NEEDS, OPPORTUNITIES, CONSTRAINTS AND TOOLS

The following sections summarize the existing and future needs of Sherwood's transportation system for pedestrians, bicyclists, transit users, and drivers. The analysis conducted through the TSP update will determine solutions to address these identified needs for each mode of travel. The following items, included in this report, prepare for the analysis that will develop transportation solutions:

- A list of needs for each travel mode
- A toolbox of measures and strategies that can be used to address the identified needs.
- Opportunities and constraints for major gaps in the pedestrian, bicycle, and roadway network.
- Evaluation criteria process that will be used to prioritize projects, and
- A summary of key items in Metro's Regional Transportation Functional Plan (RTFP) compliance checklist for Sherwood to address through this TSP update.

These items will provide the groundwork for developing a prioritized project list for the Sherwood Transportation System Plan to address the needs identified in this report.

Multi-Modal Transportation System Needs

The following sections summarize the needs of Sherwood's multi-modal transportation system.

Projected Growth

To address the future needs of the transportation system, it is important to evaluate how Sherwood and surrounding area are expected to grow. Growth in and around Sherwood have the potential to add traffic in Sherwood, whether originating/destined in Sherwood or as through trips. As shown in Figure 1A, significant growth is expected in Sherwood as well as at the fringes of the city limits. Figure 1B shows regional areas where existing urban reserve areas (URA) are anticipated to develop that will also impact the transportation system. The blend of housing and employment growth is projected to increase the households (+110 percent) and jobs (+124 percent) in and around Sherwood. Table 1 summarizes projected growth in the Sherwood area, including areas outside the urban growth boundary (UGB).

Table 1: Summary of Growth in Sherwood Area from 2010 to 2035*

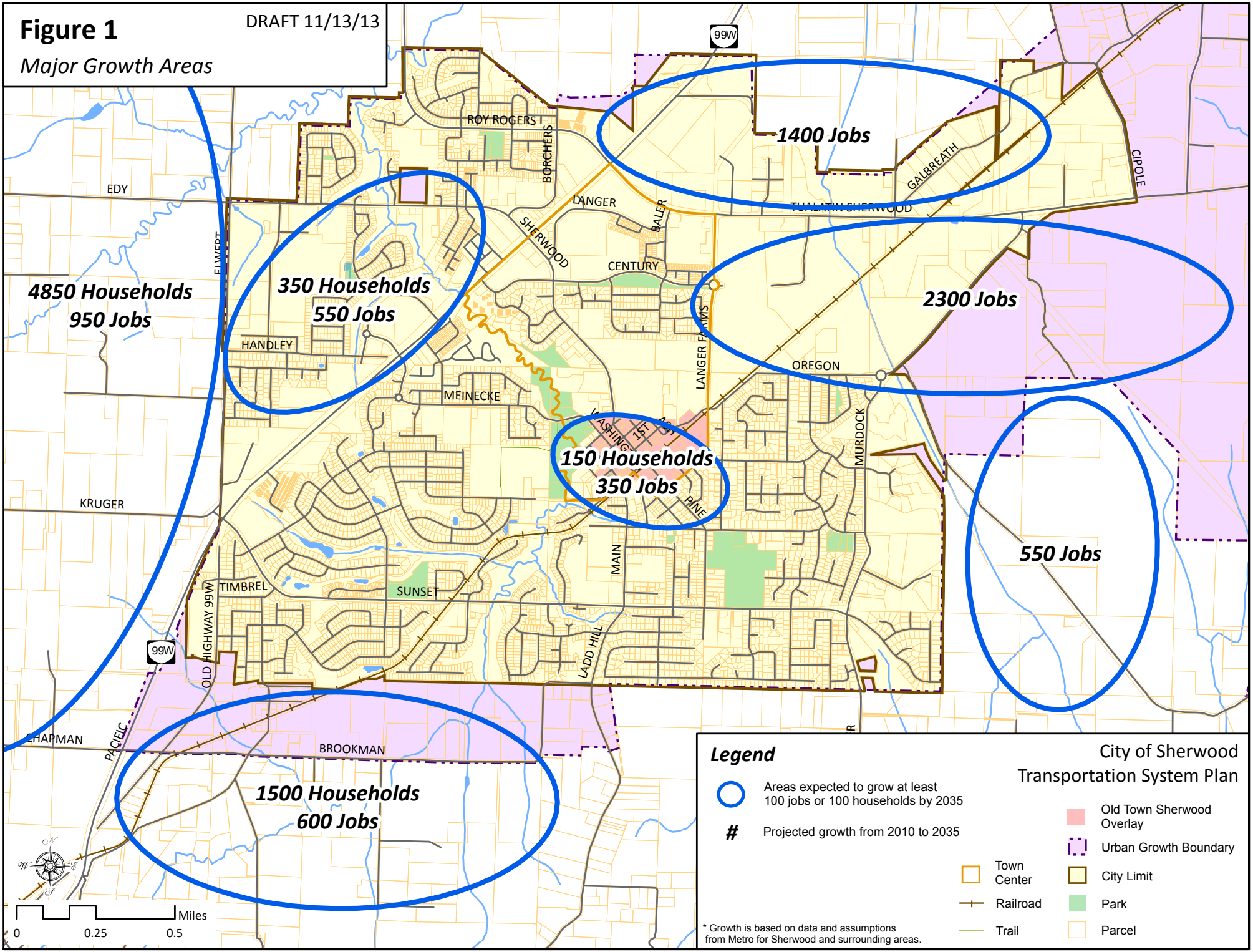
Land Use	Year 2010	Year 2035	Growth
Population	24,300	42,500	18,200 (+75%)
Households	7,500	15,950	8,450 (+110%)
Jobs	8,850	19,850	11,000 (+124%)

Note: Land use represents areas currently outside Sherwood city limits to capture overall growth in area, including vacant and reserve land. Land use growth and household size forecasts are consistent with Metro's projections.

Figure 1

Major Growth Areas

DRAFT 11/13/13



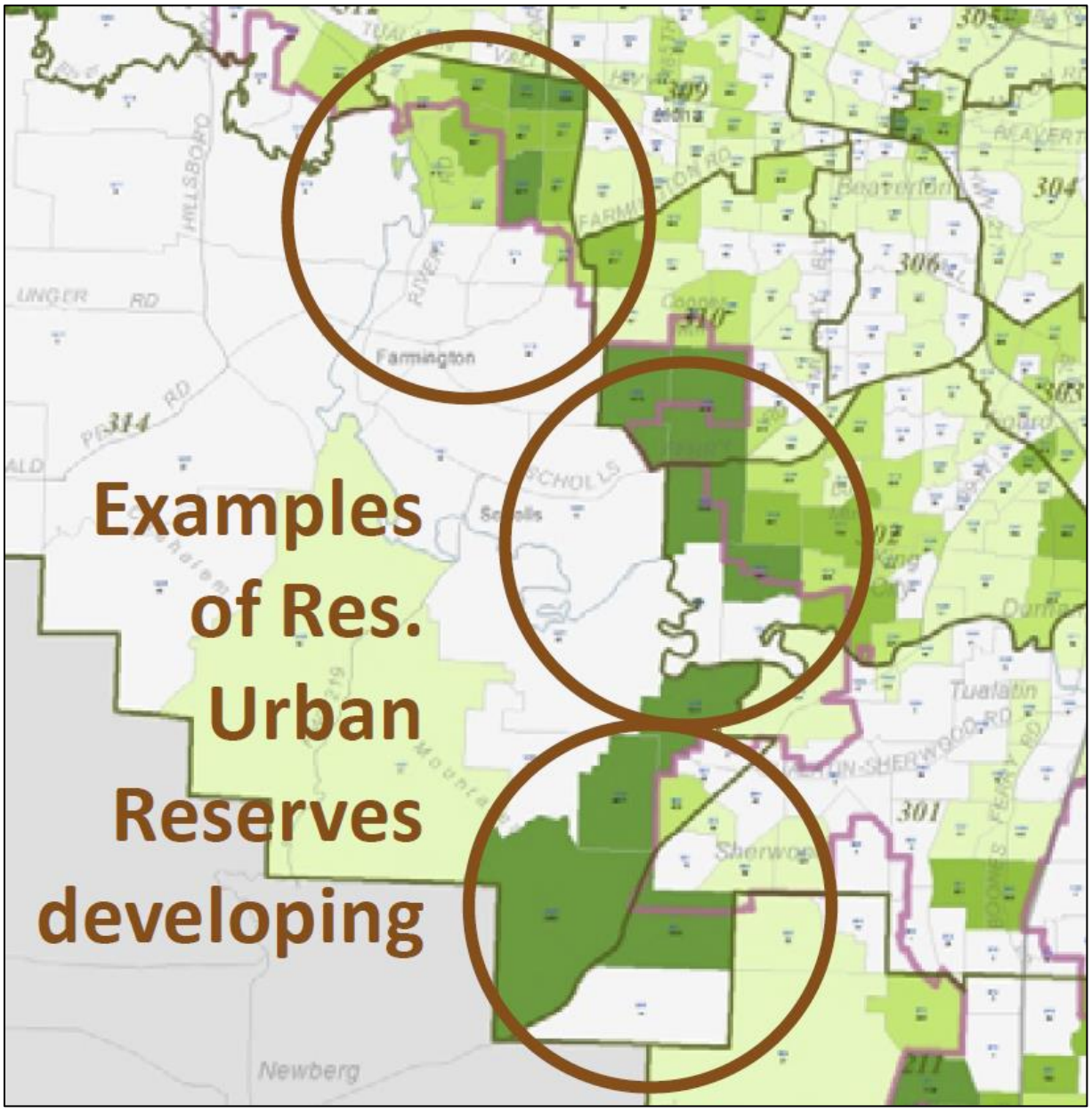


Figure 1B: Regional Residential Growth Areas (color intensity denotes growth intensity)[1]

In addition to growth within Sherwood's city limits or within the existing UGB, regional growth projections include urbanization in urban reserve areas (URA) that are currently located outside the UGB. These are areas set aside for future growth as the region expands. As a larger regional growth supply is needed in the future, the UGB will be expanded to include these areas. Figure 1B indicates that significant household growth is projected along the western edges of the UGB near Sherwood, Beaverton, and Hillsboro in areas that are currently designated as urban reserves.

[1] Source: Metro, MetroScope Jurisdiction Reviewed TAZ Gamma Forecast, DRAFT. Disclaimer: This map is for research purposes only and does not reflect policy decisions by any jurisdictional authority.

System Needs and Measures

System measures provide an overall assessment of Sherwood's future transportation system relative to existing conditions. Table 2 provides an overview of system measures that can be used to evaluate Sherwood's progress towards regional goals. As listed in Table 2, while the overall distance travelled by vehicles is projected to increase in the future, the average motor vehicle distance traveled per person is projected to decrease. This decrease is consistent with Metro's goals related to reducing reliance on the motor vehicle. The amount of delay in the system (including freight corridors) is anticipated to triple (an increase of 200%+) through 2035 without additional improvements to the system.

Table 2: System Performance Measures (PM Peak Hour)

Measure	Year 2010	Year 2035	Change
Total Vehicle Miles Travelled (VMT)	34,100 vmt	55,600 vmt	21,500 vmt (+63%)
VMT per capita	1.4 vmt/capita	1.3 vmt/capita	-0.1 (-7%)
Vehicle Hours of delay (VHD)	440	1,420	980 (+223%)
VHD on Freight Corridors*	240	870	630 (+263%)

Note: *Freight corridors include OR 99W, Tualatin-Sherwood Road, and Roy Rogers Road.

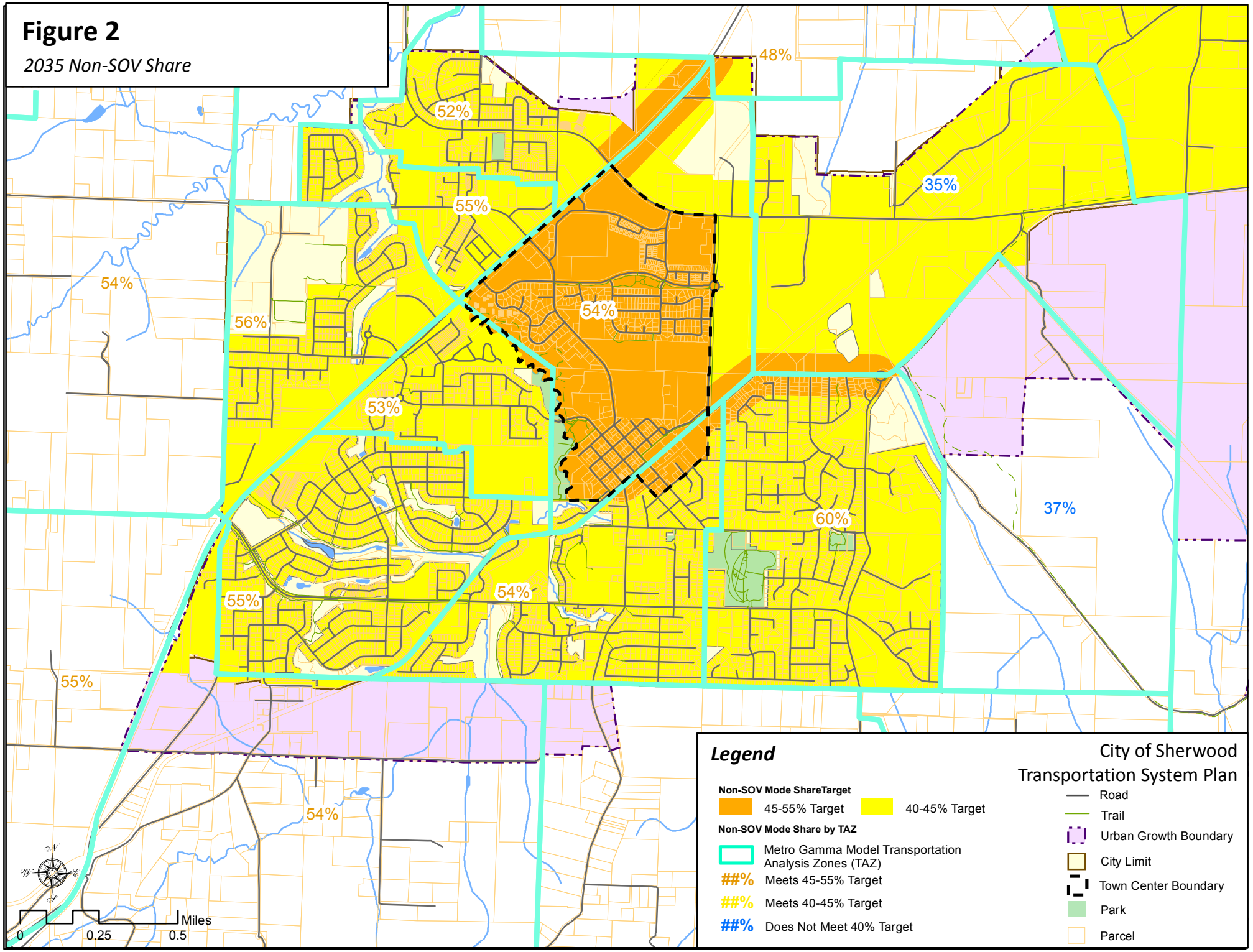
Metro also sets regional targets for the amount of trips that are made by means other than someone driving alone or a "single occupant vehicle" (SOV). These regional targets are set for the portion of non-SOV travel (trips made by pedestrian, bike, transit, carpool, etc.) based on the target land use density (the 2040 design type). The targets are structured so that more dense areas have a higher share of non-SOV trips. Each design type and non-SOV target is as follows:

- Portland Central City (60-70%)
- Regional Centers, Town Centers, Main Streets, Station Communities, Corridors, Passenger Intermodal Facilities (45-55%)
- Industrial Areas, Freight Intermodal Facilities, Employment Areas, Inner Neighborhoods, Outer Neighborhoods (40-45%)

The travel model provides estimates of the various modes of travel that can be generally assessed at the transportation analysis zone (TAZ) level. Figure 2 summarizes the level of non-SOV mode share estimated for 2035 using the regional travel demand model in comparison to the modal targets set in Metro's Regional Transportation Plan (RTP). These non-SOV targets are aggregated by design type groupings (as listed above) and colored in Figure 2 as orange (45-55% target) and yellow (40-45% target). For each TAZ, the 2035 non-SOV share is listed. The 2035 non-SOV share for each TAZ is also colored to indicate the highest target that is satisfied (orange for 45-55% target, and yellow for 40-45% target). Note that TAZ boundaries, which are the basis for the non-SOV share data, do not directly align with the 2040 design type boundaries (this is not critical). Based on the model data, it appears that the targets are typically achieved for the western areas but not met for areas east of Langer Farms Parkway.

Figure 2

2035 Non-SOV Share



Pedestrian System

While Sherwood's pedestrian network is generally well-developed, sidewalk connectivity gaps are present in key locations throughout the city, including within the Town Center, which has density and uses that support pedestrian activity. An assessment of gap locations prioritized the locations based on proximity to activity generators (such as schools, libraries, medical offices, parks, etc.). Figure 3 presents sidewalk gaps along the major street network (arterials and collectors), and indicates the preliminary prioritization based on density of activity generators. Solutions to address these gaps (including amenities on parallel facilities) will be explored during the next stage of the planning process.

Existing Needs

The *Existing Conditions Technical Report* identified the following key gaps in sidewalk connectivity:

- **Highway 99W** has significant gaps in sidewalk connectivity, especially a large portion south of Sherwood Boulevard that does not have sidewalks on either side of the highway. Several key sidewalk gaps on Highway 99W fall within high priority areas. These key gaps are adjacent to several shopping areas and medical offices.
- **Oregon Street** along most of its length between Langer Farms Parkway and Murdock Road lacks sidewalks on both sides of the road; however, the northern side of the road has undeveloped land. These sidewalk gaps, however, are in low priority areas since they are further away from the activity generators. Some gaps may be filled by funded Cedar Creek Trail improvements.
- **Edy Road** along most of its length between Highway 99W and Elwert Road lacks sidewalks on at least one side of the road. Several key sidewalk gaps along Edy Road fall within high priority areas due to the high concentration of medical offices and elementary/middle schools.
- **12th Street** between Highway 99W and Sherwood Boulevard lacks sidewalks on the south side of the street. These sidewalk gaps fall within high priority areas as it serves shopping centers, medical offices, and the major transit route through the city.
- **Division Street** along most of its length between Main Street and Mansfield Street lacks sidewalks on at least one side of the road. As a neighborhood facility, its gaps are not shown in Figure 2. However, it falls within a high priority area due to its proximity to Old Town.
- **Gleneagle Neighborhood** lacks sidewalks along all streets (12th Street, Gleneagle Drive, Glenco Court, 11th Court, and 10th Street), including those that front homes. This network of local roads falls within high priority areas due to their proximity to the major transit route through the city, medical offices, shopping centers, and schools.

Other high priority gap locations include:

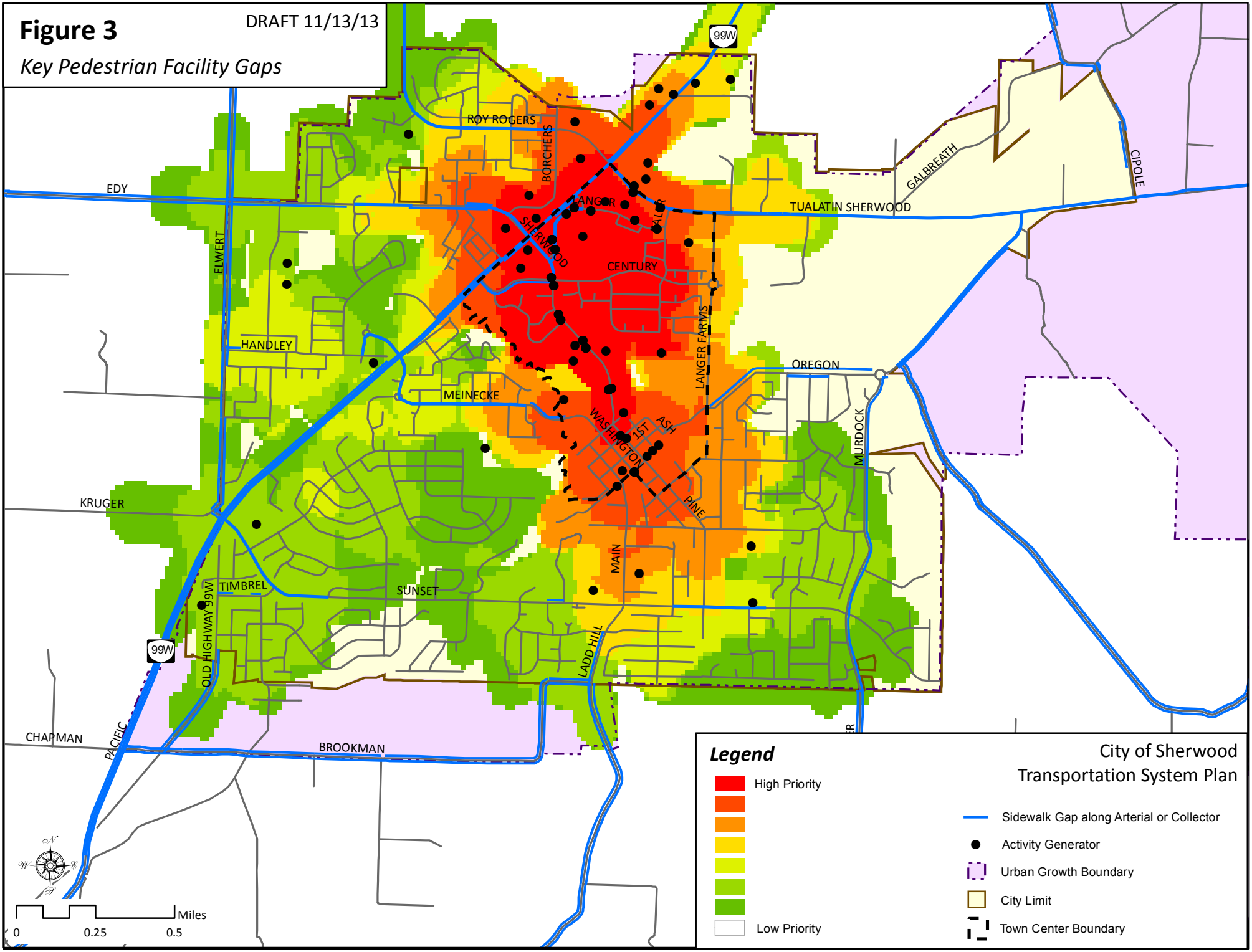
- **Meinecke Road** lacks sidewalk along the north side of the street east of Lee Drive for approximately 400 feet. This route is a major connection serving Old Town, which is dense with activity generators.

The appendix includes a complete prioritized list of sidewalk gaps on collector and arterial facilities.

Figure 3

DRAFT 11/13/13

Key Pedestrian Facility Gaps



Street crossings are another important feature of Sherwood's pedestrian system. While controlled pedestrian crossings are provided at all major signalized intersections, there are some roadways where major intersections are spaced far apart, which results in crossing barriers for pedestrians. Highway 99W only has five crossing locations in the three-mile section through town, with particularly long spacing on the 3/4-mile stretch between Sunset Boulevard and Meinecke Road. Another pedestrian crossing gap located along a major roadway is located on Sunset Boulevard between Pinehurst Drive and St Charles Way.

The Highway 99W crossings are located at signals, and each signal only allows pedestrian crossings on one leg of Highway 99W (with the other crossing being closed). In addition, the west crosswalk on Sherwood Boulevard at the intersection of Langer Drive is also closed. In some cases these closures may have been made to address traffic operation needs to improve the flow of traffic by removing conflicting pedestrian movements. However, these closures are a tradeoff that can increase the crossing movements required by pedestrians to reach their destination. In some cases, a pedestrian may be required to cross three legs on an intersection rather than the desired (closed) leg. This increases the travel time for pedestrians as well as potential conflicts with motor vehicles.

Another major feature impeding pedestrian mobility is the large area of developed land without public rights of way through the properties between Old Town and the residential area to the north. While this area contains schools, a church, and other uses, it does not provide dedicated pedestrian connections between Sherwood Boulevard and Langer Farms Parkway.

There are also existing gaps in regional connectivity between Sherwood and neighboring communities. To address this issue, coordination will be required with Washington County and neighboring communities to develop regional trail connections. The Ice Age Tonquin Trail is an example of a regional facility that will provide regional connections between Sherwood, Tualatin, and Wilsonville.

Future Needs

As Sherwood grows, demand on the pedestrian system and the need to connect the city will also grow. Gaps in the sidewalk network within significant growth areas include: Brookman Road, Elwert Road, Oregon Street, and Tonquin Road. While pedestrian demand along these facilities is low today, they will become more critical routes by 2035. Several major arterials along the fringes of the city (e.g., Murdock Road, Oregon Street, Tualatin-Sherwood Road, Elwert Road) are expected to serve large growth areas by 2035, and will pose as major barriers to pedestrians without well-spaced pedestrian crossings. As these areas develop, enhanced pedestrian crossings will be needed along these facilities. Finally, increased activity within the Town Center will continue to highlight the need for pedestrian and bicycle improvements to enhance options for multimodal travel.

Bicycle System

With the exception of Highway 99W and Tualatin-Sherwood Road, most roadways do not provide bike lanes. An assessment of bicycle lane gaps on major roads and their proximity to activity generators was conducted. Figure 4 shows bike lane gaps along major roads (arterials and collector facilities), and indicates a preliminary prioritization based on density of activity generators. Several of these prominent locations are within the Town Center area, which is shown as having high potential for bicycle need due to the proximity to a number of activity generators.

Existing Needs

There are several key roadway segments without bicycle facilities that are located in high bicycle demand areas. These priority gap locations (which may not include the entire street length) include:

- **Edy Road** from Houston Drive to Elwert Road (near medical offices and schools)
- **Borchers Drive** from Edy Road to Roy Rodgers Road (near medical offices and shopping)
- **Roy Rodgers Road** from Highway 99W to Borchers Drive (near a concentration of medical offices, and near a shopping center)
- **Langer Drive** from Baler Road to the northbound Highway 99W right-in-right-out access (along the major transit route through the city, and near shopping centers and medical offices)
- **Baler Road** from Tualatin Sherwood Road to Langer Drive (along the major transit route through the city, and near shopping centers and medical offices)
- **12th Street** from Highway 99W to Sherwood Boulevard (near the major transit route through the city, shopping centers, and medical offices)
- **Sherwood Boulevard** from 12th Street to 3rd Street (along the major transit route and near medical offices, schools, and the senior center)
- **Pine Street** from 3rd Street to Sunset Boulevard (near Old Town)
- **Meinecke Road-Washington Street** from Lee Drive to 1st Street (near Old Town)
- **Main Street** from 1st Street to Sunset Boulevard (near Old Town)

Bike gap along Sherwood Boulevard near Clyde Hopkins Elementary School

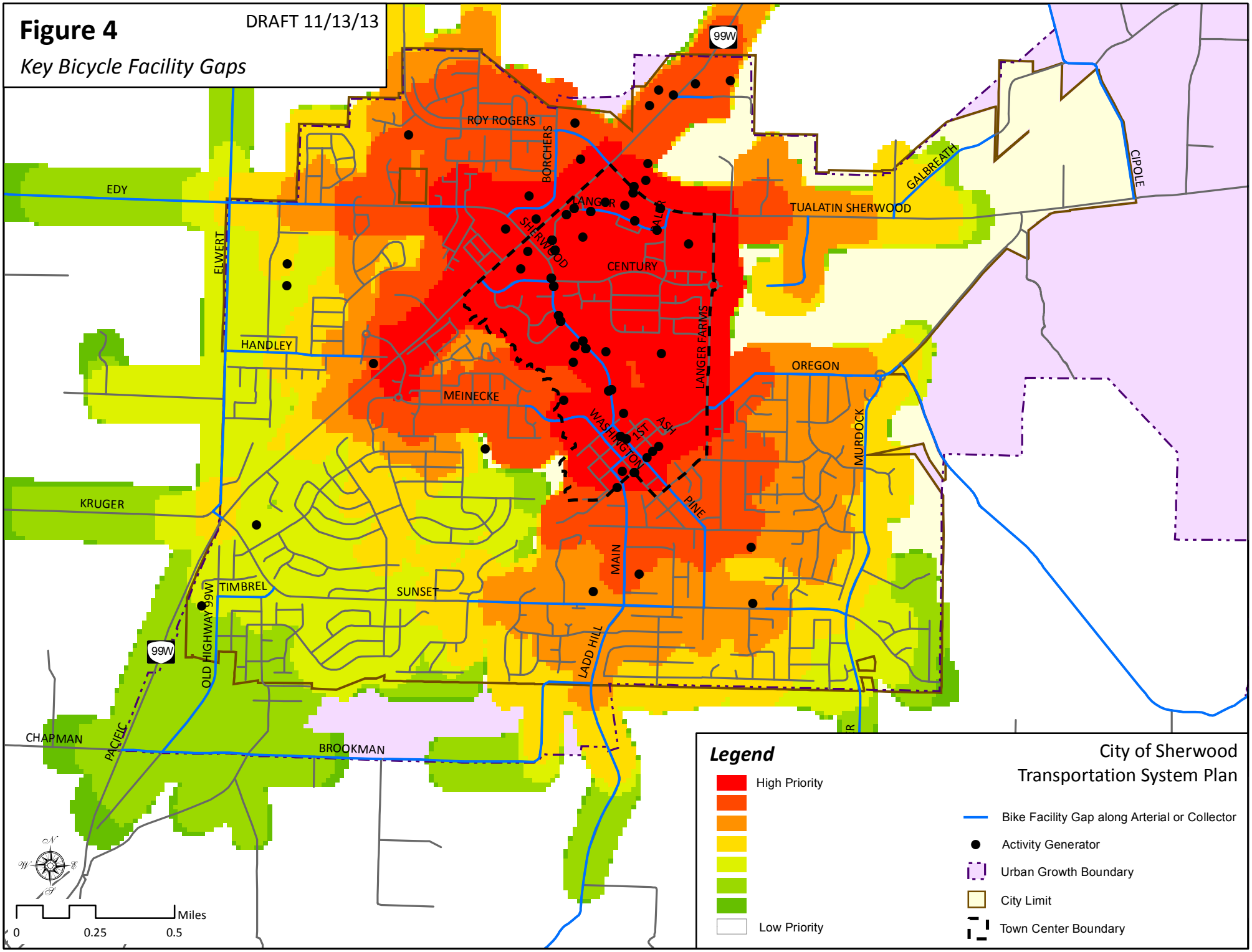
- **Oregon Street** from Langer Farms Parkway to Murdock Road (near Old Town and schools)

There are also gaps in regional connectivity. To address this issue, coordination will be required with Washington County and neighboring communities to develop regional trail connections. The Ice Age Tonquin Trail is an example of a regional facility that will provide regional connections between Sherwood, Tualatin, and Wilsonville.

Figure 4

DRAFT 11/13/13

Key Bicycle Facility Gaps



Future Needs

Many identified growth areas are absent of adequate bicycle facilities. As motor vehicle volumes increase and bicycle demand grows, there will be a greater need to separate bicycles from the travel lane. Bicycle gaps in key growth areas include: Brookman Road, Old Highway 99W, Handley Street, Galbreath Drive, Tonquin Road, Elwert Road, Edy Road, and Pine Street.

Transit System

Transit service in Sherwood is provided by the Tri-County Metropolitan District of Oregon (TriMet) and the Yamhill County Transit Area (YCTA). TriMet provides service and connections within the Portland Metro region, while YCTA connects Sherwood to Yamhill County and Tigard. The following sections discuss the existing needs of the transit system and the projected needs of the transit system as the city grows through 2035.

Existing Needs

- **Transit stop amenities:** Only some of the bus stops in Sherwood offer benches and shelters. Provision of passenger amenities at bus stops creates a more pleasant and attractive environment for bus riders and may encourage people to use the transit system.
- **Sidewalk connections to transit stops:** In general, Sherwood's sidewalk network is well built, especially near transit stops. However, filling gaps and expanding the existing sidewalk network near transit stops will make the transit system more attractive to potential users.
- **YCTA service:** YCTA bus routes currently stop at SW Langer Drive near Shari's. While demand may not facilitate expanding service within Sherwood, YCTA could consider implementing stops at the existing park and ride lots. While extending service to the major transit stop in Old Town Sherwood would increase travel times along the existing bus routes, it would provide a more manageable transit option for Sherwood residents and employees traveling to and from Yamhill County.
- **Development a transit center:** The Old Town Sherwood transit stop along SW Railroad Street is identified as a major transit stop. This stop could act as a major transit center for TriMet and YCTA routes, as well as a potential local circulation route. While this stop provides shelter, seating, signage, and trash amenities, there is still potential for further streetscape and amenity improvements (e.g., bicycle parking, sidewalk infill, pedestrian crossing enhancements). It is important to note right-of-way at this transit stop is constrained by the railroad just to the south.

Old Town major transit stop

- **Local transit circulation:** There is a need for a local Sherwood circulation route or expanded service as a large population of residents live outside a comfortable walking distance to existing transit. This route could connect residents to major trip attractors, especially TriMet and YCTA transit stops.

Future Needs

- **Transit service in future growth areas:** As shown in Figure 1, the Sherwood region will continue to grow internally as well as outside of the city limits. As these areas grow, so will demand for transit. Sherwood's public transit system should be proactively planned to meet the needs of the growing city. This includes expanding sidewalk connectivity, improving existing amenities, developing new transit stops, improving frequency, and expanding operational hours in these growth areas.

Motor Vehicle System

The motor vehicle street system was reviewed to identify major street (collector and arterial) gaps in the street grid network as well as future year 2035 capacity needs.

Connectivity Gaps

Four collector gaps within the city were previously identified in the Existing Conditions Technical Report. These gaps were determined by comparing existing street spacing to the Metro Regional Transportation Functional Plan (RTFP) recommended spacing for arterial and collector streets. It was determined that arterial spacing in Sherwood is acceptable. Collector gaps in the city include:

1. Meinecke Road to Sunset Boulevard between Highway 99W and Main Street
2. Sunset Boulevard to Brookman Road between Old Highway 99W and Ladd Hill Road
3. Roy Rodgers Road to Edy Road between Borchers Drive and Elwert Road
4. Edy Road to Handley Street between Highway 99W and Elwert Road

These locations are mapped and described in further detail in the Opportunities and Constraints section.

Mobility Needs

A travel demand model was used to estimate future year 2035 conditions on the roadway system. The model was based on Washington County's latest 2035 Gamma model with additional refinements and detail (all public roads, lane turn lanes, and intersection control) to capture estimated future circulation patterns and congestion. The model was applied as a screening tool to identify potential locations that may require additional operational or capacity improvements. The model assumed the following changes to the transportation system because of investments already committed or reasonably likely to be committed:

- Improvements consistent with Washington County's Tualatin-Sherwood Road project between Borchers Drive and Langer Farms Parkway (road cross section, intersection control, etc.)

- Improvements consistent with the developer agreement for Langer PUD (extension of Langer Farms Parkway from Tualatin-Sherwood Road to Highway 99W, Century Drive connection, traffic signal at Tualatin-Sherwood Road/Langer Farms Parkway).
- Major transportation elements of Tonquin Employment Area (new east-west collector with roundabout at Oregon Street and traffic signal at 124th Avenue)
- Major transportation elements of Brookman Area (traffic signal at Brookman Road and Highway 99W)
- Traffic signal at Scholls-Sherwood Road/Roy Rogers intersection.

Even with the above transportation system improvements, the additional growth on the transportation system through year 2035 would increase congestion at many locations. Figure 5 and Figure 6 show the general operational performance for all roadway segments and intersections using level of service (LOS) and volume-to-capacity (V/C) performance measures. LOS is similar to a report card rating to indicate general level of condition based on average delay. The V/C ratio indicates the portion of overall capacity or "how full" a road or intersection is operating. On both figures, segments and intersections shown in green are those that will operate relatively well, while those in warmer colors (up to dark red) indicate increasing levels of congestion

Figure 5 indicates the general amount of traffic projected to use streets in the Sherwood area (based on the width of the color) and the general level of congestion (noted by warmer colors). The following road segments were identified as locations that are projected to be congested during evening peak hour conditions and may require additional capacity improvements by year 2035. Locations along freight corridors are designated with *.

- OR 99W north of SW Tualatin Sherwood Rd*
- SW Roy Rogers Rd West of OR 99W*
- SW Tualatin Sherwood Rd east of OR 99W*
- SW Edy Rd west of OR 99W
- OR 99W south of SW Edy Rd*
- SW Oregon St east of SW Murdock Rd
- SW Sunset Blvd between SW Pinehurst Dr and SW Murdock Rd
- SW Langer Farms Pkwy south of SW Century Dr

Many of the intersections expected to experience higher delays by 2035 are along these roadway segments. These intersection locations are mapped in Figure 5 (based on v/c ratio) and Figure 6 (based on LOS). Many of these locations have high overall traffic volumes (such as traffic signals along Highway 99W) or are unsignalized locations where side streets have delay waiting to make a turn (such as along Sunset Boulevard). For a complete list of flagged intersections that may require additional capacity improvements by 2035, refer to the appendix.

Figure 5: Year 2035 Projected Congestion Locations (V/C)

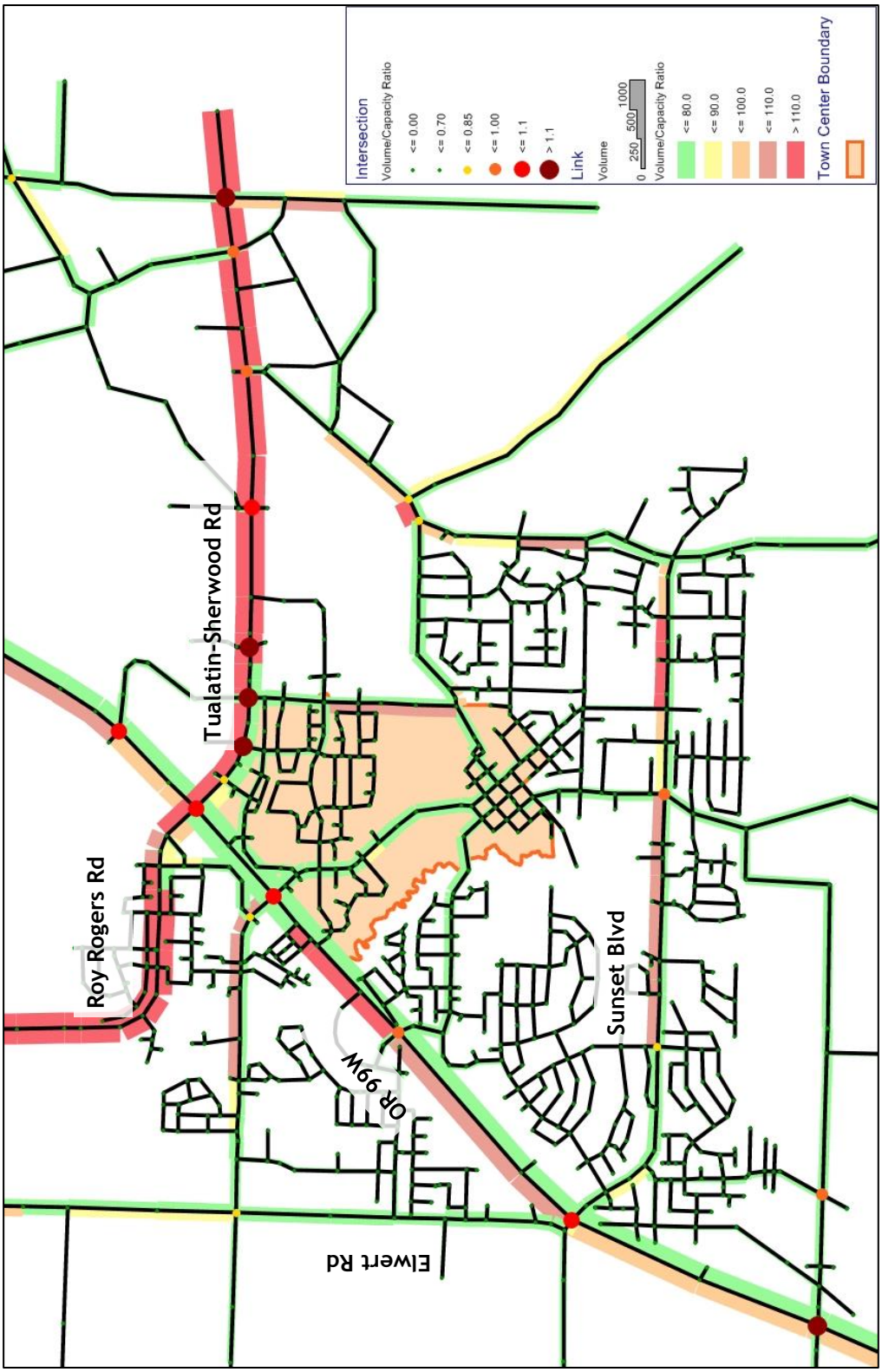
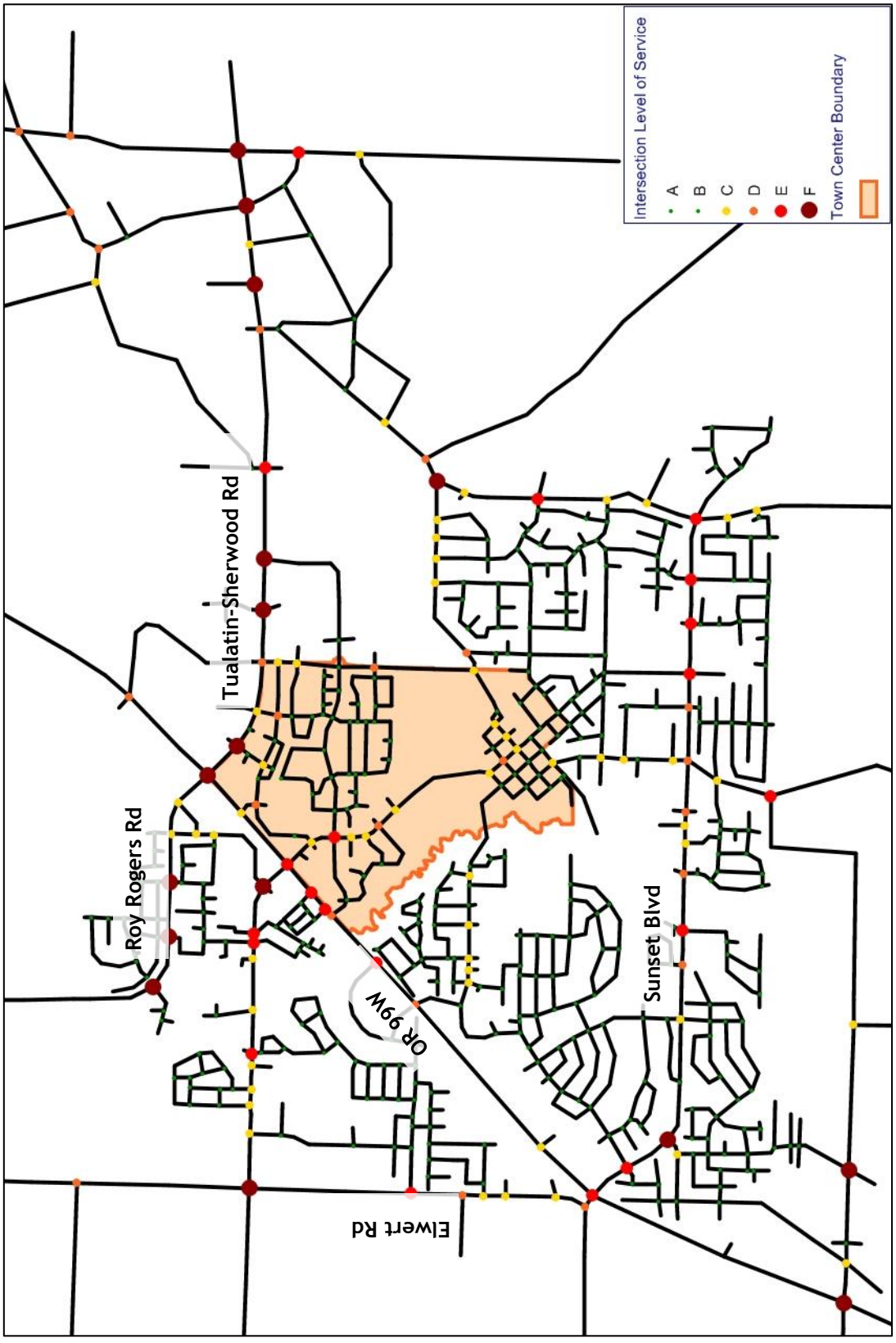


Figure 6: Year 2035 Projected Congestion Locations (LOS)



Freight Needs

The motor vehicle capacity analysis conducted with the travel demand model was also summarized for freight corridors (OR 99W, Tualatin-Sherwood Road, and Roy Rogers Road). These corridors are major facilities that serve freight as well as high volumes of non-freight traffic. Due to the high level of traffic on these corridors, they account for the majority of the existing congestion (delay) in the system. The existing delay on these corridors is approximately 55 percent of the system total. In 2035, the amount of delay on these corridors is projected to grow to 60 percent of the total. A number of roadway segments and intersections identified as capacity constraints are located along the freight corridors. Capacity constraints at these locations will need to be addressed in order to ensure the mobility of freight through the system.

Safety Needs

The following locations were identified as having safety needs based on a review of collision data.

- Road segments along Highway 99W
    - MP 14.91 to MP 15.09 (Tualatin-Sherwood Road intersection)
    - MP 16.61 to MP 16.73 (Elwert Road/Sunset Boulevard intersection)
    - MP 15.92 to MP 16.01 (Meinecke Road intersection)
- Intersections
    - Highway 99W/Tualatin-Sherwood Road/Roy Rogers Road:
        - The majority of the collisions occurred along Highway 99W in either direction and varied in distance from the intersection. This pattern of rear-end collisions is common at signalized intersections on high speed/high volume facilities.
        - There were a number of collisions on the side street approaches as well. Eight of the ten turning movement collisions occurred on Tualatin-Sherwood Road and involved vehicles turning right to travel north-eastbound on Highway 99W. This indicates a pattern that could be attributed to the yield condition and geometry of the right turn movement. Vehicles starting to turn on the yield movement and then suddenly stopping before entering the highway may cause the following vehicle (that is anticipating that the first vehicle will enter the highway) to collide. The geometry and traffic control for this movement is subject to change with the Washington County improvements that are currently under design. The congestion-related collision patterns at this location (rear-end and misjudged gap-entry) may increase along with future traffic growth.
    - Tualatin-Sherwood Road/Cipole Road:
        - Nearly all of the collisions occurred on Tualatin-Sherwood Road and slightly more occurred in the eastbound direction (34 collisions) versus the westbound

direction (26 collisions). In addition, almost one-third (19 of 62 collisions) involved more than two vehicles, which is a very high proportion of collisions and may indicate sudden breaking, possibly due to unanticipated stopping. The rear-end collision pattern is related to congestion and may be due to the mix of the rural nature of the area with urban levels of congestion. While these crashes may increase in the future along with traffic growth, the pattern also may decrease as the area becomes more urbanized and developed.

- Highway 99W/Elwert Road/Sunset Boulevard:
  - Nearly all of the collisions occurred along Highway 99W, with nearly two-thirds occurring in the southbound direction. The collisions varied in distance from the intersection, and the horizontal and vertical curvature in Highway 99W may be a contributing factor. The rural nature of this location may also contribute to driver expectancy issues related to drivers being unprepared to stop. The congestion related collision patterns on Highway 99W could increase along with future traffic growth. However, the crash frequency could decrease as the area becomes more urbanized and drivers anticipate congestion and stopping on the highway.
- Tualatin-Sherwood Road/Oregon Street:
  - Compared with the other SPIS intersections, this intersection had proportionally more turning movement collisions (21%), and half of the turning collisions (five of ten collisions) involved a vehicle making the westbound left turn from Tualatin-Sherwood Road onto Oregon Street with most of these occurring during the PM peak hour (four of five collisions). This pattern is likely related to congestion and could be a result of a number of related issues including drivers near the end of queue following other vehicles beyond the protected green indication. In addition, the traffic signal at this location was modified in June 2008 to allow "permitted" (flashing yellow) left turn movements that require the turning vehicle yield to oncoming traffic. Misjudgment of the oncoming vehicle speeds may have contributed to turning movement collisions at this location. Additional growth and traffic volume is likely to increase these congestion-related collision patterns.
- Tualatin-Sherwood Road/Gerda Lane:
  - Similar to the Cipole Road intersection, nearly all of the collisions occurred on Tualatin-Sherwood Road. However, the directionality of collisions was reversed and the majority occurred in the westbound direction (27 collisions) instead of the eastbound direction (16 collisions). Just over half of these collisions (14 of 27 collisions) occurred during the midday or p.m. peak periods (11 a.m. to 1 p.m. or 4 p.m. to 6 p.m.), likely due to higher traffic volumes. A traffic signal was

installed at this intersection in late December 2010. Two of the turning movement collisions (which are typically more dangerous) occurred before the signal was installed. The third incident, while classified as a turn movement, occurred after the signal was installed and was related to a bus following a vehicle too closely and hitting it while it yielded to a pedestrian in the crosswalk. Therefore, no traditional turn movement collisions (typically made with a vehicle going straight and hitting a conflicting left turning vehicle) occurred after the signal was installed.

- As is generally typical for other locations, the rate of rear-end collisions at this location increased following the installation of the traffic signal. Only 8 of the 44 collisions occurred during 2008 through 2010, while 36 occurred in the two years (2011 and 2012) following the traffic signal installation. This high incidence of rear-end collisions is likely to increase with future traffic growth along Tualatin-Sherwood Road.

- Highway 99W/Meinecke Road:
  - Nearly all of the collisions occurred along Highway 99W and varied in distance from the intersection. Slightly more occurred in the southbound direction (16 of the 27 collisions on Highway 99W). This patterns of rear-end collisions is similar to the trend present at the other SPIS locations.
  - This location also includes a higher portion of turn movement collisions. Half of the turn movement collisions involved multiple vehicles making a northbound right from Meinecke onto Highway 99W. These incidents may be related to overly-aggressive drivers similar to the pattern at Highway 99W/Tualatin-Sherwood Road. The third observation present at this location is related to the higher number of fixed object collisions that involve vehicles driving into the ditch. This pattern may be related to drivers misjudging the separated medians at each leg of the intersection, which has a greater separation than other intersections.

The Tools to Address Identified Needs

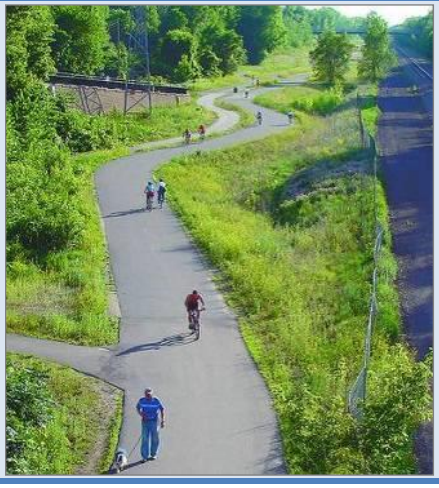
A variety of potential improvements to address the needs of the transportation system through 2035 are displayed in Table 3. These potential solutions are organized by improving walking, improving biking, improving transit, and improving driving in Sherwood.

Table 3: Potential Tools to Address the Needs of the Transportation System

MODE	TOOL	EXAMPLE
walking	**Crosswalks** High-visibility markings, often consisting of a "zebra" striping pattern, can be effective at locations with high pedestrian crossing volumes, near schools, and/or areas where motorist awareness of pedestrian crossings may be poor.	
walking	**Pedestrian Refuge Islands** Refuge islands allow pedestrians to cross one segment of the street to a relatively safe location out of the travel lanes, and then continue across the next segment in a separate gap in traffic. Refuge islands are most appropriate at midblock crossings where right-of-way allows for adequate space between opposing travel lanes.	
walking	**Sidewalks and Sidewalk Infill** Good sidewalks are continuous, accessible to everyone, provide adequate travel width and feel safe. Sidewalks can provide social spaces for people to interact and contribute to quality of place. Completing sidewalk gaps improves the connectivity of the pedestrian network. Sidewalk gap infill should be prioritized in higher demand areas. Sidewalk infill can often be addressed as frontage improvements when land develops or redevelops.	

MODE	TOOL	EXAMPLE
walking	**Curb Extensions** Curb extensions reduce the pedestrian crossing distance and improve motorists' visibility of pedestrians waiting to cross the street. Curb extensions can also serve as good locations for bike parking, benches, public art, and other streetscape features. Curb extensions are most appropriate where travel lanes are excessively wide, or where on-street parking is provided.	
walking	**Rectangular Rapid Flashing Beacon (RRFB)** The RRFB is designed to encourage greater motorist compliance at crosswalks. The RRFB is a rectangular shaped lightbar with two high intensity LED lightheads that flash in a wig-wag flickering pattern. The lights are installed below the pedestrian crosswalk sign (located on each side of the road near the crosswalk button) and are activated when a pedestrian pushes the crosswalk button. RRFB's are most applicable at midblock locations when pedestrians must cross multi-lane roadways, near schools, at locations with pedestrian safety issues, and at locations where pedestrian visibility is restricted.	
walking	**Streetscape Improvements** Streetscape improvements are features that enhance the pedestrian experience. These include public art, pocket parks, ornamental lighting, gateway features and street furniture. Many of these improvements can easily integrate environmentally- friendly "green" elements. Potential streetscape improvements are often constrained by available right-of-way, and do not directly address the connectivity or gap needs. Streetscape improvements can typically be provided along facilities where sidewalks are greater than six feet in width, or where roadways are excessively wide.	

MODE	TOOL	EXAMPLE
walking	**Pedestrian Countdown Signals** Countdown signals display the number of seconds remaining for a pedestrian to complete a crossing, enabling users to make their own judgment whether to cross or wait based on their speed and comfort. The allotted time can be adjusted to accommodate slower pedestrians, such as seniors or children.	
walking	**Curb Ramp Retrofits** Retrofitting ADA-compliant curb ramps to existing sidewalks greatly improves mobility and accessibility for mobility-impaired users. Curb ramps also improve the walking environment for pedestrians with strollers, delivery carts, and other "wheel" devices.	
biking	**Bike Lanes** Designated exclusively for bicycle travel, bike lanes are separated from vehicle travel lanes with striping and also include pavement stencils. Bike lanes are typically recommended along arterials and collectors, especially for roadways with high vehicle volumes and speeds. Right-of-way often constrains quick installation of bike lanes and can often lead to tradeoffs with parking availability.	
biking	**Bike Box** A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of stopped traffic during the red signal phase. When a bike box is present, vehicles are prohibited from turning right during a red phase. Bike boxes may not be appropriate at signalized intersections with existing or expected congestion issues.	
biking	**Bike Box for Left-turns at Signalized Intersections** A bike box for left turns (otherwise known as a Copenhagen Left) allows bicyclists to make left-turns at intersections without having to veer across traffic. A bicyclist turns left by traveling through the intersection in the direction they are heading, and then waiting in the designated left-turn box before proceeding across the street on a green light. These are most appropriate for multi-lane roadways, especially those with high vehicles volumes and speeds.	

MODE	TOOL	EXAMPLE
biking	**Share the Road Signage** 'Share the Road' signage can be used to raise awareness and legitimize the presence of bicycles on the roadways. This signage is applicable to roadways where bike lanes are not necessarily appropriate (e.g., roadways with low vehicle volumes and speeds). 'Share the Road' signage can be used to supplement shared lane markings.	
biking	**Shared Lane Marking** Shared-lane markings or "sharrows" are designed to inform motorists to expect cyclists to be in the middle of the travel lane, and to inform cyclists that they should be in the travel lane and away from parked cars. An uphill bike lane and downhill shared lane markings can be used on hilly routes that do not have room to accommodate bike lanes in both directions. Shared lane markings should not be used on facilities where vehicle speeds are significantly greater than bicyclist speeds. Roads with under 3,000 vehicles per day and speeds under 25 miles per hour are typically best suited for shared lane markings.	
biking	**Bicycle Boulevard/Neighborhood Greenway** Traffic calming can be used to optimize neighborhood streets for bicycle and pedestrian travel. Intersection improvements can be made to assist bicyclists at difficult roadway crossings. A roadway should only be converted to a bicycle boulevard where it is appropriate to discourage through-motor vehicle traffic. Bicycle boulevards work well when a parallel route is available to motorists.	
Biking/walking	**Shared-use paths** Shared-use paths can provide a desirable facility particularly for novice riders, recreational trips, and cyclists of all skill levels preferring separation from traffic. Facilities may be constructed adjacent to roads, through parks, or along linear corridors such as active or abandoned railroad lines or waterways. Shared-use paths are a useful tool when both bicycle and pedestrian gaps are present, especially when right-of-way is constrained along one side of the roadway. When right-of-way is constrained, shared-use paths may provide a less impactful solution to providing full pedestrian and bicycle facilities than a typical cross-section with bike lanes and sidewalks.	

MODE	TOOL	EXAMPLE
biking	**Wayfinding Signage and Pavement Markings** Directional signage indicating locations of destinations and travel time/distance to those destinations increases users' comfort and accessibility to the pedestrian and bicycle systems. Pavement markings can be used on bicycle boulevards, which are low-traffic bike routes without bike lanes. Wayfinding signage also helps direct bicyclists to routes with comfortable bicycle facilities.	
biking	**Colored Bike Lanes** Colored bike lanes are used in areas where automobiles and bicycles cross paths and it is not clear who has the right-of-way. Colored bike lanes and accompanying signs assign priority to the bicyclist. Due to required maintenance of repainting the bike lane, colored bike lanes are not typically a system-wide solution.	
biking	**Bicycle Detection at Signalized Intersections** Bicycle-activated loop detectors are installed within the roadway to allow the presence of a bicycle to trigger a change in the traffic signal. Detectors that are sensitive enough to detect bicycles should have pavement markings to instruct cyclists how to activate them. Bicycle detection is most effective at locations with significant bicycle activity and where traffic signal phases are often skipped due to low motor vehicle traffic.	
biking	**Bicycle Parking** <u>Short-term parking:</u> parking meant to accommodate visitors, customers and others expected to depart within two hours; requires approved standard rack, appropriate location and placement, and weather protection. <u>Long-term parking:</u> parking meant to accommodate employees, students, residents, commuters, and others expected to park more than two hours. This parking should be provided in a secure, weather-protected manner and location. Bicycle parking is typically most appropriate at bus stops, schools, parks, major commercial or employment locations, and other trip attractors.	

MODE	TOOL	EXAMPLE
transit	**Transit Stop Enhancements** Provision of passenger amenities at bus stops creates a more pleasant and attractive environment for bus riders and may encourage people to use the transit system. Common amenities include: shelters, benches, trash cans, and bus route information. Shelters should be placed at least 2 feet from the curb when facing away from the street and at least 4 feet away when facing toward it. The adjacent sidewalk must still have a 5-foot clear passage. Orientation of the shelter should consider prevailing winter winds.	
transit	**Construct Bus Pullouts** Bus pullouts allow transit vehicles to pick up and drop off passengers in an area outside the traveled way and are generally provided on high-volume and/or high-speed roadways. They are frequently constructed at bus stops with a high number of passenger boardings such as large shopping centers and office buildings. By removing stopped buses from travel lanes, delay to traffic is considerably reduced and safety is enhanced by removing an obstruction from the traveled way. They also help better define bus stop locations, can be used for bus layovers, and create a more relaxed environment for loading and unloading. Available right-of-way often constrains the ability to provide a bus pullout.	
transit	**Move Bus Stops to Far Side of Signalized Intersections** On multi-lane streets or streets with wide shoulders where motor vehicles may pass uncontrolled around a stopped bus, bus stops located on the far side of intersections are preferred to provide needed sight distance. At signalized intersections, bus stops may be located on either the near side or far side of the intersection. However, in locations where bus pullouts are desired, far-side stops should be used. In general, far-side bus stops are desired because they reduce conflicts with right turning vehicles, encourage pedestrians to cross behind the bus, minimize the area needed for curbside bus zones, make it easier for buses to reenter traffic at signalized intersections, and have fewer impacts on roadway capacity. However, far-side stops also require passengers to access the bus further from the crosswalks, may interfere with right turns from the side street, and where pullouts are not used, can result in blockages of an intersection.	

MODE	TOOL	EXAMPLE
driving	**Construct Turn Lanes to separate Turning Vehicles from Through Traffic** The provision of turn lanes (left or right) removes slowing or stopped vehicles attempting to turn off of a roadway from faster moving through traffic. This not only provides significant safety benefits, but also enhances system capacity.	
driving	**Modernization to meet Design Standards** The modernization of a roadway generally refers to upgrading elements to meet current design standards and capacity needs. Outdated roadway designs may not be serving present day demands due to insufficient number and width of lanes, poor geometry, or failure to accommodate a particular mode of travel (e.g., no bike lanes).	
driving	**Modify Intersection Approach Geometry** When the configuration of through and turn lanes at intersection approaches does not properly reflect the demand for these movements, the right of way at signalized intersections cannot be efficiently utilized. Also, poor alignment of opposing lanes or mismatched left turn treatments often require signal phasing that may not be the most effective option for maximizing through capacity. By reconfiguring the number and type of lanes approaching a signalized intersection, significant improvements in capacity may be achieved.	
driving	**Signal Timing Enhancements** The assignment of right of way to competing movements at an intersection plays a critical role in the overall capacity of that intersection and the roadway itself. Old signal timing plans may not be appropriately serving current demands or may not be designed to accommodate fluctuating demands throughout the day or week. Also, timing plans can be created based on specific priorities, such as giving preference to the mainline during peak travel periods. In some situations, signal timing may be adequate, but adjacent signals are not equipped to communicate with each other or are too close together to coordinate properly. Signal timing enhancements can be a quick and cheap solution to reducing congestion at signalized intersections.	

MODE	TOOL	EXAMPLE
driving	**Intelligent Transportation Systems (ITS)** Intelligent Transportation Systems (ITS) come in many forms and have numerous applications. In general, they include any number of ways of collecting and conveying information regarding roadway operations to agency staff managing the facility or to motorists. This can allow both operators and motorists to make informed decisions based on real-time information, leading to quicker responses to incidents, diversion away from congestion, and increased efficiencies in roadway operation.	
driving	**Restriction of Left Turns at Traffic Signals** Because left turn and through movements are often competing for limited right of way, the removal of left turns from an intersection, either completely or during a specific time of day, can significantly improve through traffic capacity. If left turns are restricted, a practical alternative route should be available. While removing left turns at signalized intersections can improve conditions at the respective intersection, it could have detrimental effects to the transportation system as a whole and may "move the problem".	
driving	**Restrict Turning Movements at Approaches** The number of conflict points on a roadway introduced by a particular approach can be significantly reduced by restricting turn movements, such as allowing only right-in and right-out movements, allowing only right-in movements, or prohibiting only left-out movements (as shown in graphic). This treatment is most appropriate for developments with several accesses or where left turns out of the access are difficult due to high conflicting volumes. Restricting turning movements can also present the opportunity to install non-traversable medians.	
driving	**Construct Non-traversable Medians** The construction of non-traversable medians is a means of reducing the number of conflict points introduced on a roadway by approaches. Non-traversable medians can be simple concrete islands or barriers or can be constructed to include landscaping or other decorated treatments. Stamping colored concrete with a brick or rock pattern is a simple median treatment that may be more aesthetically pleasing that plain concrete. They can also be used to accommodate pedestrian refuges or can have breaks allowing for limited or full turning movements.	

MODE	TOOL	EXAMPLE
driving	**Provide Alternate Access through Improved Local Street Connectivity** Reasonable alternate access can be provided where it does not currently exist by constructing new roadways adjacent to properties that abut a high volume roadway. Such roadways can take the form of frontage roads, backage roads, or can simply be new collector or local streets.	
driving	**Move Approaches to Lower Volume Facilities** This treatment is often a good option for properties fronting high volume streets (such as Tualatin-Sherwood Road) that also have frontage along lower volume road. However, where existing site circulation or building locations create a dependency for the pre-existing access, the ability to change site access may require total or partial site redevelopment. Also, before access is reestablished to a side street, it should be confirmed that there would be adequate separation between the new driveway and the intersection with the high volume roadway to avoid turning conflicts or frequent obstruction by vehicle queues.	
driving	**Consolidate Multiple Approaches to Single Properties** A common method of reducing approach density is to eliminate multiple approaches to a single property where feasible. This can be done where it has been determined that the property can adequately be served with fewer approaches than it currently maintains. However, where existing site circulation or building locations create a dependency for the pre-existing roadway access, the ability to change site access may require total or partial site redevelopment.	
driving	**Create Shared Approaches to Properties using Easements or under Common Ownership** Sharing an approach to a roadway is a means of consolidating approaches while providing direct access to properties that might not otherwise have it. This tool is most advantageous when applied between two landlocked properties that have no other means of reasonable access than to a high volume roadway. Such properties would typically be provided their own approach. However, when a shared approach can be arranged, the end result is only one approach to the roadway rather than two.	
driving	**Intersection or Roadway Capacity Enhancements** Capacity improvements at intersections (adding turn lanes or changing traffic control) are considered system management measures and are generally preferred over widening an entire corridor. Roadway widening improvements should only be considered if all other strategies have been explored and considered insufficient (see the Evaluation Criteria section).	

Opportunities and Constraints

This section identifies the opportunities and constraints of transportation system gaps previously identified in this memorandum. These items will be considered as solutions are identified and assessed during the next phase of the planning process. Due to the limitations in local and regional transportation funding opportunities, issues related to project cost can become significant obstacles. As projects are identified and prioritized, general considerations for project cost can impact project feasibility.

Pedestrian and Bicycle Gaps

For each of the identified existing and high priority pedestrian and bicycle gaps, opportunities and constraints are discussed at a high-level.

- **Highway 99W Sidewalks:** With at least 180 feet of right-of-way and existing pavement widths around 140 feet, there is ample space to build a complete sidewalk network along Highway 99W.
- **Oregon Street Sidewalks:** West of Murdock Road, a sidewalk gap exists along a strip of residences between Hall Street and Orland Street—there are no significant constraints regarding infill at this location. East of Murdock Road, a long sidewalk gap exists along the east side of Oregon Street—sidewalks could be built at this location as the adjacent properties develop.
- **Edy Road Sidewalks:** Several sidewalk gaps exist along Edy Road. Infill may be possible with minimal right-of-way impacts. Just east of Settlement Drive, a guardrail lines the south side of the street—sidewalk infill at this location may be difficult.
- **12th Street Sidewalks:** While residences line the sidewalk gap along the south side of 12th Street, available right-of-way appears to extends south past the roadway. Therefore, there is potential for building sidewalk south of the roadway. There is also an opportunity to reduce the motor vehicle width of the roadway to provide additional space for sidewalk if necessary, as the two-lane facility is at least 35 feet wide with parking allowed on the south side only.
- **Meinecke Road Sidewalks:** While the gap of sidewalk along Meinecke Road is located near wetland, sidewalk infill may be possible without impact to the wetland. However, design opportunities may be constrained by the wetland proximity.
- **Division Street Sidewalks:** Many sidewalk gaps exist along Division Street. While street and right-of-way widths change frequently, providing continuous pedestrian facilities is likely possible. It is important to note that while sidewalk infill would likely be built within right-of-way, it would be built across the frontage of many residential properties in the area.
- **Glen Eagle Neighborhood Sidewalks:** Building a sidewalk network in the Glen Eagle neighborhood would require building sidewalk along the frontage of residences in the area. In some locations these improvements may be achieved within existing right-of-way. Lower impact options could include building sidewalk on only one side of the street, or building sidewalk over existing pavement (effectively removing on-street parking).

- **Edy Road Bike Facilities:** Several gaps in bicycle facilities existing along Edy Road, especially on the south side. To provide adequate separated facilities for bicycles, the roadway would need to be widened. Widening the roadway for bikes, and filling sidewalk gaps may be difficult within existing right-of-way. Also, just east of Settlement Drive, a guardrail lines the south side of the street, which would make roadway widening difficult at this location, especially considering adjacent wetland areas. No adjacent parallel facilities exist that could provide alternative facilities for bikes.
- **Borchers Drive Bike Facilities:** Borchers Drive is a relatively wide facility that may be able to accommodate bike lanes through striping. There is a short pinch-point near Daffodil Street that would need to be widened along the east side, which could be addressed as the adjacent property is developed.
- **Roy Rodgers Road Bike Facilities:** The Tualatin Sherwood Road (SW Borchers Drive to SW Adams Avenue) project is currently being designed. It is likely that buffered bike lanes will soon be constructed through this bike gap as a continuation of the buffered bike lanes located to the east on Tualatin-Sherwood Road.
- **Langer Drive Bike Facilities:** Langer Drive is not wide enough to accommodate bicycle facilities, unless the center turn lane is removed. There is potential to widen the roadway to accommodate bike lanes. However, this would require removing and rebuilding sidewalks and landscaping, which is currently in good condition. The Sherwood Town Center Plan[2] recommends reallocating the center turn lane to provide for buffered bike lanes or a cycle track.
- **Baler Road Bike Facilities:** There may be enough right-of-way to widen this short section of roadway (approximately 240 feet) to accommodate bike lanes. However, bike lanes may not be appropriate in the northbound direction as the majority of northbound travelers turns left or right at the Tualatin-Sherwood Road intersection. There is also potential to remove the southbound left turn refuge to provide a southbound bike lane. The Sherwood Town Center Plan proposes accommodating bike lanes along Baler Road from Tualatin-Sherwood Road to Century Drive.
- **12th Street Bike Facilities:** 12th Street is a two-lane facility with on-street parking along the south side. There is potential for reducing the motor vehicle with of the roadway to accommodate bike lanes, which may result in a loss of on-street parking. However, the need for pedestrian facilities along the south side of the street may restrict the potential to widen the roadway for bike lanes. The Sherwood Town Center Plan identifies that this facility is planned to accommodate bike lanes.
- **Sherwood Boulevard Bike Facilities:** Dieting the road to provide bicycle facilities would requirement removal of the center turn lane. This is an unfavorable option as the center turn

[2] Sherwood Town Center Plan, City of Sherwood, June 2013.

lane provides refuge for motorists turning left into the numerous accesses along the facility, and allows for the pedestrian refuge islands at the two midblock school crossings. The Sherwood Town Center Plan recommends replacing the sidewalk on the east side with a wider shared-use path to accommodate bicyclists.

- **Pine Street Bike Facilities:** In Old Town Sherwood, Pine Street is a two-lane facility with on-street parking along both sides of the street. Widening the roadway would impact buildings, especially City Hall. Bicycles can either be accommodated through shared street signing and/or pavement marking. The traffic speed and volumes in Old Town are likely to remain within thresholds for shared lane bikeways.

  South of Old Town Sherwood, Pine Street is a narrow two-lane facility. To accommodate bike lanes, the roadway would need to be widened. It may be possible to widen the roadway within available right-of-way. It is important to note that widening the roadway would cut into the frontage of the residential corridor. The Sherwood Town Center Plan identifies that this facility is planned to be a shared roadway.

- **Meinecke Road-Washington Street Bike Facilities:** West of Old Town Sherwood, the cross-section of Meinecke Road-Washington Street has significant variation. North of the bridge, the roadway narrows to two-lanes. It may be possible to widen the roadway to include bike lanes and sidewalks while staying within existing right-of-way. At the bridge, separated bicycle facilities cannot be provided. South of the bridge, the roadway is wide enough to stripe bike lanes. However, this would require prohibiting on-street parking, thus removing a handful of parking spaces near the Woodhaven Community Church. The Sherwood Town Center Plan identifies that this facility is planned to accommodate bike lanes.

  Within Old Town Sherwood, the only opportunity to provide separate bicycle facilities would involve removal of on-street parking. The preferred option here is likely to sign/stripe the roadway as a shared facility. The traffic speed and volumes in Old Town are likely to remain within thresholds for shared lane bikeways.

- **Main Street Bike Facilities:** There is not available right-of-way to widen the cross-section to include bike lanes along Main Street. While this narrow 24-foot roadway cannot provide for bike lanes, separated sidewalks line the corridor. A likely unfavorable option would be to remove the landscape buffer between the roadway and sidewalks, and dedicate the space for bike lanes. Given this constraint, the facility may continue to be a shared roadway, where bicyclists have the option to ride along the sidewalk. The Sherwood Town Center Plan identifies that this facility is planned to be a shared roadway.

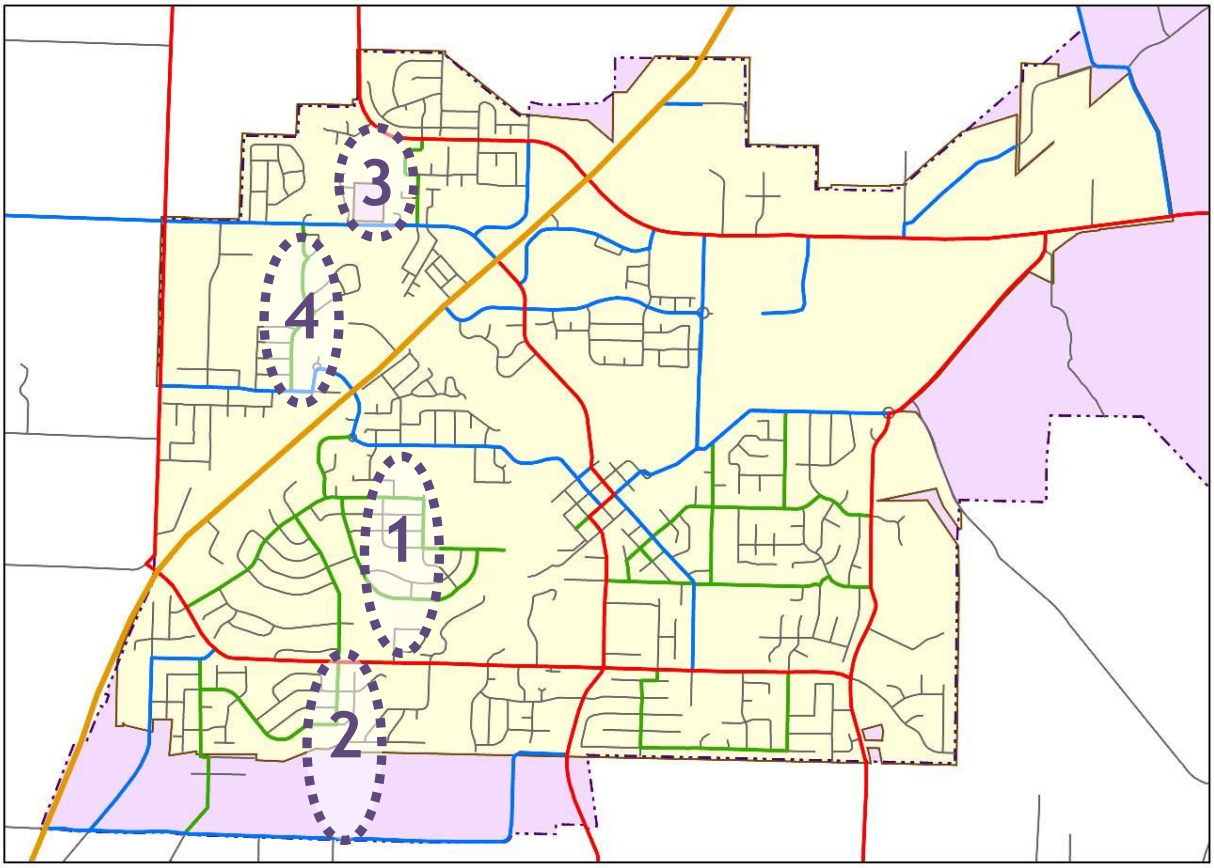
- **Oregon Street Bike Facilities:** The south side of Oregon Street is lined with residences, and the north side is bordered by a rail line and undeveloped property. The rail line and developed properties may constrain the potential for widening the roadway to include bike lanes. With the need for sidewalk along the south side of the street, extending the shared-use path that ends at

Langer Farms Parkway is a potential solution, and is identified in the Sherwood Town Center Plan as a planned improvement.

Street Network (Collector Facility) Gaps

Opportunities and constraints for each of the collector roadway gaps are discussed in the following section. The connectivity gaps are shown in Figure 7 and summarized in Table 4

Figure 7: Arterial and Collector Gaps in System Connectivity



These locations, as mapped in Figure 7, have the following opportunities and constraints:

1. **North-South gap - Meinecke Road to Sunset Boulevard (between Highway 99W and Main Street):** This area is heavily constrained by established residential neighborhoods, in addition to the rail line and the creek. Building a new collector facility through this area is infeasible. Pinehurst Drive and Dewey Drive are neighborhood routes that provide north-south connectivity in the area. However, due to the number of residences and driveways along these routes, upgrading the streets to a collector classification may not be optimal for a mobility function.
2. **North-South gap - Sunset Boulevard to Brookman Road (between Old Highway 99W and Ladd Hill Road):** This area is also constrained by established residential neighborhoods and the rail

line. Pinehurst Drive presents an ideal conceptual alignment for a collector in this area. However, it is lined with residences and driveways. In addition, to continue Pinehurst Drive south, it would require acquiring two residences at the south terminus. This combination of constraints make this gap difficult to address.

3. **North-South gap - Roy Rodgers Road to Edy Road (between Borchers Drive and Elwert Road):** While the Houston Drive and Lynnly Way facilities provide a north-south neighborhood route in the area, there is potential to create a more direct collector route just to the west. A new collector through this area may impact a small number of properties, though rail and environmental constraints do not appear to exist.

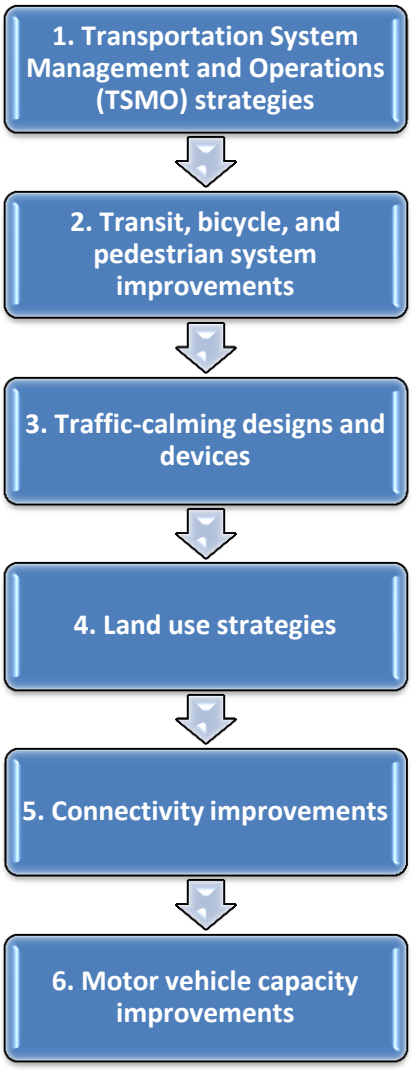
4. **North-South gap - Edy Road to Handley Street (between Highway 99W and Elwert Road):** The Bedstraw Terrace-Ladyfern Drive-Roellich Avenue neighborhood route fits the ideal collector spacing. However, this route is lined with residences and driveways the entire length, and is kinked by two three-leg intersections. Therefore, upgrading this route to a collector facility is not ideal as mobility would be significantly restricted. There are no opportunities for parallel routes due to wetland constraints to the east and existing development (e.g., established residences, Laurel Ridge Middle School) constraints to the west of the neighborhood route.

Table 4: Summary of Connectivity Gap Opportunities and Constraints

Location	Constraints			Opportunities	
	Environmental	Rail	Development	Undeveloped ROW (Future Connection)	Existing Facility
1) Meinecke Road to Sunset Boulevard between Highway 99W and Main Street	X	X	X		X
2) Sunset Boulevard to Brookman Road between Old Highway 99W and Ladd Hill Road		X	X	X	X
3) Roy Rodgers Road to Edy Road between Borchers Drive and Elwert Road			X	X	
4) Edy Road to Handley Street between Highway 99W and Elwert Road	X		X		X

Evaluation Criteria

When determining the prioritization and inclusion of projects in the Sherwood TSP Update, proposed projects will be evaluated based on the Metro Regional Transportation Functional Plan (RTFP) hierarchy of strategies. As outlined in section 3.08.022, the hierarchy of strategies is as follows:



This includes Transportation Demand Management (TDM), safety, operational, and access management improvements.

Improving connectivity and providing better amenities for pedestrians, bicyclists, and transit users presents motorists with an attractive alternative to driving.

Improving safety (or perceived safety) for bicyclists and pedestrians through traffic calming techniques may increase non-motorized travel.

These land use strategies—set forth in the Oregon Administrative Rules (OAR), section 660-012-0035 (2)—are designed to reduce trip distances and to promote walking, biking, and transit use.

Connectivity improvements to provide parallel routes, which include pedestrian and bicycle facilities. This includes connectivity improvements for roadways of all functional classifications.

These improvements will only be considered if it is determined that other strategies are not appropriate or cannot adequately address identified transportation needs.

As shown in the above hierarchy, TSMO projects will be prioritized above all other projects, and motor vehicle capacity improvement projects will be considered last.

Potential evaluation criteria were developed based on the content of Sherwood's transportation goals and policies. These potential criteria, listed in Table 5, may be implemented on a qualitative and quantitative basis to determine how potential transportation improvements align with local objectives.

Table 5: Potential Evaluation Criteria for Project Analysis

Policy Measure	Evaluation Score	
Goal 1. Provide a transportation network supportive to land use plans and alternative modes		
Circulation Improves mobility through separation of local and through traffic	+1	Increases separation of through and local trips on differentiated facilities
	0	No change
	-1	Further mixes local and through traffic on same facilities
Hierarchy Classifies and improves roadways according to designation and accompanying design standards	+1	Adds roadway improvement consistent with roadway intent/purpose
	0	No change
	-1	Doesn't follow hierarchy and accompanying design standards
Encourages non-auto modes of travel Adds bikeway, walkways, trails, transit facilities or other projects to encourage alternative modes of travel	+1	Encourages non-auto trips
	0	No change
	-1	Discourages non-auto trips
Pollution Impact Minimizes transportation related pollution to air and water	+1	Minimizes impacts to air or water quality
	0	Has average environmental impact
	-1	Has greater environmental impact than alternatives
Demand Management Invests in demand management strategies	+1	Reduces demand for single occupant trips
	0	Has no impact
	-1	Increases SOV demand on network
Goal 2. Develop a transportation system consistent with adopted local, state and regional plans		
Compatibility Compatible with other jurisdiction's plans and policies, (including adjacent cities, counties, Metro or ODOT).	+1	Compatible with other plans and contributes to their implementation
	0	Compatible with other plans, but does not necessarily contribute to their implementation
	-1	Not compatible with other plans
Agency Standards Consistent with the standards of the City, Region, and State as a whole.	+1	Consistent with all standards
	0	May require some deviations to standards, but likely to be approved
	-1	Inconsistent with standards and not expected that deviations would be approved
Modal Targets Contributes to the establishment of, and achievement toward meeting non-single occupant modal targets for all design types established in 2040 Growth Concept	+1	Contributes to meeting modal targets
	0	No impact on mode share
	-1	Negative impact on meeting modal targets

Policy Measure	Evaluation Score	
Goal 3. Establish design and development regulations to promote multi-modal transportation		
Land Development Standards Promotes standardized processes for developers to assess and accommodate transportation impacts from development	+1	Creates or abides by standardized development procedures
	0	No impact on development processes
	-1	Avoids standardizing procedures
Roadway Design Standards Promotes standardized cross-sections that ensure sufficient right of way for bikeway and pedestrian movements.	+1	Promotes standardized cross-sections that accommodate all modes
	0	Has no effect on roadway design
	-1	Does not meet design standards for applicable modes
Access Management Standards Promotes standardized property access and spacing standards for all roadway classifications	+1	Creates or applies access and spacing standards
	0	Has no impact on access and spacing
	-1	Does not meet or apply standards to access and spacing
Traffic Calming Measures Promotes standards and guidelines that encourage traffic calming and pedestrian friendly environments	+1	Promotes or builds traffic calming measures
	0	Has no effect on traffic calming initiatives
	-1	Undermines pedestrian friendly environment
Goal 4. Develop bicycle & pedestrian infrastructure to provide residents more options		
Pedestrian and Bicycle Facilities Adds bikeway and walkways that fill in system gaps, improve system connectivity, and are accessible to all users.	+1	Improves pedestrian or bicycle connectivity or accessibility
	0	No change
	-1	Reduces connectivity or accessibility
Connections to Regional Trails Supports connections to regional pedestrian and bicycle trails, particularly to recreation areas	+1	Connectivity to regional trails
	0	Has no impact on connectivity to regional trails
	-1	Negative impact on connectivity to regional trails
Access for All Eliminate physical and architectural barriers from public spaces that limit disabled and elderly access	+1	Improves accessibility to public spaces
	0	No change
	-1	Negative affect on accessibility

Policy Measure	Evaluation Score	
Goal 5. Provide reliable, convenient transit service and special options to residents and businesses		
Expands Transit Service Adds service hours, additional routes, stops, or special ride services.	+1	Improves/ increases transit service
	0	No change
	-1	Negative impact on transit services
Transit Supportive Infrastructure Improves transit supportive infrastructure and facilities	+1	Improves transit infrastructure
	0	No change
	-1	Negatively impacts transit infrastructure
Future Needs Supports preservation and development of future right of way (ROW) to support commuter rail services	+1	Preserves future ROW
	0	No change
	-1	Endangers ROW preservation
Goal 6. Provide safe and convenient connections within and between Old Town and the Six Corners Area		
Design Standards Develops or refines special standards to facilitate pedestrian and transit friendly development in Old Town and Six Corners	+1	Contributes to pedestrian & transit friendly environment in Old Town/ Six Corners Area
	0	No change
	-1	Has adverse effect on pedestrian or transit environment in Old Town/ Six Corners Area
Corridor Connectivity Improves connectivity through acquisitions and dedications to achieve better street spacing and enhance off-street trail system	+1	Improves roadway connectivity
	0	No change
	-1	Negative impact on roadway connectivity
Goal 7. Develop and maintain freight infrastructure to support local and regional economic expansion and diversification goals		
Freight Mobility Invests in infrastructure and services needed to meet current and future demand	+1	Improves freight mobility
	0	No change
	-1	Degrades freight mobility
Freight Access Regulates and improves access, including loading and transfer facilities	+1	Improves freight access
	0	No change
	-1	Degrades freight mobility

Policy Measure	Evaluation Score	
Intermodal Connectivity Partners with local, regional and state entities to support intermodal facilities for seamless freight transfer.	+1	Promotes intermodal freight connections
	0	Has no effect on intermodal freight
	-1	Degrades intermodal freight connections
Goal 8. Manage the system to ensure timely implementation and updates to comply with evolving local and regional priorities		
Funding Leverages local, regional, state, federal or private funds.	+1	Funding sources and partnerships available
	0	Feasible costs, but no identified funding
	-1	High costs and no identified funding
Project Compatibility Project or policy is listed on Capital Improvement Plan, or other approved planning document	+1	Project identified in other approved plans
	0	Project previously identified, but not approved in plan
	-1	Project doesn't exist in other planning documents

Plan and Policy Compliance

Sherwood's TSP and land use regulations were evaluated for compliance with state and regional requirements identified in the Plan and Policy Summary Report. Specifically, the evaluation focused on compliance with the State's Transportation Planning Rule (TPR) and Metro's Regional Transportation Functional Plan (RTFP). In conducting this evaluation, we reviewed the following documents:

- 2005 TSP;
- City of Sherwood Title 16, Zoning and Community Development Code ("development code" or "code"); and
- City of Sherwood Engineering Design and Standard Details Manual ("engineering manual"), Sections 120 (Street Design), 210 (Street Design), 420 (Shared-Use Paths), 430 (On-Street Facilities), and 440 (Bicycle Parking Standards).

The findings and recommendations are intended as starting points in identifying and discussing specific amendments that may be necessary to implement the recommendations of the updated TSP, as well as to meet regional and state requirements. The full set of requirements and additional findings about how the requirements are addressed through the existing plans and policies are provided in the appendix.

Summary of Recommendations

A detailed review of how the City's TSP update will comply with the RTFP and an evaluation of adopted development code and engineering standards for compliance with the RTFP and the TPR have been conducted. The following tables highlight issues identified in this detailed evaluation that will need to be discussed and addressed as part of the TSP update:

- Table 6: Issues Related to TSP Elements
- Table 7: Issues Related to the Development Code
- Table 8: Issues Related to Policy
- Table 9: Issues Related to the Engineering Manual.

Note that the numbering in these tables does not indicate importance, but is provided for reference and to aid in future discussions. RTFP and TPR citations also are provided for reference.

Table 6: Issues Related to TSP Elements

	Notes/Recommendations for Updating the TSP	TPR or RTFP Reference
TSP-1	Identify bike and pedestrian improvements needed to connect to transit stops, considering the proximity of transit stops to activity generators and the available facilities that connect them.	• RTFP Section 3.08.120A Transit System Design
TSP-2	Re-inventory and reevaluate the City's transit network, using Chapter 7 (Transit) of the current TSP as a starting point. Reprioritize the prior projects and identify new projects as necessary, with particular emphasis on connecting and integrating all travel modes.	• RTFP Section 3.08.120B.1 Transit System Design
TSP-3	Evaluate the City's collector and arterial grid system and identify system gaps and deficiencies, including regional needs consistent with the RTP.	• RTFP Section 3.08.210 Transportation Needs
TSP-4	Address the needs of youth, seniors, people with disabilities, and environmental justice populations through ADA compliant design standards and transit service improvements.	• RTFP Section 3.08.210 Transportation Needs
TSP-5	Evaluate prioritized list of RTFP strategies and their anticipated effect on the transportation system (see list in RTFP). Provide list of recommended strategies and projects, with preference given to those strategies at the top of the list. Include documentation and analysis of all recommendations and coordinate with Washington County, Metro, TriMet, and/or ODOT for projects on the City outskirts and for larger projects serving regional needs.	• RTFP Section 3.08.220 Transportation Solutions

Table 7: Issues Related to the Development Code

	Recommendations for Updating the Development Code	TPR or RTFP Reference
DC-1	Identify and update all references to the TSP in the code.	
DC-2	Ensure that code requirements in Chapter 16.96 (On-site Circulation) and Chapter 16.106 (Transportation Facilities) related to access spacing/management and design of streets, bikeways, sidewalks, and accessways/paths are consistent with the standards established in the updated TSP.	• TPR Section -0045(2)(a) Access Control • TPR Section -0045(3)(b) On-site Pedestrian and Bicycle Circulation and Connections • TPR Section -0045(7) Minimizing Roadway Width • RTFP Section 3.08.110B

	Recommendations for Updating the Development Code	TPR or RTFP Reference
		Street System Design for Pedestrian and Bicycle Access
DC-3	Define or update the following terms and ensure consistency between the TSP, code, and engineering manual: accessway, multi-use path, and shared-use path.	• TPR Section -0045(3)(b) On-site Pedestrian and Bicycle Circulation and Connections • RTFP Sections 3.08.110B & E Street System Design
DC-4	Consider whether providing additional guidance in Code Sections 16.90.030.D and 16.106.040, and/or a new section, regarding the preparation of TIAs is desired.	• TPR Section -0045(2)(b) Standards to Protect Roadways
DC-5	Given TPR requirements for coordinated review, consider whether inviting transportation facility and service providers to pre-application conferences would be helpful to the review process and thus would be language to include in the code (Section 16.70.010).	• TPR Section -0045(2)(d) Coordinated Review of Land Use Decisions
DC-6	Consider providing more guidance about the meaning/definition of "preferential" carpool and vanpool parking spaces in parking provisions in Section 16.94.010.E.3.a.	• TPR Section -0045(4)(d) Employee Parking
DC-7	Consider code changes if there are TDM program elements developed for the updated TSP that lend themselves to implementation in code.	• TPR Section -0045(5)(b) Transportation Demand Management (TDM) Programs
DC-8	Consider addressing structured parking in Chapter 16.94, including exemptions from maximum parking space standards.	• TPR Section -0045(5)(d) Parking Management
DC-9	[Administrative amendments note: Address editorial changes in the footnotes for the parking standards table in Section 16.94.020.]	• TPR Section -0045(5)(d) Parking Management
DC-10	Consider the feasibility of allowing a local street cross-section of 20-28 feet and under what conditions.	• TPR Section -0045(7) Minimizing Roadway Width
DC-11	Consider modifying the code provisions for plan and land use regulation amendments in Section 16.80.030.C (Transportation Rule Consistency) to make simpler reference to Section -0060 in order to capture all of its requirements and allowances related to reviewing plan and land use regulation amendments.	• TPR Section -0060 Plan and Land Use Regulations Amendments
DC-12	Variances – Provide a variance process in Chapter 16.84 (Variances and Adjustments) and/or Chapter 16.94 (Off-	• RTFP Section 3.08.410

	Recommendations for Updating the Development Code	TPR or RTFP Reference
	Street Parking and Loading) that allows maximum parking standards to be exceeded.	Parking Management
DC-13	Major driveways – Define major driveways in the code for mixed-use and residential developments, and add requirements in Chapter 16.90 (Site Planning) and Chapter 16.128 (Land Division Design Standards) to align major driveways with existing and/or planned streets.	
DC-14	On-street loading – Add on-street loading provisions in "appropriate locations" such as downtown. These new provisions would include specific conditions for when on-street loading would be permitted.	
DC-15	Bicycle parking – Require, rather than allow, long-term (protected and secured) parking in Section 16.94.020.C.	
DC-16	Consider whether having a hierarchy of management to capacity strategies (RTFP Section 3.08.220A) would be effective as part of traffic impact analysis and legislative decision conditions of approval.	• RTFP Sections 3.08.510 A & B Comprehensive Plan and TSP Amendments

Table 8: Issues Related to Policy

	Recommendations for Updating Policy	TPR or RTFP Reference
P-1	As noted in Table 5, the City has considered transportation solutions in 3.08.220A as part of the TSP update process.	• RTFP Sections 3.08.510 A & B Comprehensive Plan and TSP Amendments
P-2	Ensure that the policy and strategies related to parking from the Town Center Plan are integrated and consistent with updated policies in the TSP.	• RTFP Section 3.08.410I Parking Management

Table 9: Issues Related to the Engineering Standards

	Recommendations for Updating the Engineering Manual	TPR or RTFP Reference
EM-1	Ensure that code requirements in Sections 120 (Street Design), 210 (Street Design), 420 (Shared-Use Paths), 430 (On-Street Facilities), and 440 (Bicycle Parking Standards) related to access spacing/management and design of streets, bikeways, sidewalks, and accessways/paths are consistent with the standards established in the updated TSP.	• TPR Section -0045(2)(a) Access Control • TPR Section -0045(3)(b) On-site Pedestrian and Bicycle Circulation and Connections • TPR Section -0045(7)

	Recommendations for Updating the Engineering Manual	TPR or RTFP Reference
		Minimizing Roadway Width • RTFP Section 3.08.110B Street System Design
EM-2	Define or update the following terms and ensure consistency between the TSP, code, and engineering manual: accessway, multi-use path, and shared-use path.	• TPR Section -0045(3)(b) On-site Pedestrian and Bicycle Circulation and Connections
EM-3	Amend the cul-de-sac standards in Section 210.7 to be consistent with and implement the standards of the updated TSP and code.	• RTFP Section 3.08.110E Street System Design
EM-4	Ensure that the engineering manual (Section 440) is consistent with the code (Section 16.94.020.C) regarding bicycle parking requirements.	• RTFP Section 3.08.410 Parking Management