The purpose of this memorandum is to summarize the needs and deficiencies identified within the Klamath Falls Urban Area, outline possible alternatives to address those needs and deficiencies, and describe recommended improvement projects. This memorandum will serve as an initial analysis of alternatives to be considered for the Klamath Falls Urban Area TSP Update. A forthcoming memorandum will detail the preferred cost constrained alternatives.

This document is organized into three sections. The Summary of Needs and Deficiencies section outlines the deficiencies identified in Technical Memorandum #3 (Existing Conditions) and Technical Memorandum #4 (Future Conditions). The Alternatives Analysis section outlines a variety of alternatives evaluated to address future needs of the Klamath Falls Urban Area transportation system. Finally, the Key Development Areas section summarizes the proposed projects of all types within each of the key growth areas identified by the City. It is critical to minimize transportation barriers to development in the areas that are targeted for growth to minimize sprawl into other areas.

**SUMMARY OF NEEDS AND DEFICIENCIES**

This section presents needs and deficiencies identified in Technical Memorandum #3 (Existing Conditions) and Technical Memorandum #4 (Future Conditions). These summaries are organized in the following subsections:
Safety Focused Intersection and Roadway Segments – Summaries safety deficiencies identified at study intersections and roadway segments under existing conditions.

Forecasted Traffic Operations Issues – Summaries intersection operational deficiencies identified at study intersections under 2035 future conditions.

Non-Auto Modes of Travel – Summaries deficiencies related to the pedestrian, bicycle, and transit networks identified under existing conditions.

Safety Focus Intersections and Roadway Segments

Based on crash rates calculated as part of the existing conditions analysis, the following study intersections were observed to exceed their respective critical crash rate:

- OR 39 & Eberlein Avenue
- Washburn Way & Shasta Way
- Altamont Drive & Laverne Avenue
- OR 140 & Summers Lane
- OR 140 & Homedale Drive
- OR 140 & OR 39 (south of the Big Y)

Similarly, the following roadway segments were observed to exceed critical crash rates:

- OR 140 from Western UGB to OR 66
- S 6th Street from Summers Lane to OR 39
- S 6th Street from OR 39 to Fargo Street
- S 6th Street from Homedale Road to Madison Street
- Shasta Way from S 6th Street to Washburn Way
- Shasta Way from Washburn Way to OR 39
- Klamath Avenue from Main Street to 3rd Street

Figure 1 shows the location of the results of the intersection and roadway segment crash analysis.
Legend

- Safety Focus Segments
- Urban Growth Boundary
- City Limits

Legend

- Study Intersection Number
- Above Critical Crash Rate

Safety Focus Roadway Segments

Figure 1
**Forecasted Traffic Operations Issues**

Based on the travel demand forecasts and operational analysis conducted for the study intersections, the following locations are expected to operate in excess of the applicable performance standards under 2035 No-Build conditions:

- OR 39 / Biehn Street / Campus Drive
- Biehn Street / Oregon Avenue
- Esplanade Drive / OR 39
- OR 39 / Main Street
- Washburn Way / OR 39
- OR 39 / Eberlein Avenue
  (also a safety focus intersection)
- OR 39 / Shasta Way
- Homedale Road / Shasta Way
- Fargo Street / OR 39
- Homedale Road / OR 39
- OR 140 / OR 66
- US 97 SB Ramps / OR 140
- Greensprings Drive / OR 140
- Midland Highway / OR 140
- Summers Lane / Clinton Avenue
- OR 39 / OR 140 (Big Y)
- Washburn Way / OR 140 EB Ramps
- OR 140 / OR 39
  (also a safety focus intersection)

The No-Build year 2035 forecasted turning movements and operations for each of the above study intersections is provided in Technical Memorandum #4.

**Non-Auto Modes of Travel**

The following sections outline needs and issues identified for the pedestrian, bicycle, and transit networks.

**Pedestrian and Bicycle Networks**

Based on input received from through the public involvement process, many people in the community would like to see the pedestrian and bicycle networks in Klamath Falls expanded.

In the case of the bicycle network, public comments were focused on constructing new off-road trails for cyclists to use. Also, comments were focused on improving the on-street bicycle network, particularly along main travel corridors.

Comments related to improving the pedestrian network were mostly focused on identifying improvements in the vicinity of schools. Additional comments focused on providing pedestrian facilities on key collectors and arterials or providing off-street alternatives to these types of facilities.
Transit Service

Basin Transit Services (BTS) is the public transit agency for the Greater Klamath Falls Urban Area. The Transit District extends from Terminal City in the north to Kingsley Field (i.e., Klamath Falls Airport) in the south and from the Klamath Falls city limits to an area just beyond OR 39 in the east. Within this area, BTS provides three forms of service: 1) Fixed Route Bus Service; 2) Dial-A-Ride Services and 3) Historical Trolley Tours. Current service hours for fixed routes within Klamath Falls are shown below in Table 1.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Basin Transit Service Fixed Routes Time of Day Service</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Routes</strong></td>
<td><strong>Route Begins</strong></td>
</tr>
<tr>
<td>Route 1 North</td>
<td>Keller Rd</td>
</tr>
<tr>
<td>Route 1 South</td>
<td>OIT</td>
</tr>
<tr>
<td>Route 2 North</td>
<td>Gatewood</td>
</tr>
<tr>
<td>Route 2 South</td>
<td>OIT</td>
</tr>
<tr>
<td>Route 3</td>
<td>Stewart Lennox</td>
</tr>
<tr>
<td>Route 4</td>
<td>Fairgrounds</td>
</tr>
<tr>
<td>Route 5</td>
<td>Pelican City</td>
</tr>
<tr>
<td>Route 6</td>
<td>Fairgrounds</td>
</tr>
</tbody>
</table>

Notes: 1Source: [http://www.basintransit.com/routesrates.shtml](http://www.basintransit.com/routesrates.shtml)
2This is the time the first bus departs from the first stop on the route.
3First departs from Mia’s & Pia’s.
4Last bus departs from Stewart Lennox.
5Last bus departs from Downtown.

Given the hours of operation of the transit system, it mainly serves employees working traditional office hours, students with daytime classes, and non-working residents who are able to run errands or go shopping during the day. This may result in many potential users, many of whom may need to rely on transit for transportation, not being served by the existing system.
ALTERNATIVES ANALYSIS

This section presents alternative treatments, strategies and approaches that can be used to improve existing and forecasted transportation system deficiencies. The treatments, strategies and approaches are organized in the following subsections:

- **Roadway Safety** – Presents measures to reduce crashes and address safety concerns at intersections and along roadway segments based on their crash history.
- **Local Street Connectivity** – Discusses strategies for improving local street connectivity to minimize the need for out-of-direction travel for all travel modes.
- **Corridor Improvements** – Discusses specific corridors within the Urban Area that could require a more detailed evaluation in the future.
- **Access Management** – Presents treatments and policies for managing the frequency and density of driveways along roadways.
- **Transportation System Management (TSM)** – Discusses measures that aimed at optimizing traffic operations of the existing roadway system.
- **Transportation Demand Management (TDM)** – Presents strategies to influence and manage the demand for travel on a system for example exploring measures that encourage non-essential trips (e.g., trips to the grocery store) to occur outside of peak commuting hours.
- **Non-Automobile Modes of Travel** – Discusses facilities, treatments, and strategies to accommodate and facilitate travel by pedestrians, bicyclists, and transit.
- **Capacity Enhancing Roadway Treatments** – Presents treatments and approaches for adding capacity at existing intersections or along roadways.

These sub-sections are intended to outline the options or alternatives for addressing the deficiencies and needs noted in the previous section.

For ease of referencing, proposed projects, policies, programs, and travel demand management strategies have been numbered. The referencing codes are described below:

- **PRJ-XX**: Proposed Project
- **POL-XX**: Proposed Policy
- **PRO-XX**: Proposed Program (area of further evaluation)
- **TDM-XX**: Proposed Travel Demand Management Strategy

**Roadway Safety**

An analysis of intersection crash rates that identified study intersections that exceed the critical crash rate for their specific type of facility was included in Technical Memorandum #3: Existing Conditions.
An analysis of segment crash rates that identified study segments that exceed the critical crash rate for their specific type of facility is included in Appendix A. Tables 2 and 3, respectively, provide potential countermeasures for consideration to incorporate into maintenance, capacity, or urban upgrade projects when they occur.

### Table 2  Potential Countermeasures at Study Intersections Exceeding Critical Crash Rate

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Intersection</th>
<th>Potential Activities/Countermeasures to Decrease Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRJ-1</td>
<td>30. OR 39 &amp; Eberlein Avenue</td>
<td>Conduct sight distance and 85\textsuperscript{th} percentile speed studies to confirm sufficient sight distance is available. Consult NCHRP Report 613 Guidelines for Selection of Speed Reduction Treatments at High-Speed Intersections to reduce 85\textsuperscript{th} percentile speeds to desired speeds. Realign intersection to correct minor street offset and create a 90-degree angle between OR 39 and Eberlein Avenue. Investigate the feasibility of installing a roundabout at the intersection once intersection is realigned.</td>
</tr>
<tr>
<td>PRJ-2</td>
<td>32. Washburn Way &amp; Shasta Way</td>
<td>Conduct field visit to confirm traffic signal head visibility throughout the day on the southbound approach. Consider installing near-side traffic signals for approaching vehicles. Consider installing red-light running cameras.</td>
</tr>
<tr>
<td>PRJ-3</td>
<td>63. Altamont Drive &amp; Laverne Avenue</td>
<td>Conduct sight distance and 85\textsuperscript{th} percentile speed studies to confirm sufficient sight distance is available. Consult NCHRP Report 613 Guidelines for Selection of Speed Reduction Treatments at High-Speed Intersections to reduce 85\textsuperscript{th} percentile speeds to desired speeds. Conduct roundabout feasibility study for the intersection and depending on study results, install a roundabout at the intersection.</td>
</tr>
<tr>
<td>PRJ-4</td>
<td>72. OR 140 &amp; Summers Lane</td>
<td>Conduct sight distance and 85\textsuperscript{th} percentile speed studies to confirm sufficient sight distance is available. Consult NCHRP Report 613 Guidelines for Selection of Speed Reduction Treatments at High-Speed Intersections to reduce 85\textsuperscript{th} percentile speeds to desired speeds. Conduct roundabout feasibility study for the intersection and depending on study results, install a roundabout at the intersection.</td>
</tr>
<tr>
<td>Project Number</td>
<td>Intersection</td>
<td>Potential Activities/Countermeasures to Decrease Crashes</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>PRJ-5</td>
<td>74. OR 140 &amp; Homedale Drive</td>
<td>Conduct sight distance and 85th percentile speed studies to confirm sufficient sight distance is available. Consult NCHRP Report 613 Guidelines for Selection of Speed Reduction Treatments at High-Speed Intersections to reduce 85th percentile speeds to desired speeds. Conduct roundabout feasibility study for the intersection and depending on study results, install a roundabout at the intersection.</td>
</tr>
<tr>
<td>PRJ-6</td>
<td>75. OR 140 &amp; OR 39 (south of the Big Y)</td>
<td>Conduct sight distance and 85th percentile speed studies to confirm sufficient sight distance is available. Consult NCHRP Report 613 Guidelines for Selection of Speed Reduction Treatments at High-Speed Intersections to reduce 85th percentile speeds to desired speeds. Conduct roundabout feasibility study for the intersection and depending on study results, install a roundabout at the intersection.</td>
</tr>
</tbody>
</table>

### Table 3  Considerations for Roadway Segments Exceeding Critical Crash Rate

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Roadway and Segment Extents</th>
<th>Crash Trends</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRJ-7</td>
<td>OR 140 from Western UGB to OR 66</td>
<td>Primarily fixed object collisions with approximately half of all crashes occurring under icy or snowy conditions.</td>
<td>Consider installing shoulder rumble strips to reduce run-off-the-road fixed object crashes under dry conditions. Consider increased road alignment delineation. Consider study to ensure sufficient roadside clearance for motorists’ to recover if/when they leave the roadway.</td>
</tr>
<tr>
<td>PRJ-8</td>
<td>S 6th Street from Summers Lane to OR 39</td>
<td>All reported crashes were rear-end crashes. Majority resulted in at least one injury.</td>
<td>Consider decreasing (through cross easements and consolidation) the number of access driveways and increasing the spacing between access driveways along S 6th Street.</td>
</tr>
<tr>
<td>PRJ-9</td>
<td>S 6th Street from OR 39 to Fargo Street</td>
<td>Majority of crashes were rear-end crashes. Second most common crash type was turning crashes. Majority occurred under dry, daylight conditions.</td>
<td>Consider decreasing (through cross easements and consolidation) the number of access driveways and increasing the spacing between access driveways along S 6th Street.</td>
</tr>
<tr>
<td>PRJ-10</td>
<td>S 6th Street from Homedale Road to Madison Street</td>
<td>Majority of crashes turning movement and/or rear end crashes. Majority occurred under dry and daylight conditions.</td>
<td>Consider decreasing (through cross easements and consolidation) the number of access driveways and increasing the spacing between access driveways along S 6th Street. Consider installing a raised median on S 6th Street.</td>
</tr>
<tr>
<td>PRJ-11</td>
<td>Shasta Way from S 6th Street to Washburn Way</td>
<td>Majority of crashes turning movement and/or rear end crashes. Majority occurred under daylight and all occurred under dry conditions.</td>
<td>Consider decreasing (through cross easements and consolidation) the number of access driveways and increasing the spacing between access driveways along S 6th Street. Consider installing a raised median on Shasta Way.</td>
</tr>
</tbody>
</table>
Majority of crashes were rear-end crashes. Second most common crash type was turning crashes. Majority occurred under dry, daylight conditions.

Suggest a focused crash and safety study/review to determine potential countermeasures.

No evident crash trends; three crashes in five years.

No evident issues; City may wish to monitor on annual basis.

Local Street Connectivity

The Klamath Falls transportation system currently relies heavily on portions of the state highway system for local trip travel. In particular, east/west travel through the Urban Area is largely required to use OR 140, OR 39, or South 6th Street (which shares and alignment with OR 39). Because of this, local trips add congestion to state highways and must navigate amongst regional trip traffic. The reliance on the state highway system for local travel is not as prevalent for north/south trips as local alternatives are more available. However, travelers traveling north/south west of Lake Ewauna are largely reliant on US 97.

Local Improvement Options

Many local improvements have been identified by Klamath Falls area planning documents that would serve to alleviate local trip reliance on the state highway system. The local improvements identified below include those recommended by the Technical Advisory Committee and Citizens Advisory Committee for inclusion in the updated TSP. These have been modeled in the travel demand model used to determine the future system capacity needs and are shown later in this memorandum in Figure 6 in the Facilities Plan section. The local improvements recommended for inclusion in the updated TSP include:

- **Crescent Avenue Extension (PRJ-14)** – This improvement would extend the existing Crescent Avenue alignment north to Biehn Street. By providing this connection, an alternative route to OR 39 and US 97 would be created for trips to and from the north and downtown Klamath Falls.

- **East Main Street Extension (PRJ-15)** – The East Main Street Extension would extend East Main Street from the intersection of East Main Street / South 6th Street to Washburn Way / Crosby Avenue intersection. This connection would provide an alternative route for travel to/from downtown Klamath Falls and the heavily commercial Washburn Way corridor. South 6th Street is not a state highway in the vicinity of this project, but shares an alignment with OR 39 to the east, making it a route for to/from the east and south.
- **Hilyard Avenue Extension (PRJ-16)** – The extension of Hilyard Avenue would connect east portion of Hilyard Avenue, which connects with OR 39, to Homedale Road. This connection would provide a more complete transportation grid in the vicinity of the project, likely alleviating congestion along OR 39, particularly at the OR 39 / Homedale Road intersection.

- **Construct new collector from Hilyard Avenue to Harlan Drive (PRJ-17)** – This connection would increase local connectivity in vicinity of the project and provide local alternatives to OR 39. This roadway is currently planned to intersect with Hilyard Avenue between Barnes Way and OR 39 and with Harlan Drive near Monrovia Way.

- **Construct new minor collector from Dan O’Brien Way to Dahlia Street (PRJ-18)** – This connection would serve as a frontage road along US 97 and provide parallel capacity to the highway.

- **Extend Daggett Avenue to Dan O’Brien Way (PRJ-19)** – This extension would provide improved connectivity in the vicinity of OIT, possibly reducing trips diverting to US 97.

- **Extend Minor Collector from Dahila Street to Dan O’Brien Way (near Industrial Park Drive) (PRJ-20)** – This extension would provide improved connectivity in the vicinity of OIT, possibly reducing trips diverting to US 97.

### Policies

Besides roadway improvement projects, policies can be implemented that would move the Klamath Falls Urban area towards being less reliant on the state highway system. Examples of such policies are outlined below:

- Development review process should include an evaluation of reliance on state highway system. This would not be a condition of approval, but rather would inform decision makers of potential travel patterns and encourage alternative strategies. (POL-1)

- Prioritize improvements that add parallel capacity to state highway facilities. (POL-2)

- Develop alternative mobility standards for key intersections on the state highway system in the Klamath Falls Urban Area. This would limit future expansion of state highways while accepting increased levels of congestion that would deter local travel use of highways. (POL-3)
Corridor Improvements

This section identifies corridors that may need additional evaluation based on existing or forecasted demand. Further evaluation could include corridor studies, access management evaluations, or corridor refinement plans.

Crater Lake Parkway (PRO-1)

Crater Lake Parkway serves as the northern alignment of OR 39 from US 97 to South 6th Street. This facility provides a northern through route for vehicles traveling to/from US 97 in the north and OR 39 or OR 140 in the south or east, respectively.

Crater Lake Parkway is generally a facility with high mobility and limited access from US 97 in the north to South 6th Street in the south. However, in the vicinity of Main Street, more frequent access locations exist because of the local street layout.

Given that this facility serves as a significant connection for travel to and from US 97 to OR 39 and OR 140, standards that maintain a high level of mobility along this corridor should be considered. A corridor improvement plan would help develop strategies to achieve the long term goals of this corridor as growth occurs within Klamath Falls and with through trips traveling through the Urban Area. Specific locations that should be addressed by such a plan include, at a minimum:

- Campus Drive intersection
  - Serves as a major connection to the OIT campus and local medical facilities

- Esplanade Avenue intersection
  - Serves as a major connection to downtown Klamath Falls residential areas, and as a canal crossing

- Main Street intersection
  - Serves as a major connection to downtown Klamath Falls, a local school, residential areas, and as a canal crossing

- Washburn Way intersection
  - Serves as a access point to the heavily commercial Washburn Way corridor and as a canal crossing

- Shasta Way intersection
Shasta Way serves as a connection between residential areas and the Washburn Way corridor and is a developing area where congestion is likely to increase.

- South 6th Street intersection
  - Constrained environment due to canal alignment

Shasta Way (PRO-2)

Shasta Way is a developing corridor that serves east-west travel from South 6th Street to residential areas in the east. This roadway serves as an alternative route to the South 6th Street corridor.

As Klamath Falls continues to develop, congestion along Shasta Way will likely continue to increase. As such, future mobility standards and corridor goals should be considered for Shasta Way. A corridor evaluation would help establish the appropriate mix of access and mobility to be provided along Shasta Way as well as develop standards to maintain that mix as development continues to occur. Any such plan should consider the following locations, at a minimum:

- South 6th Street intersection
  - Skewed alignment could create operational or safety concerns
- Washburn Way intersection
  - Serves as an access point to the heavily commercial Washburn Way corridor
- Crater Lake Parkway intersection
  - Crater Lake Parkway is a heavily traveled arterial. As such, this intersection could become a bottleneck on the Shasta Way corridor.
- Homedale Road intersection
  - Homedale serves as a local north-south connection
- Patterson Street Intersection
  - Serves as a local north/south connection

Access Management

Access management is the systematic implementation and control of the locations, spacing, design, and operations of driveways, median openings, interchanges, roundabouts, and street connections to a roadway, according to the Access Management Manual (AMM) (1). It involves roadway design
applications, such as median treatments and auxiliary lanes, and the appropriate spacing and design of signalized intersections. Access management strives for a balanced transportation network with appropriate proportions and distributions of freeways, arterials, collectors, and local streets that are integrated with local land use activities.

Access management techniques and strategies help to preserve the transportation system investment, and guard against deteriorations in safety and increased congestion. Land use activities and property parcels are served with appropriate access by access management solutions, while safe and efficient movement of traffic is preserved. An effective access management program would include the following elements, according the NCHRP Report 548, “A Guidebook for Including Access Management in Transportation Planning” (2):

- Develop and implement an access classification system to apply access standards based on the roadway’s functional class;
- Employ the access classification system to plan, design, and maintain the roadway system;
- Define the level of access permitted for each category of the classification;
- Establish spacing criteria for signalized and unsignalized accesses;
- Apply engineering standards of geometric design and traffic engineering to access points or strategies;
- Establish policies, regulations, guidelines, and permitting procedures to implement the access management program; and
- Ensure coordination and support among all agencies that can impact the access and operations of facilities.

The steps to effective access management, according to the AMM (1), are:

1. Adopt specific policies, directives, and guidelines;
2. Set access management regulations to dictate the detailed standards to be imposed;
3. Acquire access rights to protect the roadway system;
4. Implement land development regulations at the local level, such as, zoning and subdivision regulations;
5. Undertake development review and impact assessment to determine the consequences of a permitted access or design; and
6. Assure geometric design standards and criteria are compatible with access management objectives.
Well deployed access management strategies can greatly improve travel conditions for pedestrian and bicycles. Eliminating the number of access points on roadways reduces the number of potential interruptions and conflict points between pedestrians, bicyclists, transit vehicles and cars. Access management is typically adopted as a policy in development guidelines. It can be extremely difficult to implement an access management program once properties have been developed along a corridor. Cooperation among and involvement of relevant government agencies, business owners, land developers and the public is necessary to establish an access management plan that benefits all roadway users and businesses.

Access Management Measures

From an operational perspective, access management measures limit new or consolidate the existing number of redundant access points along roadways. This enhances roadway capacity and benefits circulation. Enforcement of the access spacing standards should be complemented with the provision of alternative access points. Purchasing right-of-way and closing driveways without a parallel road system and/or other local access could seriously affect the viability of the impacted properties. Thus, if an access management measure is applied, alternative access should be developed to avoid “land-locking” a given property.

As part of every land use action, the City of Klamath Falls and Klamath County may want to consider evaluating the potential need for conditioning a given development proposal with the following items in order to maintain and/or improve traffic operations and safety along the arterial and collector roadways.

- Crossover easements on compatible parcels (considering topography, access, and land use) may be created to facilitate future access between adjoining parcels;
- Conditional access permits may be issued to developments having proposed access points that do not meet the designated access spacing policy and/or have the ability to align with opposing driveways.
- Right-of-way dedications may be provided to facilitate the future planned roadway system in the vicinity of proposed developments.
- Half-street improvements (sidewalks, curb and gutter, bike lanes/pas, and/or travel lanes) may be provided along site frontages that do not have full build-out improvements in place at the time of development.

Exhibit 1 on the following page illustrates the application of cross-over easements and conditional access permits over time to achieve the desired access management objectives. The individual steps are described in Table 4, following Exhibit 1. As illustrated in the figure and supporting table, using
these guidelines, all driveways along city, county, and state roadways will eventually move in the overall direction of the access spacing standards as development and redevelopment occur along a given street.
Exhibit 1 Example of Cross-over Easement/Indenture/Consolidation/Conditional Access Process

EXISTING CONDITIONS

STEP 1 REDEVELOPMENT OF LOT B

STEP 2

STEP 3

STEP 4

STEP 5

Complete
Table 4  Example of Crossover Easement/Indenture/Consolidation - Conditional Access Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EXISTING – Currently Lots A, B, C, and D have site-access driveways that neither meet the access spacing criteria of 300 feet nor align with driveways or access points on the opposite side of the roadway. Under these conditions motorists are into situations of potential conflict (conflicting left turns) with opposing traffic. Additionally, the number of side-street (or site-access driveway) intersections decreases the operation and safety of the roadway.</td>
</tr>
<tr>
<td>2</td>
<td>REDEVELOPMENT OF LOT B – At the time that Lot B redevelops, the City or County would review the proposed site plan and make recommendations to ensure that the site could promote future crossover or consolidated access. Next, the City/County/ODOT would issue conditional permits for the development to provide crossover easements with Lots A and C, and City/County/ODOT would grant a conditional access permit to the lot. After evaluating the land use action, the City/County/ODOT would determine that LOT B does not have either alternative access, nor can an access point be aligned with an opposing access point, nor can the available lot frontage provide an access point that meets the access spacing criteria set forth for segment of roadway.</td>
</tr>
<tr>
<td>3</td>
<td>REDEVELOPMENT OF LOT A – At the time Lot A redevelops, the City/County/ODOT would undertake the same review process as with the redevelopment of LOT B (see Step 2); however, under this scenario the City/County/ODOT would use the previously obtained cross-over easement at Lot B consolidate the access points of Lots A and B. City/County/ODOT would then relocate the conditional access of Lot B to align with the opposing access point and provide an efficient access to both Lots A and B. The consolidation of site-access driveways for Lots A and B will not only reduce the number of driveways accessing the roadway, but will also eliminate the conflicting left-turn movements the roadway by the alignment with the opposing access point.</td>
</tr>
<tr>
<td>4</td>
<td>REDEVELOPMENT OF LOT D – The redevelopment of Lot D will be handled in same manner as the redevelopment of Lot B (see Step 2).</td>
</tr>
<tr>
<td>5</td>
<td>REDEVELOPMENT OF LOT C – The redevelopment of Lot C will be reviewed once again to ensure that the site will accommodate crossover and/or consolidated access. Using the crossover agreements with Lots B and D, Lot C would share a consolidated access point with Lot D and will also have alternative frontage access the shared site-access driveway of Lots A and B. By using the crossover agreement and conditional access permit process, the City/County/ODOT be able to eliminate another access point and provide the alignment with the opposing access points.</td>
</tr>
<tr>
<td>6</td>
<td>COMPLETE – After Lots A, B, C, and D redevelop over time, the number of access points will be reduced and aligned, and the remaining access points will meet the access spacing standard.</td>
</tr>
</tbody>
</table>

Access Management Recommendations

Currently, the City of Klamath Falls and Klamath County have conflicting and inconsistent access management standards (see Roadway Standards White Paper). The Roadway Standards White Paper recommends that a uniform set of standards be developed and applied within the Klamath Falls urban area and makes recommendations on what those standards should be. The following makes recommendations on future access management policies.

Access management plans should be specifically designed for the Washburn Way, South 6th Street and Shasta Way corridors. This will allow the character, context, and vision for the roadway to be considered when standards are developed. As such, the following policy is recommended for future access management plan development.
- Access management refinement plans shall be developed for roadways classified as major collectors or higher in conjunction with the next scheduled overlay project.
- The purpose of an access management plan shall be to evaluate the existing access spacing that exists on the corridor and consolidate, as necessary, to achieve the desired mobility and access levels.

Specific corridors that should be prioritized for access management refinement plans are discussed further below. The observed access spacing that exists today for each of these corridors is shown in Table 5.

<table>
<thead>
<tr>
<th>Table 5</th>
<th>Observed Average Access Point Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corridor</td>
<td>Segment</td>
</tr>
<tr>
<td>South 6th Street</td>
<td>Shasta Way to Washburn Way</td>
</tr>
<tr>
<td>South 6th Street</td>
<td>Washburn Way to Altamont Drive</td>
</tr>
<tr>
<td>South 6th Street</td>
<td>Altamont Drive to Crater Lake Parkway</td>
</tr>
<tr>
<td>Washburn Way</td>
<td>Shasta Way to South 6th Street</td>
</tr>
<tr>
<td>Washburn Way</td>
<td>South 6th Street to Hilyard Avenue</td>
</tr>
<tr>
<td>Washburn Way</td>
<td>Hilyard Avenue to Laverne Avenue</td>
</tr>
<tr>
<td>Shasta Way</td>
<td>South 6th Street to Washburn Way</td>
</tr>
<tr>
<td>Shasta Way</td>
<td>Washburn Way to Avalon Street</td>
</tr>
<tr>
<td>Shasta Way</td>
<td>Avalon Street to Crater Lake Parkway</td>
</tr>
</tbody>
</table>

Washburn Way (PRO-3)

Washburn way south of Shasta Way serves as a major commercial area within Klamath Falls. Many existing developments along this corridor have undefined access to and from Washburn Way. This arrangement creates operational and safety concerns that will likely increase as future developments occur in the area.

The intersection of Washburn Way / Shasta Way has been identified as having a crash rate that exceeds the critical crash rate.
South 6th Street (PRO-4)

South 6th Street serves as a commercial center for Klamath Falls residents as well as a route for regional trips passing through the Urban Area. As such, access and mobility along this corridor should be carefully considered and balanced.

The segments along South 6th Street from Summers Lane to Fargo Street and from Homedale Road to Madison Street have been identified as having a crash rate that exceeds the critical crash rate.

Shasta Way (PRO-5)

Shasta Way is a corridor that runs parallel to South 6th Street and serves as an alternative route. As development occurs within the Urban Area, congestion along Shasta Way will likely rise. As such, specific standards should be outlined that maintain a high level of mobility while allowing for additional develop in the area to occur.

The intersection of Washburn Way / Shasta Way and the segment along Shasta Way from South 6th Street to Crater Lake Parkway have been identified as having a crash rate that exceeds the critical crash rate.

**Transportation System Management (TSM)**

TSM strategies include a wide variety of measures aimed at improving operations of existing transportation facilities. TSM measures can be focused on improving transportation “supply” through enhancing capacity and efficiency, typically with advanced technologies to improve traffic operations. Or they may be focused on reducing transportation demand, through promoting travel options and ongoing programs intended to reduce demand for drive alone trips, especially during peak travel periods.

The sections below present possible TSM alternatives that could be applied in Klamath Falls to improve the capacity and efficiency of the transportation system.

**Signal Retiming/Optimization (PRO-6)**

Signal retiming and optimization refers to updating timing plans to better match prevailing traffic conditions and coordinating signals. Timing optimization can be applied to existing systems or may include upgrading signal technology, including signal communication infrastructure or signal controllers or cabinets. Signal retiming can reduce travel times and be especially beneficial to improving travel time reliability. Signal retiming could also be implemented to improve or facilitate
pedestrian movements through intersections by increasing minimum green times to accommodate pedestrian crossing movements during each cycle in high pedestrian or desired pedestrian traffic areas, eliminating the need to push pedestrian crossing buttons. Bicycle movements could be facilitated by installing bicycle detection along existing or proposed bicycle routes. Signal upgrades often come at a higher cost and usually require further coordination between jurisdictions.

Klamath Falls currently has one coordinated signal systems in operation. ODOT maintains a coordinated system along a portion of South 6th Street, but it has not been updated for 5 to 10 years. This system should be updated and other new systems explored. Below is a summary of the current coordinated signal system within Klamath Falls and those that should be explored

- Current Coordinated Signal Systems
  - South 6th Street – Avalon Street to Patterson Street
    - Currently in works to coordinate from Shasta Way to Patterson Street
  - Washburn Way – Crosby Street to Laverne Avenue
    - City of Klamath Falls and ODOT currently addressing

Advanced Signal Systems (PRO-7)

Advanced signal systems incorporate various strategies in signal operations to improve the efficiency of a transportation network. Strategies may include coordinated signal operations across jurisdictions as well as centralized control of traffic signals. Advanced signal systems can reduce delay, travel time and the number of stops for vehicles, while potentially increasing average vehicle speed. In addition, these systems may help reduce vehicle emissions and have a high impact on improving travel time reliability.

Advanced signal systems may be applied to several innovative control strategies. The costs of these systems vary as a function of the types of controllers, programming needs and detection needs. Implementing any of these systems would require coordination between the City of Klamath Falls, Klamath County, and ODOT. Alternative signal systems include:

- **Adaptive or active signal control** systems improve the efficiency of signal operations by actively changing the allotment of green time for vehicle movements and reducing the average delay for vehicles. Adaptive or active signal control systems require several vehicle
detectors at intersections in order to detect traffic flows adequately, in addition to hardware and software upgrades.

**Potential Klamath Falls Applications:** Crater Lake Parkway, South 6th Street, Washburn Way, Shasta Way

- **Traffic responsive control** uses data collected from traffic detectors to change signal timing plans for intersections. The data collected from the detectors is used by the system to automatically select a timing plan best suited to current traffic conditions. This system is able to determine times when peak-hour timing plans begin or end; potentially reducing vehicle delays.

**Potential Klamath Falls Applications:** Crater Lake Parkway, South 6th Street, Washburn Way, Shasta Way

- **Transit signal priority** systems use sensors to detect approaching transit vehicles and alter signal timings to improve transit performance. This improves travel times for transit, reliability of transit travel time, and overall attractiveness of transit.

**Potential Klamath Falls Applications:** Downtown core, South 6th Street, Washburn Way

- **Truck signal priority** systems use sensors to detect approaching heavy vehicles and alter signal timings to improve truck freight travel. While truck signal priority may improve travel times for trucks, its primary purpose is to improve the overall performance of intersection operations by clearing any trucks that would otherwise be stopped at the intersection and subsequently have to spend a longer time getting back up to speed. Implementing truck signal priority requires additional advanced detector loops, usually placed in pairs back from the approach to the intersection.

**Potential Klamath Falls Applications:** US 97, Crater Lake Parkway, Portions of South 6th Street

ODOT is currently in the process of developing a project that would evaluate the effectiveness of an adaptive signal system within Klamath Falls. The extents of this system are uncertain, but ideally the system would include the major corridors within Klamath Falls including Crater Lake Parkway, South 6th Street, and Washburn Way. Recently, ODOT installed a similar system in the downtown core in Redmond.
Transportation Demand Management (TDM)

TDM measures include any method intended to shift travel demand from single occupant vehicles to non-auto modes or carpooling, travel at less congested times of the day, or to locations with more available vehicle capacity. Some common examples of TDM strategies include programs such as carpool matching assistance or flexible work shifts; parking management strategies; direct financial incentives such as transit subsidies; or facility or service improvements, such as bicycle lockers or increased bus service.

Some of the most effective TDM strategies are best implemented by employers and are aimed at encouraging non-single occupancy vehicle (SOV) commuting. Strategies include preferential carpool parking, subsidized transit passes, and flexible work schedules. Cities and other public agencies can play a critical role in support of TDM through provision of facilities and services, as well as development policies that encourage TDM.

While many TDM strategies are most effectively implemented by employers, there are numerous strategies that cities can implement or support with other agencies. These include access management and connectivity strategies that are more often associated with roadway elements of planning. Other strategies include provision of facilities (sidewalks, bicycle lanes, transit amenities) and management of existing resources (parking). Another critical role that cities play is in the policies related to development activities. Through support, incentive, and mandate, cities can ensure that new development supports a balanced transportation system. Several broad TDM strategies are summarized in Table 6. The table also identifies typical implementation roles.
### Table 6  TDM Strategies and Typical Implementing Roles

<table>
<thead>
<tr>
<th>TDM Strategy</th>
<th>City/County</th>
<th>Transportation Management Association</th>
<th>Developers</th>
<th>Transit Provider</th>
<th>Employers</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDM-1</td>
<td>Public parking management</td>
<td>P</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>TDM-2</td>
<td>Flexible parking requirements</td>
<td>P</td>
<td>S</td>
<td></td>
<td>S</td>
<td>P</td>
</tr>
<tr>
<td>TDM-3</td>
<td>Access management</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td>P</td>
</tr>
<tr>
<td>TDM-4</td>
<td>Connectivity standards</td>
<td>P</td>
<td>S</td>
<td></td>
<td></td>
<td>P</td>
</tr>
<tr>
<td>TDM-5</td>
<td>Pedestrian facilities</td>
<td>P</td>
<td>S</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>TDM-6</td>
<td>Bicycle facilities</td>
<td>P</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDM-7</td>
<td>Transit stop amenities</td>
<td>S</td>
<td>S</td>
<td>P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDM-8</td>
<td>Parking management</td>
<td>P</td>
<td>S</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>TDM-9</td>
<td>Limited parking requirements</td>
<td>P</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDM-10</td>
<td>Carpool match services</td>
<td>S</td>
<td>P</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>TDM-11</td>
<td>Parking cash out</td>
<td></td>
<td>S</td>
<td>S</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>TDM-12</td>
<td>Subsidized transit passes</td>
<td></td>
<td>S</td>
<td></td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>TDM-13</td>
<td>Carsharing program support</td>
<td>P</td>
<td>S</td>
<td></td>
<td>S</td>
<td>S</td>
</tr>
</tbody>
</table>

Note: 1 A Transportation Management Association does not currently exist in Klamath Falls
P: Primary role
S: Secondary/Support role
* Primary implementation depends on roadway jurisdiction

While all the strategies listed in Table 6 could be implemented in Klamath Falls, the urban area faces a difficult challenge related to TDM strategies. Given the climate and culture, not all of the options listed would receive strong public support or involvement. As such, care should to taken to implement strategies that are consistent with Klamath Falls lifestyles, while still effectively reducing travel demand. Below is a list of specific strategies that could be effective in Klamath Falls.

- Access Management
- Connectivity Standards
- Pedestrian Facilities
- Bicycle Facilities
- Parking Management
- Developer Incentives
Incentives can also be used to encourage development to incorporate facilities, strategies and programs that promote TDM. For example, a tiered system of SDC credits could be provided to developers that implement two or more TDM strategies such as paid parking, special carpool parking, free transit passes, shower facilities, electric vehicle charging stations, etc.

Many of the above TDM strategies would require coordination between the City/County and future developments that occur within the Klamath Falls Urban Area. This can be accomplished by outlining clear standards related to access management, connectivity, complete street design, and parking requirements, to name a few. When developing these standards, however, it is important for consistency between the City and County to maximize the effectiveness of those standards.

**Non-Automobile Modes**

The following sections identify alternatives for the pedestrian, bicycle, and transit modes.

**Pedestrian Facilities and Treatments**

Pedestrian facilities are the elements of the network that enable people to walk safely and efficiently on the transportation system. These facilities include facilities for pedestrian connectivity (sidewalks, mixed-use trails) as well as safe crossing locations (unmarked and marked crosswalks, crossing beacons, pedestrian refuge islands). Each plays a role in developing a comprehensive pedestrian network which can promote both walking trips and multi-modal trips such as using a combination of walking and transit to complete a trip.

The pedestrian system within Klamath Falls includes sidewalks and multi-use paths. Pedestrian facilities within Klamath Falls generally exist along major collectors and arterials, but holes exist in the system which limit its functionality. Pedestrian improvements should be prioritized based on their ability to complete connections between places that generate pedestrian trips. Stakeholders within Klamath Falls have conveyed a desire to focus pedestrian improvements in the vicinity of schools to allow for safe access to and from school for students.

Multi-use path projects are discussed in a subsequent section because of their utility for both pedestrians and bicyclists.

**Types of Pedestrian Facilities**

The Klamath Falls Urban Area currently has a pedestrian network that consists mainly of sidewalks along arterials, collectors, and local roads and a network of multi-use paths for commuting and
recreational uses. The sidewalk network has breaks in connectivity that limit the usability of the system within certain areas of the Urban Area, most notably along the following roadways:

- Nevada Avenue
- Eldorado Boulevard
- Spring Street
- Washburn Way
- Altamont Drive
- Hope Street
- Patterson Street
- Crosby Avenue
- Hilyard Avenue
- Laverne Avenue
- Clinton Avenue
- Harlan Drive
- Keller Road

Pedestrian Crossings

Pedestrian crossing locations allow for walking trips to connect across facilities to continue along pedestrian facilities. Most notably, the OC&E trail has a signalized pedestrian crossing at Washburn Way just south of South 6th Street. However, other such crossings (besides those at signalized intersections) are limited within the Urban Area. Pedestrian crossing options that can be implemented when need dictates, either for operational or safety purposes are shown in Table 7.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Potential Klamath Falls Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Separated Crossings</td>
<td>OR 140, Crater Lake Parkway, US 97</td>
</tr>
<tr>
<td>Pedestrian Hybrid Beacon</td>
<td>OC&amp;E trail crossings, high pedestrian volume crossings</td>
</tr>
<tr>
<td>Signalized Intersection</td>
<td>Unlikely to meet pedestrian signal warrants in Klamath Falls</td>
</tr>
<tr>
<td>Rectangular Rapid Flashing Beacon</td>
<td>Along collectors or arterials</td>
</tr>
<tr>
<td>Raised Pedestrian Refuge</td>
<td>Roadways with wide cross-sections</td>
</tr>
<tr>
<td>Marked Crosswalks</td>
<td>Installed as needs dictate</td>
</tr>
<tr>
<td>Unmarked Crosswalks</td>
<td>Along local roads or minor collectors</td>
</tr>
</tbody>
</table>

Note: A description of each of these types of crossing treatments is provided in Appendix B.

Pedestrian Alternatives

The existing roadways with sidewalks and locations on facilities classified as Minor Collectors or higher where no sidewalks exist within the Klamath Falls Urban area are shown in Figure 2. Also
shown are buffers around schools based on school district school bus policies of not providing school bus service to students within one-mile of the school. Areas that are shaded indicate that those locations that fall within an area where students could be expected to walk or bike to school. Locations where students are expected to provide their own transportation to school should be considered higher priority sidewalk locations than those outside of the no-bus areas.

Current design standards require sidewalks on all collector level roadways and above within the urban area. Therefore, the future sidewalk network would include all study roadways shown in red (no sidewalks) and yellow (sidewalks on one side). However, not all sidewalks are likely to be completed within the planning horizon and therefore it is proposed that the future sidewalk map be reviewed and each segment be designated in to one of the three following categories:

- **High Priority Sidewalks** – High priority sidewalks are those that are located near schools, near other pedestrian destinations, or in areas with safety issues. High priority sidewalks could be constructed as a sidewalk project, as development frontage improvements, as part of a vehicle capacity increasing project, or as part of an urban upgrade project. It is recommended that the sidewalk projects with this designation become part of the cost-constrained plan.

- **Remove from Future Pedestrian Network Map** – Several segments are proposed to be removed from the future pedestrian network map. These locations primarily include state facilities where the environment is anticipated to remain high speed, transitioning out of the UGB, or where there is a parallel multi-use path.

- **Future Sidewalks** – All segments currently without sidewalk that are not identified as High Priority or Remove from Future Pedestrian Network Map would be part of the TSP’s future pedestrian network. Sidewalks on these facilities could be constructed as a sidewalk project, as development frontage improvements, as part of a vehicle capacity increasing project, or as part of an urban upgrade project. However, the City and County should consider establishing a fee in lieu program where development frontage improvements would result in an isolated segment of sidewalk that would be anticipated to be isolated for a significant time period. This would allow sidewalk fees collected to be assembled to construct complete segments of sidewalk in another location that are higher priority.
The roadway segments proposed as High Priority and Remove from Future Pedestrian Network Map are shown in Figure 2. They include:

- **High Priority Segments**
  - Altamont Drive: South 6th Street to Anderson Avenue (PRJ-21)
  - Hilyard Avenue: Washburn Way to Summers Lane (PRJ-22)
  - Laverne Avenue: Washburn Way to Crest Street (PRJ-23)
  - Crest Street: Laverne Avenue to Clinton Avenue (PRJ-24)
  - Clinton Avenue: Crest Street to Summers Lane (PRJ-25)
  - Bristol Avenue: Summers Lane to Homedale Road (PRJ-26)

- **Remove from Future Pedestrian Network Map**
  - Lakeshore Drive: Klamath Lake to UGB
  - OR 39: US 97 to Portland Street
  - OR 39: Esplanade Avenue to South 6th Street
  - OR 140: Memorial Drive to Washburn Way
  - OR 140: OR 39 to UGB
  - OR 39/OR 140: Big Y to UGB
  - Lakeport Boulevard: North of Pearl Avenue
  - OR 140: Western edge of UGB
Legend

Sidewalks
- Both Sides of Street
- One Side of Street
- Multi-Use Path - Motorized Vehicles Prohibited
- Proposed Multi-Use Path
- No Sidewalks
- Potential High Priority Pedestrian Projects
- Proposed Exclude from Future Pedestrian Network Map

Elementary and Junior High Schools
High Schools
School Buffer Zone
UGB
City Limits

Draft Future Pedestrian Network

Figure 2
Bicycle Facilities and Treatments

Bicycle facilities are the elements of the network that enable cyclists to safely and efficiently travel on the transportation system. These facilities include public infrastructure (bicycle lanes, mixed-use trails, signage and striping) as well as off-road facilities (secure parking, changing rooms and showers at worksites). Each plays a role in developing a comprehensive bicycle network.

Many different bicycle facility types are needed to create a complete bicycle network that connects people to their destinations and allows cyclists to feel safe riding. Currently, Klamath Falls’ bicycle network includes marked bike lanes, shoulder lanes, and multiuse paths. A complete inventory of the existing bicycle system within Klamath Falls is shown in Figure 3.

In some locations where bicycle lanes are provided, specific conditions compromise the quality of the bicycle facility, such as high motor vehicle volumes and travel speeds. In these locations, wider bike lanes or buffers (wider striping, barriers, or medians) separating bicycles from vehicle traffic may be appropriate.

Other roadways with lower vehicle volumes may not require bicycle lanes for cyclists, but may benefit instead from low-traffic bikeway treatments to create what is known as a bike boulevard. Bike boulevards are generally parallel to roadways with high mobility for vehicles and are designed to connect similar destinations to the parallel road. Treatments along the roadway are designed to benefit bicycle mode of travel including through lanes only for bikes, switching two-way stop signs to side-street traffic, and wayfinding signs for riders.

Types of Bicycle Facilities

A brief description of the various bicycle facility types is provided below.

**Bicycle lane** – Bicycle lanes are striped lanes on the roadway dedicated for the exclusive use of bicycles. Typically, bicycle lanes are placed at the outer edge of pavement (but to the inside of right-turn lanes and/or on-street parking). Bicycle lanes improve bicycle safety, improve cyclist security, and if comprehensive can provide direct connections between origins and destinations. However, inexperienced cyclists often feel uncomfortable riding on busy streets, even when they include bicycle lanes. City of Klamath Falls street standards include bicycle lanes on all arterials and collectors, except for minor collectors that allow on-street parking. Klamath County street standards are less clear, but do provide a 40 foot wide pavement section on collectors that could be used for bicycle lanes where parking is prohibited and a center turn lane in not necessary.
Low-traffic bikeway (bicycle boulevard) – Low-traffic bikeways are also known as bike boulevards and provide high-quality bicycle facilities on continuous street corridors with low vehicular traffic volumes. Typically, low-traffic bikeways are made from existing local streets, which are reconfigured to prioritize bicycle trips and reduce through automobile trips. Local automobile access is retained. Bicycling conditions are improved by reducing stop signs to a minimum along the route and providing wayfinding information specific to bicyclists. Traffic calming is often used to slow automobile speeds and eliminate the cut-through automobile traffic that the removal of stop signs would otherwise attract.
Low-traffic bikeways are best used when they parallel major roadways and can provide cyclists with a low-volume alternative route.

**Shared-lane Pavement Marking** – Shared-lane pavement markings (often called “sharrows”) are a tool designed to help accommodate bicyclists on roadways where bicycle lanes are desirable but infeasible to construct. The sharrow marking indicates a shared roadway space, and are typically centered approximately 4 feet from the edge of the travelway to encourage cyclists to ride further away from parked and parking cars and/or the curb. Typically, sharrows are suitable on roadways with fewer than 3,000 ADT. Shared-lane pavement markings have been extensively applied in several cities, including Oregon cities, such as Corvallis. Shared-lane pavement markings have been included in the latest edition of the MUTCD. Guidance in that document indicates that shared lane markings should not be placed on roadways with a posted speed greater than 35 mph.
Examples of Shared-lane Pavement Markings

Shared-roadway – Any roadway without dedicated bicycle facilities is a shared roadway. Where traffic volumes are low, shared roadways are generally safe and comfortable facilities for cyclists. However, the ODOT Bicycle and Pedestrian Plan\(^1\) does not recommend shared roadways where automobile volumes or vehicle speeds are high. Thresholds for where shared-lanes are appropriate are based on several factors, including land-use and grade. Generally, bike lanes are preferred on most roadways with greater than 3,000 ADT or with a speed limit greater than 25 mph. For these roadways, dedicated bicycle facilities, typically bicycle lanes, are recommended. Table 8 shows how the bicycle alternatives presented would apply to Klamath Falls.

Table 8  Bicycle Alternatives

<table>
<thead>
<tr>
<th>Facility</th>
<th>Potential Klamath Falls Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle Lane</td>
<td>See Figure 3 for proposed bike lane additions</td>
</tr>
<tr>
<td>Low Traffic Bikeway</td>
<td>None proposed. Could be installed on corridors where bicycle trips should be prioritized. El Dorado Avenue is a roadway where such a facility could be explored.</td>
</tr>
<tr>
<td>Shared Bicycle Lane</td>
<td>See Figure 2 for proposed shared bicycle lane additions</td>
</tr>
<tr>
<td>Shared roadway</td>
<td>Neighborhoods, local roads, and low volume collectors</td>
</tr>
</tbody>
</table>

Bicycle Crossings and Off-Road Facilities

Bicycle crossing treatments are used to connect bike facilities at intersections with high vehicle volumes, trailheads, or other bike routes. Typical treatments include bicycle detectors at traffic signals, bicycle only signals, or preferential movements for bicyclists such as only allowing bikes to make a through movement.

Traffic signals that are actuated, meaning that green indications are only given to a movement when the signal detects the presence of a vehicle, are difficult for a cyclist if no indication is given of the location of detection equipment. Pavement markings should be used, including actuated left-turn lanes, to show cyclists where to stand to actuate a signal. Additionally, the sensitivity of all loop detectors should be set to allow for bicycle activation.

Bicycle Alternatives

The existing roadways with bicycle lanes or shoulder lanes (greater than 4 feet), the location of multi-use pathways, and locations on facilities classified as Minor Collectors or higher where no bicycle lanes exist within the Klamath Falls Urban area are shown in Figure 3. Also shown are buffers around schools based on school district school bus policies. Areas that are shaded indicated that those locations fall within an area where students could be expected to walk or bike to school. Locations where students are expected to provide their own transportation to school should be considered higher priority bicycle lane locations than those outside of the no-bus areas.

Current design standards require bicycle lanes (or shoulder lanes) on state facilities and city jurisdiction arterials. Bicycle lanes are shown as optional on city collectors (major and minor) and are not specified on county collectors although the pavement width of 40 feet could accommodate bicycle lanes depending on if a center turn lane is provided or not. It is recommended that all collector level
roadways and above within the urban area that are anticipated to serve over 3,000 vehicles per day be planned to include bicycle lanes or shoulder lanes. Roadways with less than 3,000 vehicles per day are generally suitable to have shared lanes for bicycles and vehicles. It is recommended that the TSP Update include a Future Bicycle Network map that eliminates the ambiguity of the current design standards as to whether a bicycle lane is required or optional. As with the pedestrian network, not all bicycle lanes are likely to be completed within the planning horizon and therefore it is proposed that the future bicycle lane map be reviewed and each segment be put in to one of the three following categories:

- **High Priority Bicycle Lanes** – High priority bicycle lanes are those that are located near schools, near other bicycle destinations, or in areas with safety issues. High priority bicycle lanes could be constructed as a bicycle lane project, as development frontage improvements, as part of a vehicle capacity increasing project, or as part of an urban upgrade project. It is recommended that the bicycle lane projects with this designation become part of the cost-constrained plan.

- **Remove from Future Bicycle Network Map** – Several segments are proposed to be removed from the future bicycle lane network map. These locations primarily include state facilities where the environment is anticipated to remain high speed, transitioning out of the UGB, or where there is a parallel multi-use path.

- **Future Bicycle Lanes** – All segments currently without bicycle lanes or shoulder lanes that are not identified as High Priority or Remove from Future Bicycle Network Map would be part of the TSP’s future bicycle network. Bicycle lanes on these facilities could be constructed as a bicycle project, as development frontage improvements, as part of a vehicle capacity increasing project, or as part of an urban upgrade project. However, the City and County could consider establishing a fee in lieu program where development frontage improvements would result in an isolated segment of bicycle lane that would be anticipated to be isolated for a significant time period so that the fees collected could be assembled to construct complete segments that are higher priority.

- **Shared Lane Facility** – Shared lane facilities are those collector level facilities that are desirable bicycle routes but where the future traffic is anticipated to be less than 3,000 vehicles per day and the posted speed is 35 mph or less. These facilities could use “sharrows” to indicate that they are a shared facility or could have other treatments to that would enhance their desirability for bicycles as described above under Low Traffic Bikeways.
The roadway segments proposed as High Priority and Remove from Future Bicycle Network Map, and Shared Lane Facilities are shown in Figure 5. They include:

- **High Priority**
  - Shasta Way: South 6th Street to Patterson Street (PRJ-26)
  - Washburn Way: Eberlein Avenue to South 6th Street (PRJ-27)

- **Remove from Future Bicycle Network Map**
  - Lakeshore Drive: Klamath Lake to UGB
  - OR 39: US 97 to South 6th Street

- **Shared Lane Facilities**
  - Hilyard Avenue: Washburn Way to Summers Lane (PRJ-28)
  - Pine Street: Esplanade Avenue to Payne Alley (PRJ-29)
Draft Future Bicycle Network

Legend

Bike Network
- Multi-Use Path - Motorized Vehicles Prohibited
- Proposed Multi-Use Path
- Street with Bicycle Lane
- Roads with 4’ Paved Shoulders

Bike Gaps
- Low Traffic Volume
- Medium Traffic Volume
- High Traffic Volume
- High Traffic Volume & Designated Caution Areas
- Potential High Priority Bicycle Projects
- Proposed Shared Lane
- Proposed Exclude from Bicycle Network Map

High Schools
Elementry and Junior High Schools
School Walk Area (No Bus)
UBG
City Limits

Figure 3
During the Virtual Open House, requests from the public for enhanced bicycle facilities and crossings were received for the following locations:

- Provide a bicycle connection across OR 39 from Esplanade Avenue to Melrose Street (existing conditions require bicycles to travel on OR 39 between those two locations) (PRJ-30)
- Improve bicycle crossing options at Biehn St/Campus Drive across Crater Lake Parkway (bicycles traveling northbound on Biehn Street across Crater Lake Parkway end up trapped between two lanes due to the right-turn add lane from Crater Lake Parkway to Campus Drive) (PRJ-31)
- Improve visibility and facilities for bicycles and pedestrians at Summers Lane/South 6th Street (PRJ-32)

Multi-use Pathways

Multi-use pathways are other facilities dedicated to pedestrians and bicyclists. They provide an excellent alternative to on-street pedestrian or bicycle facilities and have an integral role in recreation, commuting, and accessibility for residents. However, the construction of these facilities is often expensive due to the potential need for right-of-way acquisitions.

Klamath Fall’s most prominent multi-use path is the OC&E trail that bisects the eastern portion of the Urban Area. This pathway is used for a variety of recreational and commuter purposes. Currently, this pathway has a dedicated signalized crossing of Washburn Way just south of South 6th Street.

Additional multi-use pathways are being considered by both the City and the County. In particular, the County has plans to build a new multi-use pathway in the vicinity of Foothills Boulevard located in the northeast quadrant of the Urban Area. The proposed alignment is shown on Figure 2 and Figure 3.

Additional multi-use pathways recommendations received from the public through the Virtual Open House (but not shown on the draft map currently) include:

- Extend OC&E trail to downtown (PRJ-33)
- Extend OC&E trail to Klamath Community College (PRJ-34)
- Extend multi-use pathway near Foothills Boulevard (PRJ-35)

It is recommended that these extensions be considered for inclusion in the Draft Preferred Plan.
Transit

Transit serves three main types of riders:

- **Captive riders**, those passengers who cannot afford to own or operate a car, are too young or too old to drive, or have a disability that prevents them from driving, and therefore rely on public transportation to meet their mobility needs. Transit service fulfills a basic social need for these passengers.

- **Captive-by-choice riders**, people who could afford to own and operate a car, but choose not to for environmental, lifestyle, or other reasons. These people will seek out locations to live in that provide quality walking and bicycling facilities for shorter trips and quality transit service for longer trips.

- **Choice riders**, people who own a car, but will choose to use transit when it offers an advantage over the automobile (e.g., parking cost savings, travel time savings, ability to use travel time in more productive ways). Improving transit service quality by improving service frequencies, service spans, travel speeds, etc. attracts choice riders to use transit service.

From a community perspective, transit service can be a tool for supporting a diverse community in terms of ages, incomes, and abilities; an environmentally friendly means to address the community’s transportation needs; a way to avoid costly and impactful street widening projects; and a catalyst for new development that enhances the community’s livability.

In smaller communities, the majority of transit ridership often consists of captive riders. However, cities such as Klamath Falls that have larger institutional land uses (such as universities)—particularly ones that charge for parking (OIT charges $110 per academic year)—may see a significant number of choice riders associated with those institutions. In addition, where land uses (grocery stores and housing located in close proximity) and alternative transportation facilities (e.g., sidewalks, bicycle facilities, bus routes) are provided in a way to make it feasible to travel around the city without an automobile, smaller cities can also generate captive-by-choice ridership.

**Transit Service Quality Attributes**

Regardless of what type of rider a person is, there are some basic service attributes that make bus service accessible and convenient for the public. Accessibility determines whether or not a particular trip can be made by bus. If the bus doesn’t run close to one’s origin or destination, or if service isn’t provided at the times one needs to travel, transit is not an option for that trip. Assuming that transit
is an option, convenience factors determine whether one will choose transit for a given trip instead of another travel mode.

Accessibility

Accessibility attributes include where the bus (or other transit vehicle) goes, when during the day and week it runs, and how often it runs. “How often” is determined by the frequency of service, “when” is determined by the span of service, and “where” is determined by the coverage of service. Each of these factors has important cost and ridership generation implications.

Impacts of Accessibility Improvements

Higher-frequency service attracts choice riders, but operating costs and capital costs for additional buses increase proportionately to the increase in frequency. Span of service determines what types of customer markets are served by transit—for example, shoppers, commuters, and students attending night classes. Increasing the span of service increases the types of trips that can be made by transit (again attracting ridership), but operating costs increase proportionately to the increase in service hours. Finally, coverage determines the origins and destinations within the community that are served by transit. Increasing coverage increases the number of people who have access to transit, but operating costs and capital costs for additional buses increase proportionately to the increase in service hours required to serve new areas. In addition, to meet Americans with Disabilities Act (ADA) requirements, paratransit (dial-a-ride) service will need to be provided during any new service hours and within ¾ mile of new bus routes, which incurs additional operating costs.

Ways to Improve Transit Accessibility

As an example of how increases in funding can influence transit accessibility, assume a transit agency currently spends $300,000 a year to operate a single bus up and down its city’s main street every 30 minutes from 6:30 a.m. to 6:30 p.m., Monday through Friday. If the agency could afford to double the amount of money it spends each year on operating transit service (including the required ADA service, and recognizing that fares typically cover only 10–20% of the total cost of providing service), it would have several options:

- It could choose to add a second bus to the current route, improving the frequency to every 15 minutes. There would also be capital costs associated with purchasing a second bus to provide the added frequency.
- It could create a second route that served a different portion of the city every 30 minutes. The round-trip distance that the bus could travel within 30 minutes, including time for a driver
break, would determine how large an area would benefit from the new service. There would also be capital costs associated with purchasing a second bus to serve the new route.

- It could increase the service hours on the current route to 6:30 a.m. to 12:30 a.m. Monday through Saturday and 6:30 a.m. to 6:30 p.m. on Sunday. Because the same bus could operate the additional service hours, there would be no immediate capital costs involved, but the bus might need to be replaced sooner than otherwise, due to the additional miles it would be travelling each day and week.

A decision on the best option would be dependent upon current ridership and capacity (are the buses full during peak times?), demand for transit service beyond the current hours (are there major employers or schools with evening shifts or classes?), and if there are areas of population without a transit route. Ridership data, transit rider surveys, and surveys of non-riders at major employers, schools, and unserved residential areas could be used to assess the best option for a community.

**Access to Transit**

Most transit passengers are pedestrians at one or both ends of their transit trip. Therefore, it is particularly important to have a good pedestrian network in the vicinity of transit stops, to maximize the number of locations that can be reached by the transit service that is provided. Most passengers are willing to walk up to ¼ mile to access local bus service and up to ½ mile to access high-frequency and/or high-speed service such as bus rapid transit and rail modes, trading off added walking time for reduced waiting time at stops and/or shorter travel times while on a transit vehicle. A “good pedestrian network” includes such things as a continuous sidewalk network to and from transit stops; safe ways to cross streets, particularly at bus stops; and ADA compliance (e.g., curb cuts) to minimize barriers that might keep persons with disabilities from using the service. Providing such a network should be a consideration when prioritizing pedestrian network improvements.

Some passengers may wish to use their bicycle to access transit. An average person can travel four times as fast on a bicycle than on foot, which greatly expands the area a bicyclist can reach from a bus stop in the same amount of time as walking. Providing bicycle racks on buses allows bicyclists to be able to use their bicycle at both ends of their transit trip. In smaller communities where travel distances are short and buses run infrequently, a given trip can be made by bicycle in about the same time as by bus. However, even in these cases, bicycle racks can be useful in serving, for example, bicyclists who experience flat tires as well as origins and destinations in hilly areas. Basin Transit
provide bicycle racks on its buses. If in some cases (e.g., service to universities), the demand for bicycle rack space on some trips is greater than the number of spaces available (typically 2 or 3). Attention should focus at that point to providing (1) secure bicycle parking at transit stops and (2) service close to bicyclists’ destinations, to minimize the need to bring a bicycle along on a bus.

Access vs. Efficiency

A fundamental trade-off faced by transit service providers is whether service hours should be spread over the agency’s entire service area (prioritizing access), or whether service hours should be concentrated in the highest-ridership corridors (prioritizing efficiency). For example, Rogue Valley Transportation District (RVTD) emphasizes efficiency, with service focused along main streets, while Corvallis Transit operates under a city policy to provide transit service within ¼ mile of 95% of the city’s residents. Prioritizing access means that more locations have access to service, but that most locations will receive service relatively infrequently. Prioritizing efficiency focuses service on the areas with the highest population and job densities and most transit-supportive demographics, giving those areas more frequent service than would be possible if service covered the entire area (given a fixed budget). Basin Transit, the transit service provider for Klamath Falls, provides hourly service to many locations within Klamath Falls, thus providing coverage, but also provides essentially half-hourly service in the corridor where the “mainline” Routes 1 and 2 overlap, thus also providing a degree of efficiency.

Convenience

Convenience attributes include the reliability of service (will I get to the doctor on time, will I have to stand out in the cold longer than planned), the speed of the trip, the comfort of the trip, and the cost of the trip.

Service Reliability

As illustrated in the previous paragraph, reliability is a customer service issue, but it also has potential impacts to a transit agency’s operations and bottom line. From an operations perspective, the less reliable a route, the more slack time that needs to be built into the schedule to allow a late-arriving bus to begin its next trip on time. This extra time is time that could otherwise be spent providing service—for example, by extending the route. From a financial perspective, unreliable service is unattractive to riders (thus reducing potential farebox revenue) and—in a worst case—it requires an extra bus to be added to a route to maintain the schedule, thus increasing an agency’s costs.
There are many potential sources of reliability issues. From a city’s perspective, things that it can do to address bus reliability include:

- Addressing congestion issues that slow down buses—either by addressing the issue for all roadway users (for example, by increasing roadway capacity), by providing measures directed specifically at buses (for example, by allowing buses to jump to the front of the queue using right-turn lanes at traffic signals), or by providing new street connections that buses can use to avoid congested locations.

- Adjusting traffic signal timing—for example, by reducing traffic signal cycle lengths when possible (so that when a bus does have to stop, it doesn’t stop for so long), or by providing signal priority for buses at key locations, where traffic signal stays green a little longer than normal to allow a bus to make it through an intersection.

- Managing roadway access—for example, by requiring that new driveways be located farther away from signalized intersections, so that transit agencies have greater flexibility in locating bus stops.

**Speed**

Many of the issues and potential solutions listed above for reliability also apply when it comes to bus speeds. The faster a bus can operate, the more distance it can cover in a given amount of time (i.e., the longer the route), or the fewer the buses needed to operate a given length of route at a specified headway.

From a customer perspective, the total amount of time required to make a trip is also important. Therefore, having direct walking routes to and from bus stops, quick and safe ways of crossing streets, and quick connections between buses when a transfer is required are also important. To minimize transfer times, Basin Transit operates two timed-transfer connection points (one downtown and one near the fairgrounds), where the “feeder” routes meet the “mainline” routes and allow for quick connections.

**Comfort**

Comfort issues include comfort waiting for the bus to come and comfort on-board the bus (e.g., related to crowding). From the city’s perspective, it can support passenger comfort waiting for the bus by ensuring that its street standards provide sufficient space for Basin Transit to install bus shelters where demand warrants, while maintaining sufficient sidewalk space to meet ADA requirements and other pedestrian needs.
Cost

Once the decision has been made to purchase a car, most of its costs (e.g., possible interest on a car loan, registration, insurance, fuel, servicing) are not associated with any one trip or type of trip. In contrast, people think of the cost of riding the bus every time they board and pay a cash fare or show a transit pass. To make transit more competitive with the automobile, some cities support programs designed either to (1) reduce the perceived cost of riding transit (e.g., employer-sponsored transit subsidies) or (2) increase the perceived cost of using a car (e.g., by charging for parking or making it more difficult to find). Some cities, such as Ashland, Oregon and Boulder, Colorado subsidize local transit service through programs that allow passengers to pay a reduced fare (with the city paying the difference), by sponsoring free downtown shuttles, by developing neighborhood group bus pass programs, or by paying the local transit operate to provide more frequent bus service than they would otherwise receive.

Transit Alternatives

Existing Conditions Summary

Technical Memorandum #3 presented the existing condition of Klamath Falls’ transportation system. With respect to transit service, the following information from that memo is relevant:

- Many developed portions of Klamath Falls are located within ¼ mile of a bus route.
- Service is provided 12 hours a day on weekdays (6:30 a.m. to 6:30 p.m. from downtown on the mainline routes, up to one-half hour earlier or later elsewhere) and for 6 hours on Saturdays.
- Most areas receive service once an hour; areas served by both Routes 1 and 2 (OIT, downtown, portions of South 6th Street) receive service twice an hour.
- Timed transfers between feeder and mainline routes can be made downtown and at the transfer center located near the fairgrounds.
- Most—but not all—of the streets used by mainline Routes 1 and 2 have sidewalks; most of the streets used by the feeder routes do not.
- The City has relatively few on-street bicycle facilities.

Figures 4 and 5 compares the locations where bus service is considered to be provided (i.e., is located within ¼ mile of a bus route) and the locations of the highest-density areas within Klamath Falls under existing and future conditions, respectively. The Transit Capacity and Quality of Service Manual
defines “transit-supportive” areas as locations that can support at least hourly transit service; these have a minimum of 3 households per gross acre or 4 jobs per gross acre. Although residential and job density are by no means the only indicators of potential areas of transit ridership (income, car ownership, and locations of major institutions also play a role), they are good tools for indicating where—all other things being equal—concentrations of potential customers are located. Figure 4 shows that nearly all of the developed portions of the City’s transit-supportive traffic analysis zones are served, with the exception of the southern portion of downtown.

Future Conditions

As summarized in Technical Memorandum #1, Basin Transit’s 1995 Transit Development Plan identified frequency improvements as being a higher priority in the future than expanded geographic coverage, as they tended to generate greater ridership. The plan also identifies the need for street connections between large developments, to allow the efficient through-routing of transit service.

Figure 5 shows the locations of transit-supportive areas anticipated to develop by the year 2035. Future transit-supportive areas not currently served by transit consist of portions of South 6th Street between downtown and Washburn Way, and an area north of Dan O’Brien Way.
Klamath Falls Transit Analysis
Base Year 2010 Land Use

Legend
- Transit Center
- TransitBuffer
- Minimum of 4 Employees Per Acre
- Minimum of 3 Households Per Acre
- Urban Growth Boundary

Basin Transit
- Line 1
- Line 2
- Line 3
- Line 4
- Line 5
- Line 6
Klamath Falls Transit Analysis
Future Year 2035 Land Use

Legend
- Transit Center
- TransitBuffer
- Minimum of 4 Employees Per Acre
- Minimum of 3 Households Per Acre
- Urban Growth Boundary

Lines:
- Line 1
- Line 2
- Line 3
- Line 4
- Line 5
- Line 6

Figure 5
Alternatives

Transit Service Alternatives

- **Frequency Improvements.** In the future, Route 1 would be the highest priority for improved frequency, as it serves the greatest number of transit trip generators. The feeder routes would be timed to connect with Route 1, allowing Route 2’s schedule to be adjusted to allow service three times an hour between OIT, downtown, and the fairgrounds.

- **Span Improvements.** Route 1 would also be a candidate for a longer service span, to provide service for students attending night classes at OIT, for retail and other employees who work in the evening, and other potential riders who need to travel during the evening. Secondarily, additional service could be considered on Saturdays (to serve people needing to work on Saturday).

- **Coverage Changes.** If Route 1’s frequency was improved, Route 2 could be adjusted to serve the South 6th Street and south downtown areas not currently served by transit, while maintaining existing service levels within the neighborhood north of South 6th Street and east of Washburn Way. With road improvements, Route 5 could be converted to a two-way route connecting OIT, new development along Dan O’Brien Way, Pelican City, and downtown. The key improvement needed would be widening the Quarry Road railroad underpass to accommodate two lanes of traffic (or providing a new grade-separated crossing in that portion of Klamath Falls—for example, by continuing Dan O’Brien Way across both US 97 and the railroad). This routing would address both the future transit-supportive area service need north of OIT, as well as improving the bus connection from Pelican City to the medical and educational services on the opposite side of US 97.

Table 9 below shows transit alternatives available and how each could apply to Klamath Falls.

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Alternative</th>
<th>Potential Klamath Falls Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRJ-36</td>
<td>Frequency Improvement</td>
<td>Increase frequency on Route 1</td>
</tr>
<tr>
<td>PRJ-37</td>
<td>Span Improvements</td>
<td>Extend frequency of Route 1</td>
</tr>
<tr>
<td>PRJ-38</td>
<td>Coverage Changes</td>
<td>Modify Route 2 to serve downtown and South 6th Street</td>
</tr>
<tr>
<td>PRJ-39</td>
<td></td>
<td>Modify Route 5 to serve OIT, Dan O’Brien Way, Pelican City, and Downtown</td>
</tr>
</tbody>
</table>
Infrastructure Alternatives

- Prioritize sidewalk construction along streets with transit service and portions of streets leading to streets with transit service.

- Roadway/intersection improvements to minimize impact of future congestion on buses. The intersection analysis indicates capacity improvements are necessary at the following intersections located along existing transit routes:
  
  - 7. OR 39 / Biehn Street / Campus Drive
  - 14. Biehn Street / Oregon Avenue
  - 23. Esplanade Drive / OR 39
  - 27. OR 39 / Main Street
  - 28. Washburn Way / OR 39
  - 33. OR 39 / Shasta Way
  - 35. Homedale Road / Shasta Way
  - 42. Fargo Street / OR 39
  - 43. Homedale Road / OR 39
  - 52. OR 140 / OR 66
  - 54. US 97 SB Ramps / OR 140
  - 56. Greensprings Drive / OR 140
  - 64. Summers Lane / Clinton Avenue
  - 67. OR 39 / OR 140 (Big Y)

- Complete street connections between subdivisions; if potential cut-through auto traffic is perceived as an issue, consider bus gates (used in Europe) that allow bus, pedestrian, bicycle, and emergency vehicle traffic through, while preventing auto traffic.

Transit System Alternatives

Future expansions of the Klamath Falls transit system expansion can focus on increased frequency of service, expanded operation hours, or expanded route coverage. Currently, the transit system covers the majority of the transit supportive areas in the Urban Area, as shown previously in Figure 1. However, the hours of operation of the transit system are from roughly 6:30 a.m. to 7:00 p.m. on weekdays and 10:00 a.m. to 4:00 p.m. on Saturdays. No service is provided on Sundays. This makes the transit service useful mainly to employees working traditional office hours, students with
daytime classes, and non-working residents who are able to run errands or go shopping during the day. Customer markets not currently being served include:

- Employees working non-traditional hours (e.g., weekends and evenings). These tend to be the type of jobs that are attractive to students, and the jobs tend to be lower-paying, which makes transit service an attractive alternative to driving to work for these employees.

- OIT or Klamath Community College students who take evening classes, need to study or go to activities on campus in the evening, or want to patronize area restaurants and bars without having to drive.

The City, County, and Basin Transit should consider what customer markets should be served by the transit system and weigh the benefits of increased frequency of service, expanded operation hours, expanded route coverage, or some combination of these.

In addition to transit service enhancement, other actions could be taken by the City, County, or Basin Transit to enhance the transit system within Klamath Falls. These include:

- Making sure ADA-compliant sidewalk facilities are provided along and leading to streets with transit service.

- Providing adequate street lighting at bus stops and along streets leading to bus stops.

- Providing secure bicycle storage facilities at key stops, and evaluating major streets for opportunities to improve pedestrian crossing opportunities.

- Supporting other alternative modes—such as improving bicycle facilities, developing a bike-sharing program, or supporting car-sharing programs—can make it easier for area residents to forego owning a car; those residents will then likely use transit service for a portion of their trips.

- Encouraging higher-density and mixed-use development along transit routes through its land use planning efforts.
Capacity Enhancing Roadway Projects

The following subsections present the draft roadway capacity project recommendations for the auto mode. These are based on existing and future no build conditions analyses as well as input from project stakeholders. The treatments, strategies and approaches are organized in the following subsections:

- **Roadway Segment Projects** – Presents roadway segment projects including new roads, roadway extensions and roadway widening projects that are in addition to the local street connectivity projects from the previous section.
- **Intersection Projects** – Presents specific intersection projects to address forecasted operational deficiencies.

Roadway Segment Projects

The Klamath Falls Area Travel Demand Model was used to evaluate the potential impact of the recommended draft projects. Figure 6 below shows the location and extent of the roadway segment projects considered for this analysis. They include the local street connectivity projects described previously plus the following additional roadway projects:

- Construct new roadway north to Old Fort Road from Homedale Road/Foothills Boulevard (PRJ-40)
- Construct new roadway north from Foothills Boulevard near Beverly Drive (PRJ-41)
- Extend Washburn Way north (PRJ-42)
- Upgrade Emerald Street south of OR 66 (PRJ-43)
- Construct new roadway south of OR 66 near OR 140 intersection (PRJ-44)

Figure 6 also notes the intersections that will still require a capacity increasing project despite the enhanced network connectivity (deficiencies at the Biehn Street/Oregon Avenue and Midland Highway/OR 140 intersections were mitigated by the enhanced network connectivity).

Although many of the local connectivity projects do not appear to provide significant system benefits, many of these projects are intended to serve future growth and development, not reduce existing congestion. As such, all of the projects shown in Figure 6 are recommended to remain in the TSP and be constructed when development or demand dictate.
Intersection Projects

The lane configurations and traffic control devices required to mitigate the deficient intersections are shown on Figures 7A and 7B. As noted above, enhanced network connectivity mitigated deficiencies at the Biehn Street/Oregon Avenue and Midland Highway/OR 140 intersections. Table 10 lists the proposed intersection improvement projects and their resulting traffic operations. These projects address the capacity deficiencies identified in the existing and future conditions analyses. Technical analysis worksheet are included in Appendix C.
PROPOSED INTERSECTION IMPROVEMENTS

- STOP SIGN
- TRAFFIC SIGNAL
- YIELD SIGN
MT - MODIFY SIGNAL TIMING
MP - MODIFY SIGNAL PHASING
\ - PROPOSED IMPROVEMENTS
Future Year 2035
Intersection Improvements
Traffic Conditions
Weekday PM Peak Hour
### Table 10  Proposed Intersection Improvements

<table>
<thead>
<tr>
<th>Project</th>
<th>Intersection</th>
<th>Mobility Standard</th>
<th>2035 Performance Level</th>
<th>Proposed Mitigation Measure</th>
<th>Resultant Performance Level</th>
<th>Considerations</th>
</tr>
</thead>
</table>
| PRJ-45  | #7 – OR 39/Biehn Street/Campus Drive | 0.70 v/c          | 0.73 v/c               | Construct NBL               | 0.63 v/c                     | -Would require constructing second receiving lane  
- Potential impacts to adjacent gas station  
- Consider alternative mobility standard |
| PRJ-46  | #14 – Biehn Street/Oregon Avenue  | LOS “E”           | LOS “F”                | Construct SBL               | LOS “D”                      | -Eight-hour signal warrant not met in 2035  
- Peak and Four-Hour warrant is met in 2035 |
| PRJ-47  | #23 – OR 39/Espanade Street       | 0.85 v/c          | 0.95 v/c               | None Proposed               | -                            | -Severe constraints limit improvements options  
- Improvements should be focused on alternative routes |
| PRJ-48  | #27 – Main Street/OR 39           | 0.85 v/c          | 0.87 v/c               | Modify signal timing       | 0.85 v/c                     | -Constrained environment near intersection  
- Consider alternative mobility standard |
| PRJ-49  | #28 – OR 39/Washburn Way          | 0.75 v/c          | 0.78 v/c               | Modify signal phasing      | 0.73 v/c                     | -Install projected/permitted phasing northbound  
- Install permitted phasing southbound  
- Install overlap phasing for eastbound right-turn  
- Install overlap phasing for southbound right-turn  
- Consider alternative mobility standard |
| PRJ-50  | #30 – Eberlein Avenue/OR 39       | 0.90 v/c          | >1.0 v/c               | Traffic signal              | 0.51 v/c                     | -Signal warrant met in 2035 due to high right-turn |
| PRJ-51  | #33 – OR 39/Shasta Way            | 0.75 v/c          | 0.78 v/c               | Modify signal phasing      | 0.75 v/c                     | -Install protect/permitted phasing on Shasta Way  
- Consider alternative mobility standard |
| PRJ-52  | #35 – Shasta Way/Homedale Road    | LOS “E”           | LOS “F”                | Traffic signal              | LOS “C”                      | -Eight-hour signal warrant not met in 2035  
- Peak and Four-Hour warrant is met in 2035 |
| PRJ-53  | #42 – Fargo Street/OR 39          | 0.90 v/c          | >1.0 v/c               | Traffic signal              | 0.79 v/c                     | -No signal warrants met in 2035  
- Consider as part of coordinated signal system |
| PRJ-54  | #43 – Homedale Road/OR 39         | 0.85 v/c          | 0.94 v/c               | Construct EBR               | 0.83 v/c                     | -Impacts to adjacent church parking lot are likely |
| PRJ-55 | #52 – OR 140/OR66 | 0.70 v/c | 0.85 v/c | None proposed | - | -Area will be considered as part of Greensprings IAMP |
| PRJ-56 | #54 – US 97 SB Ramps/OR 140 | 0.85 v/c | >1.0 v/c | Traffic signal | 0.70 v/c | -Area will be considered as part of Greensprings IAMP |
| PRJ-57 | #56 – Greensprings Drive/OR140 | 0.90 v/c | >1.0 v/c | Traffic signal | 0.60 v/c | -Area will be considered as part of Greensprings IAMP |
| PRJ-58 | #61 – Midland Highway/OR 140 | 0.70 v/c | 0.72 v/c | Construct WBT auxiliary through lane | 0.47 v/c | -Significant expense for minor issue  
| | | | | | | -System improvements would likely mitigate impact  
| | | | | | | -Consider alternative mobility standard |
| PRJ-59 | #64 – Summers Lane/Clinton Avenue | LOS “E” | LOS “F” | Traffic signal | LOS “B” | -Eight-hour signal warrant not met in 2035  
| | | | | | | -Peak and Four-Hour warrant is met in 2035 |
| PRJ-60 | #67 – OR 39/OR 140 (Big Y) | 0.70 v/c | 0.94 v/c | Construct SBL | 0.70 v/c | -Would require second receiving lane  
| | | | | | | -Potential right-of-way impacts to adjacent parcels |
| PRJ-61 | #70 – Washburn Way/OR 140 EB Ramps | 0.85 v/c | >1.0 v/c | Traffic signal | 0.68 | -Part of identified STIP project  
| | | | | | | -Off-ramp lanes should be reconfigured |
| PRJ-62 | #75 – OR 39/OR 140 | 0.70 v/c | 0.96 v/c | Traffic signal | 0.70 v/c | -Intersection outside of UGB |
KEY DEVELOPMENT AREAS

Due to operational performance standards and roadway connectivity issues, the transportation system can at times be a barrier for development. Below is a summary of the proposed improvements (identified in the previous sections) for several key areas targeted for growth and where it is critical that barriers to development be minimized.

Pelican City

Pelican City is an area of Klamath Falls located to the northwest of downtown Klamath Falls and on the southeast side of the Klamath Lake. The area is somewhat isolated from the rest of the community by the alignment of US 97 to the east. As such, trips to and from this area rely heavily on the Lakeport Boulevard and the US 97 / Nevada Street / Oregon Avenue interchange as well as an unsignalized access to US 97 at Coli Avenue. Each of these access points to Pelican City are projected to operate acceptably with the planning horizon based on the growth assumptions for this area within the Transportation Analysis Zones. The proposed Crescent Avenue Extension project helps provide additional access routes for Pelican City and reduces reliance on US 97 and its interchanges. Proposed projects anticipated to minimize development barriers for this area include:

- Crescent Avenue Extension (PRJ-14)
- Modify transit Route 5 to serve more areas (PRJ-39)

Basin View

Basin View is an area located north of Foothills Boulevard on the northeast side of Klamath Falls. This area is projected to have new development occur in the future. Along with that development, several new collector roadways have been identified that will serve this area and provide two access points to Foothills Boulevard and one to Old Fort Road. Old Fort Road will provide a more direct route to downtown and to US 97 for development in the northern portion of the development area. Although not projected to carry a significant amount of traffic, the connection to Old Fort Road will eliminate the need for the entire area to funnel down Foothills Boulevard. With these planned connections, all study intersections serving this area are projected to operate acceptably with the planning horizon based on the growth assumptions for this area within the Transportation Analysis Zones. The
connection to Old Fort Road will increase in value if an extension of Campus Drive to Old Fort Road via Collman Dairy Road were to be planned.

Proposed projects anticipated to minimize development barriers for this area include:

- Extend multi-use path near Foothills Boulevard (PRJ-35)
- Construct new roadway north to Old Fort Road from Homedale Road/Foothills Boulevard (PRJ-40)
- Construct new roadway north from Foothills Boulevard near Beverly Drive (PRJ-41)

**Airport Industrial Park**

The Airport Industrial Park area is located to the west of the Klamath Falls Airport, east of Washburn Way, and south of OR 140. Due to limited access and crossings of OR 140, Washburn Way is the only access to the Airport Industrial Park from OR 140 and includes two at-grade railroad crossings (one on Washburn Way and one on Joe Wright Road). The Airport Industrial Park can also be accessed from US 97 via Joe Wright Road. This route has only one at-grade railroad crossing (on Joe Wright Road). With the proposed signal to mitigate operations at the intersection of Washburn Way/OR 140 Eastbound Ramp Terminal, all of the study intersections serving this area are projected to operate acceptably with the planning horizon based on the growth assumptions for this area within the Transportation Analysis Zones. If the at-grade railroad crossings result in undesirable levels of congestion due to train traffic, a more cost effective manner to address this than constructing a grade crossing would be to construct a new collector facility that avoids both rail crossings by connecting Washburn Way to Joe Wright Road east of the railroad tracks and intersecting Joe Wright Road at Airport Way (PRJ-63).

Proposed projects anticipated to minimize development barriers for this area include:

- Improve safety at OR 140 / Summers Lane (PRJ-4)
- Install traffic signal at OR 140 EB Ramps / Washburn Way (PRJ-61)
- Construct an extension/realignment of Washburn Way to the intersection of Joe Wright Road/Airport Way (PRJ-63)
South 6th Street

The South 6th Street corridor serves as a major east-west route through the Klamath Falls Urban Area. In addition, this corridor serves as a major commercial center for the area and as a key connection between downtown Klamath Falls and housing areas and additional commercial corridors, such as Washburn Way.

Given the significance of South 6th Street within the Klamath Falls transportation system, any facilities along it that exceed performance thresholds could become a barrier to development (namely the intersections of Fargo Street and Homedale Road). Additional barriers include the existing safety issues (several segments of S. 6th Street are identified as safety focus segments) and access management.

One of the intersections that require mitigation in the future is the Fargo Street intersection. A signal would mitigate the operational issues at this location. It is a closely spaced intersection with of Summers Lane and Crater Lake Parkway (OR 39) and signalization would likely require a coordinated signal system including these three intersections. The canal between Summers Lane and Crater Lake Parkway also make physical improvements to this location challenging and expensive.

Proposed projects anticipated to minimize development barriers for this area include:

- Improve safety from Summers Lane to OR 39 (PRJ-8)
- Improve safety from OR 39 to Fargo Street (PRJ-9)
- Improve safety from Homedale Road to Madison Street (PRJ-10)
- East Main Street Extension (PRJ-15)
- Install traffic signal at Fargo Street / OR 39 (PRJ-53)
- Construct eastbound right-turn lane at Homedale Road / OR 39 (PRJ-54)

Washburn Way

The Washburn Way corridor serves as a major commercial center for the Klamath Falls Urban Area, particularly south of the South 6th Street intersection. This roadway also serves as a major north-south connection through Klamath Falls, connecting with Crater Lake Parkway in the north, OR 140 in the south, and providing access to the airport.

Like South 6th Street, any facilities along Washburn Way that exceed performance thresholds could become a barrier to development; however, all of the intersections along Washburn Way are
Projected to operate acceptably within the planning horizon based on the growth assumptions for this area with the proposed traffic signal at the OR 140 Eastbound Ramp Terminal on Washburn Way. However, safety issues at the Shasta Way intersection and access management along the corridor are additional barriers to development along the corridor.

Proposed projects anticipated to minimize development barriers for this area include:

- Improve safety at Washburn Way / Shasta Way (PRJ-2)
- East Main Street Extension (PRJ-15)
- Extend Washburn Way north (PRJ-42)
- Modify signal phasing at OR 39 / Washburn Way (PRJ-49)
- Install traffic signal at OR 140 EB Ramps / Washburn Way (PRJ-61)

**Summary of Projects**

As a result of analysis conducted and input gathered as part of the TSP update effort, the following issues have been identified for the transportation system within the Klamath Falls Urban Area:

- 18 intersections are forecasted to exceed applicable mobility standards under future conditions. Mitigation measures that address these deficiencies are proposed for 16 of these locations.
- 6 intersections and 7 roadway segment were observed to exceed critical crash rates.
- Gaps in the connectivity and coverage of the pedestrian and bicycle networks were identified. An emphasis was put on proposing improvements that would improve these networks in the vicinity of schools.
- Transit service within Klamath Falls was found to cover nearly all the existing and expected transit supportive areas within the Urban Area. Future expansion of the transit system could be focused on expanding frequency, coverage, or operating hours of the service.
- Certain areas within Klamath Falls are particularly susceptible to transportation related development barriers, meaning that transportation deficiencies could make future development expensive and/or unfeasible, due to a reliance on limited access locations or proximity to critical system junctions.
Travel within Klamath Falls currently relies heavily on the state highway system for local connections. Future projects have been identified that would provide parallel or alternative routes for these trips.

Based on the issues identified above, the following recommendations have been proposed:

- Table 2 and Table 3 identify intersection and segment safety projects that should be incorporated into maintenance, capacity, or urban upgrade projects when they occur at these locations. These projects could also be considered as stand-alone safety projects.
- Alternatives and policies have been proposed for Access Management, Transportation system Management, and Transportation Demand Management.
- Figure 6 shows the roadway projects included in the alternative analysis. These are recommended for inclusion in the updated TSP.
- Figure 7 shows the recommended intersection improvement projects. These are recommended for inclusion in the updated TSP.
- Figure 2 shows the existing pedestrian facilities, gaps, and proposed priority areas.
- Figure 3 shows the existing bicycle facilities, gaps, proposed priority areas, and recommended sharrow corridors.
- Expansion of the transit system is recommended to be focused on increased frequency or extended service hours.

**Next Steps**

This memorandum serves as a summary of alternatives available to address the challenges that the Klamath Falls Urban Area transportation system is expected to face in the future. Final recommendations will be based on PMT, TAC, and CAC feedback, project cost estimates, and anticipated future funding levels. The preferred alternative will be documented and summarized in the forthcoming Technical Memorandum #6.