2007 during the evening peak period (3:00 to 6:00 p.m.) at the study intersections. As shown on Figure 3-3, the bicycle volumes were grouped into three categories:

- Low (1 to 4 bicyclists observed per hour).
- Medium (5 to 9 bicyclists observed per hour).
- High (over 9 bicyclists observed per hour).

There are very few shoulders provided on roadways in the City, therefore bicycle use is low where bike lanes are not provided. Most of the study intersections had less than four bicyclists travel through during the evening peak hour. This level of bicycle activity is considered to be light usage. The highest bicycle volumes were observed at the Elm Street/Pacific Avenue intersection with 12 bicycles during the evening peak hour.

3.3 Transit

Fixed route transit service is provided to Forest Grove by TriMet (Line 57), Yamhill County Transit Authority (YCTA) and Ride Connection. Figure 3-4 shows the existing transit route within Forest Grove and highlights the areas within one-quarter mile walking (network) distance of TriMet Line 57 stops, selected activity centers in Forest Grove and the service area for TriMet's LIFT service – a three-quarter mile distance from TriMet fixed route service within the TriMet service district. Table 3-3 summarizes the characteristics of existing fixed route service within the City.

Figure 3-3. Bicycle Facilities

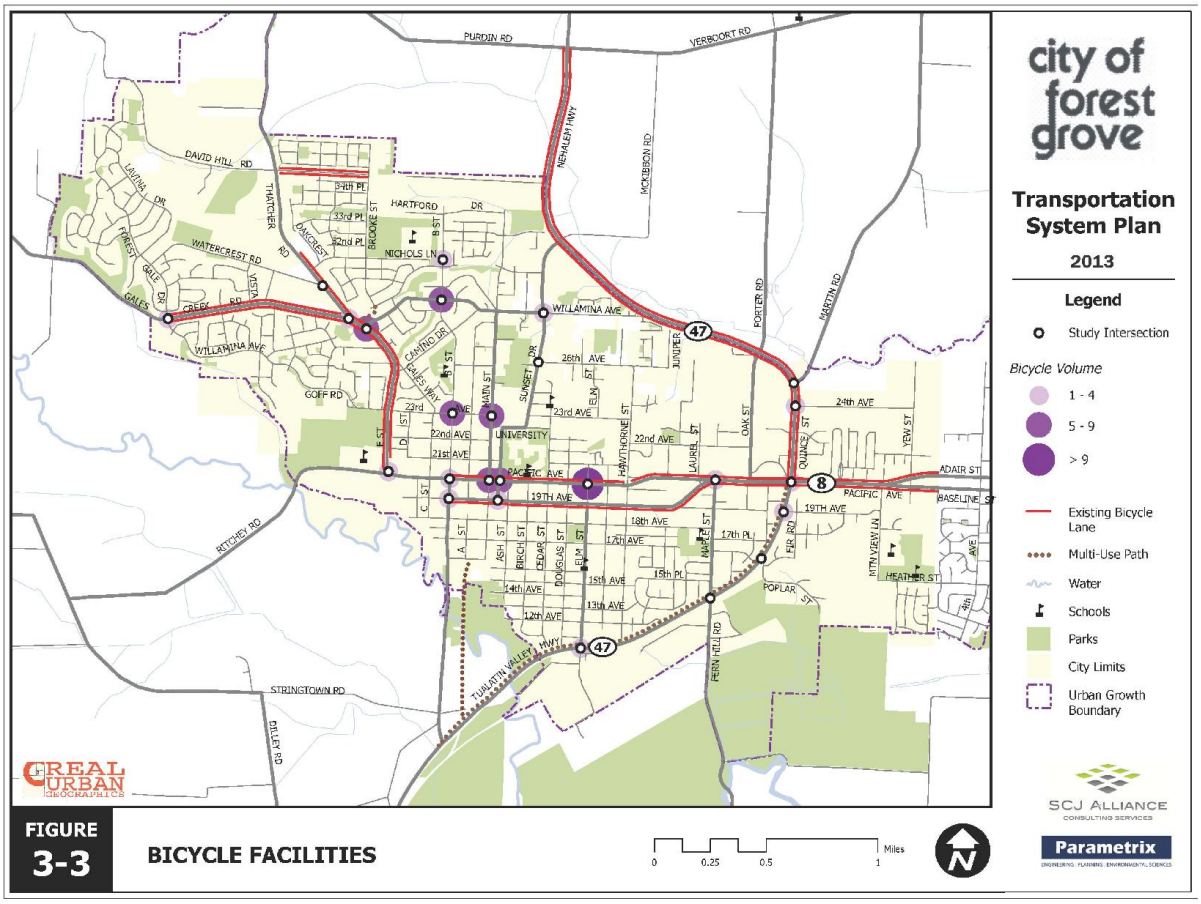


Figure 3-4. Oregon Scenic Bikeway

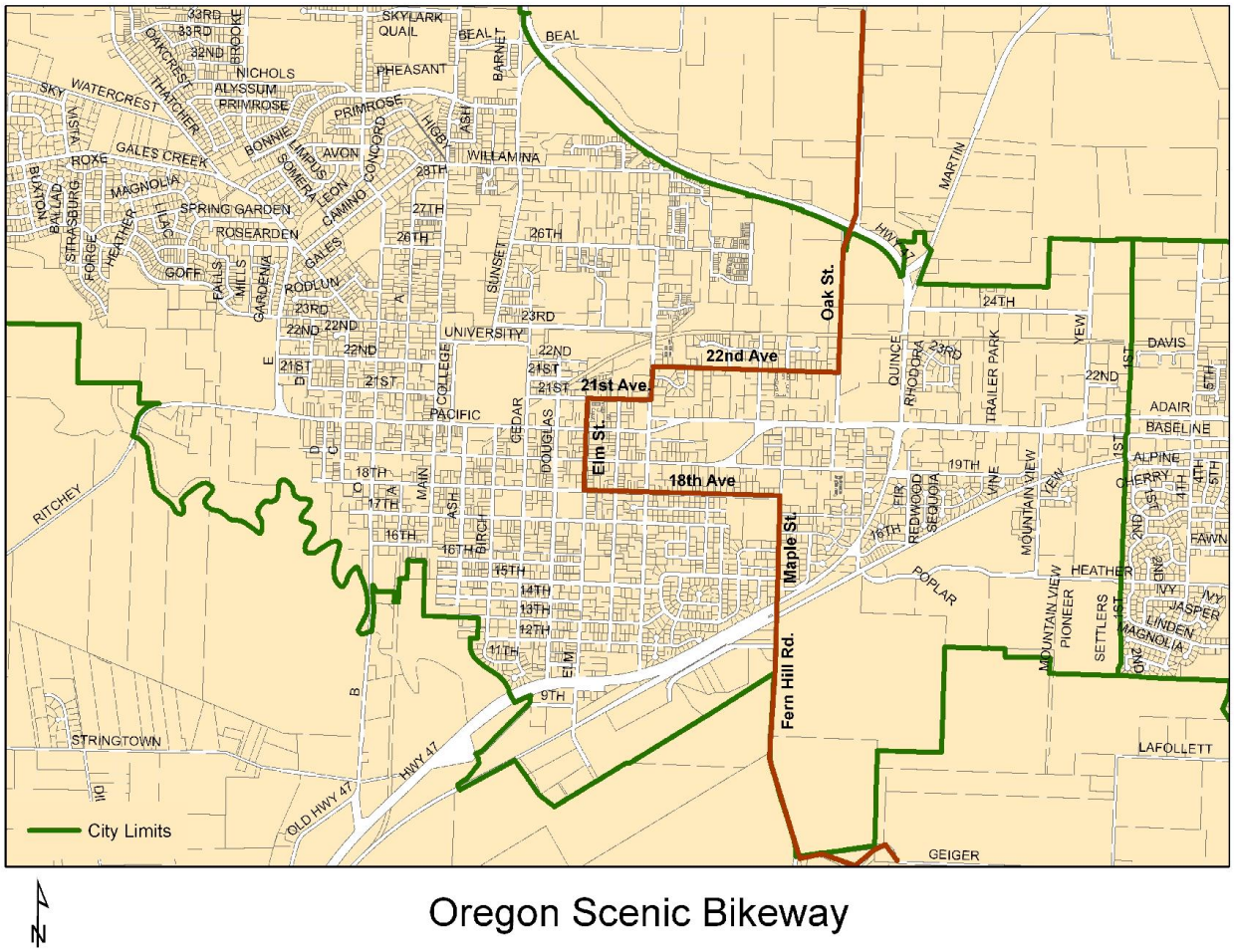


Figure 3-5. Existing Transit Routes (2013)

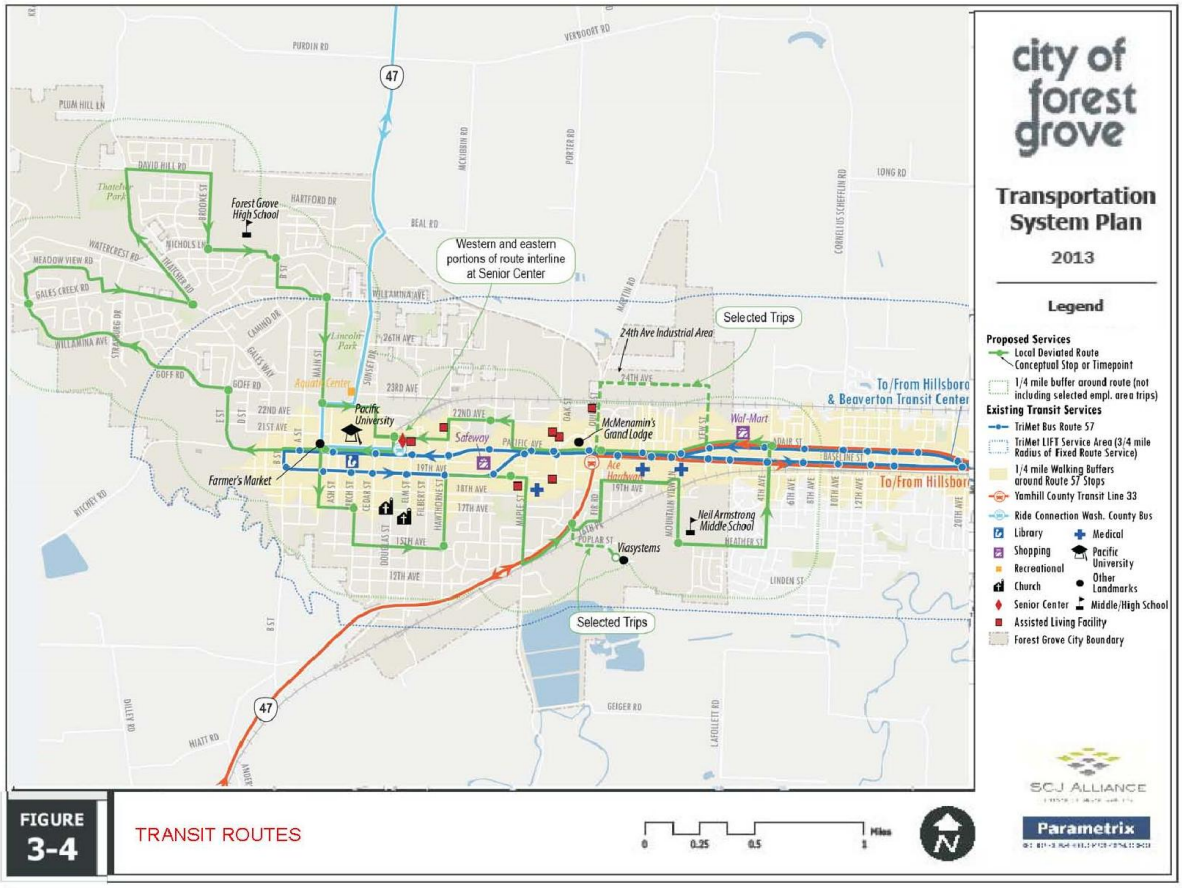


Table 3-3. Summary of Fixed Route Service in Forest Grove

Provider	Route and Name	Service Type	Service Days/Hours	Frequency of Service (Minutes or # of Trips)				
				Weekday				
				Peak Hour	Midday	Evening	Saturday	Sunday
TriMet	#57 – TV Hwy/ Forest Grove	Frequent Service Bus Route	Weekdays 4am-2am Sat 5am-3pm Sun 5am-2pm	17 min	20 min	20-30 min	18-30 min	18-30 min
YCTA	33 – McMinnville/ Forest Grove	Intercity	Weekdays 6am-7pm No Sat/Sun Service	3 round trips	2 round trips	N/A	N/A	N/A
Ride Connection	Forest Grove – Banks – North Plains - Hillsboro	Community Bus	Weekdays 7-9 am & 4:30-6:45pm No Sat/Sun Service	2 round trips	N/A	N/A	N/A	N/A

3.3.1 TriMet Fixed-Route Service

TriMet operates one bus route serving Forest Grove, Line 57 (TV Hwy). Line 57 provides the only local transit service for the general public in Forest Grove and regional connections between Forest Grove, Cornelius, Hillsboro, Aloha, and Beaverton. In Hillsboro, passengers can connect to TriMet bus lines (46, 47, and 48), MAX light rail, and YCTA service. At Beaverton Transit Center (TC), transit riders can connect to TriMet bus lines (20, 52, 53, 54, 58, 61, 76, 78, and 88), MAX light rail service, and WES commuter rail service. There are several additional transfer opportunities along the Line 57 route. Line 57 is one of TriMet's 13 frequent service routes[1] and runs every 17 minutes during the AM and PM peak periods, 20 minutes midday, and every 20-30 minutes in the evening. It provides service for about 22 hours per day on weekdays and Saturdays, and 21 hours on Sundays. The route runs westbound along Pacific Avenue and eastbound along 19th Avenue, and serves 25 stops in Forest Grove.

Table 3-4 lists the boarding and alighting activity within Forest Grove by direction of travel. Eastbound alightings and westbound boardings identify use of Line 57 for trips within Forest Grove Major boarding locations in the eastbound direction include 19th Avenue at B Street, and 19th Avenue at Main Street. Along with 19th Avenue at 19th Way, these two locations have been identified as "major transit stops" as defined in the Regional Transportation Plan. Most boarding activity occurs in the eastbound direction, indicating that most Line 57 passenger activity in Forest Grove is for travel to/from locations outside of Forest Grove. In the westbound direction, most passengers ride from elsewhere and alight within Forest Grove. Wheelchair boardings are highest in the vicinity of Safeway and Walmart.

Table 3-4. TriMet Line 57 Daily Boardings and Alightings within Forest Grove

Route	Service Day	Eastbound Boardings (Ons)	Eastbound Alightings (Offs)	Westbound Boardings (Ons)	Westbound Alightings (Offs)
57	Weekday	1,079	142	99	1,004
57	Saturday	861	113	81	781
57	Sunday	690	94	65	652

Note: Eastbound Line 57 trips are from Forest Grove to Beaverton TC. Westbound trips are from Beaverton TC to Forest Grove.
Source: TriMet Passenger Census – Spring 2012

[1] http://trimet.org/schedules/frequentservice.htm

TriMet Line 57 typically carries a total of nearly 7,600 daily passengers overall on weekdays, and 1,178 of those passengers (nearly 16%) board within Forest Grove.[2] Overall productivity on weekdays is nearly 61 passengers per revenue hour on Line 57, which has historically had among the highest productivity of all TriMet routes. Productivity of the Forest Grove portion of the route is higher than overall productivity both on weekdays and weekends.

3.3.2 Local Transit Service (GroveLink)

This section provides additional detail for the local transit service that began in August 2013.

Basic Service Concept

The service routing is shown on the transit map. The system is a refined version of the conceptual routes included in the Transit Enhancement Plan (2009) and the Forest Grove TSP (2010). It has the following characteristics:

- The service would operate as a deviated fixed-route or flex service. It would serve specified fixed stops at or between published time points, but would be able to flex or deviate off the route between time points to pick up passengers who live beyond walking distance of fixed stops or are unable to access the stops. Use of the fixed stops would be encouraged to optimize route efficiency and maximize time available for deviations. Certain zones may be served only on-demand.
- The service would be structured into two one-way loop routes, one focused on the eastern portion of the city (operating in a counter-clockwise direction) and the other focused on the western portion of the city (operating in a clockwise direction).
- The east and west loops would be interlined, to allow a single-seat and/or single-fare connection between origins and destinations on the west and east sides of the city. A timed transfer could be implemented during peak hours to enable a faster travel time for certain travel patterns.
- The route provides service to the western portion of Forest Grove, which lacks transit service, and connects residential areas throughout the city to Forest Grove High School and Neil Armstrong Middle School, Pacific University, and key retail destinations and activity centers. The eastern portion of the route follows a portion of the Line 57 corridor to serve as a feeder and to connect residents to activity centers along this corridor, but also deviates to provide greater coverage in residential areas, particularly south of 19th Avenue.
- Peak hour service would include runs serving shift times at key employers. Based on an informal survey of employers, some shift times could be met by the proposed service, while others could be met only partially. Some trips serving employers could connect to MAX light rail in Hillsboro. Initially, based on startup funding sources, such trips would be limited, but could be expanded with funding contributions from employers.

This type of service model is inherently flexible, which is appropriate for serving the lower density areas in Forest Grove, and would need to be adapted to actual passenger demand and usage patterns.

[2] TriMet Spring 2012 Passenger Census

Operating Parameters

It is estimated that each portion of the route would require approximately 30-45 minutes to operate; this would depend on passenger demand and the number of stops and deviations required. Initially, it is assuming that two buses operate during peak hours; this would enable approximately 45-60 minute headways, including additional time for deviations/flex service and more focused service for work and school trips. Off-peak, a 90 to 120-minute headway could be maintained with one bus in operation. The level of service could be adjusted in the future based on demand and resources.

3.3.3 Yamhill County Transit

As shown in Figure 3-4 and in Table 3-3 (above) YCTA operates one route (#33) between McMinnville and Hillsboro on weekdays only. The route makes five round trips daily, with three round trips during peak periods and two round trips during midday. Route 33 runs along Tualatin Valley (TV) Highway, stops at the intersection with Pacific Avenue (Ace Hardware), and continues to Hillsboro.

3.3.4 Ride Connection – Washington County Bus

Ride Connection provides the Washington County Bus[3] serving rural transit riders. The service connects Forest Grove, Banks, North Plains, and the Hillsboro Transit Center. The Washington County Bus makes two round trips on weekdays only, one in the morning and one in the late afternoon/evening. The stop in Forest Grove is located downtown adjacent to the Senior Center, on the corner of 21st Avenue and Douglas Street. About 10 percent of passengers on the Washington County Bus board or alight in Forest Grove.

3.3.5 Demand Responsive Transit Services

TriMet LIFT Demand-Responsive Service

In addition to fixed route service, TriMet operates LIFT ADA paratransit service that provides shared-rides to people with disabilities or who are otherwise unable to use regular public transportation. The LIFT service area extends three-quarters of a mile beyond fixed-route bus and MAX service, within the TriMet service district, as illustrated for Forest Grove in Figure 3-4 (above). LIFT hours of operation are the same as bus and MAX service. Rides must be reserved in advance no later than 5:00 PM the day before and riders can subscribe to the service for a recurring trip. Major origins and destinations for LIFT rides taken by Forest Grove residents are listed in Table 3-5 (within Forest Grove).

Table 3-5. Major LIFT Origins and Destinations for Forest Grove Residents (within City)

Location	Percent of Local LIFT Trips
Forest Grove Senior Center	27%
Mt Olive Lutheran Church	13%
St Anthony's Church	10%
Mountain View Medical Center	8%
Condonett Condos	7%
Forest Grove Rehabilitation & Care Center	7%
Camelot Care Center	5%
Safeway	3%
Raines Dialysis	3%
Wynwood of Forest Grove	3%

These origins and destinations comprise 86% of LIFT trips by Forest Grove residents with both trip ends in Forest Grove.
Source: Compiled from TriMet Data, 2012 (partial year)

[3] http://www.rideconnection.org/ride/Services/WashingtonCoBus.aspx

Ride Connection U-Ride Service

Ride Connection operates Washington County U-Ride service for seniors age 60 and older and persons with disabilities. The service zone includes areas within two driving miles of the urban growth boundary for Forest Grove and Cornelius. U-Ride service is door to door and must be requested in advance.[4]

Ride Connection Job Access Reverse Commute (JARC) Services

Ride Connection offers two transportation services for low-income adults for job search, job training, or job commute. These services are available Monday through Friday from 6:00 AM to 6:00 PM, with no fare required, and serve employment-related trips:

- Originating and ending in Forest Grove and Tigard[5]
- Within the City Limits of Forest Grove and Cornelius[6]

Other Shuttle Services

According to the 2009 Transit Enhancement Study, there are up to nine shuttle services operating in Forest Grove, including the Jennings McCall and Camelot Car residential care facilities.

Taxis

A number of taxi operators provide service in Forest Grove.

Airport and Intercity Bus and Rail Connections

Connections to Portland Airport are available with a transfer to TriMet MAX Red Line at Beaverton TC or downtown Portland. Connections to Amtrak and Greyhound stations are available with a transfer to TriMet services in downtown Portland.

3.3.6 School Bus Service

School bus service is provided to all students in Forest Grove, elementary through high school, who live farther than one-mile from the school or must cross a major street while walking to and from school.

3.3.7 Summary of Key Findings and Conclusions

Key findings from the review of existing conditions, including an initial assessment of unmet transit needs in Forest Grove, include:

- Based on TriMet demographic analysis conducted as part of the Westside Service Enhancements Project, Forest Grove has among the highest level of minority residents comprising its population of any community in this broad study area. Based on a review of demographic characteristics conducted for this study, higher shares of various demographic groups that typically have the greatest need for transit service are present in Forest Grove than in Washington County and the Portland Metro area.
- Households without access to vehicles are concentrated along the Line 57 corridor, however lower-income workers are located in other parts of the city not served by transit.

[4] Forest Grove Transit Enhancement Report, Appendix, U-Ride Service Outline.
[5] http://www.rideconnection.org/ride/Services/JobAccess.aspx
[6] http://www.forestgrove-or.gov/images/stories/residents/pdf/FGJARCflyer%20-%20with%20footer.pdf

- Forest Grove residents comprise a relatively small share of workers employed in Forest Grove and a significant majority of residents work outside of the city. Therefore, regional connectivity is of high importance to both Forest Grove residents and non-residents who work in Forest Grove.
- Many employment locations are located along the Line 57 corridor, although not necessarily within a quarter-mile network access distance from Line 57 stops, including the 24th Avenue Industrial Area. Moreover, these employment sites are not accessible to Forest Grove workers who live outside of the Line 57 corridor. Some significant employment areas are well beyond transit access, including along Hwy 47 south of Pacific Avenue and Via Systems, the largest employer in Forest Grove.
- TriMet Line 57 provides a high level of service to Forest Grove, i.e., high frequency and long hours of service (span), and offers access to/from other transit services in Hillsboro and Beaverton including bus routes and light rail. This service is highly productive (number of boardings per vehicle revenue hour) both overall and within Forest Grove.
- However, Line 57 provides limited local circulation within Forest Grove, operating in a linear east-west corridor through the city. As recognized by the 2009 Transit Enhancement Study, some parts of Forest Grove are underserved by transit, including Forest Grove High School. An extension of existing Line 57 service to the high school, analyzed in conjunction with the Transit Enhancement Study, did not meet TriMet's criteria for service expansion.
- Residential areas in the northwest part of Forest Grove lie further beyond the reach of existing fixed-route service or the proposed Forest Grove High School extension of Line 57 that was previously evaluated.
- Transit facilities are well-developed for Line 57 stops; most of the Line 57 stops with the highest boarding activity have shelters; four stops with approximately 30 or more boardings lack shelters. Overall, eleven Line 57 stops have shelters.
- Various transit services supplement fixed-route service in Forest Grove, including Ride Connection U-Ride and TriMet LIFT, but are not available to the general public.

3.4 Motor Vehicles

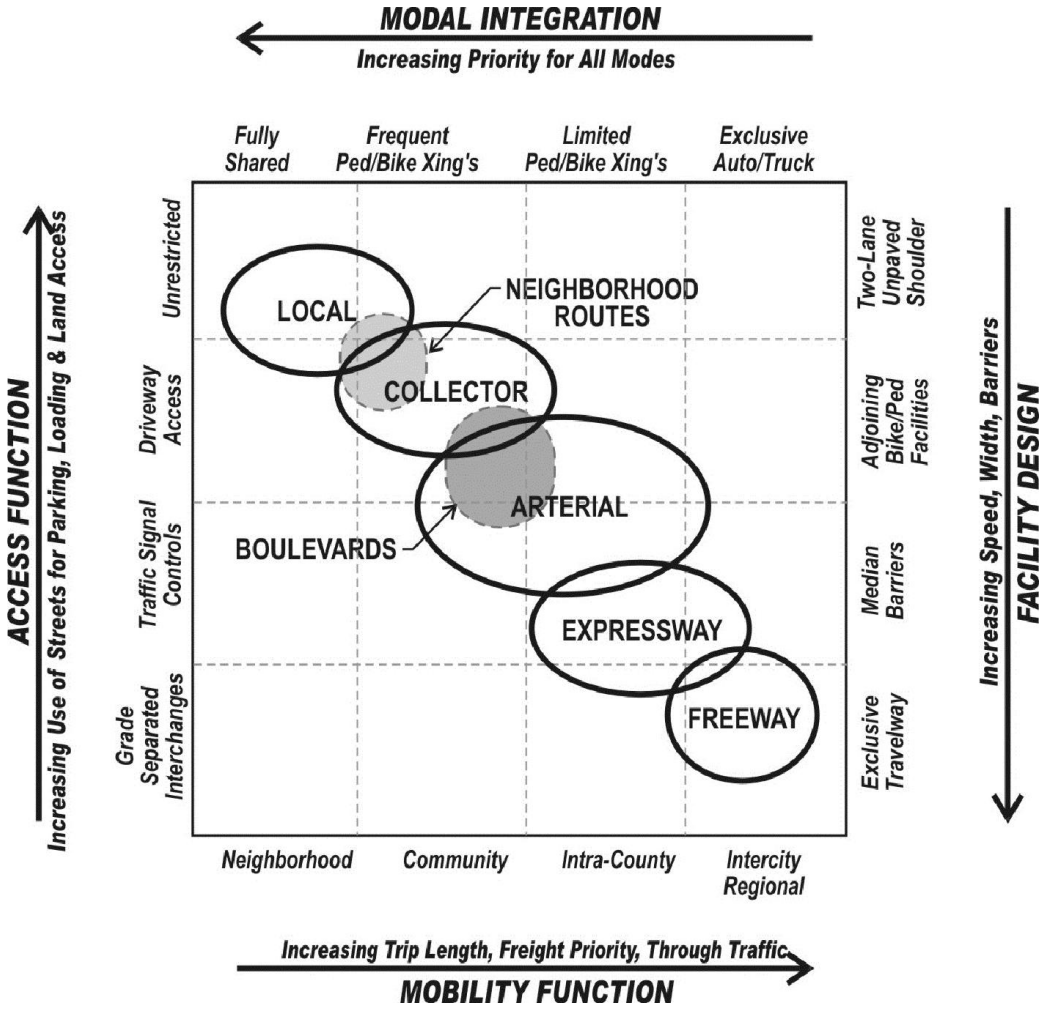
3.4.1 Functional Classification

The functional classification system is designed to serve transportation needs within the community. The schematic diagram on the following page shows the competing functional nature of roadway facilities as it relates to access, mobility, multi-modal transport, and facility design. The diagram is useful to understand how worthwhile objectives can have opposing effects. For example, as mobility is increased (bottom axis), the provision for non-motor vehicle modes (top axis) is decreased accordingly. Similarly, as access increases (left axis), the facility design (right axis) dictates slower speeds, narrower roadways, and non-exclusive facilities. The goal of selecting functional classes for particular roadways is to provide a suitable balance of these four competing objectives.

The diagram shows that as street classes progress from local to freeway the following occurs:

Mobility Increases – Longer trips between destinations, greater proportion of freight traffic movement, and a higher proportion of through traffic.

Integration of Pedestrian and Bicycle Decreases – Provisions for sidewalks and bike facilities are required through the arterial class, however, the frequency of intersection or mid-block crossings for non-



motorized vehicles steadily decreases with higher functional classes. The expressway and freeway facilities typically do not allow pedestrian and bike facilities adjacent to the roadway and crossings are grade-separated to enhance mobility and safety.

Access Decreases – The shared uses for parking, loading, and direct land access is reduced. This occurs through parking regulation, access control and spacing standards (see opposite axis).

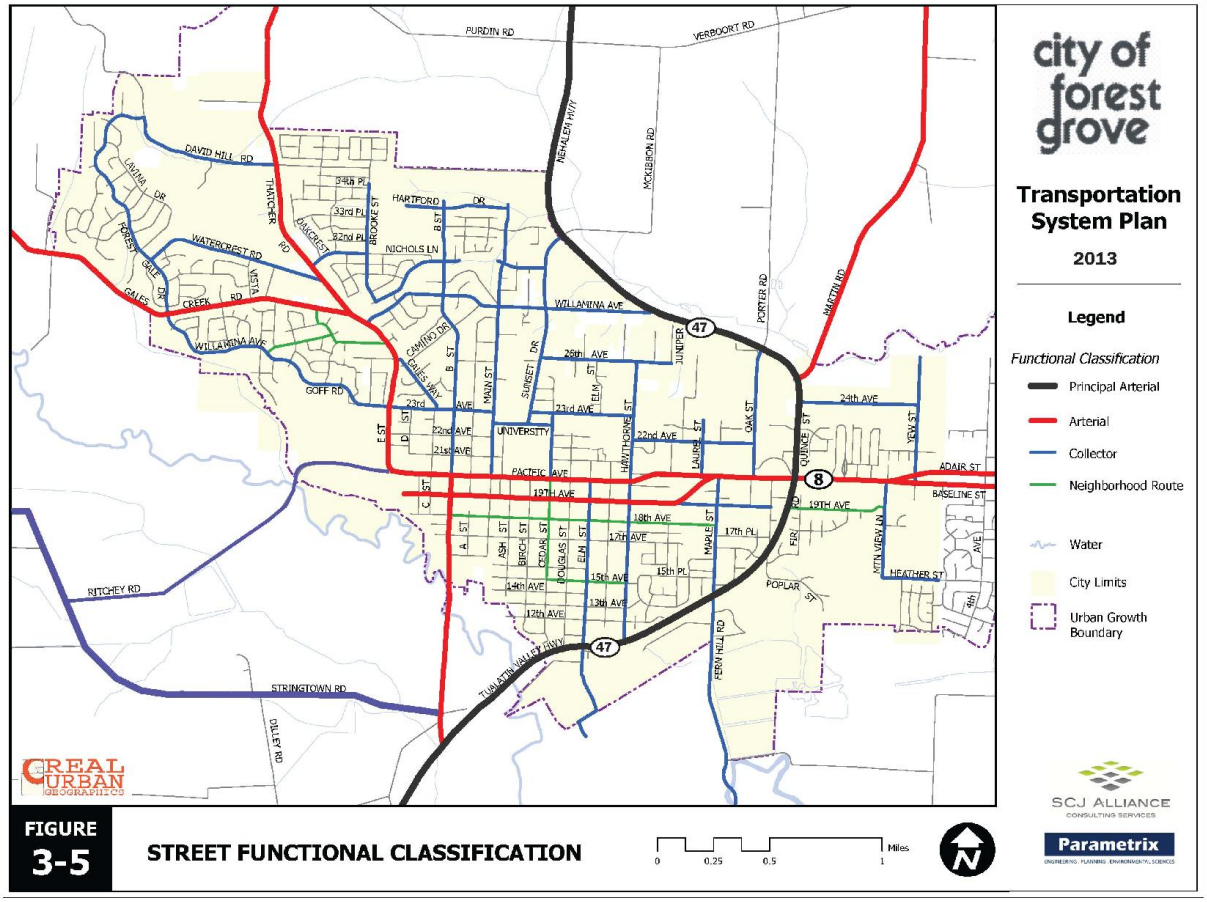
Facility Design Standards Increase – Roadway design standards require increasingly wider, faster facilities leading to exclusive travel ways for autos and trucks only. The opposite end of the scale is the most basic two-lane roadway with unpaved shoulders.

Two additional areas are noted on the diagram for Neighborhood Routes and Boulevards that span two conventional street classes.

The existing functional classification of streets in Forest Grove is represented by Figure 3-5. Any street not designated as either an arterial, collector, or neighborhood route is considered a local street.

Washington County roadway classifications differ somewhat with those of the City of Forest Grove. Metro only classifies roads that are considered to be of regional significance. Metro classifications are

Figure 3-4. Existing Street Functional Classification



from the 2004 RTP. The roadway functional classifications for the City, County and Metro are summarized in Table 3-6.

This TSP update addresses the limitations of the existing functional class and establishes a system that meets City and regional policy issues. A functional class system based primarily on connectivity would allow the design flexibility to handle issues identified above. Forest Grove's functional classification system was reviewed as part of this project and the proposed functional classification system is discussed in the Roadway Plan (Chapter 8).

Table 3-6. Major Street Network Summary

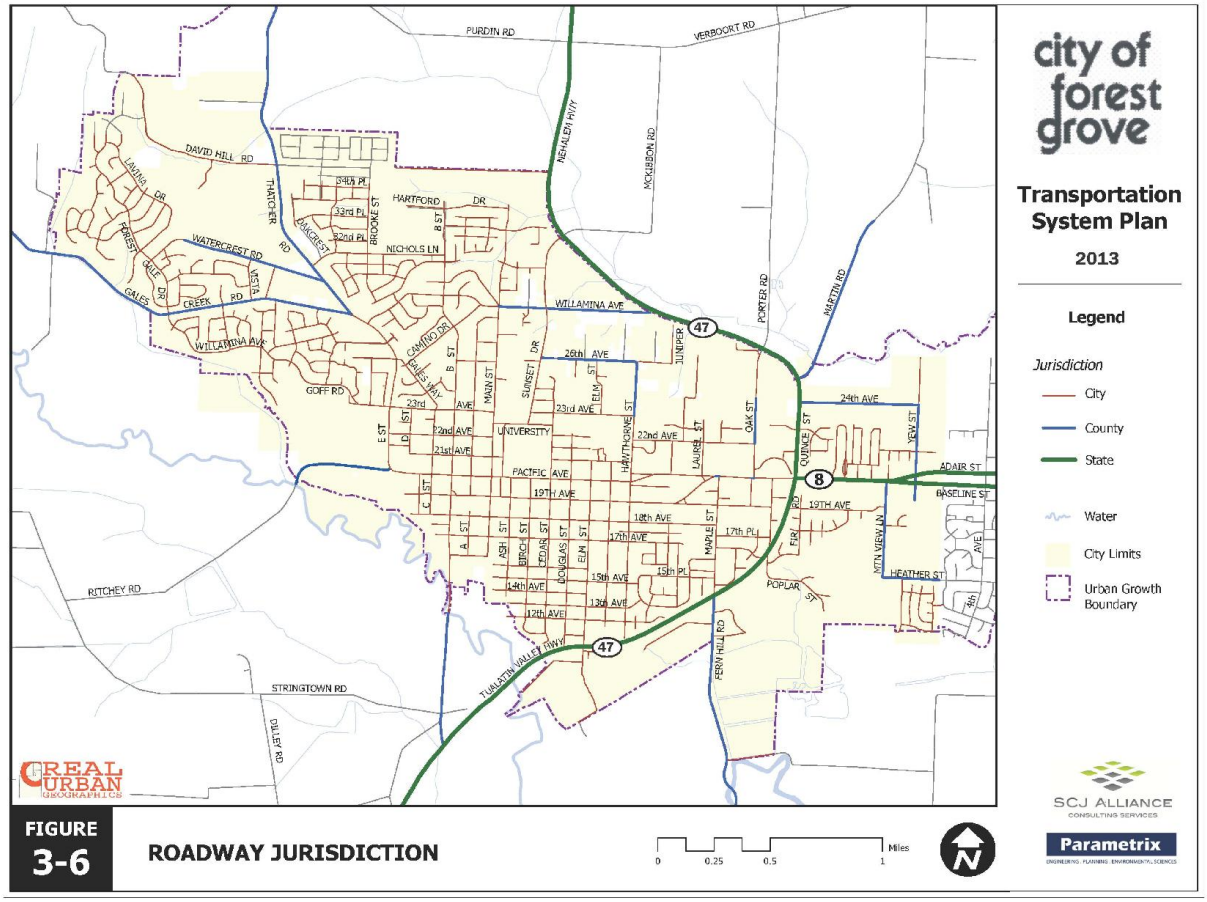
	Functional Classification			
Street	**Forest Grove**	**Washington County**	**Metro**	**Lanes**
19th Avenue	Arterial	Arterial	Minor Arterial	2
B Street (south of Pacific)	Arterial	Arterial	Minor Arterial	2
E Street	Arterial	Arterial	Minor Arterial	2
Gales Creek Road	Arterial	Arterial	Minor Arterial	2
Highway 47	Principal Arterial	Principal Arterial	Principal Arterial	2
Pacific Avenue (east of E St.)	Arterial	Arterial	Minor Arterial	2
Quince Street	Principal Arterial	Principal Arterial	Principal Arterial	2
Thatcher Road	Arterial	Collector	Minor Arterial	2
TV Highway (Highway 8)	Arterial	Arterial	Major Arterial	4
David Hill Road	Collector/NA	NA	Future Minor Arterial	2
Sunset Drive	Collector	Collector	NA	2
University Avenue	Collector	Collector	NA	2
23rd Avenue	Collector	Collector	NA	2
24th Avenue	Collector	Collector	NA	2
26th Avenue	Collector	Collector	NA	2
B Street (north of Pacific)	Collector	Collector	NA	2
Elm Street	Collector	Collector	NA	2
Forest Gale Drive	Collector	Collector	NA	2
Gales Way	Collector	Collector	NA	2
Hawthorne Street	Collector	Collector	NA	2
Main Street (north of 19th)	Collector	Collector	NA	2
Maple Street	Collector	Collector	NA	2
Fern Hill Road	Collector	Arterial	NA	2
Mountain View Lane	Collector	Collector	NA	2
Oak Street (north of Pacific)	Collector	Collector	NA	2
Porter Road	NA	NA	NA	2
Sunset Drive	Collector	Collector	NA	2
Watercrest Road	Collector	Collector	NA	2
Willamina Avenue	Collector	Collector	NA	2
Yew Street	Collector	Collector	NA	2
Pacific Avenue (west of E. St.)	Collector	Collector	NA	2

Source: 2011 Forest Grove TSP, Washington County TSP and 2010 Metro Regional Transportation Plan
NA = Data not available or not applicable

3.4.2 Roadway Jurisdiction

Roadway ownership and maintenance responsibilities of the various roads throughout the study area are identified in Figure 3-6. Highway 47 / Quince Street and Highway 8 / Pacific Avenue are state highways and under ODOT jurisdiction. Pacific Avenue is under City of Forest Grove jurisdiction west of Highway 47. The remaining roadways are under the jurisdiction of Washington County or the City of Forest Grove.

Figure 3-5. Roadway Jurisdiction



3.4.3 Roadway Characteristics

Field inventory was conducted to determine characteristics of major roadways in the study area. Data collected included posted speed limits and intersection controls. These characteristics define roadway capacity and operating speeds that may affect travel path choices for drivers.

Pavement Condition

A visual inspection of the street system of Forest Grove was conducted using a pavement condition rating system. The system has three rating categories: good, fair and poor. These general ratings reflect the severity and amount of pavement distress. Figure 3-7 shows the existing pavement conditions for Forest Grove. Table 3-7 shows the breakdown of mileage in each of the classes of pavement condition. This condition assessment is not a comprehensive one. The City of Forest Grove has a more detailed pavement condition assessment program which may vary from Figure 3-7 and Table 3-7.

Table 3-7. Roadway Pavement Conditions Summary

Surface Conditions	Distance (miles)
Good	26.5
Fair	1.9
Poor	2.1
	30.51

Note: **Based on visual survey taken in July 2007 on arterial and collector facilities.**

Solutions to flooding on B Street in the vicinity of Gales Creek and Fern Hill Roads near wetlands should be considered in the next five years.

Traffic Speed

Speed zones on arterials and collectors within the City of Forest Grove are summarized in Figure 3-8. There are three ways a speed zone can be established by statute. One is in a "residence district," another is a “business district” and the third is a school zone.[7] A residence district can be posted at 25 mph. A business district and a school zone can be posted at 20 mph. In all other cases, an engineering study is required to determine the appropriate speed zone (the basis is the 85th percentile speed).[8] The study is typically done by the appropriate ODOT region office. The recommendation (based on the engineering study) is then forwarded from the ODOT region office to Salem to be approved by the State Traffic Engineer.

If the jurisdiction requesting the speed study does not agree with the results of the engineering study and recommendation to the State Traffic Engineer, the jurisdiction can appeal the decision to the Speed Zone Review Panel (which meets once a year).

[7] Speed zones can be established by statute which is vaguely defined in the Oregon Vehicle Code in 801.430.
[8] The 85th percentile vehicle speed represents a condition when 15 percent of the vehicles surveyed were traveling faster than the 85th percentile speed and 85 percent were traveling slower than the 85th percentile speed.

Figure 3-6. Pavement Conditions

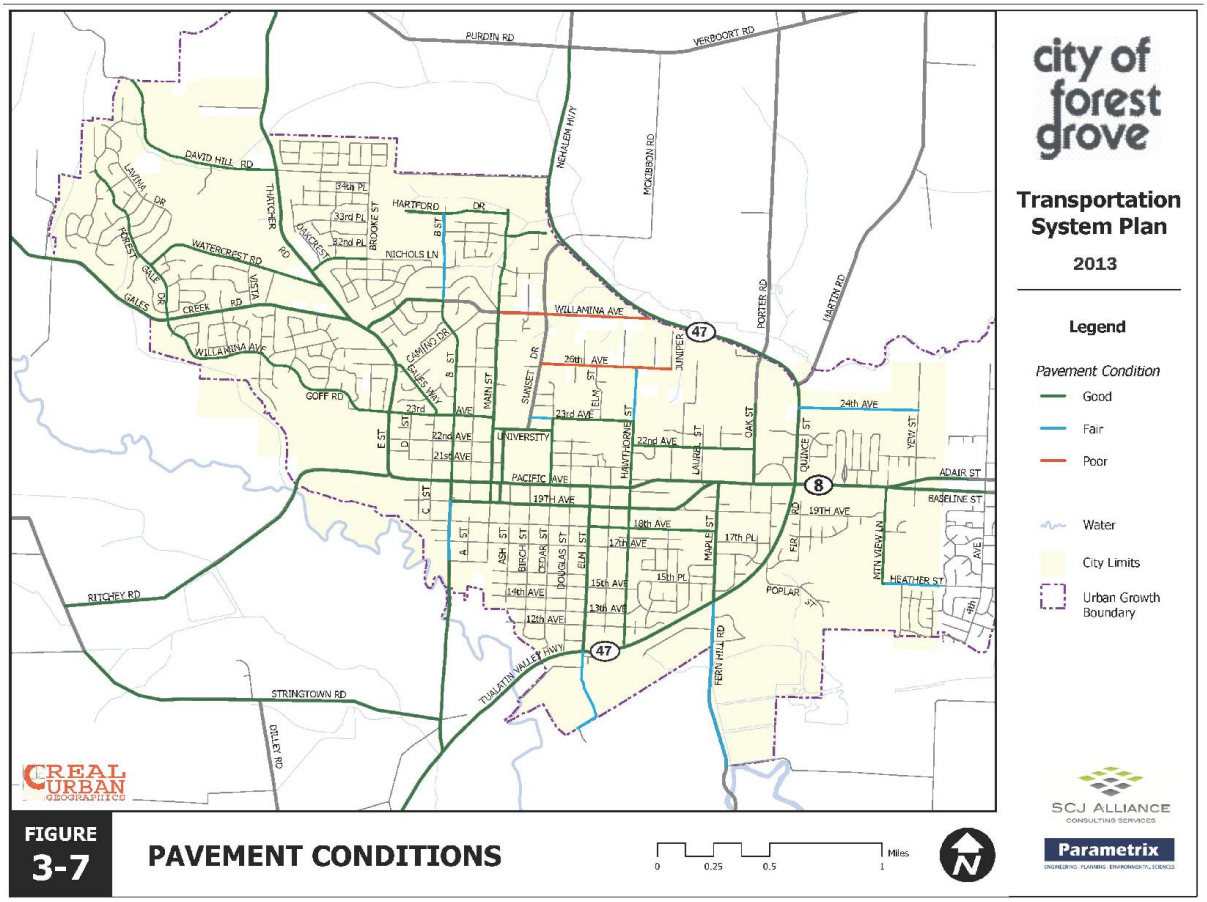
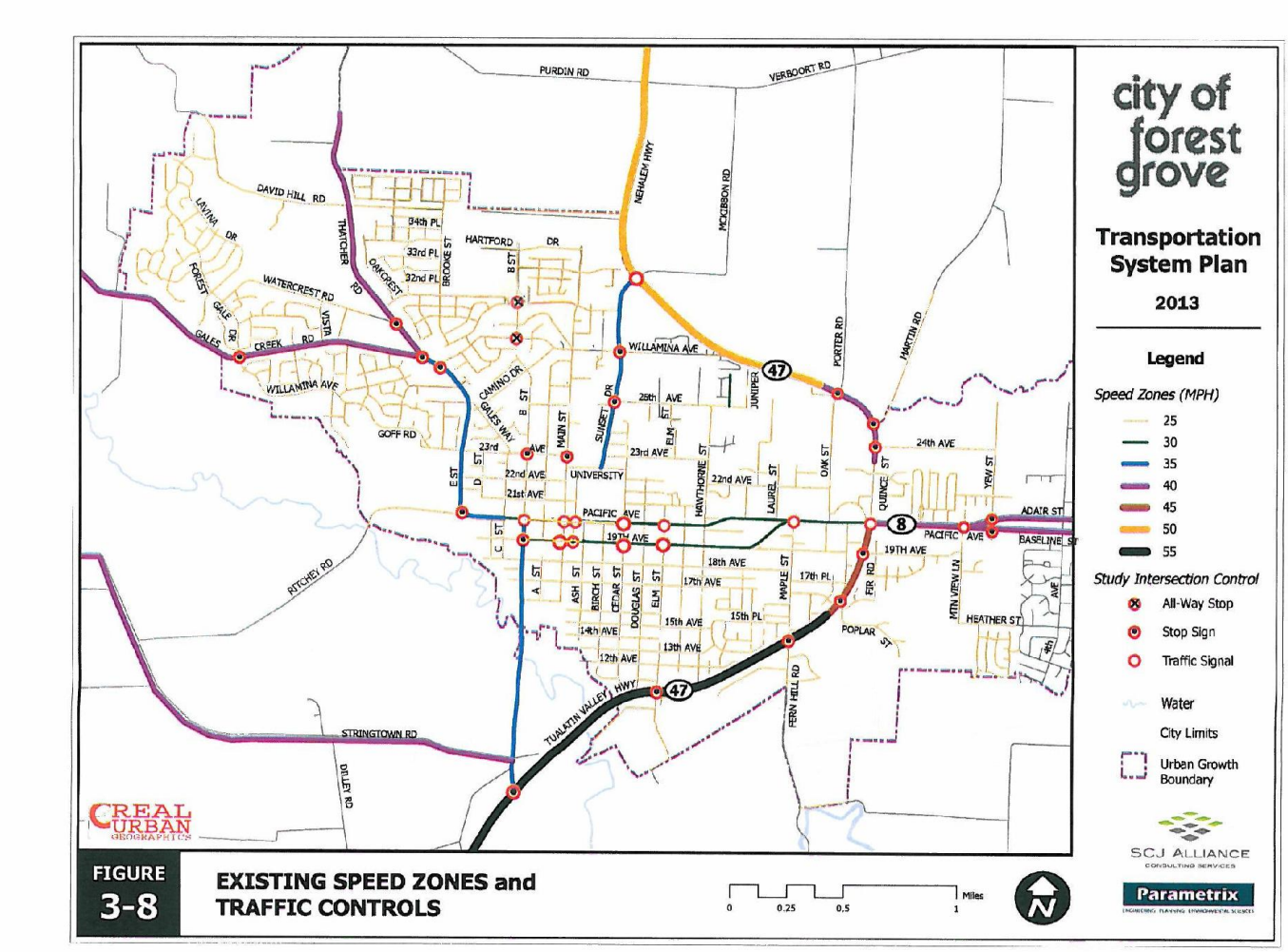


Figure 3-7. Existing Speed Zones and Traffic Controls



Vehicle speeds on several collector and residential streets are a concern for the community. In most cases, speeding becomes very noticeable when it is above 30-35 miles per hour. Speeding typically occurs on local streets where the streets are wide and straight for long stretches, or where downhill grades are extended.

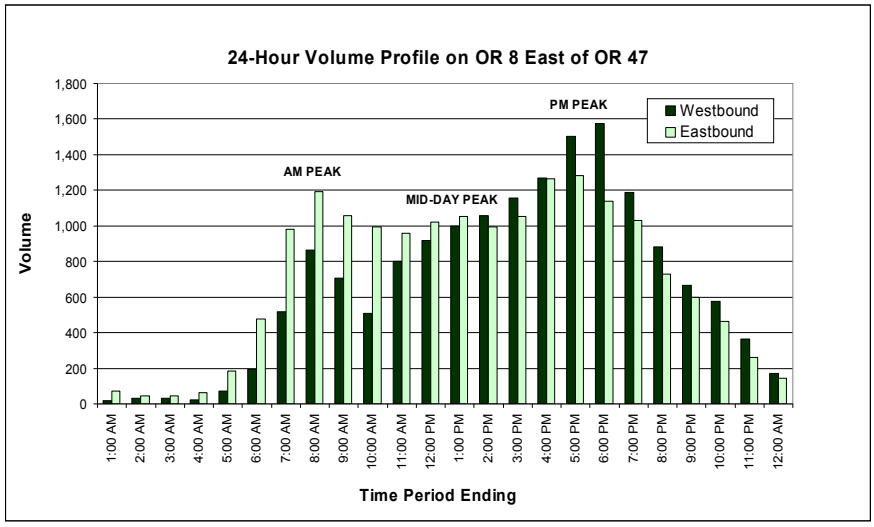
Intersection Control

The only signalized study intersections in Forest Grove are located along Pacific Avenue and Highway 47. The remaining study intersections are controlled by stops signs either on the minor street approaches or as an all-way stop intersection. The study intersection locations and existing intersection controls are shown in Figure 3-8. The study intersections include seven signalized intersections, 19 intersections with stop control and two all-way stop controlled intersections.

Motor Vehicle Volume

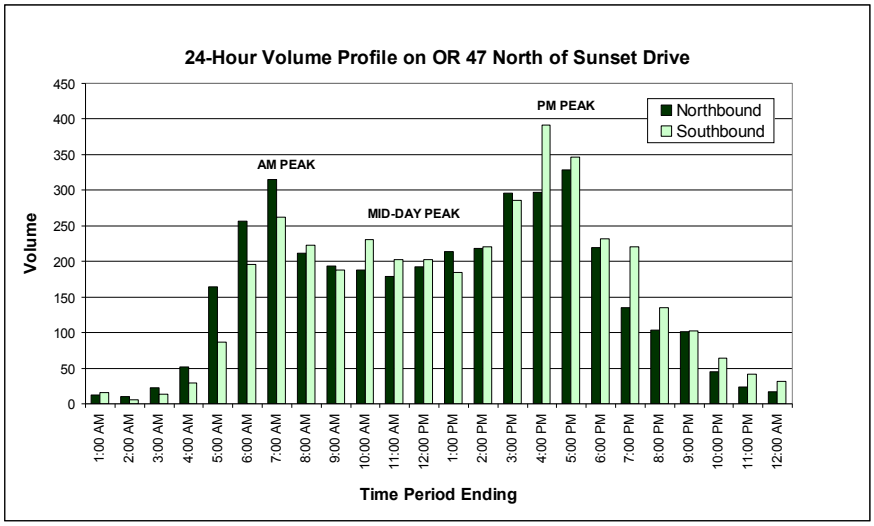
Roadway volume surveys were conducted in June of 2007 as part of the Forest Grove Transportation System Plan update. The traffic counts conducted as part of this inventory provide the basis for analyzing existing problem areas as well as establishing a base condition for future monitoring. Turn movement counts were conducted at 28 intersections during the evening (4-6 PM) peak period to determine intersection operating conditions. The analysis to identify future needs and deficiencies (Chapter 4) is focused on the PM peak period traffic conditions. These counts are included in Appendix B.

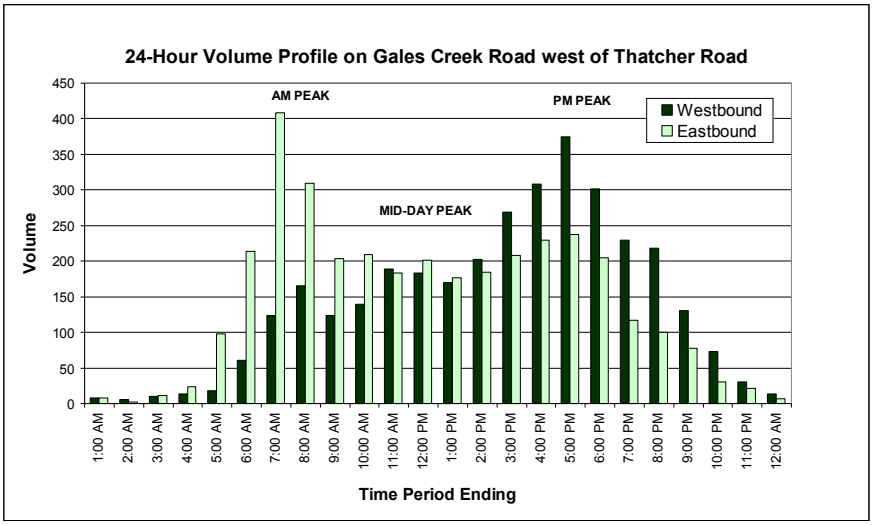
The PM peak hour counts at each study intersection, along with some 24-hour directional counts are used to estimate average daily traffic on roadways. Existing daily volumes are shown in Figure 3-9. These average daily traffic estimates are used to identify overall changes in traffic patterns, but are not used directly to identify deficiencies or needs.



The estimated daily traffic volumes help to demonstrate overall trends of travel behavior in Forest Grove. Volumes along Sunset Drive as well as other alternative routes in/out of Forest Grove have drastically dropped with the new Highway 47 alignment. On a typical day, Highway 8 and Highway 47 are the most heavily traveled roadways in Forest Grove. East of Highway 47, Highway 8 carries about 31,400 vehicles per day (two-way). Highway 47 carries about 7,700 vehicles per day (two-way) north of Sunset Drive. Typically,

the evening peak period is when traffic volumes are highest. This can be attributed to a combination of commute, retail and school trips. The volume profiles shown on the next page illustrate the trends of motor vehicle travel for three survey locations within Forest Grove. The volume profiles summarize the daily traffic by hour of day per direction.





3.4.4 Traffic Levels of Service

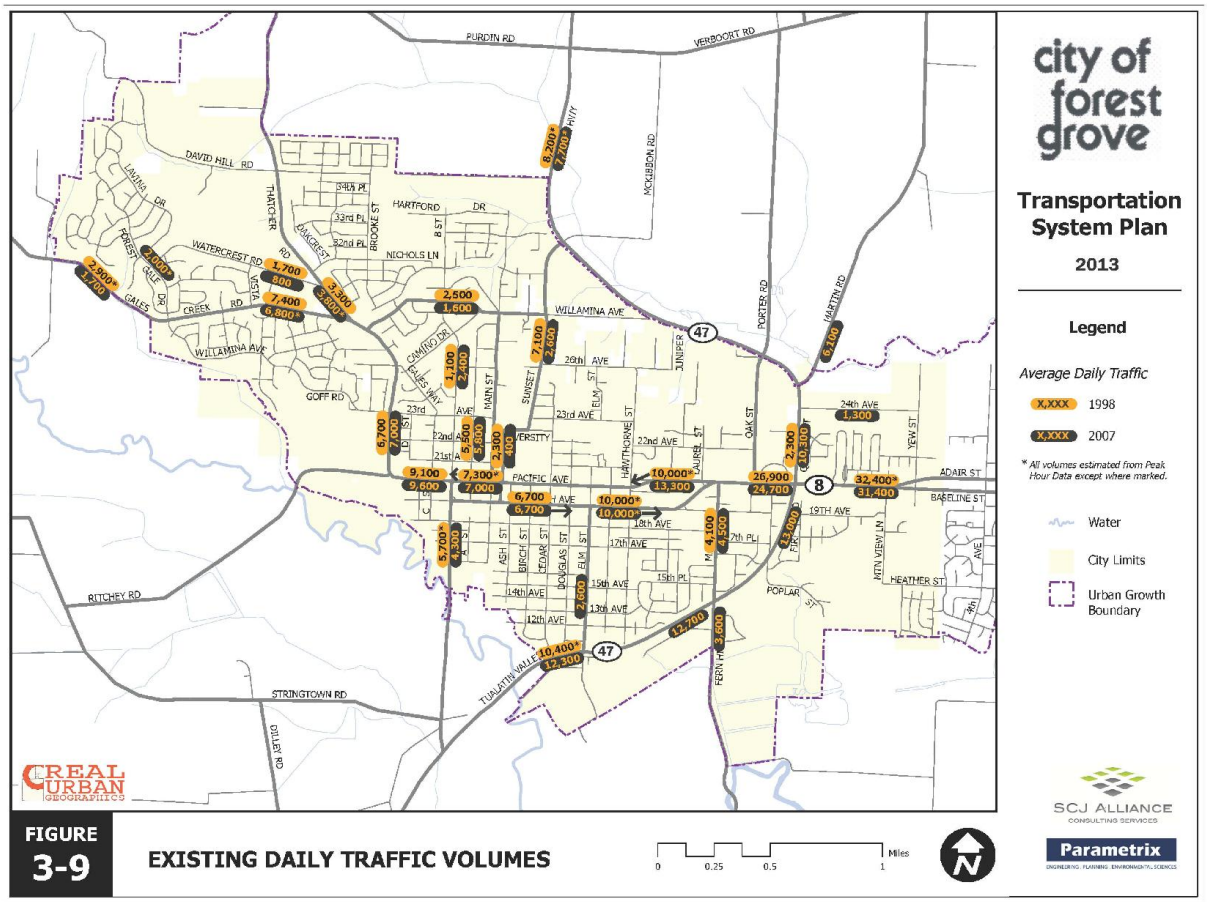
While analysis of traffic flows and functional classifications are useful in understanding the general nature of traffic in an area, traffic volumes alone indicate neither the ability of the street network to carry additional traffic, nor the quality of service afforded by the street facilities. For this, the concept of level of service has been developed to correlate traffic volume data to subjective descriptions of traffic performance at intersections.

Level of Service (LOS) is used as a measure of effectiveness for both unsignalized and signalized intersection operation. It is similar to a "report card" rating based upon average vehicle delay.

- Level of Service A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand.
- Level of Service D and E are progressively worse peak hour operating conditions.

- Level of Service F represents conditions where average vehicle delay exceeds 80 seconds per vehicle entering a signalized intersection and demand has exceeded capacity.

Figure 3-8. Existing Daily Traffic Volumes



Intersections controlled by STOP signs on the minor street approaches are subject to a separate capacity analysis methodology. These unsignalized intersections provide levels of service only for major and minor street turning movements, and not the traffic on the major facility. For this reason, LOS E and even LOS F can occur for a specific side street turning movement, however, the majority of traffic may not be delayed (in cases where major street traffic is not required to stop). LOS E or F conditions at intersections without traffic signals generally provide a basis to study the intersection further and to determine availability of acceptable gaps, safety and traffic signal warrants.

Table 3-8 and Figure 3-10 provide a summary of PM peak hour levels of service at selected intersections. The LOS for intersections controlled by STOP signs represents the condition for the major/minor street approach, respectively. The city has adopted a minimum standard for level of service of LOS D.

Table 3-8. PM Peak Hour Intersection Level of Service

No.	Intersection	Operational Standard	Level of Service (LOS) [1]	Average Delay* (Seconds) [2]	Volume / Capacity (V/C) [2]
	Unsignalized Intersections				
1	Gales Creek Road/Forest Gale Drive	LOS E/0.99	A/B	11.4	0.13
2	Thatcher Road/Watercrest Road	LOS E/0.99	A/B	11.2	0.03
3	Gales Creek Road/Thatcher Road	LOS E/0.99	A/C	16.5	0.35
4	Gales Creek Road/Willamina Avenue	LOS E/0.99	A/C	12.9	0.10
5	Sunset Drive/Willamina Avenue	LOS E/0.99	A/B	10.9	0.11
6	Sunset Drive/26th Avenue	LOS E/0.99	A/A	9.2	0.06
7	23rd Avenue/B Street	LOS D	A/B	12.2	0.23
8	23rd Avenue/Main Street	LOS D	A/B	11.0	0.14
9	Pacific Avenue/E Street	LOS E/0.99	A/B	14.3	0.24
10	19th Avenue/Council Street	LOS D	A/B	12.5	0.10
11	Highway 47/Verboort & Purdin	V/C=0.99	A/D	32.0	0.71
12	Highway 47/Porter & Oak	V/C=0.99	A/C	16.6	0.14
13	Highway 47/Martin Way	V/C=0.99	A/D	29.5	0.73
14	Highway 47/24th Avenue	V/C=0.99	A/C	15.3	0.19
15	Highway 47/19th Avenue	V/C=0.99	A/D	30.9	0.42
16	Highway 47/Poplar Street	V/C=0.99	A/C	20.0	0.31
17	Highway 47/Maple Street	V/C=0.99	**A/F**	**111.0**	**1.00**
18	Highway 47/Elm Street	V/C=0.99	A/D	31.3	0.45
19	Highway 47/B Street	V/C=0.99	A/C	21.6	0.37
20	Adair Street/Yew Street	V/C=0.99	**A/F**	**>180**	**1.00**
21	Baseline Street/Yew Street	V/C=0.99	A/F	63.4	0.70
	All-Way Stop Controlled Intersections				
22	19th Avenue/B Street**	LOS D	A/D	26.6	0.85
23	B Street/Willamina Avenue	LOS D	A/A	8.5	0.19
24	Bonnie Lane/B Street	LOS D	A/A	8.5	0.24
	Signalized Intersections				
25	Highway 47/Sunset Drive	V/C=0.99	C	28.4	0.37
26	Pacific Avenue/Quince Street	V/C=0.99	D	51.2	0.92

Table 3-8 Continued. PM Peak Hour Intersection Level of Service

No.	Intersection	Operational Standard	Level of Service (LOS) [1]	Average Delay* (Seconds) [2]	Volume / Capacity (V/C) [2]
27	Pacific Avenue/Mt. View Lane	V/C=0.99	A	8.3	0.66
28	Pacific Avenue/B Street	LOS D	C	25.6	0.57
29	Pacific Avenue/Main Street	LOS D	B	15.6	0.49
30	Pacific Avenue/College-Council	LOS D	A	5.2	0.39
31	Pacific Avenue/Elm Street	LOS D	A	9.6	0.46
32	Pacific Avenue/Maple Street	LOS D	B	15.9	0.71

* Minor street average delay reported for unsignalized intersections

** The atypical signal control at this intersection is treated as a four-way stop for LOS calculations.

1 First value is the free movement, second value is the worst stopped movement.

2 Worst stopped movement.

Source: SCJ Alliance from DKS Associates, Inc.

All of the study intersections with traffic signals currently operate at LOS D or better. Some queuing occurs at the Pacific Avenue / Quince Street and Pacific Avenue / Main Street intersections during peak hours. Most study intersections with STOP sign controls operate at level of service C or better during the evening peak hour. In other words, the minor street approaches have average delays of less than 25 seconds during this hour.

Three intersections along Highway 47 (19th Avenue, Elm Street, and Martin Way) operate with LOS D on minor approaches, as does the Baseline Street / Yew Street intersection. Highway 47 / Maple Street and Adair Street / Yew Street operate at LOS F on minor approaches. The intersections of Highway 47/Maple Street and Highway 47 / Martin Way met MUTCD[9] traffic signal warrant 3 (Peak Hour Warrant). The capacity analysis calculation sheets are in Appendix C.

3.4.5 Crash History

Crash data was obtained for the study intersections from Oregon Department of Transportation for the period between January 1, 2002 and December 31, 2006. Figure 3-11 shows crash locations with any reported collisions within 200 feet of an intersection. Locations that have only one reported vehicle to vehicle collision in four years are not statistically significant. Table 3-9 summarizes the highest intersection crash rates.

Typically, intersections on collector and arterial roadways with a collision rate over 1.00 suggest further safety investigation is warranted. As shown in the table, only the B Street / 23rd Avenue intersection is calculated to have a rate of over 1.00 collisions per million vehicles. A review of reported collisions at this intersection showed that most collisions were caused by vehicles traveling towards Pacific Avenue from B Street failing to respect right-of-way or failing to obey the posted stop sign. The presence of ample sight distance at this intersection suggests that enhanced visibility of posted stop signs, a reduction in posted speeds, or modification of intersection controls may provide a solution. Recommendations for this intersection are incorporated into the Roadway Plan (Chapter 8).

[9] *Manual on Uniform Traffic Control Devices (MUTCD)*, FHWA, 2003.

Table 3-9. Study Intersection Crash Data

Rank	North-South Roadway	East-West Roadway	Reported Crashes (2002-2006)	Intersection ADT	Crash Rate (per MEV)
1	B Street	23rd Avenue	10	4,950	1.22
2	Yew Street	Adair Street	19*	18,200	0.57
3	B Street	Pacific Avenue	12	13,210	0.55
4	Highway 47	Pacific Avenue	30	39,710	0.46
5	Maple Street/Fern Hill Rd	Highway 47	11	15,950	0.42
6	Main Street	Pacific Avenue	8	12,760	0.38
7	Gales Creek Road	Willamina Avenue	5	8,670	0.35
8	Elm Street	Highway 47	7	14,025	0.30
9	Sunset Drive	26th Avenue	1	2,640	0.23
10	Elm Street	Pacific Avenue	4	11,790	0.20
11	Highway 47	Martin Road	4	11,890	0.20
12	Maple Street	Pacific Avenue	8	26,630	0.18
13	B Street	Willamina Avenue	1	3,820	0.16
14	Thatcher Road	Watercrest Road	1	4,225	0.14
15	Mountain View Lane	Pacific Avenue	8*	32,890	0.13
16	Thatcher Road	Gales Creek Road	2*	8,480	0.13
17	B Street	19th Avenue	2	9,790	0.12
18	Yew Street	Baseline Street	3*	15,030	0.11
19	Highway 47	24th Avenue	2	11,600	0.10
20	Highway 47	Poplar Street	2	13,700	0.09
21	Highway 47	19th Avenue	2	14,170	0.09
22	E Street	Pacific Avenue	1	8,690	0.06

Source: Oregon Department of Transportation (ODOT) crash analysis and reporting unit
*Crash data is for 2004-2008.

The Washington County Safety Priority Index System (SPIS) is used to identify and evaluate existing hazardous intersections for potential safety improvements. The County SPIS list is compiled from vehicle crashes reported to ODOT and includes intersections that have three or more crashes, or one or more severe injury or fatal crashes, based on the most recent three years of crash data. The SPIS list only includes intersections where the County has jurisdiction of at least one leg of the intersection. There are currently four intersections within the City of Forest Grove that appear on the latest SPIS list (2006 – 2008). These intersections along with their corresponding priority rank are listed below.

- Fern Hill Road / Maple Street/OR 47 (19)
- Oregon Highway 47 / Purdin Road-Verboort Road (42) – intersection reconstructed and flashing beacon removed in 2005.
- Oregon Highway 47 / B Street (65)
- 1st Avenue / Baseline Street (192)

3.4.6 Trucks

Currently, there are no designated principal truck routes in Forest Grove. The intent of the truck route system is to provide connections with truck routes serving areas within and outside of Forest Grove making efficient truck movement and the delivery of raw materials, goods, services and finished products possible. These routes are generally found in and serve areas where there are concentrations of commercial and/or industrial land uses.

Figure 3-9. Existing Intersection Level of Service

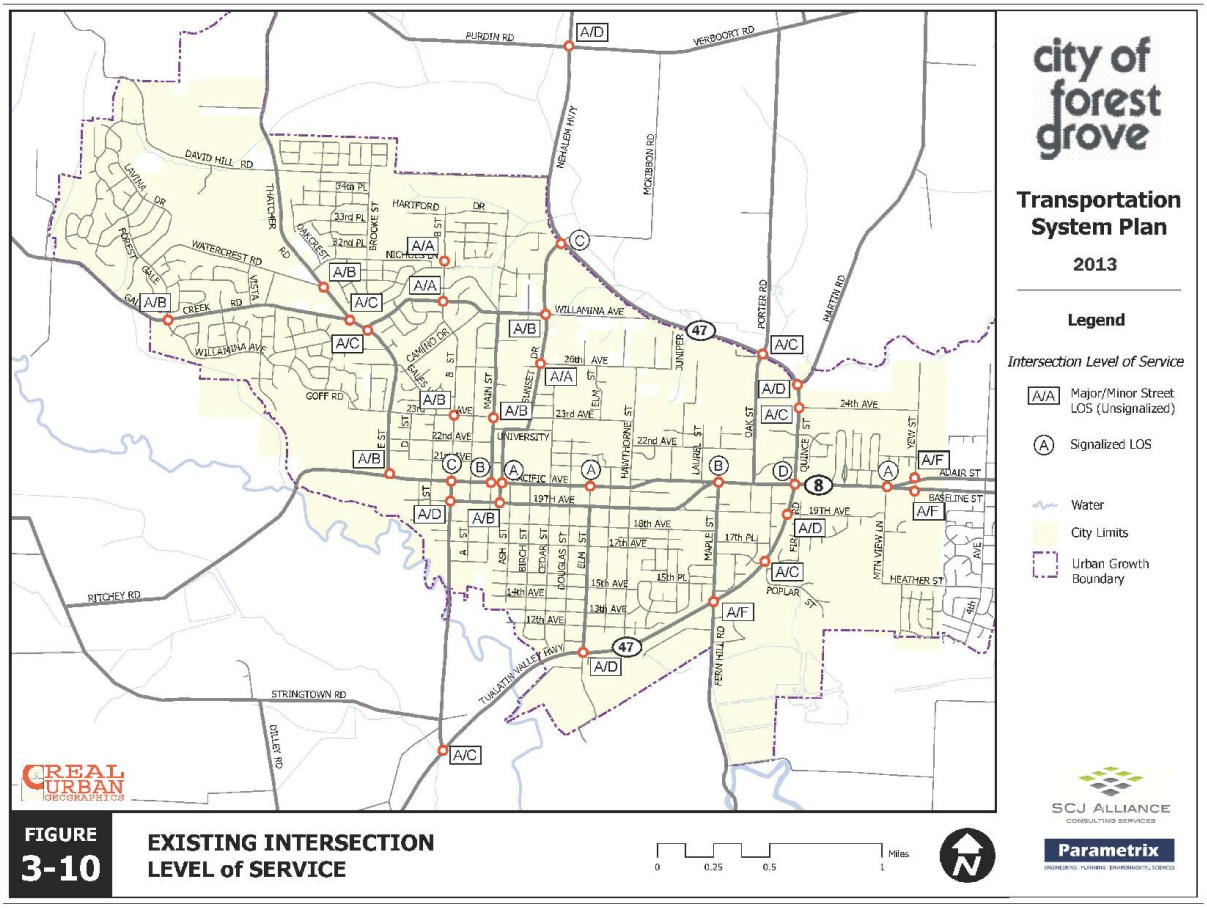
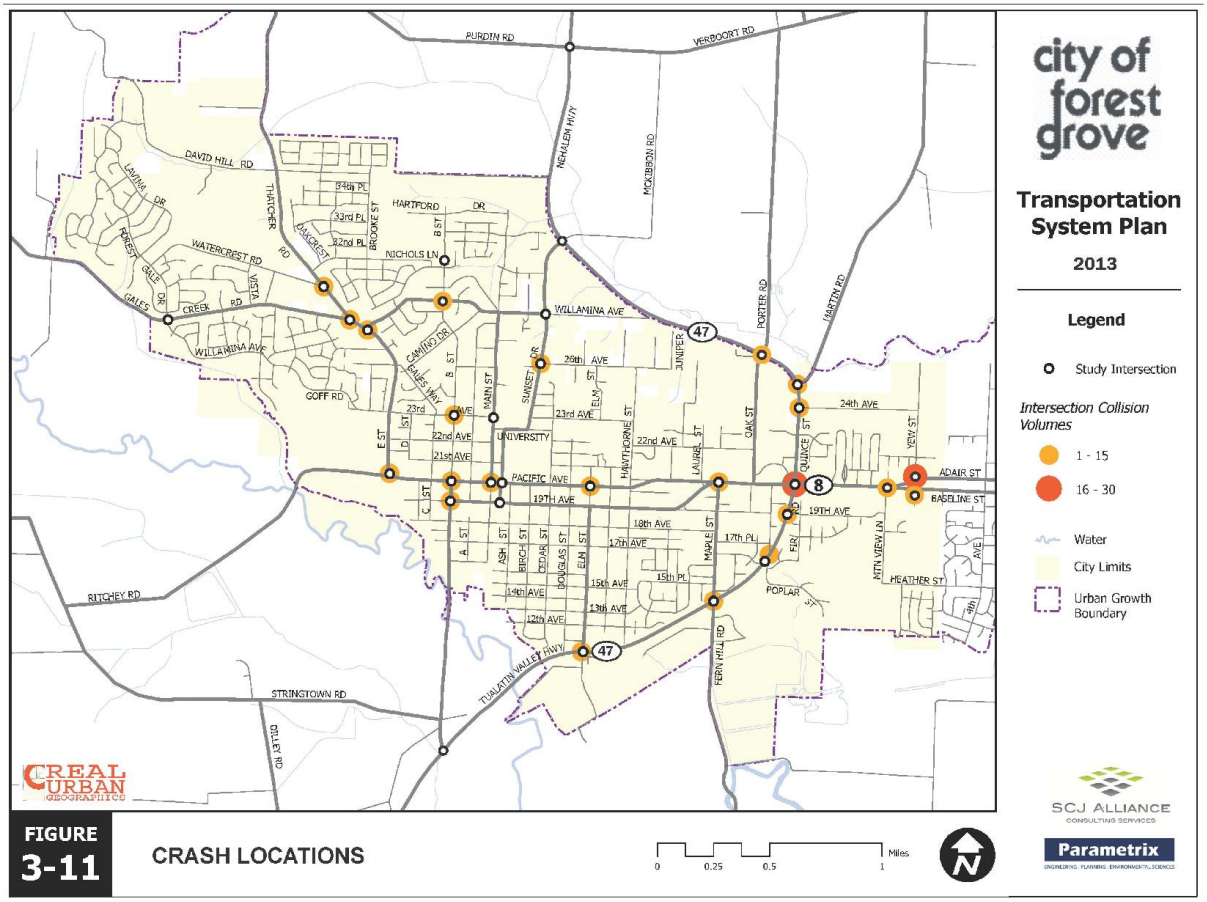


Figure 3-10. Crash Locations



Since the city does not have designated truck routes, the truck community relies on the designated state facilities and other key roadways as a default. The local elements include TV Highway, Highway 47, the Pacific Avenue / 19th Avenue couplet, Gales Creek Road, and B Street. Figure 3-12 shows truck routes within Forest Grove, with truck volume percentages during the PM peak hour.

Establishment of a designated truck route in the City along with overnight truck parking should be considered in the next five years with public involvement.

3.5 Rail Transportation

The Portland and Western alignment begins in Forest Grove near 21st Avenue and Douglas Street and travels along the 23rd Avenue alignment, parallel to Pacific Avenue, continuing east through the industrial zoned properties north of TV Highway. This railroad right-of-way is owned by the Oregon Department of Transportation. The Portland and Western southern alignment transverses the entire city parallel to the southern portion of Highway 47 along the east side, then continues east along TV Highway. None of the railroad crossings are grade separated. No improvements or changes in rail service are planned at this time. The two rail lines in Forest Grove are shown in Figure 3-12.

3.6 Air Transportation

Forest Grove is served by the Portland International Airport, located in Northeast Portland on the Columbia River. The Portland International Airport is a major air carrier transportation and freight facility, which serves Oregon and Southwest Washington. It provides a base for over twenty commercial airlines and air freight operations. The Port of Portland reported that 14.0 million passengers were served at the Portland International Airport in 2006.

Forest Grove is also served by the Hillsboro Airport, a general aviation facility located on the northern edge of Hillsboro. The airport is home to a number of private entities that provide aviation and aviation-related services, including scenic tours and other charter flights, helicopter and fixed-wing flight training, and aviation repair and maintenance.

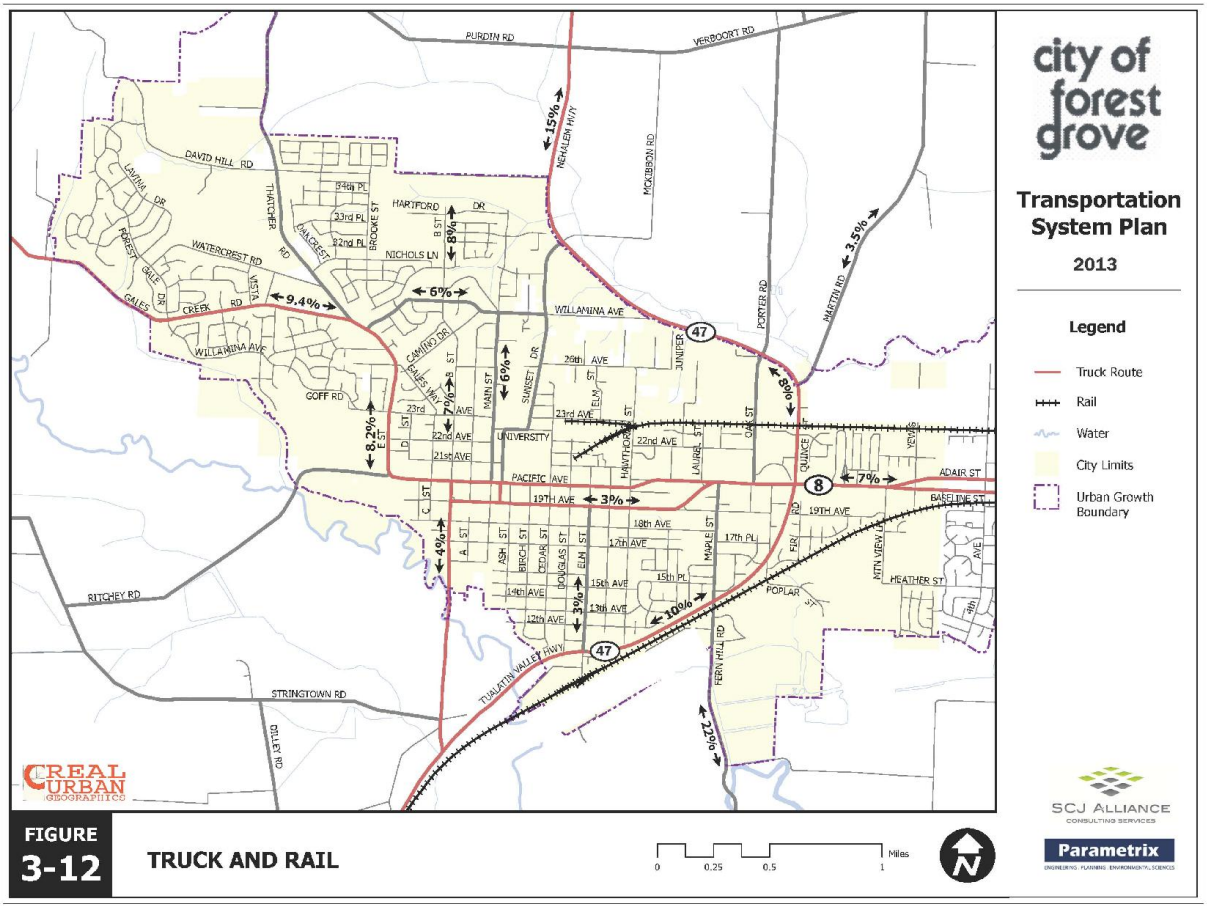
3.7 Water Transportation

There are no navigable waters within Forest Grove.

3.8 Pipelines

The only major pipeline facility that affects the location of future transportation corridors in the Forest Grove area is a high-pressure natural gas feeder line owned and operated by Northwest Natural Gas Company. The feeder line route enters Forest Grove along Porter Road / Oak Street and ends just north of Highway 8.

Figure 3-11. Truck and Rail



4. FUTURE TRAVEL DEMAND

4.1 Travel Demand and Land Use

The Forest Grove Transportation System Plan (TSP) addresses existing system needs and additional facilities that are required to serve future growth in the forecast year 2035. Metro's urban area transportation forecast model was used to determine future traffic volumes in Forest Grove. This forecast model translates assumed land uses into person travel, selects travel modes and assigns motor vehicles to the roadway network. These traffic volume projections form the basis for identifying potential roadway deficiencies and for evaluating alternative circulation improvements. This section describes the forecasting process including key assumptions including the following:

- **Summary of projected land use growth** in the Forest Grove area to 2035 includes the City's Preferred Land Use Alternative developed under the 2013 Comprehensive Plan Periodic Review effort. This alternative is consistent with the overall city household and employment control totals from the Metro 2035 Gamma forecasts for each Transportation Analysis Zone (TAZ) in the study area.
- **Discussion of the regional travel demand model** developed and maintained by Metro for the Portland Metropolitan Area.
- **Analysis of projected 2035 PM peak hour traffic volumes and expected intersection-level traffic operations**. Information presented includes the two land use scenarios identified above (Baseline Conditions and Preferred Land Use Alternative) and also identifies intersection operational performance standards or targets. These are used to both define transportation system deficiencies and to guide the development of initial improvement options.

4.1.1 Projected Land Use Growth

Land use is a key factor in developing a functional transportation system. The amount of land that is planned to be developed, the type of land uses and how the land uses are mixed together have a direct relationship to expected demands on the transportation system. Understanding the amount and type of land use is critical to taking actions to maintain or enhance transportation system operation.

Projected land uses for the Forest Grove 2035 Baseline Conditions scenario are consistent with Metro's 2035 Gamma land use assumptions. These are slightly different from the land use assumptions inherent in the adopted 2035 Regional Transportation Plan (RTP) but are expected to be used for the next RTP Update. Use of the 2035 Gamma forecasts was specifically requested by Metro for the development of local Transportation System Plans in the region. Projected land uses were also developed for the City's Preferred Land Use Alternative which differ from the 2035 Gamma scenario, but which are consistent with the future land use patterns under consideration as a part of Periodic Review.

Complete land use data sets were developed for the following conditions.

- Existing 2010 Conditions (base travel forecast for the region)
- Future 2035 land use (totals are consistent with Metro's Gamma forecast but distribution within Forest Grove is different)

The base year travel demand model is updated periodically by Metro to maximize consistency with existing household and employment information throughout the region. The most recent year for which

land use and employment data is available is 2010, and this was used as a starting point for developing future year growth projections. The 2010 land use database includes geo-spatially located information for the number of dwelling units, retail/service employees and other employees. Table 4-1 summarizes the land uses for the 2010 base and future 2035 scenario within the Forest Grove TSP study area.

For transportation forecasting TAZs represent the sources of vehicle trip generation. There are approximately 17 Metro TAZs within the Forest Grove TSP study area which are illustrated in Figure 4-1. A detailed summary of the land uses for each TAZ within the Forest Grove study area is provided in Appendix D along with a map showing the major elements of this land use alternative.

Table 4-1. Forest Grove TSP Study Area Land Use Summary

Land Use	2010	2035	Increase	% Increase
Households	8,039	11,159	3,120	39%
Retail/Service Employees	3,141	5,368	2,227	71%
Other Employees	2,789	5,480	2,691	96%

Source: Metro 2012.

At the existing level of land development, the transportation system generally operates without significant motor vehicle deficiencies in the study area. As land uses are changed in proportion to each other (i.e. there is a significant increase in employment relative to household growth), there will be a shift in the overall operation of the transportation system. Retail land uses generate higher amounts of trips per acre of land than households and most other land uses. The location and design of retail land uses in a community can greatly affect transportation system operations. Additionally, if a community is homogeneous in land use character (i.e. all employment or residential), the transportation system must support significant trips coming to or from the community rather than within the community. Typically, there should be a mix of residential, commercial, and employment type land uses so that some residents may work and shop locally, reducing the need for residents to travel long distances.

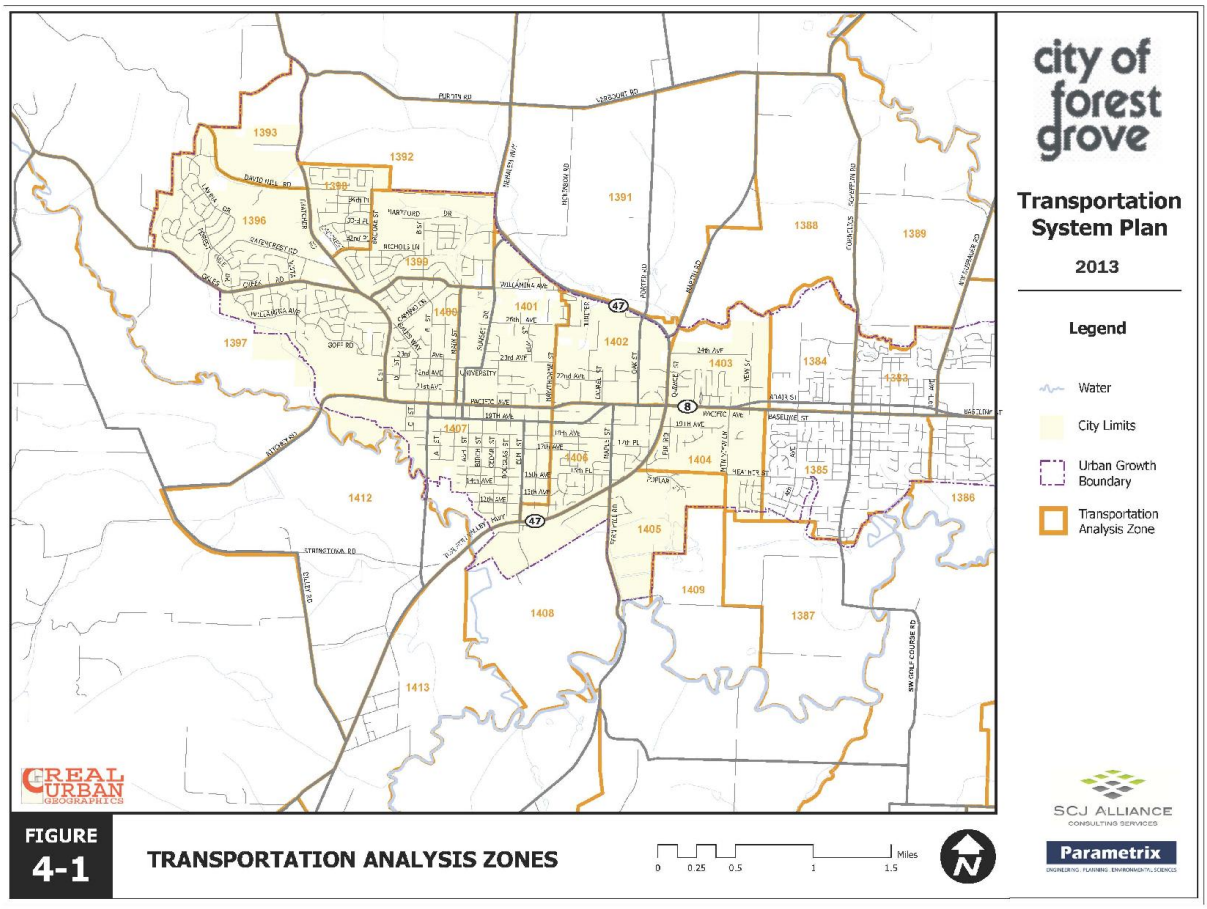
As shown in Table 4-1, the future 2035 land use indicates moderate growth in housing with more significant growth in employment within the TSP study area. The major residential growth areas are the far northwest portion of the city (near David Hill Road, east and west of Thatcher Road) and the southwest portion of the city (south of Pacific Avenue, west of B Street). The major employment growth areas include the central city area and the south portion of the city (south of Highway 47, west of Fern Hill Road). The transportation system should be monitored to make sure that land uses in the plan are balanced with transportation system capacity.

4.2 Travel Forecasting

4.2.1 Metro Area Travel Demand Model

The objective of the transportation planning process is to provide the information necessary for making decisions on when and where improvements should be made to the transportation system to meet expected travel demand. A determination of future traffic system needs in Forest Grove requires the ability to accurately forecast travel demand resulting from estimates of future population and employment for the City. As part of the Regional Transportation Plan (RTP) update process, Metro has developed an urban area travel demand model that reflects the land use and travel behavior characteristics of the region. For the Forest Grove TSP, the regional 2035 Gamma travel demand model associated with the next update to the 2010 RTP was used as a basis to develop future forecasts.

Figure 4-1. Transportation Analysis Zones



The roadway network used in the traffic model represents the existing street and highway system. Some local streets were included in the model, but many are represented by centroid connectors in the model process. Future roadway improvements were added to the 2035 model to mitigate the impacts of motor vehicle traffic growth, using the RTP Financially Constrained System as a starting point.

Forecasts of PM peak hour traffic flows were produced for key roadways within the Forest Grove TSP study area. Traffic volumes were projected on all arterials and most collector streets. The resulting traffic volumes were verified against 2007 turn movement counts.

Traffic forecasting can be divided into several distinct but integrated components that represent the logical sequence of travel behavior. These components and their general order in the traffic forecasting process are as follows:

- Trip Generation
- Trip Distribution
- Mode Choice
- Traffic Assignment

Trip Generation

The trip generation process translates land use quantities (number of dwelling units, retail, and other employment) into vehicle trip ends (number of vehicles entering or leaving a TAZ or sub-TAZ) using trip generation rates established during the model verification process. The Metro trip generation process is elaborate, entailing detailed trip characteristics for various types of housing, retail employment, non-retail employment, and special activities. The trip rates are based on travel survey data for the Metro area. The model process is tailored to variations in travel characteristics and activities in the region.

Table 4-2 illustrates the estimated growth in total vehicle trips between 2010 and 2035 for both the Baseline scenario and the Preferred Alternative. Included are trips both inbound to and outbound from each TAZ in the study area that were generated during the 2-hour PM peak period. Vehicle trips in Forest Grove would grow by approximately 54 percent between 2010 and 2035 if the land develops according to Metro's RTP Gamma 2035 land use assumptions. Vehicle trips would grow by about 58 percent with the Preferred Alternative. Assuming a 25-year horizon to the 2035 scenario, this represents annualized growth rate of about 1.74 percent per year for Baseline conditions and 1.84 percent per year for the Preferred Alternative.

Table 4-2. Forest Grove Vehicle Trip Generation (2-Hour PM Peak Period)

		2035 Trips	
	2010 Trips	**2035**	**Percent Increase**
Forest Grove TSP Update Study Area	14,268	22,536	58%

Source: Metro, 2012

The magnitude of increase in PM peak vehicle trips is smaller than the non-residential land use increases in Table 1 as a result of expected changes in travel behavior. Changes in mode choice, trip distribution, and new social demographics can all impact travel patterns compared to existing conditions. Travelers may increase carpooling, walking, biking or transit usage relative to single occupancy vehicle travel. Trip

distribution to destinations in closer proximity to origins is likely to occur with increased development. Additionally, shifts in travel to off-peak time periods may occur with increased congestion.

Trip Distribution

This step estimates how many trips travel from one zone in the model to any other zone. Distribution is based on the number of trip ends generated in each zone pair and on factors that relate the likelihood of travel between any two zones to the travel time between zones. In projecting long-range future traffic volumes, it is important to consider potential changes in regional travel patterns. Although the locations and amounts of traffic generation in Forest Grove are essentially a function of future land use in the city, the distribution of trips is influenced by regional growth. External trips (trips that have either an origin and not a destination in Forest Grove or have a destination but not an origin in Forest Grove) and through trips (trips that pass through Forest Grove and have neither an origin nor a destination in Forest Grove) were projected using trip distribution patterns based upon census data and traffic counts performed at gateways into the Metro area Urban Growth Boundary (UGB).

As an example, this step determines how many of the total trips originating in TAZ 1321 (the TAZ representing the neighborhoods west of E Street and south of Gales Creek Road) have destinations in each other TAZ within the Portland Metro region. While most of these trips end up with destinations to other TAZs within Forest Grove, a percentage of these trips will be destined for TAZs as far away as Wilsonville, Gresham or Vancouver. Some trips may also be allocated to external zones, representing travel to areas outside of the Portland Metro area.

Mode Choice

This step determined how many trips will be taken by various modes (single-occupant vehicle, transit, carpool, pedestrian, bicycle, etc.). The 2010 mode splits are incorporated into the base model and adjustments to mode split may be made for the future scenarios, depending on any expected changes in transit or carpool use. These considerations are built into the forecasts used for 2035.

Traffic Assignment

In this process, trips from one zone to another are assigned to specific travel routes in the network, and resulting trip volumes are accumulated on links of the network until all trips are assigned.

Network travel times are updated to reflect the congestion effects of the traffic assigned through an equilibrium process. Congested travel times are estimated using a series of factors, all of which attempt to simulate the impact of congestion on travel times (greater delay) as traffic volume increases. These factors take into account the specific characteristics of each roadway link, such as capacity, speed and facility type. This allows the model to reflect conditions somewhat similar to driver behavior.

4.2.2 Model Verification

The base 2010 modeled traffic volumes were compared against actual traffic volume counts across screenlines, on key arterials and at key intersections. Most arterial traffic volumes meet screenline tolerances for forecast adequacy. Based on this performance, the model was used for future forecasting and assessment of future roadway improvements.

4.2.3 Model Application to Forest Grove

Intersection turn movements were extracted from the Forest Grove enhanced model at key intersections for both the base year 2010 and forecast year 2035 scenarios. These intersection turn movements were not used directly, but a portion of the increment of the 2035 turn movements over the 2010 turn movements was added to existing (2007) turn movement counts in Forest Grove. A post processing technique was utilized to refine model travel forecasts to the volume forecasts utilized for

2035 intersection analysis. The turn movement volumes used for future year intersection analysis can be found in Appendix E.

4.3 Future Traffic Operations Analysis

Motor vehicle capacity needs within the TSP study area were determined for future conditions. This section presents the capacity analysis conducted to determine the street improvements that would be necessary as part of a long-range Preferred Plan.

2035 traffic volume forecasts were analyzed to identify locations where evening peak hour performance will drop below minimum desirable levels. This analysis focuses on study intersections. Traffic volumes were developed as described above and applied to existing intersection geometries. The value in reviewing the motor vehicle system performance is that it highlights where the planned system fails to meet performance standards. These locations will be reviewed to consider street improvements alternatives that could better serve planned growth.

4.3.1 Intersection Operation Performance Standards

Level of Service, delay and volume-to-capacity ratios are used as measures of effectiveness for study intersection performance. As part of its adoption of the 2010 TSP, the City endorsed use of a minimum standard Level of Service (LOS) D to determine project improvement needs. ODOT and Washington County standards apply to roadways under their jurisdiction. The applicable intersection operational standards for Washington County and ODOT are summarized below.

ODOT defines a maximum volume-to-capacity ratio for Highway 47 and Highway 8 (Tualatin Valley or TV Highway) of 0.99[10]. Washington County defines acceptable performance in urban areas as volume-to-capacity ratio of 0.99 with LOS E or better[11].

4.3.2 2035 Land Use

Analysis of the transportation impacts associated with the 2035 land use includes several transportation improvements that are reasonably funded and likely to be constructed by 2035. Several roadway improvements are already planned for the Forest Grove area by various agencies. Washington County's MSTIP includes projects in Forest Grove that are funded by Washington County with some federal assistance. Metro's Regional Transportation Plan includes elements for state facilities that are federally mandated in the State Transportation Improvement Program (STIP) and other local plan components (MTIP). Table 4-3 summarizes the planned improvements near Forest Grove that are included in the baseline 2035 roadway network.

For purposes of analysis in this base scenario, only the addition of a westbound right turn lane to the intersection of Highway 8 (Pacific Avenue) and Highway 47 (Quince Street) was included since that now exists. While this intersection experiences significant delay in existing and future conditions, in order to qualify for some funding sources, the intersection must have performance measures that are below identified minimum performance standards.

[10] *Oregon Highway Plan, Policy Element*, Table 7, Oregon Department of Transportation, 1999.
[11] *Washington County 2020 Transportation System Plan*, Washington County, 2002.

Table 4-3. Planned Transportation Improvements in 2035 Model

Description/Location	Project/Limits	Jurisdiction
Heather Industrial Connector	Extend from western terminus in the City of Cornelius to Highway 47.	Forest Grove/ Wash Co.
23rd/24th Avenue Extension	Construct collector roadway between Hawthorne Avenue and Highway 47.	ODOT/ Forest Grove
Highway 8 / Highway 47 Intersection Improvements	Turn lanes and traffic signal modification.	ODOT/Forest Grove

Source: Metro / Washington County

Traffic Operational Performance

Table 4-4 summarizes intersection performance for the 2035 Preferred Land Use Alternative. Based on the analysis, a majority of the study intersections would meet performance standards with the capacity improvements identified above. The table includes information for each intersection including the relevant operational standard based on roadway jurisdiction (e.g., ODOT, Washington County or City), Level of Service for the through unstopped movement and the worst case stopped movement, average delay for the worst case stopped movement, and volume-to-capacity ratio for the worst case stopped movement.

Several unsignalized intersections would operate with LOS F for the minor street approach. Eight intersections are expected to fail to meet operational standards, with volume-to-capacity ratios exceeding 1.0 for the minor approach (typically vehicles attempting to make left turns across major street traffic). Five of these intersections are located along Highway 47 both to the north and south of Pacific Avenue. Three intersections are located in the northeastern portion of the city between Oak Street/Porter Road and 24th Avenue, including Martin Road. Two intersections are located along Highway 47 south of Pacific Avenue at Maple and Elm Streets. The remaining two intersections include the County road intersection of Gales Creek and Thatcher Roads, and the City intersection of 19th Avenue at B Street.

For these intersections, the majority of traffic flowing along the major approaches experiences no delay. However, turning vehicles may experience significant delay potentially leading to queuing or even route diversion. Mitigation for these intersections typically entails either additional turn lanes or installation of traffic signals.

One signalized intersection would exceed applicable operational standards – Pacific Avenue at Quince Street (Highway 8 at Highway 47). The existing RTP includes improvements at this intersection which are anticipated to be constructed over the next year or two. 2035 Preferred Alternative traffic operational worksheets are included in Appendix F.

Preliminary Traffic Signal Warrants

Installation of traffic signal controls at unsignalized intersections has the potential to improve traffic operations and safety for both vehicles and pedestrians. Preliminary traffic signal warrants[12] were evaluated at all unsignalized study intersections that failed to meet performance standards under 2035 traffic volume conditions with the Preferred Land Use Alternative. The Peak Hour Warrant analysis was

[12] Preliminary Traffic Signal Warrants, MUTCD Warrant 1 (Eight-Hour Vehicular Volume), TPAU Procedure Manual, ODOT.

Table 4-4. 2035 PM Peak Hour Traffic Operations

No.	Intersection	Operational Standard	2035 Level of Service (LOS) [1]	2035 Average Delay (Seconds) [2]	2035 Volume / Capacity (V/C) [2]
	Unsignalized Intersections				
1	Gales Creek Road/Forest Gale Drive	LOS E/0.99	A/B	14.5	0.20
2	Thatcher Road/Watercrest Road	LOS E/0.99	A/B	14.8	0.07
3	Gales Creek Road/Thatcher Road	LOS E/0.99	**A/F**	**196.8**	**1.28** [3]
4	Gales Creek Road/Willamina Avenue	LOS E/0.99	A/D	26.8	0.56
5	Sunset Drive/Willamina Avenue	LOS E/0.99	A/C	15.5	0.47
6	Sunset Drive/26th Avenue	LOS E/0.99	A/A	9.8	0.10
7	23rd Avenue/B Street	LOS D	A/C	17.2	0.34
8	23rd Avenue/Main Street	LOS D	A/C	15.6	0.31
9	Pacific Avenue/E Street	LOS E/0.99	A/D	28.7	0.59
10	19th Avenue/Council Street	LOS D	A/B	13.5	0.15
11	Highway 47/Verboort&Purdin	V/C=0.99	A/F	70.3	0.71 [4]
12	Highway 47/Porter Road&Oak Street	V/C=0.99	**A/F**	**>200**	**1.29** [3]
13	Highway 47/Martin Way	V/C=0.99	**A/F**	**124.3**	**1.20**
14	Highway 47/24th Avenue	V/C=0.99	**A/F**	**>200**	**1.95** [3]
15	Highway 47/19th Avenue	V/C=0.99	A/C	24.9	0.35
16	Highway 47/Poplar Street	V/C=0.99	A/E	41.2	0.62
17	Highway 47/Maple St/Fern Hill Rd	V/C=0.99	**A/F**	**>200**	**>2.00**
18	Highway 47/Elm Street	V/C=0.99	**A/F**	**>200**	**1.37**
19	Highway 47/B Street	V/C=0.99	A/F	197.6	0.92
20	Adair Street/Yew Street	V/C=0.99	**A/F**	**>200**	**>2.00**
21	Baseline Street/Yew Street	V/C=0.99	A/F	120.2	0.91
	All-Way Stop Controlled Intersections				
22	19th Avenue/B Street*	LOS D	**F**	**62.4**	**0.80** [3]
23	B Street/Willamina Avenue	LOS D	B	12.5	0.48
24	Bonnie Lane/B Street	LOS D	A	8.5	0.30
	Signalized Intersections				
25	Highway 47/Sunset Drive	V/C=0.99	B	19.6	0.61
26	Pacific Avenue/Quince Street	V/C=0.99	**E**	**78.8**	**1.02** [3]
27	Pacific Avenue/Mt. View Lane	V/C=0.99	B	11.0	0.86
28	Pacific Avenue/B Street	LOS D	D	46.2	0.72
29	Pacific Avenue/Main Street	LOS D	A	8.5	0.56
30	Pacific Avenue/College-Council	LOS D	B	12.5	0.51
31	Pacific Avenue/Elm Street	LOS D	A	9.3	0.66
32	Pacific Avenue/Maple Street	LOS D	B	19.1	0.89

* The atypical signal control at this intersection is treated as a four-way stop for LOS calculations.
1 First value is free movement, second value is worst stopped movement.
2 Worst stopped movement for minor street average delay reported for unsignalized intersections.
3 Development of local street connections will divert enough traffic from this intersection to meet standards. Monitor.
4 Development of local street connections may divert added WB traffic to this location requiring improvements. Monitor.
Source: SCJ Alliance

based on PM peak hour traffic volumes. The results of this analysis are shown in Table 4-5. Appendix G includes traffic signal analysis worksheets.

Table 4-5. 2035 Signal Warrant Analysis

Intersection	Signal Warrant Met?
Gales Creek Road/Thatcher Road	No
Highway 47/Oak-Porter	Yes
Highway 47/Martin Road	Yes
Highway 47/24th Avenue	Yes
Highway 47/Maple Street	Yes
Highway 47/Elm Street	Yes
Adair Street/Yew Street	Yes
19th Avenue/B Street	No

Preliminary traffic signal warrants were met at several study intersections under 2035 traffic volume conditions with the Preferred Land Use Alternative. Intersections meeting PM peak hour traffic signal warrants should be analyzed at a future date based on Eight Hour Warrants before construction of a traffic signal occurs. Meeting traffic signal warrants does not guarantee that a signal will be installed, but provides criteria that should be utilized along with engineering judgment.

4.4 Intersection Improvements

4.4.1 Improvement Options

An assessment was conducted of the results of signalization at the intersections of Highway 47 with Oak/Porter, Martin and 24th, which were assumed to operate in coordination. While analysis shows that each intersection would benefit from signalization, traffic queuing impacts are expected between Martin Road and 24th Avenue, making it necessary to consider a different solution to traffic circulation impacts in this area.

The initial lane configuration assumed in the analysis of future traffic operations at the intersection of Pacific Avenue with Quince Street (Highway 47) includes the addition of a westbound right turn lane consistent with the analysis conducted for the 2010 TSP. Even with this addition, the intersection would fail under 2035 PM peak hour conditions. Accordingly, the addition of a southbound right turn lane was considered, consistent with the improvement currently proposed for this location. With the addition of this improvement, the intersection is expected to operate at an acceptable LOS D with a V/C ratio of 0.94. However, there are potential queuing impacts that could occur for specific movements on all legs of the intersection.

The assessment of signalization on Highway 47 south of Pacific Avenue included the intersections of both Maple and Elm Streets. These intersections were assumed to operate in actuated, uncoordinated mode due to extent of their separation from other signalized locations. Traffic operations at both locations with the addition of signals would be acceptable. It should also be noted that installation of these signals may also help to provide gaps in traffic to facilitate egress from stop-controlled side streets at other nearby intersections. However, it should be noted that the addition of these signals would not meet ODOT signal spacing standards. Additionally, signalization of the intersection of Gales Creek Road at Thatcher Road would also result in acceptable traffic operational performance. Worksheets for the analysis of improvement options are included in Appendix H.

4.4.2 Potential Impacts of Local Street Improvements on Key Intersections

A second travel demand model run was conducted for the Preferred Land Use Alternative that included all of the new local street and connectivity improvements that are shown in Figure 8-7 including the extension of David Hill Road from its current terminus eastward to intersect at Highway 47. The results of operations analysis for this model run are presented in Table 4-6. Note that the results of both signalized and unsignalized traffic operations at the intersection of Highway 47 with David Hill Road have been included in the table. Signalization of this location would be appropriate when warranted. Intersection traffic operations analysis worksheets for this scenario are included in Appendix L.

Key observations related to the effect of adding enhanced local street connectivity throughout the City are as follows:

- **Gales Creek Road at Thatcher Road**: With the addition of the Vista Drive and Talisman Lane extensions between Gales Creek and Thatcher Roads a significant volume of existing and projected future traffic would be diverted away from the intersection of Gales Creek and

Table 4-6. 2035 PM Peak Hour Traffic Operations with Added Local Street Connectivity

			2035		
No.	Intersection	Operational Standard	Level of Service (LOS) [1]	Average Delay (Seconds) [2]	Volume / Capacity (V/C) [2]
	Unsignalized Intersections				
1	Gales Creek Road/Forest Gale Drive	LOS E/0.99	A/C	18.4	0.25
2	Thatcher Road/Watercrest Road	LOS E/0.99	A/C	17.2	0.09
3	Gales Creek Road/Thatcher Road	LOS E/0.99	A/B	11.6	0.24
4	Gales Creek Road/Willamina Avenue	LOS E/0.99	A/B	11.3	0.09
5	Sunset Drive/Willamina Avenue	LOS E/0.99	A/B	14.7	0.16
6	Sunset Drive/26th Avenue	LOS E/0.99	A/B	12.6	0.44
7	23rd Avenue/B Street	LOS D	A/C	16.2	0.32
8	23rd Avenue/Main Street	LOS D	A/B	12.4	0.23
9	Pacific Avenue/E Street	LOS E/0.99	A/D	26.3	0.28
10	19th Avenue/Council Street	LOS D	A/B	13.0	0.13
11	Highway 47/Verboort&Purdin	V/C=0.99	**A/F**	**>200**	**>2.00** [3]
12	Highway 47/Porter Rd &Oak Street	V/C=0.99	A/E	36.1	0.65
13	Highway 47/Martin Way	V/C=0.99	**A/F**	**>200**	**>2.00**
14	Highway 47/24th Avenue	V/C=0.99	**A/D**	**25.7**	**0.53**
15	Highway 47/19th Avenue	V/C=0.99	A/C	21.2	0.31
16	Highway 47/Poplar Street	V/C=0.99	A/D	26.8	0.48
17	Highway 47/Maple St/Fern Hill Rd	V/C=0.99	**A/F**	**>200**	**>2.00**
18	Highway 47/Elm Street	V/C=0.99	**A/F**	**172.2**	**1.20**
19	Highway 47/B Street	V/C=0.99	A/E	143.9	0.77
20	Adair Street/Yew Street	V/C=0.99	**A/F**	**>200**	**>2.00**
21	Baseline Street/Yew Street	V/C=0.99	A/F	120.2	0.91
33	Highway 47/David Hill Road	V/C=0.99	A	8.4	0.60
	All-Way Stop Controlled Intersections				
22	19th Avenue/B Street*	LOS D	B	14.2	0.55
23	B Street/Willamina Avenue	LOS D	B	12.1	0.48

No.	Intersection	Operational Standard	2035 Level of Service (LOS) [1]	2035 Average Delay (Seconds) [2]	2035 Volume / Capacity (V/C) [2]
24	Bonnie Lane/B Street	LOS D	B	10.5	0.36
	Signalized Intersections				
25	Highway 47/Sunset Drive	V/C=0.99	B	16.1	0.50
26	Pacific Avenue/Quince Street	V/C=0.99	D	53.4	0.97
27	Pacific Avenue/Mt. View Lane	V/C=0.99	B	11.4	0.84
28	Pacific Avenue/B Street	LOS D	C	28.4	0.65
29	Pacific Avenue/Main Street	LOS D	A	9.7	0.55
30	Pacific Avenue/College-Council	LOS D	C	27.1	0.39
31	Pacific Avenue/Elm Street	LOS D	B	11.1	0.61
32	Pacific Avenue/Maple Street	LOS D	C	20.4	0.96
33	Highway 47/David Hill Road	V/C=0.99	**F**	**>200**	**1.54**

* The atypical signal control at this intersection is treated as a four-way stop for LOS calculations.
1 First value is free movement, second value is worst stopped movement.
2 Worst stopped movement for minor street average delay reported for unsignalized intersections.
3 Development of local street connections may divert added WB traffic to this location requiring improvements. Monitor.
Source: SCJ Alliance

Thatcher Roads. Without these improvements it will be necessary to signalize or otherwise improve traffic operations at the Gales Creek/Thatcher intersection. With these road extensions, major improvements would not be needed.

- **Highway 47 at Verboort Road/Purdin Road**: A redistribution of traffic onto Verboort Road from destinations to the north and east would result in increased westbound right turn volumes at the intersection of this street with Highway 47. This redistribution is destined, in part, to the proposed mixed use development in the northwestern portion of the city facilitated by the extension of David Hill Road to intersect with Highway 47. This redistribution also draws westbound traffic away from the Highway 47/Martin Road intersection, helping to address expected future congestion problems at this location.
- **Highway 47 at Martin Road and 24th Avenue**: As noted above, the addition of new local and arterial street connections in the northwestern portion of the City will help to reduce regional traffic entering the city via Martin Road. However, these intersections would be significantly affected by the addition of a street connection to the west of Highway 47, aligning with Martin Road. This new street will connect with 23rd Avenue, ultimately serving a potential future Transit-Oriented Development growth area. The addition of this new east/west collector street would help to reduce through traffic volumes along Highway 47, but would worsen traffic operations at Martin Road, exacerbating the need for intersection improvements that could include signalization. This in turn affects the operation of Highway 47 at 24th Avenue which lies in close proximity to Martin Road.
- **19th Avenue at B Street**: This intersection would see a significant change in traffic patterns with the extension of 19th Avenue westerly to connect with Pacific Avenue at E Street and/or to continue west to connect with the existing southern terminus of Strasburg Drive. The major movement of traffic at this location would change from a heavy southbound left turn (nearly 600 vehicles per hour with the Preferred Alternative) to a more evenly balanced split between southbound lefts and eastbound through movements with the Added Streets scenario. Traffic operations for the southbound movement would improve from LOS F to LOS B.

5. PEDESTRIAN SYSTEM PLAN

With the foundations of an excellent pedestrian system already in place, Forest Grove has the potential to become one of the region's most walkable communities. This chapter identifies priorities for improving this system over the next 20 years. Building upon existing local and regional planning efforts, the Preferred Plan pedestrian network reflects the extensive input offered by City staff, stakeholder groups, and Forest Grove residents. This chapter focuses on pedestrian infrastructure improvements, while Appendix I includes programmatic strategies for improving walking and bicycling in Forest Grove.

5.1 Preferred Plan Pedestrian Network

The pedestrian network builds upon Forest Grove's existing system of sidewalks, shared use paths, neighborhood accessways and other pedestrian infrastructure currently in place. Depicted in the proposed Pedestrian System Plan (Figure 5-3), Preferred Plan projects are intended to enhance pedestrian safety and convenience while making walking a more attractive travel mode. These projects include filling gaps in the sidewalk system, developing an interconnected shared use path network, and targeting specific intersections for pedestrian crossing enhancements. The pedestrian network was developed based on extensive input from previous planning efforts as well as input from the Project Advisory Group, City leaders and Forest Grove residents. It should be noted that most future shared use path corridors depicted on the system map represent conceptual alignments, with further evaluation needed to identify specific routes. The sections below discuss specific pedestrian facilities in greater detail, while Table 5-1 at the end of this chapter presents the project list.

5.1.1 Sidewalks

Forest Grove benefits from a relatively complete sidewalk system in several areas, including the downtown core, immediate surrounding neighborhoods, and on recently-constructed and reconstructed streets such as Sunset Drive and portions of David Hill Road. A City ordinance requires sidewalks to be built along new roads and as properties redevelop along existing streets. Forest Grove's 2013-2018 Capital Improvements Program (CIP) identifies new street corridors that will include sidewalks, including:

- A new street roughly following the 23rd/24th Avenue alignment between Hawthorne Street and Highway 47
- An extension of 19th Avenue between Oak Street and Highway 47
- An extension of David Hill Road between Brooke Street and Highway 47

In addition to the new street following the 23rd/24th Avenue alignment (mentioned above), Metro's RTP also shows several new streets that would include sidewalks, including:

- An extension of 19th Avenue west of B Street, connecting with the existing Pacific Avenue and E Street intersection
- An extension of Heather Street between Mountain View Lane and Poplar Street

New and realigned street corridors shown in this TSP will include sidewalks, as will streets identified for widening and/or reconstruction.

The major challenge facing Forest Grove lies in retrofitting existing streets where sidewalks are fragmented or lacking altogether, and in areas where significant redevelopment is not expected to

occur. Completing some sidewalk links can be challenging, especially in older residential areas where residents have developed fencing and landscaping within the public right-of-way, and may consider those areas to be part of their personal space. In addition, some residents may not want traditional sidewalks due to the rural look of their neighborhoods, and potential impacts to mature landscaping and trees. Regardless, the public right-of way that is generally located on either side of the paved driving and parking area is intended for walking, whether or not a sidewalk currently exists.

The City is taking an active role in completing sidewalk infill projects, as demonstrated by recent sidewalk improvements in the downtown core and surrounding areas. The CIP includes several planned sidewalk infill projects, including Gales Way between E Street and 23rd Avenue, B Street between 19th Avenue and the Gales Creek Bridge, and 18th Avenue between Hawthorne and Maple streets. The CIP also includes a "Town Center Pedestrian Improvements" project to replace deteriorated sidewalks in the downtown core.

This Plan continues the City's efforts of expanding the sidewalk system through street construction, reconstruction, and sidewalk infill projects. While the Pedestrian System Plan (Figure 5-3) depicts future sidewalks on Collector and Arterial roadways, the City should work to provide sidewalks on all streets to enhance pedestrian connectivity. Specific corridors that would especially benefit from sidewalk improvement projects include Willamina Avenue, B Street, Mountain View Lane, Gales Creek Road, and Highway 8. The City should also work with local schools to provide continuous sidewalks linking residential areas with school campuses, including sidewalks leading directly to school building entrances.

5.1.2 Intersection Improvements

Although pedestrian crossings at intersections represent a major challenge in Forest Grove's existing walking environment, improvement opportunities exist. This Plan has an overall strategy to improve intersections and other pedestrian crossings through a variety of treatments. Most intersections that could benefit from improvements are located on streets with wide cross-sections (e.g., with multiple travel lanes), higher vehicle speeds and volumes, and/or other conditions complicating pedestrian crossing movements. Examples include intersections along Highway 8 east of the Pacific/19th couplet, the trail/roadway crossings along Highway 47, and the intersection of Gales Creek Road and Thatcher Road. This Plan also identifies intersection improvements as part of several proposed Bicycle Boulevard corridors to facilitate easy and safe crossings for bicyclists and pedestrians at major streets. The Bicycle System Plan chapter (Chapter 6) discusses Bicycle Boulevards in greater detail.

The following sections describe treatments the City could use to improve pedestrian crossings at intersections.

5.1.3 Signal Timing Evaluation and Modification

Traffic signals in Forest Grove are either pre-timed or actuated. Pre-timed signals accommodate pedestrian crossings through automatic phasing concurrent with parallel vehicle traffic. At actuated signals, pedestrians usually push an activation button to trigger the walk signal. Providing adequate pedestrian crossing time is a critical element of the walking environment at signalized intersections. The Manual on Uniform Traffic Control Devices (MUTCD) recommends traffic signal timing to assume a pedestrian walking speed of 3.5 feet per second, meaning that the length of a signal phase with parallel pedestrian movements should provide sufficient time for a pedestrian to safely cross the adjacent street. It should be noted however that the four feet per second walking speed does not reflect the walking rates of many users. At crossings where children, older pedestrians or pedestrians with disabilities are expected, crossing speeds as low as three feet per second may be assumed. Jurisdictional responsibility for signals depends on the intersection under focus, therefore the City and ODOT should periodically evaluate signal timing plans to ensure adequate pedestrian crossing times are provided.

5.1.4 Innovative Pedestrian Signal Features

Pedestrian Countdown Signals

According to the Manual on Uniform Traffic Control Devices (MUTCD), "Pedestrian Signal Heads provide special types of traffic signal indications exclusively intended for controlling pedestrian traffic. These signal indications consist of the illuminated symbols of a WALKING PERSON (symbolizing WALK) and an UPRAISED HAND (symbolizing DON'T WALK)." An advanced type of pedestrian signal head contains a countdown signal, in addition to the WALK/DON'T WALK symbol. The countdown signal displays the number of seconds remaining for the individual to complete their crossing (see Figure 5-1). These applications could be effective throughout Forest Grove, including in the downtown core (where higher volumes of pedestrians exist) and along streets with wide pedestrian crossing distances such as Highway 8 east of the Pacific/19th couplet.

Figure 5-1. Pedestrian Countdown Signal

Leading Pedestrian Interval (LPI)

Including LPIs at signalized crossings provides pedestrians with a three- to four-second head start into the intersection before parallel traffic is released by the green light. LPIs ensure that pedestrians are well into the intersection and visible to turning vehicles prior to vehicles entering the crosswalk.

Accessible Pedestrian Signals

Accessible pedestrian signals supplement pedestrian signal indications with audible and/or vibrotactile information. These treatments include directly-audible or transmitted tones, speech messages, Talking Signs, and/or vibrating surfaces. They are intended to make real-time pedestrian signal information accessible to visually-impaired pedestrians. Audible signals can also provide directional guidance, which is particularly useful at non-perpendicular intersections and at wide multi-lane crossings. Many different technologies exist. Newer signal types have a quiet, slowly repeating locator tone indicating to approaching pedestrians that they must push a button to trigger a WALK signal. Directly-audible or transmitted speech messages can identify the location of the intersection and the specific crosswalk controlled by that push button. A vibrating arrow at the push button can also supplement the audible signals. To be considered for audible signals, an intersection must first meet the following basic criteria:

- The intersection must already be signalized;
- The location must be suitable for audible signals in terms of safety, noise level, and neighborhood acceptance;
- There must be a demonstrated need for an audible signal device (typically through a user request).

5.1.5 Curb Ramps

Curb ramps are a fundamental element of an accessible pedestrian system. A sidewalk without a curb ramp can be useless to someone in a wheelchair, forcing them back to a driveway and out into the street for access. Likewise, street crossings must be aligned and properly designed to accommodate the needs and desires of all people. Many of the single access ramps built in previous decades direct users

diagonally into the intersection (rather than straight into the crosswalk area). This can be problematic for visually-impaired pedestrians as they could experience difficulty orienting themselves toward the crosswalk. Where possible, all intersection corners should provide dual curb ramps oriented directly across the street, as shown in Figure 5-2. Curb ramps should also have detectable warning strips to accommodate the visually-impaired.

Figure 5-2. Dual Curb Ramps with Detectable Warning Strips

5.1.6 Streetscape Improvements

Pacific University's Master Plan proposes several streetscape and pedestrian "gateway" treatments that could vastly improve the walking and bicycling environment where the University campus meets surrounding city streets. Specifically, the Plan recommends streetscape improvements along the segments of University Avenue and College Way bordering the campus, and along 21st Avenue between Main Street and College Way. The Master Plan also recommends "gateway" treatments for the intersections of University Avenue at Sunset Drive, Main Street at 21st Avenue, and College Street at 21st Avenue. Streetscape and gateway treatments typically include wide sidewalks, planter strips, crosswalk pavement texturing, pedestrian-scale lighting, street trees, and other elements emphasizing bicycle/pedestrian comfort and safety. The City of Forest Grove should actively pursue opportunities to implement these projects to strengthen the University's connection with the surrounding community.

5.1.7 Shared Use Paths

Today, Forest Grove has the foundation of what could be an excellent interconnected path system. The base of this system includes the Highway 47 path, internal paths within city parks, and numerous neighborhood accessways. The City is also actively pursuing path development opportunities, as exhibited by recent efforts to construct the Gales Creek Trail, and the formation of a committee to complete a trail along Council Creek. The recently-completed Community Trails Plan provides the base of Forest Grove's future shared use path network. The City should keep this momentum going by pursing path development opportunities, some of which are discussed below.

5.1.8 Opportunities to Formalize/Enhance Existing Paths

Relatively small-scale improvements could substantially enhance the path system already in place. In southern Forest Grove for instance, the Highway 47 path serves as a critical transportation and recreation facility; yet cracking and heaving on some segments complicates bicycle and pedestrian travel. The City and ODOT could upgrade and repave these segments. The City could go a step further by formalizing Highway 47 path access points at several neighborhood streets. Today, users have created informal demand paths to access the Highway 47 path from nearby residential neighborhoods. The City should also improve path/roadway crossings that currently pose difficulties for non-motorized users. Specific problem areas include intersections along the Highway 47 path (mentioned above), and the existing path/roadway crossing at Larabee Street in northern Forest Grove (this crossing currently lacks curb ramps).

5.1.9 New Path Corridors

Forest Grove's Community Trails Plan lays out a citywide trail system to meet the transportation and recreation needs of residents and visitors. The Plan's vision is centered on the "Emerald Necklace," a combination of shared use paths (including segments of the planned and proposed Gales Creek and Council Creek trails), soft surface trails, and on-street facilities forming a loop around the city. The Preferred Plan also identifies potential connections to bicycle/pedestrian destinations outside the city, including Hagg Lake (via Carpenter Park), Gaston (via a former railroad corridor), Banks (via Highway 47), and Fernhill Wetland (via Council Creek).

Metro's Regional Transportation Plan (RTP) also identifies several future shared use path corridors, including a path roughly following Forest Grove's western urban growth boundary between Richey Road and David Hill Road. The RTP also proposes a shared use path along David Hill Road between Forest Gale Drive and Thatcher Road.

5.1.10 Path Feasibility Studies

Path feasibility studies devote detailed attention to specific trail projects. These studies examine a particular path corridor in-depth, and include opportunities-and-constraints analyses, development of potential path alignment options, selection of a preferred alignment, and preliminary cost estimates. Feasibility studies are particularly useful for agencies exploring potential path corridors in areas faced with topographic, environmental, political or other challenges. Forest Grove residents and trail advocacy groups have consistently expressed a desire for shared use paths in potentially-challenging areas, most notably along Council Creek.

Metro has also identified the Council Creek Trail as an element of a future regional trail system. Roughly following Council Creek, this trail would pass through Banks, Forest Grove and Cornelius, connecting with existing and planned segments of the Banks-Vernonia Trail, Gales Creek Trail, and the Turf-to-Surf Trail. This Plan recommends conducting a feasibility study to evaluate potential local alignments for the Council Creek Trail. This effort would demonstrate the City's commitment to enhancing both local and regional trail connections.

5.1.11 Accessways

Forest Grove benefits from a comprehensive system of accessways providing direct bicycle/pedestrian connections in areas with limited street system connectivity. Opportunities exist to improve existing accessways, such as paving uncompleted accessway segments (e.g., the accessway connecting Forest Grove High School with Hartford Drive). The City should inventory its existing accessway network and identify and implement necessary improvements.

The City should also explore accessway development opportunities in existing neighborhoods and continue developing accessways in future residential subdivisions. Opportunities in existing neighborhoods include an undeveloped north-south corridor in the Homestead subdivision in eastern Forest Grove. Development of an accessway in this neighborhood would directly connect non-motorized users with Heather Street and Fern Hill Elementary School. The City should also continue developing accessways in future urban expansion areas (e.g., in northern Forest Grove) to maximize bicycle and pedestrian connectivity.

5.1.12 Pedestrian and Bicycle Access to Transit

Tremendous opportunities exist for increasing pedestrian/bicycle-transit partnerships in Forest Grove and throughout TriMet's service area. Pedestrian infrastructure improvements within ½ mile of transit stops enhances pedestrian safety, comfort, and may generate more ridership since most passengers

start and end their trips as pedestrians. Integrating bicycles with transit allows the bicyclist to overcome barriers such as hills, inclement weather, night riding, and breakdowns. To improve the pedestrian/bicycle-transit link, Forest Grove and TriMet should:

- Complete the sidewalk network on both sides of streets along the Line 57 bus route (specifically along Highway 8 east of the Pacific/19th couplet, and on streets leading to the bus route) to ensure connectivity and accessibility for all users;
- Provide benches, shelters, lighting, maps and Transit Tracker ID numbers posted at major transit stops, and signs and Transit Tracker ID numbers at all other transit stops;
- Establish criteria for prioritizing investments in, and location of, secure bicycle parking at or near transit stops (including bike racks for short-term parking, and bicycle lockers or other facilities for long-term parking);
- Address the needs of bicycle and pedestrian circulation in the design of future transit centers and/or park-and-rides;
- Ensure transit access wherever bicycles are used by continuing to provide bike racks on TriMet buses and encouraging transit riders to purchase folding bikes for carry-on use; and
- Provide secure, long-term, and sheltered bike parking at transit stops.

5.2 Service to Diverse Communities

In 1994, President Clinton signed Executive Order 12898. The order states the duty of each public agency is to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations." This has been described as environmental justice. As an entity utilizing federal funds, Metro is responsible for integrating environmental justice standards into its transportation program and planning activities. Since the local TSP must comply with the Metro Regional Transportation Plan and the City utilizes federal funds allocated by Metro for transportation projects, the City must also integrate environmental justice in its transportation planning work. Environmental justice communities include low income, minority, or elderly households. An overview of environmental justice communities in Forest Grove is provided below. An assessment of how the local transportation system serves local environmental justice communities is also follows.

- Low Income Households: Most low income households in Forest Grove are located within the general proximity of the Pacific Avenue corridor. Several manufactured home parks are located along the Pacific Avenue corridor providing affordable housing for lower income households in the community.
- Minority Households: Census Tract 332 Block Group 1 east of Quince Street and north of Pacific Avenue, includes the highest concentration of minority households within the community. Approximately 60 .6% of the population of this Block Group is of Hispanic origin. This compares to 23.1 % for the City of Forest Grove as a whole.
- Elderly: Approximately 34% of the Forest Grove population is age 65 or older. Several assisted living facilities are located adjacent to the Pacific Avenue corridor. A retirement community is located east of Mountain View Drive and south of Heather Street.

The local pedestrian system plan addresses these environmental justice communities in Forest Grove in several ways. First, the recommendations in this plan for connecting existing gaps and improving the overall quality of the pedestrian environment will enhance access via walking to

critical destinations within the community including schools, shopping, jobs, personal business, and existing and future transit service.

Second, development of added local street connectivity and trails as proposed in this plan will provide for a finer grained walk and bicycle system which will help to shorten travel distances and make active transportation a more viable means of travel. These findings also apply to the bicycle system and transit service plans.

5.3 Pedestrian System Project List

Table 5-1 lists pedestrian improvement projects and planning-level cost estimates. The table identifies projects specifically focusing on pedestrian facilities, while the Roadway Plan (Chapter 8) identifies street system improvements (e.g., new street corridors) that would also include sidewalks or other walkways. Table 5-1 also includes joint bicycle/pedestrian improvement projects (e.g., a project to add bike lanes and sidewalks to an existing street). The table also includes programmatic recommendations, which are discussed in greater detail in Appendix I.

Project cost estimates were based on similar non-motorized planning efforts in Forest Grove and other nearby communities, and do not include additional costs related to right-of-way acquisition, storm drainage relocation or improvements, or utilities relocation. Further engineering study will be necessary to provide a more accurate cost estimate for budgeting these improvement projects.

The table is not intended to be an exhaustive list of all pedestrian projects, rather it is intended to lay out where the City should prioritize efforts. It should be noted that all identified projects represent important elements of the pedestrian network, and should be implemented as soon as opportunities arise.

Table 5-1. Pedestrian System Projects and Programs

Project	Segment	Description	Planning-Level Cost Estimate (thousands)
Gales Way[1]	E Street to 23rd Ave.	Complete sidewalk gaps	$457
Goff Road	Willamina Avenue to E Street	Complete sidewalk gaps	-[5]
Highway 8/ Pacific Avenue	Oak Street to Mountain View Lane	Complete sidewalk gaps	$82
Highway 47	Fern Hill Road to Poplar Street (south side)	Construct sidewalk.	$15
Poplar Street	Highway 47 to Heather Street Extension	Construct sidewalk.	$20
B Street[1]	Gales Creek bridge to 18th Avenue	Complete sidewalk gaps	$220
B Street[3]	23rd Avenue to Willamina Avenue	Complete sidewalk gaps	$150

Table 5-1 Continued. Pedestrian System Projects and Programs

Project	Segment	Description	Planning-Level Cost Estimate (thousands)
Willamina Avenue[3]	Gales Creek Road to Sunset Drive	Complete sidewalk gaps	$328
Highway 8/ Baseline Street	Mountain View Lane to east city limits	Complete sidewalk gaps	$30
Highway 8/ Adair Street	Mountain View Lane to east city limits	Complete sidewalk gaps	$48
21st Avenue	Cedar St. to Douglas Street	Complete sidewalk gaps	$5
23rd Avenue[3]	Cedar Street to Sunset Drive	Complete sidewalk gaps	$12
23rd Avenue	D Street to Gales Way	Complete sidewalk gaps	$46
Hawthorne Street	12th Avenue to 26h Avenue	Complete sidewalk gaps	$190
Laurel Street	22nd Avenue to Pacific Avenue	Complete sidewalk gaps	$15
Gales Creek Road	Forest Gale Way to Thatcher Road	Complete sidewalk gaps	$254
Highway 8	Mountain View Lane to Highway 47	Pedestrian Crossing (potentially at location of new traffic signal)	$100
Town Center Pedestrian Improvements[1]	N/A	Conduct inventory of downtown sidewalks, and re-construct deteriorated sidewalks as needed; project also includes illumination, benches, bike racks, and pedestrian crossing enhancements	$200
University Avenue[2]	College Way to Cedar Street	Implement streetscape improvements identified in Pacific University Master Pan	$109
College Way[2]	Pacific Avenue to University Avenue	Implement streetscape improvements identified in Pacific University Master Pan	$118
21st Avenue[2]	Main Street to College Way	Implement streetscape improvements identified in Pacific University Master Pan	$24
Thatcher Road[3]	Gales Creek Road. to David Hill Road	Construct bike lanes and complete sidewalk gaps	$574
Fern Hill Road[3]	Fern Hill wetlands nature trail to Highway 47	Construct bike lanes and complete sidewalk gaps	$130
Bonnie Lane Path[3]	Gales Creek Road. to Brooke Street	Construct shared use path between Gales Cr. Rd. and western terminus of Bonnie Ln. (near Brooke St.)	$39
Highway 47 Path Improvements	B Street to Highway 8	Repave existing deteriorated path segments; formalize path access points from adjacent residential streets; improve path/roadway crossing treatments at B, Elm, and Maple streets	$164

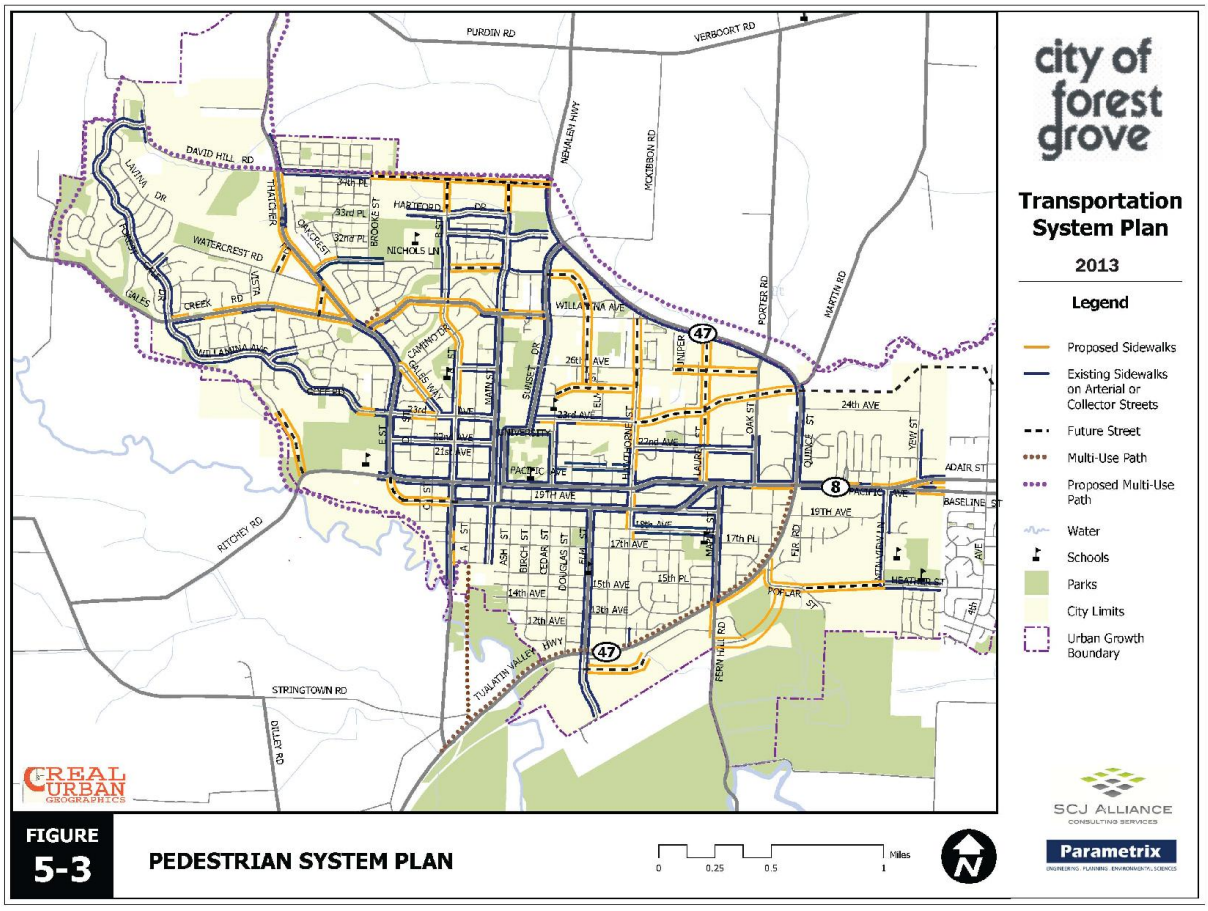
Table 5-1 Continued. Pedestrian System Projects and Programs

Project	Segment	Description	Planning-Level Cost Estimate (thousands)
Council Creek Trail Feasibility Study	N/A	Conduct feasibility study evaluating potential alignments for the Council Creek Trail in Forest Grove	$200
Accessway Improvements	Citywide	Conduct citywide inventory of existing neighborhood accessways, and implement improvements (e.g., paving, re-paving, etc.) as needed	$500
Safe Routes to School improvements	N/A	Inventory bicycle/pedestrian facilities near Forest Grove schools, and identify specific deficiencies that complicate bicyclist and pedestrian travel. Design and construct improvements, including shared use paths, neighborhood accessways, bike lanes, sidewalks, curb ramps, crosswalks, and other intersection improvements where necessary. Assign higher prioritization to projects along major bike- and walk-to-school routes	$1,000
Sidewalk Infill Program	Citywide	Fund an annual Sidewalk Infill Program to complete sidewalk gaps on existing streets	$50[4]
ADA Transition Plan	Citywide	Develop an ADA Transition Plan identifying specific projects/strategies for bringing existing sidewalks and other pedestrian facilities into compliance with ADA standards	$50
Spot Improvement Program	Citywide	Fund an annual Spot Improvement Program to address bicycle/pedestrian system needs	$50[4]
Bikeway/ Walkway Maintenance Program	Citywide	Develop and implement an annual Maintenance Program to provide regularly-scheduled maintenance activities for the on- and off-street bikeway and walkway system	$20[4]
	Total		$5,155

Note: Cost estimates do not include contingency, design or construction management.

1 This project (or a portion of the project) is listed in Forest Grove's 2007-2012 Capital Improvements Plan.
2 This project (or a portion of the project) is listed in the 2007 Pacific University Master Pan.
3 This project (or a portion of the project) is listed in the 1999 Forest Grove TSP.
4 This estimate represents an annual project cost.
5 To be constructed as development occurs.

Figure 5-3. Pedestrian System Plan



6. BICYCLE SYSTEM PLAN

Forest Grove has potential to transform itself into one of the region's most bikeable communities. The foundations of an excellent system already exist, but challenges will arise while improving it further. This chapter identifies a 20-year Preferred Plan for expanding this system. The bicycle network builds upon previous and on-going planning efforts, and reflects the extensive input offered by City staff, stakeholder groups, and Forest Grove residents. This chapter focuses on bicycle infrastructure improvements, while Appendix I describes programmatic strategies for improving walking and bicycling in Forest Grove.

6.1 Preferred Plan Bicycle Network

Although Forest Grove currently lacks a comprehensive bikeway network, the City has potential to create an excellent system. The Preferred Plan bicycle network builds upon the system of bike lanes, shoulder bikeways, shared use paths, and accessways already in place, and also takes advantage of many lower volume bicycle-friendly streets. Depicted on the Bicycle System Plan (Figure 6-7), Preferred Plan projects aim to fill system gaps and develop a more complete network. The system includes an expanded bike lane network on streets where bicyclists could benefit from delineated separation from motorists, while shoulder bikeways (serving bicyclists and pedestrians) are identified on several roadways at the urban/rural fringe. The network also includes several Bicycle Boulevards, taking advantage of Forest Grove's extensive network of lower volume streets. As described in the Pedestrian System Plan (Chapter 5), the network also includes a system of shared use paths and accessways. The network was developed based on extensive input from previous planning efforts as well as input from the Project Advisory Committee, City leaders and Forest Grove residents. It should be noted that most future shared use path corridors depicted on the system map represent conceptual alignments, with further evaluation needed to identify specific routes. The sections below discuss specific bicycle facilities in greater detail, while Table 6-2 at the end of this chapter presents the project list.

6.1.1 Bike Lanes

Several major streets in Forest Grove lack dedicated bike lanes. Safely accommodating bicyclists on major roadways is important for several reasons. First, major streets generally offer the most direct routes between bicyclist destinations while providing better connectivity compared with lower-order streets. Consequently, commuter cyclists and those traveling longer distances often gravitate to these routes. Second, the commercial character of major streets (e.g., employment, shopping, etc.) makes these corridors destinations in and of themselves.

To safely accommodate bicyclists on corridors with current or anticipated high traffic volumes, bike lanes are identified on several major streets in Forest Grove. In developing the bike lane network, consideration was given to several factors, including:

- Gaps in the existing bike lane system.
- Previous and on-going planning efforts identifying the need for bike lanes on specific streets.
- Planned street improvements that will include bike lanes as part of construction.
- Whether an existing street could be retrofitted to include bike lanes.
- Planned land development projects with the potential to generate bicycle travel demand on major streets.

Implementation of the bike lane projects depicted on the Bicycle System Plan would primarily occur through new street construction, widening of existing streets, or roadway re-striping. The following sections describe these approaches in greater detail.

6.1.2 Bike Lanes as Part of New Street Construction

Bike lanes should be included as part of new Arterial and Collector street construction. Forest Grove's 2007-2012 Capital Improvements Plan (CIP) identifies several planned new major streets, including;

- A new street roughly following the 23rd/24th Avenue alignment between Hawthorne Street and Highway 47
- An extension of 19th Avenue between Oak Street and Highway 47
- An extension of David Hill Road between Brooke Street and Highway 47

The CIP does not explicitly list bike lanes as part of these new street projects, however their Collector and/or Arterial status (and associated traffic volumes) indicate the need for dedicated bike lanes. Consistent with the City's street design standards, bike lanes will be provided as part of any new Collector and Arterial roadways identified in this TSP.

In addition to the new street following the 23rd/24th Avenue alignment (mentioned above), Metro's RTP also shows several new streets that would include bike lanes, including:

- An extension of 19th Avenue west of B Street, connecting with the existing Pacific Avenue and E Street intersection
- An extension of Heather Street between Mountain View Lane and Poplar Street

6.1.3 Bike Lanes as Part of Roadway Widening Projects

Continued urban expansion on Forest Grove's outskirts could alter the role of existing rural roadways. As these roadways transition to serve predominantly urban traffic, roadway widening may be necessary to address vehicle capacity and safety needs. Even without vehicle capacity expansion, roadway widening may be necessary to provide greater separation between bicyclists and increasing vehicle traffic volumes (e.g., by adding dedicated bike lanes). In Forest Grove, example corridors where widening may be applicable include Thatcher Road and Fern Hill Road.

6.1.4 Bike Lanes as Part of Roadway Re-Striping Projects

Roadway re-striping represents one of the most cost-effective and least physically intrusive approaches for expanding a community bike lane system. Often referred to as a "road diet," roadway re-striping reallocates a street's space to better accommodate multiple travel modes. In Forest Grove, several streets appear to have more vehicle and on-street parking capacity than is needed, and this excess capacity could be utilized to better serve non-motorized users. For instance, on-street parking on Pacific Avenue between B and E streets appears to be underutilized. The City could take advantage of this opportunity by re-striping this segment of Pacific Avenue to include on-street parking on one side while providing bike lanes on both sides (see Figures 6-1 and 6-2). This improvement would complete the missing link of the continuous east-west bike lane corridor on Gales Creek Road, E Street, the Pacific/19th couplet, and Highway 8. Bike lane retrofit opportunities exist on several other streets, including B Street (south of 19th Avenue), and on Maple Street (see Figures 6-3 and 6-4). Additional bike lane retrofit projects identified in the Metro RTP include Willamina Avenue (between Gales Creek Road and Sunset Drive) and B Street (between 26th and Willamina avenues).

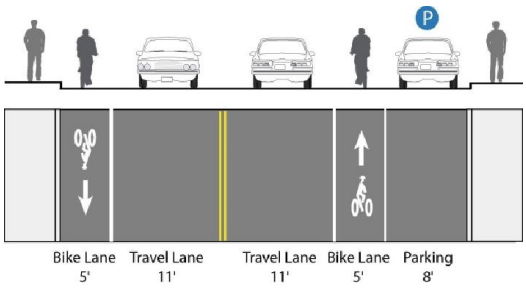


Figure 6-1. Pacific Avenue west of B Street (Existing Conditions)

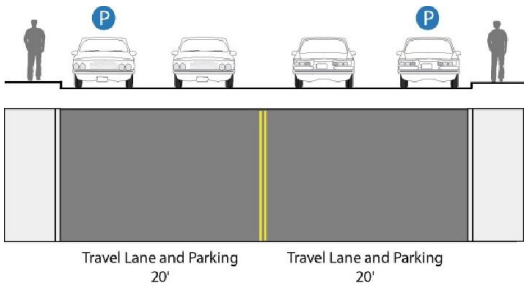


Figure 6-2. Pacific Avenue west of B Street (With Bike Lanes)

Figure 6-3. Maple Street south of 18th Avenue (Existing Conditions)

Figure 6-4. Maple Street south of 18th Avenue (With Bike Lanes)

6.1.5 Shoulder Bikeways

Shoulder bikeways are common in less-developed and rural areas, and typically consist of a paved shoulder (four to six feet wide) for pedestrian and bicycle travel. This Plan recommends shoulder bikeways on several roads in Forest Grove's outlying areas, including Gales Creek Road (west of Willamina Avenue), Thatcher Road (north of David Hill Road), and Fern Hill Road (south of Taylor Way). Shoulder widening would be necessary on most of the roadways listed above. Although shoulder bikeways may suitably accommodate bicyclists and pedestrians today, the City will need to consider additional treatments (e.g., bike lanes, sidewalks and shared use paths) as new development occurs and as traffic volumes increase in these areas.

6.1.6 Bicycle Boulevards

Several areas in Forest Grove benefit from a generally well-connected system of lower volume streets that – with the addition of relatively small-scale treatments – could become excellent bicycling routes for riders of all ages and skills. These streets (commonly referred to as "Bicycle Boulevards") accommodate bicyclists and motorists in the same travel lanes, often with no specific vehicle or bicycle lane delineation. Traffic controls along a Bicycle Boulevard assign priority to thru cyclists while encouraging thru vehicle traffic to use alternate parallel routes. Traffic calming and other treatments along the corridor reduce vehicle speeds so that motorists and bicyclists generally travel at the same speed, creating a safer and more-comfortable environment for all users. Boulevards also incorporate treatments to facilitate safe and convenient crossings where bicyclists must traverse major streets. Bicycle Boulevards work best in well-connected street grids, where riders can follow reasonably direct

and logical routes with few “twists and turns.” Boulevards also work best when higher-order parallel streets exist to serve thru vehicle traffic.

6.1.7 Bicycle Boulevard Applications

This section describes various treatments commonly used for developing Bicycle Boulevards. The treatments have been divided into five main application levels based on their level of physical intensity, with Level 1 representing the least physically-intensive treatments that could be implemented at relatively low cost. Identifying appropriate application levels for individual Bicycle Boulevard corridors provides a starting point for selecting appropriate site-specific improvements. The five Bicycle Boulevard application levels include the following:

- Level 1: Signage
- Level 2: Pavement markings
- Level 3: Intersection treatments
- Level 4: Traffic calming
- Level 5: Traffic diversion

It should be noted that corridors targeted for higher-level applications would also receive relevant lower-level treatments (as shown in Figure 6-5). For instance, a street targeted for Level 3 applications should also include Level 1 and 2 applications as necessary. It should also be noted that some applications may be appropriate on some streets while inappropriate on others. In other words, it may not be appropriate or necessary to implement all Level 2 applications on a Level 2 street. Furthermore, several treatments could fall within multiple categories as they achieve multiple goals. To identify and develop specific treatments for each Bicycle Boulevard, the City should involve the bicycling community, neighborhood groups, and the Public Works Department. Further analysis and engineering work may also be necessary to determine the feasibility of some applications.

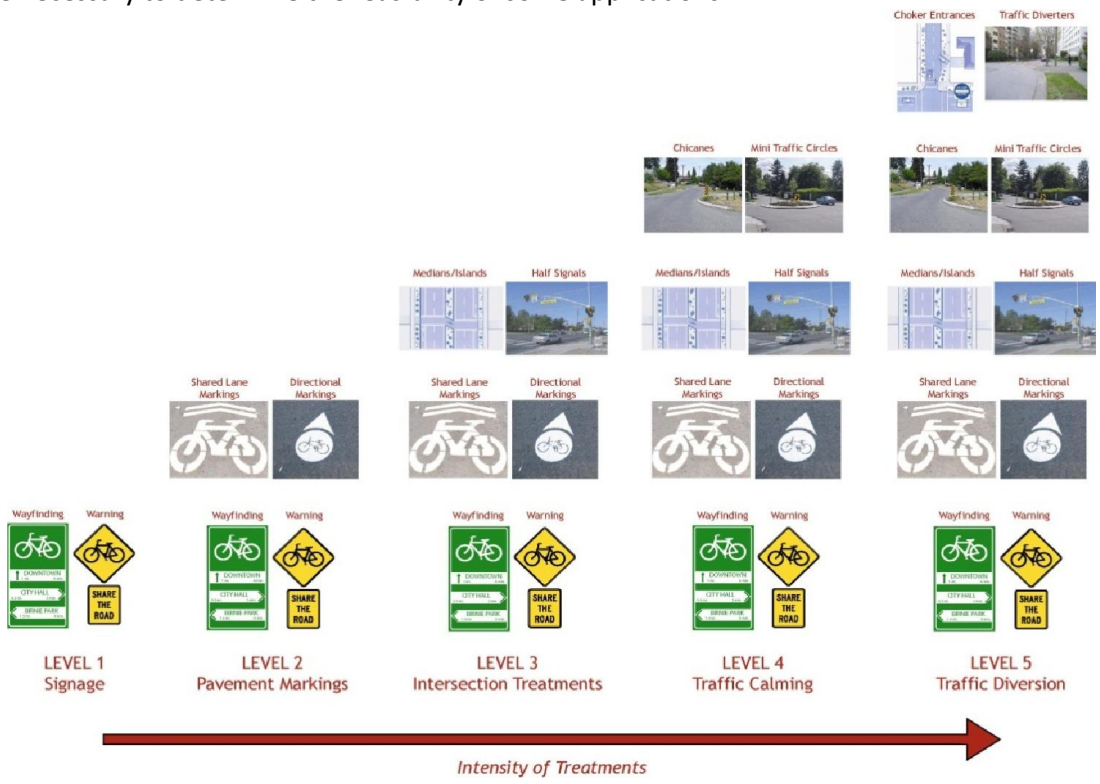


Figure 6-5. Bicycle Boulevard Application Levels

Table 6-1 describes various treatments associated with the five Bicycle Boulevard application levels, while Figure 6-6 depicts an example of Bicycle Boulevard applications on a hypothetical street.

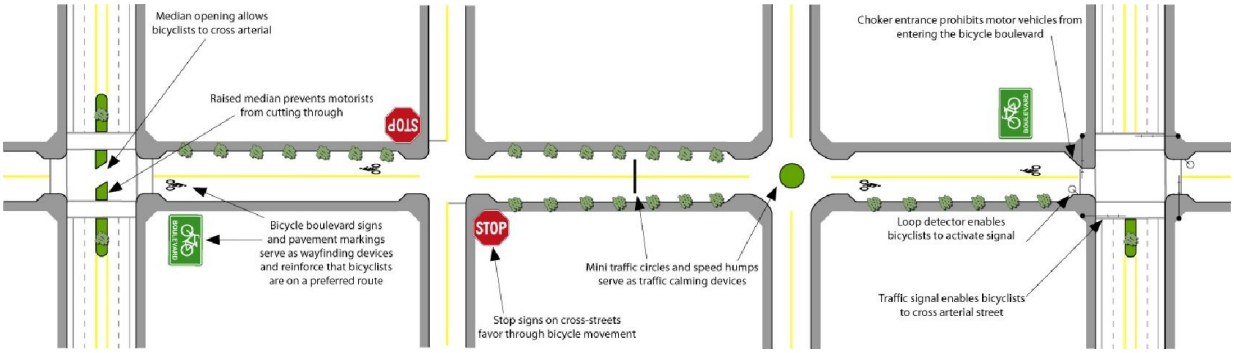


Figure 6-6. Sample Bicycle Boulevard Treatments on a Hypothetical Street

6.1.8 Bicycle Boulevards in Forest Grove

The Bicycle Plan (Figure 6-7) depicts several Bicycle Boulevard corridors in Forest Grove. A Bicycle Boulevard roughly following Willamina Avenue, Goff Road and 23rd Avenue would connect western Forest Grove neighborhoods with downtown and Pacific University, while also providing an alternative to Gales Creek Road. A Bicycle Boulevard following Cedar Street would connect Pacific University with the Clark Historic District and other nearby neighborhoods, while also connecting directly with the Highway 47 path. An east-west Bicycle Boulevard would pass through the Clark Historic District on 18th Avenue, providing a bicycle connection to Joseph Gale Elementary School and Tuality Forest Grove Hospital. East of Maple Street, the corridor would continue on 17th Place to reach the Highway 47 path.

Table 6-1. Bicycle Boulevard Application Levels and Treatments

Application Level	Treatment	Description
Level 1 – Signage	Warning signage	Signage placed along the Bicycle Boulevard advising motorists to "share the road;" also placed on major cross-streets approaching the Bicycle Boulevard advising motorists of bicyclist crossings
	Wayfinding signage	Signs placed on bikeways on and leading to the Bicycle Boulevard; also placed at key bicyclist decision points; often display destinations, distances and "riding time"
Level 2 – Pavement markings	On-street parking delineation	Discourages motorists from parking their vehicles too far into the adjacent travel lane
	Directional pavement markings	Placed along the Bicycle Boulevard as a route reinforcement tool; direct riders through complex routing areas (e.g., multiple turns)
	Shared lane markings	Used on streets where bike lanes are desired but not possible; placed strategically to encourage bicyclists to avoid the "door zone" of adjacent parked cars

Table 6-1 Continued. Bicycle Boulevard Application Levels and Treatments

Application Level	Treatment	Description
Level 3 – Intersection treatments	Stop sign placement	Stop signs placed on cross-streets approaching the Bicycle Boulevard, minimizing the number of bicyclist "stops and starts" while riding on the Boulevard
	Curb extensions	Create a visual "pinch point" for motorists, thereby reducing speeds; reduce bicycle/pedestrian crossing distances at intersections
	Medians/refuge islands	Elevated or delineated islands breaking up a crossing into multiple segments; create a visual "pinch point" for motorists
	Bicycle left turn lanes	Facilitate bicyclist left turns where Bicycle Boulevards meet major streets at off-set intersections
	Bicycle loop detectors	Detect the presence of bicyclists at signalized intersections
	Bike boxes	Advanced stop bars at signalized intersections, enabling bicyclists to move to the "head of the line;" reduce conflicts between turning vehicles and thru-moving bicyclists at an intersection
	Half signals	Placed at intersections where vehicle speeds and/or volumes on a major cross-street create few crossable "gaps" for bicyclists approaching from the Bicycle Boulevard
Level 4 – Traffic calming	Chicanes	Series of raised or delineated curb extensions on alternating sides of a street forming an S-shaped curb; can also be achieved by alternating on-street parking on alternate sides of the roadway
	Mini traffic circles	Raised or delineated islands placed at intersections, reducing vehicle speeds through narrowed travel lanes and tighter turning radii
	Speed humps/speed cushions	Rounded raised areas of the pavement requiring approaching motorists to reduce speed
Level 5 – Traffic diversion	Choker entrances	Intersection curb extensions or raised islands allowing full bicycle passage while restricting vehicle access to/from a Bicycle Boulevard
	Traffic diverters	Raised features directing vehicle traffic off the Bicycle Boulevard while allowing thru bicycle passage

6.1.9 Shared Use Paths

Today, Forest Grove has the foundation of what could be a spectacular interconnected path system. The Pedestrian System Plan (Chapter 5) describes the approach for improving and expanding this system.

6.1.10 Bicycle Parking

Lack of secure, convenient bicycle parking is a deterrent to bicycle travel. Bicyclists need parking options that provide security against theft, vandalism, and weather. Like automobile parking, bicycle parking is most effective when located close to trip destinations, is easy to access, and is easy to find. Where quality bicycle parking facilities are not provided, determined bicyclists lock their bicycles to street signs, utility poles or trees. These alternatives are undesirable as they are usually not secure, may interfere with pedestrian movement, and can create liability or damage street furniture or trees. Bicycle parking facilities that are conveniently located and adequate in both quantity and quality can help reduce

bicycle theft and eliminate inappropriate parking, benefiting everyone. Bicycle parking is highly cost-effective compared with automobile parking.

6.1.11 Parking Requirements

Field visits and discussions with Forest Grove residents indicate that more bicycle parking is needed in some areas, including downtown, Pacific University and at several schools. Section 10.8.540 of Forest Grove's Development Code specifies minimum bicycle parking requirements for multi-family housing as well as retail, office, industrial, and institutional developments. The requirements also pertain to transit stations, park-and-ride lots, and parking structures. The required number of spaces represents 20 percent of the required number of vehicle parking spaces (with a minimum of two spaces).

Although the Ordinance's "blanket" requirements ensure a minimum number of bicycle parking spaces for most developments, the requirements may not fully address parking demand for some land uses. The City should revisit the current bicycle parking requirements and consider revising them to reflect the needs of individual land uses, especially those with traditionally higher demand such as commercial centers.

Forest Grove could also benefit from long-term bicycle parking and other end-of-trip facilities. The City should consider establishing long-term parking requirements for large employment centers such as business parks and government buildings. Long-term bicycle parking facilities typically include bicycle lockers, attended facilities, and/or other secure provisions, while other end-of-trip facilities include showers and changing areas.

The City should undertake a bicycle parking analysis to determine whether all bicycle parking required by the Development Code is provided, and if so, that it is sited in locations that are visible and free of obstacles. It should also be noted that the Development Code only establishes parking minimums, and new developments should be encouraged to exceed these standards.

6.1.12 Facility Design Requirements

Section 10.8.540 of the Development Code specifies bicycle parking design requirements, which reflect guidelines recommended by the Oregon Bicycle and Pedestrian Plan. As mentioned above, the City should continue enforcing Development Code requirements. The City should also review bicycle parking facilities at government buildings to ensure their location and design meet current Development Code requirements. The City should also work with the School District to improve the quality of bike parking facilities at Forest Grove schools.

6.1.13 Bicycle and Pedestrian Access to Transit

Tremendous opportunities exist for increasing pedestrian/bicycle-transit partnerships in Forest Grove and throughout TriMet's service area. Given Forest Grove's location on the periphery of the urbanized area, destinations that can reasonably be biked to are relatively limited. In this environment, transit stops are particularly important destinations to consider for bicycle and pedestrian travel. Removing barriers to bicycling within the city and improving transit stop access can greatly improve the attractiveness of transit as an alternative to motor vehicle travel. The Pedestrian System Plan (Chapter 5) describes strategies that the City of Forest Grove and TriMet should employ to enhance pedestrian/bicycle-transit connections.

6.2 Bicycle System Project List

Table 6-2 lists bicycle improvement projects and planning-level cost estimates. The table identifies projects specifically focusing on bicycle facilities, while the Roadway Plan (Chapter 8) identifies street

system improvements (e.g., new street corridors) that would also include bike lanes or wide shoulders. Also included in Table 6-2 are bicycle-related programmatic recommendations, described in greater detail in Appendix I. Projects that would include joint bicycle/pedestrian improvements (e.g., shared use paths or street improvement projects that would include bike lanes and sidewalks), are listed in the Pedestrian System Plan (Chapter 5).

Project cost estimates were based on similar non-motorized planning efforts in Forest Grove and other nearby communities, and do not include additional costs related to right-of-way acquisition, storm drainage relocation or improvements, or utilities relocation. Further engineering study will be necessary to provide a more accurate cost estimate for budgeting these improvement projects.

The table does not list all bicycle projects, but is intended to lay out where the City should concentrate its efforts first. It should be noted that all projects represent important elements of the bikeway network, and should be implemented as soon as opportunities arise. See Appendix I for further information.

Table 6-2. Bicycle System Projects and Programs

Project	Segment	Description	Planning Level Cost Estimate (thousands)
Pacific Ave.	B St. to E St.	Re-stripe roadway to provide bike lanes	$7
Maple St. / Fern Hill Rd.	Hwy. 47 to Taylor Way	Re-stripe roadway to provide bike lanes	$15
B St.[1]	Gales Cr. bridge to 19th Avenue	Re-stripe roadway to provide bike lanes	$13
Hawthorne St.	26th Ave. to Pacific Ave.	Re-stripe roadway to provide bike lanes	$12
Thatcher Rd.	Gales Creek Rd. to David Hill Rd.	Re-stripe roadway to provide bike lanes	$15
Willamina Ave.	Thatcher Rd. to Sunset Dr.	Re-stripe roadway to provide bike lanes	$18
Gales Cr. Rd.	Western UGB to Forest Gale Dr.	Construct shoulder bikeway	$388
Thatcher Rd.	David Hill Rd. to northern UGB	Construct shoulder bikeway	$582
Fern Hill Rd.	Southern UGB to Taylor Way	Construct shoulder bikeway	$394
18th Ave./17th Place	B St. to Hwy. 47 Path	Develop Bicycle Boulevard	$77
Cedar St.	Hwy. 47 Path to 24th Ave.	Develop Bicycle Boulevard	$65
B St.	19th Ave. to David Hill Road	Develop Bicycle Boulevard	$70

Table 6-2 Continued. Bicycle System Projects and Programs

Project	Segment	Description	Planning Level Cost Estimate (thousands)
Willamina Ave./Goff Rd./23rd Ave.	Gales Cr. Rd. to Main St.	Develop Bicycle Boulevard	$83
Bicycle Wayfinding Signage Plan	N/A	Develop citywide bicycle Wayfinding Signage Plan identifying: appropriate locations for signs, destinations to be highlighted on each sign, and approximate distance and riding time to each destination	$20
Development Code bicycle parking requirements update	N/A	Update Development Code to establish short-term bicycle parking requirements for additional individual land uses, and to establish long-term parking requirements	$10
	Total		$1,769

Note: Cost estimates do not include contingency, design or construction management.

1 This project (or a portion of the project) is listed in the 1999 Forest Grove TSP.

Figure 6-7. Bicycle System Plan

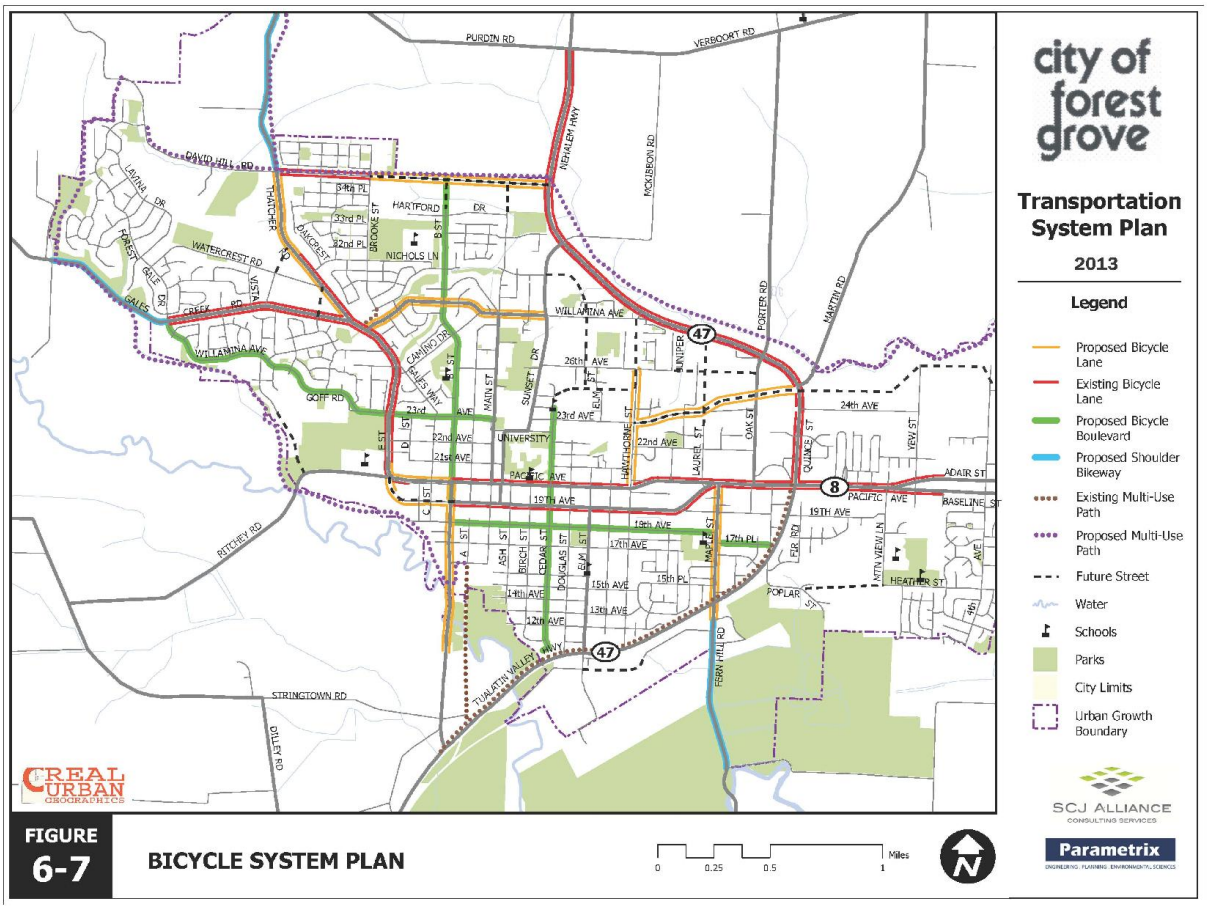
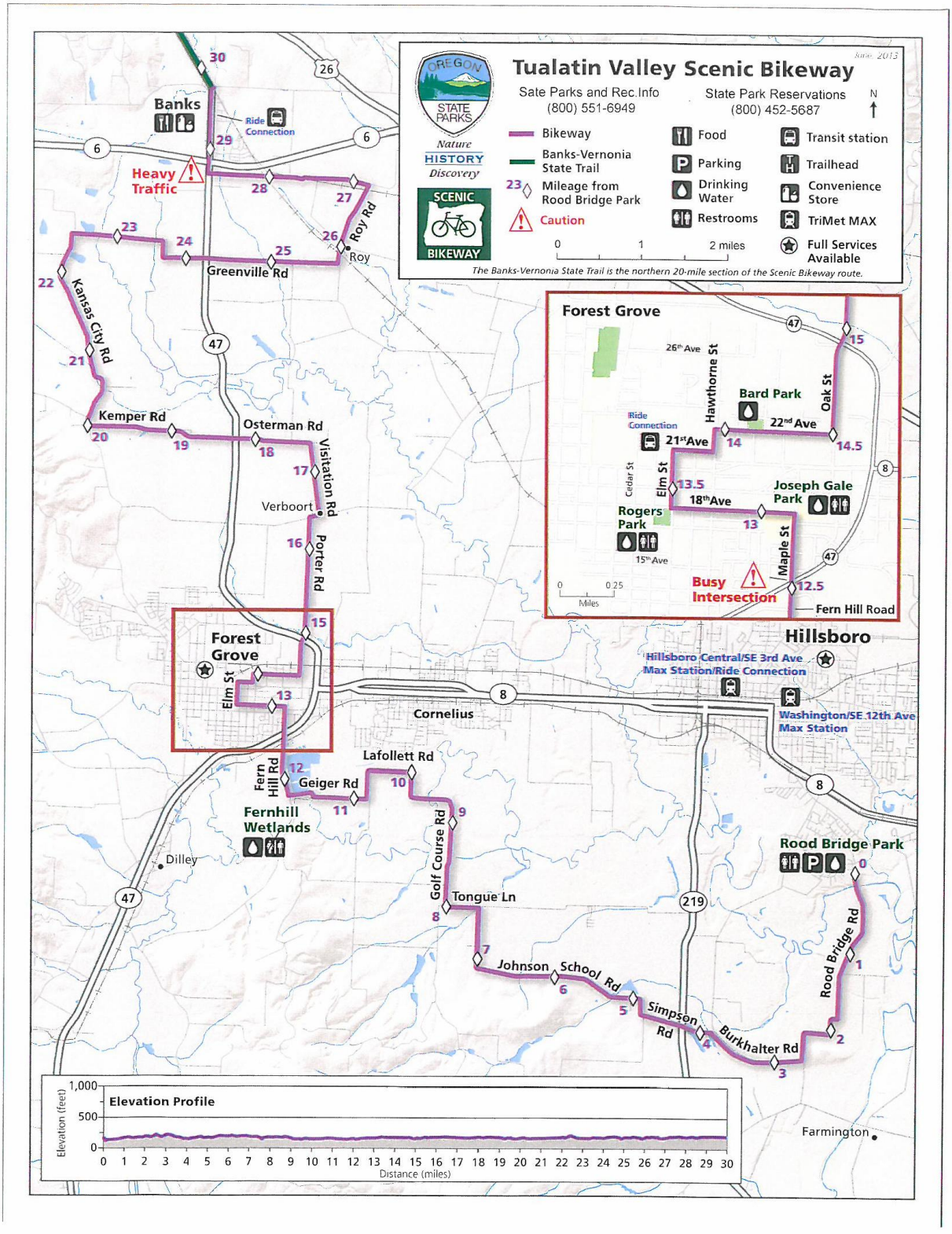


Figure 6-8. Oregon Scenic Bikeway



7. TRANSIT PLAN

This chapter summarizes existing and future transit needs in the City of Forest Grove. The transit plan was developed with input from TriMet, city staff and other agencies.

7.1 Background

TriMet is the regional transit provider for the Portland metro area and currently operates one bus route (line 57) within Forest Grove (see Figure 7-1). Line 57 provides frequent service between the Beaverton Transit Center and Forest Grove via the Pacific Avenue and 19th couplet and the Tualatin Valley (TV) Highway (Oregon Highway 8). The TV Highway Corridor is designated as one of TriMet's Frequent Service corridors.[13] Line 57 ranks as one of TriMet's top 10 bus routes in terms of ridership and is within the top 5 most productive (boarding rides per vehicle hour) bus lines.[14] Pedestrian access and bus stop improvements identified for line 57 were implemented in 2009.[15] The characteristics of the existing transit service are detailed in Existing Conditions (Chapter 3).

TriMet's Transit Investment Plan[16] (TIP) identifies strategies for meeting regional public transit needs. It focuses on improvements to the total transit system, including upgrades to existing lines. The TIP focuses on targeted, strategic improvements to the system with the following priorities:

- Priority 1: Build the "Total Transit System" (customer information, access to transit, stop amenities, frequency, reliability, comfort, safety, etc.)
- Priority 2: Expand high-capacity transit (commuter rail, light rail, and streetcar)
- Priority 3: Expand Frequent Service
- Priority 4: Improve local service

Related to these priorities, the TIP identifies three significant projects relevant to Forest Grove:

- Priority 1: Restoration of service levels on Frequent Service corridors as resources permit; this includes 147 weekly vehicle hours reduced on line 57.[17]
- Priority 2: Metro's High Capacity Transit System Plan, which will analyze potential MAX extensions, including to Forest Grove.[18]
- Priority 4: The Westside is identified as an area of future focus, and Forest Grove has been included in the Westside Service Enhancements Project, conducted in 2012 and 2013.[19] A recommendation of this study is to develop partnerships to provide community transit service solutions that are tailored to the needs of each community.

[13] Transit Investment Plan (TIP), TriMet, FY2012. See Figure 5.1.
[14] A Profile of the Regional Transit System in the Portland Metropolitan Region, Metro, 2007.
[15] TIP, TriMet, FY2012. See pages 75-76 and 103.
[16] *Transit Investment Plan* TriMet, 2009.
[17] TIP, TriMet, FY2012. See Figure 3.1 and page 19.
[18] TIP, TriMet, FY2012. See page 66-67.
[19] TIP, TriMet, FY2012. See page 87.

7.2 Transit Service Design Guidelines

The following characteristics highlight several key market factors for implementing efficient transit service:

- **Density**. Density, and the organization of density, is a key consideration that determines the size of a transit market. A particular level of transit service requires a minimum density over a minimum area, e.g., an isolated concentration of intense development on the outskirts of the city is likely to be more difficult to serve than moderate-intensity development distributed along the length of a corridor. Density can be considered to be the combined level of population and employment per gross acre.
- **Destinations.** Activity centers clustered along a route, with strong anchors, or major activity centers, at each route endpoint make transit more attractive and efficient.
- **Design.** Neighborhoods where all roads are designed to connect to major streets allow transit users to reach stops without walking out-of-direction. Inadequate pedestrian access and safety will discourage most residents from using transit`

Table 7-1 provides general guidelines relating these market factors to specific transit service types and characteristics.[20]

Table 7-1. Transit Design Guidelines

Service Attributes			Transit Market Factors	
Route Type	**Service Characteristics**	**Mode of Service**	**Density Along Route[1]**	**Destination Anchors[1]**
High Frequency Urban Local Fixed-Route	▪ Frequent (15-minute or better) ▪ Fast (may have limited stops) ▪ Two-way service	Bus (or Future Rapid Bus[3])	20+ persons/acre within ¼ mile of corridor served	▪ High-quality anchors ▪ 25+ persons per acre within ¼ to ½ mile radius
Moderate Frequency Urban Local Fixed Route	▪ 30-minute headway (frequency) ▪ All-day local service	Bus	16+ persons/acre within ¼ mile of corridor served	▪ High-quality anchors ▪ Major trip generators
Low Frequency Urban Local Fixed Route	▪ 60-minute headway (frequency) ▪ May be limited to weekdays	Bus	8+ persons/acre within ¼ mile of corridor served	▪ Major trip generators (hospital, senior center, etc.)
Community Shuttle/Circulator	▪ Local circulation ▪ Personalized to community or neighborhood demand centers	Bus, Vintage Trolley, Mini-Bus, Van	2+ persons/acre within ¼ mile of corridors served	▪ No anchors required, but large trip generators needed along route
Flex Route	▪ Local circulation ▪ Optional	Bus, Mini-Bus	0.5+ persons per acre, average in Flex Area	▪ Major trip generators

[20] These guidelines are not specific to Forest Grove, but are appropriate for smaller communities.

	point-to-point service and on-demand curbside pickups/drop offs

Notes: (1) Considered as combined persons and jobs per acre.

In general, mixed-use nodes and increased population and employment densities are supportive of transit if they are located along and accessible from existing transit corridors, i.e., TriMet Line 57 service, or potential transit corridors that may be served by TriMet or other local service in the future. Mixed-use nodes and increased density that are located away from existing or potential corridors or require out-of-direction transit routing or deviations will make it more difficult to efficiently serve Forest Grove with local transit.

7.3 Transit Needs

The quality of transit service within Forest Grove can be characterized by the following indicators:

- Transit route coverage
- Frequency
- Reliability
- User amenities

The following sections present the analysis and findings for each of these service characteristics, and identify potential needs for future transit service improvements in Forest Grove.

7.3.1 Transit Coverage

Transit coverage area is generally considered to include land within a ¼-mile walking distance from transit stops. With longer distances, walking can take more than 10 minutes, reducing the likelihood of transit being used. The transit coverage area for existing service in Forest Grove generally lies between 16th and 23rd Avenues along Pacific Avenue and 19th Avenue (illustrated in figure 7-1). Less than half of the city is within a ¼-mile distance from existing transit stops. However, most land uses that provide density that supports fixed-route transit service are contained within the current service area. Comprehensive Plan land use designations and zoning districts indicate that Central Business District (CBD) and community commercial zones are located along the Pacific Avenue / 19th Avenue couplet. Multi-family housing is generally contained within the transit service area as well, with some exceptions north of the Pacific University campus and west of the Pacific Avenue /19th Avenue couplet.

The minimum land use density[21] required to support a fixed route transit bus service with 1-hour scheduled between arrivals is about three housing units per acre or four employees per acre. It is important to note that this is a minimum standard and does not necessarily apply to TriMet's decision-making process. Fixed-route service with 30 minutes between arrivals generally requires seven housing units per residential acre and 15 housing units per acre for more frequent service (10 minutes per arrival).[22] These guidelines are comparable to those provided in Table 7-1 above. Generally, low-density commercial and industrial land uses, as well as single family residential, do not provide the necessary ridership demand to make fixed route transit service cost effective. Central business districts (CBD) and concentrations of multi-family residential and other higher density land uses generate enough transit

[21] Thresholds for minimum land use density to support fixed-route transit service are based on definitions in the 2000 *Highway Capacity Manual*, Chapter 30 for area-wide analysis methodologies.

[22] A Toolbox for Alleviating Traffic Congestion, Institute of Transportation Engineers, 1989

demand to support fixed route service. However, even intense land uses located in isolation from other density are difficult to serve with transit.

Options for Increasing Transit Coverage

The future demand for transit service in Forest Grove is expected to increase with expected future development. As the residential areas to the north and west of the city center are developed, demand for transit services to those portions of the city will increase. As recognized by the 2009 Transit Enhancement Study, some parts of Forest Grove are underserved by transit, including Forest Grove High School. However, TriMet analyzed several options for extending existing line 57 fixed-route service to Forest Grove High School in conjunction with the City's Transit Enhancement Study, and found that they did not meet TriMet's criteria for service expansion.

Alternatively, implementation of a local circulator bus (e.g., jitney) or a demand-responsive, deviated fixed-route, or flex-route service could be a joint City / TriMet effort and would increase transit coverage in Forest Grove. Such a route would provide service to local destinations, as well regional connections via line 57. Examples of locally-provided bus service near the Portland Metro area include Canby, Sandy, and Wilsonville. These transit services are often fareless, financed by a 0.6% employer payroll tax as well as federal and state grants. Canby Area Transit provides four service routes with one hour between successive arrivals. Two of the routes are within the City, while two lines connect to nearby cities. The approximate existing annual operating expenses were $600,000[23] for Canby Area Transit, $1.1 million for Sandy Transit[24], and $3.2 million for South Metro Area Rapid Transit[25] in Wilsonville. These figures do not include significant capital investments required to purchase vehicles, equipment and/or facilities.

Transit coverage can also be improved by providing adequate access to transit service. This includes spacing between stops, which has a tradeoff with the speed of service. Typically, the recommended transit stop spacing in urban areas is a minimum of 500 feet. Today, the bus stops on 19th Avenue and Pacific Avenue are located between 550 and 1200 feet apart (averaging approximately 850 feet between stops in the City). The proximity of the two parallel roadways increases the density of nearby transit stops, but also increases walking access distances in one travel direction. Given the regional orientation of TriMet service, there may be some limited opportunities to reduce spacing between stops, but there are other strategies that that the City can use to improve pedestrian accessibility to transit. These include improving sidewalk conditions, providing safe, conveniently-spaced street crossings of major arterials, including the 19th-Pacific couplet, and improving street connectivity.

7.3.2 Transit Frequency

Transit route frequency is an important measure of transit quality of service and mode attractiveness. Route frequency is determined by headway - the length of time between two vehicle arrivals at a single stop. Route 57 is a frequent service bus providing 17-minute headways between 6 a.m. and 9 p.m. and 30 to 60 minute headways in the early morning and late evening.

7.3.3 Transit Reliability

Transit service reliability is a key performance characteristic for retaining riders. Congested roadways, bottlenecks and traffic signals can delay transit vehicles and cause transit vehicles to arrive off schedule and close together. In the future, the Pacific Avenue and 19th Avenue transit corridors will be faced with increased congestion and traffic signal control delays. Improving overall signal timing and implementing

[23] Canby Transit Plan, May 2001
[24] Sandy Transit Master Plan, January 2009.
[25] Wilsonville Transit Master Plan, August 2008

transit signal priority as traffic signals are upgrade or replaced is one option for reducing traffic delay to transit vehicles.

Bus stop relocation can improve transit reliability. Transit stops should be spaced appropriately to provide adequate accessibility to riders while limiting bus delays from overly frequent stops. The proximity of stop locations represents a tradeoff between improving coverage area and reducing travel times (and improving reliability). Transit stop relocations should be coordinated with pedestrian improvements, such as curb extensions, as they are constructed. The placement of bus stops on the near- or far-side of intersections is an important consideration in conjunction with traffic signal strategies.

7.3.4 User Amenities

The purpose of transit stop amenities is to improve the convenience and attractiveness of using the transit system. Good public transportation is important to the livability of a community. Accessible transit stops are essential to a useable system. TriMet prioritizes the need for bus stop amenities by ridership and special circumstances (senior center, etc.). Potential improvements to the overall system include:

- Transit Tracker – Transit riders can utilize Transit Tracker by phone to access next bus arrival times using the bus stop ID number provided at the bus stop.
- Bus shelters – Improve the convenience of using the transit system by providing a comfortable place to wait for the bus.
- Curb extensions – The extension of the sidewalk area into the parking lane provides a more convenient pedestrian connection to a stopped bus.
- Street lighting – Bus stops should be highly visible locations so pedestrians can easily identify the locations and good security can be provided.
- Park and Ride Lots – Improves access to transit service by providing free designated parking lots near concentrated transit demand.

One of the most significant user amenities for bus services is a shelter at the transit stop. Many of the bus stops within the study area today have bus shelters or other amenities due to the high volume of passengers and TriMet's continuing construction of access improvements along line 57. Further improvements were implemented along the route in 2009 via TriMet's TIP implementation of expanded frequent service. Improvements within Forest Grove included[26]:

- New sidewalk, curb ramps, drainage, and backfill on Pacific Avenue at the Rose Grove manufactured home park (east of Quince Street)
- Bus shelter upgrade, tree removal, and new sidewalk at 19th Avenue and Cedar Street.
- Replacement of existing sidewalk, curb and backfill at 19th Avenue and Ash Street.
- Replacement of existing sidewalk, re-direction of parking and added landscaping strip on 19th Avenue between A Street and Main Street.

[26] TIP, TriMet, FY2012. See page 75-76.

In addition to stop amenities, one of the critical elements of encouraging transit ridership is to provide quality pedestrian access. The Pedestrian Plan (Chapter 5) identifies projects focused on improving access between activity centers and existing transit service.

7.3.5 Transit Enhancement Report

The Forest Grove Transit Enhancement Report identified a number of findings related to transit needs for the City. The findings for Forest Grove include:

- Vital importance of TriMet Line 57
- Existing bus transit under-serves Forest Grove
- Significant use to access existing light rail service in Hillsboro
- Strong support for light rail expansion to Forest Grove
- High existing transit use for off-peak leisure and recreation to Portland
- Opportunity exists for a local bus circulator or feeder service within the City
- Opportunity exists to better promote Lift, Ridewise, and Ride Connection programs

While not discussed in the transit enhancement report, the concept of an area-wide transit service covering western Washington County has also been discussed. The concept may be advanced for future study.

7.3.6 TriMet Westside Service Enhancements Project

TriMet's Westside Service Enhancements Project, evaluated ways to improve transit service for the region's west side residents and businesses including Forest Grove as part of a five-year plan. The project is assessing demographic changes and community needs, plans for residential and employment growth, and infrastructure improvements. Analysis for the study indicates that Forest Grove has among the highest concentrations of minority populations in the study area. The project includes assessing safety and pedestrian improvements that would improve access to transit stops and help spur transit use. Improving transit service within Forest Grove is among the issues raised during public meetings held within the Westside area. The most important recommendations of relevance to local transit service in Forest Grove is a Community Transit strategy to develop service partnerships to deliver alternative local services (shuttles, dial-a-ride, deviated fixed-routes, etc.) with a different (i.e., lower) cost structure.

7.3.7 Forest Grove Local Transit Study

The Forest Grove Local Transit Study (2013) further evaluated the need for enhanced local transit circulation and improved access to regional destinations, building upon the Forest Grove Transit Enhancement Plan and TriMet's Westside Service Enhancements Project. The study goals included to help the City determine the regulatory, financial, and operational feasibility of establishing local transit circulation within its city limits, and coordinate with this update of the City's Transportation System Plan (TSP).

Several peer case studies were identified to illustrate different models for providing regional and local service in regions/cities comparable to the Portland Metro area and Forest Grove. Key findings from the peer case studies include:

- In the Portland region, several cities have withdrawn from the TriMet service district and in some cases have opted to use local payroll taxes to provide local service. In particular, the experience of the City of Canby (Canby Area Transit) highlights that while a municipality on the

edge of the TriMet service area can provide a higher level of locally-focused service, doing so may compromise the convenience of regional connections. CAT operates regional intercity service and ADA Paratransit that connect to TriMet services in Oregon City. Within Canby, CAT operated fixed-route service until recent budget shortfalls; it has replaced it with general public Dial-A-Ride service and experienced a consequent 18% decline in ridership.

- In the Denver region, the regional transit provider, RTD, has partnered with local jurisdictions to develop service types that meet local needs. This includes a "point-deviated" Call-n-Ride service type where fixed-route service does not meet productivity standards. In Golden, CO, a city comparable to Forest Grove, the City, the Colorado School of Mines, and RTD partnered to develop a Call-n-Ride service that is planned to launch with opening of light rail service in the city in Spring 2013. RTD will continue to operate a fixed-route serving central Golden that has similar circulation patterns, operating characteristics, and productivity to Line 57 in Forest Grove. Although Golden is similar to Forest Grove in various respects, it has considerably higher employment of about 17,000 jobs.
- In the Minneapolis Twin Cities region, a number of jurisdictions have opted-out from the Metro Transit service area. This includes the City of Savage, where the Minnesota Valley Transit Authority (MVTA) operates a flex-route that provides local service in the city; this service model was a primary motivation for selecting Savage as a case study. Savage is also served by a peak express route and a suburban local route, however neither provides significant local circulation in the city. Conversely, other jurisdictions with the choice of "opting-out" have remained within partnered with Metro Transit to improve local service; the importance of regional connections through these cities has been a key factor in those decisions.
- In the Boston region, MBTA provides operating support for local "overlay" transit services in some suburban parts of its service area. The Town of Burlington operates coverage-oriented local transit service while the MBTA operates regionally-oriented services and this service is comparable in productivity to MBTA local service within Burlington.

Based on a review of existing conditions, a market analysis, and the peer cases, the study concluded that developing a local deviated/flex-route service is a key opportunity for the City and that Ride Connection is a potential service partner that already operates service in the City, has an understanding of the transit market in Forest Grove, and has the capacity to implement and operate transit service in the City.

7.3.8 Transportation Disadvantaged

Many people have trouble using public transportation for reasons ranging from emotional and physical disabilities to financial difficulties. This group, referred to as the transportation disadvantaged, is a significant segment of the U.S. population. The largest group of the transportation disadvantaged consists of those over 65 and those with a physical or mental disability. Because these groups do not share the same travel patterns and because their travel needs are diverse, providing them with transit service is a challenge.

Forest Grove has a larger share of these demographic groups compared to the Portland Metro region and Washington County (it should be noted that some individuals are included in one or more demographic groups):

- The 2010 U.S. Census indicates that 12.3 percent of Forest Grove's population (nearly 2,600 persons) is over the age of 65.
- About 14.7 percent of Forest Grove's population has one or more disabilities.

- Approximately 20 percent of Forest Grove households (about 1,450 households) earn below the federal poverty level, based on the 2008-2010 American Community Survey 3-year average. The share of low-income households in Forest Grove is about double that of Washington County overall.

These individuals or households, and youths below the legal driving age and/or without access to a motor vehicle, represent some of the Forest Grove population considered transportation disadvantaged. It is critical that steps be taken to meet these needs, as such persons frequently have few alternatives to transit service.

Federal law also mandates assistance for those with special needs. The Americans with Disabilities Act (ADA) of 1990 requires transit agencies to make their services fully accessible to disabled persons and to provide paratransit services for those unable to use accessible transit. By law, TriMet must offer ADA complementary service within three-quarters of a mile from a fixed transit route. It is important to continue TriMet's LIFT Program and Ride Connection services to areas within the City not supported by transit service.

LIFT services provided by TriMet and Ride Connection U-Ride service also address the needs of the local elderly and disabled population. TriMet Line 57 serves the area of the community with the highest concentration of low income, minority, and elderly households. The LIFT services provided by TriMet also address the needs of the local elderly and disabled population. The non-profit Ride Connection network provides Forest Grove with door-to-door service to people with disabilities and seniors (age 60 or over) via Washington County U-Ride. The service area covers western Washington County and is free of charge. School bus service is provided to all students in Forest Grove, elementary through high school, who live farther than one-mile from the school or must cross a major street while walking to and from school.

No specific problems with transportation services for disadvantaged Forest Grove residents have been identified. As the population continues to age, the needs of the elderly and disabled are expected to increase.

The City of Forest Grove should continue to support services to the elderly and ADA-eligible residents. Some inexpensive ways in which the city of Forest Grove may assist in promoting the services currently offered to the elderly and disabled are to post notices on their public bulletin boards, and to use meetings with the public to make notices and fliers available. In addition, the proposed deviated fixed-route transit service for Forest Grove will expand service coverage in Forest Grove, including serving the Homestead retirement community on Heather Street.

7.4 Transit Project List

To meet transportation performance standards and serve future growth, the future transportation system needs multi-modal improvements to manage the forecasted travel demand. Future growth can be accommodated with significant investment in transportation improvements.

TriMet is responsible for changes to existing transit routes through their annual TIP report. In order for the City to have its transit needs assessed, the City can provide input to TriMet’s TIP through the Washington County Coordinating Committee or through the TIP Open House held every January.

The City will pursue development of local service to expand the transit service coverage area. The new local service will initially be developed independently of TriMet service. This potential service will complement the regional service currently provided by TriMet. In the future, this service could be coordinated with other service in nearby cities including Banks, Cornelius, Hillsboro and North Plains. The concept for local circulator service being established by the City and Ride Connection is described in

the next sub-section. Estimated annual operating cost for this local circulator route is approximately $250,000 per year initially, with various options to expand service hours, frequency, and days of operation in the future based on demand and resources. The full cost of all long-term options would be about $530,000 annually. Capital costs for service startup are estimated at between $235,000 to $255,000, including two buses, stop infrastructure, and marketing and other startup costs. The City of Forest Grove and its partners can apply for grant funding (federal, state, and/or regional) to assist with operating and capital costs. The project plan includes 20 years of operating such a route includes only initial capital costs to establish the service (e.g., vehicles, facilities, etc.).

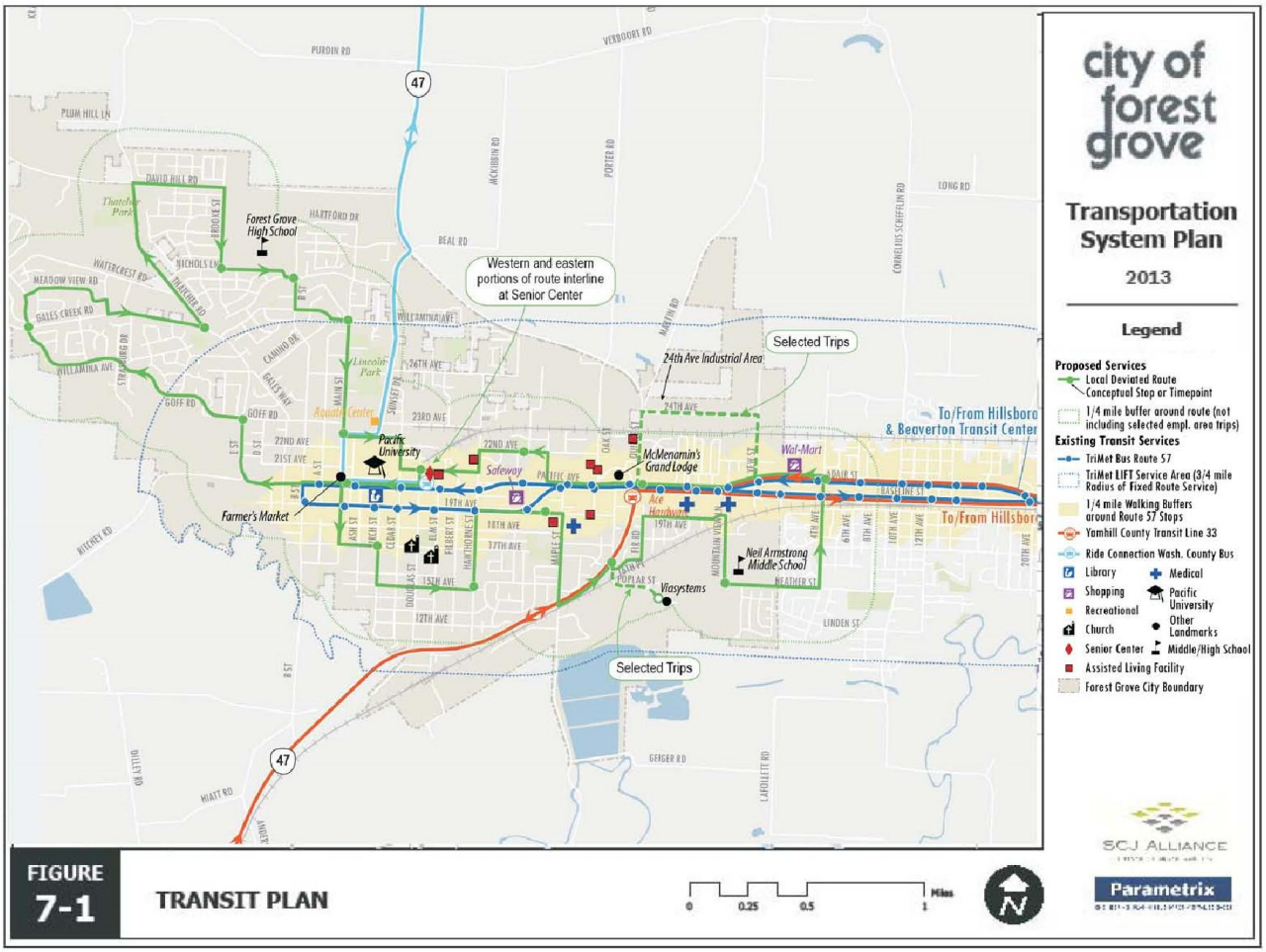
Transit projects were determined based on the identified needs, policies and project feasibility. Proposed transit plan projects are summarized in Table 7-2. Forest Grove should coordinate with TriMet to incorporate changes to bus service within the City and work with Ride Connection to implement the local circulator service. For illustrative purposes, expanded coverage area is illustrated in Figure 7-1 including both TriMet line 57, the Ride Connection Washington County Bus service (Forest Grove – Banks – North Plains – Hillsboro), Yamhill County line 33, and a new local service route. The figure does not prescribe or recommend service changes to existing routes but provides the current working concept for the new route (subject to refinement as additional implementation outreach is conducted by the City and Ride Connection). Final routing details and frequency of potential local transit services, provided either by TriMet, Ride Connection, or another agency, will be deferred to the City of Forest Grove Transit Study and/or other future studies with specific transit findings.

Transit enhancements to existing TriMet service are ultimately decided based on regional transit goals by TriMet and Metro (in conjunction with county and local agencies). As such, no direct funding for transit is assumed from the City even though costs for these projects may be substantial. These projects are under the jurisdiction of, and/or will be funded by, other agencies. The City may provide additional financial support if it is deemed appropriate to facilitate transit projects of particular interest and benefit to the City.

Table 7-2. Transit Master Plan Projects

Project	Description
High Capacity Transit	Support study and development of MAX light rail extension to Forest Grove.
Bus Stop Enhancements	Coordinate with TriMet to provide transit stop amenities including bus shelters, information kiosks, and street lighting at additional transit stops.
Pacific Avenue / 19th Avenue Transit Signal Priority	Coordinate with TriMet to construct and implement transit signal priority on Pacific Avenue and 19th Avenue as congested conditions occur and ridership volumes increase.
Improve Service Coordination for Bus Line #57	Coordinate with TriMet to modify the schedule, stop locations, or additional service area coverage for line #57.
Improve Pedestrian Connections to Transit Facilities	Construct sidewalks, crosswalks, etc. adjacent to transit routes and facilities (i.e. park-and-ride lots, bus stops, etc.). Focus on enhancing pedestrian access within ¼ mile of bus stops.
Provide More Local Service	Provide local transit services to meet transit needs in areas of the city outside of the line 57 coverage area, particularly in the western area of the city.
Increase Density Adjacent to Transit	Direct growth to increase the density of development along transit routes in an effort to support regional transit service goals.

Figure 7-1. Transit System



7.4.1 Local Transit Service (GroveLink)

This section provides additional detail for the local transit service concept. The conceptual operating parameters for such a local transit circulator in Forest Grove are subject to refinement as the service is implemented and additional public outreach is conducted.

Basic Service Concept

The proposed service routing, shown in Figure 7-1, is a refined version of the conceptual routes included in the Transit Enhancement Plan (2009) and the Forest Grove TSP (2010). It has the following characteristics:

- The service would operate as a deviated fixed-route or flex service. It would serve specified fixed stops at or between published time points, but would be able to flex or deviate off the route between time points to pick up passengers who live beyond walking distance of fixed stops or are unable to access the stops. Use of the fixed stops would be encouraged to optimize route efficiency and maximize time available for deviations. Certain zones may be served only on-demand.
- The service would be structured into two one-way loop routes, one focused on the eastern portion of the city (operating in a counter-clockwise direction) and the other focused on the western portion of the city (operating in a clockwise direction).
- The east and west loops would be interlined, to allow a single-seat and/or single-fare connection between origins and destinations on the west and east sides of the city. A timed transfer could be implemented during peak hours to enable a faster travel time for certain travel patterns.
- The route provides service to the western portion of Forest Grove, which lacks transit service, and connects residential areas throughout the city to Forest Grove High School and Neil Armstrong Middle School, Pacific University, and key retail destinations and activity centers. The eastern portion of the route follows a portion of the Line 57 corridor to serve as a feeder and to connect residents to activity centers along this corridor, but also deviates to provide greater coverage in residential areas, particularly south of 19th Avenue.
- Peak hour service would include runs serving shift times at key employers. Based on an informal survey of employers, some shift times could be met by the proposed service, while others could be met only partially. Some trips serving employers could connect to MAX light rail in Hillsboro. Initially, based on startup funding sources, such trips would be limited, but could be expanded with funding contributions from employers.

This type of service model is inherently flexible, which is appropriate for serving the lower density areas in Forest Grove, and would need to be adapted to actual passenger demand and usage patterns.

Operating Parameters

It is estimated that each portion of the route would require approximately 30-45 minutes to operate; this would depend on passenger demand and the number of stops and deviations required. Initially, it is assuming that two buses operate during peak hours; this would enable approximately 45-60 minute headways, including additional time for deviations/flex service and more focused service for work and school trips. Off-peak, a 90 to 120-minute headway could be maintained with one bus in operation. The level of service could be adjusted in the future based on demand and resources. Table 7-3 summarizes the local service operating parameters.

Table 7-3. Initial and Longer-Term Operating Parameters

	Initial Service	Longer-Term
Days of Operation	Weekday Peak and Midday	Add: Evening Service Add: Saturday Service
Local Circulator Service Type	Flex/Deviated Route (No ADA requirement)	Likely remains appropriate, but can re-evaluate based on travel patterns, land use
Weekday Service Span and Headway	6 AM - 7 PM (13 hours) Peak: 30-45 min. (2 vehicles) Off-peak: 60-90 min (1 vehicle)	6 AM – 10 PM (16 hours) Could increase headway to regular 30 min. peak and 60 min. off-peak (based on demand and funding)
Weekend Service Span and Headway	None	8 AM – 5 PM Saturdays, 60-90 min. headways (1 vehicle) Expand to 10 PM and regular 60 min. headways
Type of Vehicles	Approx. 14-passenger buses	Potentially move to larger vehicles
Employer-Oriented Service	Selected trips serve employment areas, connect to MAX	Consider expanding peak-hour connections to MAX based on funding. Future: Direct HCT connection

Operating Costs

Initial operating costs for a local transit service with the above operating parameters are estimated at $250,000 per year initially, with various options to expand service hours, frequency, and days of operation in the future. The full cost of all long-term options would be about $530,000 annually, however this long-term vision would be implemented in phases based on future growth of the City, increased demand, and available resources. Table 7-4 summarizes service operating costs.

Table 7-4. Initial and Longer-Term Operating Costs

Initial Startup and Long-Term	Annual Service Hours	Total Annual Operating Cost
Initial: weekday service from 6 AM – 7 PM	4,850	$250,000
Long-Term (implemented in phases): weekday service 6 AM-10 PM, with 30 minute peak and 60 minute off-peak and evening headways; Saturday service 8 AM – 10 PM with 60 minute headways	10,650	$530,000

Note: Cost based on Ride Connection 2013 cost per service hour.

Capital Costs

Capital costs for service startup are estimated at between $235,000 to $255,000, including:

- Two buses ($134,450)
- Stop infrastructure with amenities ranging from a basic stop with concrete pad, seat, and signage, to higher-amenity stops with a shelter and bench ($80,000-$100,000)
- Marketing and other startup costs ($20,000)

8. ROADWAY PLAN

Forest Grove has a relatively mature roadway network centered around the downtown grid with a developing section in the northwest part of the city. This chapter identifies a 20-year Preferred Plan for addressing the future needs of the roadway system for motor vehicles. The roadway functional classifications and design standards are also identified. The roadway network builds upon previous and on-going planning efforts, and reflects the extensive input offered by City staff, stakeholder groups, and Forest Grove residents.

8.1 Roadway Function

Roadways have two primary functions; to provide mobility and to provide access. These functions can be incompatible since high or continuous speeds are desirable for mobility, while low speeds are more desirable for land access. Arterial facilities emphasize a high level of mobility for through movement; local facilities emphasize the land access function; and collectors offer a balance of both functions. The planning effort to identify the functional class of roadways in Forest Grove is essential to preserve and protect future mobility and access, by all modes of travel.

Functional classification has commonly been mistaken as a determinate for traffic volume, road size, urban design, land use and various other features which collectively are the elements of a roadway, but not its function. Traffic volume, design (including access standards) and size of the roadway are outcomes of function. Function can be best defined by the degree of connectivity. Without connectivity, neither mobility nor access can be served. Roadways that provide the greatest reach of connectivity are the highest level facilities.

8.1.1 Functional Classification Definitions

Arterials can be defined by regional level connectivity. These routes go beyond the city limits in providing connectivity and can be defined into two groups: principal arterials (typically state routes) and arterials. The movement of persons, goods and services depends on an efficient arterial system.

Principal Arterials are typically freeways and state highways that provide the highest level of connectivity. These routes connect over the longest distance (sometimes miles long) and are less frequent than other arterials or collectors. These highways generally span several jurisdictions and many times have statewide importance.

Arterial streets serve to interconnect and support the principal arterial highway system. These streets link major commercial, residential, industrial and institutional areas. Arterial streets are typically spaced about one mile apart to assure accessibility and reduce the incidence of traffic using collectors or local streets in lieu of a well-placed arterial street. Many of these routes connect to cities surrounding Forest Grove.

Collector streets provide both access and circulation within residential and commercial/industrial areas. Collectors differ from arterials in that they provide citywide connectivity, do not require as extensive control of access and penetrate residential neighborhoods, distributing trips from the neighborhood and local street system. These routes may span large areas of the city but typically do not extend significantly into adjacent jurisdictions.

Neighborhood Routes are usually long relative to local streets and provide connectivity to collectors or arterials. Because neighborhood routes have greater connectivity, they generally have more traffic than local streets and are used by residents in the area to get into and out of the neighborhood, but do not serve citywide or large area circulation. They are typically about a quarter to a half mile in total length.

Traffic from cul-de-sacs and other local streets may drain onto neighborhood routes to gain access to collectors or arterials. Because traffic needs are greater than a local street, certain measures should be considered to retain the neighborhood character and livability of these routes. Neighborhood traffic management measures may in some cases be appropriate (including devices such as speed humps or traffic circles.

Local Streets have the sole function of providing access to immediate adjacent land. Service to "through traffic movement" on local streets is deliberately discouraged by design.

8.1.2 Proposed Changes to Functional Classification

With the addition of increase street connectivity as proposed by the TSP, changes to the existing functional classification system are necessary. These changes are reflected in Figure 8-1 and include:

- New arterials including: David Hill Road between Thatcher Road and OR 47, connection between western terminus of 19th Street and intersection of Pacific Avenue at E Street.
- New or newly designated collectors including: extension of B Street from Hartford Drive to David Hill Road, extension of Main Street from Hartford Drive to David Hill Road, completion of Nichols Lane between B and Main Streets, extension of 23rd Avenue from Hawthorne Lane to OR 47 including modified intersection with Martin Road, extension of 26th Avenue from existing eastern terminus to Oak Street, extension of Laurel Street from existing northern terminus to potential future intersection with OR 47 (as proposed in the recent Forest Grove Transit-Oriented Development Study), extension of Holladay Street from Cornelius west to OR 47 at Martin Road, development of new road between the southern terminus of Strasburg Drive and 19th Avenue, and the extension of Heather Street to intersection with existing Poplar Street.

8.2 Parking

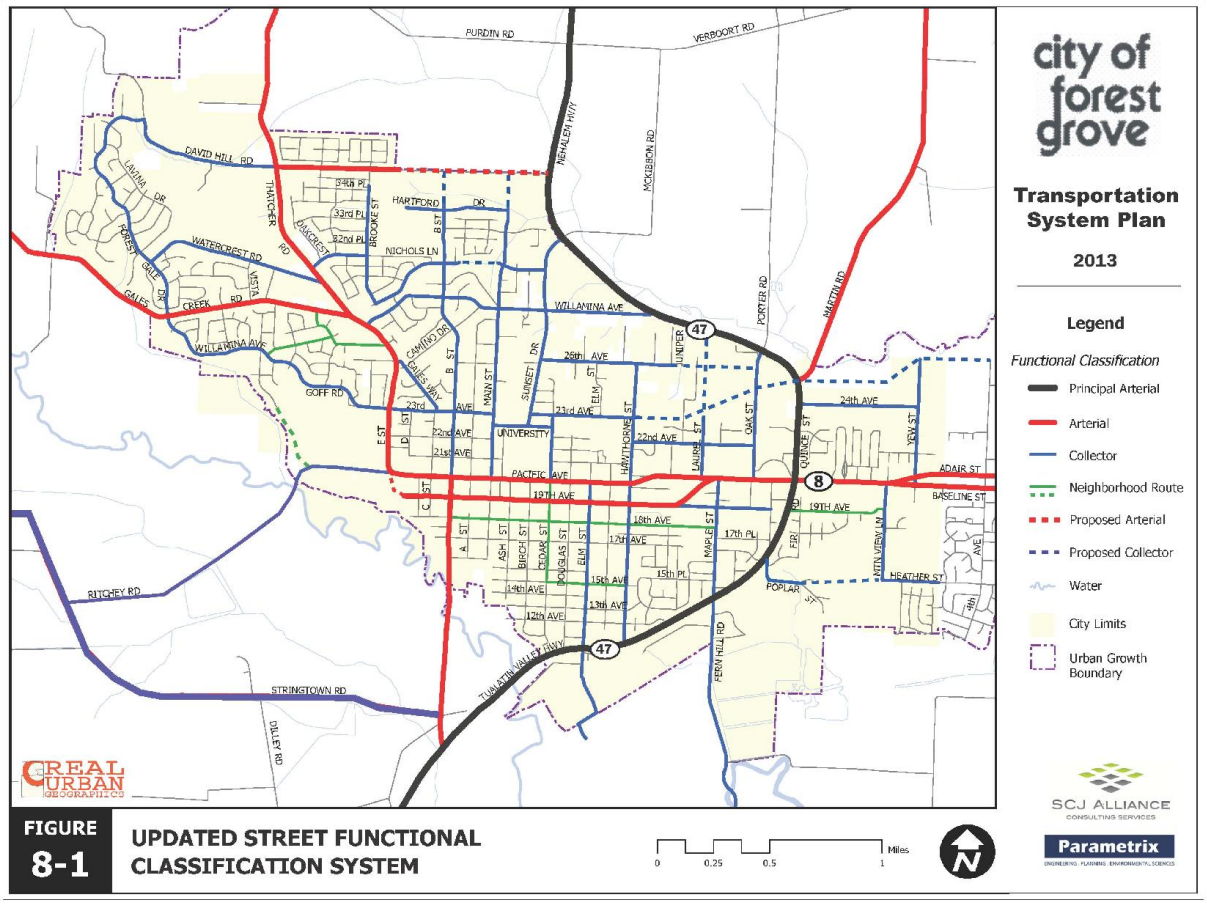
Parking has generally been a minor transportation issue in Forest Grove. New land uses were required to provide the code designated number of parking spaces to assure there would be no impact to surrounding land uses (overflow parking). These parking ratios were developed based upon past parking demand characteristics of each land use type. Parking has become an element of transportation planning policy through adoption of the Transportation Planning Rule (sections 660-012-020(2g) and 660-12-045(5c)) and the Metro Urban Growth Management Functional Plan, Title 2. By adopting the minimum and maximum parking ratios outlined in Title 2, the City will be able to address the TPR required reduction in parking spaces per capita over time.

Several strategies were identified to address the desire to reduce parking needs in Forest Grove:

- Shared parking
- Parking pricing
- Maximum Parking Ratios
- Review of parking needs by individual developments at the site plan review stage. Parking provisions should be compared to demand, as identified by ITE or DEQ.[27]

[27] *Parking Demand*, 3nd Edition, Institute of Transportation Engineers, 2004; and *Peak Parking Space Demand Study*, Oregon Department of Environmental Quality, by JHK & Associates, June 1995.

Figure 8-1. Updated Street Functional Classification System



In addition to general parking requirements, a need for additional parking for trucks, particularly near the industrial areas within the city has been identified. Further study may be appropriate to access the future needs of truck parking within Forest Grove.

8.3 Access Management

Access management is important for maintaining traffic flow and mobility, particularly on high volume roadways. Where local and neighborhood streets function to provide access, collector and arterial streets serve greater traffic volume. Numerous driveways or street intersections increase the number of conflicts and potential for accidents and decrease mobility and traffic flow. Forest Grove needs a balance between streets that provide access and streets that serve mobility.

Several access management strategies were identified to improve access and mobility in Forest Grove:

- Provide left turn lanes where warranted for access onto cross streets.
- Work with land use development applications to consolidate driveways where feasible.
- Meet Washington County and ODOT access requirements on arterials.
- Use Washington County and ODOT standards for access on arterials and collectors.
- Establish City access standards for new developments and requirements that are consistent with Metro Title 6 access guidelines.
- Limit new single family residential access on arterials and collectors.
- Specific access management plans be developed for key corridors to maximize the capacity of the existing facilities and protect their functional integrity.

8.4 Transportation Demand Management / Transportation System Management and Operations

The Oregon Transportation Planning Rule outlines a goal of reducing vehicle miles traveled (VMT) per capita. The Metro 2040 Growth Concept identifies targets a reduction of motor vehicle emissions. Transportation Demand Management (TDM) and Transportation System Management and Operations (TSMO) are efforts towards achieving these goals.

Transportation Demand Management is the general term used to describe any action that removes single occupant vehicle trips from the roadway network during peak travel demand periods. The following are examples of TDM measures that are encouraged in Forest Grove:

- Working with employers to install bicycle racks
- Working with property owners to place parking stalls for carpoolers near building entrances
- Providing information regarding commute options to larger employers
- Encouraging linkage of housing, retail and employment centers
- Supporting flexible working hours
- Supporting telecommuting
- Providing incentives to take transit and use other modes (e.g. transit pass subsidies)
- Scheduling deliveries outside of peak travel demand hours

Transportation System Management and Operations (TSMO) focuses on low cost strategies to enhance operational performance of the transportation system. Measures that can optimize performance of the transportation system include signal improvements, intersection channelization, access management, HOV lanes, ramp metering, rapid incident response, and programs that smooth transit operation. These measures can reduce delay for motor vehicles and help maintain consistent speeds that limit vehicle emissions. TSMO strategies will be considered in the future as necessary and appropriate.

8.5 Neighborhood Traffic Management

Neighborhood Traffic Management (NTM) is a term that has been used to describe traffic control devices typically used in residential neighborhoods to slow traffic or possibly reduce the volume of traffic. NTM is descriptively called traffic calming due to its ability to improve neighborhood livability. Forest Grove has done little in the way of testing and implementing NTM measures such as speed humps, chokers, pavement texturing, circles, chicanes and other elements. The City has a three-step ad hoc program for addressing neighborhood concerns that include 1) use of the speed wagon to establish a baseline condition; 2) monitoring by Neighborhood Watch groups; and 3) police enforcement. No formalized NTM program is currently in place. If an NTM program is established, a more proactive position can be taken in managing neighborhood concerns. A formal NTM program may include establishing minimum performance criteria, a ranking system, and preferred conditions for implementing other control devices and strategies. The following are examples of neighborhood traffic management strategies:

- Speed wagon (reader board that displays vehicle speed)
- Speed humps
- Traffic circles
- Medians
- Landscaping
- Curb extensions
- Chokers (narrows roadway at spots in street)
- Narrow streets
- Closing streets
- Photo radar
- On-street parking
- Selective enforcement
- Neighborhood watch

8.6 Roadway Design Characteristics

Design characteristics of streets in Forest Grove were developed to meet the function and demand for each facility type. Because the actual design of a roadway can vary, the objective was to define a system that allows standardization of key characteristics to provide consistency, but also to provide criteria for application that provides some flexibility, while meeting standards. In addition, guidance for the development of Green Streets consistent with regional policy is provided in this section.

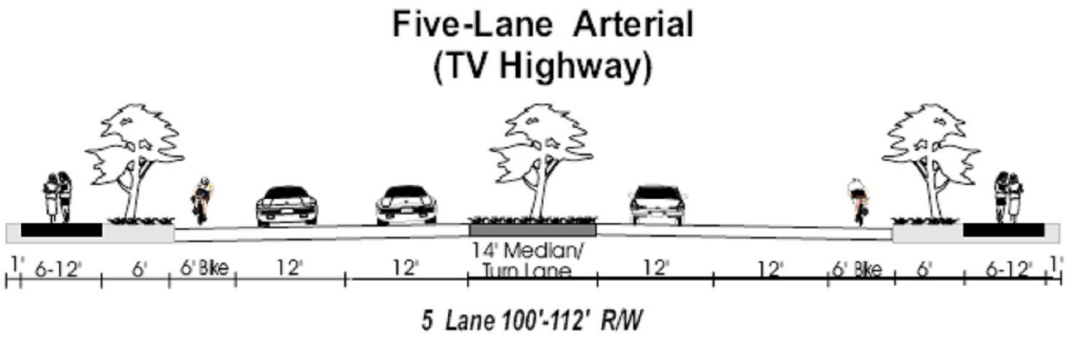
8.6.1 Street Cross Sections

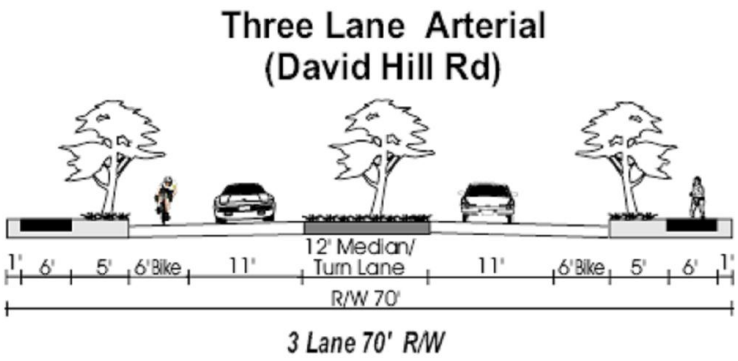
Figures 8-2 to 8-6 depict sample street cross-sections and design criteria for arterials, collectors, neighborhood routes and local streets.

The arterial street section indicates a range of sidewalk width. The actual width constructed would reflect right-of-way constraints and land use policies. Improvements to arterial with a “boulevard”

designation would include wider sidewalks than a major arterial with a “street” designation. For example, the 19th Street/Pacific Avenue couplet is designated by Metro as a Boulevard Design district with additional features and requirements beyond the typical arterial cross-section.

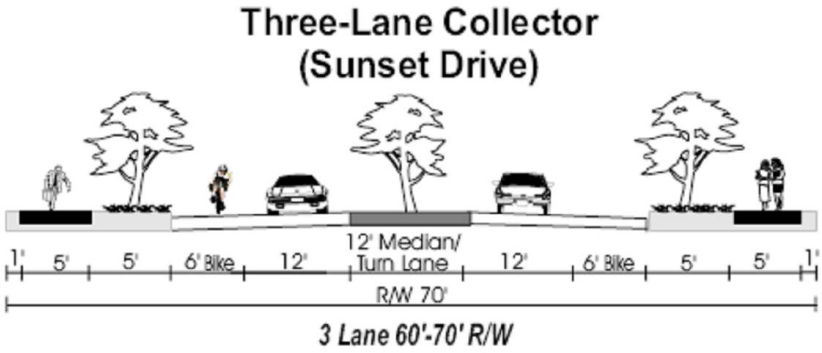
Figure 8-2. Sample Street Cross Sections for Arterials





Criteria	5 Lane Arterial	3 Lane Arterial
Vehicle Lane Widths:	11-14 ft.	11-12 ft.
On Street Parking:	None	None
Bicycle Lanes:	5-6 ft.	5-6 ft.
Sidewalks:	6-12 ft.	5-8 ft.
Landscape Strips:	0-8 ft.	0-8 ft.
Medians/Turn Lane Widths:	12-14 ft.	12-14 ft.
Neighborhood Traffic Management:	Not Appropriate	Not Appropriate

Figure 8-3. Sample Street Cross Sections for Collectors



Criteria	Collector
Vehicle Lane Widths:	10-12 ft.
On Street Parking:	5-8 ft.
Bicycle Lanes:	5-6 ft.
Sidewalks:	5-7 ft.
Landscape Strips:	0-8 ft.
Medians/Turn Lane Widths:	10-14 ft.
Neighborhood Traffic Management:	Under Special Conditions

Figure 8-4. Sample Cross Section for Neighborhood Routes

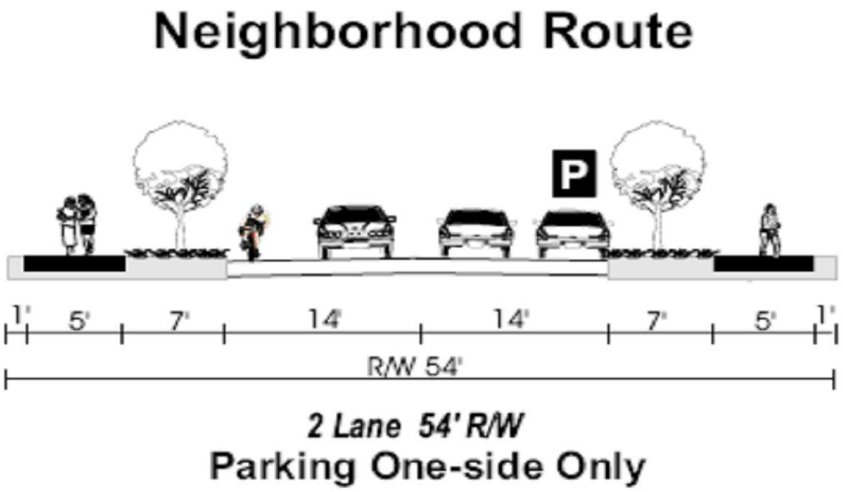
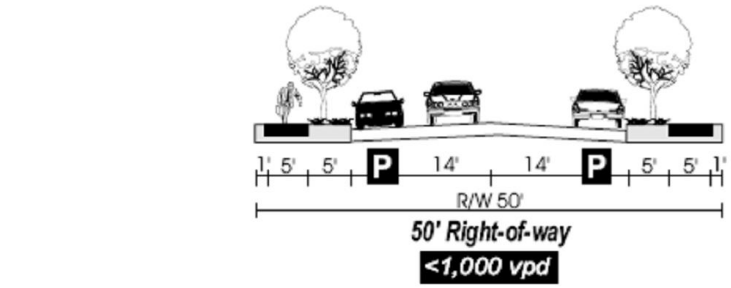
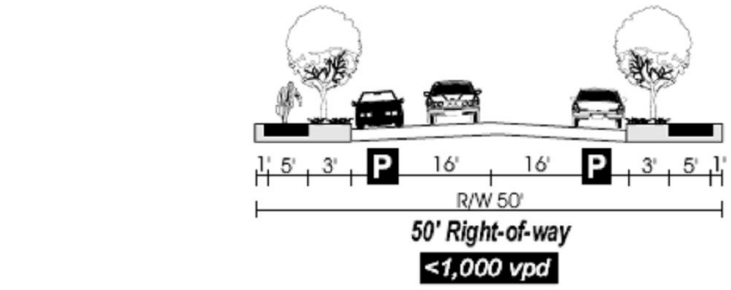


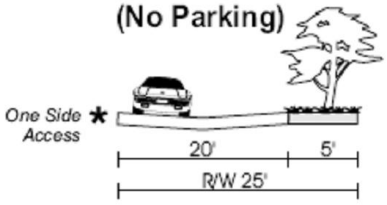
Figure 8-5. Sample Cross Sections for Residential/Local Streets



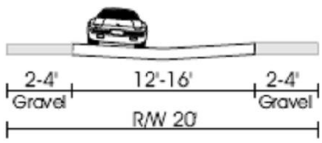
32' Standard Residential



Alley
(No Parking)



Alley
(No Parking)



Cul-de-sac
(No Parking)

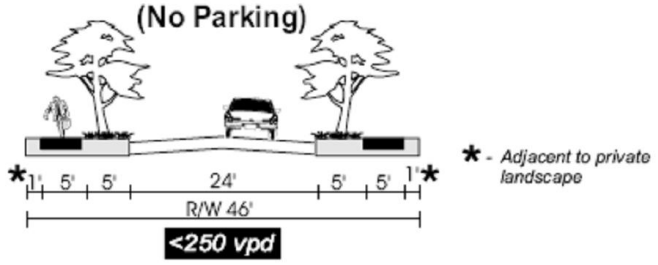
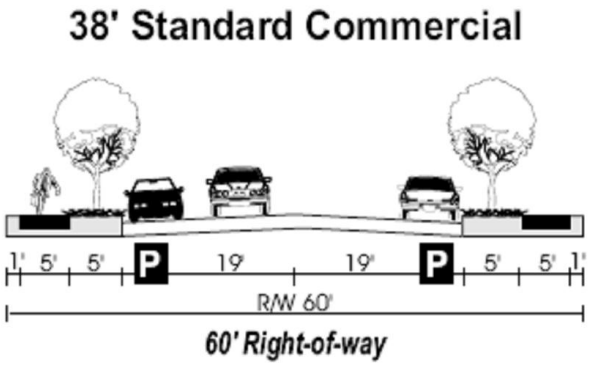
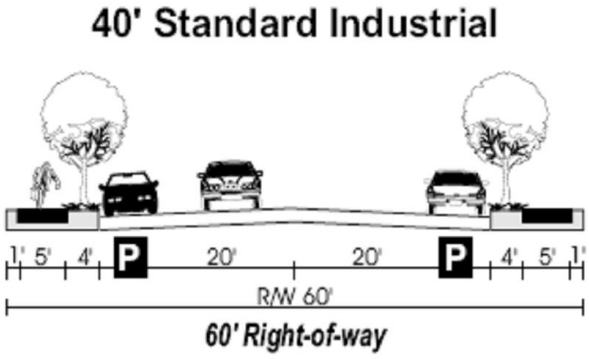


Figure 8-6. Sample Cross Sections for Commercial/Industrial Local Streets





The most common roadways in Forest Grove are two, three and five lanes wide. Where center left turn lanes are identified, the actual design of the street may include sections without center turn lanes or with median treatments, where feasible. The actual treatment will be determined within the design and public process for implementation of each project. Specific right-of-way needs will need to be monitored continuously through the development review process to reflect current needs and conditions. More specific detail may become evident in development review which requires improvements other than these outlined in this 20 year general planning assessment of street needs.

The City of Forest Grove will need to coordinate with regional agencies to assure consistency in cross section planning with the Washington County Transportation System Plan and the Metro Regional Transportation Plan.

8.6.2 Green Streets

An additional element of roadway design for construction projects in Forest Grove is "green streets" characteristics. The main concept behind green street design is the incorporation of storm water management with environmentally sound street design to help protect streams and wildlife habitat. Green streets also have the additional benefit of adding other enhancing elements to the street right-of-way area, including increased safety and attractiveness for pedestrians and maximized opportunities for street trees and other landscaping. Additionally, green street design allows for multimodal travel choices and a visual and physical connection to public and open spaces. Table 8-1 is a matrix outlining different green street design elements/techniques.

Table 8-1. Green Street Design Elements

Element	Application	How It Works
Rainwater Harvesting	Capture and re-use stormwater runoff for landscape irrigation.	Stormwater is conveyed to storage facilities and collected during the wet season for use during the dry season.
Permeable Paving	Replace most of the impermeable surfaces in the right-of-way with permeable materials, such as permeable pavement, concrete, or paving blocks.	The permeable materials allow water infiltration through the surface to the subgrade.
Bio-retention	Above ground or subgrade containers are used to promote infiltration and evapotranspiration of stormwater.	Engineered or amended soils can be used to promote this process.
Bio-swales	Subgrade channels with vegetation used to convey and treat stormwater.	Vegetation is used to control flow velocities and settle pollutants.

Application of green street design is generally not based on functional class and can span across and be applicable to multiple types of streets. Green street design may not be suitable in many circumstances. The soils within an area where green street design could be implemented need to be tested to determine the rate of infiltration they can sustain. In addition to green streets, traditional storm water management facilities need to be designed to control overflow if the capacity of the green streets are exceeded.

8.7 Previously Identified Projects

Several roadway improvements are already planned for the Forest Grove area by various agencies. Washington County Major Streets Transportation Improvement Program (MSTIP) includes projects in Forest Grove that are funded by Washington County with some federal assistance. Metro's Regional Transportation Plan includes elements for state facilities that are federally mandated (STIP) and other local plan components (MTIP). Table 8-2 summarizes the planned roadway improvements near Forest Grove as of the 2010 Regional Transportation Plan. Where possible, the agency responsible for the project and project dates are provided.

Table 8-2. Previously Planned Roadway Improvements

Description/ Location	Project/Limits	Estimated Project Cost (Millions)[28]	Jurisdiction	Schedule
Heather Industrial Connector	Extend from western terminus in the City of Cornelius to Highway 47.	$7.2	Forest Grove/Wash Co.	2008-2017
Highway 47 Improvements	Various intersection improvements between Purdin/Verboort and B Street.	$20.4	ODOT/ Forest Grove	2008-2017
Thatcher Road Realignment	Realign at Gales Creek Road Intersection.	$4.5	Forest Grove	2008-2017
23rd Avenue Extension	Construct collector roadway between Hawthorne Avenue and Highway 47.	$12.4	ODOT/ Forest Grove	2008-2017
E Street / Pacific Avenue / 19th Avenue Intersection	Extend 19th Avenue west and connect to E Street and Pacific Avenue with round-about.	$6.0	Forest Grove	2008-2017
Holladay Street Extension (East)	Construct new collector connecting from 4th Avenue to Yew Street	$3.8	Cornelius	2018-2025
David Hill Road Extension	Construct new arterial from Thatcher Road to Highway 47	$6.2	Forest Grove	2008-2017
Highway 8 / Pacific Avenue / 19th Avenue Improvements	Retrofit street with boulevard design from Highway 47 to B Street. Includes intersection improvements at Yew/Adair/19th	$20.5	ODOT/ Forest Grove	2008-2017
	Total	$81.0		

Source: Metro / Washington County

8.8 Future Needs

Chapter 4 (Future Travel Demand) describes the operational deficiencies expected in 2035. The motor vehicle deficiencies are based on operational analysis with forecasted volumes. Future volumes are based on 2035 travel demand model volumes for the City's Preferred Land Use Alternative. This analysis assumes construction of previously planned transportation improvements (Table 8-2). The following ten intersections are identified as future deficiencies:

[28] Cost estimate is based on average of Metro cost estimates in 2007 and at expected construction date (2008-2017 for most Forest Grove projects).

- Gales Creek Road / Thatcher Road
- Porter Road & Oak Street / Highway 47
- Martin Road / Highway 47
- 24th Avenue / Highway 47
- Maple Street / Highway 47
- Elm Street / Highway 47
- B Street / Highway 47 (Baseline conditions only)
- Adair Street / Yew Street
- 19th Avenue / B Street
- Pacific Avenue / Quince Street

In addition to operational deficiencies identified at study intersections, local street connections are needed to improve circulation within Forest Grove and provide improved connectivity for pedestrians, bicyclists, and motor vehicles.

Due to the complex and interconnected transportation issues of various corridors and sub-areas within the City, the need has been identified for several Refinement Plan studies to further develop appropriate long-term solutions. The proposed Refinement Plan Study areas would include:

- Addressing existing and potential future congestion at the intersections of Yew Street with Adair Street, Yew Street with Baseline Street, and Mountain View Lane with Pacific Avenue. Potential improvements could focus on these intersections specifically or could be expanded to address additional street connections between Yew Street and Mountain View Lane to east/west roadways including OR 8 (Pacific Avenue), 24th Avenue, and Holladay Street.
- Highway 47 access between approximately Hawthorne Street on the north and 19th Avenue on the south. This area would include the challenging highway intersections with Martin Road and 24th Avenue along with the proposed extensions of 23rd Avenue (east to intersect with Highway 47) and Holladay Street (west to intersect with Highway 47).
- Development of a local street plan to guide future development of the David Hill area in the northwestern portion of the City. Existing challenges relate both to the long-term need to improve David Hill Road to an urban section (portions of this road are currently narrow and winding with minimal shoulders), to connect David Hill Road to Highway 47, and to provide a system of local streets serving the expected residential and mixed use development in this area. Topography and the need to preserve vegetative corridors must also be considered.
- Development of a street connectivity plan to provide access to the City's northern urban reserve, as well as circulation within the urban reserve area. The intent of this refinement plan is to ensure that potential improvements within the existing UGB do not preclude creation of a logical and context-sensitive street system when the urban reserve is ultimately developed.

The solutions proposed in the Preferred Roadway Plan are considered to be preliminary, and may be modified upon completion of the future Refinement Plan Study for these areas.

8.9 Preferred Plan Roadway Network

The Preferred Plan roadway network builds upon the existing roadway network. Preferred Plan projects aim to fill system gaps and develop a more complete network. The system includes new roadways, new connections between roadways and intersection improvements to address expected deficiencies. The network was developed based on extensive input from previous planning efforts, as well as input from ODOT, DLCD, Metro, City leaders and Forest Grove residents. It should be noted that proposed

roadways and connections depicted on the preferred plan map represent conceptual alignments, with further evaluation needed to identify specific routes. The proposed improvements are tied to land that will have future development actions. It is important that these planning level transportation improvement proposals carry through and develop further at the time of specific land use planning. Improvements tied to industrial land are particularly preliminary and may require significant adjustment as land use decisions are made. Additionally, development of projects affecting the state highway system will require on-going coordination with ODOT building on the discussions held during development of this document and the 2010 TSP.

The sections below discuss specific roadway facilities in greater detail, while Table 8-3 at the end of this chapter presents the project list.

8.9.1 Local Street Connectivity

Much of the local street network in Forest Grove is fairly well connected, with multiple access opportunities for entering or exiting neighborhoods. This is particularly true for the area south of Pacific Avenue, where a "grid" street system is in place. However, there are a number of locations in Forest Grove where, due to the lack of connection points, the majority of neighborhood traffic is funneled onto one single street. This type of street network results in out-of-direction travel for motorists and an imbalance of traffic volumes. In addition to motor vehicles, direct connections contribute greatly to accessibility for pedestrians and bicyclists.

By providing connectivity between neighborhoods, out-of-direction travel and vehicle miles traveled (VMT) can be reduced, accessibility between various modes can be enhanced and traffic levels can be balanced out between various streets. The proposed connections in this section are intended to accomplish these objectives. Local connections can reducing potential neighborhood traffic impacts and mitigate capacity deficiencies by better dispersing traffic.

The preferred criteria used for providing connections is as follows

- Every 300 to 500 foot grid for pedestrians and bicycles
- Every 500-1,000 foot grid for automobiles

New local connections are most important in the areas north of the Pacific Avenue both to the east, where there is a significant amount of undeveloped industrial land, and to the west, where there is a significant amount of anticipated residential development. Figure 8-7 shows the proposed local street connections for Forest Grove. In each case, the specific alignments and design will be better determined upon further engineering and/or development review. Topography, railroads and environmental conditions limit the level of connectivity in Forest Grove. Where appropriate, neighborhood traffic management may be incorporated into design and construction of new connections to protect existing neighborhoods from potential traffic impacts.

One area of particular sensitivity for local connections is located between the proposed David Hill Road extension and Hartford Drive. Roadway connectivity in the area requires further exploration before desired connections can be identified. The area is identified in Figure 8-7 as requiring additional study, as is the area along Highway 47 where future potential access locations and/or acceptable to ODOT have not been determined.

8.9.2 Future Study Areas

Figure 8-7 identifies four areas of the City requiring further study. During the TSP update, various ideas for improvements in the study areas were discussed, but no one proposed plan was agreed upon by all of the affected jurisdictions. More refined analysis is needed before conclusions on a preferred plan for

each study area can be reached. The TSP is a policy level document and not a vehicle for in-depth transportation analysis. A more in-depth analysis needs to include the following:

1. Evaluate alternative plans;
2. Evaluate implications of proposed alternatives on the transportation system (e.g., connectivity, circulation, access, traffic intersections, capacity, preliminary design, etc.);
3. Present how various alternatives and the proposed plan relate to various standards (e.g., type of standards, standards met or not, etc.); and
4. Recommend an alternative based on an evaluation of outcomes.

The following is a summary of the issues in each study area including a short discussion of that analysis that has been conducted and the ideas proposed for further review.

Yew Street / Adair Street / Mountain View Lane Study Area

The area that encompasses the intersections of Yew Street/Adair Street, Yew Street/Baseline Street, and Mountain View Lane/Pacific Avenue has been identified as needing further study. The Yew Street/Adair Street intersection has an existing deficiency (Level of Service F) and, with projected increases in traffic volumes, intersection operations will further degrade. Additionally, the Yew Street/Baseline Street intersection is projected to have future operational deficiencies for minor street approaches. The Mountain View Lane/Pacific Avenue intersection has an existing traffic signal where Adair Street and B Baseline Street converge to become Pacific Avenue. Several solutions to address the operational deficiency at Yew and Adair Streets have been suggested including additional turn lanes, new roadways such as connections between Yew Street and Mountain View Lane to east/west roadways including OR 8 (Pacific Avenue), 24th Avenue, and Holladay Street, turn restrictions with alternative routing, channelization, and coordinated traffic signals. The City's preferred alternative includes installation of traffic signals to improve operations and safety at the unsignalized intersections. However, this solution raises concerns about signal spacing along Highway 8 approaching the intersections with Baseline and Mountain View Lane. More discussion of various alternatives is included in Appendix J. A long-term solution may include these or other alternatives, and will require further study to identify a short/long-term solution. ODOT involvement and approval would be required for final recommendations.

Highway 47 Access (Hawthorne Street to 19th Avenue) Study Area

The area along Highway 47 between approximately Hawthorne Street on the north and 19th Avenue on the south has been identified for further study. This area needs further evaluation of a long-term access plan to state facilities and further evaluation of local circulation improvements to serve freight traffic and expected growth in local trips. The issues along this corridor include:

- Existing and potential future traffic congestion at the intersections of Highway 47 with Pacific and 19th Avenues.
- The idea of a potential new connection to Highway 47 in the area between Hawthorne Street and 24th Avenue to accommodate land development and growth in travel demand.
- The extension of 23rd Avenue and Holladay Street to connect growth areas in Forest Grove and Cornelius to Highway 47 in the vicinity of Martin Road.

Highway 47 at Pacific and 19th Avenues

These intersections currently operate with some delay (Level of Service D) which is expected to worsen in the future. Other operational deficiencies include long intersection traffic queues and substandard turning radii. Several solutions have been proposed to address these deficiencies including incorporating coordinated signal timing, constructing new roads that would extend existing roadways, installing channelization, adding new turn lanes, and providing for pedestrian enhancements.

Information from this preliminary evaluation has been included in Appendix J. Due to the complexity and interrelated transportation issues, the area has been identified for a refinement planning study (see further discussion below). ODOT involvement and approval would be required for final recommendations.

Highway 47 between Hawthorne Street and 24th Avenue

The idea of a potential connection for local access along Highway 47 in the vicinity of Willamina Avenue, Juniper Street, Hawthorne Street, or Laurel Street (discussed as part of the recent Transit-Oriented Development or TOD planning process), has been identified for further study. Several general concepts were developed for this proposed connection including providing additional Highway 47 access to accommodate demand, preserving mobility along Highway 47, developing corrections to operational deficiencies, and improving local road circulation. More discussion of this study area is included in Appendix J.

23rd Avenue / Holladay Street Extensions

Through the TOD planning process a preferred alignment of the 23rd Avenue extension was identified to connect with Highway 47 at Martin Road. Additionally, Holladay Street would be extended west through and from the City of Cornelius to connect with the highway at Martin Road.

Conclusions

Further evaluation of improvements along Highway 47 will be necessary before the issues identified above can be resolved. This evaluation would be conducted as part of a proposed Refinement Plan Study for the northeast portion of the City. The proposed Refinement Plan Study area would include analysis of:

- Highway 47 intersections between 19th Avenue in the south to the proposed Hawthorne Street intersection northwest of the existing Porter Street/Oak Street intersection.
- A potential alignment of the proposed extension of 23rd Avenue (east to intersect with Highway 47) and Holladay Street (west to intersect with Highway 47) including a recommended connection with Highway 47.
- Connections between Yew Street and Mountain View Lane to east/west roadways including OR 8 (Pacific Avenue), 24th Avenue, and Holladay Street.
- Feasibility for advancing a coordinated timing scheme for Highway 47 and /or extension of the Pacific Avenue / 19th Avenue couplet eastward through Highway 47. It should be noted that ODOT currently considers a coordinated timing scheme along Highway 47 to be infeasible and would not support the extension of the Pacific 19th Avenue couplet eastward to Highway 47.

The solutions proposed in this area in the Preferred Roadway Plan are considered to be preliminary, and may be modified upon completion of the future Refinement Plan Study for this area. ODOT involvement and approval would be required for final recommendations.

David Hill Study Area

The northwestern portion of the City, in the vicinity of David Hill Road, also includes transportation system challenges that require further study. These challenges relate both to the long-term need to improve David Hill Road to an urban section (portions of this road are currently narrow and winding with minimal shoulders), to connect David Hill Road to Highway 47, and to provide a system of local streets serving the expected residential and mixed use development in this area. Topography and the need to preserve vegetative corridors must also be considered. Identification of this study area including a commitment by the City to evaluate local circulation options is necessary to comply with the

requirements of the Transportation Planning Rule (TPR) – hence its identification as a TPR Refinement Area. Compliance with the Regional Transportation Plan (RTP) and Regional Transportation Functional Plan (RTFP) will also require evaluation of local circulation options in this study.

Northern Urban Reserve Study Area
While this area is currently outside of the Forest Grove Urban Growth Boundary (UGB), it lies immediately north of existing development, including the future alignment of David Hill Road between that development and Highway 47. Evaluation of potential concept level local circulation options in this area is necessary to ensure that the proposed David Hill Road improvements and the recommended extensions of B and Main Streets to David Hill Road can be accommodated further north when the area is developed in the future. Additionally, identification of a backbone local circulation system will benefit the orderly development of the area in the future.

Highway 47 South of 19th Avenue
The Highway 47 corridor south of 19th Avenue includes several intersections in need of further study for safety and mobility improvements. These intersections include:

- Highway 47 at Maple Street/Fern Hill Road;
- Highway 47 at Elm Street; and
- Highway 47 at B Street.

The Highway 47 at Maple Street/Fern Hill Road intersection provides connectivity between Pacific Avenue and the Fern Hill wetlands. This intersection is a critical gateway into the City from rural Washington County to the south. This intersection also provides access from Highway 47 to the residential areas served by Maple Street. Key services are located on Maple Street including the Forest Grove Tuality Hospital and Joseph Gale Elementary School. The Highway 47/Maple Street/Fern Hill Road intersection also provides access across Highway 47 to the Fern Hill wetlands recreational area. For these reasons this intersection requires further study for mobility and safety improvements. Funding for specific improvements should be determined through a refinement plan for this key intersection.

The Highway 47 and Elm Street intersection provides access to residential areas north of Highway 47 and the employment area south of Highway 47. Further evaluation of unresolved mobility and safety issues is needed at this location.

Another gateway into the City is located at the Highway 47 with B Street intersection. B Street provides a direct route from Highway 47 to the Forest Grove Town Center. In addition, B Street provides truck access to Highway 47 to and from the Forest Grove solid waste transfer station on B Street. Several serious accidents have been reported at this location including fatalities. Further study and refinement in needed at this intersection to address safety and mobility concerns.

8.9.3 Preferred Plan Project List

Table 8-3 lists roadway improvement projects for motor vehicles as well as planning-level cost estimates. The table may also include bicycle facilities, sidewalks, pedestrian crossings, and transit projects. Figure 8-7 shows the Preferred Plan roadway network including the projects listed in Table 8-3. All roadway alignments are conceptual.

Project cost estimates were based on previous cost estimates and similar planning efforts in other Metro communities. These estimates may not include additional costs related to right-of-way

acquisition, storm drainage relocation or improvements, or utilities relocation. Further engineering study will be necessary to provide a more accurate cost estimate for budgeting these improvement projects. All project cost estimates reflect 2014 dollars.

Table 8-3 does not list all roadway projects or alternatives, but is intended to lay out where the City should concentrate its efforts based on existing knowledge. It should be noted that all projects represent important elements of the roadway network, and should be implemented as soon as opportunities arise. A subset of projects from Table 8-3 has been included in the financially constrained project list of this Forest Grove Transportation System Plan (TSP) update (Table 10-3). This subset project list has the highest short-term need for implementation to satisfy performance standards, or other policies established for the Forest Grove Transportation System Plan. This subset of projects also needed to be identified in the Regional Transportation Plan (RTP) to be eligible for federal transportation funding. Effort will be concentrated on amendments to the financially constrained project list of the Regional Transportation Plan (RTP) to include projects not currently listed (i.e. Yew/Adair Street intersection), therefore setting up needed amendments to Table 10-3. Also, new project needs may arise as land use develops and changes over time.

Projects to be Added to the Regional Transportation Plan

Table 8-3 includes several projects that are intended to address congestion impacts related to community growth. As the City will request that these projects be added to the RTP, the TSP must address how a variety of improvement options were considered before advancing congestion relief projects for adoptions in a local TSP. These improvement options include the following:

- TSMO strategies including localized TDM, safety, operational and access management improvements;
- Transit, bicycle and pedestrian system improvements;
- Traffic calming designs and devices;
- Land use strategies in OAR 660-012-0035(2) to help achieve thresholds and standards in Tables 3.08-1 and 3.08-1 of the Regional Transportation Functional Plan or alternative thresholds and standards established pursuant to section 3.08-230.
- Connectivity improvements to provide parallel arterials, collectors or local streets that include pedestrian and bicycle facilities, consistent with the connectivity standards in Section 3.08.110 and design classifications in Table 2.6 of the RTP, in order to provide alternative routes and encourage walking, biking and access to transit.
- Motor vehicle capacity improvements, consistent with RTP Arterial and Throughway Design and Network Concepts in Table 2.6 and section 2.5.2 of the RTP, only upon demonstration that other strategies (above) are not appropriate or cannot adequate address identified transportation needs.

The affected projects and an overview of the analysis process leading to the proposal in Table 8-3 are as follows:

- **#1: David Hill Road Extension** – this project provides for a new arterial roadway at the RTP recommended spacing to serve a newly urbanizing and developing portion of the City of Forest Grove. As such it provides a basic backbone facility offering connectivity and multi-modal connections to serve currently undeveloped land within the City's UGB and adjacent to the City's northern urban reserve. The development of TSMO strategies; transit, bicycle and pedestrian improvements; traffic calming; and other local street connectivity improvements will be considered in conjunction with this project. The David Hill Road extension is currently funded

through the Washington County MSTIP program and the City recommends that this project be added to the financially-constrained RTP.

- **#3: Highway 47 at Martin Road** – this intersection is currently unsignalized and operates within ODOT's mobility targets. As the community grows, this intersection (and the immediately adjacent intersection of 24th Avenue) will become increasingly congested warranting consideration of traffic control modifications and/or other intersection improvements. This intersection serves not only local traffic moving from the northwestern part of the City to the vicinity of Oregon Highway 8, but also traffic entering the city from the US 26 corridor and the surrounding unincorporated areas. Today approximately 80 percent of Forest Grove workers are employed outside of the city, and the Martin Road corridor is a key route for these workers.

  Both signalization and installation of a roundabout were initially considered for this location, however no resolution of differences between affected agencies could be achieved. Nor did preparation of an Access Management Plan for Highway 47 in 2010 identify a preferred course of action that these agencies could endorse. Accordingly, this area is shown in the Roadway Network Plan as a "TRP Refinement Area" for which further study and deliberation needs to be conducted leading to a recommended course of action. This study should be conducted within the next five years to ensure implementation of the chosen improvements within the desired 6-10 year window identified in Table 10-3. The City is actively engaged in encouraging the expansion of transit service within Forest Grove, and between the City and other destinations to help address potential future congestion at this location. This TSP also includes a variety of local street connectivity improvements to help reduce the demand for traffic along Highway 47, which could also help operations at this location. The City recommends that a placeholder project be included in the financially-constrained RTP to address the need for a refinement plan and any potential improvements at this location that may result from such a plan.

- **#4 and #13: Highway 47 at B Street** – the first of these two projects at this Highway 47 intersection at the southern edge of the City (#3) focuses on addressing existing safety problems. Specifically, this project would provide for enhanced illumination at this location to reduce existing concerns about visibility. As such it is recommended by the City for inclusion in the financially-constrained RTP. The second project at this location (#13) is intended to address future congestion for the stopped movement (B Street) at this currently unsignalized intersection. The city is not currently requesting that this project be included in the financially-constrained RTP, but that further analysis and discussion with ODOT be undertaken to identify an optimal solution.

- **#5: Highway 47 at Fern Hill Road/Maple Street** – this intersection currently operates in excess of ODOT's mobility target (the target being $v/c \leq 0.99$ and operations analysis showing $v/c = 1.00$). This intersection is a key connection point between the core of the City and destination to the south and carries both commuter and freight traffic. In evaluating potential improvements, the City has considered land use modifications that encourage more mixed use development (particularly in the Town Center area and northwestern parts of the city); the development of improved local transit service; the addition of bicycle and pedestrian facilities in locations throughout the city; and the development of improved local street connectivity (particularly along the south side of Highway 47 through existing industrial properties in the vicinity of the intersection). Collectively, these improvements would not be sufficient to address the anticipated growth in congestion and the need for improvement to ensure both the safety of motorists in this area and to address the expected operational deficiencies. The City recommends that this project be included in the financially-constrained RTP.

- **#14: Highway 47 at Purdin Road/Verboort Road** – this intersection is currently located outside of the Forest Grove UGB in rural Washington County. Today, the intersection operates within acceptable performance targets, but this will change based on future development in the northwestern part of the City and when the Purdin Road urban reserve is developed.

Table 8-3. Roadway Projects and Programs (2014 Dollars in Millions)

No.	Name	Description	Purpose	Metro Project ID*	Total Cost ($Million)
1	David Hill Road Extension	Construct new 2-lane collector with bicycle lanes, sidewalks and street lights from existing east terminus to Highway 47	Improve connectivity and balance circulation.	10772	$13.61
2	Highway 47 / Pacific Avenue Intersection Improvements *	Additional channelization, crosswalk, and traffic signal modification at intersection. Specific improvements may be modified at a future date.	Improve access and mobility. Improve substandard turn radius and pedestrian crossing.	10780a	$1.3
3	Highway 47 / Martin Road Intersection Improvements *	Construct improvements (e.g. round-about) at Highway 47 intersection with Holladay Street Extension, and Martin Road/23rd Ave. Extension	Improve operational deficiencies. Improve access and mobility.	10780b	$1.56
4	Highway 47 / B Street Intersection Improvements *	Construct improvements (e.g. traffic signal.)	Improve operational deficiencies.	10780c	$1.79
5	Highway 47 / Fern Hill-Maple Street Intersection Improvements *	Construct improvements (e.g. traffic signal) at Highway 47 intersection with Maple Street / Fern Hill Road, including interconnect with rail crossing	Improve operational deficiencies.	10780d	$5.0
6	23rd Avenue Extension	Construct new 2-lane collector without median and with bike lanes from Hawthorne Avenue east to Highway 47.	Improve connectivity and balance circulation. Improve access to industrial areas.	10774	$4.26
7	Highway 8 / Pacific Ave. / 19th Ave. Improvements *	Retrofit street with boulevard design from B Street to City Limits	Improve safety and modernization.	10779	$9.63
8	Thatcher Road Realignment	Realign intersection at Thatcher Road at Gales Creek Road, signalize, include bike lanes	Eliminate substandard angles and improve intersection spacing. Improve access to labor markets and trade areas.	10773	$3.71

Table 8-3 Continued. Roadway Projects and Programs (2014 Dollars in Millions)

No.	Name	Description	Purpose	Metro Project ID*	Total Cost (Million)
9	High Capacity Transit Expansion	Analysis for proposed extension of light rail service from Hillsboro to Forest Grove.	Improve transit access to West Washington Co., connect the Pacific University campuses in Hillsboro and Forest Grove, accommodate growth with less traffic, encourage transit oriented development, supplement and relieve Highway 8, and reduce oil dependency.	10771	$2.29
10	Council Creek Trail	16-mile multi-use trail from the end of the Westside MAX light-rail line in Hillsboro, through Washington County, and the Cities of Cornelius, Forest Grove and Banks, connecting to the Banks-Vernonia State Trail	Complete gap in system and improve safety and access to Cities.	10806	$5.20
11	Bike Lanes and Sidewalks	Address various network gaps within City	Complete gap in system and improve safety and access to town center.	10782	$4.47
12	E Street / Pacific Avenue-19th Avenue Intersection	Construct 19th Avenue as 2-lane arterial between C and E Streets with roundabout at Pacific Avenue.	Improve connectivity and balance circulation.	10775	$4.94
13	Hwy 47 and Purdin Road Intersection Improvements *	Construct improvements at Highway 47 (e.g. roundabout) to connect Purdin and Verboort Roads	Improve operational deficiencies.	10780f	$3.17
14	Heather Industrial Connector	Construct new 2-lane industrial collector from western terminus of Heather Street to Poplar Street	Improve connectivity and balance circulation.	10778	$1.73
15	Holladay Street Extension	Construct new 2-lane industrial collector from Yew Street from Cornelius to Quince Street	Improve local system connectivity.	10795	$12.08

Table 8-3 Continued. Roadway Projects and Programs (2014 Dollars in Millions)

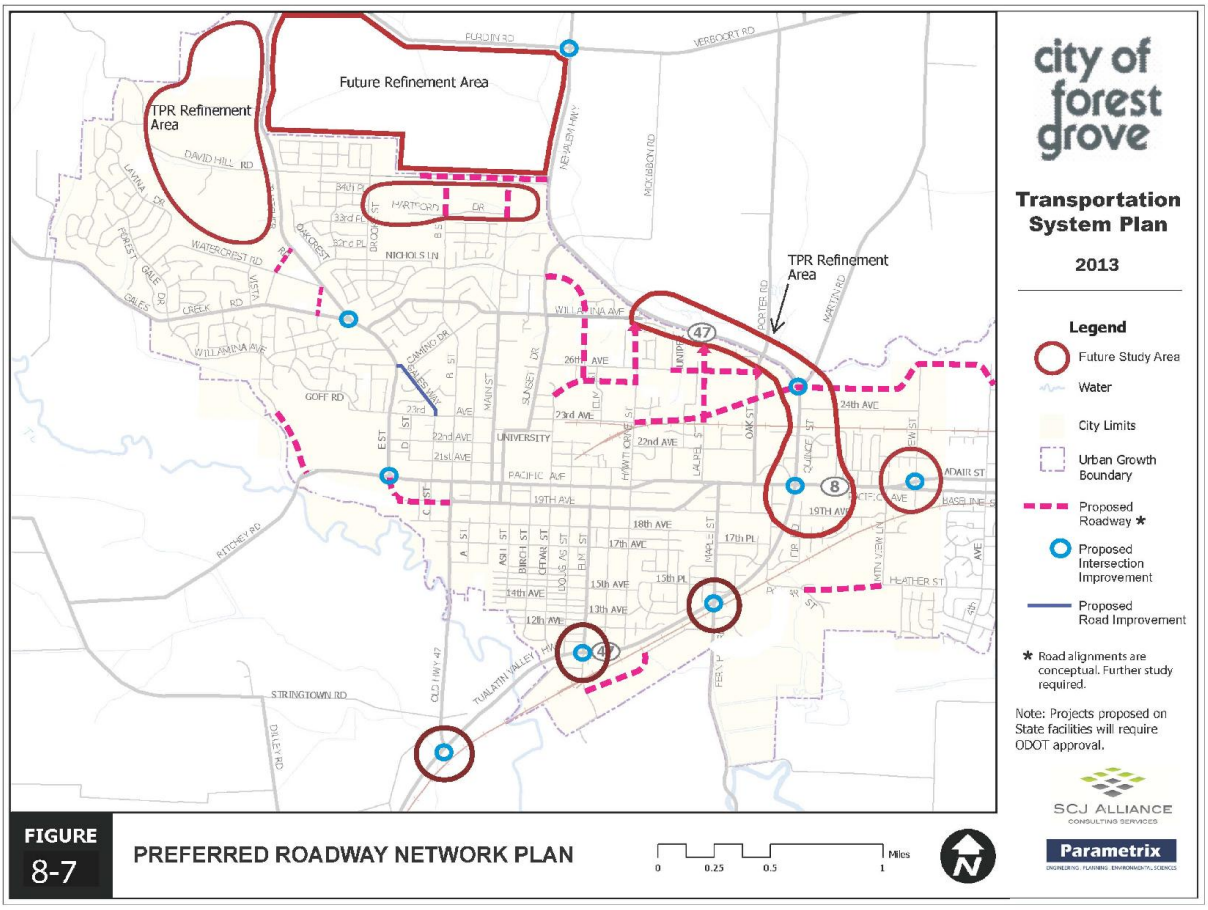
No.	Name	Description	Purpose	Metro Project ID*	Total Cost $Million
16	Hwy 47 /Elm Street Intersection Improvements *	Construct improvements (e.g. traffic signal.)	Improve operational deficiencies.	NA	$0.52
17	Yew Street / Adair Street Intersection Improvements *	Construct improvements (e.g. traffic signal)	Improve operational deficiencies.	NA	$2.60
18	Overnight Truck Parking	Location to be determined	Develop plan for overnight truck parking.	NA	<$0.11
19	B Street Extension	Construct 2-lane local roadway between Hartford Drive and David Hill Road Extension	Improve local street system connectivity	NA	$6.1
20	Main Street Extension	Construct 2-lane local roadway between Hartford Drive and David Hill Road Extension	Improve local street system connectivity	NA	$2.34
21	Vista Drive Extension	Construct 2-lane local roadway between Watercrest and Thatcher Roads	Improve local street system connectivity	NA	$1.12
22	Talisman Lane Extension	Construct 2-lane local roadway between Gales Creek Road and Thatcher Road	Improve local street system connectivity	NA	$0.63
23	19th Avenue/Strasburg Drive Extension	Construct 2-lane collector between southern terminus of Strasburg Drive and E Street at 19th Avenue	Improve connectivity and balance traffic flow	NA	$4.38
24	Gales Way, E Street to 23rd Avenue	Reconstruct and widen pavement with curbs, gutters and sidewalks	Improve local street system connectivity and safety	NA	$0.457
25	Bonnie Lane/Douglas Street	Construct 2-lane local roadway between Sunset Drive and 26th Avenue	Improve local street system connectivity	NA	$3.08
26	Hawthorne Street Extension	Construct 2-lane collector between Willamina Street and 26th Avenue	Improve connectivity and balance traffic flow	NA	$1.30

Table 8-3 Continued. Roadway Projects and Programs (2014 Dollars in Millions)

No.	Name	Description	Purpose	Metro Project ID*	Total Cost $Million
27	25th Avenue	Construct 2-lane local roadway between Cedar and Hawthorne Streets	Improve local street system connectivity	NA	$1.55
28	Laurel Street Extension	Construct 2-lane collector between northern terminus of Laurel Street and just south of Hwy 47. Will require railroad crossing.	Improve connectivity and balance traffic flow	NA	$2.33
29	26th Avenue Extension	Construct 2-lane collector between Boyd Lane and Oak Street	Improve connectivity and balance traffic flow	NA	$2.14
30	Taylor Way Extension (West)	Construct 2-lane industrial road between Elm Street and western terminus of Taylor Street	Improve connectivity and balance traffic flow	NA	$7.84
31	26th Avenue	Improve 26th Avenue to City standards	Improve operational deficiencies	NA	$9.8
32	Willamina Avenue	Improve Willamina Avenue to City standards	Improve operational deficiencies	NA	$1.4
TOTAL					**$122.44**

Notes:
* Projects will require ODOT approval. Inclusion of a project in this table does not obligate or imply the obligation of funds for any specific project.

Figure 8-7. Preferred Roadway Network Plan



9. OTHER MODES

This chapter summarizes existing and future rail, air, water and pipeline needs in the City of Forest Grove. While auto, transit, bicycle and pedestrian transportation modes have a more significant effect on the quality of life in Forest Grove, other modes of transportation must be considered and addressed.

9.1 Rail

A Portland and Western railroad link begins in Forest Grove (near 21st Avenue and Douglas Street) and continues east, parallel to Highway 8. This segment of rail line is being considered as part of a proposed corridor for high capacity transit (light-rail, commuter rail or bus rapid transit) connection to TriMet's existing rail service. The southern Portland and Western rail route transverses the entire city parallel to the southern portion of Highway 47 along the east side, then continues east along Highway 8, along the south side. Trains run through Forest Grove infrequently. No improvements or changes in rail service are planned at this time, though some proposed traffic signals at roadway intersections may require interconnection with rail crossings.

9.2 Air

There are no airports within the City of Forest Grove. Forest Grove is served by the Portland International Airport, located approximately 40 miles to the east in Northeast Portland on the Columbia River. Forest Grove is also served by the Hillsboro Airport, a general aviation facility located on the northern edge of Hillsboro. No airports are expected within the City in the future. Therefore, no policies or recommendations in this area of transportation are provided for Forest Grove.

9.3 Water

There are no navigable waters within Forest Grove, therefore, no policies or recommendations in this area of transportation are provided.

9.4 Pipeline

The only major pipeline facilities that affect the location of future transportation corridors in the Forest Grove area running through the Forest Grove area is a high-pressure natural gas feeder line owned and operated by Northwest Natural Gas Company. The feeder line route enters Forest Grove along Porter Road/Oak Street and ends just north of Highway 8.

A new high-capacity water pipeline will be constructed from the water treatment plant on Fern Hill Road easterly into downtown Hillsboro. The preferred alignment transverses the industrial property immediately east of the plant then continues along the Heather Street alignment into Cornelius. Further east at 14th Street, the alignment will bend to the north up to Highway 8 where it will then bend east until it intersects the north-south pipeline at Dennis Avenue. The new pipeline only affects Heather Street along its existing alignment. The construction will occur within the existing right-of-way without need for alignment modifications. No other future pipelines are expected within the City. No policies or recommendations in this area of transportation are provided for Forest Grove.

9.5 Trucks

Currently, there are no designated principal truck routes in Forest Grove. The intent of the truck route system is to provide connections with truck routes serving areas within and outside of Forest Grove making efficient truck movement and the delivery of raw materials, goods, services and finished products possible. These routes are generally found in and serve areas where there are concentrations of commercial and/or industrial land uses.

Since the city does not have designated truck routes, the truck community relies on the designated state facilities and other key roadways as a default. The local elements include TV Highway, Highway 47, the Pacific Avenue / 19th Avenue couplet, Gales Creek Road, and B Street. Figure 3-12 shows truck routes within Forest Grove, with truck volume percentages during the PM peak hour.

Establishment of a designated truck route in the City along with overnight truck parking should be considered in the next five years with public involvement.

10. FINANCING AND IMPLEMENTATION

10.1 Introduction

This chapter outlines the funding sources that can be used to meet the transportation needs of the community. The costs for the elements of the transportation system plan are outlined and compared to the potential revenue sources. Options are discussed regarding how the costs of the plan and revenues can be balanced. A list of projects is identified for Revenue Forecast Scenario, where all projects can reasonably be funded based on identified funding levels.

The inclusion of proposed projects and actions in this plan does not obligate or imply obligations of funds by any jurisdiction for project level planning or construction. The inclusion of proposed projects and actions does serve as an opportunity for the projects to be included, if appropriate, in the State Transportation Improvement Program (STIP) and the Forest Grove Capital Improvements Program (CIP), but such inclusion is not automatic. It is incumbent on the state, county, city and general public to take action to encourage and support inclusion into the STIP and CIP at the appropriate time. Because a project must have actual identified funding to be included in the STIP and CIP, the ultimate number of projects that can be included in these documents is constrained by available funding.

10.2 Current Funding Strategies

Transportation funding is commonly viewed as a user fee system where the users of the system pay for infrastructure through motor vehicle fees (such as gas tax and registration fees) or transit fares. However, a great share of motor vehicle user fees goes to road maintenance, operation and preservation of the system rather than construction of new system capacity. Much of what the public views as new construction is commonly funded (partially or fully) through system development charges (SDCs), local improvement districts (LIDs) and frontage or off-site improvements required as mitigation for land development.

The City of Forest Grove currently utilizes two continuing sources of funding for maintenance and construction of its transportation infrastructure, as described below. These sources provide annual funding that is used to maintain street facilities or construct new roadway improvements, with some restrictions on the type and location of projects.

10.2.1 State/County Fuel Tax and Vehicle License Fee

The State of Oregon Highway Trust Fund collects various taxes and fees on fuel, vehicle licenses, and permits. A portion is paid to cities annually on a per capita basis. By statute, the money may be used for any road-related purpose. Forest Grove uses it for street operating needs.

Oregon gas taxes are collected as a fixed amount per gallon of gasoline served. Gas tax in Oregon last increased in 2011 (currently 30 cents per gallon), and this tax does not vary with changes in gasoline prices. There is no adjustment for inflation tied to the gas tax, so the lack of change since 2011 means that the purchasing power of the revenue collected erodes over time as the cost to construct and repair transport systems increase. Fuel efficiency in new vehicles has further reduced the total dollars expected to be collected through this system. Oregon vehicle registration fees are collected as a fixed amount at the time a vehicle is registered with the Department of Motor Vehicles. Vehicle registration fees in Oregon are $43 per vehicle per year for passenger cars. There is no adjustment for inflation tied to vehicle registration fees.

In addition to the revenues from state fuel tax, Forest Grove also receives a share of the one-cent countywide gas tax. In 2009, this equaled approximately $83,000. This revenue source has not grown and, on average, hovered around $850,000 per year. Therefore, it is expected to remain flat. The City expects to receive approximately $1.8 million from this source over the next 22 years.

Over the last five years, Forest Grove has received an average of approximately $1,100,000 in State gas tax and vehicle registration fee revenue. The majority of these funds are spent on roadway surface maintenance of local streets. Because there is no index for cost inflation, this revenue level would increase only proportionate with the city's population growth. The City of Forest Grove estimates gas tax and other state revenues to increase to approximately $1.3 million annually. Forest Grove is expected to receive approximately $31.5 million over the next 22 years based on that revenue estimate and the projected increase in City population.

10.2.2 System Development Charges

System development charges (SDC) are fees collected from new development, generally based on the proposed land use and size. The transportation component of the fee is typically based on the land use's potential to generate vehicle trips. These charges are used as a dedicated funding source for capacity adding projects for the transportation system including sidewalks, bike lanes, and transit capital projects. The funds collected can be used to construct or improve portions of streets impacted by applicable development.

In Washington County, this charge to new development was known as the Traffic Impact Fee (TIF) until November, 2008, when County voters replaced the TIF with a Transportation Development Tax (TDT). Beginning in July of 2009, the TDT increased the fees relative to the Traffic Impact Fee and established a mechanism to adjust rates based on an index of road construction, material, labor, and right of way costs.

The TDT fee is based on county-wide calculations of SDC-eligible project costs and total increases in person trips. Person trips include not only vehicle trips, but also passenger trips and transit trips. The motor vehicle component of cost per person trip was determined to be $391 with additional costs of $44 for transit and $3 in compliance components[29]. Charges assessed will vary based on the specific development characteristics. For purposes of this analysis, the motor vehicle and transit cost per person trip is multiplied by the increase in person trips to estimate available SDC revenues.

The projected increase in person trips for Forest Grove is based on Metro estimates for drive alone trips as well as auto passenger and transit trips for 2010 and 2035. The PM peak period forecasts are converted to average daily person trips. The increase in daily person trips is shown in Table 10-1.

Table 10-1. Forest Grove Vehicle Trip Generation (Daily Person Trip Ends)

	2010 Trips	2035 Trips	Increase
Forest Grove TSP Update Study Area	118,155	157,070	38,915

Source: Metro, 2012

Average revenues received for each of the last five fiscal years was approximately $444,000 income from the TIF and TDT for development within Forest Grove. The TDT income potential over the next 22 years was estimated based on the forecasted land use changes and resulting person trip growth for

[29] Transportation Development Tax Methodology Report, Appendix A - Washington County, August, 2008.

Forest Grove. The Washington County motor vehicle and transit cost per person trip rates were applied to the pro-rated growth projection from 2008 to 2030 (34,245 person trip ends). For motor vehicle projects, Forest Grove is expected to collect approximately $21.9 million from SDC fees over the next 22 years based on these land use forecasts. Transit project revenues are expected to be $348,000. In addition, there is an existing TIF account balance of $2.55 million.

10.2.3 Transit

The City of Forest Grove has been promoting the expansion of transit service over the past several years. The City requested TriMet to expand the Line 57 service to the High School in 2008, and conducted a local transit study in 2009. Recently, the City allocated $30,000 to conduct a transit study to explore local transit options further.

During the completion of this study, Ride Connection was approached by TriMet to seek funding for providing general transit service in Forest Grove. Ride Connection was successful in obtaining the following three grants:

- JARC Operation costs for one year $121,000 for Forest Grove
- FTA 5310 Operation costs for two years $121,000 per year
- FTA 5310 Bus Equipment (two 14-passenger buses) $134,450

The JARC (Job Access Reverse Commute) grant has a 50 percent match and the FTA Section 5310 operating grant has a 10.27 percent match requirement. TriMet will fund the local match for the operational costs. The City of Forest Grove will match the purchase of buses through the use of Transportation Impact Fees (the City match will be $13,808).

Ride Connection will administer and operate the service. The service will be a deviated fixed route operation as recommended by the recent Transit Study prepared by Nelson-Nygaard. Operations are planned from 6 am to 7 pm Monday through Friday with 30-minute pick-up during the peak hours.

The City will provide maintenance service for the buses. The grants include up to $3,000 per year per vehicle for maintenance. The City's cost for maintenance will be reimbursable (less the 10.27 percent match requirement which equals a maximum of about $678 per year for both vehicles). Since the buses will be new, maintenance will be mainly in the form of oil changes and other minor warranty service. The vehicles will be equipped with lifts and bike racks. Ride Connection has vendors that will provide servicing for the lift equipment.

The City will also provide other facilities to support the provision of transit service. These include bus stop signs and shelters where appropriate (e.g., the high school for initial operations). It is anticipated that office space and parking would be provided at the Forest Grove Senior Center but that has yet to be finalized.

To ensure successful implementation, the City will also administer a travel behavior survey and provide publicity for the new service. The survey will be provided by Ride Connection and will focus on helping refine and finalize the service routing and the location of stops through community input.

10.2.4 Summary

Table 10-2 summarizes the current funding sources and the estimated revenue over the next 22 years. Total revenues collected would be approximately $58.4 million with the current sources. Funds from estimated TDT fees are based on the future land use forecasts and would be obtained from potential development. If the forecasted future growth does not occur, the amount of TDT revenue would be reduced.

Table 10-2. Current Transportation Revenues for Forest Grove (2013 Dollars)

Funding Category	Estimated 22 Year Revenues
State/County Fuel Apportionment & State Vehicle License Fee	$33,400,000
Motor Vehicle System Development Charge (TDT)	$21,914,780
Transit System Development Charge (TDT)	$ 348,000
System Development Charge Account Balance (TIF)	$ 2,552,000
Bicycle and Pedestrian Path Fund	$ 220,000
Total Revenues	**$58,434,780**

Other funding sources not listed included in Table 10-2 are frequently used to fund projects in Forest Grove. However, these sources are not included in the estimate of transportation revenues because they are either irregular (i.e. not a reoccurring and regularly scheduled revenue stream) or not allocated by the City (i.e. may not be applied to projects of the City's choosing). Notable examples of other revenue sources include federal grants, county Major Streets Transportation Improvement Program (MSTIP) funds, and Metropolitan Transportation Improvement Program (MTIP). These revenues tend to be project-specific and are therefore included in the TSP by lowering the expected share of project costs that would be covered by the City. MSTIP funding is identified through the Washington County Coordinating Committee and approved by the County Board of Commissioners. MTIP distributes federal transportation money in the region through Metro, ODOT, TriMet and SMART. Other revenue sources are likely to be available, but are assumed in this plan only for specific projects, due to the high level of uncertainty and lack of City control involved.

10.3 Projects and Programs

This section presents the recommended transportation projects and programs developed for the City of Forest Grove to serve local travel for the coming 22 years. The Pedestrian, Bicycle, Transit, and Roadway projects in the Preferred Plan (Chapter 8, Table 8-3) for each mode identify desired projects for the transportation system. The Financially-Constrained Plan project list (Table 10-3) is a subset of the Preferred Plans list. Table 10-3 includes those projects that have the highest short-term need for implementation to satisfy performance standards, or other policies established for the Forest Grove Transportation System Plan. Projects have not been listed in order of importance. The priority ranking indicated in Table 10-3 (e.g., project timing) does not capture all of the transportation deficiencies due to financial constraints that limit the number of projects that are included in the financially-constrained plan.

The City's share of the project list shown on Table 10-3 totals approximately $35.6 million. As seen in Table 10-2 in the prior section, capital funds available from the new TDT and from the TIF fund balance will yield approximately $25 million. The additional $10.6 million needed to cover the cost of the projects will come from the State and County gas taxes and vehicle license fees, other revenues the City may implement or from grant funds. The costs for the remaining projects noted in the Preferred Plan have not been included in the funding needs analysis for the city because the Financially-Constrained Plan is limited to projects most likely to be funded within the planning horizon. Other projects listed in

the Preferred Plans require additional funding and they are expected to be built beyond the 22-year horizon.

10.3.1 Project Cost Estimates

Cost estimates (general, order of magnitude) were developed for the projects identified in the roadway, bicycle, transit, and pedestrian elements. Existing cost estimates, from sources such as the City's current CIP or the Metro RTP, were utilized where appropriate. Other projects were estimated using general unit costs for transportation improvements, and reflect some, but likely not all of the unique project elements that can significantly add to project costs[30]. Development of more detailed project costs can be prepared in the future with more refined financial analysis. Since many of the projects overlap elements of various modes, the costs were developed at a project level incorporating all modes, as appropriate. It may be desirable to break project mode elements out separately, however, in most cases, there are greater cost efficiencies of undertaking a combined, overall project. Each of these project costs will need further refinement to detail right-of-way requirements and costs associated with special design details as projects are pursued.

In addition to the overall cost of projects, estimates are also made regarding the share of costs assumed by various agencies, private development, and the City. These are not intended to represent funding commitments by any agencies. The estimated City cost share has been used strictly to identify a reasonable plan for City expenditures over the 22-year planning horizon. One key cost assumption includes a typical 33/67 percent cost share split between City and Private development, respectively, on many local projects. In addition, other jurisdictional funding sources were assumed for specific projects as reasonably likely funding sources including MTIP, MSTIP, Clean Water Services (CWS) or the STIP. These other sources lower the expected share of specific project costs that would be covered by the City.

10.3.2 Other Transportation Programs and Services

In addition to the physical system improvements identified in the previous section, the transportation facilities will require on-going operation and maintenance improvements across a variety of areas. These other transportation programs will be implemented to respond to specific policies and needs in maintaining roadway pavement quality, supporting safe routes to schools programs, implementing neighborhood traffic management, and on-going updates and support of related planning documents.

Roadway Maintenance

The current annual cost of maintaining roadways under the jurisdiction of Forest Grove was estimated at $1.1 million which is paid for by gas tax revenues from the state and county. Future annual maintenance costs for Forest Grove roadways will likely increase as the City takes jurisdiction over existing roadways from Washington County or builds new roadways within the City limits. It was assumed that over the next 22 years, the number of roadway miles the City would be responsible for maintaining would increase by approximately 10 percent. To estimate the City's road maintenance responsibility over the next 22 years, the annual maintenance costs (in 2014 dollars) for Forest Grove was increased by 10 percent resulting in an estimated cost of $26.6 million to maintain roadways.

[30] Cost estimates prepared for the TSP do not reflect specific project construction costs, but represent an estimate based on assumed cross-section consistent with the street's functional classification and any anticipated traffic control improvements. Further preliminary engineering evaluation is required to determine impacts to right-of-way, environmental mitigation and/or utilities. Experience has shown that individual projects costs can increase by 25 to 75 percent as a result of the above factors.

Table 10-3. Forest Grove Financially-Constrained Plan Projects (2014 Dollars in Millions)

#	Name	Description	Jurisdiction Owner/ Operator	Metro Project ID	RTP Financially Constrained	Total Cost	Non-City Funds	City Funds	Project Timing
1	David Hill Road Extension	Construct new 2-lane collector with bicycle lanes, sidewalks and street lights from existing terminus to Highway 47	City	10772	Add	$13.61 **	$13.61	$0.0	0-5 years
2	Highway 47 / Pacific Avenue Intersection Improvements *	Additional channelization, crosswalk, and traffic signal modification at intersection. Specific improvements may be modified at a future date.	ODOT	10780a	Yes	$1.3 **	$0.8	$0.5	0-5 years
3	Highway 47 / Fern Hill-Maple Street Intersection Improvements*	Construct improvements (e.g. traffic signal) at Highway 47 intersection with Maple Street / Fern Hill Road, including interconnect with rail crossing	ODOT	10780d	Add	$5.0 **	$4.5	$0.5	0-5 years
4	Thatcher Road Realignment	Realign intersection at Thatcher Road at Gales Creek Road and add traffic signal	City & County	10773	Yes	$3.71 ***	$0.0	$3.71	0-5 years
5	Bike Lanes and Sidewalks	Thatcher (Gales Ck-David Hill), Willamina (Gales Ck-Sunset), B Street (26th-Willamina) Ped & BIke Improvements	City	10782	Yes	$4.47 **/***	$2.47	$2.00	0-5 years
6	E Street / Pacific Avenue-19th Avenue Intersection	Extend 19th Avenue west and connect to E Street and Pacific Avenue with round-about.	City	10775	Yes	$4.94 ***	$1.47	$3.2	0-5 years
7	Overnight Truck Parking	Location to be determined	City	NA	No	$0.11	$0.0	$0.11	0-5 Years
8	B Street Extension	Construct 2-lane local roadway between Hartford Drive and David Hill Road Extension	City	NA	No	$6.1 ***	$3.76	$2.34	0-5 Years
9	Gales Way , E Street to 23rd Avenue	Reconstruct and widen pavement with curbs, gutters and sidewalks	City	NA	No	$0.457	$0.0	$0.457	0-5 Years

#	Name	Description	Jurisdiction Owner/ Operator	Metro Project ID	RTP Financially Constrained	Total Cost	Non-City Funds	City Funds	Project Timing
10	26th Avenue Improvements	Improve 26th Avenue to City Standards	City	NA	No	$9.8	$8.4	$1.4	0 -5 Years
11	Local Transit Improvements – Short-Term	Vehicular acquisition and installation of amenities (e.g., bus shelters, etc.)	Ride Connection /City	NA	Add	$0.255	$0.229	$0.026	0-5 Years
12	Highway 47 / Martin Road Intersection Improvements*	Construct improvements (e.g. roundabout) at Highway 47 intersection with Holladay Street Extension, Martin Road, and 23rd Avenue Extension	ODOT	10780b	Add	$1.56 **	$1.46	<$0.10	6-10 years
13	Highway 47 / B Street Intersection Improvements*	Construct safety improvements	ODOT	10780c	Add	$1.79 **	$1.69	<$0.10	6-10 years
14	Council Creek Trail	16-mile multi-use trail from Hillsboro to Banks. Multi-use trail from the end of the Westside MAX in Hillsboro, thru Washington County, & Cities of Cornelius, Forest Grove, & Banks, connecting to Banks-Vernonia State Trail, with added short trail south to Tualatin River.	TBD	10806	Yes	$5.20 **	$4.1	$1.10	6-10 years
15	Highway 8 / Pacific Avenue-19th Avenue Improvements *	Retrofit street with boulevard design from B Street to Cornelius City Limits	City & ODOT	10779	Yes	$9.63 **/***	$7.23	$2.4	6-10 Years
16	Highway 47 / Purdin Road Intersection Improvements*	Construct improvements at Highway 47 (e.g. roundabout) to connect Purdin Road and Verboort Rd.	ODOT	10780f	No	$3.32 **	$3.32	$0.0	6-10 Years
17	Heather Industrial Connector	Construct new 2-lane industrial collector from west terminus of Heather to Poplar Streets	City & County	10778	Yes	$1.73 **	$1.73	$0.0	6-10 Years

18	Highway 47 / Elm Street Intersection Improvements*	Construct improvements (e.g. traffic signal.)	ODOT	NA	No	$0.52 **	$0.52	$0.0	6-10 Years
19	Yew Street / Adair Street Intersection Improvements*	Construct improvements (e.g. traffic signal)	ODOT	NA	No	$2.60 ***	$0.7	$1.9	6-10 Years
20	Main Street Extension	Construct 2-lane local roadway between Hartford Drive and David Hill Road Extension	City	NA	No	$2.34 ***	$$0.0	$2.34	6-10 Years
21	Vista Drive Extension	Construct 2-lane local roadway between Watercrest and Thatcher Roads	City	NA	No	$1.12 ***	$0.75	$0.37	6-10 Years
22	Talisman Lane Extension	Construct 2-lane local roadway between Gales Creek Road and Thatcher Road	City	NA	No	$0.63 ***	$0.42	$0.21	6-10 Years
23	19th Avenue/ Strasburg Drive Extension	Construct 2-lane collector between southern terminus of Strasburg Drive and E Street at 19th Avenue	City	NA	No	$4.38 ***	$1.45	$2.93	6-10 Years
24	Hawthorne Street Extension	Construct 2-lane collector between Willamina Street and 26th Avenue	City	NA	No	$1.30 ***	$0.43	$0.87	6-10 Years
25	25th Avenue	Construct 2-lane local roadway between Cedar and Hawthorne Streets	City	NA	No	$1.55 ***	$0.51	$1.04	6-10 Years
26	26th Avenue Extension	Construct 2-lane collector between Boyd Lane and Oak Street	City	NA	No	$2.14 ***	$0.71	$1.43	6-10 Years
27	Taylor Way Extension (West)*	Construct 2-lane industrial road between Elm Street and western terminus of Taylor Street	City	NA	No	$7.84 ***	$7.84	$0.0	6-10 Years
28	Willamina Ave. Improvements	Improve Willamina Avenue to City Standards	City	NA	No	$1.4	$0.0	$1.4	6 – 10 Years
29	Local Transit Improvements – Longer Term	Vehicular acquisition and installation of amenities (e.g., bus shelters, etc.)	Ride Connection /City	NA	Add	$0.695	$0.624	$0.071	6-20 Years

30	High Capacity Transit Expansion	Analysis for proposed extension of light rail service from Hillsboro to Forest Grove.	ODOT/ TriMet	10771	Yes	$2.29 **	$2.29	$0.0	11-20 Years
31	23rd Avenue Extension	Extend from Hawthorne Avenue east to Highway 47.	City	10774	Yes	$4.26 **/***	$2.86	$1.4	11-20 years
32	Holladay Street Extension (Cornelius to Quince St.)	Construct new roadway to city standards	City	NA	Yes	$12.08**/**	$9.08	$3.0	11-20 years
								$35.6M	

Source: City of Forest Grove. Estimated share of city cost provided by City of Forest Grove.
Notes: **PROJECT PRIORITIES ARE BASED ON ANTICIPATED PROJECT TIMING**

*Project will require ODOT approval. Inclusion of a project in this table does not obligate or imply the obligation of funds for any specific project.

**Partially or fully funded by jurisdictional agency (i.e. TriMet, ODOT, Washington County, Metro or other).

***Partially or fully funded by private development exactions.

School Safety Program

Each school within the city should be evaluated to review the convenience and safety of connections for pedestrians and bicycle travel from the neighborhoods that they serve. A "Safe Route to School" plan identifies key routes for pedestrian and bike circulation around the schools, and suggests needed improvements to traffic controls, crossing management, and on-site circulation that would improve safety for school-aged children. An annual allocation of $5,000 is set aside for this purpose.

Neighborhood Traffic Management (NTM)

Specific NTM projects are not defined. These projects will be subject to neighborhood consensus based upon City placement and design criteria. A City-wide NTM program may be developed with criteria and policies adopted by the City Council. Speed humps can cost $2,000 to $4,000 each and traffic circles can cost $3,000 to $8,000 each. A speed trailer can cost about $10,000. It is important, where appropriate, that any new development incorporate elements of NTM as part of its on-site mitigation of traffic impacts. Annual allocation of $10,000 is identified for the program development and implementation of NTM projects.

Bike and Pedestrian Path Maintenance

Bicycle and pedestrian paths will deteriorate over time, requiring maintenance and potentially reconstruction. As future paths are constructed, they will also require maintenance. Forest Grove is estimated to need approximately $5,000 annually to maintain bicycle and pedestrian facilities.

10.3.3 Forest Grove Costs for TSP Plans

The cost estimates outlined in the Transportation System Plan to implement the Financially-Constrained Plan for Roadways, Transit, Bicycles and Pedestrians total approximately $35.6 million, and the recommended transportation operations, maintenance and service programs would add $27.0 million for a total cost over 22 years of $62.64 million. Refer to Chapter 4 through 9 for details on the individual projects by travel mode. Note that some additional projects are listed in the Financially-Constrained Plans that are expected to be funded by other agencies (e.g. ODOT, Metro, TriMet). These non-City costs have not been included in the estimate in Table 10-4, but are identified in the Preferred Plans.

Table 10-4. Forest Grove Transportation Plan Costs over 22 Years (2014 Dollars)

Transportation Element	Approximate Cost ($1,000)
System Improvement Projects (City-funded Financially-Constrained projects)	
Total Capital Projects	**$35,6**
Operations and Maintenance Programs and Services	
Road Maintenance ($1.1M/yr plus 10%)	$26,600
School Safety Program ($5,000/yr)	$110
Neighborhood Traffic Management ($10,000/yr)	$220
Bicycle & Pedestrian Maintenance ($5,000/yr)	$110
Total Operations and Maintenance Programs	**$27,040**
22 YEAR TOTAL	**$62,64**

The estimated $62.64 million in transportation plan costs approximately matches the identified total for revenues over the 22-year horizon. It is important to note that this analysis is very sensitive to estimates

of population and employment growth as well as proportional inflation rates for revenues and costs. Separate City estimates indicate the potential for a more challenging financial picture over the next 22 years. New funding sources to allow additional Preferred Plan projects to be included on future Revenue Forecast Scenario Plans are discussed in the next section.

10.4 New Funding Sources and Opportunities

Additional transportation improvement projects identified in the Preferred Plans for each mode will require funding beyond the levels currently collected by the City. There are several potential funding sources for transportation improvements. This section summarizes several funding options available for transportation improvements. These are sources that have been used in the past by agencies in Oregon. In most cases, these funding sources, when used collectively, are sufficient to fund transportation improvements for local communities. Due to the complexity of today's transportation projects, it is necessary to seek several avenues of funding projects. Unique or hybrid funding of projects generally will include these funding sources combined in a new package.

Within the Portland region, funding for major transportation projects often is brought to a vote of the public for approval. This is usually for a large project or list of projects. Examples of this public funding include the Westside Light Rail Project. Because of the need to gain public approval for transportation funding, it is important to develop a consensus in the community that supports needed transportation improvements. That is the value of the Transportation System Plan. In most communities where time is taken to build a consensus regarding a transportation plan, funding sources can be developed to meet the needs of the community.

Transportation program funding options range from local taxes, assessments, and charges to state and federal appropriations, grants, and loans. All of these resources can be constrained based on a variety of factors, including the willingness of local leadership and the electorate to burden citizens and businesses; the availability of local funds to be dedicated or diverted to transportation issues from other competing City programs; and the availability and competitiveness of state and federal funds. Nonetheless, it is important for the City to consider all of its options and understand where its power may exist to provide and enhance funding for its Transportation programs.

The following funding sources have been used by cities to fund the capital and maintenance aspects of their transportation programs. There may be means to begin to or further utilize these sources, as described below, to address new needs identified in the Transportation System Plan.

10.4.1 General Fund Revenues

At the discretion of the City Council, the City can allocate General Fund revenues to pay for its Transportation program (General Fund revenues primarily include property taxes, use taxes, and any other miscellaneous taxes and fees imposed by the City). This allocation is completed as a part of the City's annual budget process, but the funding potential of this approach is constrained by competing community priorities set by the City Council. General Fund resources can fund any aspect of the program, from capital improvements to operations, maintenance, and administration. Additional revenues available from this source to fund new aspects of the Transportation program are only available to the extent that either General Fund revenues are increased or City Council directs and diverts funding from other City programs. Given the current financial situation within the City, general fund revenues are unlikely to be used to fund transportation projects.

10.4.2 Voter-Approved Local Gas Tax

Several communities in Oregon have adopted local gas taxes by public vote. The taxes are paid to the city monthly by distributors of fuel. The process for presenting such a tax to voters will need to be consistent with Oregon State law as well as the laws of the City of Forest Grove. Table 10-5 summarizes some of the cities in Oregon that collect a local gas tax. Cornelius and Milwaukie are two cities in Portland Metro that levy a two cents per gallon local gas taxes. A four-year moratorium on new local gas taxes was passed by the 2009 Oregon Legislature.

Table 10-5. Local Gas Taxes in Oregon

City	2010 Population	Vote Passage Date	Tax Rate
Cornelius	11,870	2009	2 cents/gallon
Cottage Grove	9,690	2003	3 cents/gallon
Dundee	3,160	2004	2 cents/gallon
Eugene	156,190	2003	3 cents/gallon
Milwaukie	20,290	2007	2 cents/gallon
Sandy	9,570	2003	1 cent/gallon
Springfield	59,400	2003	3 cents/gallon
Stanfield	2,040	1999	1 cent/gallon
The Dalles	13,620	1986	3 cents/gallon
Tillamook	4,940	1982	1.5 cents/gallon
Woodburn	24,080	1989	1 cent/gallon

Source: League of Oregon Cities, Local Gas Tax Information, May 2005, updated.

10.4.3 Street Utility Fee Revenue

A number of Oregon cities supplement their street funds with street utility fees. Local cities with adopted street utility fees include Lake Oswego, Wilsonville, Hillsboro and Tualatin. Tualatin, and North Plains, with a similar population (approximately 26,000) to Forest Grove, earns approximately $620,000 in gross annual revenue from street utility fees. Establishing user fees to fund applicable transportation activities and/or capital construction ensures that those who create the demand for service pay for it proportionate to their use. The street utility fees are recurring monthly or bi-monthly charges that are paid by all residential, commercial, industrial, and institutional users. The fees are charged proportionate with the amount of traffic generated, so a retail commercial user pays a higher rate than a residential user. Tualatin charges a monthly fee of $3.42 per single family dwelling unit while Hillsboro charges $3.10 per residential unit. Typically, there are provisions for reduced fees for those that can demonstrate they use less than the average rate implies, for example, a resident that does not own an automobile or truck.

From a system health perspective, forming a utility also helps to support the ongoing viability of the program by establishing a source of reliable, dedicated funding for that specific function. Fee revenues can be used to secure revenue bond debt used to finance capital construction. A street utility can be formed by Council action and does not require a public vote.

It is recommended that the City consider establishing a street utility fee in the near future to increase funding. Street utility fees can provide a stable source of dedicated revenue useable for transportation system operations and maintenance and/or capital construction. Rate revenues can also secure revenue

bond debt if used to finance capital improvements. Street utilities can be formed by Council action, and billed through the City utility billing system.

10.4.4 Other Funding Sources

Urban Renewal District

An Urban Renewal District (URD) would be a tax-funded district within the City. The URD would be funded with the incremental increases in property taxes that result from construction of applicable improvements. This type of tax increment financing has been used in Oregon since 1960. Uses of the funding include, but are not limited to, transportation. It is tax-increment funded rather than fee funded and the URD could provide for renewal that includes, but is not limited to, transportation projects.

Local Improvement District Assessment Revenue

The City may set up Local Improvement Districts (LIDs) to fund specific capital improvement projects within defined geographic areas, or zones of benefit. LIDs impose assessments on properties within its boundaries. LIDs may not fund ongoing maintenance costs. They require separate accounting, and the assessments collected may only be spent on capital projects within the geographic area. Citizens representing 33% of the assessment can terminate a LID and overturn the planned projects so projects and costs of a LID must meet with broad approval of those within the boundaries of the LID.

Direct Appropriations

The City can seek direct appropriations from the State Legislature and/or U.S. Congress for transportation capital improvements. There may be projects identified in the Plan for which the City may want to pursue these special, one-time appropriations.

Special Assessments

A variety of special assessments are available in Oregon to defray costs of sidewalks, curbs, gutters, street lighting, parking and CBD or commercial zone transportation improvements. These assessments would likely fall within the Measure 50 limitations. A regional example would be the Westside LRT where the local share of funding was voter approved as an addition to property tax.

Employment Taxes

TriMet collects a tax for transit operations in the Portland region through payroll and self employment taxes. Approximately $145 million are collected annually in the Portland region for transit.

Debt Financing

Debt financing can be used to mitigate the immediate impacts of significant capital improvement projects and spread costs over the useful life of a project. Though interest costs are incurred, the use of debt financing can serve not only as a practical means of funding major improvements, but is also viewed as an equitable funding strategy, spreading the burden of repayment over existing and future customers who will benefit from the projects. The obvious caution in relying on debt service is that a funding source must still be identified to fulfill annual repayment obligations.

Voter-Approved General Obligation Bond Proceeds: Subject to voter approval, the City can issue General Obligation (G.O.) bonds to debt finance capital improvement projects. G.O. bonds are backed by the increased taxing authority of the City, and the annual principal and interest repayment is funded through a new, voter-approved assessment on property City-wide (a property tax increase). Depending on the critical nature of any projects identified in the Transportation Plan, and the willingness of the electorate to accept increased taxation for transportation improvements, voter-approved G.O. bonds

may be a feasible funding option for specific projects. Proceeds may not be used for ongoing maintenance.

Revenue Bonds: Revenue bonds are debt instruments secured by rate revenue. In order for the City to issue revenue bonds for transportation projects, it would need to identify a stable source of ongoing rate funding. Interest costs for revenue bonds are slightly higher than for general obligation bonds, due to the perceived stability offered by the "full faith and credit" of a jurisdiction.

Oregon Transportation Infrastructure Bank Loans: A statewide revolving loan fund designed to promote innovative transportation funding solutions. State support for the program is provided by the Financial Services Branch of ODOT. In general, eligible projects include highway, transit, bikeway and pedestrian access projects. Projects are rated on established criteria and recommended based on the rankings. Repayment of loans must begin within five years of project completion and must be complete within 30 years or at the end of the useful life of the project.