City of Roseburg
Transportation System Plan Update

Technical Memorandum #3
(Task 5.4 – Current System Operations)

Prepared for

City of Roseburg
900 SE Douglas Avenue
Roseburg, Oregon

Prepared by

David Evans and Associates, Inc.
2100 SW River Parkway
Portland, Oregon

October 2017

This page intentionally left blank

Table of Contents

List of Tables

List of Figures

Appendices

The Transportation System Today

This memorandum provides an overview of the current transportation system operations and deficiencies for all modes within Roseburg's Urban Growth Boundary (UGB).

The information included in this memorandum will be used in conjunction with *Technical Memorandum #2* and input from the project team to determine the existing transportation system needs for the Roseburg Transportation System Plan (TSP) update.

Introduction

Roseburg serves as the county seat and regional center of Douglas County and thus, its transportation network plays a central role in supporting the region's economic vitality and overall livability. Roseburg is also an important waypoint along Interstate 5 (I-5), located roughly midway between Eugene and Medford. By way of its central location in the county, the transportation system supports a significant share of regional automobile and truck trips. At a more localized scale, the transit, bicycle and pedestrian network serve residents and visitors alike either by commute necessity or for recreation.

All transportation modes are important to serve the needs of residents and businesses in Roseburg and the surrounding region. The Roseburg TSP will consider how well the multimodal system of highways and roads, public transit and active transportation facilities serves the transportation needs of residents, visitors, and freight shippers within and through Roseburg.

Roseburg TSP - A Comprehensive, Citywide Assessment

A TSP examines the City's multimodal transportation system as a whole, considers planning for street maintenance, connectivity, access, safety and the impact of future growth throughout the network. In order to review the system that is most likely to affect an average Roseburg citizen or visitor, and to efficiently use time and resources for analysis, TSPs generally focus on the higher-order, arterial and collector street system. Arterials and collectors, by definition, are meant to provide connections across a city and between neighborhoods and activity centers. As such, Roseburg's arterial and collector street intersections and corridors are the focus of the TSP Update.

Figure 1 summarizes Roseburg's arterial and collector street network and the study intersections. The analysis area is bounded by the Urban Growth Boundary (UGB). It should be noted that in some cases, local roadways or private streets may also have operational or safety concerns. For example, the system-wide assessment may flag either safety or traffic congestion issues on a local street that results from operational problems at adjacent intersections of the arterial/collector street network.

Street and Highway System

The assessment of traffic conditions includes development of existing traffic volumes and assessment of traffic operations for 75 study intersections within the Roseburg UGB. Of these study intersections, significant data was sourced from existing or recent studies and did not require new processing (results will still be summarized). Appendix A of this memorandum documents these locations and lists the previous study where the original analysis is found.

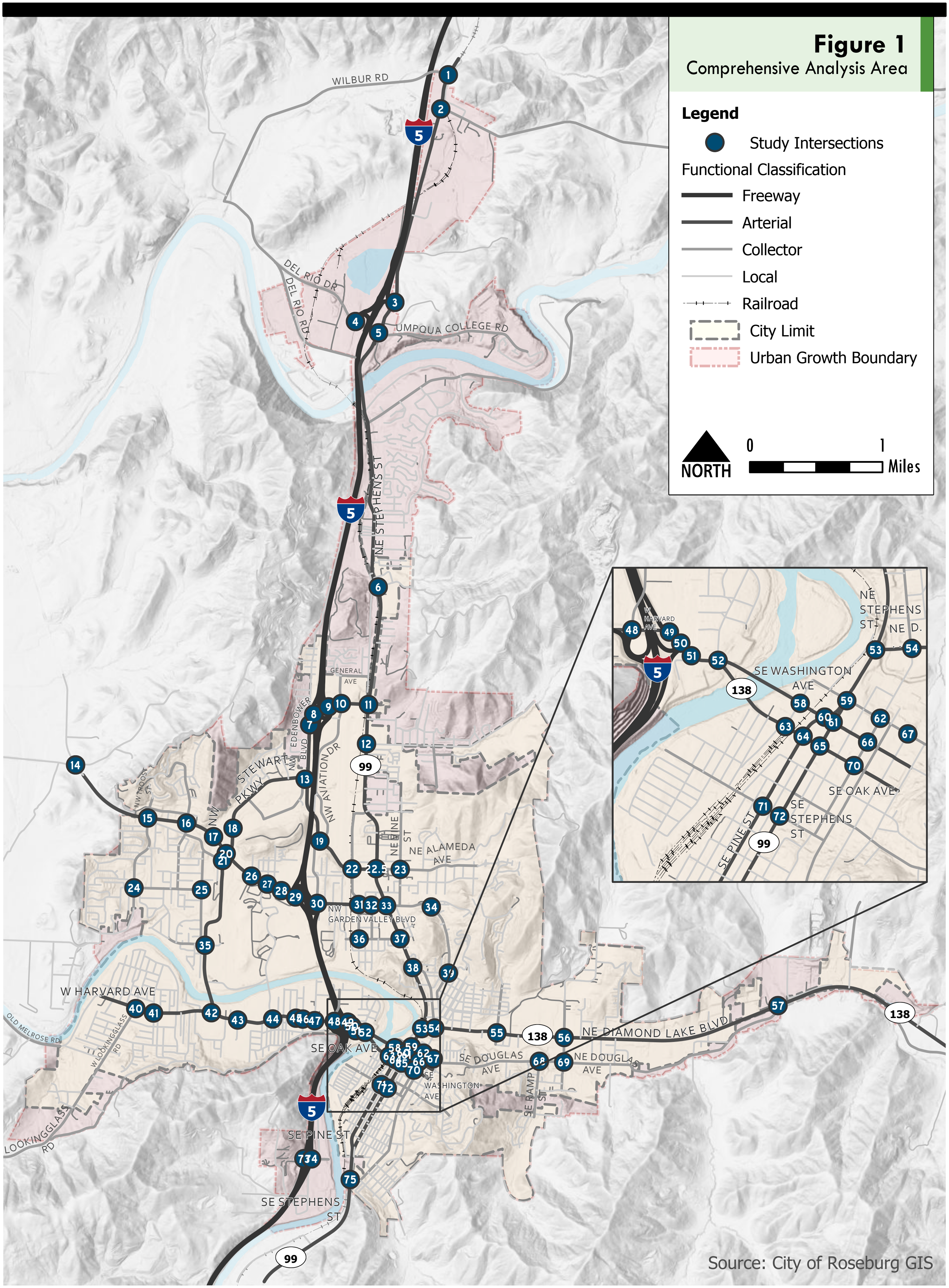


Figure 1
Comprehensive Analysis Area
Legend
Study Intersections
Functional Classification
Freeway
Arterial
Collector
Local
Railroad
City Limit
Urban Growth Boundary
NORTH
0
1
Miles
WILBUR RD
DEL RIO DR
DEL RIO RD
UMPQUA COLLEGE RD
NE STEPHENS ST
GENERAL AVE
NW EDENBOWER BLVD
NW AVIATION DR
STEWART PKWY
NW TROOST ST
NE VINE ST
NE ALAMEDA AVE
NW GARDEN VALLEY BLVD
W HARVARD AVE
OLD MELROSE RD
W LOOKINGGLASS RD
LOOKINGGLASS RD
SE OAK AVE
SE DOUGLAS AVE
NE DOUGLAS AVE
NE DIAMOND LAKE BLVD
SE WASHINGTON AVE
SE RAMP ST
SE PINE ST
SE STEPHENS ST
W HARVARD AVE
NE STEPHENS ST
NE D.
SE WASHINGTON AVE
SE OAK AVE
SE STEPHENS ST
SE PINE ST
Source: City of Roseburg GIS

Volume Development

Standard practice is to analyze a single system peak hour which represents a single hour of the day that has the highest hourly vehicular volume. For Roseburg, the common weekday peak hour for the study intersections was found to occur from 4:30 pm to 5:30 pm. The peak hour at each intersection may or may not correspond to the common peak hour. During the summer months, traffic volumes are generally higher due to an influx of visitors to the region; recreational opportunities and agriculture production are higher in the drier months as well.

The intersections that experience the highest level of vehicle traffic during the PM peak hour are concentrated near the Roseburg City Center, I-5 Exit 124 and 125 interchanges or the nexus of arterials with community destinations (commercial centers and the Roseburg VA). The top 10 most traveled study intersections during the PM Peak Hour are listed here from highest to lowest:

1. I-5 Exit 125 Southbound Ramps at Garden Valley Blvd
2. Garden Valley Blvd at Stewart Pkwy
3. Garden Valley Blvd at Stephens St
4. I-5 Exit 125 Northbound Ramps at Garden Valley Blvd / Mulholland Dr
5. Garden Valley Blvd at Garden Valley Shopping Center
6. I-5 Exit 124 SB Ramps at Harvard Ave
7. I-5 Exit 124 NB Off Ramp / Harvard Ave
8. Garden Valley Blvd at Centennial Dr / Estelle St
9. Garden Valley Blvd at Goetz St / Duck Pond St
10. I-5 Exit 124 Northbound On-Ramps at Harvard Ave

See Appendix A for a summary of volumes by movement and intersection.

Truck Traffic (Freight)

The percentage of truck traffic at the study intersections (measured by approach) ranges from 0-15% during the peak hour. Truck traffic volumes are highest along Diamond Lake Boulevard (east of Stephens Street), Stephens Street and at the intersections that access commercial centers, which is consistent with land uses along these corridors.

Heavy vehicles are more likely to be traveling north-south along I-5 and Stephens Street or east-west along OR 138. Much of the truck movement in Roseburg is attributed to the logging operations in the region (via OR 138) and interstate and regional commercial activity. In Roseburg, Reddaway Trucking and Umpqua Diary generate freight traffic along Stephens Street. Stephens Street is also used to access the Green District outside of Roseburg.

Similarly, Roseburg Regional Airport generates truck traffic from FedEx and other freight carriers.

Vehicular Analysis

Mobility Targets / Operational Criteria

Transportation engineers have established various methods for measuring traffic operations of roadways and intersections. Most jurisdictions in Oregon apply measures outlined in the Highway Capacity Manual using either the volume-to-capacity (v/c) ratio or level of service (LOS) to report intersection operations and performance. Both the LOS and v/c ratio concepts require consideration of factors that include traffic demand, capacity of the intersection or roadway, delay, frequency of interruptions in traffic flow, relative freedom for traffic maneuvers, driving comfort, convenience, and operating cost. The V/C and LOS are defined here. Also included is a description of 95th percentile queues. Queuing analysis can provide additional context to the operational outputs.

> ***Volume-to-Capacity (V/C) Ratio:*** A comparison of traffic volume demand to intersection capacity. As the v/c ratio approaches 1.00, traffic becomes more congested and unstable, with longer delays.
>
> ***Level of Service (LOS):*** Level of service is a function of control delay, which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
>
> It should be noted that, although delays can sometimes be long for some movements at a STOP-controlled intersection, the v/c ratio may indicate that there is adequate capacity to process the demand for that movement. Similarly at signalized intersections, some movements, particularly side street approaches or left turns onto side streets, may experience longer delays because they receive only a small portion of the green time during a signal cycle, but their v/c ratio may be relatively low. For these reasons, it is important to examine both v/c ratio and LOS when evaluating overall intersection operations.
>
> ***95th Percentile Queues:*** The 95th percentile queue length (meaning 95 percent of all queues will be shorter) is used to examine queuing and where demand may exceed available storage.

The City of Roseburg identifies a dual performance measure in the city's TSP. The dual performance measure refers to v/c ratio standards based on roadway classifications and also specifies a LOS performance standard of LOS D or better for signalized intersections and LOS E or better for unsignalized intersections. Roseburg also has specific standards for intersections within the downtown district boundary that allow for slightly more congestion.

Not all roadways serving the city are under Roseburg's jurisdiction. The Oregon Highway Plan (OHP) Highway Mobility Standards are the overriding operations standards for Oregon highways (I-5, freeway ramps and OR 138). Douglas County's performance standards utilize volume-to-capacity ratios that vary according to the county's roadway classifications.

The specific mobility targets for each intersection are listed in Appendix A.

Traffic Operations Analysis Procedures

All operations were evaluated using the methodology outlined in the *2010 Highway Capacity Manual* (HCM) along with the procedures outlined in ODOT's Analysis Procedures Manual (APM). The Synchro/SimTraffic analysis software was selected to perform the intersection analysis since it can provide the v/c ratio and LOS output of an HCM analysis and consider the systematic interaction of the intersections with regard to queuing and delays.

The signal timing for the existing conditions analysis was collected from the most recent signal timing worksheets provided by ODOT; in order to most accurately reflect current conditions, timing was not optimized for analysis.

Appendix A provides detailed descriptions of the nuances of the simulation software.

Driving Conditions

Figure 2 reports a summary of the vehicular traffic operational results for each analysis intersection. Level of service is indicated by color of intersection marker, with the v/c indicated in text. If an intersection marker is outlined in bold, it exceeds the applicable mobility target.

Analysis of the PM peak shows that of the 75 study intersections, four are currently not meeting mobility targets. Table 1 (Page 7) below provides a detailed summary of the existing operations for each study area intersection. The four intersections exceeding mobility targets are shaded in grey.

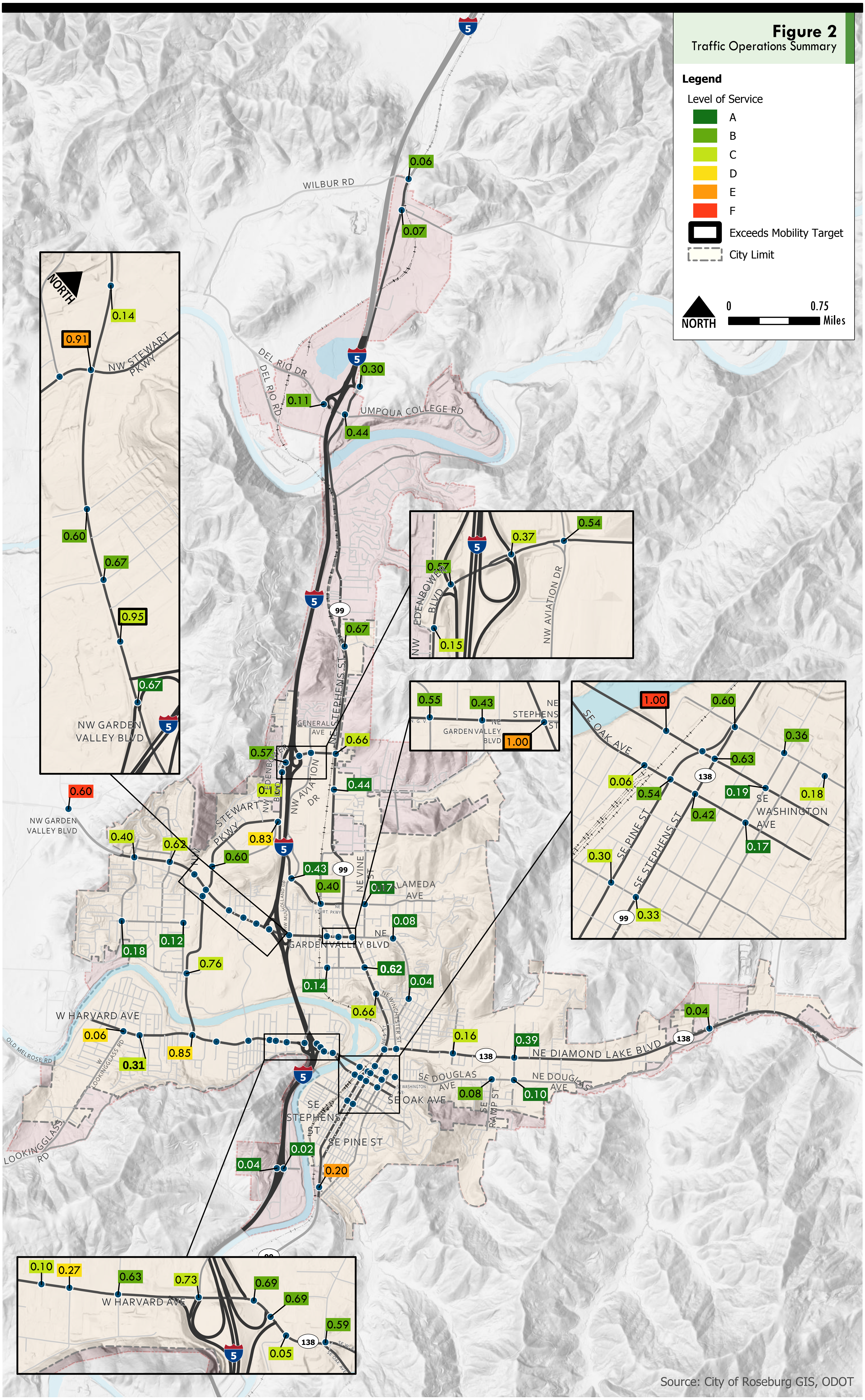


Figure 2
Traffic Operations Summary
Legend
Level of Service
A
B
C
D
E
F
Exceeds Mobility Target
City Limit
NORTH
0
0.75
Miles
WILBUR RD
DEL RIO DR
DEL RIO RD
UMPQUA COLLEGE RD
NW STEWART PKWY
NW GARDEN VALLEY BLVD
GENERAL AVE
NE STEPHENS ST
NW AVIATION DR
NW EDENBOWER BLVD
NE VINE ST
LAMEDA AVE
NE GARDEN VALLEY BLVD
W HARVARD AVE
OLD MELROSE RD
W LOOKINGGLASS RD
LOOKINGGLASS RD
NE WINCHESTER ST
NE DIAMOND LAKE BLVD
SE DOUGLAS AVE
NE DOUGLAS AVE
SE OAK AVE
SE RAMP ST
SE STEPHENS ST
SE PINE ST
SE WASHINGTON AVE
Source: City of Roseburg GIS, ODOT

TABLE 1. EXISTING (YEAR 2016) PM PEAK HOUR – INTERSECTION OPERATIONS

ID	Intersection	Critical Movement[1]	V/C[2]	LOS[2]	Mobility Target[3]
1	OR 99 at Wilbur Rd	EB L/R	0.06	B	0.85
2	OR 99 at N Bank Rd	WB L/R	0.07	B	0.85
3	OR 99 at I-5 Exit 129 NB Ramps	Overall	0.30	B	0.75
4	I-5 Exit 129 SB Ramps at Del Rio Rd	SB L	0.11	B	0.95
5	OR 99 at Del Rio Rd at Umpqua College Rd	Overall	0.44	B	0.85, LOS D
6	Stephens St at Kenneth Ford Dr	Overall	0.67	B	0.85, LOS D
7	Edenbower Blvd at Broad St*	EB L/R	0.15	C	0.85, LOS E
8	I-5 Exit 127 SB Ramps at Edenbower Blvd*	Overall	0.57	B	0.85
9	I-5 Exit 127 NB Ramps at Edenbower Blvd*	NB L/T	0.37	C	0.85
10	Edenbower Blvd at Aviation Dr*	Overall	0.54	B	0.85, LOS D
11	Edenbower Blvd at Stephens St*	Overall	0.66	C	0.85, LOS D
12	Stephens St at Newton Creek Rd	Overall	0.44	A	0.85, LOS D
13	Stewart Pkwy at Edenbower Blvd*	Overall	0.83	D	0.85, LOS D
14	Garden Valley Blvd at Melrose Rd	EB L/T	0.60	F	0.85
15	Garden Valley Blvd at Troost St	Overall	0.40	C	0.85, LOS D
16	Garden Valley Blvd at Kline St	Overall	0.62	C	0.85, LOS D
17	Garden Valley Blvd at Roseburg Valley Mall (Middle Entrance)	SB L/R	0.14	C	0.85, LOS E
18	Stewart Pkwy at Roseburg Mall Entrance	Overall	0.60	B	0.85, LOS D
19	Stewart Pkwy at Aviation Dr/Mullholland Dr	Overall	0.43	A	0.85, LOS D
20	**Garden Valley Blvd at Stewart Pkwy****	**Overall**	**0.91**	**E**	**0.85, LOS D**
21	Stewart Pkwy at Valley View Dr	EB L	0.46	E	0.85, LOS E
22	Stewart Pkwy at Airport Rd	Overall	0.40	B	0.85, LOS D
23	Vine St at Alameda Ave	NB L/T/R	0.17	A	0.90, LOS E
24	Troost St at Calkins Rd	SB L/T/R	0.18	A	0.90, LOS E
25	Keasey St at Calkins Rd	EB L/R	0.12	A	0.90, LOS E
26	Garden Valley Blvd at Goetz St/Duck Pond St	Overall	0.60	B	0.85, LOS D
27	Garden Valley Blvd at Centennial Dr at Estelle St**	Overall	0.67	B	0.85, LOS D
28	**Garden Valley Blvd at Garden Valley Shopping Center****	**Overall**	**0.95**	**C**	**0.85, LOS D**
29	I-5 Exit 125 SB Ramps at Garden Valley Blvd**	Overall	0.67	A	0.85
30	I-5 Exit 125 NB Ramps at Garden Valley Blvd at Mulholland Dr**	Overall	0.80	C	0.85
31	Garden Valley Blvd at Airport Rd at Cedar St**	Overall	0.55	B	0.85, LOS D
32	Garden Valley Blvd at Walnut St	Overall	0.43	B	0.85, LOS D
33	**Garden Valley Blvd at Stephens St****	**Overall**	**>1.0**	**E**	**0.85, LOS D**
34	Garden Valley Blvd at Rocky Ridge Dr	SB L/R	0.08	A	0.85, LOS E
35	Stewart Pkwy at Harvey Ave	Overall	0.76	C	0.85, LOS D
36	Chestnut Ave at Cedar St	WB L/T/R	0.14	A	0.90, LOS E
37	Stephens St at Chestnut Ave	Overall	0.62	A	0.85, LOS E
38	Stephens St at Winchester St	SB L	0.66	C	0.85, LOS E
39	Lincoln St at Malheur Ave	WB L/T/R	0.04	A	0.90, LOS E
40	Harvard Ave at Lookingglass Rd	NB L	0.06	D	0.85, LOS E
41	Harvard Ave at W Broccoli St	SB L/T/R	0.31	C	0.85, LOS E
42	Harvard Ave at Stewart Pkwy**	Overall	0.85	D	0.85, LOS D
43	Harvard Ave at W Keady Ct.	Overall	0.50	B	0.85, LOS D
44	Harvard Ave at Centennial Dr	Overall	0.57	A	0.85, LOS D
45	Harvard Ave at Maple St **	SB L/R	0.10	C	0.85, LOS E

TABLE 1. EXISTING (YEAR 2016) PM PEAK HOUR – INTERSECTION OPERATIONS

ID	Intersection	Critical Movement[1]	V/C[2]	LOS[2]	Mobility Target[3]
46	Harvard Ave at Harrison St **	NB L/T/R	0.27	D	0.85, LOS E
47	Harvard Ave at Umpqua St **	Overall	0.63	B	0.85, LOS D
48	I-5 Exit 124 SB Ramps at Harvard Ave**	Overall	0.73	C	0.85
49	I-5 Exit 124 NB On-Ramps at Harvard Ave**	Overall	0.69	B	0.85
50	I-5 Exit 124 NB Off Ramp at Harvard Ave**				
51	Harvard Ave at Corey St **	NB L/R	0.05	C	0.90
52	Washington Ave at Madrone St **	Overall	0.59	B	0.90
53	Diamond Lake Blvd at Stephens St	Overall	0.55	C	0.90
54	Diamond Lake Blvd at Jackson St at Winchester St	Overall	0.62	C	0.90
55	Diamond Lake Blvd at Fulton St	SB L/T/R	0.16	C	0.95 (N/S) 0.90 (E/W)
56	Diamond Lake Blvd at Rifle Range St	Overall	0.39	A	0.90
57	Diamond Lake Blvd at Douglas Ave	NB L/R	0.04	B	0.90 (N/S) 0.85 (E/W)
58	**Washington Ave at Spruce St ** **	**NB L/T**	**>1.0**	**F**	**0.95, LOS E**
		WB L/T	0.42	A	0.90
59	Stephens St at Douglas Ave	Overall	0.60	B	0.90
60	Washington Ave at Pine St	Overall	0.66	C	0.90
61	Washington Ave at Stephens St	Overall	0.63	B	0.90
62	Douglas Ave at Jackson St	EB L/T/R	0.36	B	0.95, LOS E
63	Oak Ave at Spruce St **	SB L	0.06	C	0.90
64	Oak Ave at Pine St	Overall	0.54	B	0.90
65	Oak Ave at Stephens St	Overall	0.42	B	0.90
66	Washington Ave at Jackson St	WB L/T	0.19	A	0.95, LOS E
67	Douglas Ave at Kane St	NB L	0.18	C	0.95, LOS E
68	Douglas Ave at Ramp Rd	NB L	0.08	B	0.90, LOS E
69	Douglas Ave at Rifle Range St	SB L/R	0.10	A	0.90, LOS E
70	Oak Ave at Jackson St	EB T	0.17	A	0.95, LOS E
71	Pine St at Mosher Ave	EB T/R	0.30	C	0.95, LOS E
72	Stephens St at Mosher Ave	EB L/T	0.33	C	0.95, LOS E
73	I-5 Exit 123 SB Ramps at Portland Ave	WB L/T	0.04	A	0.95
74	I-5 Exit 123 NB Ramps at Portland Ave	NB T/R	0.02	A	0.95
75	Stephens St at S Gate Shopping Center	WB L/T	0.20	E	0.85, LOS E

Shaded rows exceed applicable mobility targets; Acronyms: EB = eastbound; WB = westbound; NB = northbound; and SB = southbound. L = left; T = through; and R = right.

* Intersection operations reported from Interchange Area Management Plan (IAMP) 127 (December 2014)

** Intersection operations reported from Draft IAMPs 124/125 (October 2013)

1. At intersections the results are reported for the worst operating movements on major and minor approaches that must stop or yield the right of travel to other traffic flows. For signalized intersections, the overall operations are reported.
2. The v/c ratios and LOS are based on the results of the macrosimulation analysis using Synchro, which does not account for the influence of adjacent intersection operations.
3. Mobility target is reported for the critical movement; Unsignalized intersections may have two different mobility targets for the major and minor approaches (Action 1F.1, Oregon Highway Plan, 1999)

Signalized Intersection Operations

All of the study intersections that fail to meet mobility targets were analyzed as part of the Interchange Area Management Plans (IAMPs) for I-5 Exits 124 and 125. Garden Valley Boulevard at Stewart Parkway, Garden Valley Boulevard at Stephens Street, and Garden Valley Boulevard at BLM Access/Garden Valley Shopping Center intersections are signalized intersections either approaching or exceeding capacity.

All legs of the intersection of Garden Valley Boulevard at Stewart Parkway are congested during the PM Peak Hour. Many of the left turning movements approach or exceed their capacity, meaning that vehicles may have to wait for the traffic signal to cycle through at least once before they are able to pass through the intersection. Similarly, the intersection of Garden Valley Boulevard at the Shopping Center (and BLM access) is approaching capacity for movements coming out of the Shopping Center and BLM.

Garden Valley Boulevard at Stephens Street is the only intersection experiencing an overall v/c exceeding 1.0. When the traffic demand exceeds the available capacity (v/c greater than 1.0) vehicles experience excessive delay and queuing. It is also expected that vehicles may require more than one signal cycle to pass through the intersection. Stephens Street via Garden Valley Boulevard is the primary route linking northwest Roseburg and Garden Valley commercial centers with northeast Roseburg and downtown. The lack of alternate routes forces this intersection to accommodate more traffic than it can handle. Harvard Avenue/Washington Avenue/Oak Avenue via Stewart Parkway and Stewart Park Drive also serves as a connection between west and northwest Roseburg and east and downtown Roseburg. However, this route experiences less regional traffic from neighboring rural communities to the northwest visiting Roseburg's commercial centers since it is less direct.

Unsignalized (STOP Controlled) Intersection Operations

Critical movements at unsignalized intersections are typically the minor-street left turns or, in the case of single-lane approaches, the minor street approaches. These movements are required to yield to all other movements at the intersection and thus are subject to the longest delays and have the least capacity. Left turns from the major street are also subject to delays, since motorists making these maneuvers must also yield to oncoming major-street traffic.

The intersection of Washington Street (OR 138) at Spruce Street is a two-way STOP controlled intersection. Washington Street (OR 138) is part of a couplet and mostly serves traffic traveling west. Spruce Street is a local street, however the OHP mobility target governs (it would fail the local target as well). The users experiencing the long delays at this intersection are northbound vehicles that must stop and wait for a gap in westbound traffic before continue through the intersection.

Several intersections are approaching the mobility targets and will likely become further congested in the future. The intersections to flag for further review in the future year 2040 analysis are:

- 13. Stewart Pkwy at Edenbower Blvd (overall)
- 21. Stewart Pkwy at Valley View Dr (eastbound movements)
- 30. I-5 Exit 125 NB Ramps at Garden Valley Blvd at Mulholland Dr (overall)
- 40. Harvard Ave at Lookingglass Rd (northbound movements)
- 42. Harvard Ave at Stewart Pkwy (overall)
- 46. Harvard Ave at Harrison St (northbound movements)
- 75. Stephens St at S Gate Shopping Center (westbound movements)

Appendix A summarizes the results of the traffic operations analysis and presents the v/c ratios and LOS performance by lane group for the studied intersections. It also summarizes the overall operational results at the signalized intersections and the individual movements.

System Queuing Analysis

In addition to the operational criteria that measure intersection performance, it is also important to examine queuing and where demand may exceed available storage. Queues that spill out of storage bays and into adjacent travel lanes impair intersection performance by reducing capacity and creating potential safety concerns. Queues may also extend from one intersection through another upstream intersection which also impairs performance. The 95^{th} percentile queue length (meaning 95 percent of all queues will be shorter) is used for this analysis.

Intersections that meet mobility targets and Roseburg's transportation network are able to successfully serve vehicles throughout the day. That said, users may still encounter areas of slowing that are considered acceptable by operational standards, but can influence how a driver perceives traffic congestion along their route. Areas that experience the most congestion are the main arterial corridors at intersections and in areas with increased accesses/driveways. These routes are Stewart Parkway, Garden Valley Boulevard, Edenbower Boulevard, Harvard Avenue and Stephens Street. These areas are described in more detail below and generally pertain to PM Peak Hour conditions.

Stewart Parkway is one of the few north-south routes that cross the South Umpqua River in the study area (the others are Stewart Park Drive and I-5). Because of this, vehicles traveling from northwest Roseburg to southwest and south have limited options, which causes vehicles to queue back at intersections with other arterial corridors (Garden Valley Boulevard, Edenbower Boulevard and Harvard Avenue).

Garden Valley Boulevard experiences the longest queues near Stewart Parkway, Garden Valley Shopping Center, the I-5 interchange ramp terminals and the west leg of the intersection with Stephens Street. In the westbound direction through these areas, congestion could be due to higher lane utilization in the right lane as most cars are vying to position themselves to enter the freeway or shopping center. In the eastbound direction, vehicles wanting to travel toward southeast Roseburg must go via the intersection with Stephens Street.

Edenbower Boulevard serves traffic entering and exiting the freeway at I-5 Exit 127. These volumes cause consistent queuing at the intersection with Stewart Parkway, and occasional queuing with Aviation Drive and Edenbower Boulevard.

Harvard Avenue is the most direct east-west route to and from downtown Roseburg and the primary route to Roseburg High School and I-5 Exit 124. Queuing is most prevalent along this corridor near these locations due to their close proximity to each other and importance as community features.

Stephens Street experiences the most queuing near its intersections with other arterials such as Stewart Parkway, Garden Valley Boulevard and OR 138. It is the primary north-south route into and out of downtown Roseburg and serves a significant amount of the freight traffic within and through Roseburg.

The recent improvements to the OR 138 corridor have improved traffic flow along its route through downtown.

Many two-way STOP-controlled streets intersecting the main corridors (e.g. Lookingglass Road, Chestnut Avenue and Winchester Street) will queue back a couple hundred feet during the peak hour, especially if there are multiple left-turning vehicles. Side street queuing increases during the peak commute hours (morning, lunch time and evening) during the weekdays, but is mostly likely not occurring continuously throughout the day.

For further details on specific movements that exceed available capacity and detailed simulation results, see Appendix A.

Pedestrian Network Evaluation

A robust pedestrian network provides a safe, convenient and accessible system of sidewalks, paths and crossings. The pedestrian experience is also linked to other modal systems. For example, crossing several lanes of traffic increases stress on the pedestrian, while the presence of bicycle lanes improves comfort by providing a buffer between the pedestrian and vehicles. Opportunities to improve transit and active transportation connectivity can also provide benefits to pedestrian mobility. This section reviews Roseburg's pedestrian network at a system-wide level.

Pedestrian facilities were evaluated for all arterials and collectors, as well as any roadways or pathways that provide critical routes or links within the study area. The assessment was done based on the qualitative multimodal application as outlined in the ODOT Analysis Procedures Manual (APM).

A qualitative multimodal analysis provides a comprehensive assessment of all modes, taking into account the impact of adjacent modes of travel. The pedestrian analysis conducted as part of this TSP uses available data from *Technical Memorandum #2 (Transportation System Inventory)*. The analysis uses a ranking system with four categories, from poor to excellent and is summarized in Table 2. These rankings take into account available facilities and many factors that influence the comfort of a pedestrian.

When rating each pedestrian corridor, the following factors were considered:

- Outside travel lane width
- Bicycle lane/shoulder width
- Presence of buffers (landscaped or other)
- Sidewalk/path presence
- Lighting
- Number of travel lanes
- Speed of motorized traffic
- Traffic control
- Crossing width
- Distance between crossings
- Median islands
- Number of accesses/points of vehicle interaction

The presence of sidewalks alone does not necessarily warrant a "good" rating as that sidewalk could need significant upgrades, maintenance, or not feel safe to the user. Most of Roseburg's existing pedestrian facilities could be classified a "fair" or "good". Though none of the segments are rated "excellent", there are several ways to improve existing sidewalks, like adding landscaping, street lighting or upgrading facilities to current standards. For example, Vine Street has sidewalk pavers, a bicycle lane that buffers vehicle traffic, good lighting and low roadway speeds; but is missing extra amenities such as designated mid-block crossings, pedestrian refuges and transit accessibility features.

Trails and Multi-Use Paths

The City also maintains a system of trails and multi-use paths, however the existing database does not provide enough detailed information to inform a qualitative analysis. General observations on the trail system and its connections to the greater transportation system are provided below.

Recent improvements have linked the existing trail system that runs adjacent to the South Umpqua River through Stewart Park, the Duck Pond, the Veterans Administration Campus, Gaddis Park and into the downtown corridor within central Roseburg all the way south to the Green District. A secondary connection was also just completed, providing access from Roseburg High School directly into the downtown corridor adjacent to Oak Avenue. This entire system links most neighborhoods and areas within the southern half of the UGB all the way north to Garden Valley Boulevard.

North of Garden Valley Boulevard there are no multi-use trails. Pedestrian and bicycle access is limited to the use of sidewalks and roadway bike lanes where they exist. Connectivity is limited, specifically to the Winchester area north of Roseburg and the Umpqua Community College Campus.

The system currently lacks lighting and other safety related amenities for the multi-use path located adjacent to the South Umpqua River. Lighting multi-use paths increases user comfort and potentially provides safety benefits.

The system is depicted graphically in the bicycle network evaluation (page 17).

TABLE 2. PEDESTRIAN SYSTEM QUALITATIVE ASSESSMENT

Roadway Name	Assessment
Airport Rd	Fair
Alameda Ave	Poor
Aviation Dr	Good
Bellows St	Poor
Calkins Ave*	Fair
Cedar St (north of Chestnut Ave)	Good
Chestnut Ave	Good
Diamond Lake Blvd	Fair
Douglas Ave (east of Ramp Rd)	Poor
Douglas Ave (west of Ramp Rd)*	Good
Edenbower Blvd (north of Stewart Pkwy)	Good
Edenbower Blvd (between Renann St and Stewart Pkwy)	Good
Fairmount Ave*	Poor
Fulton St	Poor
Garden Valley Blvd (east of Stephens St)*	Good
Garden Valley Blvd (west of Stephens St)*	Fair
Harvard Ave*	Fair
Harvey Ave	Good
Highland Dr*	Fair
Hughwood Dr	Good
Jackson St (between Mosher Ave and Douglas Ave)	Good
Kane St	Fair
Keasey St	Good
Kline St	Good
Lane Ave (east of Stephens St)	Good
Lincoln St	Poor
Lookingglass Rd	Poor
Main St (between Lane Ave and Douglas Ave)	Good
Mosher Ave	Good
Oak Ave*	Good
Pine St	Good
Ramp St	Fair
Renann St	Good
Rifle Range St	Good
Stephens St (Old Highway 99)*	Fair
Stewart Pkwy	Good
Troost St	Good
Valley View Dr (between Kline St and Stewart Pkwy)	Poor
Vine St*	Good
Walnut St (north of Chestnut Ave)	Good
Washington Ave*	Good
Winchester St	Fair
* Identified as a critical route for pedestrians	

Looking east along Douglas Ave, east of Rifle Range St
Assessment: Poor (Image Source: Bing Maps 2015)

Looking west along Calkins Ave, west of Keasey St
Assessment: Fair (Image Source: Bing Maps 2015)

Looking south along Vine St at Roseland Ave
Assessment: Good (Image Source: Bing Maps 2015)

Transit System Operations

Similar to the pedestrian network analysis, the transit system assessment was completed based on the qualitative multimodal application that is outlined in the ODOT APM and uses available data from *Technical Memorandum #2 (Transportation System Inventory)*.

The ratings of each transit corridor are summarized in Table 3. Roadways with transit service are assigned a context-based subjective "Excellent/Good/Fair/Poor" rating based on the following factors:

- ***Frequency and on-time reliability:*** More frequent service and higher on-time schedule reliability are better than less frequent service and less reliable schedules.
- ***Schedule speed/travel times:*** Faster average peak hour schedule speeds and travel times are rated better than slower speeds and longer travel times.
- ***Transit stop amenities:*** The presence of shelters, benches, and lighting is rated better than stops with limited or no amenities. High-rated stops should have adequate boarding/maneuvering areas.
- ***Connecting pedestrian/bike network:*** Stops connected to a network of paths or sidewalk-equipped streets with improved crossings are better than those with no pedestrian facilities.

At best, transit frequency in Roseburg is hourly, which is considered "fair". Service every half hour would be considered "good". Increasing the frequency of transit service would also have the additional benefit of improving the pedestrian experience.

It is important to remember that every transit rider is either a pedestrian or cyclist, and thus a connected and accessible bicycle and pedestrian system is critical in supporting an active transit system. Whether walking or using a mobility device, all riders need to be able to get to their stops safely and comfortably. In some cases, transit is the primary means of transportation for some people, including youth, seniors and people with disabilities. In Roseburg, less than half of the transit stops have covered seating, though most have some form of wayfinding signage. Lower scoring is mostly due to transit schedules/frequency.

An example of Umpqua Transit's covered bus stop on Stephens St with wayfinding signage (Image Source: Google Maps 2015)

TABLE 3. TRANSIT SYSTEM QUALITATIVE ASSESSMENT

Roadway Name	Transit
Diamond Lake Blvd	Fair
Garden Valley Blvd (west of Stephens St)*	Fair
Harvard Ave*	Fair
Oak Ave*	Fair
Pine St	Poor
Stephens St (Old Highway 99)*	Fair
Stewart Pkwy	Poor
Washington Ave*	Fair

* Identified as a critical route for pedestrians

Recently (October 1, 2017) Greyhound bus service was discontinued in Roseburg. It should also be noted that Douglas County has decided to establish a Transit District and the TSP process is tracking its progress.

Bicycle Level of Traffic Stress Analysis

The City of Roseburg has gone through a number of planning efforts that either directly or indirectly address bicycle needs within the city.[1] As mentioned in *Technical Memorandum #2: Transportation System Inventory*, the current bicycle network in Roseburg links neighborhoods to local destinations through the use of multi-use paths and trails, as well as marked bicycle lanes on arterial and collector roads. This network is an important foundation for a continuous and connected bicycle system; which is underscored by the designation of Roseburg as a Bronze Status bicycle friendly community by the League of American Bicyclists.

That said, the presence of a bike lane does not necessarily translate to a comfortable experience for a bicyclist and the Bicycle Level of Traffic Stress (LTS) methodology can aide in identifying where the bicycle network can be improved.

The bicycle operations within the study area were analyzed using ODOT's methodology for Bicycle LTS for roadway segments. LTS measures the effect of traffic-based stress on bicycles by quantifying the perceived comfort levels a bicyclist experiences on a given facility. Some characteristics used to determine LTS are presence of a bicycle lane, width of facilities, posted speed, adjacent parking facilities and land use (rural or urban). Roseburg's network is mostly considered urban. Where roadway speeds exceed 40 mph and curb or sidewalk is not present, the rural standard was applied. The LTS methodology does not account for the steepness of the roadway.

LTS can be classified as Level 1, 2, 3 or 4, where Level 1 is low stress and Level 4 is high stress.

Figure 3 displays the LTS for each collector/arterial within the City of Roseburg. The corridors are segmented by determining factors such as speed, presence of bike lanes or number of traffic lanes. Background information for how the LTS was calculated is available in Appendix B.

[1] Roseburg Bike and Pedestrian Plan, 2009

LTS is greatly influenced by traffic speeds. LTS methodology will score a segment of roadway without a bike lane higher than one with if the traffic speeds on the shared facility are less than or equal to 25 mph and the dedicated bike lane facility has to travel adjacent to vehicles traveling at 35 mph.

Along Roseburg's most heavily traffic roadways, bicyclists are required to share the road or travel next to fast moving vehicles. Though the downtown network has low speeds, bicyclists may have to dodge car doors or vehicles with hindered sight distance. The study area roadways that were measured at a LTS 3 and 4, were due to lack of facilities/buffers and high vehicular speeds. The segments that are classified as LTS 1 have either separated bicycle facilities or low traffic speeds on low volume roadways. As previously mentioned, the methodology does not consider inclines. It should be noted that steep roadways such as SE Lane Avenue are considered to operate at LTS 1, but are likely an uncomfortable experience for cyclists.

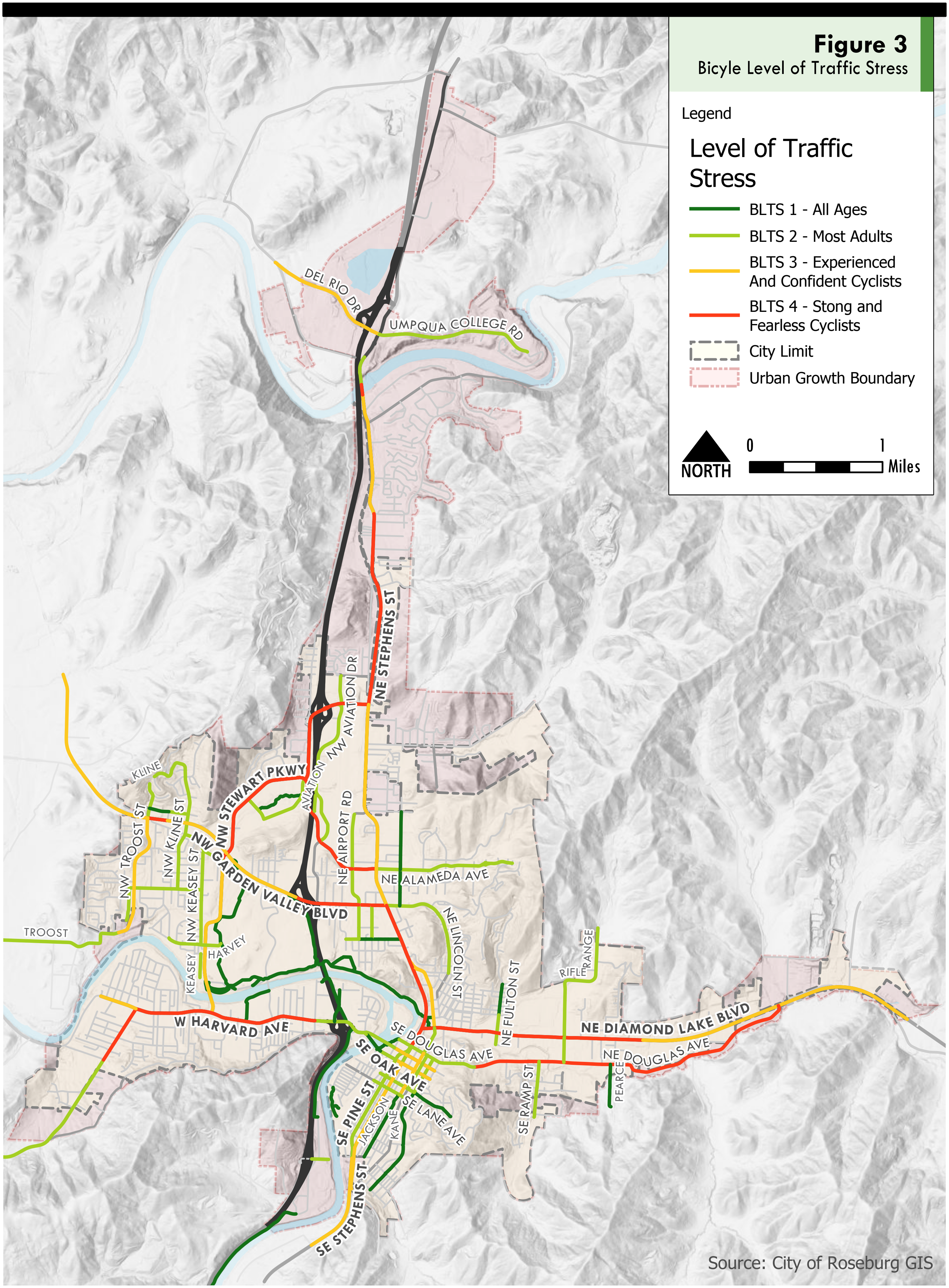


Figure 3
Bicyle Level of Traffic Stress
Legend
Level of Traffic Stress
BLTS 1 - All Ages
BLTS 2 - Most Adults
BLTS 3 - Experienced And Confident Cyclists
BLTS 4 - Stong and Fearless Cyclists
City Limit
Urban Growth Boundary
NORTH
0
1
Miles
DEL RIO DR
UMPQUA COLLEGE RD
NE STEPHENS ST
NW AVIATION DR
AVIATION
NW STEWART PKWY
KLINE
NW TROOST ST
NW KLINE ST
NW KEASEY ST
NW GARDEN VALLEY BLVD
NE AIRPORT RD
NE ALAMEDA AVE
NE LINCOLN ST
TROOST
HARVEY
KEASEY
W HARVARD AVE
SE DOUGLAS AVE
SE OAK AVE
SE PINE ST
JACKSON
KANE
SE LANE AVE
SE STEPHENS ST
NE FULTON ST
RIFLE
RANGE
NE DIAMOND LAKE BLVD
NE DOUGLAS AVE
PEARCE
SE RAMP ST
Source: City of Roseburg GIS

Freight Assessment

Truck Mobility

I-5 serves interstate commerce and is the primary freight route linking Roseburg and the Greater Douglas County area with destinations along the west coast. OR 138 is designated by ODOT as a "Reduction Review Route". This type of route requires review of any "hole in the air" capacity, meaning that potential projects need to consider the entire area (height, width and length) a truck and its load will occupy while traversing a section of roadway.

According to the current Roseburg TSP, "freight transportation movement is a major transportation issue in Roseburg". Important local freight routes include Garden Valley Boulevard, Stephens Street, Pine Street, and Diamond Lake Boulevard. In addition to these corridors, I-5 and the interchange ramps in the study area are important routes for serving freight.

As previously noted within this report, due to topography of the area and existing routes, I-5 is used by local residents more often than not as a local arterial to travel back and forth between one side of the river and the other. This is most notable between Exit 124 (Harvard Avenue Interchange) and Exit 125 (Garden Valley Boulevard Interchange), but is also evident for the entire corridor between Exits 119 and 129. Since areas north and south of Roseburg are home for many who work and shop in Roseburg, this puts additional local area traffic stress on this bottleneck section of I-5.

Geometric Deficiencies

There is an upcoming project in the Roseburg area that will include a detailed traffic analysis of recurring traffic flow bottlenecks on the I-5 mainline between Exits 129 and 119. The congestion limits the freeway system's function, capacity and performance to efficiently move traffic through the greater Roseburg area. Existing geometric concerns at the interchanges are summarized below.

Exit 129 (Winchester): The interchange was relocated to the north, expanded, and reconstructed in 2008-2009 and there are no observable geometric deficiencies or congestion issues with this new intersection now that it properly aligns with Umpqua College Road and the re-aligned Del Rio Road.

Exit 127 (North Roseburg): Recent improvements were made to the signalized intersections of Edenbower Boulevard at Aviation Drive and Edenbower Boulevard at Stephens Street improved the overall functionality of this interchange. From a local functionality standpoint, as traffic continues to increase on Edenbower, the westbound turn onto Edenbower from the northbound off ramp will continue to be a source of frustration and difficult turning movement until this becomes signalized.

Exit 125 (Garden Valley): During periods of peak traffic, congestion on the I-5 Exit 125 northbound off ramp often backs up onto I-5, creating a dangerous situation for all northbound I-5 traffic. This deceleration length is deficient and lacks sufficient storage for and queuing. There are also deficient acceleration lengths of the on ramps and spacing between ramps.

Exit 124 (Harvard): Similar to Exit 125, the Harvard Avenue Interchange has remained unchanged for many years primarily due to the physical constraints that Mt. Nebo, the South Umpqua River and Roseburg High School put on the interchange. In addition to the existing topography, the interchange ramps have deficient acceleration and deceleration lengths. Compounded with sight distance concerns, the interchange could create unsafe conditions on the mainline.

Exit 123 (Fairgrounds): The Douglas County Fairgrounds Interchange provides access to a handful of homes and the Douglas County Fairgrounds. This interchange, specifically the southbound off-ramp, has deficient deceleration lengths. This becomes a problem during large events at the Fairgrounds such as the Douglas County Fair, concerts, and racing events. During these events, traffic will back up onto I-5 and special “event congestion” signage and traffic control is required on I-5.

Rail Freight

The Central Oregon & Pacific Railroad (CORP) operates several trains that pass through Roseburg. The railroad route in the study area runs approximately parallel to I-5 and Stephens Street, about a half-mile east of the highway. There are at-grade railroad crossings at the following cross streets:

- Edenbower Boulevard
- Stewart Parkway
- Garden Valley Boulevard
- Chestnut Avenue
- Douglas Avenue
- Washington Avenue
- Oak Avenue
- Mosher Avenue
- Hooker Road

All of the crossings have some form of Train Activated Warning Device, however none have pedestrian gate arms. When trains pass through Roseburg, cross-traffic is required to stop. Depending on the time of day, this causes varying lengths of queued vehicles and causes delay for all modes that are required to wait for the train to pass. As of 2016 the CORP operates, at most, 36 trains a week through Roseburg.

The CORP switch yard was recently relocated from the Mill-Pine District of Roseburg, located directly adjacent to and the southwest of the Downtown Corridor, north of town to the Winchester area. Prior to this move; the loading, unloading, and stacking of trains would stop traffic in and around the Oak Avenue/Washington Avenue area multiple times a day. Parked trains often stopped traffic for up to 15 minutes at a time, sometimes backing up all the way to the I-5 Exit 124 interchange. This caused traffic congestion and delay on a daily basis. Since the move of the switchyard, current delays are limited to only a few minutes at a time.

While the relocation of the switchyard has greatly reduced rail related impacts and congestion in the central Roseburg area, it has created a congestion issue at the northern edge of the UGB. When trains are being stacked at the new switchyard location in Winchester, they often are backed up and parked over Highway 99 (North Stephens Street) and North Bank Road to the east of the switchyard; again, for up to 15 minutes at a time. While there are alternative routes for traffic to get around HWY 99 at this location (specifically by using Wilbur Road), there are no alternative routes to alleviate traffic on North Bank Road. North Bank Road provides access between Wilbur and Glide and is a secondary alternative to Diamond Lake Boulevard for access to the North Umpqua River, Diamond Lake, and Crater Lake. North Bank Road between Wilbur and Glide is also a rural residential area for residential homes and ranches.

The Douglas County Public Works Department has been looking for several years at providing an alternative route around the railroad tracks and switchyard to North Bank Road, but has yet to find an alternative alignment or funding source for this project.

Safety Analysis

A safety analysis was conducted to determine whether any significant, documented safety issues exist within the management area and to inform future measures or general strategies for improving overall safety. This analysis includes a review of crash records, crash rates, and ODOT Safety Priority Index System (SPIS) data. Supporting documentation for the safety analysis is found in Appendix C.

Crash History

The crash analysis included a review of crash history data supplied by the ODOT Crash Analysis and Reporting Unit for the period between January 1, 2011, and December 31, 2015, which were the five most recent full years for which crash data were available at the time of the analysis. A summary of collision types is presented in Exhibit 1, the city-wide data is summarized in Table 4 and breakdown of crashes at study area intersections and segments are presented in Table 4 and Table 5 , respectively.

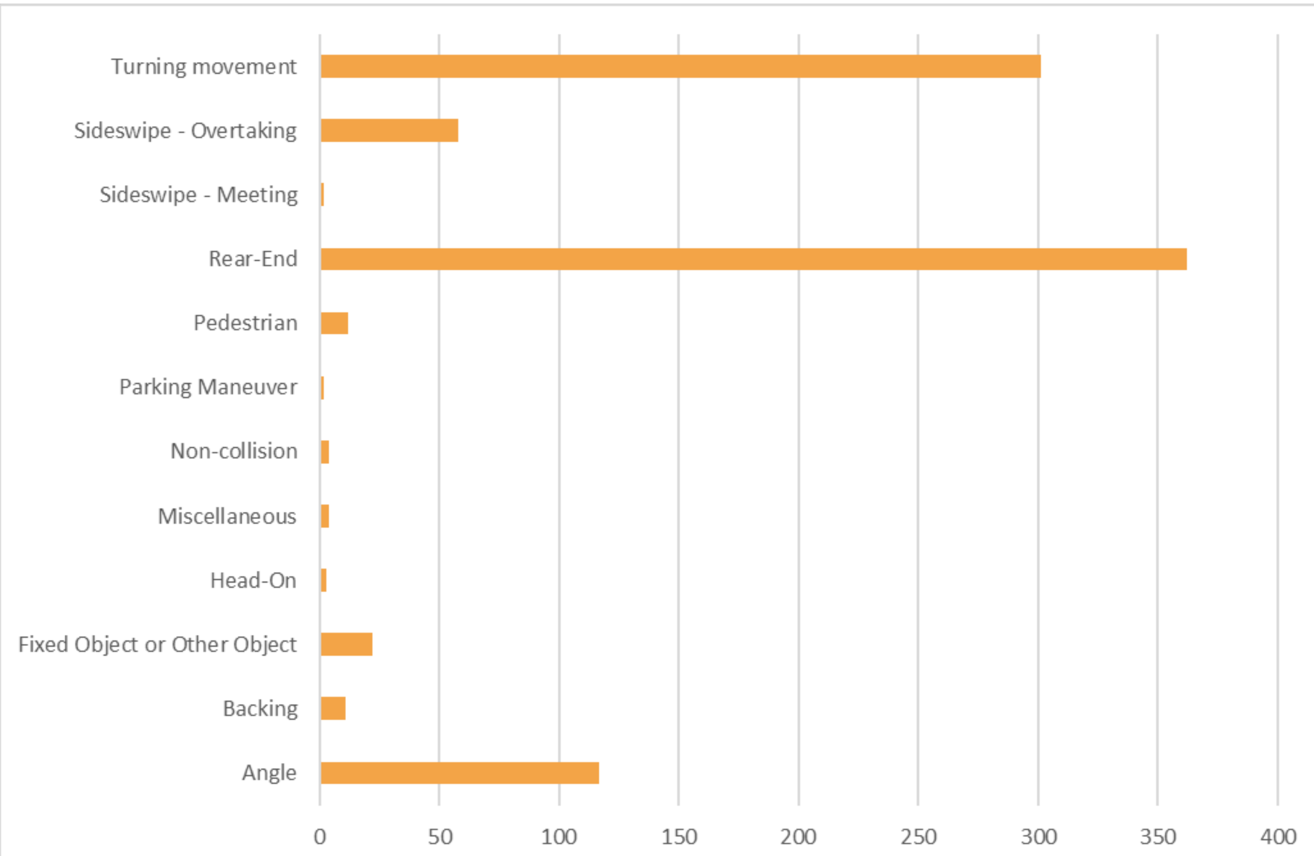
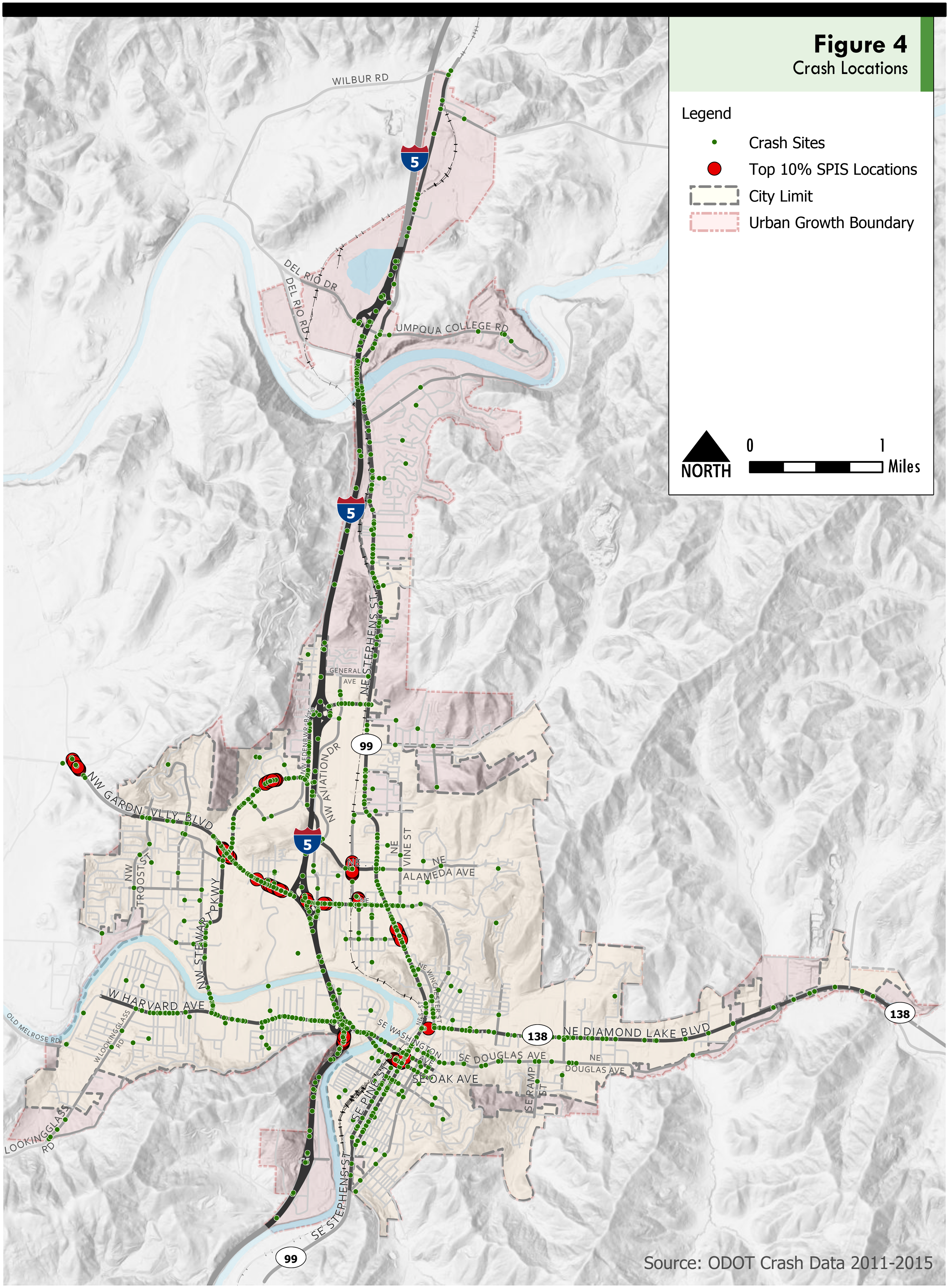


EXHIBIT 1. SUMMARY OF COLLISION TYPES

Intersection Analysis

There were 898 crashes during the five-year analysis period at project intersections, and 2,008 within the UGB during the same period. The two intersections with the highest number of crashes were Garden Valley Boulevard at Stewart Parkway (61 crashes) and Oak Avenue at Stephens Street (45 crashes). Of the reported study intersection crashes, 475 resulted in minor injury(s), 419 resulted in property damage only, and one resulted in a fatality or serious injury. The highest proportions of crashes were rear-end collisions.

Figure 4
Crash Locations



Source: ODOT Crash Data 2011-2015

TABLE 4. CRASH HISTORY AT STUDY AREA INTERSECTIONS (YEARS 2011-2015)

	Location	Observed Crash Rate	Critical Crash Rate	Statewide 90^{th} Percentile Crash Rate	Collision Type: Angle	Backing	Fixed Object or Other Object	Head-On	Miscellaneous	Non-collision	Parking Maneuver	Pedestrian	Rear-End	Sideswipe - Meeting	Sideswipe - Overtaking	Turning movement	Total	Severity: Fatalities	Injuries	Property Damage Only
1.	OR 99 at Wilbur Rd	***0.39***	0.51	0.29	-	-	-	-	1	-	-	-	2	-	-	-	**3**	-	1	2
2.	OR 99 at N Bank Rd	***0.38***	0.50	0.29	-	-	-	-	-	-	-	-	1	-	-	2	**3**	-	1	2
3.	OR 99 at I-5 Exit 129 NB Ramps	0.00	0.50	0.51	-	-	-	-	-	-	-	-	-	-	-	-	**-**	-	-	-
4.	I-5 Exit 129 SB Ramps at Del Rio Rd	***0.36***	0.45	0.29	-	-	2	-	-	-	-	-	2	-	-	-	**4**	1	1	2
5.	OR 99 at Del Rio Rd at Umpqua College Rd	0.00	0.72	0.86	-	-	-	-	-	-	-	-	-	-	-	-	**-**	-	-	-
6.	Stephens St at Kenneth Ford Dr	0.25	0.42	0.51	1	-	-	-	-	-	-	-	5	-	-	1	**7**	-	3	4
7.	Edenbower Blvd at Broad St	0.14	0.34	0.29	-	-	-	-	-	-	-	-	3	-	-	1	**4**	-	3	1
8.	I-5 Exit 127 SB Ramps at Edenbower Blvd	0.34	0.66	0.86	-	1	1	-	-	-	-	-	3	-	-	7	**12**	-	9	3
9.	I-5 Exit 127 NB Ramps at Edenbower Blvd	0.39	0.67	0.86	1	-	-	-	-	-	-	-	8	-	-	4	**13**	-	5	8
10.	Edenbower Blvd at Aviation Dr	0.57	0.67	0.86	2	-	-	-	-	-	-	-	14	-	-	3	**19**	-	12	7
11.	Edenbower Blvd at Stephens St	0.35	0.65	0.86	1	-	-	-	-	-	-	-	8	-	-	5	**14**	-	7	7
12.	Stephens St at Newton Creek Rd	0.42	0.68	0.86	-	-	-	-	-	-	-	-	6	-	-	7	**13**	1	11	1
13.	Stewart Pkwy at Edenbower Blvd	0.68	0.63	0.86	-	-	1	2	-	1	-	-	15	-	7	7	**33**	-	17	16
14.	Garden Valley Blvd at Melrose Rd	0.15	0.35	0.41	2	-	-	-	-	-	-	-	-	-	-	2	**4**	-	3	1
15.	Garden Valley Blvd at Troost St	0.22	0.68	0.86	-	-	-	-	1	-	-	-	2	-	1	3	**7**	-	2	5
16.	Garden Valley Blvd at Kline St	0.29	0.64	0.86	2	-	-	-	-	-	-	-	6	-	1	4	**13**	-	11	2
17.	Garden Valley Blvd at Roseburg Valley Mall (Middle Entrance)	0.05	0.31	0.29	-	-	-	-	-	1	-	-	-	-	-	1	**2**	-	1	1
18.	Stewart Pkwy at Roseburg Mall Entrance	0.59	0.64	0.86	1	-	1	-	-	-	-	1	2	1	-	21	**27**	-	14	13
19.	Stewart Pkwy at Aviation Dr/Mullholland Dr	0.72	0.69	0.86	2	-	-	-	-	-	-	-	2	-	-	16	**20**	-	10	10
20.	Garden Valley Blvd at Stewart Pkwy	0.73	0.59	0.86	4	-	-	-	-	-	-	-	36	-	5	16	**61**	-	33	28
21.	Stewart Pkwy at Valley View Dr	***0.37***	0.34	0.29	-	-	1	-	-	-	-	-	1	-	1	8	**11**	-	3	8
22.	Stewart Pkwy at Airport Rd	***1.20***	0.71	0.86	3	-	-	-	-	-	-	-	3	-	-	24	**30**	-	20	10
23.	Vine St at Alameda Ave	0.23	0.49	0.41	2	-	-	-	-	-	-	-	-	-	-	-	**2**	-	1	1
24.	Troost St at Calkins Rd	0.15	0.55	0.41	1	-	-	-	-	-	-	-	-	-	-	-	**1**	-	1	-
25.	Keasey St at Calkins Rd	0.28	0.53	0.29	1	-	-	-	-	-	-	-	1	-	-	-	**2**	-	1	1
26.	Garden Valley Blvd at Goetz St/Duck Pond St	0.48	0.62	0.86	3	-	-	-	-	-	-	-	19	-	-	4	**26**	-	18	8
27.	Garden Valley Blvd at Centennial Dr/Estelle St	0.64	0.62	0.86	1	-	-	-	-	-	-	-	25	-	3	6	**35**	-	20	15
28.	Garden Valley Blvd at Garden Valley Shopping Center	0.62	0.62	0.86	-	-	1	-	-	-	-	1	23	-	1	10	**36**	1	19	16
29.	I-5 Exit 125 SB Ramps at Garden Valley Blvd	0.14	0.59	0.86	-	-	-	-	-	-	-	-	8	-	-	4	**12**	-	3	9
30.	I-5 Exit 125 NB Ramps at Garden Valley Blvd/Mulholland Dr	0.48	0.60	0.86	1	-	-	-	-	-	-	-	14	-	6	12	**33**	-	14	19
31.	Garden Valley Blvd at Airport Rd at Cedar S	0.54	0.64	0.86	2	-	-	-	-	-	-	2	9	-	-	12	**25**	-	13	12
32.	Garden Valley Blvd at Walnut St	0.33	0.65	0.86	-	-	-	-	-	-	-	-	7	-	1	5	**13**	-	7	6
33.	Garden Valley Blvd at Stephens St	0.48	0.60	0.86	1	1	1	-	-	-	-	-	20	-	1	11	**35**	-	23	12
34.	Garden Valley Blvd at Rocky Ridge Dr	0.00	0.51	0.29	-	-	-	-	-	-	-	-	-	-	-	-	**-**	-	-	-
35.	Stewart Pkwy at Harvey Ave	0.32	0.67	0.86	1	-	-	-	-	-	-	-	9	-	-	1	**11**	-	4	7
36.	Chestnut Ave at Cedar St	0.22	0.64	0.41	1	-	-	-	-	-	-	-	-	-	-	-	**1**	-	1	-
37.	Stephens St at Chestnut Ave	***0.49***	0.30	0.29	-	1	-	1	-	-	-	1	14	-	2	6	**25**	-	17	8
38.	Stephens St at Winchester St	0.16	0.30	0.29	-	-	-	-	1	-	-	-	4	-	-	3	**8**	-	4	4
39.	Lincoln St at Malheur Ave	0.30	0.73	0.41	1	-	-	-	-	-	-	-	-	-	-	-	**1**	-	-	1

	Location	Observed Crash Rate	Critical Crash Rate	Statewide 90th Percentile Crash Rate	Collision Type: Angle	Backing	Fixed Object or Other Object	Head-On	Miscellaneous	Non-collision	Parking Maneuver	Pedestrian	Rear-End	Sideswipe - Meeting	Sideswipe - Overtaking	Turning movement	Total	Severity: Fatalities	Injuries	Property Damage Only
40.	Harvard Ave at Lookingglass Rd	0.11	0.38	0.29	-	-	-	-	-	-	-	-	-	-	-	2	**2**	-	1	1
41.	Harvard Ave at W Broccoli St	0.18	0.37	0.41	2	-	1	-	-	-	-	-	-	-	-	1	**4**	-	3	1
42.	Harvard Ave at Stewart Pkwy	0.51	0.63	0.86	2	-	1	-	-	-	-	-	20	-	1	1	**25**	-	16	9
43.	Harvard Ave at W Keady Ct.	0.24	0.66	0.86	-	-	1	-	-	-	-	-	3	-	1	4	**9**	-	3	6
44.	Harvard Ave at Centennial Dr	0.18	0.39	0.51	-	-	-	-	-	-	-	-	4	-	-	3	**7**	-	5	2
45.	Harvard Ave at Maple St	0.06	0.30	0.29	-	-	-	-	-	-	-	-	2	-	-	1	**3**	-	2	1
46.	Harvard Ave at Harrison St	0.12	0.30	0.41	-	1	-	-	-	-	-	1	1	-	-	3	**6**	-	3	3
47.	Harvard Ave at Umpqua St	0.34	0.63	0.86	1	1	-	-	-	-	-	2	6	-	1	6	**17**	-	10	7
48.	I-5 Exit 124 SB Ramps at Harvard Ave	0.38	0.62	0.86	1	2	1	-	1	-	-	-	7	-	-	10	**22**	-	12	10
49.	I-5 Exit 124 NB On-Ramps at Harvard Ave	0.07	0.30	0.41	-	-	-	-	-	-	-	-	1	-	2	1	**4**	-	2	2
50.	I-5 Exit 124 NB Off Ramp at Harvard Ave	0.25	0.62	0.86	-	-	1	-	-	-	-	-	7	-	-	6	**14**	1	4	9
51.	Harvard Ave at Corey St	0.04	0.30	0.29	-	-	-	-	-	-	-	-	2	-	-	-	**2**	-	1	1
52.	Washington Ave at Madrone St	0.23	0.63	0.86	-	1	-	-	-	-	-	1	4	1	-	4	**11**	-	6	5
53.	Diamond Lake Blvd at Stephens St	0.40	0.39	0.51	1	-	2	-	-	1	-	-	8	-	2	3	**17**	-	9	8
54.	Diamond Lake Blvd at Jackson St at Winchester St	0.43	0.64	0.86	5	2	1	-	-	-	-	1	6	-	-	4	**19**	-	10	9
55.	Diamond Lake Blvd at Fulton St	0.03	0.34	0.41	-	-	-	-	-	-	-	-	1	-	-	-	**1**	-	1	-
56.	Diamond Lake Blvd at Rifle Range St	0.30	0.68	0.86	1	-	-	-	-	1	-	-	3	-	2	2	**9**	-	3	6
57.	Diamond Lake Blvd at Douglas Ave	0.05	0.38	0.29	-	-	1	-	-	-	-	-	-	-	-	-	**1**	-	1	-
58.	Washington Ave at Spruce St	***0.53***	0.34	0.41	7	-	-	-	-	-	-	-	2	-	3	3	**15**	-	10	5
59.	Stephens St at Douglas Ave	0.00	0.64	0.86	-	-	-	-	-	-	-	-	-	-	-	-	**-**	-	-	-
60.	Washington Ave at Pine St	0.46	0.66	0.86	8	-	2	-	-	-	-	-	1	-	3	3	**17**	-	5	12
61.	Washington Ave at Stephens St	0.42	0.64	0.86	6	-	-	-	-	-	-	-	3	-	4	6	**19**	-	6	13
62.	Douglas Ave at Jackson St	***0.43***	0.42	0.41	2	-	-	-	-	-	-	-	1	-	-	3	**6**	-	3	3
63.	Oak Ave at Spruce St	0.15	0.37	0.29	-	-	-	-	-	-	-	-	-	-	1	2	**3**	-	-	3
64.	Oak Ave at Pine St	***1.17***	0.69	0.86	24	-	-	-	-	-	-	1	1	-	2	4	**32**	-	18	14
65.	Oak Ave at Stephens St	***1.50***	0.68	0.86	19	-	-	-	-	-	-	1	5	-	4	16	**45**	-	22	23
66.	Washington Ave at Jackson St	0.14	0.53	0.41	-	-	-	-	-	-	1	-	-	-	-	-	**1**	-	-	1
67.	Douglas Ave at Kane St	0.23	0.42	0.29	-	-	-	-	-	-	1	-	1	-	-	1	**3**	-	1	2
68.	Douglas Ave at Ramp Rd	***0.31***	0.54	0.29	-	-	-	-	-	-	-	-	-	-	1	1	**2**	-	-	2
69.	Douglas Ave at Rifle Range St	0.22	0.63	0.29	-	-	1	-	-	-	-	-	-	-	-	-	**1**	-	1	-
70.	Oak Ave at Jackson St	***0.43***	0.54	0.41	1	-	1	-	-	-	-	-	-	-	-	1	**3**	-	-	3
71.	Pine St at Mosher Ave	0.30	0.39	0.41	2	-	1	-	-	-	-	-	-	-	2	-	**5**	-	-	5
72.	Stephens St at Mosher Ave	0.35	0.39	0.41	1	1	-	-	-	-	-	-	1	-	-	3	**6**	-	3	3
73.	I-5 Exit 123 SB Ramps at Portland Ave	0.00	0.88	0.41	-	-	-	-	-	-	-	-	-	-	-	-	**-**	-	-	-
74.	I-5 Exit 123 NB Ramps at Portland Ave	0.00	0.92	0.41	-	-	-	-	-	-	-	-	-	-	-	-	**-**	-	-	-
75.	Stephens St at S Gate Shopping Center	0.04	0.36	0.41	-	-	-	-	-	-	-	-	-	-	-	1	**1**	-	1	-

Bold and Italicized indicates crash rate over statewide 90th percentile crash rate, shaded indicates crash rate over reference population critical crash rate.

Source: ODOT Transportation Development Division, Transportation Data Section, Crash Analysis and Reporting Unit 2011-2015

Segment Analysis

Crash rates can be calculated for both intersections and segments. The ODOT APM clarifies that segments should ideally be close to one mile in length. In the Roseburg urban area, obtaining one mile segments is difficult, however the majority of urban crashes are intersection related and captured in Table 4. Since short sections less than a half mile in length typically skew the crash rates, segment crash rates were only calculated along I-5 through the study area. See Table 5.

TABLE 5. CRASH HISTORY ALONG I-5 SEGMENTS

Highway	Beginning Mile Point	End Mile Point	ADT	Total Crashes	Fatalities and Serious Injury	Observed Rate
I-5	122	123	42,400	6	0	0.08
I-5	123	124	43,300	27	2	0.34
I-5	124	125	50,400	51	2	0.55
I-5	125	126	50,400	23	4	0.25
I-5	126	127	33,900	10	0	0.16
I-5	127	128	33,900	16	1	0.26
I-5	128	129	33,900	17	0	0.27
I-5	129	130	35,000	31	6	0.49
I-5	130	131	32,400	5	0	0.08

Source: ODOT crash report data (2011-2015)

Compared to published crash rates in ODOT Table II (Five-Year Comparison of State Highway Crash Rates) all of the segments along I-5 are below the 2015 rate of 0.77 crashes/MEV for urban city interstate freeways. If comparing against suburban area rates, I-5 from mile points 124-125 and 129-130 exceed the 2015 rate of 0.39 crashes/MEV.

2017 Oregon Interstate Highway Speed Limit Engineering Investigation

The Oregon Department of Transportation analyzed the segments of interstate system where the speeds of vehicles were currently posted 65 mph for cars and 55 mph for trucks to determine if truck speeds should be increased, including I-5 through Roseburg. Crash data was compiled for all study sections for years 2012 through 2014 and compared against the statewide averages for interstate highways. Speed data was collected and summarized for each section.

According to crash data, from 2012 to 2014, the rate of fatal and injury crashes that occurred between mileposts 122 and 127 was nearly double the statewide average. During that time period, 59 people were injured and three were killed. In October 2017, a reduction in the speed limit was recently approved for the I-5 mainline from mile post 123 to 127 due to safety concerns.

Network Screening

The Highway Safety Manual (HSM) Part B describes the critical crash rate method as a means of identifying locations that warrant further investigation. The critical crash rate is based upon average crash rates at comparable sites, traffic volume, and a confidence interval. Locations where the calculated crash rate exceeds the critical crash rate should be reviewed more closely to assess crash patterns.

Based on critical crash rates determined by the HSM Part B Network Screening methodology, 12 intersections had observed crash rates exceeding the calculated critical crash rate:

- 13. Stewart Pkwy at Edenbower Blvd
- 19. Stewart Pkwy at Aviation Dr/Mullholland Dr
- 20. Garden Valley Blvd at Stewart Pkwy
- 21. Stewart Pkwy at Valley View Dr
- 22. Stewart Pkwy at Airport Rd
- 27. Garden Valley Blvd at Centennial Dr/Estelle St
- 37. Stephens St at Chestnut Ave
- 53. Diamond Lake Blvd (OR 138) at Stephens St
- 58. Washington Ave at Spruce St
- 62. Douglas Ave at Jackson St
- 64. Oak Ave at Pine St
- 65. Oak Ave at Stephens St

These intersections account for 313 of the crashes (35%) recorded at study area intersections within the five-year analysis period.

Observed crash rates were also compared against the statewide 90th percentile urban crash rates. There were 10 intersections whose observed crash rates exceeded the statewide crash rates. Of those 10, five are included in previous list of locations exceeding the critical crash rate. The other five are listed below:

- 1. OR 99 at Wilbur Road
- 2. OR 99 at North Bank Road
- 4. I-5 Exit 129 Southbound Ramps at Del Rio Road
- 68. Douglas Avenue at Ramp Road
- 70. Oak Avenue at Jackson Street

The following paragraphs provide further detail about crash patterns at each of the 12 locations and summarize possible causes.

Stewart Parkway at Edenbower Boulevard had a crash rate of 0.68 crashes/MEV. There were 33 crashes over the five-year data period. The majority (15) of these collisions were rear end and are likely the result of drivers approaching the intersection at posted speed and encountering queues backing up from the intersection before anticipated. This intersection only exceeded the critical crash rate.
Stewart Parkway at Aviation Drive/Mullholland Drive had a crash rate of 0.72 crashes/MEV and a total of 20 crashes, the majority of which occurred as a result of turning vehicles (16). Turning-related collisions often occur when the signal phasing is permitted and the driver fails to yield to oncoming traffic. This intersection only exceeded the critical crash rate.

Garden Valley Boulevard at Stewart Parkway had a crash rate of 0.73 crashes/MEV. There were 61 crashes over the five-year data period, the highest of any study area intersection. This is one of the busiest intersections in Roseburg. Consistent with the types of collisions common at busy signalized intersections, over half were rear end (59%). This intersection only exceeded the critical crash rate.

Stewart Parkway at Valley View Drive had 11 collisions during the five-year data period with a crash rate of 0.37 crashes/MEV. The majority of these crashes were turning movement collisions (8). This intersection is closely spaced to the intersection of Stewart Parkway with Garden Valley Boulevard and is likely impacted by queuing upstream. This intersection exceeded the critical crash rate and the statewide 90th percentile crash rate.

Stewart Parkway at Airport Road had 30 crashes during the five-year data period with a crash rate of 1.20 crashes/MEV. The majority of these crashes were turning (24), likely caused by permitted phasing at the traffic signal. This intersection exceeded the critical crash rate and the statewide 90th percentile crash rate.

Garden Valley Blvd at Centennial Dr/Estelle St just exceeded the critical crash rate for this intersection type with a crash rate of 0.64 crashes/MEV. There were 35 crashes during the five-year study period. Similar to other signalized intersections, rear end collisions are the most common at this intersection. This intersection only exceeded the critical crash rate.

Stephens Street at Chestnut Avenue had a crash rate of 0.49 crashes/MEV. There were 25 crashes during the analysis period. Nearly half (14) of the crashes were rear end collisions with turning movement being the next largest type (6). There was one pedestrian-related collisions at this location and the remainder were likely due to driver inattention. This intersection exceeded the critical crash rate and the statewide 90th percentile crash rate. This intersection has since become signalized.

Diamond Lake Boulevard (OR 138) at Stephens Street had a crash rate of 0.40 crashes/MEV. There were 17 crashes during the five-year study period. Eight of the crashes were rear end collisions. The remaining nine crashes varied among angle, object, sideswipe and turning movement. This location has a significant amount of freight traffic and the northern leg has a slight grade that could contribute to the crashes. This intersection is part of the new OR 138 improvement project and could see changes in crash patterns in the future. This intersection only exceeded the critical crash rate.

Washington Avenue at Spruce Street had 15 crashes during the five-year data period with a crash rate of 0.53 crashes/MEV. Seven crashes were angle collisions and the rest were split between rear end, side swipe and turning movement. This location sees northbound drivers rushing across a couple lanes of traffic or trying to enter before a large enough gap in traffic exists. This intersection is part of the new OR 138 improvement project and could see changes in crash patterns in the future. This intersection exceeded the critical crash rate and the statewide 90th percentile crash rate.

Douglas Avenue at Jackson Street had six crashes during the five-year data period with a crash rate of 0.43 crashes/MEV. Half (3) were turning movement related, two were angle collisions and there was one rear end collision. This is a lower volume study intersection compared to many of the others in this list, however drivers must pay attention to the high pedestrian activity in the area. This intersection exceeded the critical crash rate and the statewide 90th percentile crash rate.

Oak Avenue at Pine Street had 32 crashes during the five-year data period with a crash rate of 1.17 crashes/MEV, the third highest crash rate of the study area intersections. The majority (24) were angle collisions. Many angle collisions are due to driver error (inattention, physically ill, slowing down). This intersection is part of the new OR 138 improvement project and could see changes in crash patterns in the future. This intersection exceeded the critical crash rate and the statewide 90th percentile crash rate.

Oak Avenue at Stephens Street had 45 crashes during the five-year data period with a crash rate of 1.50 crashes/MEV, the highest crash rate of the study area intersections and second highest number of crashes. The most common collision type at this intersection is angle collisions (19), and then turning movement (16). This intersection is part of the new OR 138 improvement project and could see changes in crash patterns in the future. This intersection exceeded the critical crash rate and the statewide 90th percentile crash rate.

OR 99 at Wilbur Road had a crash rate of 0.39 crashes/MEV. There were three crashes over the five-year data period. Two of these collisions were rear end. The traffic volume at this intersection is low compared to other similar intersection types in the study area. This intersection only exceeded the statewide 90th percentile crash rate.

OR 99 at Bank Road had a crash rate of 0.38 crashes/MEV and a total of three crashes, the majority of which occurred as a result of turning vehicles (2). Similar to OR 99 at Wilbur Road, this intersection sees low volumes of vehicles compared to others in the study area. This intersection only exceeded the statewide 90th percentile crash rate.

I-5 Exit 129 SB Ramps at Del Rio Road had a crash rate of 0.36 crashes/MEV. There were four crashes over the five-year data period. Two were rear-end collisions and the other two were fixed object. This intersection was the location of one fatal collision. This intersection only exceeded the statewide 90th percentile crash rate.

Douglas Avenue at Ramp Road had a crash rate of 0.31 crashes/MEV. There were two crashes over the five-year data period. One sideswipe and one turning movement. These types of collisions could be the result of mainline traffic traveling too fast for the roadway and the side street vehicle not yielding right of way; trees and landscaping may obscure sight distance. This intersection only exceeded the statewide 90th percentile crash rate.

Oak Avenue at Jackson Street had a crash rate of 0.43 crashes/MEV. There were three crashes over the five-year data period. One angle, one fixed object and one turning movement. These types of collisions are most likely due to driver inattention or failing to yield the right of way. This intersection only exceeded the statewide 90th percentile crash rate

Safety Priority Index System (SPIS)

The SPIS is a method used in Oregon to identify safety problem areas along state highways. Highways are evaluated in approximately one-tenth mile increments (often grouped into larger segments). Each year these segments are ranked by assigning a SPIS score based on the frequency and severity crashes observed, while taking traffic volume into account. When a segment is ranked in the top 10% of the index, a crash analysis is typically warranted and corrective actions are considered. These segments can be found in Table 6. There are three segments along I-5 and seven segments along OR 138 within the study area that are identified as being in the top 10% of the most recent SPIS rankings.

TABLE 6. TOP 10% ODOT SPIS SITE SUMMARY

Year	Highway	Beginning Mile Point	End Mile Point	ADT	Total Crashes	Fatal & Injury A[1] Crashes	City/ County	Cross Street
2014	I-5	120.32	120.49	40,100	5	3	Douglas	N/A
2014	OR 138	-0.96	-0.83	23,800	14	1	Roseburg	Bellows
2014	OR 138	-0.42	-0.22	10,433	47	1	Roseburg	Spruce
2014	OR 138	0	0.11	11,222	17	1	Roseburg	Jackson
2014	OR 138	0.28	0.40	14,800	5	2	Roseburg	Boston
2014	OR 138	0.33	0.43	14,411	5	2	Roseburg	Casper
2015	I-5	123.93	124.11	41,400	17	1	Douglas	N/A
2015	I-5	125.03	125.14	40,866	12	2	Roseburg	N/A
2015	OR 138	-0.41	-0.22	11,622	50	1	Roseburg	Spruce
2015	OR 138	0.01	0.1	9,700	12	1	Roseburg	Winchester

1. Incapacitating or serious Injury Source: ODOT SPIS Data (2014 and 2015 reports[2])

One segment on I-5, between mile point 125.03 and 125.14 on I-5 includes the intersection at NW Garden Valley Blvd and NW Mulholland Dr. Both the traffic signal and multiple accesses could be contributing to the high number of crashes along this section of I-5 (connection).

The other I-5 segments are on I-5 mainline and are not included in the study intersections of the city's TSP. A future planning study is expected to focus on the I-5 mainline through the study area.

For OR 138, the segments listed are within the improvement area of the OR 138 solutions project. It is recommended that this area is monitored in the future and compared to the current crash history to determine if the improvement project impacted the crash patterns and safety along the corridor.

[2] Only 2014 and 2015 data is available. August 2017 message from ODOT: "We have identified some irregularities with the 2016 SPIS reports and the OASIS program, and we have initiated an additional quality control evaluation. As such we have removed the 2016 reports from view."

Findings and Next Steps

Under existing conditions, Roseburg's transportation network operates below operational mobility targets for all but four intersections. The city continues to add bicycle facilities and improve pedestrian routes, and transit amenities better the user experience. All of this combined leads to an integrated transportation system that improves the more accessibility for all users, but still has room for growth.

When looking at the system as a whole, it is apparent that certain segments and intersections consistently experience increased delays for vehicular users, connectivity concerns for bicyclists and pedestrians, and fixed routes for freight and transit travel. This is not a result of poor intersection or roadway design, but an underlying network connectivity concern that has become more apparent as Roseburg has grown. To prepare Roseburg's transportation system for growth in the future, land use changes may be needed to compliment transportation improvements to reduce travel demand on impacted transportation facilities.

Roseburg's geography and lack of a parallel street system contributes to traffic patterns that place stress on high-volume corridors such as Stewart Parkway, Garden Valley Boulevard and Harvard Avenue, particularly near the I-5 interchanges. The information provided in this memorandum indicates that there are opportunities for improvement within the current transportation system.

As previously mentioned, Roseburg continues to improve its transportation system through roadway projects, sidewalk infill, creating bicycle routes and focused planning. As the TSP process continues, additional consideration will be given to opportunities to further advance transportation options for all modes:

- The majority of the study intersections currently meet their respective mobility standards with the exception of four intersections, all of which were included as part of the previous IAMP 124/125 planning effort. There are several movements at the signalized intersections that currently exceed the striped storage for the movement.
- Much of the congestion and operational concerns along roadways exist due to underlying network connectivity concerns; drivers do not have a choice but to travel certain corridors.
- Though many designated bicycle routes exist, the level of traffic stress for the cyclists is high and does not create a comfortable environment for novices.
- The gaps in shoulders and bicycle facilities limit the potential to attract new riders or encourage existing rider to commute or complete other trips by bike.
- Asses transit, bike, and pedestrian network and identify gaps; and identify corresponding projects to complete safe, comfortable, and convenient connections between destinations
- Transit amenities are in place at transit stops, but improvements to frequency would increase the attractiveness of using transit.
- The pedestrian network could be made more attractive along busy corridors (Garden Valley Boulevard and Stephens Street) through access management or improving comfort level.
- There are several intersections that currently exceed the 95th percentile crash rates.