Final Report for

Oregon Department of Transportation

Oakridge Pedestrian Safety Study

Prepared by

DKS

in association with

Oakridge
MOUNTAIN BIKING CAPITAL OF THE NORTHWEST

February 2016

ACKNOWLEDGMENTS

Oregon Department of Transportation:

Amanda Salyer, Senior Traffic Investigator, Region 2
David Reesor, Senior Region Planner, Area 5

City of Oakridge:

Louis Gomez, City Manager

Project Committee (e.g. Technical Advisory Committee, Steering Committee):

Kevin Martin, Police Chief
Kent Dockery, Pastor
Cammie Harris, Point 2 Point
Don, Superintendent
McKenzie Bowerman, Business Owner

DKS Associates:

Scott Mansur, PE, PTOE, Project Manager
Jordin Ketelsen, Project Engineer
Rachel Vogt, Project Engineer Assistant
Danella Whitt, Graphics

Stakeholder Group

Mark Forbes, Business Owner
Elizabeth Barclay, Business Owner
Candis Michaels, Business Owner
Christy McDougal, First Student Bus Driver

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1 EXECUTIVE SUMMARY

INTRODUCTION

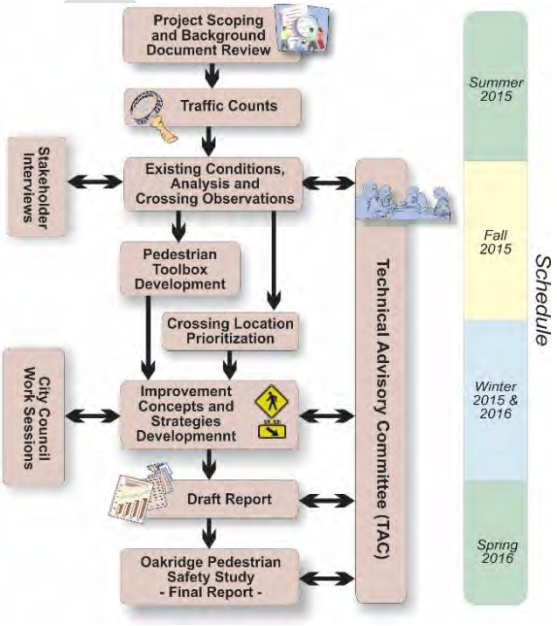
The OR 58 corridor in Oakridge, Oregon is a safety concern for Oregon Department of Transportation (ODOT), City staff, and the residents in the area. Fatal and serious injury pedestrian crashes within the study area has led to ODOT and the City of Oakridge partnering to prepare a safety study that will improve safety for all modes of travel. The primary emphasis for this study was to provide safe pedestrian and bicycle crossing locations along OR 58.

This study consisted of public involvement and technical analysis. The results were a compilation of recommended safety projects along OR 58 that would improve pedestrian and bicycle safety.

PUBLIC INVOLVEMENT

ODOT managed the Oakridge Pedestrian Safety Study in partnership with the City of Oakridge. Project stakeholders (including Oakridge Police, Oakridge School District, business owners and members of the community) provided feedback on all components of the study.

A schematic of the study process is shown below.



PROJECT SCHEDULE SCHEMATIC

Primary direction and input were provided by the Technical Advisory Committee (TAC). This committee directed the study, reviewed methods and findings, and assisted in reaching consensus on project recommendations.

Members of the TAC included agency staff from ODOT, the City of Oakridge, and other key members of the community.

Additional public involvement included one-on-one stakeholder interviews and a City Council work session. These involvement opportunities allowed citizens to comment on the plan, make suggestions, voice concerns, and provide feedback.

TECHNICAL ANALYSIS

Technical analysis included collecting data for vehicle, bicycle, and pedestrian observations and performing crossing improvement location prioritization. A corridor-wide analysis was also performed considering pedestrian and bicycle facilities and corridor lighting.

Crossing observations were made at multiple locations along OR 58, and a clear need for additional pedestrian and bicycle crossing accommodations along the corridor was found. Pictures of some observed crossing locations are shown.

BEST WESTERN NEAR WEST END OF OR 58 CORRIDOR

The analysis emphasized high pedestrian activity land-uses including businesses, stores, food services, and hotels. The primary factors contributing to pedestrian safety concerns include:

- High vehicular speeds and volumes
- Wide roadway cross section
- Lack of center turn lanes for existing four-lane cross sections along portions of the corridor
- Inconsistent roadway lighting (which particularly affects nighttime safety)
- Absence of pedestrian crossing treatments (i.e. refuge medians, beacons and signage)

OR 58 EASTBOUND NEAR RAINBOW ROAD

PEDESTRIANS CROSSING OR 58 NEAR ROCK ROAD

PEDESTRIAN TOOLBOX

To assist in the selection of recommended conceptual crossing treatments, a toolbox of available pedestrian crossing treatments was prepared and refined to include only those treatments that were considered feasible for the OR 58 corridor. Two example strategies, such as overhead fighting beacons and rapid rectangular flashing beacons (RRFB) with warning signage, are shown below. See Chapter 3 (Crossing Treatment Toolbox) for the complete list of treatments.

PEDESTRIAN TOOLBOX EXAMPLE TREATMENTS (ON LEFT: OVERHEAD FLASHING BEACON; ON RIGHT: RRFB SIGN ASSEMBLY)

RECOMMENDED PROJECTS

The final recommended projects include conceptual unsignalized crossing concepts and traffic signal improvements as well as corridor-wide projects. Planning level cost estimates were also prepared for the projects.

CONCEPTUAL CROSSING IMPROVEMENTS

Crossing improvement concepts were developed for five locations and the priority of those improvements are shown in the table below.

Rank	Crossing Locations	Priority
1	Rock Road to Jones Road	Short-term
2	West of River Road	Short-term
3	Rainbow Road	Mid-term[a]
4	Hills Street	Mid-term
5	Union Street	Mid-term
A[b]	East of Jones Road	TBD[c]

[a] Lighting improvements only at Rainbow Road
[b] Crossing location added based on public input
[c] Crossing location will be a short-term priority with construction of pedestrian bridge/community center

At the priority location ranked first, recommended improvement treatments include Rectangular Rapid Flashing Beacons (RRFB), sidewalk infill, and supplemental street lighting. ODOT and the City of Oakridge are currently working on a design for an enhanced pedestrian crossing at this location. Additionally, a secondary crossing location with RRFBs is recommended east of Jones Road based on the City's future plans to construct a community center and pedestrian bridge near this location.

At the priority location ranked second, it is recommended that a raised median, curb extension, or other traffic calming improvement should be made along with sidewalk in fill along the south side of OR 58. Similar recommendations are made for the third and fourth priority locations with the addition of improved street lighting.

A fifth crossing location along OR 58 near Rainbow Road (ranked third) was also considered; however, due to current land uses, non-conforming access spacing, connectivity challenges, and inconsistent pedestrian crossing locations, pedestrian crossing improvements were not perceived to significantly facilitate safe pedestrian activity across OR 58.

Chapter 4 (Pedestrian Improvement Design Concepts) discusses the conceptual crossing improvements in greater detail. All concepts are subject to project development and the concepts may change based on additional analysis and stakeholder feedback.

TRAFFIC SIGNAL IMPROVEMENTS

Signalized intersection safety improvements were considered at Crestview Street. Short term improvements at this location include supplementary lighting, pedestrian countdown timers, and sidewalk infill.

An example of pedestrian countdown timers is shown below. See Chapter 4 (Pedestrian Improvement Design Concepts) for the complete list of treatments.

Example of Pedestrian Countdown Timer

CORRIDOR-WIDE PROJECTS

Corridor-wide safety treatments were also considered along the entire length of the study area corridor and include:

- Street Lighting
- Speed Feedback Signs
- Lane Conversions

No specific locations were identified for access management with the exception of the pedestrian crossing improvement locations that Chapter 3 discusses in greater detail.

OR 58 Lane Conversion

The OR 58 corridor presents an opportunity to consider a three-lane roadway conversion to increase corridor safety due to the surrounding land uses, available roadway width, collision analysis, and motor vehicle volumes.

A conceptual design of the proposed three-lane cross sections along OR 58 is shown below. It is important to note that extensive medians were not considered as part of this project.

Five- To Three-Lane Conversion Concept

Details regarding potential OR 58 lane conversions can be found in Chapter 5.

Cost Estimates

Cost estimates were prepared for each of the crossing improvement locations as well as the identified signalized improvement locations and are listed in the table to the right. A 20% engineering and construction fee and a 20% contingency were applied individually to the cost estimate for each location. The total estimated cost is $405,000 for all crossing improvement locations, $50,000 for the signalized improvement location, $590,000 for corridor-wide implementation of sidewalk infill and speed feedback sings, and $130,000 for the three lane conversion. The cost estimates for sidewalk infill are divided into two phases; first priority infill locations and the remaining locations along the corridor that currently do not have sidewalks.

All projects combined are estimated to cost $1,175,000. Because funding sources are not currently identified for these recommended improvement projects, this study is intended to assist ODOT and the City in acquiring the needed project funding.

COST ESTIMATES OF PROPOSED SAFETY PROJECTS

Safety Improvement	Estimated Cost
Crossing Improvement Locations	
Rock Road – Jones Road	$100,000
River Road - Thatcher Lane	$50,000
Rainbow Road	$50,000
Hills Street	$50,000
Union Street	$55,000
East of Jones Road	$100,000
Crossing Improvements	**$405,000**
Signalized Improvement Locations	
OR 58/Crestview Street	$50,000
Signalized Improvements	**$50,000**
Corridor-Wide Treatments	
Sidewalk Infill – Phase 1 (First Priority In-Fill)	$250,000
Sidewalk Infill – Phase 2 (Completing all Sidewalk Gaps)	$300,000
Speed Feedback Signs	$40,000
Corridor-Wide Treatments	**$590,000**
Three Lane Conversion	**$130,000**
All Improvement Locations	**$1,175,000**

Chapter 6 provides additional cost estimate and prioritization information for each project. These project implementation resources are intended to assist ODOT and the City of Oakridge, in using this study as a tool for acquiring the needed project funding.

CHAPTER 2 EXISTING CONDITIONS

This chapter summarizes existing transportation conditions that affect pedestrian and bicycle crossing needs for OR 58 in the City of Oakridge, Oregon. Figure 2-1 shows the study area, which includes a 2.74 mile section of OR 58 within the City's limits. The scope of the analysis was determined in conjunction with agency staff from the Oregon Department of Transportation (ODOT) and the City of Oakridge. Pedestrian and bicycle facilities, safety analysis, and motor vehicle conditions are discussed in the following sections.

ROADWAY NETWORK

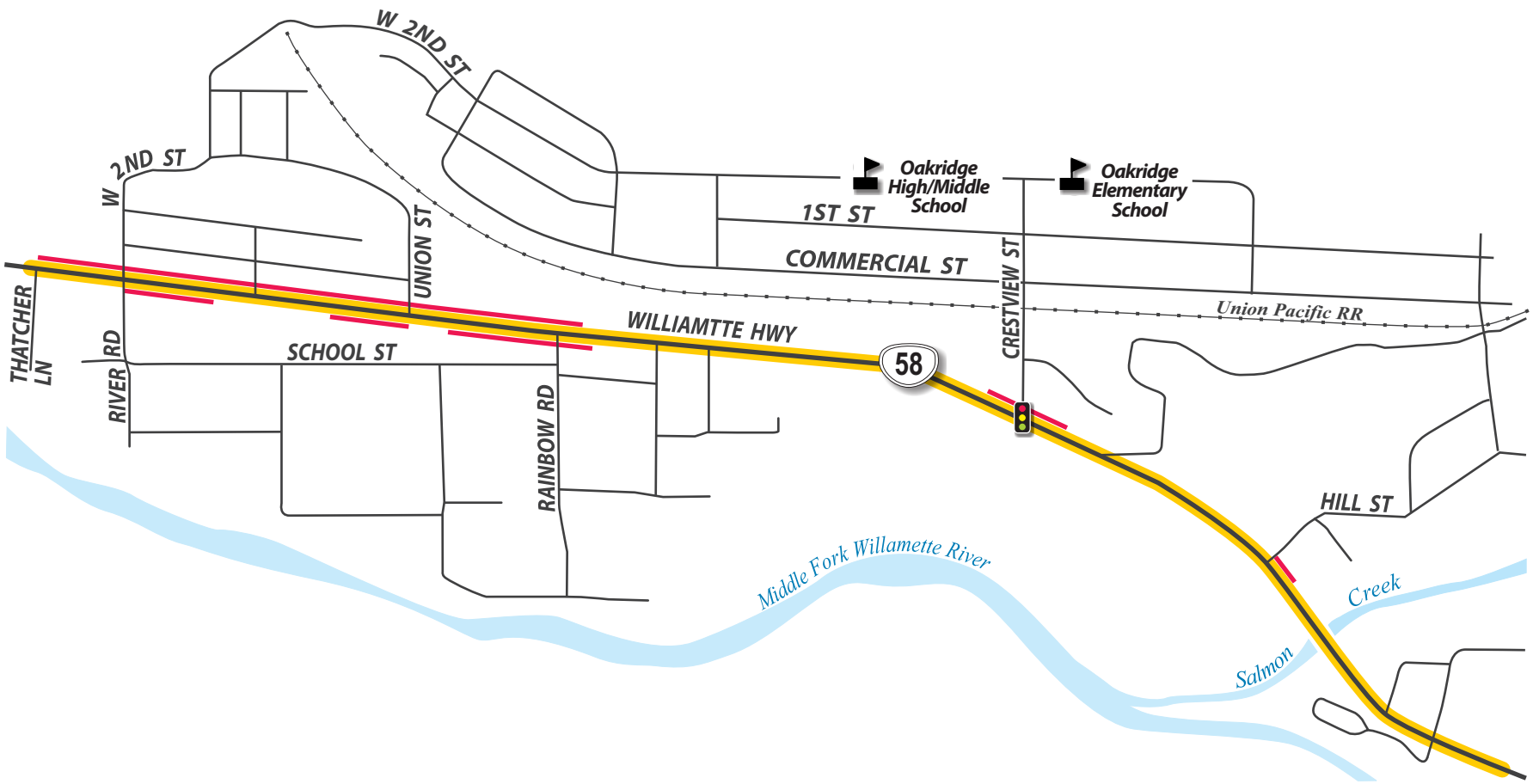
The transportation characteristics of the key study area roadway and cross streets are shown in Table 2-1 and include functional classification, number of travel lanes, and posted speeds, and the presence of sidewalks and/or bike lanes. The functional classification is a key roadway characteristic because it specifies the purpose of the facility[1] and is a determining factor of applicable cross-section, access spacing, and intersection mobility targets. Key north-south roadways that intersect OR 58 include 2nd Street/River Road, Union Street, Rainbow Road, Rock Road, Jones Road, Crestview Street, and Hills Street.

Table 2-1: Existing Study Area Roadway Characteristics

Roadway	ODOT Functional Classification[a]	Travel Lanes	Posted Speed
OR 58	Other Rural Principle Arterial	4	35
2nd Street/River Road	Rural Minor Collector[b]	2	25
Union Street	Local	2	25
Rainbow Road	Local	2	25
Rock Road	Local	2	25
Jones Road	Local	2	25
Crestview Street	Rural Major Collector	2	25
Hills Street	Rural Major Collector	2	25

[a] *Data from ODOT State and Non-state Federal Functional Classification of Roads City of Oakridge*
[b] *River Road classified as Local*

[1] The primary purpose of an arterial is to provide mobility, whereas at the opposite end of the spectrum, a local road is primarily concerned with site access. Collector roadways provide a transition between arterials and local roads.



LEGEND

- Project Study Corridor
- Existing Sidewalk
- Existing Traffic Signal

DKS

No Scale

Figure **2-1**

STUDY AREA

The majority of OR 58 is a five-lane road with a two-way left turn lane as a center lane (see photo below). Portions of OR 58 consist of a narrower four-lane section with no two-way left turn lane. There are intermittent sidewalks along the majority of the existing study area roadway. There are no marked bicycle lanes on OR 58 within the study area.

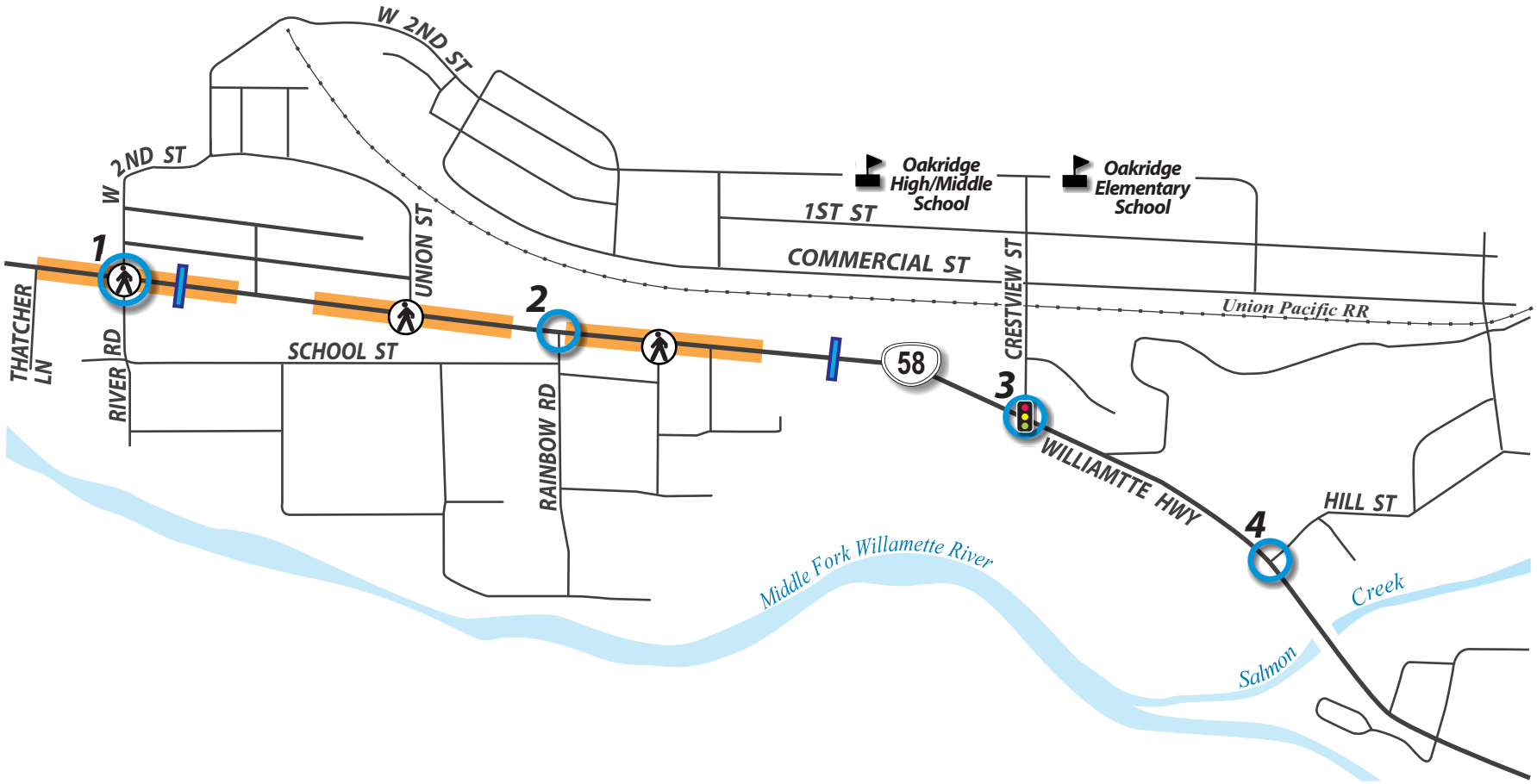
CROSS SECTION OF OR 58 NEAR 2ND STREET/RIVER ROAD

The Average Daily Traffic (ADT) count along OR 58 ranges from 6,100 to 8,100. OR 58 is classified in the Oregon Highway Plan (OHP)[2] as a State Highway, it is designated as a freight route, and is a Reduction Review Route; the route has "No reduction of vehicular capacity" (ORS 366.215) and trucks must be allowed a “hole-in-the-air” which is defined by ODOT as, “the entire area (height, width and length) a truck and its load will occupy while traversing a section of roadway.” Any proposed modifications that could potentially impact freight routes will have to go through further processing to receive full approval.

Pedestrian and Bicycle Facilities and Activity

Pedestrian and bicycle facilities were evaluated and observed along OR 58 with emphasis at select locations identified by the project team and stakeholders, as shown in Figure 2-2. These locations were selected based on the project team’s local knowledge, and pedestrian generators in the area, especially businesses such as hotels, markets, and restaurants as well as the elementary, middle, and high schools located to the north of Union Pacific railroad tracks.

[2] 1999 Oregon Highway Plan (as amended July 2006).



LEGEND

- Signalized Pedestrian Crossing
- # - Traffic Movement Count Locations *(Numbered)*
- Approximate Location of 500 ft. Pedestrian Crossing Count Segments
- Tube Count Location

DKS

No Scale

Figure 2-2

DATA COLLECTION LOCATIONS

PEDESTRIAN FACILITIES

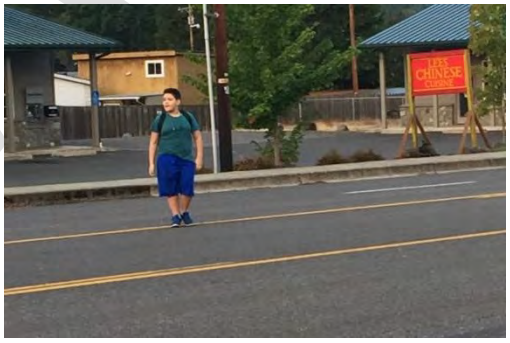
The existing pedestrian facilities were previously shown in Figure 2-1 along OR 58. The facilities consist of discontinuous sidewalks, widened shoulders, and gravel or dirt paths that include various obstructions such as utility poles and driveways. There is one signalized intersection along OR 58 at Crestview Street that provides signalized pedestrian crossings with marked crosswalks. However, the crosswalk on the east leg of the intersection leads to a guardrail where pedestrians have no sidewalk or shoulder along the highway, as shown in the photo below.

OR 58/CRESTVIEW STREET CROSSWALKS

The City of Oakridge and ODOT are currently considering a new crosswalk with a RRFB along OR 58 between Rainbow Road and Rock Road to increase pedestrian safety. The proposed preliminary design of the RRFB is provided in the Appendix.

PEDESTRIAN ACTIVITY

Most students in the Oakridge School District that live south of the Union Pacific railroad tracks are bused to the elementary, middle, and high schools. Pedestrian activity was observed along OR 58 occurs before and after school near the three perpendicular routes that cross over the Union Pacific railroad tracks and connect the residential land use in the southern portion of the city to the schools to the north. These key perpendicular connectors include 2nd Street (also accessed by Union Street), Crestview Street, and Hill Street. The majority of intersections on OR 58 do not have marked crosswalks with the exception of the OR 58/Crestview Street intersection that is signalized.



CHILD CROSSING OR 58 NEAR UNION STREET

Pedestrian crossing activity was observed on two separate occasions[3] in order to capture both summer and school activity. During the summer, counts were collected for the a.m., mid-day, and p.m. peak hours along OR 58 at four intersections[4] and three mid-block[5] locations as selected by the project team (shown in Figure 2-2).

[3] Data was collected in August to observe summer activity and in September to observe school activity.

[4] Quality Counts turning movement counts were taken on Tuesday, August 18, 2015 at OR 58 and 2nd Street, Rainbow Road, Crestview Street, and Hills Street. The intersection counts were taken on August 18, 2015 and the mid-block counts were taken on August 27, 2015 from 7-9 a.m., 11 a.m.-1 p.m., and 4-6 p.m.

CHILDREN WALKING ALONG OR 58 NEAR UNION STREET

Once school was in session, pedestrian activity along OR 58 was observed and counted in the vicinity of 2nd Street and Union Street[6] in order to become familiar with pedestrian behavior before and after school. Observations during the drop-off and pick-up times for the schools took place on September 11, 2015.

The observations took place during dry weather when typical pedestrian activity levels would be at their highest. The pedestrian volumes for the summer and during school hours are shown in Table 2-2. The highest summer crossing volumes occurred during the mid-day peak hour at or near Rainbow Road, which is expected due to the close proximity of Dairy Queen, the Chevron gas station and mini-mart, and Cascade General Store. During the school observations, the location near Union Road had the highest pedestrian volumes, which is expected due to an unmarked dirt path that crosses the railroad tracks and connects to each of the schools.

Table 2-2: Pedestrian Crossing Volumes

Summer Counts

Study Intersection (Signalized Y/N)	A.M. Peak Hour Intersection				Mid-day Peak Hour Intersection				P.M. Peak Hour Intersection			
	NB	*SB*	*EB*	*WB*	*NB*	*SB*	*EB*	*WB*	*NB*	*SB*	*EB*	*WB*
OR 58/2nd Street (N)	-	-	-	-	-	-	-	-	1	-	-	-
OR 58/Rainbow Road (N)	5	1	-	-	10	2	-	-	4	1	1	-
OR 58/Crestview (Y)	4	-	-	-	1	-	-	-	1	-	-	-
OR 58/Hills Street (N)	6	2	-	-	2	-	-	-	3	-	-	-
Study Location	**Mid-Block**				**Mid-Block**				**Mid-Block**			
OR 58/2nd Street & McAtee Road	1				7				5			
OR 58/Rainbow Road & Rock Road	8				11				9			
OR 58/Rock Road & Jones Road	5				10				15			

School Counts

Study Intersection	A.M. Peak Hour Intersection	P.M. Peak Hour Intersection
OR 58/2nd Street	1	2
OR 58/Union Street	7	7
Study Location (Approx. 500 feet)	**Mid-block**	**Mid-block**
OR 58/2nd Street & McAtee Road	2	5
OR 58/Union Street & Rainbow Road	2	5

[5] Quality Counts mid-block crossing counts were taken on Thursday, August 27, 2015 along OR 58 in the vicinity of McAtee Road/2nd Street, Rainbow Road/Rock Road, and Rock Road/Jones Road.

[6] Project Team mid-block crossing counts were taken on Friday, September 11, 2015.

PEDESTRIAN CROSSING CONFLICT ANALYSIS

Pedestrian crossing conflict analysis was performed along the OR 58 study corridor at three locations during the a.m., mid-day, and p.m. motor vehicle peak periods during the summer and two locations during the a.m. and p.m. motor vehicle peak periods while school was in session. The purpose of the conflict analysis was to observe pedestrian crossing behavior to better understand safety issues.

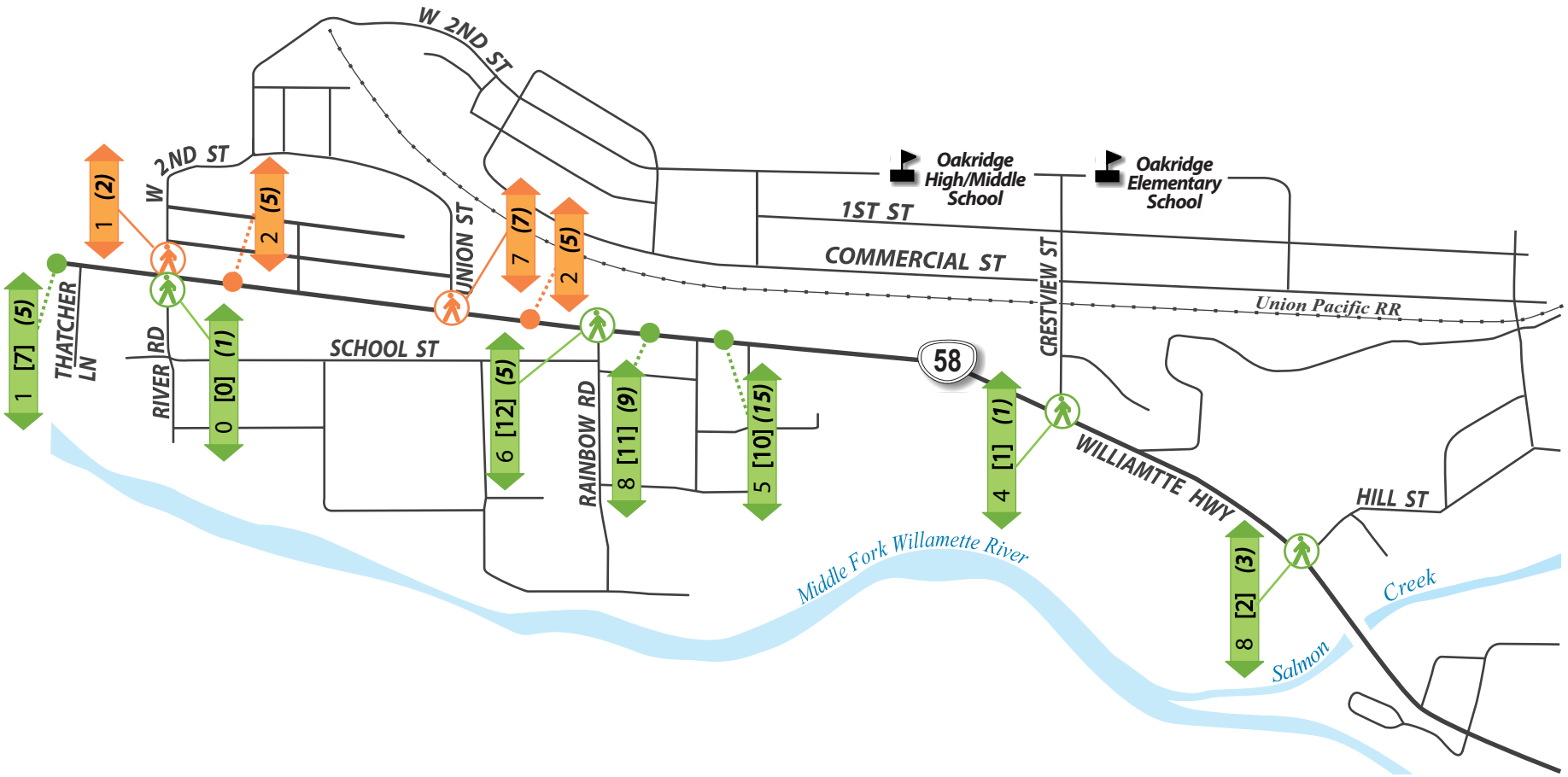
The selection of the locations was performed by the project team and considered various criteria, including high concentration of pedestrian collisions, high pedestrian crossing volumes, potential railroad crossing paths, and nearby pedestrian generators (including schools, markets, etc.). The locations selected include those shown in Figure 2-2.

PEDESTRIAN-VEHICLE CONFLICT NEAR RAINBOW ROAD ON OR 58

During the observations, pedestrian activity along the study corridor was also observed. The majority of pedestrians crossing along Highway 58 occurred at Rainbow Road or Rock Road and crossing near 2nd Street/River Road were primarily guests of the Best Western Hotel. Each location had a unique trend in the variation of the number of pedestrian crossing volumes throughout the day. Most of the locations had one or two key crossing areas, which typically occurred at an intersection or near a key business.

The observed activity and patterns for each location are discussed in the following sections. Figure 2-4 shows a summary of issues that were observed along the study area between pedestrians and vehicles. Along OR 58, pedestrians must cross five lanes and vehicles may stop in one lane and block other vehicle's vision and the vision of the pedestrian. Vehicles that wish to turn onto OR 58 from Union Street, Rainbow Road, and other access streets must look for vehicles in both directions in addition to pedestrians crossing both at intersections and midblock locations. At OR 58 and Union Street and Or 58 and Rainbow Road there are now marked crosswalks across OR 58. Additionally, several pedestrians chose to cross at the midblock locations. Due to the lack of bicycle lanes along OR 58, cyclists will ride on the sidewalk which creates conflicts between bicyclists and pedestrians.

PEDESTRIAN CROSSING AT THE 2ND STREET/OR 58 INTERSECTION



LEGEND - Pedestrian Data

- Approximate Location of 500 ft. Pedestrian Crossing Count Segments
- Mid-Block Crossing Location

School Year Peak Hour Volumes	Summer Break Peak Hour Volumes
AM *(PM)*	AM [After] *(PM)*

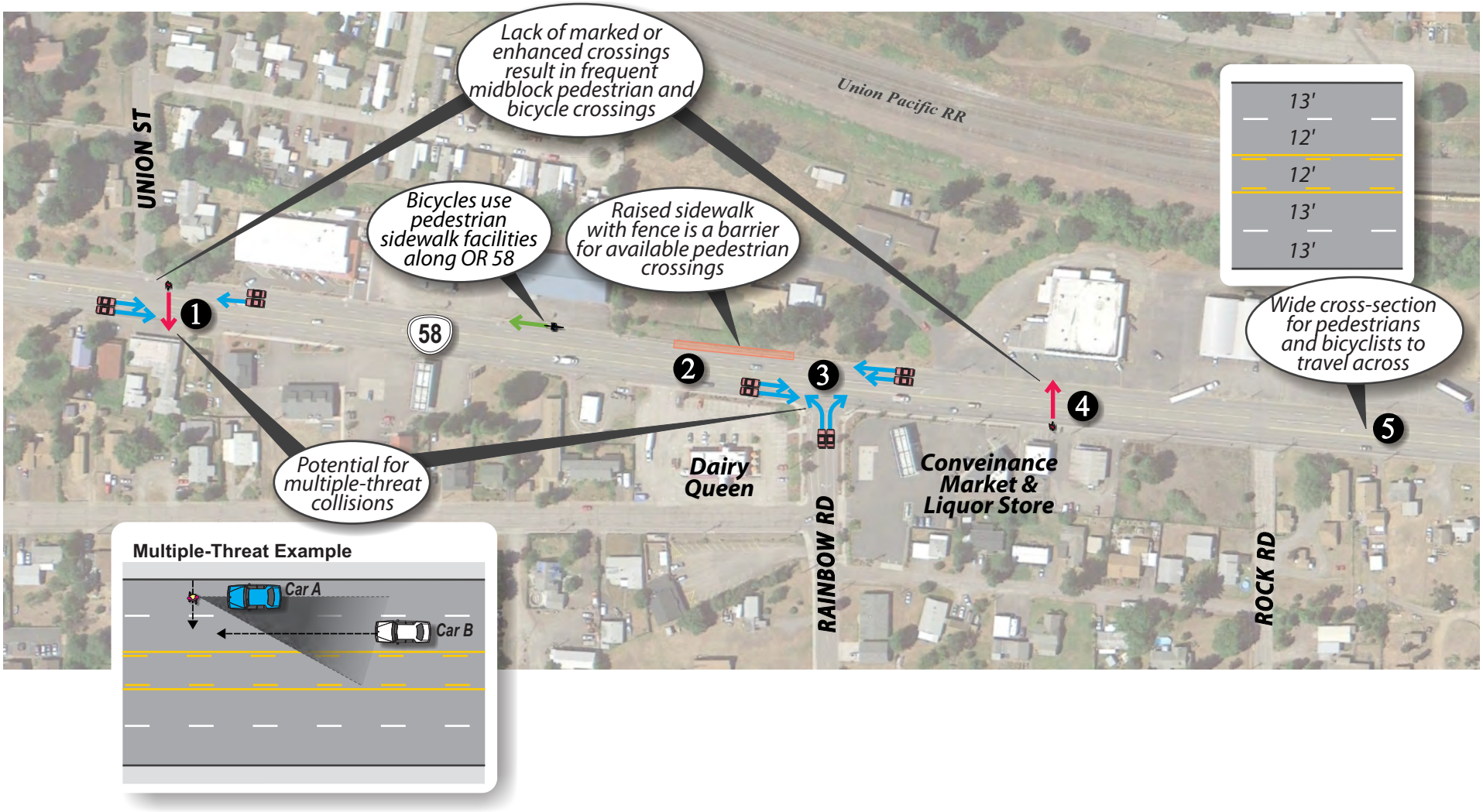
AM Peak - *7:00-9:00AM* **Afternoon** - *1:00-3:00PM* **PM Peak** - *4:00-6:00PM*

DKS

No Scale

Figure 2-3

EXISTING PEDESTRIAN PEAK HOUR CROSSING VOLUMES



LEGEND

- Motor Vehicle Movement
- Pedestrian Movement
- Bicycle Movement
- # - Conflict Point

DKS

No Scale

Figure 2-4

CONFLICT ANALYSIS SUMMARY

McAtee Road to 2nd Street/River Road

Near the 2nd Street/River Road intersection, sidewalks are present on the north side of the road. There is not a marked crosswalk across OR 58 in the vicinity, which led to pedestrians crossing at numerous midblock locations. There are also access points leading to empty parking lots near the intersection that are used by freight trucks as parking. Although motor vehicle traffic volumes are relatively low, the speed limit is 35 mph (the 85th percentile speed indicates that the majority of traffic is traveling at 41 mph in this segment of the highway) and the percent of heavy vehicles is 15%-20% throughout the day.

PEDESTRIAN CROSSING HWY 58 AT 2ND STREET/RIVER ROAD

There were very few pedestrians crossing at the intersection of OR 58 and 2nd Street/River Road when school was in session and even fewer during the summer. 2nd Street crosses the railroad tracks and provides access to the schools to the north of OR 58. Most pedestrian crossings that occurred near the unsignalized 2nd Street/River Road were made by adults during the mid-day and p.m. peak hour. The photo above shows a pedestrian crossing OR 58 at the intersection. There were also occasional pedestrians that crossed in the vicinity of the Best Western Hotel between McAtee Road and 2nd Street/River Road.

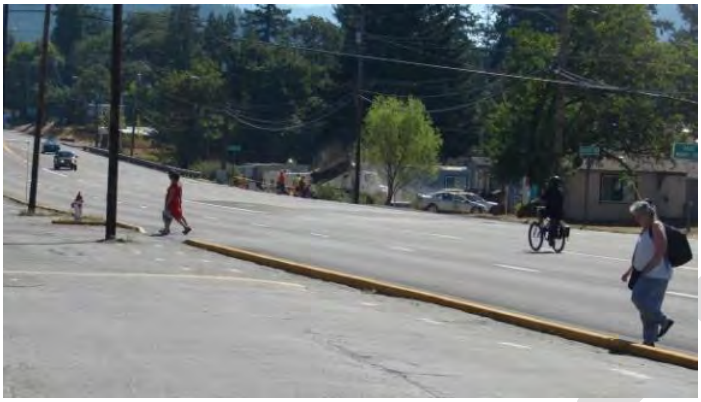
Union Road to Rainbow Road

This location was only observed when school was in session primarily because of the unmarked dirt path that crosses over the railroad tracks and connects to the schools as shown by the red line in Figure 2-5. Most pedestrian activity on the Highway at this location was adults and teenagers. Crossing the Union Pacific Railroad (UPRR) on foot is illegal and is not desired. The City is considering building a pedestrian bridge over the UPRR tracks near Commercial Street and South Diamond Street to provide pedestrians traveling to and from school a more direct, safe, and legal crossing.

FIGURE 2-5: SCHOOL WALKING ROUTES

RAINBOW ROAD TO JONES ROAD

The majority of pedestrian activity at this location occurred during the summer. Most crossings were northbound and occurred during the mid-day peak period from 11 a.m. to 1 p.m. This is likely due to the food and convenience stores that are located near the OR 58 and Rainbow Road intersection. The photo shows two different pedestrians crossing OR 58 and a cyclist riding in the median of the road. Although motor vehicle traffic volumes are relatively low, the speed limit is 35 mph (the 85th percentile speed indicates that the majority of traffic is traveling at 42 mph in this segment of the highway) and the percent of heavy vehicles is 15%-20% throughout the day. As previously discussed, this location is currently being considered for a new crosswalk as well as a rectangular rapid flash beacon (RRFB).



PEDESTRIANS CROSSING OR 58 NEAR ROCK ROAD

BICYCLE FACILITIES AND ACTIVITY

Bicycle facilities and activity were observed at the same locations as previously discussed in the pedestrian activity section. The current bicycle facilities are limited and include shoulders that are wide enough for bicycles along OR 58. Mountain biking is a popular recreational activity near Oakridge and several trails start outside of the city.

It was observed that there was very little bicycle traffic on the Highway during the summer. A total of 5 bicycles were observed during the day that often rode on the sidewalk. The photo below shows a child riding along an area that is within a private parking lot, likely because the road does not have designated bicycle lanes. Bicyclists on the sidewalk present several safety issues for pedestrians and the bicyclists themselves. Pedestrians aren't always capable of responding quickly to cyclists on sidewalks, especially elderly pedestrians or those with pets or strollers. Because of this, bicycle/pedestrian crashes have the potential to result in minor injuries. Furthermore, bicyclists traveling on the sidewalks are difficult for motor vehicles to see when they are riding behind trees, parked cars and other objects.

BICYCLIST RIDING ALONG PRIVATE PARKING LOT

STREET LIGHTING OBSERVATIONS

Street lighting observations were conducted along the OR 58 corridor on August 18, 2015. On OR 58, there are intermittent overhanging street lights on alternating sides of the road approximately every 100 to 150 feet.

At some intersections there are additional street lights. Even though there is some existing street lighting along the majority of the OR 58 corridor within the study area, the observed light levels indicate that supplemental lighting at potential pedestrian and bicycle crossing locations is needed. Table 2-3 describes in more detail the lighting observations at key locations along the OR 58 study corridor.

Table 2-3: OR 58 Study Area Street Lighting Observations

Approximate Location	Comments	Recommendation
2nd Street/River Road	Two street lights are on the northeast and northwest corner of the intersection on either side of 2nd Street.	Additional Lighting Needed
Union Street	One street light is on the northeast corner of the intersection.	Additional Lighting Needed
Rainbow Road	One street light is on the southeast corner of the intersection and two ornamental street lamps are along Rainbow Road; however the majority of Highway 58 near the intersection is still very dark.	Additional Lighting Needed
Rock Road	One street light is on the southeast corner of the intersection.	Additional Lighting Needed
Crestview Street	Two street lights are at the intersection; one on the northeast corner of the intersection and the other on the southwest corner of the intersection. There is additional lighting provided in the shopping center parking lot in the northeast corner of the intersection.	Additional Lighting Needed
Hills Street	One street light is on the northeast corner of the intersection.	Additional Lighting Needed

COLLISION ANALYSIS

The collision analysis for OR 58 considered ODOT's Safety Priority Index System (SPIS) findings and the past five years of available collision data, specifically considering any collisions involving pedestrians or bicycles. The intent was to identify trends as well as potentially hazardous locations in need of mitigation.

SAFETY PRIORITY INDEX SYSTEM (SPIS)

The Safety Priority Index System (SPIS) is a ranking system developed by ODOT to identify potential safety problems on state highways. SPIS scores are developed based upon crash frequency, severity, and rate for a 0.10 mile or variable length segment along the state highway over a rolling three-year window (i.e., every year it is updated with the most recent three years). A prioritized list of the top 15 percent of statewide SPIS sites is created for each region, and the top five percent are investigated by the five Region Traffic managers' offices. For the most current three years analyzed (2011-2013), there are no SPIS locations in Oakridge along OR 58 that are in the top 15 percent of statewide SPIS sites.

ODOT COLLISION ANALYSIS

The raw collision data obtained from the ODOT Crash and Analysis Reporting Unit was also evaluated. This evaluation considered the most recent five years (2009-2013) of collision data.

Table 2-4 summarizes collisions along the study corridor and includes collision severity, collisions per year, and the average collision rate for the ten year period. Overall, the yearly collision rate for the OR 58 corridor is 3.4 collisions per million vehicle-miles traveled. The average ODOT State Highway Crash Rate for similar functional classification roadways (State Highway System – Rural Highway System, Rural Cities, Other Principal Arterials) is 1.47 collisions per million vehicle-miles traveled.[7] Therefore, the corridor crash rate is significantly less than the state wide average for similar facilities.

Table 2-4: OR 58 Study Area Collision Data (2009 through 2013)

Corridor (Distance)	Collisions (by Severity)				Collisions per Year	Collision Rate[b,c]
	Fatal	*Injury*	*PDO*[a]	*Total*		
OR 58 (2.74 mi.)	1	7	9	17	3.4	0.48

[a] *PDO = Property Damage Only.*
[b] *Rate Calculation = Collisions per year / (Average Daily Traffic x 365 days /1 million vehicle-miles traveled)*
[c] *An average ADT of 7,100 vehicles was used to calculate the collision rate.*

The collision data in Table 2-4 also shows one fatal collision and no Injury A[8] along OR 58 between 2009 and 2013. The fatality was an incident that occurred at the signalized intersection of Crestview Street and OR 58 involving two vehicles colliding during a turning maneuver. The collision reports state that the fatality occurred during the day on a dry surface and it was noted that the drivers were at fault by disregarding the traffic signal (i.e. running the red signal) and driving too fast for conditions.

[7] 2013 State Highway Crash Rate Tables, ODOT Crash Analysis and Reporting Unit, July 2013; Table IV.
[8] Injury A crash is a severe or debilitating injury B and injury C and injury C type crashes are lower level severity.

Two 'Injury B' collisions that involved at least one pedestrian occurred between Rainbow Road and Rock Road. One collision occurred at dusk and involved a pedestrian illegally being in the roadway while the other occurred during the day and involved a driver running a stop sign.

FIGURE 2-6: COLLISION ANALYSIS ALONG OR 58 IN THE CITY OF OAKRIDGE

Further investigation was performed for the corridor to assess whether there are any clear trends in the collision data. First, the collision data between 2009 and 2013 was broken down by the type of collision. Table 2-5 shows the collision breakdown by type for each of the study corridor segments. As shown, the most prevalent collision types were turning movement collisions. Together they account for approximately 40 percent of the total collisions, which is typical on urban highways. Lighting conditions are an important factor to consider in collision analysis. As shown in Table 2-5, the greatest number of collisions occurred during the daylight. One pedestrian collision from 2009-2013 occurred during daylight hours and a second occurred at dusk.

Table 2-5: Collision Breakdown by Collision Type and Lighting (2009 through 2013)

Corridor (Distance)	Collision Breakdown by Collision Type								Total
	Rear-End	*Turn*	*Angle*	*Fixed Obj.*	*Bike/ Ped*	*Side-Swipe*	*Head On*	*Other*	
OR 58 (2.74 mi.)	4	7	0	3	2	1	0	0	17
	Collision Breakdown by Lighting								**Total**
	Daylight		*Dusk*		*Dark with Street Lights*		*Dark without Street Lights*		
OR 58 (2.74 mi.)	13		2		1		1		17

MOTOR VEHICLE CONDITIONS

Existing traffic conditions were evaluated for the OR 58 study corridor which included roadway network characteristics, vehicular volume, speed, heavy vehicle summary, intersection turn movement counts, mobility targets, and existing intersection performance.

VEHICULAR VOLUME, SPEED, AND HEAVY VEHICLE SUMMARY

Table 2-6 presents data collected from 24-hour tube counts[9] at two select locations along the OR 58 corridor. This data includes vehicular bi-directional volumes, 85th percentile speed,[10] and heavy vehicle traffic percentages. As shown in the table, the travel speeds range from four to eight mph above the current posted speeds. This is an important finding related to higher travel speeds and impacts to pedestrian safety.

Table 2-6: OR 58 Bi-Directional Volumes, Speeds, and Heavy Vehicle Usage

Surveyed Data[a]	Location along OR 58	
	East of 2nd Street/River Road	*East of Jones Road*
Average Daily Traffic		
Eastbound	3,039 (49.2%)	3,990 (49.0%)
Westbound	3,137 (50.8%)	4,147 (51.0%)
Total	6,176	8,137
85th Percentile Speed		
Eastbound	39 mph	42 mph
Westbound	43 mph	42 mph
Posted Speed		
Both Directions	35 mph	35 mph
Truck Traffic Percentage[b]		
Eastbound[c]	12%	10%
Westbound[c]	14%	10%

[a] *Quality Counts 24-hour classification and speed counts were taken on Tuesday, August 18, 2015.*
[b] *Specified as vehicles with three or more axles.*
[c] *2013 Heavy Vehicle Percentage on OR 58 at mile point 37.39 was 33.21%*

[9] Quality Counts 24-hour classification and speed counts were taken on Tuesday, August 18, 2015.
[10] The 85th percentile speed is defined as the speed below which 85 percent of the vehicles are traveling.

To further understand the vehicular use of OR 58 over the course of a 24-hour period, Figure 2-7 shows the vehicle movements throughout the day at the location just east of 2nd Street/River Road. As shown, the highest traffic volume for both eastbound and westbound vehicles is during the mid-day.

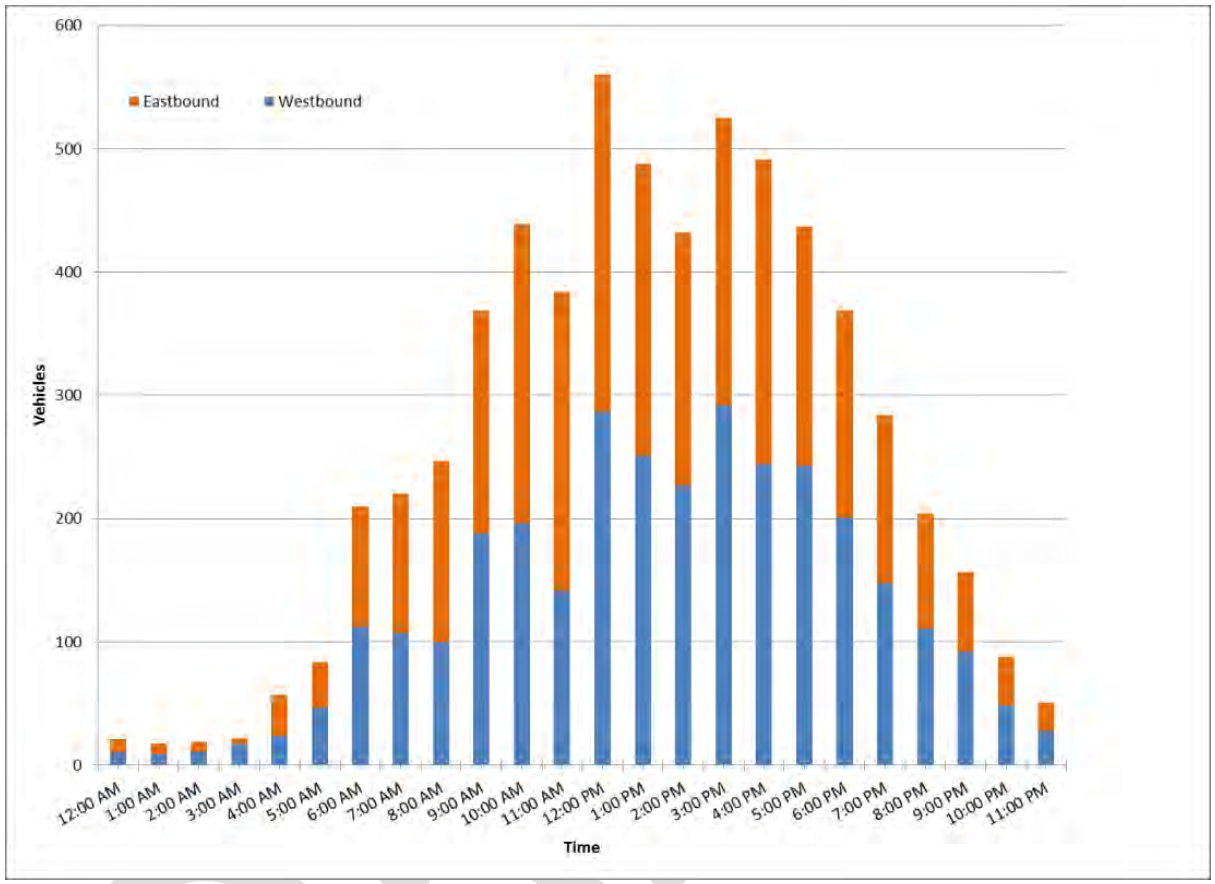


FIGURE 2-7: OR 58 24-HOUR DIRECTION VOLUMES EAST OF 2ND STREET/RIVER ROAD

INTERSECTION TURN MOVEMENT VOLUMES

Intersection vehicle turn movement volumes were collected at four intersections along the study corridor. The Crestview Street/OR 58 intersection is signalized and the remaining are unsignalized. These intersections were selected in conjunction with the project team and are listed below from east to west:

- OR 58 at 2nd Street/River Road
- OR 58 at Rainbow Road
- OR 58 at Crestview Road
- OR 58 at Hills Street

The traffic volumes were counted during the a.m. (7:00 a.m. to 9:00 a.m.), mid-day (11:00 a.m. to 1:00 p.m.) and p.m. (4:00 a.m. to 6:00 p.m.) peak periods.[11] The a.m., mid-day and p.m. peak hour traffic volumes for the four study intersections are shown in Figure 2-8. Also included in Figure 2-8 are the lane configurations and traffic control at the study intersections. The detailed two-hour traffic counts are included in the appendix. The data was collected in August, which is the month with the highest ADT according to the Automatic Traffic Recorder Station located along OR 58 just south of Oakridge.[12] Therefore, no seasonal adjustment rate was applied.

MOBILITY STANDARDS

Agency mobility standards often require intersections to meet level of service (LOS) or volume-to-capacity (v/c) intersection operation thresholds.

- The **intersection LOS** is similar to a "report card" rating based upon average vehicle delay. Level of service A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. Level of service D and E are progressively worse operating conditions. Level of service F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays.
- The **volume-to-capacity (v/c) ratio** represents the level of saturation of the intersection or individual movement. It is determined by dividing the peak hour traffic volume by the maximum hourly capacity of an intersection or turn movement. When the v/c ratio approaches 0.95, operations become unstable and small disruptions can cause the traffic flow to break down, as seen by the formation of excessive queues.

OR 58 is an Oregon Department of Transportation (ODOT) facility classified as a Statewide Highway and freight route within the study area boundaries. According to the *1999 Oregon Highway Plan* (*OHP*), ODOT mobility targets are given as v/c ratios and are based on the highway category.[13] The mobility targets for OR 58 are show in Table 2-7 and are the same for both signalized and unsignalized intersections.

Table 2-7: Applicable Study Intersection Mobility Target

Major Roadway	Jurisdiction (Classification and Designations)	Mobility Target
OR 58	ODOT (Statewide Highway, Freight Route)	v/c ≤ 0.85

[11] Quality Counts turn movement counts taken on Tuesday August 18, 2015
[12] 2013 ATR Station Data provided by ODOT for OR 58 at mile point 37.36, 0.10 miles east of Kitson Springs Road
[13] *1999 Oregon Highway Plan*, Oregon Department of Transportation, 1999; Table 6 in Policy 1F displays the maximum allowable v/c ratios for areas outside of the Portland Metropolitan Area.

EXISTING INTERSECTION PERFORMANCE

The existing performance of the study intersections was evaluated using Synchro™ software, which employs methodology from the *2010 Highway Capacity Manual*[14] for unsignalized intersections and *2000 Highway Capacity Manual*[15] for signalized intersections. The traffic volumes and transportation system configurations described previously were used to determine intersection levels of service (LOS) and volume-to-capacity (v/c) ratios. The results of the intersection operations analysis are presented in Table 2-8.

As shown, all of the intersections currently meet ODOT mobility targets. Figure 2-8 shows the existing vehicle peak hour traffic volumes at each of the study intersections.

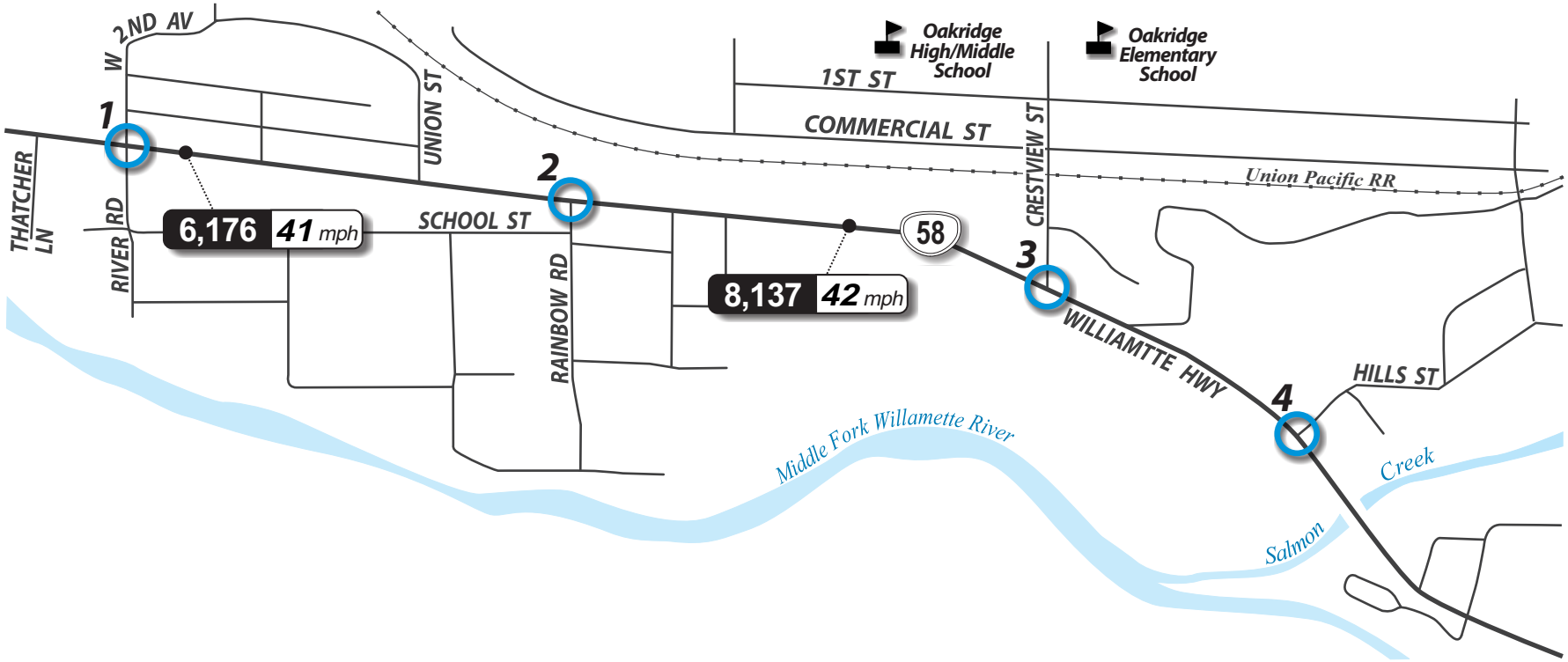
Table 2-8: Study Intersection Performance

Intersection	Mobility Target	A.M. Peak Hour			Mid-day Peak Hour			P.M. Peak Hour		
	ODOT	*Delay*	*v/c*	*LOS*	*Delay*	*v/c*	*LOS*	*Delay*	*v/c*	*LOS*
Signalized										
OR 58/Crestview Street	0.85 v/c	4.9	0.10	A	7.4	0.25	A	7.2	0.23	A
Unsignalized										
OR 58/2nd Street	0.85 v/c	9.9	0.04	A/A	13.2	0.08	A/B	11.3	0.03	A/B
OR 58/Rainbow Road	0.85 v/c	10.4	0.06	A/B	13.7	0.09	A/B	12.2	0.08	A/B
OR 58/Hills Street	0.85 v/c	9.1	0.05	A/A	10.8	0.13	A/B	9.9	0.07	A/A

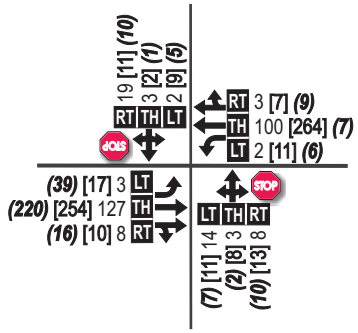
Signalized intersection:
Delay = Average Intersection Delay (sec.)
v/c = Volume-to-Capacity Ratio
LOS = Level of Service

Unsignalized intersection:
Delay = Critical Movement Approach Delay (sec.)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Major Street LOS/Minor Street LOS

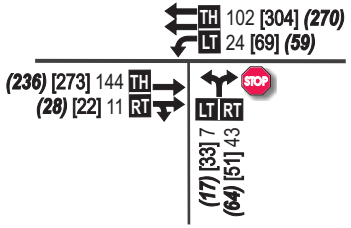
[14] *2010 Highway Capacity Manual*, Transportation Research Board, Washington, D.C., 2010.
[15] *2000 Highway Capacity Manual*, Transportation Research Board, Washington, D.C., 2000.



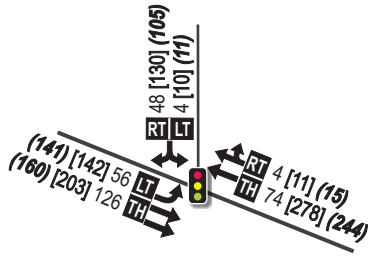
1. *OR 58 @ River Rd./W. 2nd St.*



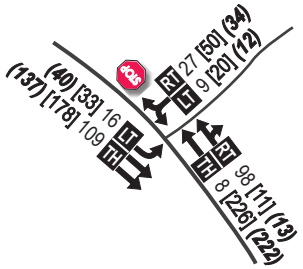
2. *OR 58 @ Rainbow Rd.*



3. *OR 58 @ Crestview St.*



4. *OR 58 @ Hills St.*



LEGEND

- # - Traffic Movement Count Locations *(Numbered)*
- STOP - Stop Sign
- Traffic Signal
- Lane Configuration
- AM **[Afternoon]** ***(PM)*** - Peak Hour Traffic Volumes
- LT TH RT (Left•Thru•Right) - Volume Turn Movement
- ADT 00,000 / 85th Percentile Speed 00 mph

DKS

No Scale

Figure **2-8**

EXISTING MOTOR VEHICLE PEAK HOUR TRAFFIC VOLUMES

FUTURE TRAFFIC CONDITIONS

A 20-year growth rate was applied to the OR 58 corridor in order to project future transportation growth from 2015 to 2035 in order to analyze the existing transportation system. The annual growth factor was obtained with direction from the ODOT Analysis Procedures Manual which utilizes ODOT Future Highway Volume Table (FHVT).[16]

The FHVT predicts a minimal amount of growth on the OR 58 study corridor with a 20-year factor of 0.0013 for OR 58 (this is only a fraction of a percent per year). This assumption is conservative based on trends provided by the Automatic Traffic Recorder (ATR) station located just south of Oakridge, which showed that after a decline from 2005-2012, traffic volumes have steadily rose since 2012. Additionally, the City of Oakridge Transportation System Plan (TSP)[17] found that from 2000 to 2020 the growth factor would be 0.0074.

Table 2-9 displays the projected 2035 traffic volumes modeled from the 20-year growth rate from the FHVT of 0.13%. As shown, intersection delay, LOS, and v/c ratios hardly increase over the 20-year period with all of the study intersections still meeting mobility targets.

Table 2-9: Study Intersection Projected Performance (2035)

Intersection	Mobility Target	A.M. Peak Hour			Mid-day Peak Hour			P.M. Peak Hour		
	ODOT	*Delay*	*v/c*	*LOS*	*Delay*	*v/c*	*LOS*	*Delay*	*v/c*	*LOS*
Signalized										
OR 58/Crestview Street	0.85 v/c	4.9	0.09	A	7.5	0.26	A	7.4	0.24	A
Unsignalized										
OR 58/2nd Street	0.85 v/c	10.2	0.04	A/B	13.0	0.09	A/B	12.2	0.06	A/B
OR 58/Rainbow Road	0.85 v/c	10.2	0.05	A/B	13.3	0.08	A/B	12.6	0.09	A/B
OR 58/Hills Street	0.85 v/c	9.1	0.05	A/A	10.5	0.11	A/B	9.9	0.07	A/A

Signalized intersection:
Delay = Average Intersection Delay (sec.)
v/c = Volume-to-Capacity Ratio
LOS = Level of Service

Unsignalized intersection:
Delay = Critical Movement Approach Delay (sec.)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Major Street LOS/Minor Street LOS

[16] The 2033 FHVT is created using data from the Transportation Volume Tables. The future volumes are estimates only and local growth patterns and comprehensive plans may affect the actual outcome.

[17] 2000, City of Oakridge Transportation System Plan

Even though the 20-year growth rate factor from the FHVT is the supported methodology, a sensitivity analysis was performed to experiment with higher growth rates and their impact to the study area. Table 2-10 displays the v/c ratios for the study intersections along OR 58 using a growth rate of 0.74% per year (the previous City of Oakridge TSP growth rate) which is nearly six times higher than FHVT growth assumption. As shown in the table below, all intersections still meet ODOT v/c ratio requirements and there is very little change in traffic operations with the TSP growth rate. Given the current five-lane cross section within the City of Oakridge, there is significant capacity available at each of the intersections.

Table 2-10: Study Intersection Sensitivity Analysis using a 0.74% Growth Rate per Year

Intersection	Mobility Target	A.M. Peak Hour			Mid-day Peak Hour			P.M. Peak Hour		
	ODOT	*Delay*	*v/c*	*LOS*	*Delay*	*v/c*	*LOS*	*Delay*	*v/c*	*LOS*
Signalized										
OR 58/Crestview Street	0.85 v/c	5.0	0.10	A	7.7	0.29	A	7.6	0.27	A
Unsignalized										
OR 58/2nd Street	0.85 v/c	10.5	0.05	A/B	13.7	0.09	A/B	12.7	0.06	A/B
OR 58/Rainbow Road	0.85 v/c	10.4	0.06	A/B	14.0	0.10	A/B	13.1	0.10	A/B
OR 58/Hills Street	0.85 v/c	9.2	0.06	A/A	10.7	0.12	A/B	10.0	0.08	A/B

Signalized intersection:
Delay = Average Intersection Delay (sec.)
v/c = Volume-to-Capacity Ratio
LOS = Level of Service

Unsignalized intersection:
Delay = Critical Movement Approach Delay (sec.)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Major Street LOS/Minor Street LOS

CHAPTER 3 CROSSING TREATMENT TOOLBOX

This toolbox summarizes several potential pedestrian crossing enhancements which can be applied to crossing locations along the OR 58 corridor. Each crossing location should be reviewed to determine the appropriate combination and application of treatments.[18] The toolbox includes the following treatment options:

- Median Refuge Islands and Curb Extensions
- Rectangular Rapid Flashing Beacon (RRFB) with Raised Median
- High Intensity Activated Crosswalk (HAWK)
- Overhead Flashing Beacons (Standard and RRFB)
- Street Lighting

The cost estimates listed with each crossing enhancement are planning level cost estimates based on comparisons to similar, constructed projects. Cost estimates are listed per pedestrian crossing and where possible show the estimated Project Engineering (PE) and Construction Engineering (CE) costs. The crash reduction factors (CRF) listed with each crossing enhancement are from the ODOT CRF Final List which is a collection of CRF values including the HCM values, the Crash Medication Factors clearinghouse values, research documents, and finally engineering judgement.

Items which were considered but left out of the Pedestrian Toolbox include:

- **Traffic Calming Measures:** These measures (i.e. speed humps, narrow lanes) are not consistent with the 'arterial' and 'truck route' classifications of OR 58 and emergency service needs.
- **Lowering Speed Limit:** The speed limit is determined by roadway characteristics and the 85th percentile speed of traffic. Studies show that 'artificially' lowering the speed of a roadway is ineffective at garnering driver compliance. However, some of the other improvements may calm traffic and result in lower travel speeds. Therefore, after other projects have been implemented, future speed limit lowering investigation can be performed to see if lowering the speed is justified.
- **In-Roadway Lighting:** These are highly susceptible to roadway damage (especially snow plows), cost intensive for both installation and maintenance, and are not approved by ODOT.
- **Grade-Separated Pedestrian Crossing (i.e., Pedestrian Bridge or Tunnel):** This measure would be very expensive and require significant right of way to address ADA needs. In addition, such crossings are not always used by pedestrians.
- **Pedestrian Traffic Signal:** This measure does not meet the MUTCD minimum pedestrian volume thresholds for the corridor.[19]

[18] All marked crosswalks on the state highway system require State Traffic-Roadway Engineer approval.

[19] *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*. 2010 ed. Washington, D.C.: U.S. Dept. of Transportation, Federal Highway Administration, 2012.

MEDIAN REFUGE ISLANDS AND CURB EXTENSIONS

Median refuge islands are raised curbs that provide a clear pedestrian area that are placed in the center of the roadway and separate opposing lanes of traffic. They can have a staggered or straight pedestrian cut-through or path configuration. Curb extensions are protracted corner curbs that can be utilized for both signalized and unsignalized intersections.

Median refuge islands provide a sheltered place (vertical deflection) in the median where pedestrians can wait for gaps in traffic. They also allow a two-stage crossing to occur where the pedestrian clears one direction of travel movement at a time on two-way streets. A refuge island with a staggered pedestrian cut-through or path requires the pedestrian to turn towards on-coming traffic before crossing, which encourages the pedestrian to take a better view of the on-coming traffic. Curb extensions and median refuge islands provide pedestrians with shorter crosswalk travel length. They also reduce vehicle lane size, thus, vehicle speeds are often reduced as well.

ADVANTAGES

- Allows pedestrians to cross one direction of traffic at a time
- Provides a protected area for pedestrians
- Reduces the size of individual gaps needed to make a safe crossing
- Provide a better view of oncoming traffic when using a staggered cut-through path
- Contributes to traffic calming

DISADVANTAGES

- Added obstruction in roadway
- May need additional ROW to meet ADA requirements for ramps by sidewalks.
- Medians can conflict with left turn lane needs, adjacent private driveways and public streets
- ROW constraints may not allow.

EXAMPLES

ESTIMATED COST

$30,000 per crossing (PE/CE: $8,000)

CRASH MODIFICATION FACTOR

Installing any type of median barrier reduced all crash types for all severities by 30%. Installing a raised median with marked crosswalks reduced all severity types of pedestrian crashes by 46%.

RECTANGULAR RAPID FLASHING BEACON (RRFB) WITH RAISED MEDIAN

The Rectangular Rapid Flashing Beacon (RRFB) is a special LED flashing device installed below a crosswalk sign and placed at marked, unsignalized crosswalk locations.[20] The RRFB is pedestrian actuated with either hardwired or wireless pushbuttons. It can also be wireless and solar powered, which would make for easier installation (though monetary cost would be approximately equal due to higher equipment cost.)[21]

The RRFB increases pedestrian visibility by attracting driver attention with the flashing beacons and making them aware of the pedestrian's presence. Studies to date have shown driver stopping compliance rates around 80% when not paired with a median, but upwards of 88% to 90% when paired with a median.

ADVANTAGES

- High motorist compliance, while yielding low rear-end resulting vehicle crashes
- Improves pedestrian visibility and safety
- Allows for normal traffic flow when not actuated
- Solar or AC power capable
- Lower installation cost as compared to traffic signal pole type installations

DISADVANTAGES

- Interim approval status with FHWA
- Larger roadways can make curb-side signing less obvious to motorists
- Does not provide a 'red' condition which requires vehicles to stop
- Can have a 'dimming' effect when power is low

ESTIMATED COST

$62,000 per crossing; includes installation of raised median ($30,000) and four sign assemblies ($8,000 each), which include RRFBs, solar panels, and wireless system. Note: only two sign assemblies are needed if no median is installed (PE/CE: $16,500)

EXAMPLES

CRASH MODIFICATION FACTOR

Installing a RRFB with a median on a three or more lane roadway reduces all severity types of pedestrian crashes by 56%. Without a median, all severity types of pedestrian crashes are reduced by 10%.

[20] RRFBs on the state highway system require State Traffic-Roadway Engineer approval.

[21] Pictures from Manual on Uniform Traffic Control Devices (MUTCD) website, http://mutcd.fhwa.dot.gov/, 6/16/2010.

HIGH INTENSITY ACTIVATED CROSSWALK (HAWK)

A pedestrian hybrid beacon (commonly referred to as a HAWK) uses a Yellow-Red lens configuration (two red lens on top and yellow lens on bottom) to provide a signalized, mid-block pedestrian crossing.[22] The pedestrian hybrid beacon is used to warn and control traffic to assist pedestrians in crossing a street at a marked crosswalk. This beacon system cannot be implemented where the minor street approaches are stop controlled.

The pedestrian hybrid beacon is designed to require traffic to stop for the pedestrian walk interval (steady red) and to allow traffic movement during the flashing 'don't walk' stage of the pedestrian crossing (flashing red). The pedestrian hybrid beacon also provides flashing yellow and solid yellow warning indication to traffic that indicates the upcoming 'walk' stage/steady red. NCHRP Report 562 documented compliance for this type of beacon crosswalk at upwards of 90%.[23]

ADVANTAGES

- Provides a 'red' condition which requires vehicles to stop for pedestrians
- Can be installed at locations that do not meet typical traffic signal volume warrants
- Improves visibility of crossing and pedestrians
- Gives drivers an indication that conditions are changing with a flashing yellow and steady yellow indication, and provides a clearance interval
- Pedestrian actuated, not active all of the time
- MUTCD approved (Section 4F.02)

DISADVANTAGES

- High installation and maintenance costs
- Drivers may stop for 'dark' signal, when HAWK is not actuated

EXAMPLES

ESTIMATED COST

$150,000 per crossing (PE/CE: $30,000)

CRASH REDUCTION FACTOR

Installing a HAWK all severity types of bicycles and pedestrian crashes by 69%.

[22] HAWKs on the state highway system require MUTCD warrant analysis and State Traffic-Roadway Engineer approval.
[23] NCHRP 562, pg. 17.

Overhead Flashing Beacons (Standard and RRFB)

Overhead flashing beacons are flashing amber beacons installed on traffic signal poles and mast arms along with overhead signs. Warning signs are typically placed in advance of the marked crosswalk or on signs located adjacent to the crosswalk entry. The flashing beacons can be programmed to either operate continuously or be pedestrian actuated. Recent proposals to the Federal Highway Administration (FHWA) for overhead installations have included the use of RRFB on the mast arm, in lieu of the standard flashing amber beacon. While this was approved for experimental use by FHWA at a crossing in the State of Washington, it has not been implemented in the field to date.

Overhead flashers are used to increase driver awareness when approaching a marked crosswalk at an uncontrolled location. NCHRP 562 documented wide ranging vehicle yielding compliance for these types of beacons. Compliance was generally higher when some form of pedestrian actuation was used in conjunction with the overhead flashing beacon installation.

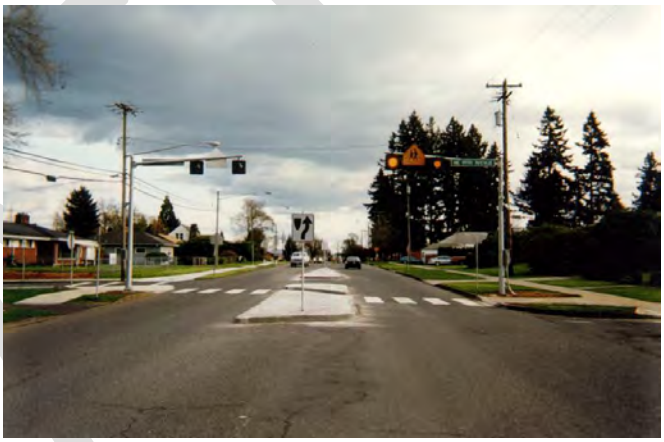
Advantages

- Increase driver awareness
- Can be pedestrian activated

Disadvantages

- Does not provide a steady red signal indication requiring traffic to stop
- High installation cost
- Some maintenance costs

Examples



Estimated Cost

- Standard Flashing Amber: $80,000 per crossing (PE/CE: $15,000)
- Overhead RRFB: $100,000 per crossing (PE/CE: $15,000)

Crash Reduction Factor

Installing an Overhead Flashing Beacon (standard and RRFB) all severity types of pedestrian crashes by 10%. If a median is installed at the same time as the Overhead Flashing Beacon, crashes are reduced by 56%.

STREET LIGHTING

Street light poles are located near high-pedestrian and bicycle activity locations and can be added on one or both sides of the street. They can also be oriented toward pedestrian activity at key locations such as transit stops, bicycle conflict points and commercial land uses. Light levels should satisfy both the appropriate RP-8-05 recommended lighting levels and applicable ODOT/City of Oakridge standards.

Street lighting provides increased pedestrian and bicycle visibility during the night and the dawn/dusk periods of the day by providing contrast between the pedestrian and their surroundings.

ADVANTAGES

- Improved pedestrian and bicycle visibility during nighttime, dawn, and dusk hours
- Improved vehicle visibility for pedestrians and bicycles to judge gaps in traffic
- Greater pedestrian safety by providing improved visual recognition of approaching pedestrians and bicyclists.

DISADVANTAGES

- Installation costs
- Maintenance costs
- ROW constraints may not allow installation of lighting

ESTIMATED COST

$1,000 per light for utility pole mounted lights and approximately $15,000 per pole for ODOT steel cobra head street light poles (including conduit, wiring and trenching). (PE/CE: $4,000 per light or 27%)

CRASH REDUCTION FACTOR

Installing street lighting at an intersection reduces all severity types of nighttime crashes by 38%. Installing street lighting along a roadway segment reduces all severity types of nighttime crashes by 28%.

EXAMPLES

CHAPTER 4 PEDESTRIAN IMPROVEMENT DESIGN CONCEPTS

This section documents the development of recommended pedestrian safety improvements for the OR 58 corridor in the City of Oakridge, Oregon. The Technical Advisory Committee (TAC) comprised of staff members from Lane Transit District, Oakridge School District, Police Department, Business Owners, key members of the community, and the City of Oakridge provided feedback on the existing conditions findings as well as the priority locations. In addition, stakeholder interviews with Oakridge School District, First Student bus service, and several frontage business owners provided important local knowledge of the study corridor and helped in the assessment of existing needs and deficiencies. The safety improvement concepts that were developed for this corridor consist of pedestrian crossing treatments at key locations as well as pedestrian and bicycle related traffic signal and corridor-wide treatments.

PEDESTRIAN CROSSING TREATMENTS

Significant attention was given to the development of pedestrian crossing treatment concepts. The intent of the crossing treatments will be to provide crossing enhancements and facilitate pedestrian movements at key pedestrian and bicycle crossing locations. The pedestrian crossing treatment discussion involves the pedestrian crossing "toolbox" (as previously discussed in Chapter 3), improvement location prioritization, and explanations of potential crossing improvement concepts for selected locations along the study corridor.

RRFB ON A PEDESTRIAN REFUGE ISLAND

UNSIGNALIZED IMPROVEMENT LOCATION PRIORITIZATION

Potential crossing improvement locations along the study area corridor were prioritized based on a variety of factors. The purpose of the prioritization process was to identify where new pedestrian crossing treatments could be constructed where safety needs are present as well as to facilitate future funding resources. Therefore, the primary locations that were considered were those within the study area located farther than 250 feet from the nearest signalized pedestrian crossing.[24]

[24] *Evaluation of Alternative Pedestrian Control Devices*, SPR 721, ODOT, 2012.

TYPICAL CROSS-SECTION OF OR 58

The prioritization of potential crossing improvement locations was performed based on feedback from stakeholders and the TAC as well as evaluation criteria established through coordination with the City, ODOT, and TAC. Different weighting factors were applied to provide emphasis to selected criteria, especially to pedestrian and bicycle collisions. The evaluation criteria include the following (listed in order of greatest weighting):

- Collisions (2009-2013)
- Collisions in the vicinity during the time period
- Collisions involving pedestrians and bicyclists in the vicinity during the time period
- Pedestrian volumes during AM, midday, and PM peak hours
- The presence of nearby pedestrian generators including:
  - School Crossings
  - Residential Connections
  - Restaurants/Convenience Markets
  - Hotels
  - Nearby Transit Stops

Scores for each location were calculated by summing the applicable weighted criteria scores for each potential location. Each collision was weighted five points and an additional 5 points were added if it was a pedestrian or bicycle collision, pedestrian volumes were weighted one point if greater than ten pedestrians during the peak hour and two points if greater than 20 pedestrians during the peak hour, and pedestrian generators were weighted by two points per generator. The prioritized list of the top five locations resulting from the application of the evaluation criteria is provided in Table 4-1. A detailed scoring table is provided in the Appendix.

Table 4-1: Crossing Location Weighted Scores and Rankings

Rank	Potential OR 58 Crossing Locations	Weighted Score	Comments
1	Rock Road - Jones Road	35	• Nearby restaurants include Subway and A&W • Rock Road and Jones Road connect residential land uses south of OR 58 to commercial land uses to the north of OR 58 • Other nearby generators include the Oakridge Liquor Store and Cascade General Store
2	River Road - Thatcher Lane	33	• Cascade Motel, Bluewolf Motel, and Best Western are located north of OR 58 • Nearby restaurants include Stewart's Drive-In, Smokin' Oak Barbeque and a deli located to the south of OR 58 • River Road is a key connector to OR 58 for residential land uses to the south
3	Rainbow Road	27	• Dairy Queen and Chevron are located at this intersection • Rainbow Road is a key connector to OR 58 for residential land uses to the south
4	Hills Street	16	• Arbor Inn and The Oakridge Motel are located near here • Residential land uses are located to the north and south of Hills Street • A designated Diamond Express stop is located on Hills Street just north of the OR 58 intersection
5	Union Street	14	• This location is currently a prominent school crossing • Nearby generators include Lee's Gourmet Kitchen and St. Vincent de Paul Society • Union Street is a key connector to OR 58 for residential land uses to the north
A	East of Jones Road	-	• This location was added based on the City's future plan to construct a pedestrian bridge over the Railroad • Nearby generators are similar to the Rock Road – Jones Road location

CROSSING IMPROVEMENT CONCEPTS FOR UNSIGNALIZED LOCATIONS

Potential crossing improvement concepts were analyzed for each location. Figure 4-1 shows an overview map of the prioritized locations. Each location is discussed in the sections below from highest to lowest ranking, including pedestrian crossing improvement concept sketches and identification of potential street lighting improvements.

The additional potential crossing location east of Jones Road was added as a study location based on the City's future plans to construct a community center and a pedestrian bridge over the railroad crossing north of OR 58 that would serve as a key route to school for students south of OR 58. This location was added after the initial evaluation had been completed and is therefore not included in the original rankings.Furthermore, the planned community center and pedestrina bridge does not currenlt exit, therefore no pedestrain voumes currently exist.

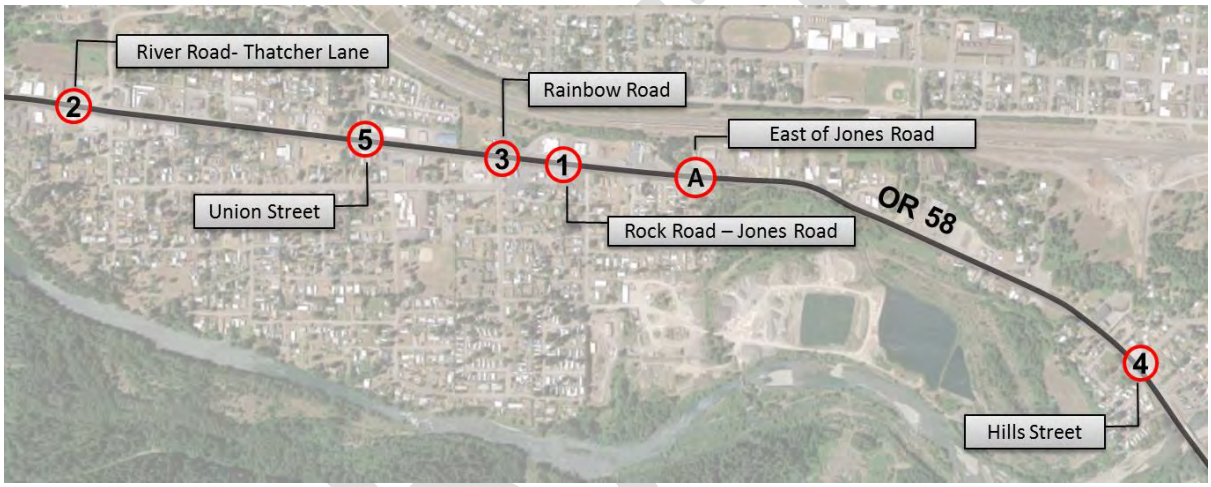


FIGURE 4-1: PRIORITY CROSSING LOCATIONS

ROCK ROAD – JONES ROAD (PRIORITY LOCATION #1)

The segment between the OR 58/Rock Road and OR 58/Jones Road intersections ranked as the highest priority location due to the amount of pedestrian activity, especially during the afternoon peak period. The high crossing volumes are due to the nearby pedestrian generators including the A&W, Subway, and Cascade General Store located to the north of OR 58 and the Oakridge Liquor Store and residential areas located to the south of OR 58. Additionally, three collisions occurred in this segment, one of which involved a pedestrian and was classified as an Injury B severity.[25]

Based on the results of the NCHRP Report 562 analysis, a raised median with pedestrian refuge and an active or enhanced pedestrian signal treatment is recommended based on the pedestrian crossing levels during the afternoon period and high traffic volumes on OR 58.[26] ODOT and the City of Oakridge are currently working on

[25] Injury A crash is a severe or debilitating injury B and injury C and injury C type crashes are lower level severity.

[26] *Improving Pedestrian Safety at Unsignalized Crossings,* Report 562 National Cooperative Highway Research Program. 2006.

a design for an enhanced pedestrian crossing at this location. A conceptual sketch of the crossing improvement is shown in Figure 4-2 and more detailed design drawing of the RRFB crossing can be found in the Appendix.

The raised median allows a two-stage crossing for pedestrians so each direction of traffic can be crossed separately as gaps in traffic are available, which reduces the pedestrian crossing distance. The design of the raised median with a slight "z-crossing" forces the pedestrian to look in the direction of oncoming traffic before crossing. Adding the raised median requires modifying the existing striping along OR 58 to accommodate the needed width of the pedestrian refuge. The modification will not intrude on the "hole-in-the-air" space which is defined by ODOT as, "the entire area (height, width and length) a truck and its load will occupy while traversing a section of roadway." There are no existing marked crosswalks near or between Rock Road and Jones Road.

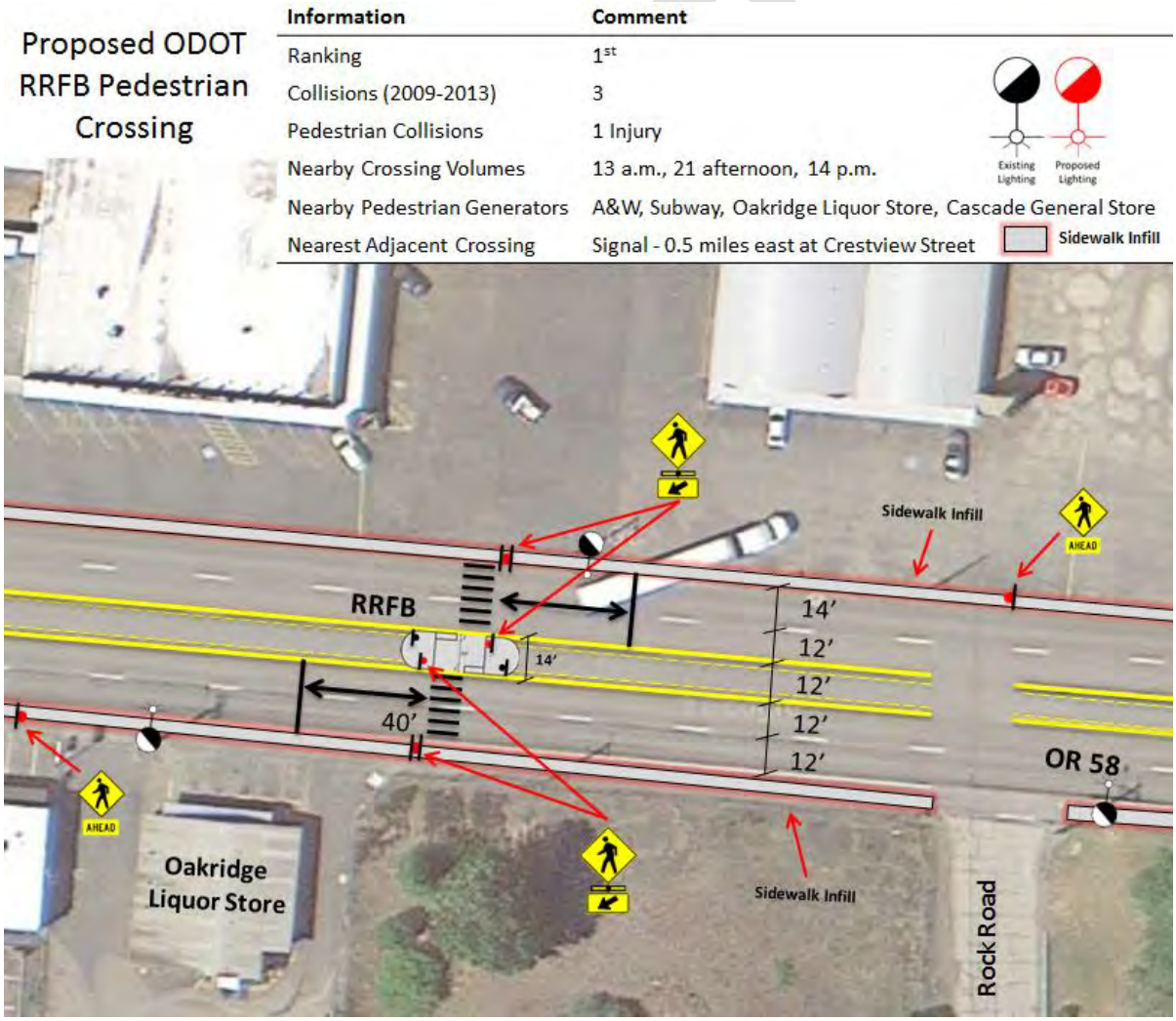
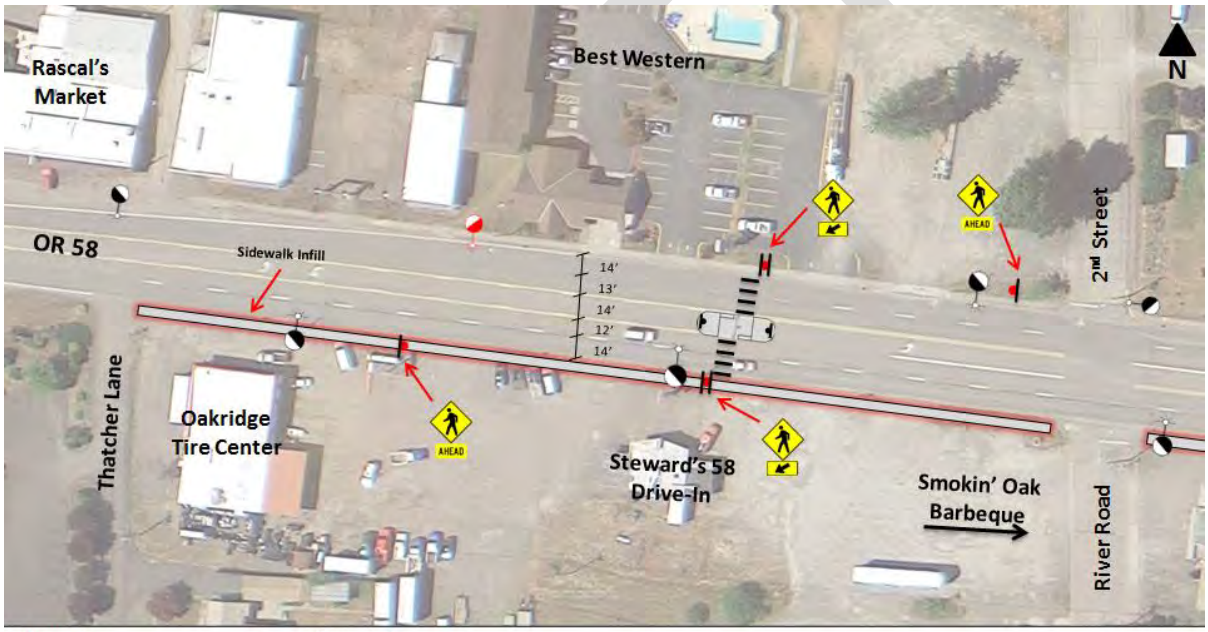


FIGURE 4-2: OR 58 STREET CROSSING IMPROVEMENTS AT ROCK ROAD (PROPOSED ODOT RRFB)

RIVER ROAD – THATCHER LANE (PRIORITY LOCATION #2)

The segment along OR 58 between 2nd Street/River Road and Thatcher Lane ranked as the 2nd highest priority location due to the multiple pedestrian generators, distance from nearest crossing, and number of pedestrians crossing. Pedestrian generators in this area include the Best Western, Bluewolf Motel, and Cascade Motel located to the north of OR 58 and Steward's 58 Drive-In, Smokin' Oak Barbeque, and deli located to the south of OR 58. Additionally, three collisions occurred in this area, one of which involved a bicyclist and was classified as an Injury A severity.

Based on the results of the enhanced pedestrian crossing analysis, RRFB's are not recommended; however a raised median, curb extensions, traffic calming, etc., should be considered to improve the pedestrian safety at this location. The 2nd Street/River Road/OR 58 intersection has sufficient lighting; however along OR 58 within this segment there is a need for additional lighting. Street lighting recommendations along OR 58 between the intersections as well as at any potential crossing improvements are shown in Figure 4-3.



Information	Comment
Ranking	2nd
Collisions (2009-2013)	3
Bicycle Collisions	1 Injury
Nearby Crossing Volumes	1 a.m., 7 afternoon, 5 p.m.
Nearby Pedestrian Generators	Cascade Motel, Bluewolf Motel, Best Western, Stewart's Drive-In, Smokin' Oak Barbeque, Deli
Nearest Adjacent Crossing	Signal - 1.2 miles east at Crestview Street
Current Lighting Levels	Deficient levels

FIGURE 4-3: OR 58 BETWEEN THATCHER LANE AND RIVER ROAD CROSSING LOCATION IMPROVEMENT

RAINBOW ROAD (PRIORITY LOCATION #3)

The OR 58/Rainbow Road intersection ranked as the 3rd highest priority location due to the high number of pedestrians crossing, especially during the afternoon peak period. The higher pedestrian volumes are from the pedestrian generators including the Dairy Queen and Chevron located to the south of OR 58. This location is just to the west of the Rock Road to Jones Road segment, which was the 1st priority location. Additionally, three collisions occurred in this area, one of which involved a pedestrian and resulted in an Injury B severity.

Based on the results of the analysis, RRFB's are not recommended; however a raised median, curb extensions, traffic calming, etc., should be considered to improve the pedestrian safety. At this time no enhanced crossing tools are recommended because the recommended RRFB crossing is located 500 feet east of this intersection. Street lighting recommendations along OR 58 near the OR 58/Rainbow Road intersection includes additional standalone and wood pole mounted lighting shown in Figure 4-4. A potential median could be installed on the west leg; however sidewalk improvement would be required on the north side of OR 58.

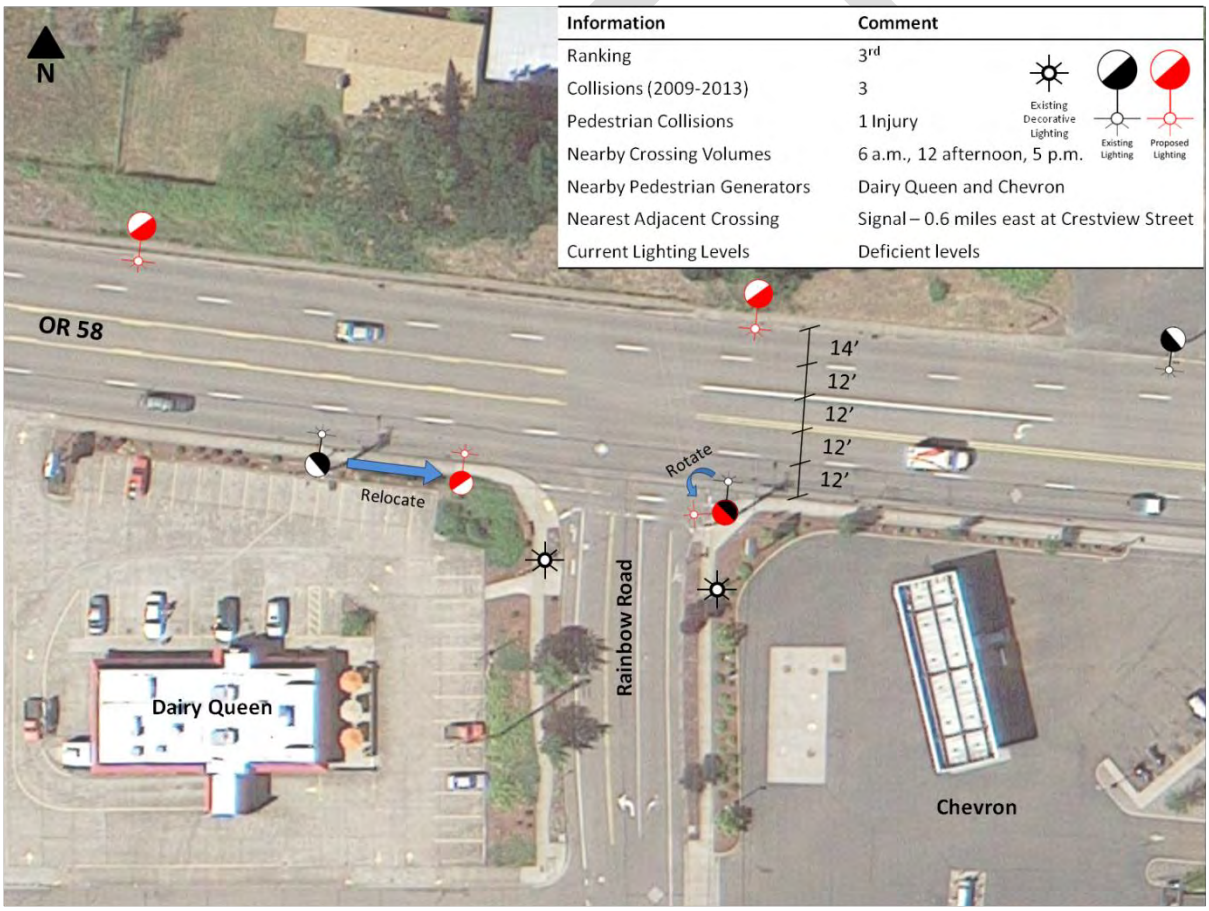


FIGURE 4-4: RAINBOW ROAD CROSSING LOCATION IMPROVEMENT

HILLS STREET (PRIORITY LOCATION #4)

The OR 58 and Hills Street intersection ranked as the 4th highest priority location due to the number of pedestrians crossing, especially during the a.m. peak period. The pedestrian generators include the Arbor Inn and Oakridge Motel north of OR 58 and a designated Diamond Express stop located on the east side of Hills Street near the intersection. There was one collision that occurred near this intersection but it did not involve a pedestrian or bicyclist and was not classified as a serious injury.

Based on the results of the analysis, RRFB's are not recommended; however a raised median, curb extensions, traffic calming, etc., should be considered to improve the pedestrian safety at this location. Street lighting recommendations at the OR 58/Hills Street intersection include additional standalone and wood pole mounted lighting and potential pedestrian crossing improvements at this location are showing in Figure 4-5.

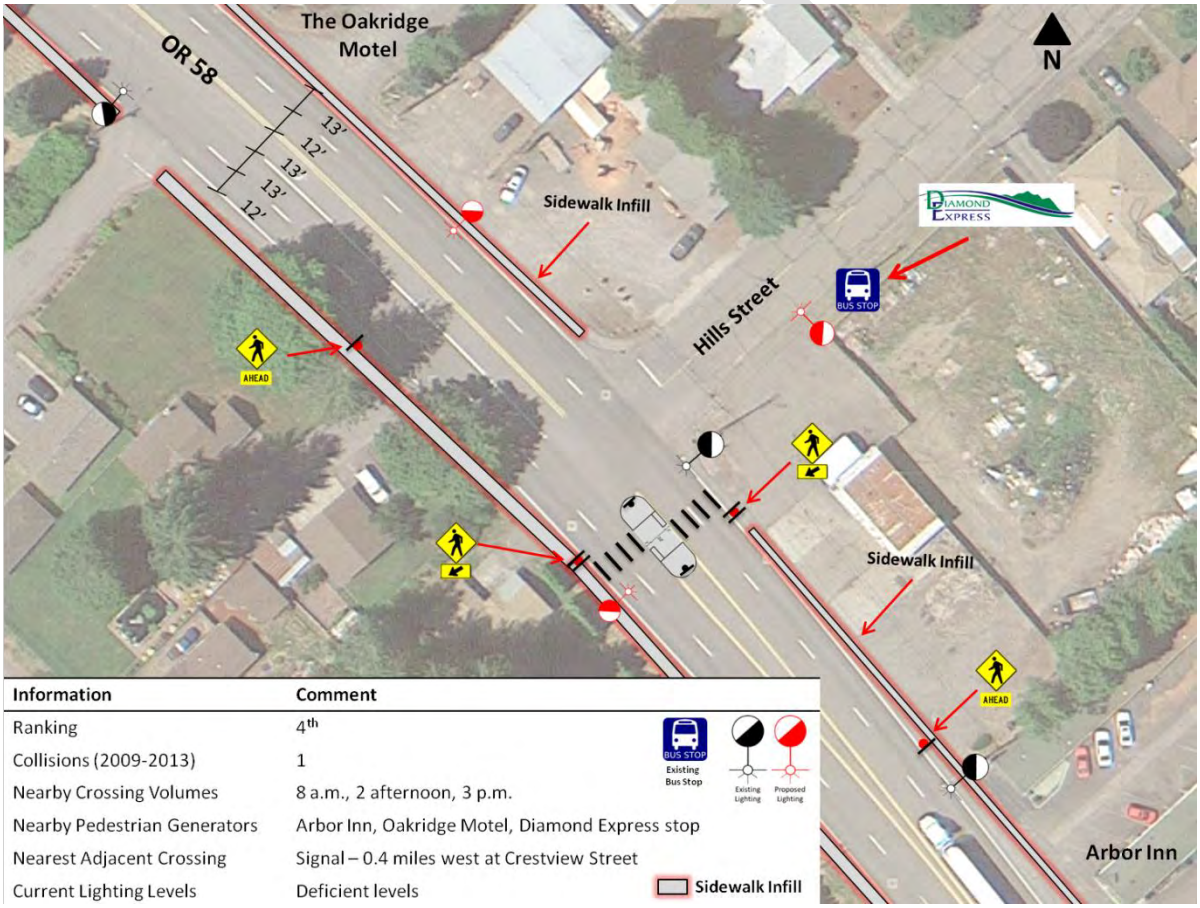


FIGURE 4-5: OR 58/HILLS STREET INTERSECTION IMPROVEMENT LOCATION

UNION STREET (PRIORITY LOCATION #5)

The final location is the OR 58/Union Street intersection because this intersection had the highest number of pedestrian crossings that were school related during the a.m. and p.m. peak periods. Additional pedestrian generators include Lee's Gourmet Kitchen and St. Vincent de Paul Society. There was one collision that occurred near this intersection but it did not involve a pedestrian or bicyclist and was not classified as a serious injury.

Based on the results of the analysis, RRFB's are not recommended; however a raised median, curb extensions, traffic calming, etc., should be considered to improve pedestrian safety at this location. Street lighting recommendations at the OR 58/Union Street intersection include additional standalone and wood pole mounted lighting is proposed at this location and potential pedestrian crossing improvements at this location are shown in Figure 4-6.

Information	Comment
Ranking	5th
Collisions (2009-2013)	1
Nearby Crossing Volumes	7 a.m., 0 afternoon, 7 p.m.
Nearby Pedestrian Generators	School crossing, Lee's Gourmet Kitchen, St. Vincent de Paul Society, and Oakridge DMV
Nearest Adjacent Crossing	Signal – 0.8 miles east at Crestview Street
Current Lighting Levels	Deficient levels

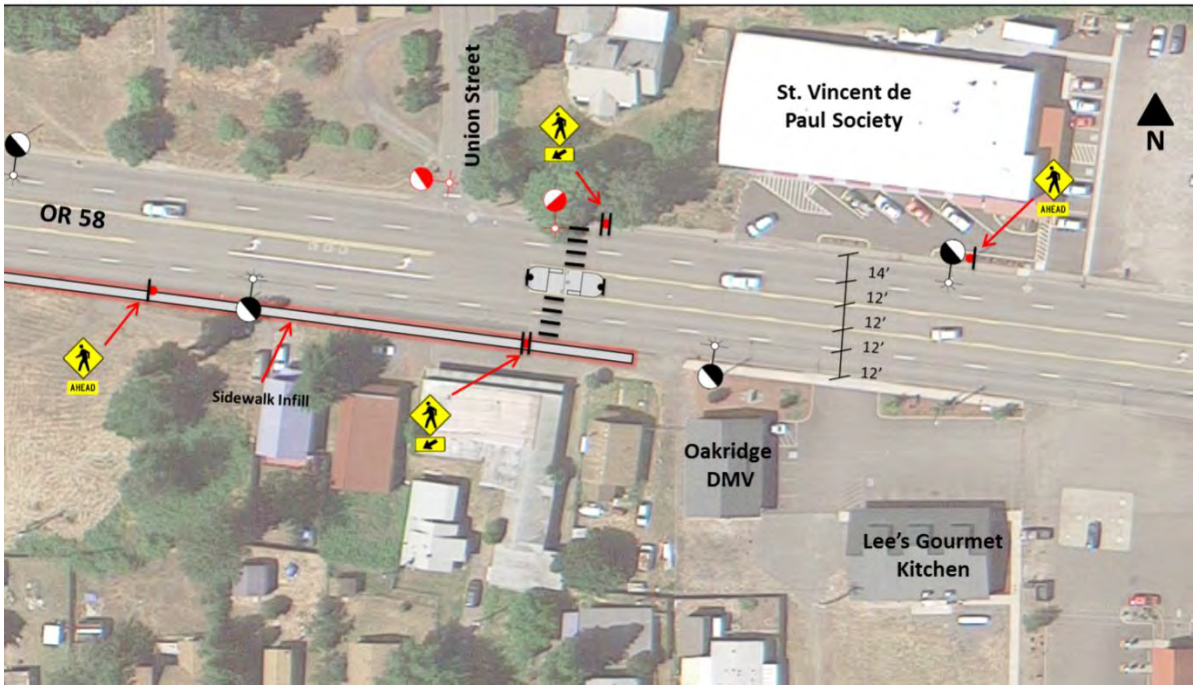


FIGURE 4-6: OR 58/UNION STREET CROSSING IMPROVEMENT LOCATION

EAST OF JONES ROAD (ADDITIONAL PRIORITY LOCATION)

The additional location approximately 500 feet east of Jones Road was considered per the City's request. Future development plans include building a community center and a pedestrian bridge over the railroad providing a more direct route to the Oakridge Schools. It was assumed that pedestrian traffic and generators would be similar to those between Rock Road and Jones Road. There were no reported crashes at this location.

A raised median with pedestrian refuge and an active or enhanced pedestrian signal treatment is recommended. Unlike the previous locations, the roadway is a four-lane cross section which does not have the available width to support a raised median. Street lighting, sidewalk infill, and recommended pedestrian crossing improvements at this location are shown in Figure 4-7.

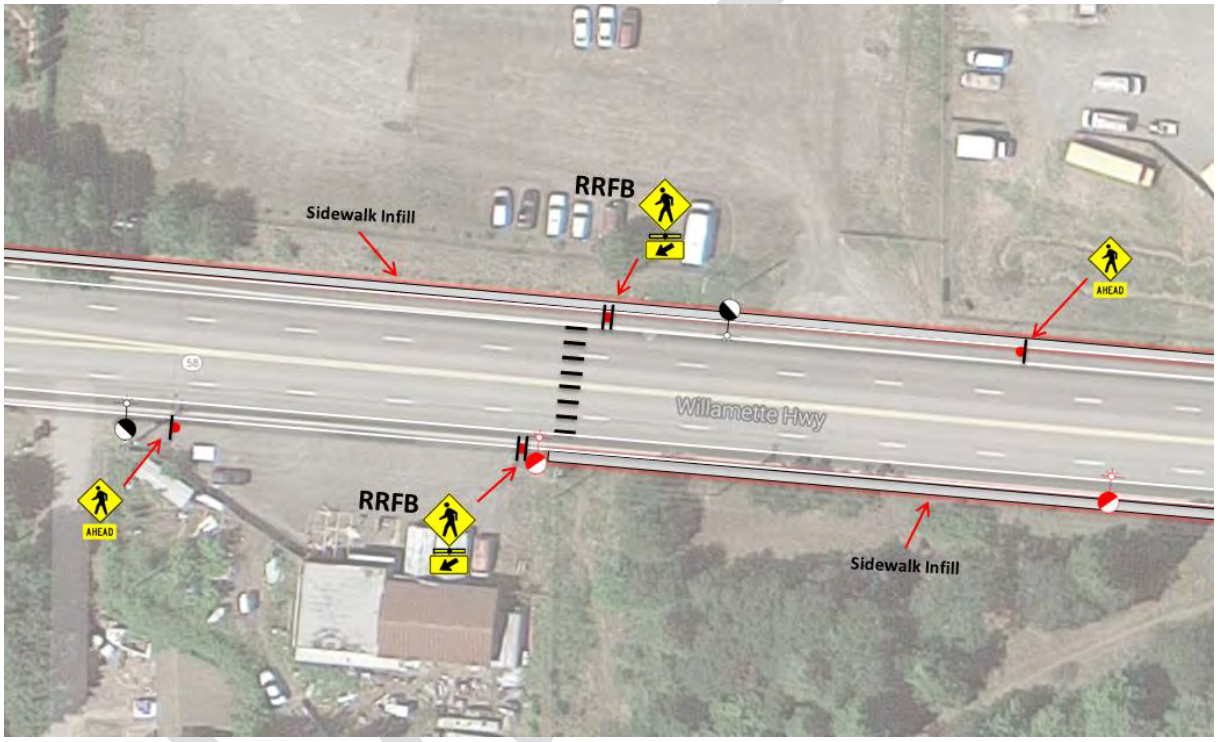
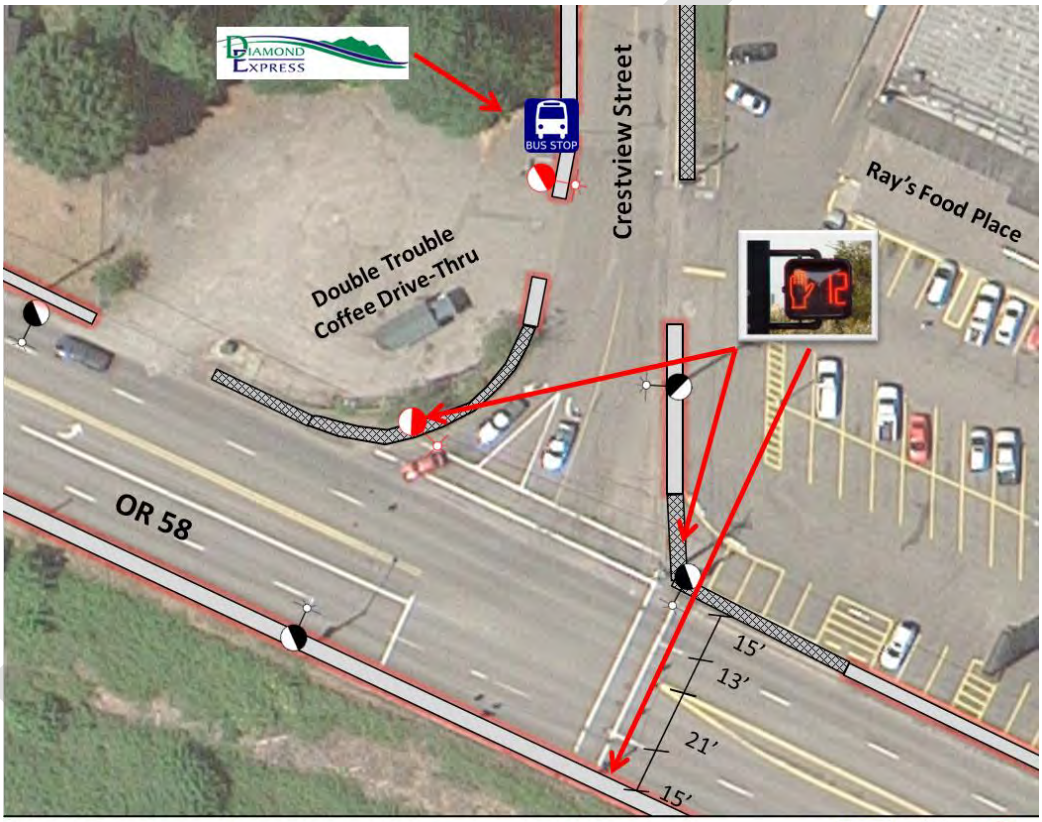


FIGURE 4-7 ADDITIONAL CROSSING EAST OF JONES ROAD WITH RRFB

TRAFFIC SIGNAL IMPROVEMENTS

There is one signalized intersection within the study area where observed intersection safety improvements are needed; the OR 58/Crestview Street intersection.

The intersection improvements needed for this location include intersection lighting, pedestrian countdown timers, and improved sidewalk near the intersection as shown in Figure 4-8. Two new standalone street lights are recommended to the west of the intersection. It is also recommended that the signal controller be upgraded to a 2070 controller to allow for the removal of conflict points between vehicles and pedestrians during the permissive eastbound left turn vehicle movement.



Information	Comment
Collisions (2009-2013)	1
Nearby Crossing Volumes	8 a.m., 2 afternoon, 3 p.m.
Nearby Pedestrian Generators	Double Trouble Coffee Drive-Thru, Ray's Food Place, Diamond Express stop, School Crossing
Current Lighting Levels	Deficient levels

BUS STOP Existing Bus Stop
Existing Lighting
Proposed Lighting
Existing Sidewalk
Proposed Sidewalk

FIGURE 4-8: OR 58 AND CRESTVIEW STREET INTERSECTION IMPROVEMENT NEEDS

Pedestrian countdown timers are devices used in conjunction with standard signalized intersection infrastructure that provides information to pedestrians about how much time is left to cross the street. Studies have shown pedestrian countdown timers improve safety for pedestrians.[27]

EXAMPLE OF A PEDESTRIAN COUNTDOWN

CORRIDOR-WIDE TREATMENTS

Corridor-wide pedestrian safety treatments were also considered along the entire length of the study area corridor to improve overall pedestrian safety. Treatments include speed feedback signs, street lighting, and a potential three-lane conversion on OR 58 which is discussed in Chapter 5.

SPEED FEEDBACK SIGNS

Speed feedback signs are low-cost treatments that have been shown to reduce traffic speeds, particularly along roadways where travel speeds commonly exceed the posted speed limit.[28] FHWA studies show that 85th percentile motor vehicle travel speeds could be reduced by five to ten percent in the event of a speed feedback sign installation.[29]

SPEED FEEDBACK SIGN

Due to concern from the stakeholders regarding drivers traveling too fast and that the 85th percentile speeds were above the posted speed limit for the OR 58 study corridor, it is recommended that speed feedback signs be placed along the corridor at the following three locations shown in Figure 4-9:

- OR 58 east of 2nd Street/River Road – south side
- OR 58 near Jones Road – both sides
- OR 58 south of Salmon Creek Bridge – north side

[27] Highway Safety Manual, Edition 1, Volume 3, 14A.5.1.4. 2010.
[28] Speed Feedback Signs would require approval from ODOT Region Traffic Engineer
[29] *Engineering Countermeasures for Reducing Speeds*, Federal Highway Administration, <http://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/>.

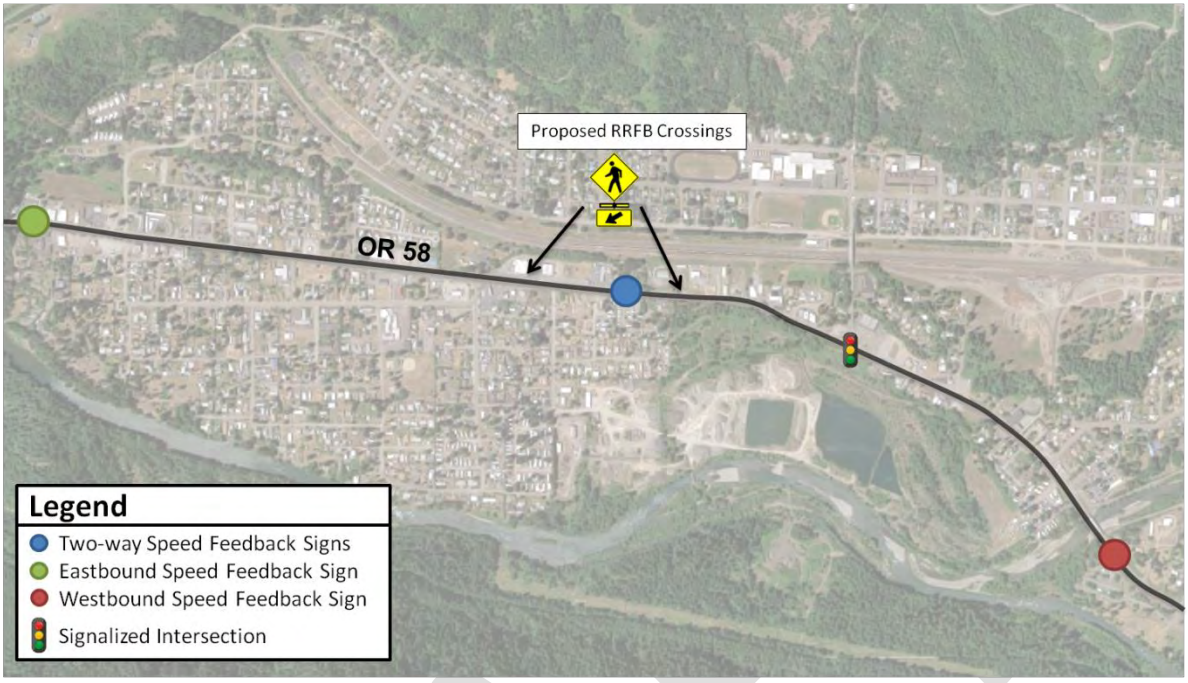


FIGURE 4-9: SPEED FEEDBACK SIGN AND SIGNALIZED INTERSECTION LOCATIONS

STREET LIGHTING

The Highway Safety Manual states that collisions could be reduced by 28% when lighting is provided on roadways where there was previously no lighting present.[30] Even though there is some existing street lighting along the majority of the OR 58 corridor, observed lighting levels indicate that supplementary lighting is needed in addition to the lighting proposed at the specific crossing improvement locations.

Supplemental street lighting is recommended along the entire corridor with street lights provided on utility poles where available. When a utility pole is not available, stand-alone cobrahead street lights are recommended, consistent with the overall vision of future corridor lighting. This supplemental lighting is considered a mid-term priority. Coordination with the utility provider to relocate utility poles will be necessary to provide adequate light levels along the corridor. LED upgrades could also be considered that would improve the energy efficiency of the lighting system.

NEW COBRAHEAD STREET LIGHT (R) AND SUPPLEMENTAL LIGHTING ON UTILITY POLE (L)

[30] Highway Safety Manual, Edition 1, Volume 3, Table 13-55. 2010.

CHAPTER 5 OR 58 LANE CONVERSION ALTERNATIVE

THREE-LANE CONVERSION

The OR 58 study corridor presents an opportunity to consider a three-lane roadway conversion due to the surrounding available roadway width, collision analysis, and motor vehicle volumes. This conversion would improve corridor safety by calming traffic and providing improved facilities for bicycles and pedestrians.

Below is a high-level discussion on how each of these elements relate to the OR 58 corridor within the City of Oakridge and how a general five- to three-lane conversion consisting of two travel lanes and a continuous center turn lane could affect all modes of transportation within the area. A specific three-lane alternative with corresponding considerations is presented later in this section.

CORRIDOR OPERATIONS

Table 5-1 lists the planning level capacity for typical arterial cross-sections. The average daily traffic along the corridor is approximately 6,100 vehicles east of 2nd Street/River Road and 8,100 vehicles east of Jones Road which is well below the three-lane roadway capacity range. As indicated in Chapter 2, daily traffic on OR 58 is expected to increase to approximately 9,300 vehicles per day by 2035 (i.e., 20-year horizon). This traffic volume is still well below the typical capacity for a three-lane roadway, which suggests that a three-lane roadway would easily accommodate the corridor's future traffic demand.

Table 5-1: Arterial Capacity by Cross-Section

Arterial Cross-Section	Planning Level Capacity (vehicles per day)
Three-lane (1 per direction, 1 center turn)	18,000 – 20,000
Four-Lane (2 per direction)	20,000 – 28,000
Five-Lane (2 per direction, 1 center turn)	36,000 – 42,000

Note: The lower end of the capacity range is for facilities with little to no access control (a significant number of access points), while the higher capacity is for facilities with good access control (limited driveways).

A corridor travel time analysis was completed using SimTraffic.® The impact of a conversion to a three-lane arterial cross-section would have minimal impacts to the existing corridor travel times, as seen in Table 5-2. The corridor travel time increases by an average of 4 seconds and the minor street delays increase by less than one second.

Table 5-2: Travel Time and Delay Results

	Five-Lane		Three-Lane		Net Difference
	Eastbound	*Westbound*	*Eastbound*	*Westbound*	
Travel Time *(mm:ss)*					
Existing	2:17	2:13	2:21	2:16	3-4 sec.
Future - Calculated Growth Rate	2:17	2:12	2:22	2:18	5-6 sec.
Future - TSP Growth	2:15	2:16	2:19	2:21	4-5 sec.
Minor Street Delay *(sec)*					
Existing	4.3	4.4	7.9	8.9	3.6-4.5 sec.
Future - Calculated Growth Rate	4.0	4.9	8.3	9.6	4.3-4.7 sec.
Future - TSP Growth Rate	4.5	6.0	8.7	11.7	4.2-5.7 sec.

Land Use

The existing land use in Oakridge includes major pedestrian and bicycle trip generators. Locations such as grocery stores, convenience markets, and fast food restaurants like the one shown in the photo, encourage local pedestrian and bicycle travel. Additionally, there is a large residential area located south of OR 58 that generates pedestrians and bicyclists desiring to travel to destinations on the north side of OR 58 (i.e. schools and downtown area), making OR 58 a natural divider of the city. Currently the wide cross-section and lack of pedestrian crossing facilities and bike lanes results in OR 58 being a barrier to pedestrian and bicycle travel within the City. However, a three-lane conversion would allow for a safer, more comfortable environment for residents when accessing the variety of land uses on either side of OR 58.

DAIRY QUEEN LOCATED NEAR RAINBOW ROAD

Motor Vehicle Volume and Operations

A 20-year growth rate was applied to the OR 58 corridor in order to project future transportation growth from 2015 to 2035 in order to analyze the existing transportation system. The annual growth factor was obtained with direction from the ODOT Analysis Procedures Manual (APM).[31] The FHVT predicts a minimal amount of growth on the OR 58 study corridor with a 20-year factor of 0.13 percent for OR 58 (this is only a fraction of a percent per year). This assumption is conservative based on trends provided by the Automatic Traffic Recorder (ATR) station located on OR 58 just south of Oakridge, which showed that after a decline from 2005-2012, traffic volumes have steadily rose since 2012. Additionally, the City of Oakridge TSP assumed a 0.74 percent annual growth factor from 2000 to 2020. [32]

[31] The 2035 FHVT is created using data from the Transportation Volume Tables

[32] 2000, City of Oakridge Transportation System Plan

Table 5-3 shows that the current five lane configuration is projected to provide adequate intersection capacity through the year 2035 along the study corridor. Also shown in this table are the traffic operations if the current cross section was converted to a three-lane cross section. As shown, the intersection capacity still remains adequate.

Table 5-3: Future 2035 Study Intersection Performance

Intersection	Mobility Target	Existing Cross-Section (2035 Midday Peak Hour)			With Three-Lane Conversion (2035 Midday Peak Hour)		
	ODOT	*Delay*	*v/c*	*LOS*	*Delay*	*v/c*	*LOS*
Signalized							
OR 58/Crestview Street	0.85 v/c	7.5	0.26	A	8.5	0.39	A
Unsignalized							
OR 58/2nd Street	0.85 v/c	13.0	0.09	A/B	14.0	0.10	A/B
OR 58/Rainbow Road	0.85 v/c	13.3	0.08	A/B	14.2	0.09	A/B
OR 58/Hills Street	0.85 v/c	10.5	0.11	A/B	11.1	0.12	A/B

Signalized intersection:
Delay = Average Intersection Delay (sec.)
v/c = Volume-to-Capacity Ratio
LOS = Level of Service

Unsignalized intersection:
Delay = Critical Movement Approach Delay (sec.)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Level of Service

Although the 20-year growth rate factor from the 2035 FHVT is the supported methodology, a sensitivity analysis was performed on the capacity calculations to experiment with higher growth rates based on the City of Oakridge TSP growth rate (0.74% per year) and their impact to the study area. Table 5-4 displays a comparison of the current five-lane configuration and the three-lane conversion v/c ratios for four intersections along OR 58 using a growth rate of 0.76% per year. As shown in the table below, all intersections still meet ODOT v/c ratio requirements under the three-lane road configuration.

Table 5-4: Future 2035 Study Intersection Sensitivity Analysis with TSP Growth

Intersection	Mobility Target	Existing Cross-Section (2035 Midday Peak Hour)			With Three-Lane Conversion (2035 Midday Peak Hour)		
	ODOT	*Delay*	*v/c*	*LOS*	*Delay*	*v/c*	*LOS*
Signalized							
OR 58/Crestview Street	0.85 v/c	7.7	0.29	A	10.2	0.44	B
Unsignalized							
OR 58/2nd Street	0.85 v/c	13.7	0.09	A/B	15.0	0.11	A/C
OR 58/Rainbow Road	0.85 v/c	14.0	0.10	A/B	15.1	0.11	A/C
OR 58/Hills Street	0.85 v/c	10.7	0.12	A/B	11.4	0.14	A/B

Signalized intersection:
Delay = Average Intersection Delay (sec.)
v/c = Volume-to-Capacity Ratio
LOS = Level of Service

Unsignalized intersection:
Delay = Critical Movement Approach Delay (sec.)
v/c = Critical Movement Volume-to-Capacity Ratio
LOS = Level of Service

QUEUING ANALYSIS

A queuing analysis was done at OR 58 and Crestview Street to determine if a right turn storage lane should be recommended. The results in Table 5-5 show that the existing 200 foot storage lane for the eastbound left turns is sufficient for future traffic volumes and that a recommended 50 foot storage lane be installed when the three lane conversion is complete. At the remaining unsignalized intersections the existing left turn storage lanes are sufficient and there was not enough traffic volumes to recommended additional right turn storage lanes.

Table 5-5: 95th Percentile Queuing Analysis for Future Traffic Volumes (2035)

OR 58/Crestview Street	*Future Calculated Growth*	*Future TSP Growth*	*Recommended Storage Length*
Eastbound Left-turn*	113 ft	145 ft	> 150 ft*
Eastbound Through	97 ft	110 ft	-
Westbound Right-turn	37 ft	36 ft	> 50 ft
Westbound Through	100 ft	125 ft	-

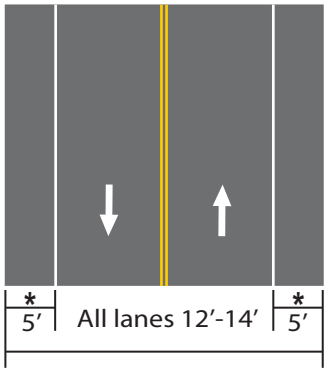
*Existing 200 foot storage lane

AVAILABLE ROADWAY WIDTH

The OR 58 study corridor's existing pavement width is approximately 62 feet.[33] Details regarding the cross sections of specific locations along the OR 58 corridor can be seen in Figure 5-1. Despite the relatively wide width of the facility, there are no dedicated bike lanes. Implementing the three-lane conversion along the OR 58 study corridor would improve comfort and safety for all modes of travel with a relatively low cost (updated striping and signing) as the modifications could be accommodated within the existing curb to curb space. The conversion would use the existing pavement cross section and would only require striping to implement the three-lane conversion.

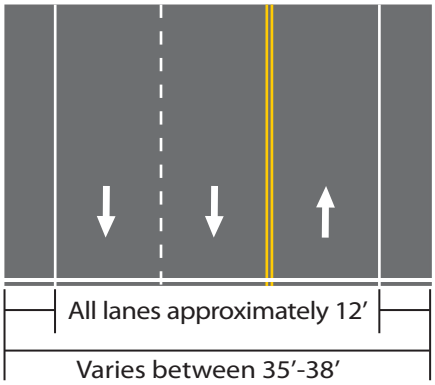
[33]Roadway width measured from face of curb to face of curb.

2-Lane

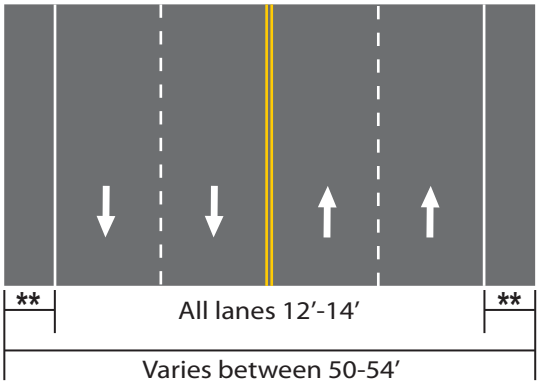


* Cross section west of City of Oakridge does not include shoulder

3-Lane

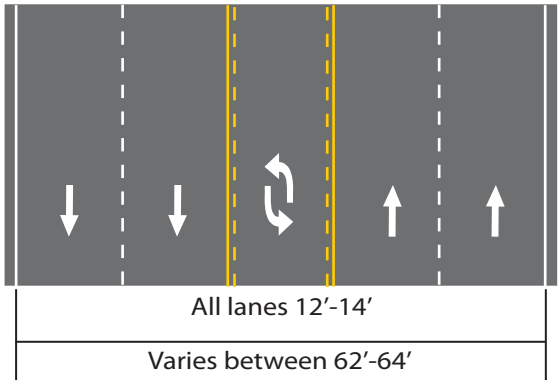


4-Lane



** Cross sections north of Salmon Creek Bridge do not include shoulder

5-Lane



LEGEND

- 2-Lane Cross-Section
- 3-Lane Cross-Section
- 4-Lane Cross-Section
- 5-Lane Cross-Section

DKS

Figure **5-1**

EXISTING CROSS-SECTIONS ALONG OR 58

CONVERSION ALTERNATIVE

Thoughtful implementation of a five- to three-lane conversion in this study corridor could help create a foundation for a continuous and cohesive roadway while balancing the needs and objectives of surrounding land uses. The application of a three-lane conversion along OR 58 within Oakridge would allow the existing roadway width to be re-purposed for the enhancement of the travel experience for all modes and no modification to the current pavement width would be necessary. This space gives way to flexibility; offering adequate area for buffered bike lanes or a combination of other roadway elements including raised medians.

A three-lane conversion alternative was evaluated to increase safety, provide continuous left turn pockets, and compliment surrounding land uses by providing buffered bicycle lanes that encourage multimodal transportation. Details about the alternative are outlined in Table 5-6.

Table 5-6: Three-Lane Alternative Considerations

	Alternative Considerations
Motor Vehicle Mobility	• Reduces number of travel lanes from five to three • Three lane provides adequate capacity, and causes minimal increase in travel time (approximately 2 seconds) • Maintains twelve-foot outside travel lanes
Walkability	• Existing sidewalks remain • Bike lanes provide additional separation for bicyclist and pedestrians from motor vehicle lanes • Locations with a pedestrian refuge median availability reduces cross-section distance for crossing
Bicycle Facilities	• Includes six-foot bike lanes with a six-foot buffer • Where existing road is four-lanes, include six-foot bike lanes without buffer
Freight Service	• Maintains twelve-foot travel lanes and a 14-foot left turn lane for freight movements • Four travel lanes are reduced to two • Additional of buffered bicycle lanes allows for improved right turn maneuvers at intersections and driveways • Maintains existing pavement cross-section
Business Accessibility	• Improved bicycle and pedestrian access
Other	• Improved truck turning radii for business access

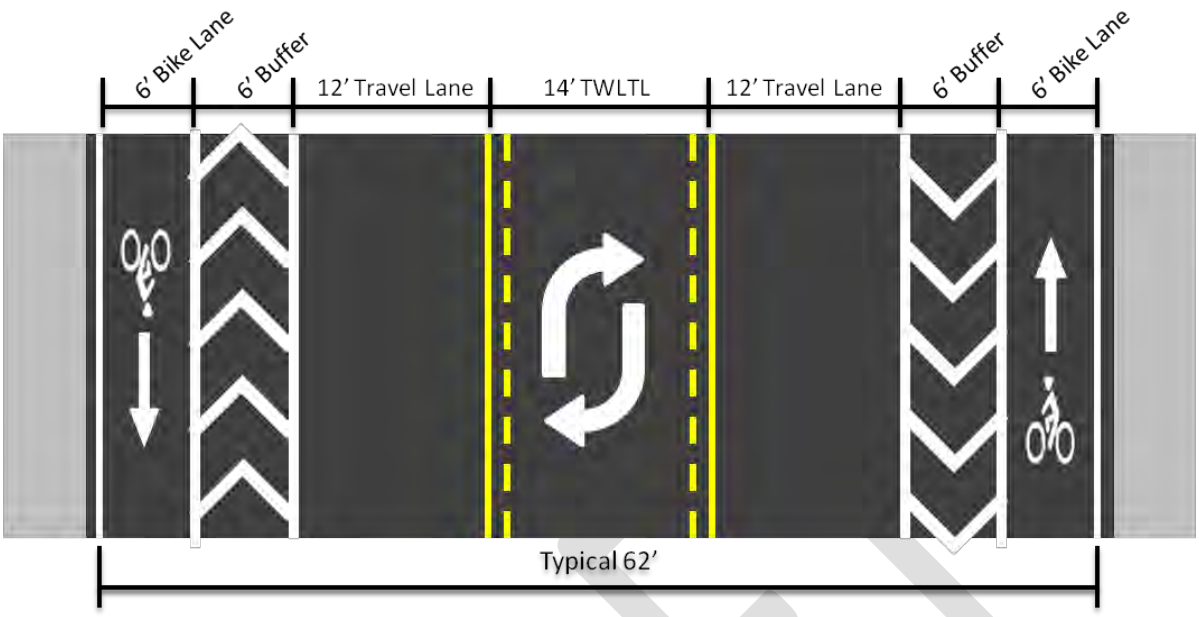


FIGURE 5-2: FIVE-LANE TO THREE-LANE CONVERSION ALTERNATIVE FOR OR 58 CORRIDOR

ROCK ROAD STREET CROSSING IMPROVEMENT CONCEPT WITH THREE LANE CONVERSION

The three-lane alternative would include one northbound through lane, one southbound through lane, a two-way center left turn lane, as well as bike lanes and a buffer lane on both sides to provide the maximum comfort for bicyclists, as shown in Figure 5-2.

The roadway space provided from the five- to three-lane conversion would allow for the combination of an RRFB and raised median pedestrian refuge to provide all of the benefits mentioned in both of the short term crossing improvement concepts for the Rock Road location. Figure is a concept figure that displays how the three-lane conversion could facilitate the pedestrian crossing improvements near Rock Road.

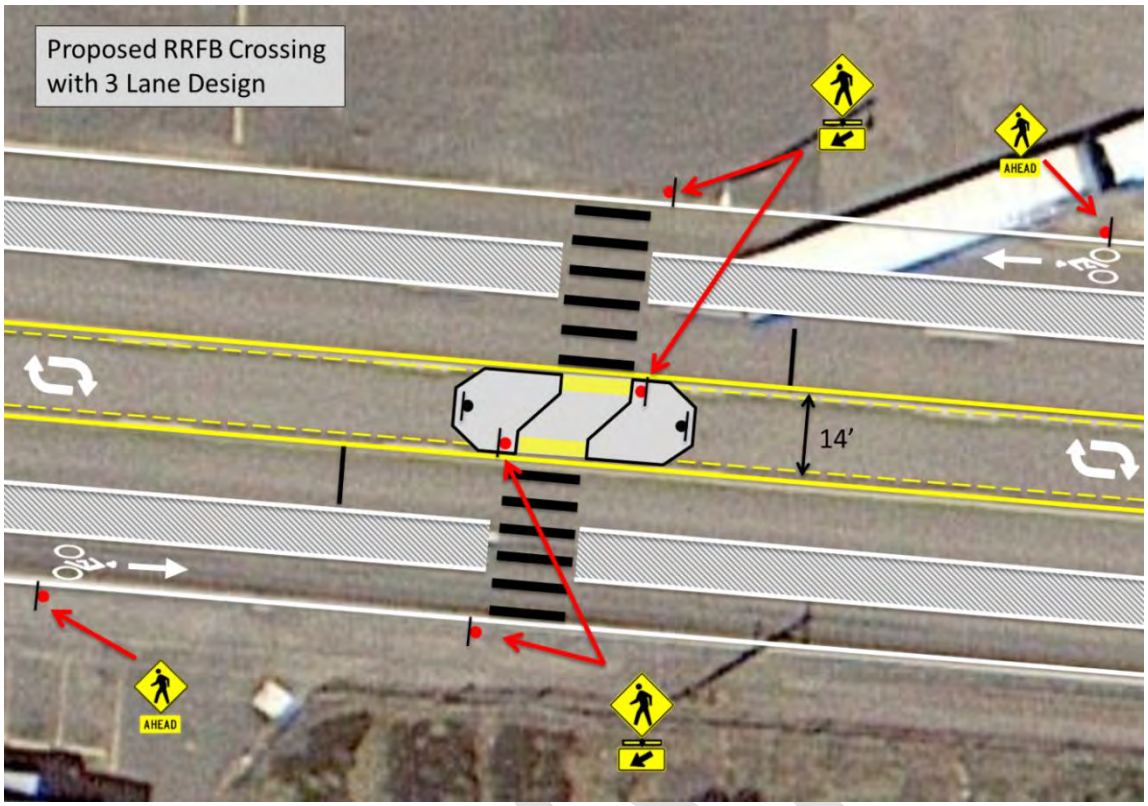


FIGURE 5-3: OR 58 THREE-LANE CONVERSION CROSSING IMPROVEMENT CONCEPT

EAST OF JONES ROAD CROSSING IMPROVEMENT CONCEPT WITH THREE LANE CONVERSION

The three-lane alternative for the existing four-lane cross section would include a center two way left turn lane, one northbound through lane, one southbound through lane, and bicycle lanes in each direction, as shown in Figure 5-4.

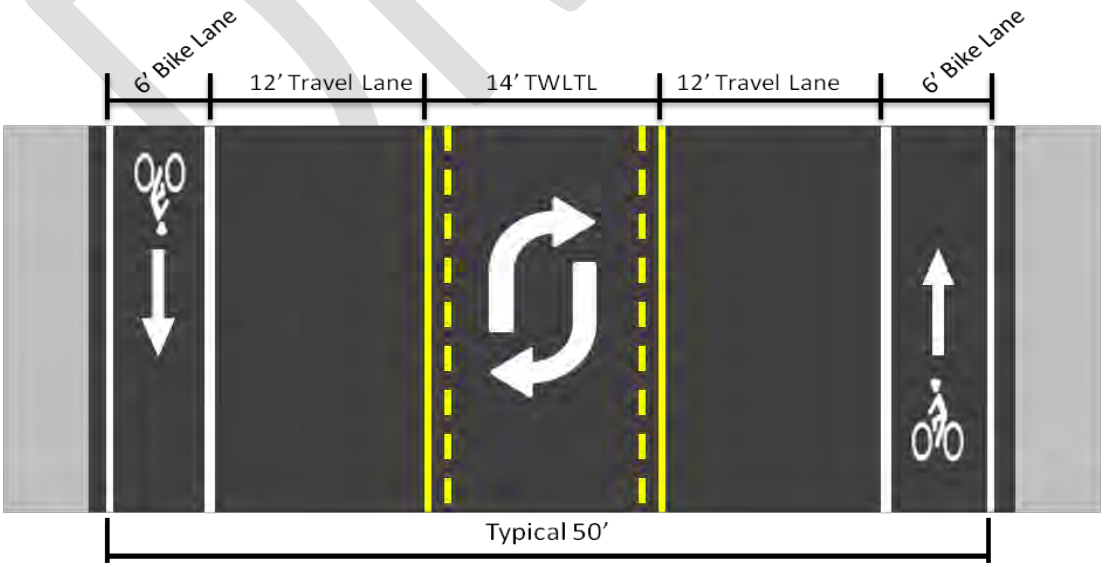


FIGURE 5-4: FOUR-LANE TO THREE-LANE CONVERSION ALTERNATIVE FOR OR 58 CORRIDOR

As shown in Figure 5-5, the roadway space provided from the four to three-lane conversion would allow for the combination of a raised median pedestrian refuge and curb extensions to provide all of the benefits mentioned in both of the short term crossing improvement concepts for the location east of Jones Road. This design however does not include a bicycle buffer lane.

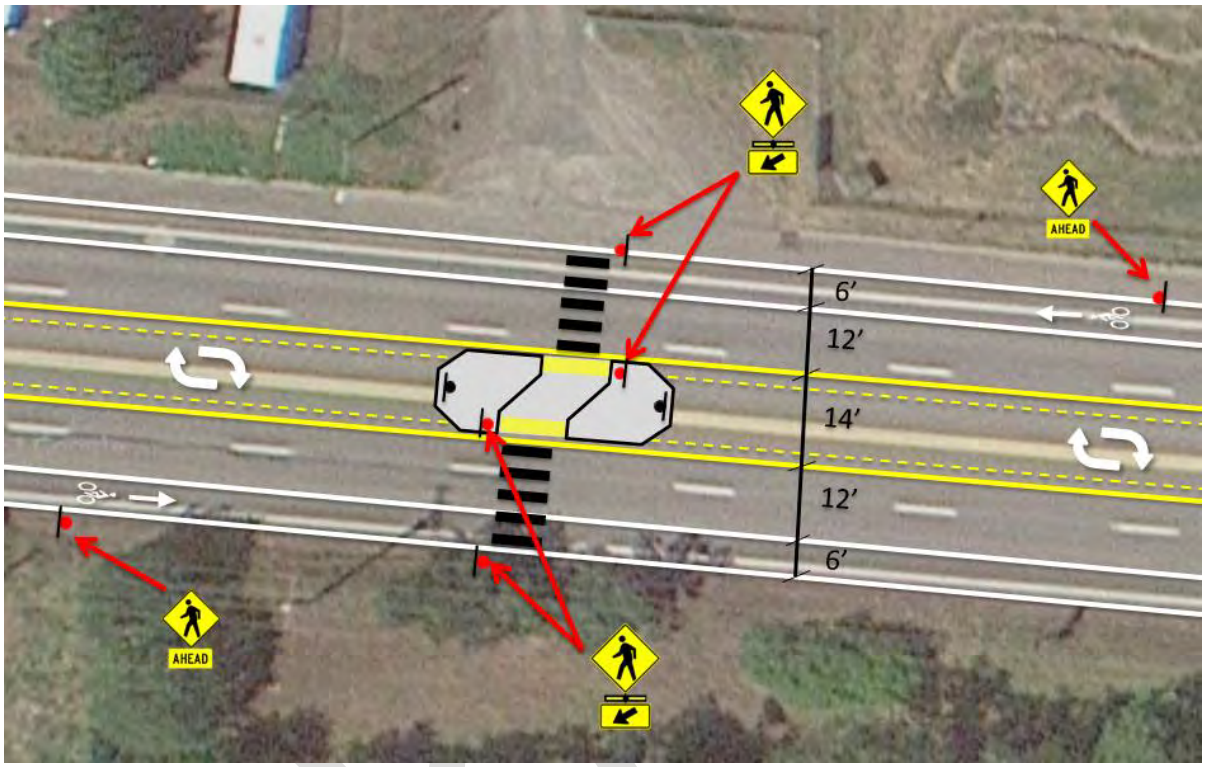


FIGURE 5-5: EAST OF JONES THREE-LANE CONVERSION DESIGN CONCEPT

FREIGHT MOBILITY

OR 58 is classified in the Oregon Highway Plan (OHP)[34] as a State Highway, it is designated as a freight route, and is a Reduction Review Route; the route has "No reduction of vehicular capacity" (ORS 366.215) and trucks must be allowed a “hole-in-the-air” which is defined by ODOT as, “the entire area (height, width and length) a truck and its load will occupy while traversing a section of roadway.” Any proposed modifications that could potentially impact freight routes will have to go through further processing to receive full approval.

The recommended alternative for the three-lane conversion along OR 58 within the City of Oakridge will require freight mobility approval. Pedestrian crossing recommendations that include raised medians will also require further coordination with the freight community.

[34] 1999 Oregon Highway Plan (as amended July 2006).

CHAPTER 6 PROJECT IMPLEMENTATION

PROJECT IMPLEMENTATION

Project implementation resources were prepared for the recommended crossing improvement concepts and overall corridor treatment options, which were discussed previously in Chapters 4 and 5. The implementation resources include prioritization of the improvement projects and associated cost estimates.

PROJECT PRIORITIZATION

The recommended projects are listed by improvement type in Table 6-1 based on whether they are short-term or mid-term priority. No long-term priorities were found during this study.

Table 6-1: Prioritized Safety Improvements on the OR 58 Corridor

Improvement Type	Projects Listed by Priority	
	Short-Term	*Mid-Term*
Pedestrian Crossing Improvement	• Rock Road RRFB Pedestrian Crossing • River Road Pedestrian Median Refuge	• Hills Street and Union Street Pedestrian Median Refuge • East of Jones Road RRFB Crossing[a]
Traffic Signal Improvement	• Pedestrian Countdown Timers at Crestview Street Signal	
Street Lighting	• At Crossing Improvement Locations • Rainbow Road	• Diamond Express Stops
Speed Feedback Sign	• OR 58 near Rainbow Road • OR 58 east of Hills Street • OR 58 west of Thatcher Lane	
Sidewalk Infill	• Along south side of OR 58 between Thatcher Lane and Jones Road • Along north side of OR 58 between Rock Road and Crestview Street	• Along both sides of OR 58 near Hills Street • As need along remainder of corridor
OR 58 Lane Conversion	• Continue coordination with ODOT, City, and Freight Mobility to advance conversion alternative	

[a] *This project will become a higher priority once the expected pedestrian bridge and community center is built*

Further discussion with the City Council and public is necessary to determine whether the three-lane conversion is desired prior to seeking approval from ODOT and freight stakeholders. If the three-lane conversion receives support, it is advised to hold off on the OR 58 pedestrian crossing improvements until the final OR 58 cross section is determined.

COST ESTIMATES

Cost estimates were prepared for each of the crossing improvement locations as well as the identified signalized improvement locations and are listed in Table 6-2. A 20% engineering and construction fee and a 20% contingency were applied individually to the cost estimate for each location. The total estimated cost is $405,000 for all crossing improvement locations, $50,000 for the signalized improvement location, $590,000 for corridor-wide implementation of sidewalk infill and speed feedback sings, and $130,000 for the three lane conversion. The cost estimates for sidewalk infill are divided into two phases; first priority infill locations and the remaining locations along the corridor that currently do not have sidewalks.

All projects combined are estimated to cost $1,175,000. Because funding sources are not currently identified for these recommended improvement projects, this study is intended to assist the Oregon Department of Transportation (ODOT) and the City of Oakridge in acquiring the needed project funding.

Table 6-2: Cost Estimates of Proposed Safety Projects

Safety Improvement	Total Estimated Cost[a]
Crossing Improvement Locations	
Rock Road – Jones Road	$100,000
River Road - Thatcher Lane	$50,000
Rainbow Road	$50,000
Hills Street	$50,000
Union Street	$55,000
East of Jones Road	$100,000
Total Cost for Crossing Improvement Locations	**$405,000**
Signalized Improvement Locations	
OR 58/Crestview Street	$50,000
Total Cost for Signalized Improvement Locations	**$50,000**
Corridor-Wide Treatments	
Sidewalk Infill – Phase 1 (First Priority In-Fill)	$250,000
Sidewalk Infill – Phase 2 (Completing all Sidewalk Gaps)	$300,000
Speed Feedback Signs	$40,000
Total Cost for Corridor-Wide Treatments	**$590,000**
Total Three Lane Conversion	**$130,000**
Total Cost for All Improvement Locations	**$1,175,000**

[a] *A 20% engineering and construction fee and a 20% contingency were applied to the cost estimate for each location*