

Local Road Safety Plan

Prepared For:

City of Yelm

Prepared By:

SCJ Alliance

8730 Tallon Lane NE, Suite 200

Lacey, WA 98516

360.352.1465

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City of Yelm
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Local Road Safety Plan

Project Information

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Prepared for: City of Yelm
106 2nd Street SE
Yelm, WA 98597

Reviewing Agency

Jurisdiction: City of Yelm
Patrick T Hughes, PE, City Engineer

Project Representative

Prepared by: SCJ Alliance
8730 Tallon Lane NE, Suite 200
Lacey, WA 98516
360.352.1465
scjalliance.com

Contact: Ryan Shea, PTP, Senior Transportation Planner
Eric Johnston, PE, Principal

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Signature

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Prepared by Ryan Shea, PTP and Anne Sylvester, PTE



Approved by Eric Johnston, PE



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1 INTRODUCTION

The City of Yelm is actively pursuing improvements to reduce crashes and enhance safety for its multimodal transportation system. As part of that effort, the city has prepared this *Local Road Safety Plan* (LRSP) following the risk-based, data-driven analytical procedures outlined in guidance provided by the Washington State Department of Transportation (WSDOT) Local Programs Division. This guidance is designed to support WSDOT's efforts to implement the *Target Zero – Washington State Strategic Highway Safety Plan* which relies on a data-based approach that analyzes crash trends and contributing factors in the development of successful crash reduction strategies.

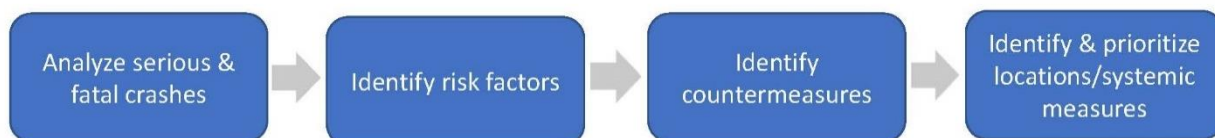
1.1 Purpose of the Study

The purpose of this plan is to improve safety for different modes of transportation along city streets through the analysis of crash data, identifying and prioritizing risk factors that impact safety, and establishing and prioritizing engineering countermeasures and strategies that reduce the number and severity of crashes in the city.

1.2 Analysis Methodology

The *Local Road Safety Plan* follows the WSDOT's recommended approach for developing a prioritized list of engineering countermeasures. Analysis was conducted following a multi-step process that relied on five years of crash data (2017 through 2021). The multi-step process includes:

1. Evaluate crash data to identify crashes with a fatality and/or a serious injury. Identify contributing circumstances and characterize crash types and locations.
2. Based on this data, identify key risk factors which contribute to the crashes identified in the city of Yelm and compared to an average of risk factors for Western Washington in the aggregate. Risk factors were categorized into three priority levels based on significance in relation to the reported severe crashes.
3. Select the most common risk factors and group these by priority level based on their significance in relation to the reported severe crashes.
4. Identify and score high priority crash locations.
5. Identify countermeasures to address the types of crashes in the high priority locations.
6. Develop a prioritized list of projects including both systemic and spot improvements and cost estimates.



1.3 Study Area

Yelm is located off the I-5 corridor between the Olympia/Lacey area in Thurston County and Joint Base Lewis-McChord (JBLM) in Pierce County. The study area for the *Yelm Local Road Safety Plan* includes the entire area within the city's corporate limits. The population of Yelm was 6,848 in 2010, growing to 10,617 by 2020¹. This data indicates that the population in Yelm grew by over 55 percent during the ten years between 2010 and 2020. The population of Thurston County in 2010 was 252,264 of which Yelm represented 2.7 percent. By 2020, Thurston County's population was estimated to increase to 294,793² of which Yelm was 3.6 percent indicating that Yelm is growing more rapidly than Thurston County as a whole. In fact, Yelm has been the most rapidly growing community in Thurston County.

Population growth, in part, has been due to increases in the number of persons per household, likely due to an influx of young military families associated with JBLM. Overall Yelm's population has the youngest median age of all of the cities and towns in Thurston County at 29 years old (Census 2010). Almost five percent of off-base Joint Base Lewis-McChord households live in Yelm. Based on projections from the Thurston Regional Planning Council, Yelm's population is expected to grow to approximately 23,900 by 2040, an increase of 125 percent³.

Figure 1 illustrates the boundaries of the City of Yelm, its Urban Growth Area, and its general location in Western Washington. The figure also identifies key roadway corridors which include state highway facilities, some with limited access, including SR 507, SR 510, and SR 510 Alt (Yelm Bypass).

1.4 City Plans and Policies Related to Transportation Safety

The existing Yelm Comprehensive Plan, Transportation System Plan and Downtown Strategy Plan have several goals and numerous policy statements that speak to providing for the safe and cost-effective movement of goods, services, and people. Some of these policy statements are broad and generalized but others address more specific problems that are important to the city, and/or reflect the dominant crash types or systemic risk factors found within the community. Some of these include guidance on sidewalk replacement, safer pedestrian crossings, intersection control improvements and integration of trails all of which have a strong correlation to the spot and systemic problems identified in the Safety Plan.

The Safety Plan was developed with full consideration of existing goal and policy statements moving from the more generalized to the more specific as data was collected and analyzed, and recommended improvements were developed and prioritized. As shown in the data, key problem locations included intersections with angle crashes and/or lack of illumination, as well as several locations where the lack of multimodal facilities contributed to either actual crashes or were considered a systemic problem.

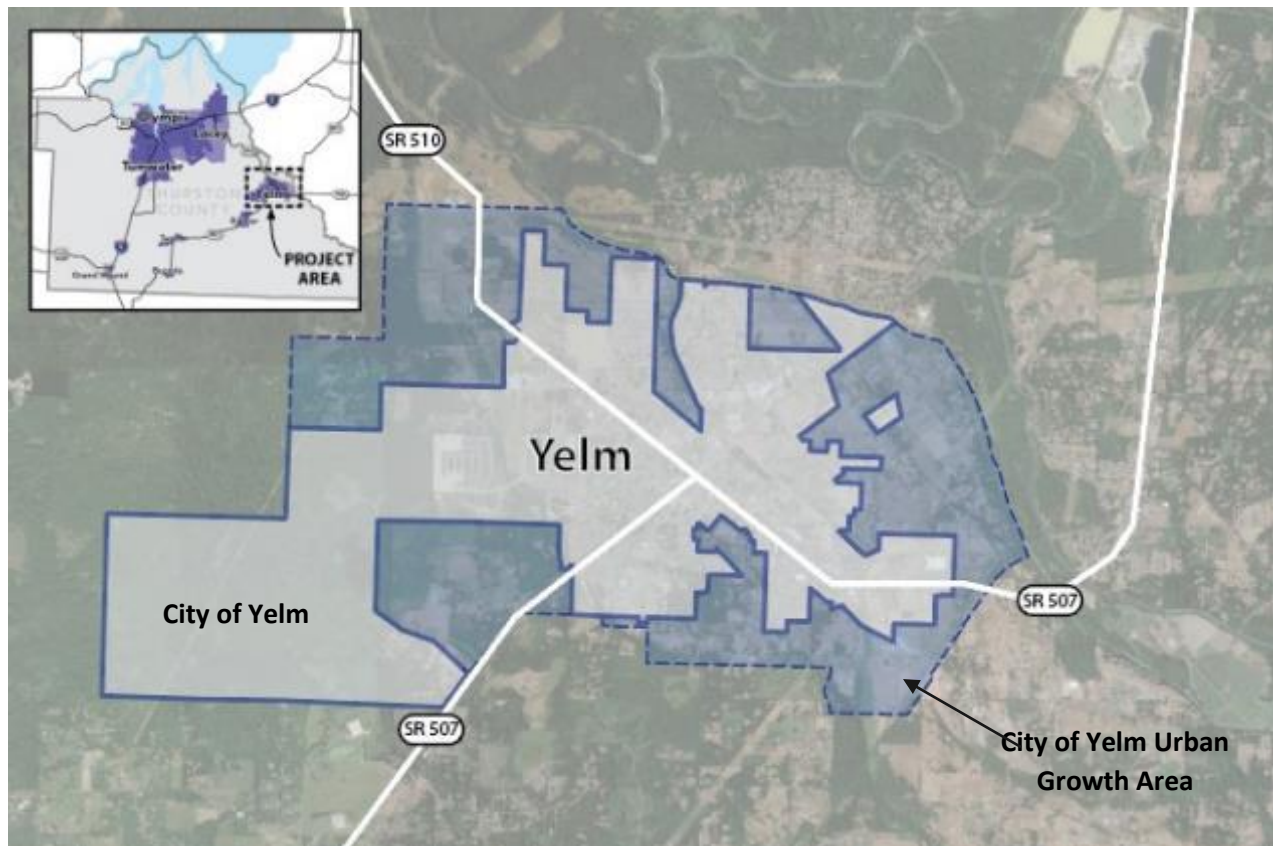
The Safety Plan relies on the goal and policy statements provided by the existing Comprehensive Plan and Transportation System Plan for guidance in the development and implementation of improvements. Additionally, the Transportation System Plan provides strategies for reducing traffic flow through the community via the new Yelm Bypass, and the implementation of improvements through the use of development mitigation and the 6-Year Transportation Improvement Program.

¹ https://www.ofm.wa.gov/sites/default/files/public/dataresearch/pop/april1/ofm_april1_poptrends.pdf

² Ibid.

³ Thurston Regional Planning Council, *Population Forecast Allocations for Thurston County*, June 2019.

Figure 1. Study Area and Vicinity



1.5 Report Content and Organization

This report is organized into seven chapters, the first of which is this Introduction. **Chapter 2** identifies and discusses historic crash data in the City of Yelm (2017 through 2021) with an emphasis on what are characterized as “severe” crashes. These include crashes that result in fatalities and/or serious injury. Chapter 2 also presents historic data for bicycle and pedestrian crashes in the city. Crash data is stratified by both corridors and intersections. Chapter 2 also includes a summary of risk factors by number and percent for severe crashes in Yelm in comparison with Western Washington.

Chapter 3 documents the contributing circumstances behind the crashes experienced in Yelm and identifies the most common risk factors through analysis of the crash data presented in Chapter 2. Risk factors were categorized into two priority levels based on significance in relation to the reported severe crashes along with bicycle and pedestrian crashes.

Chapter 4 identifies high priority crash locations using the Level 1 and Level 2 risk factors identified in Chapter 3.

Chapter 5 discusses the identification of countermeasures for each of the high priority corridors and local concern areas based on the likely effectiveness of the countermeasure in addressing the relevant types of crashes and risk factors at each location.

Chapter 6 presents a further refinement of the identification of countermeasures in the high priority corridors focusing on both systemic measures that can be implemented throughout the city and spot locations where specific countermeasures can be applied. For systemic improvements, applicable locations were identified, and planning level cost estimates were prepared. For spot improvements, the discussion focuses on specific activities that can be implemented at these priority locations along with planning level cost estimates.

Chapter 7 presents a summary of key findings, conclusions, and recommendations for the Yelm *Local Road Safety Plan*.

2 ANALYSIS OF HISTORIC CRASH DATA

Historical crash data was obtained for the City of Yelm for the five-year time period from January 1, 2017 through December 31, 2021. Crash data is collected by WSDOT from all crash reports completed by responding law enforcement officials. Crash data includes information related to crash circumstances, locations, driver behaviors, contributing factors, and severity including degree of injury. This data can be used to identify the factors that most clearly indicate the reasons why a crash occurred and provide the basis for developing engineering, education, or enforcement countermeasures.

WSDOT crash data included all streets within the city limits of Yelm plus portions of SR 507 along E Yelm Avenue, SR 510 including W Yelm Avenue and 1st Street S, and SR 510 Alt for which Phase 1 west of Cullens Road SE has been constructed.

During the five-year analysis period, there were a total of 714 crashes with 265 crashes occurring on City-operated streets and 449 crashes occurring on SR 507 or SR 510 which are operated by WSDOT. **Figure 2** presents a graphic image of these crashes by location. The more intense the colors in the figure, the greater the number of crashes that occurred during the five-year period. Of particular significance for the analysis presented in this report are severe crashes and those involving bicyclists and/or pedestrians. These crashes are discussed in the following sections and illustrated in Figures 3 and 4.

2.1 Severe Crashes

Of the 714 total crashes on Yelm streets in the five-year analysis period, there were no fatalities and 17 resulted in a serious injury. Serious injuries represented a total of 2.4 percent of all crashes in the city. Fatal and serious injury crashes, referred to in this report as severe crashes, are the focus of the *Local Road Safety Plan*. Of the 17 severe crashes, eight occurred on SR 507, and three occurred on SR 510 within the city limits. The remaining six crashes occurred on various city streets including two on Tahoma Boulevard SE. **Figure 3** shows the location of the 17 severe collisions during the five-year study period. The information in this figure is presented in more detail in **Table 1**.

Nine severe crashes occurred at intersections, and five of those crashes occurred at intersections that do not have traffic signals. One of the nine intersections (SR 507 at Grove Road) experienced three severe crashes during the 2017-2021 study period, while the others experienced one crash each.

2.2 Pedestrian and Bicycle Crashes

There were 13 total crashes in Yelm during the study period which involved a pedestrian or bicyclist. Only one of these crashes, or approximately eight percent, resulted in a serious injury. This crash involved a vehicle hitting a pedestrian on E. Yelm Avenue between 103rd Avenue and Creek Street (milepost 28.98).

Figure 4 shows the location of pedestrian and bicycle crashes. More detailed information about these crashes is provided in **Table 2**. The locations where pedestrian and bicycle crashes occurred includes:

- E. Yelm Avenue (SR 507) between 103rd and Creek Street (one serious injury crash involving a pedestrian who did not yield right of way)

Figure 2. 2017-2021 Crashes in Yelm

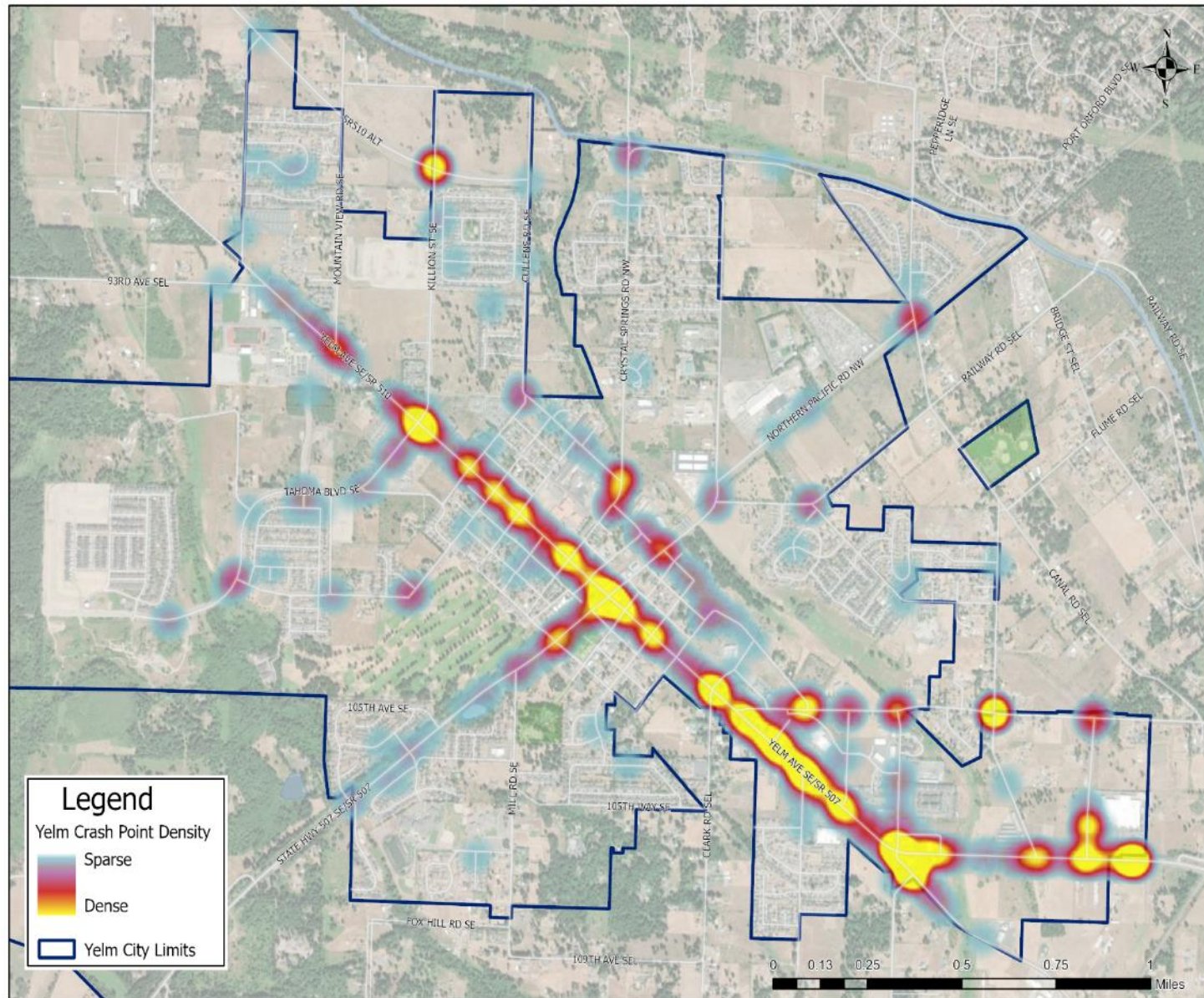


Figure 3. 2017-2021 Severe Crashes in Yelm

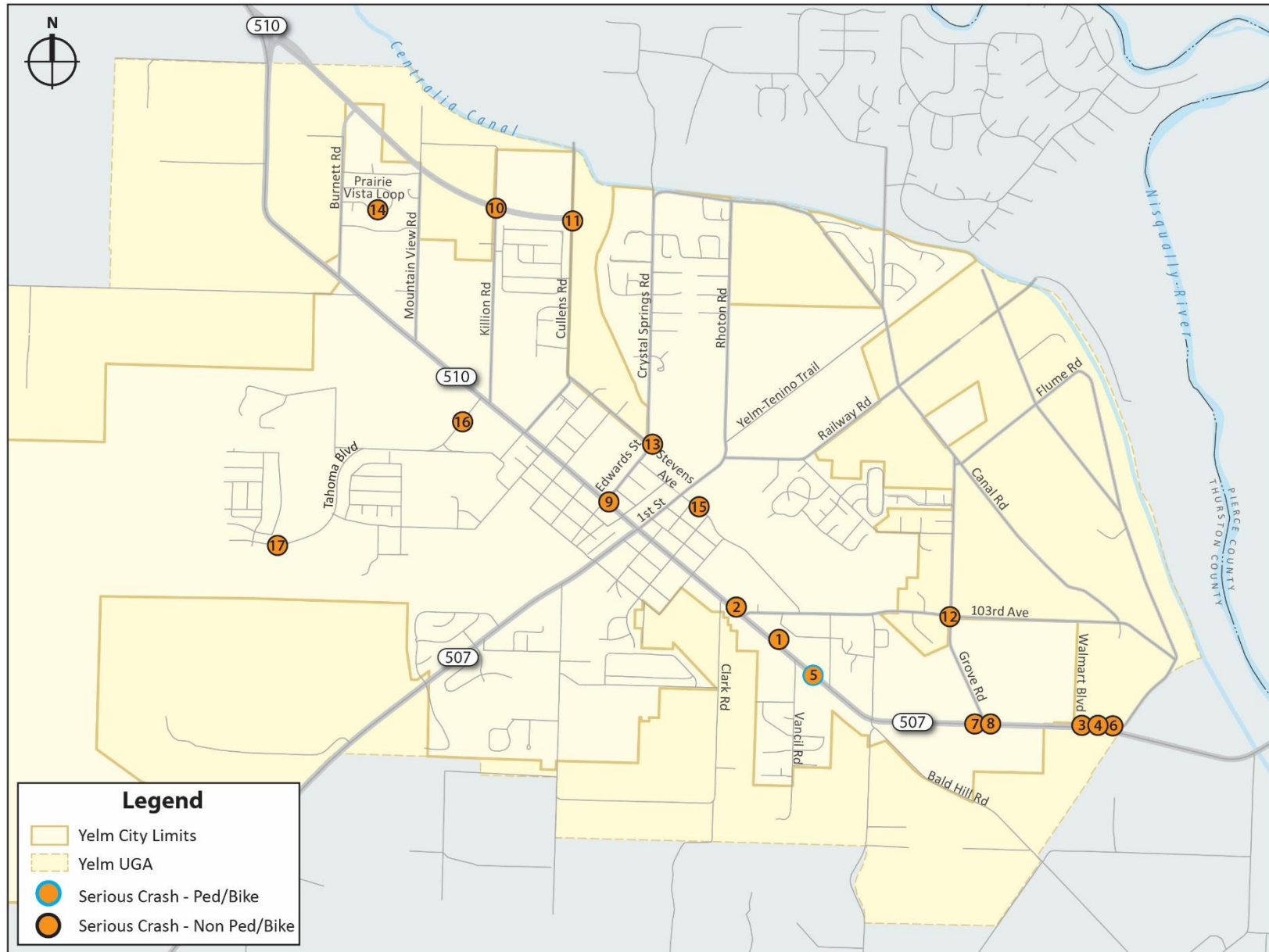


Figure 4. Location of Pedestrian and Bicycle Crashes

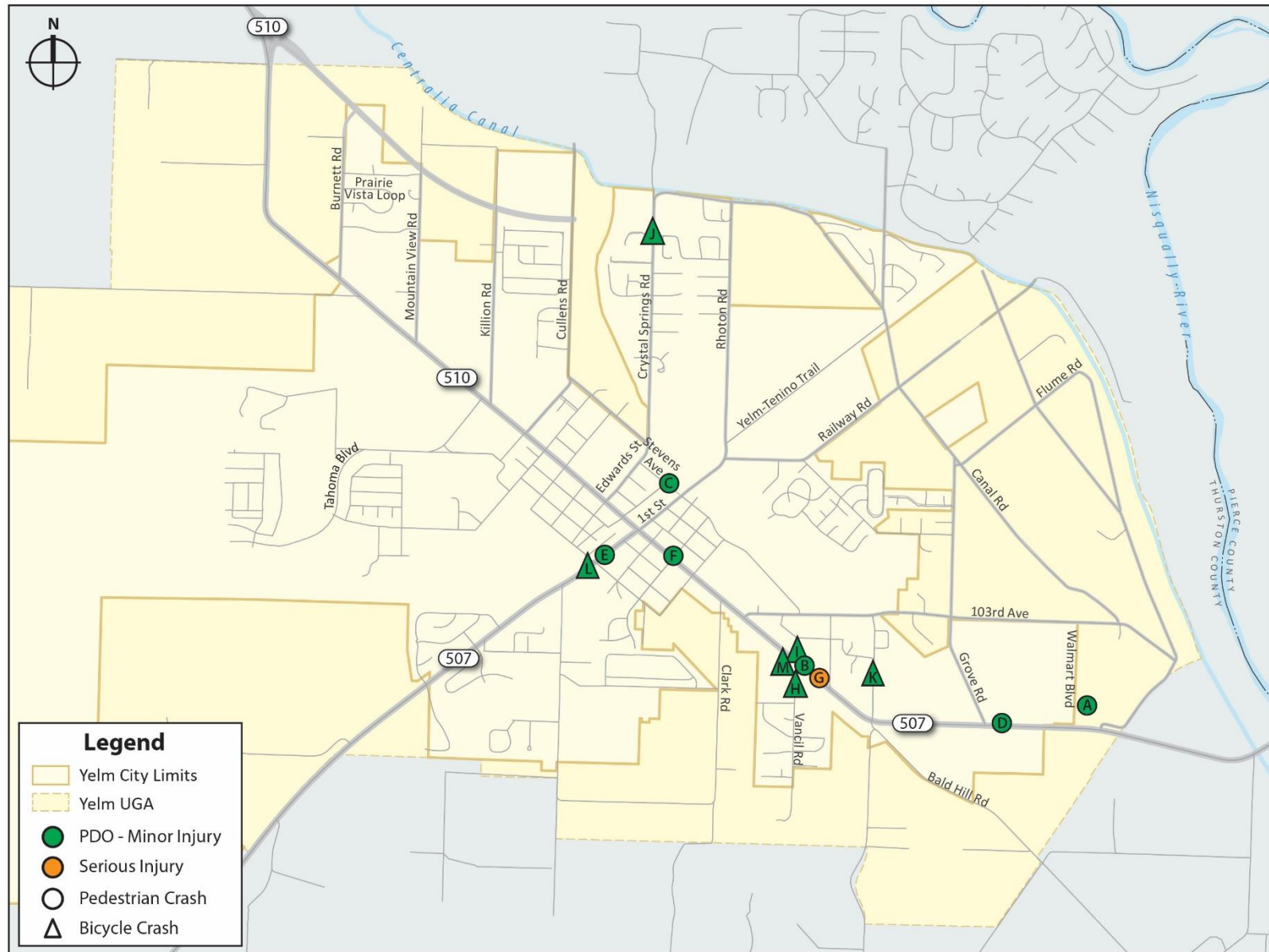


Table 1. Summary of Severe Crashes (Serious Injuries), 2017 to 2021

No.	Corridor	Milepost	Intersection/Segment	Segment Length (Miles)	Functional Classification	Number of Travel Lanes	Speed Limit	Contributing Cause	Crash Type
1	E. Yelm Avenue (SR 507)	28.72	103 rd Avenue to Plaza Drive	0.56	Principal Arterial	2 thru & TWLTL	35	Operating defective equipment	Head-On
2	E. Yelm Avenue (SR 507)	28.60	SR 507 at Clark Road	--	Principal Arterial	2 thru & TWLTL	35	Apparently asleep or fatigued	Rear End
3	E. Yelm Avenue (SR 507)	29.78	170 th Street to Centralia Canal	0.32	Principal Arterial	2 thru & turns	35	Apparently ill	Rear End
4	E. Yelm Avenue (SR 507)	29.82	170 th Street to Centralia Canal	0.32	Principal Arterial	2 thru & turns	35	Inattention	Sideswipe
5	E. Yelm Avenue (SR 507)	28.98	Vancil Road to Plaza Drive	0.56	Principal Arterial	2 thru & TWLTL	35	Pedestrian did not grant right of way	Pedestrian
6	E. Yelm Avenue (SR 507)	29.84	SR 507 at Walmart Driveway	--	Principal Arterial	2 thru & turns	35	Did not grant right of way	Turn
7	E. Yelm Avenue (SR 507)	29.59	SR 507 at Grove Road	--	Principal Arterial	2 thru & turns	35	Did not grant right of way	Angle
8	E. Yelm Avenue (SR 507)	29.59	SR 507 at Grove Road	--	Principal Arterial	2 thru & turns	35	Did not grant right of way	Angle
9	W Yelm Avenue (SR 510)	15.47	Cullens Street to 1 st Street	0.48	Principal Arterial	2 thru & TWLTL	35	Apparently asleep or fatigued	Fixed Object
10	W Yelm Avenue (SR 510 Yelm Loop)	14.44	SR 510 at Killion Road	--	Principal Arterial	2 thru & turns	35	Disregarded traffic signal	Angle
11	W Yelm Avenue (SR 510 Yelm Loop)	14.70	SR 510 at Cullens Road	--	Principal Arterial	2 thru & turns	35	Under influence of alcohol	Fixed Object
12	103 rd Avenue	--	103 rd Avenue at Grove Road	--	Major Collector	2 thru	25	Apparently ill	Angle
13	Crystal Springs Road	--	Crystal Springs Road at Coates Avenue	--	Local	2 thru	25	Inattention	Vehicle overturned
14	Prairie Vista Loop	--	Burnett Road to Andes Court	0.04	Local	2 thru	25	Person fell from vehicle while backing	Other

Table 1 Continued. Summary of Severe Crashes (Serious Injuries), 2017 to 2021

No.	Corridor	Milepost	Intersection/Segment	Segment Length (Miles)	Functional Classification	Number of Travel Lanes	Speed Limit	Contributing Cause	Crash Type
15	Stevens Avenue	--	1 st Street to 4 th Street	0.20	Major Collector	2 thru	25	Excessive speed while negotiating a curve	Fixed object
16	Tahoma Boulevard	--	Tahoma Boulevard at Driveway south of SR 510	--	Local	4 thru & TWLTL	35	Inattention	Angle
17	Tahoma Boulevard	--	Longmire Street to Dotson Street	0.31	Local	4 thru & turns	35	Exceeding safe speed limit	Fixed object

Table 2. Summary of Severe and Other Crashes Involving Bicycles or Pedestrians, 2017 to 2021

No.	Corridor	Milepost	Intersection/Segment	Segment Length (Miles)	Functional Classification	Number of Travel Lanes	Speed Limit	Severity	Contributing Cause	Crash Type
A	Walmart Throughway	--	Walmart Throughway east of Walmart Boulevard	--	Local	2 thru	NA	Possible injury	Inattention	Vehicle hit pedestrian
B	E. Yelm Avenue (SR 507)	28.91	SR 507 at Plaza Drive	--	Principal Arterial	2 thru & TWLTL	35	Possible injury	Inattention, disregarded traffic signal (no signal at this location)	Vehicle hit pedestrian
C	Stevens Avenue	--	Stevens Avenue at Railroad Avenue	--	Major Collector	2 thru	25	Possible injury	Inattention	Vehicle hit pedestrian
D	E. Yelm Avenue (SR 507)	29.62	Grove Road to 170th Street	0.13	Principal Arterial	2 thru & turns	35	Possible injury	None identified	Vehicle hit pedestrian
E	1st Street (SR 507)	28.09	Mosman Avenue to E. Yelm Avenue	0.18	Principal Arterial	2 thru & TWLTL	25	Suspected minor injury	Under the influence of alcohol, did not grant right of way	Vehicle hit pedestrian
F	E. Yelm Avenue (SR 507)	28.39	SR 507 at 3rd Street	--	Principal Arterial	2 thru & turns	35	Suspected minor injury	Motorist did not grant right of way	Vehicle hit pedestrian
G	E. Yelm Avenue (SR 507)	28.98	Vancil Road to Plaza Drive	0.56	Principal Arterial	2 thru & TWLTL	35	Suspected serious injury	Pedestrian did not grant right of way	Vehicle hit pedestrian
H	Vancil Road	--	Vancil Road at Driveway south of E. Yelm Avenue	--	Local	2 thru	25	Possible injury	Bicyclist did not grant right of way	Vehicle hit bicyclist
I	E Yelm Avenue (SR 507)	28.91	SR 507 at Plaza Drive	--	Principal Arterial	2 thru & TWLTL	35	Possible injury	Bicyclist did not grant right of way	Vehicle hit bicyclist
J	View Drive Court	--	View Drive Court at Crystal Springs Street	--	Local	2 thru	25	Suspected minor injury	Bicyclist inattention	Vehicle hit bicyclist
K	Creek Street	14.70	Creek Street at Driveway north of 106th Avenue	--	Local	2 thru & turns	25	Possible injury	Bicyclist inattention	Vehicle hit bicyclist
L	1st Street (SR 507)	28.07	1st Street at Mosman Avenue	--	Principal Arterial	2 thru & TWLTL	25	Suspected minor injury	Bicyclist did not grant right of way	Bicyclist hits vehicle
M	E Yelm Avenue (SR 507)	28.91	SR 507 at Plaza Drive	--	Principal Arterial	2 thru & TWLTL	35	Suspected minor injury	Bicyclist did not grant right of way	Vehicle hit bicyclist

Note: Location G is the same as location #5 in Table 1.

- E. Yelm Avenue (SR 507) at Plaza Drive (one suspected minor injury and two possible injury crashes)
- Other suspected minor injury crashes involving pedestrians or bicyclists occurred at:
 - 1st Street (SR 507) between Mosman Avenue and E. Yelm Avenue
 - E. Yelm Avenue (SR 57) at 3rd Street
 - View Court Drive at Crystal Springs Street
 - 1st Street (SR 507) at Mosman Avenue
- Other possible injury crashes involving pedestrians or bicyclists occurred at:
 - Walmart Throughway east of Walmart Boulevard
 - Stevens Avenue at Railroad Avenue
 - E. Yelm Avenue (SR 507) between Grove Road and Walmart Boulevard SE
 - Vancil Road at driveway south of E. Yelm Avenue
 - Creek Street at driveway north of 106th Avenue

2.3 Intersection Crashes

The crash data presented in Tables 1 and 2 is stratified by intersection in **Table 3**, including both signalized and unsignalized locations. Two of the three crashes at signalized intersections involved serious injuries – both of which occurred along either SR 507 or SR 510. The other one occurred on a city street, involved a bicyclist, and resulted in a suspected minor injury. It occurred at an intersection where there were bicycle facilities on most legs but not on the affected approach leg (eastbound) where there was a conflict with a right turn lane.

Fifteen crashes occurred at unsignalized intersections. Seven of these crashes involved serious injuries, four of which occurred on either SR 507 or SR 510, and the other three on city streets. The pedestrian crashes occurred at locations where there were sidewalks or crosswalks. With two exceptions, the bicycle crashes largely occurred where bicycle lanes or wide shoulders were present.

The most common contributing causes to intersection severe and bicycle/pedestrian crashes include failure to grant right of way (eight), and inattention (six).

2.4 Corridor (Roadway Segment) Crashes

Table 4 summarizes the crash data presented in Tables 1 and 2 for roadway segments. A total of 11 locations have been identified including those involving severe crashes, as well as bicycle and pedestrian-related crashes. Eight of the 11 locations included in this table involve severe crashes, while the remainder involved pedestrians (one location is duplicated as it involves a pedestrian-related severe crash). Information presented in Table 4 includes crash type and contributing causes, speeds, specific movement involved in the crash, lighting and roadway conditions, the absence of illumination and the presence or absence of dedicated pedestrian or bicycle facilities.

As noted in the table, the most common type of severe crash occurring on roadway segments in Yelm involved hitting fixed objects (three out of eight). The most common contributing causes to severe crashes and bicycle/pedestrian crashes involved failure to grant right of way (three), inattention (two), illness or fatigue (two), and speeding (two).

Table 3. Data Summary for Intersections and Conditions

No.	Intersections	Crash Type	Contributing Cause	Speed	Movement	Lighting Condition	Illumination	Road Surface	Notes
Signalized Intersections									
2	E. Yelm Avenue (SR 507) at Clark Road	Rear End	Apparently asleep or fatigued	35	Both going straight	Daylight	NA	Wet	
10	W Yelm Avenue (SR 510 Yelm Loop) at Killion Road	Angle	Disregarded traffic signal	35	Making left turn	Daylight	NA	Dry	
L	1st Street at Mosman Avenue	Bicyclist hits vehicle	Bicyclist did not grant right of way	25	Vehicle making right turn	Daylight	NA	Dry	Bicycle lanes on 3 legs, no separation from vehicle right turn lane
Unsignalized Intersections									
6	E. Yelm Avenue (SR 507) at Walmart Driveway	Turn	Did not grant right of way	35	Making left turn	Dark	Lights on	Wet	
7	E. Yelm Avenue (SR 507) at Grove Road	Angle	Did not grant right of way	35	Making right turn	Daylight	NA	Dry	
8	E. Yelm Avenue (SR 507) at Grove Road	Angle	Did not grant right of way	35	Making left turn	Daylight	NA	Dry	
11	W Yelm Avenue (SR 510 Yelm Loop) at Cullens Road	Fixed object	Under influence of alcohol	35	Going straight	Daylight	NA	Dry	
12	103 rd Avenue at Grove Road	Angle	Apparently ill	25	Entering at angle	Dark	Lights on	Wet	Raining
13	Crystal Springs Road at Coates Avenue	Vehicle overturned	Inattention	25	Going straight	Daylight	NA	Dry	
16	Tahoma Boulevard at Driveway south of SR 510	Angle	Inattention	35	Making left turn	Daylight	NA	Wet	Raining
B	E. Yelm Avenue (SR 507) at Plaza Drive	Vehicle hit pedestrian	Inattention, disregarded traffic signal (no signal at this location)	35	Vehicle going straight hits pedestrian	Daylight	NA	Dry	Crosswalk on Plaza Drive (side street)
C	Stevens Avenue at Railroad Avenue	Vehicle hit pedestrian	Inattention	25	Vehicle going straight hits pedestrian	Daylight	NA	Dry	Crosswalk on Railroad Avenue (side street)

Table 3 Continued. Data Summary for Intersections and Conditions

No.	Intersections	Crash Type	Contributing Cause	Speed	Movement	Lighting Condition	Illumination	Road Surface	Notes
Unsignalized Intersections									
F	E. Yelm Avenue (SR 507) at 3 rd Street	Vehicle hit pedestrian	Motorist did not grant right of way	35	Making right turn	Daylight	NA	Dry	Crosswalks on SR 507
H	Vancil Road at driveway south of E. Yelm Avenue (SR 507)	Vehicle hit bicyclist	Bicyclist did not grant right of way	25	Going straight	Daylight	NA	Dry	No bicycle facilities
I	E. Yelm Avenue (SR 507) at Plaza Drive	Vehicle hit bicyclist	Bicyclist did not grant right of way	35	Making left turn	Daylight	NA	Dry	Bicycle lanes on SR 507
J	View Drive Count at Crystal Springs Street	Vehicle hit bicyclist	Bicyclist inattention	25	Going straight	Daylight	NA	Dry	Wide shoulders on Crystal Springs
K	Creek Street at driveway north of 106th Avenue	Vehicle hit bicyclist	Bicyclist inattention	25	Going straight	Daylight	NA	Dry	No bicycle facilities
M	E. Yelm Avenue (SR 507) at Plaza Drive	Vehicle hit bicyclist	Bicyclist did not grant right of way	35	Going straight	Daylight	NA	Dry	Bicycle lanes on SR 507

Table 4. Data Summary for Roadway Segments and Conditions

No.	Roadway Segment	Crash Type	Contributing Cause	Speed	Movement	Lighting Condition	Illumination	Road Surface	Notes
1	E. Yelm Avenue (SR 507), 103 rd Avenue to Creek Street	Head on	Operating defective equipment	35	Both going straight, opposite direction	Dark	Lights on	Dry	
3	E. Yelm Avenue (SR 507), 170 th Street to Centralia Canal	Rear end	Apparently ill	35	Going straight, one stopped	Daylight	NA	Dry	
4	E. Yelm Avenue (SR 507), 170 th Street to Centralia Canal	Sideswipe	Inattention	35	Going straight, one stopped.	Daylight	NA	Dry	
5	E. Yelm Avenue (SR 507), Vancil Road to Plaza Drive	Pedestrian	Pedestrian did not give right of way	35	Going straight	Daylight	NA	Dry	
9	W. Yelm Avenue (SR 510), Cullens Street to 1 st Street	Fixed object	Apparently asleep or fatigued	35	Going straight	Dark	Lights on	Dry	
14	Prairie Vista Loop, Burnett Road to Andes Curt	Other	Person fell from moving vehicle	25	Vehicle backing	Dark	Lights on	Wet	
15	Stevens Avenue, 1st Street to 4th Street	Fixed object	Excessive speed	25	Negotiating curve	Daylight	NA	Dry	
17	Tahoma Boulevard	Fixed object	Exceeding safe speed limit	35	Going straight	Daylight	NA	Dry	
A	Walmart Throughway east of Walmart Boulevard	Vehicle hit pedestrian	Inattention	NA	Going straight	Dark	Lights on	Wet	Raining, no pedestrian facilities
D	E. Yelm Avenue (SR 507), Grove Road to 170 th Street	Vehicle hit pedestrian	None identified	35	Going straight	Dark	No lights	Wet	Raining, shoulders but no sidewalks
E	1st Street (SR 507), Mosman Avenue to E. Yelm Avenue	Vehicle hit pedestrian	Under the influence of alcohol, did not grant right of way	25	Going straight	Dark	Lights on	Wet	Sidewalk on west side, narrow shoulder on east side
G	E. Yelm Avenue (SR 507), 103 rd Avenue to Creek Street	Vehicle hit pedestrian	Pedestrian did not grant right of way	35	Going straight	Daylight	NA	Dry	Sidewalks or pathways available

Note: Location G is the same as location #5.

2.5 Comparison with Western Washington

The severe crashes in Yelm were reviewed to identify and characterize the risk factors associated with them. Based on available data from the records of the 17 severe crashes reported in Yelm, key crash factors were identified. In developing the list of crash factors that were most significant for Yelm city streets, consideration was given to both contributing causes and other features included in the crash record and on characteristics of the crash location. These risk factors are included in **Table 5** along with comparable information on the presence of these same risk factors averaged for the locations of severe crashes in Western Washington.

Table 5. Comparison of Crash Factors Present on City Streets in Severe Crashes

Crash Risk Factors	City of Yelm	Western Washington Cities
<i>By Crash Type</i>		
Entering at Angle	5 (29.4%)	14.1%
Hit Fixed Object	4 (23.5%)	18.2%
Rear End	2 (11.8%)	4.1%
Hit Pedestrian	1 (5.9%)	28.4%
<i>By Contributing Cause</i>		
Failure to Grant Right of Way	4 (23.5%)	6.2%
Asleep/Fatigued/Ill	4 (23.5%)	0.6%
Inattention	3 (17.6%)	4.7%
Excessive Speed	2 (11.8%)	6.1%
<i>By Light Condition</i>		
Dark - Street Lights On	4 (23.5%)	34.7%
Dark – Street Lights Off	0 (0.0%)	4.9%

Bold = Higher than the rest of Western Washington

Table 5 summarizes the crash factors present in multiple severe crashes in the city of Yelm and the corresponding percentage of those crash factors experienced by other cities in Western Washington. As indicated in bold, many of the key crash factors in Yelm are occurring at higher levels than other Western Washington cities. This is likely due to the presence of SR 507/SR510, which is a high-volume corridor through Yelm that not all cities must contend with, resulting in Yelm experiencing higher amounts of angle and rear end severe crashes. The key contributing causes are all higher as well, however this is likely the result of many statewide crashes being assigned no contributing cause, thus diluting the percentages for crashes with causes provided.

2.6 Comparison with Community Demographics

Federal regulations and guidance address the fair treatment of disadvantaged populations in the implementation of transportation improvements. New projects must ensure potential project impacts are not disproportionately burdensome to these populations. An analysis of environmental justice (EJ) populations within the City of Yelm was performed to ensure the effects of crash risk factors do not disproportionately affect disadvantaged populations and that proposed transportation projects are equitably allocated.

Demographic statistics on race and poverty status, as well as overall study area characteristics, are used to evaluate EJ effects. EJ populations include people of color and low-income populations, defined as follows:

- ◆ **People of color:** The percent of individuals in a block group⁴ who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word “alone” in this case indicates that the person is of a single race, not multiracial.
- ◆ **Low-income:** The percent of a block group’s population in households where the household income is less than or equal to twice the federal “poverty level.”⁵

Census data was gathered using EPA’s Environmental Justice Screening and Mapping Tool (EJScreen)⁶, which uses official U.S. Census Bureau 2017-2021 American Community Survey (ACS) 5-Year Estimates provided at the block group level. Six census block groups lie either fully or partially within the city limits, as shown in **Figure 5**.

To determine whether disparate impacts exist among EJ populations, ACS population data was gathered for each block group as well as for the City of Yelm as a whole. Based on WSDOT guidance⁷, the EJ populations within the city overall were used as a comparison group. The comparison group percentage was divided by the percentage of EJ population in each block group to determine disparate impact; a resulting ratio of less than 0.80 indicates a disparate impact on that population.

The results of the disparate impact analysis were then compared with the severe crash locations in the City of Yelm to ensure there is no disproportionately high and adverse effect on any EJ population. The analysis is summarized below.

2.6.1 People of Color

Within the City of Yelm as a whole, people of color make up 24 percent of the population. Among the city’s six block groups, people of color comprise between 18.7 and 29.4 percent of the population. Using the methodology described above, this analysis found no disparate impact among people of color within the City of Yelm (see **Table 6**).

⁴ Block groups are geographic units used for data collection by the U.S. Census Bureau. A block group generally has a population of 600 to 3,000 and is the smallest geographic unit for which the Census Bureau publishes sample data.

⁵ “Overview of Socioeconomic Indicators in EJScreen,” <https://www.epa.gov/ejscreen/overview-socioeconomic-indicators-ejscreen>

⁶ EPA EJScreen Mapping Tool, <https://ejscreen.epa.gov/mapper/>

⁷ “Determining EJ Effects on Project Populations,” WSDOT, April 2020, <https://wsdot.wa.gov/sites/default/files/2021-10/Env-EJ-Tsk458dDetProjEffect.pdf>

Figure 5. Block Groups in the City of Yelm

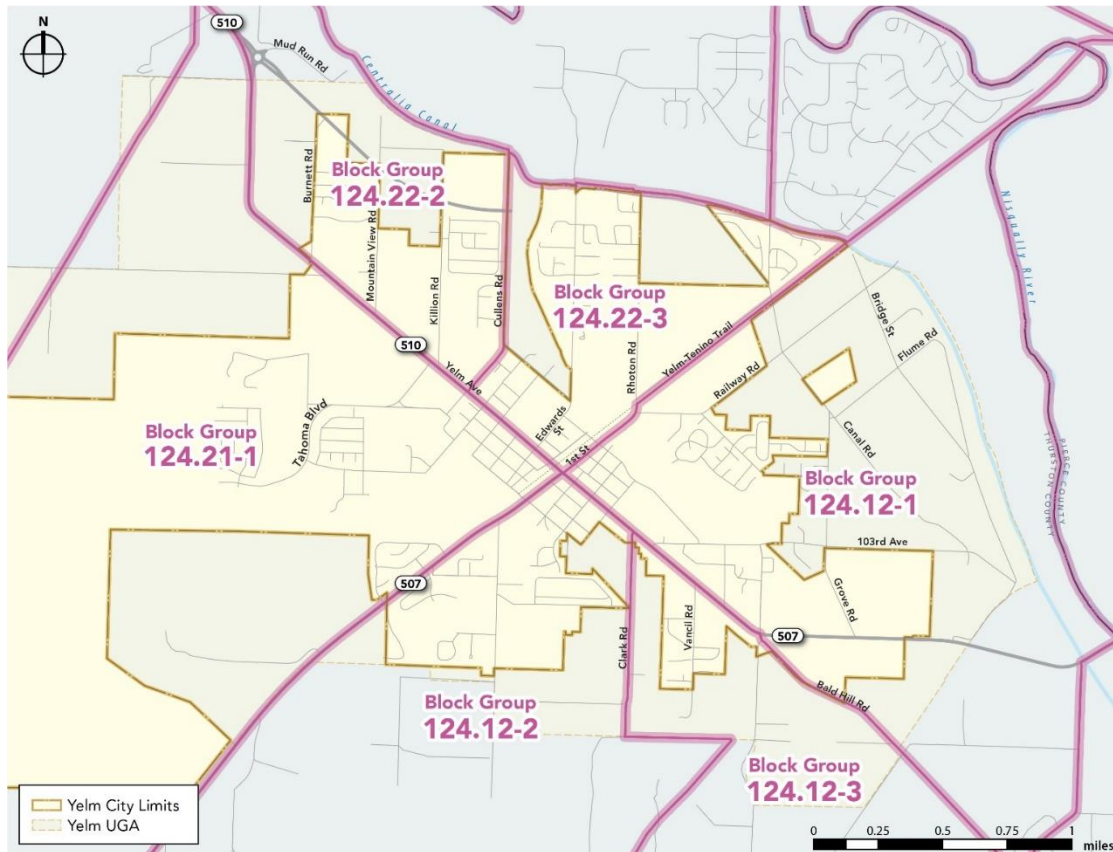


Table 6. People of Color, City of Yelm

Geography	People of Color as % of Total Population	Disparate Impact Ratio*	Disparate Impact?
City of Yelm (Comparison Group)	24.0%	-	
Block Group 124.12-1	29.4%	0.82	No
Block Group 124.12-2	23.6%	1.02	No
Block Group 124.12-3	23.5%	1.02	No
Block Group 124.21-1	28.5%	0.84	No
Block Group 124.22-2	18.7%	1.29	No
Block Group 124.22-3	19.3%	1.25	No

*To determine disparate impact: divide **comparison group** percentage by **block group** percentage; if result is less than 0.80, there is disparate impact.

2.6.2 Low-Income Populations

Within the City of Yelm as a whole, low-income persons make up 23.8 percent of the population. Among the city's six block groups, the low-income population ranges from 6.5 to 34.4 percent. The analysis found no disparate impact among low-income populations in the City of Yelm except for one block group, 124.12-1 in the northeast corner of the city (see **Table 7**).

Table 7. Low-Income Population, City of Yelm

Geography	Low-Income Pop. as % of Total Population	Disparate Impact Ratio*	Disparate Impact?
City of Yelm (Comparison Group)	23.8%	-	
Block Group 124.12-1	34.4%	0.69	Yes
Block Group 124.12-2	24.5%	0.97	No
Block Group 124.12-3	6.5%	3.68	No
Block Group 124.21-1	16.7%	1.43	No
Block Group 124.22-2	29.5%	0.81	No
Block Group 124.22-3	19.6%	1.21	No

*To determine disparate impact: divide **comparison group** percentage by **block group** percentage; if result is **less than 0.80**, there is disparate impact.

2.6.3 Effects on EJ Populations

EJ population concentrations were compared with crash locations to determine whether existing crash risk factors have a disproportionately high and adverse effect on any EJ population in the City of Yelm. The percentage of EJ populations within each block group is represented graphically in **Figure 6** and **Figure 7**, with severe crash locations overlaid on the census data.

Figure 6. Percentage People of Color by Block Group as Compared to Severe Crash Locations

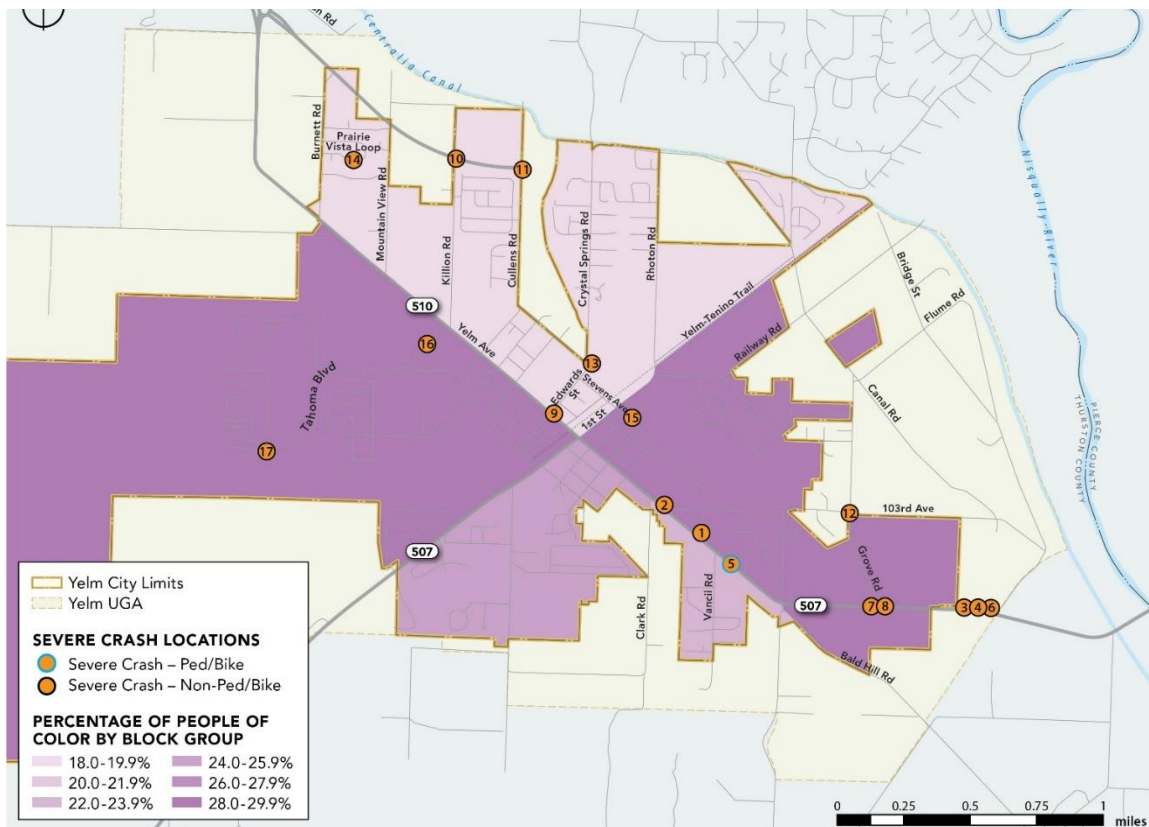
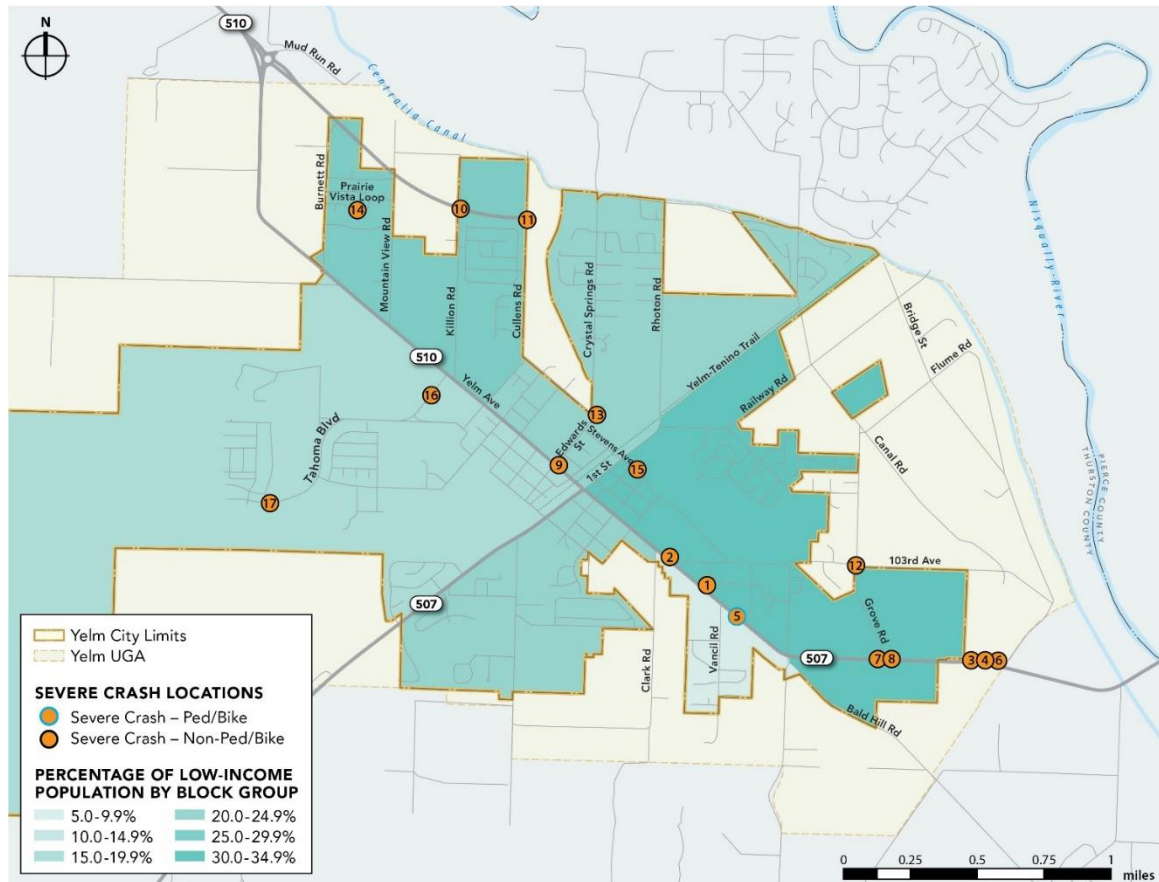


Figure 7. Percentage Low-Income Population by Block Group as Compared to Severe Crash Locations



The severe crash locations are reasonably evenly dispersed throughout the city, with a slightly higher concentration along SR 507 at the eastern end of town (adjacent to block group 124.12-1, the area of Yelm with the highest low-income population and for which the analysis indicated a slight disparate impact). The same is true when looking at all crashes or at pedestrian and bicycle crashes only (see Figures 2 and 4).

As noted above, the analysis indicated a slight disparate impact for low-income populations in block group 124.12-1. While this impact is very minor, lower-income populations generally have less vehicle access and are therefore more likely than other populations to rely on non-motorized transportation or public transit. Because there is also a slightly higher concentration of crashes in this vicinity, this low-income population should be taken into account to some extent during project allocation. However, the overall crash distribution indicates that there is no disproportionately high and adverse effect for any EJ population within the City of Yelm.

3 CONTRIBUTING CIRCUMSTANCES/SELECTION OF MOST COMMON RISK FACTORS

Based on the review of severe crash data presented in Chapter 2, an analysis was conducted to determine the circumstances that contributed to a crash and to identify the most common risk factors. Risk factors included crash type, contributing factors, roadway and intersection characteristics and driver/pedestrian behavior.

3.1 Contributing Circumstances

Based on the crash data from 2017 through 2021 presented in Table 1, the top contributing circumstances observed in severe crashes in Yelm included:

- Failure to grant right of way (four or 23.5% of all severe crashes)
- Asleep/fatigued/ill (four or 23.5% of all severe crashes)
- Inattention (three or 17.6% of all severe crashes)
- Excessive speed (two or 11.8% of all severe crashes)

None of these contributing causes represented more than 25 percent of all severe crashes.

3.2 Crash Types

Based on data in Table 1, the top crash types at the locations with severe crashes included:

- Angle (five or 29.4% of all severe crashes)
- Hitting fixed objects (four or 23.5% of all severe crashes)
- Rear end (two or 11.8% of all severe crashes)
- Pedestrian (one or 5.9% of all severe crashes)

Based on guidance found in WSDOT's *Target Zero – Washington Strategic Highway Safety Plan*, the primary risk factors found in severe crashes were grouped into priority levels 1, 2, and 3. The levels are based either on the percentage of traffic fatalities and serious injuries associated with each factor or the presence of a bicyclists or pedestrian (a very vulnerable roadway user) in the crash.

- **Priority Level 1:** Contributing risk factors that are involved in 25 percent or more of fatal or serious injury crashes. According to WSDOT's *Target Zero Plan*, these are the risk factors typically associated with the greatest number of fatal and serious injury crashes.
- **Priority Level 2:** Crashes involving vulnerable roadway users including bicyclists and pedestrians
- **Priority Level 3:** Risk factors that are involved in less than 25 percent of fatal or serious injury crashes

From the data analysis, patterns arose showing several factors that were present in the serious injury collisions. The risk factors for Priority Levels 1,2, and 3 are listed below.

Priority Level 1: As indicated from the data in Table 1, angle crashes represented 29.4 percent of all severe crashes including three at the intersection of E. Yelm Avenue (SR 507) and Grove Road. No other contributing circumstances or crash types represented more than 25 percent of severe crashes but several were close at 23.5 percent including failure to grant right of way, being asleep/fatigued/ill, or

hitting fixed objects. For purposes of this report, these risk factors were not considered as Priority Level 1 issues but may be considered in identifying priority locations for improvements.

Priority Level 2: While most pedestrian and bicycle-related crashes in Yelm during the study period did not result in a fatality or serious injury, the group of travelers is among the most vulnerable on the road and should be considered as a priority. For purposes of this report, all bicycle and pedestrian crashes are considered as Priority Level 2.

Priority Level 3: All other crash types and potential risk factors identified in Table 1 including:

Contributing Causes

- Failure to yield
- Hitting fixed objects
- Being asleep/fatigued/ill
- Defective equipment
- Inattention
- Disregarding traffic signal
- Under the influence of alcohol
- Falling from vehicle
- Speeding
- Rear end

Crash Types

- Head on
- Rear ends
- Sideswipe
- Turn
- Vehicle overturned
- Other

4 IDENTIFICATION OF HIGH PRIORITY LOCATIONS

Severe crashes on streets in the city of Yelm are dominated by a mix of risk factors including both crash types and contributing causes. Priority Level 1 includes the highest priority locations which can be considered for location-specific or systemic improvements. Priority Level 2 includes bicycle and pedestrian-related crashes, only one of which involved a serious injury, and are also considered high priority locations for the identification of improvements.

4.1 Priority Level 1

As noted in Chapter 3, angle crashes represented 29.4 percent of all severe crashes including three at the intersection of E. Yelm Avenue (SR 507) and Grove Road. No other contributing circumstances or crash types represented more than 25 percent of severe crashes but several other locations were identified as having a significant level of angle crashes leading to non-severe injuries. All of these locations are considered for Priority Level 1 improvement recommendations.

4.1.1 Specific Locations for Improvement

- **SR 507 (E. Yelm Avenue) at Grove Road** – three severe crashes occurred at this location over the five-year planning period.
 - **#7: Right Turn Angle Crash** - An angle crash occurred on 5/16/2021 during daylight hours when the pavement was dry and the weather clear. The vehicle identified at fault was making a right turn from the north to the west and failed to give right of way to a vehicle coming from the east and moving straight to the west. The intersection is stop-controlled on the side street movement where the right turn was made.
 - **#8: Left Turn Angle Crash** – An angle crash occurred on 9/28/2021 during daylight hours when the pavement was dry and the weather clear. The vehicle identified at fault was making a left turn from the north to the east and failed to give right of way to a vehicle coming from the east and heading straight to the west. The left turn movement was stop-controlled.
 - **#12: Right Angle Crash** - An angle crash occurred on 2/21/2021 during nighttime hours when it was raining and the pavement was wet. A single luminaire over the intersection was in operation. The vehicle identified at fault was moving straight from the west to the east and hit a vehicle stopped at the side street stop sign. The listed contributing cause was apparent illness.
- **SR 507 (E. Yelm Avenue) between Grove Road and Walmart Boulevard SE (#D)** - one non-severe pedestrian crash occurred approximately 0.03 miles east of the intersection with Grove Road during the five-year study period. As this crash occurred so close to those identified above at the intersection of Grove Road with E. Yelm Avenue it has been included as a Priority Level 1 location for purposes of this Safety Plan. This crash occurred on 12/4/2021 during hours of darkness and rain when the pavement was wet. There was no illumination at this location. The vehicle was going straight on SR 507 and no contributing causes were identified. It should be noted that this location will be reconstructed as part of the SR 510 Yelm Loop phase 2 project, tentatively scheduled for 2024 construction.

- **SR 510 Spur (W. Yelm Avenue) at Killion Road (#10)** – one severe crash occurred at this location that involved an angle collision. A total of 13 crashes occurred at this intersection over the five-year planning period, of which 12 involved angle crashes and one involved hitting a fixed object.
- **507 (E. Yelm Avenue) at Walmart Driveway (#6)** – One severe crash occurred at this location which involved a turning collision. A total of 13 angle crashes occurred at this driveway out of a total of 17 crashes over the five-year study period. It should be noted that this location will be reconstructed as part of the SR 510 Yelm Loop phase 2 project, tentatively scheduled for 2024 construction.
- **507 (E. Yelm Avenue) Near Walmart Driveway (#3 and 4)** – These crashes occurred within 0.06 of a mile from the Walmart driveway intersection and could be considered related to the presence of that intersection and Walmart related traffic. Two severe crashes occurred, one of which involved a rear end collision and the other a sideswipe. A total of nine crashes occurred in this area over the five-year study period none of which involved angle crashes. It should be noted that this location will be reconstructed as part of the SR 510 Yelm Loop phase 2 project, tentatively scheduled for 2024 construction.
- **Grove Road at 103rd Avenue (#12)** – One severe crash occurred at this location which involved an angle collision. This crash occurred on 2/21/2021 at 6:30 pm. It was raining and dark with streetlights on. Pavement was wet. The intersection was controlled by a four-way stop and caused by a motorist making a right turn from southbound to westbound. The contributing causes was cited as illness. Nineteen total crashes occurred at this intersection during the five-year study period of which 13 involved entering at an angle.
- **Bald Hill Road at Morris Road** – No severe crashes occurred at this location but there were a total of 32 crashes of which 13 involved angle collisions.
- **103rd Avenue at West Road** – No severe crashes occurred at this location but there were a total of 12 crashes of which five involved angle crashes.

4.1.2 Systemic Improvements

High priority systemic improvements were identified in response to the highest risk factors identified in the Yelm study area. These were associated with angle crashes and included identification of locations where:

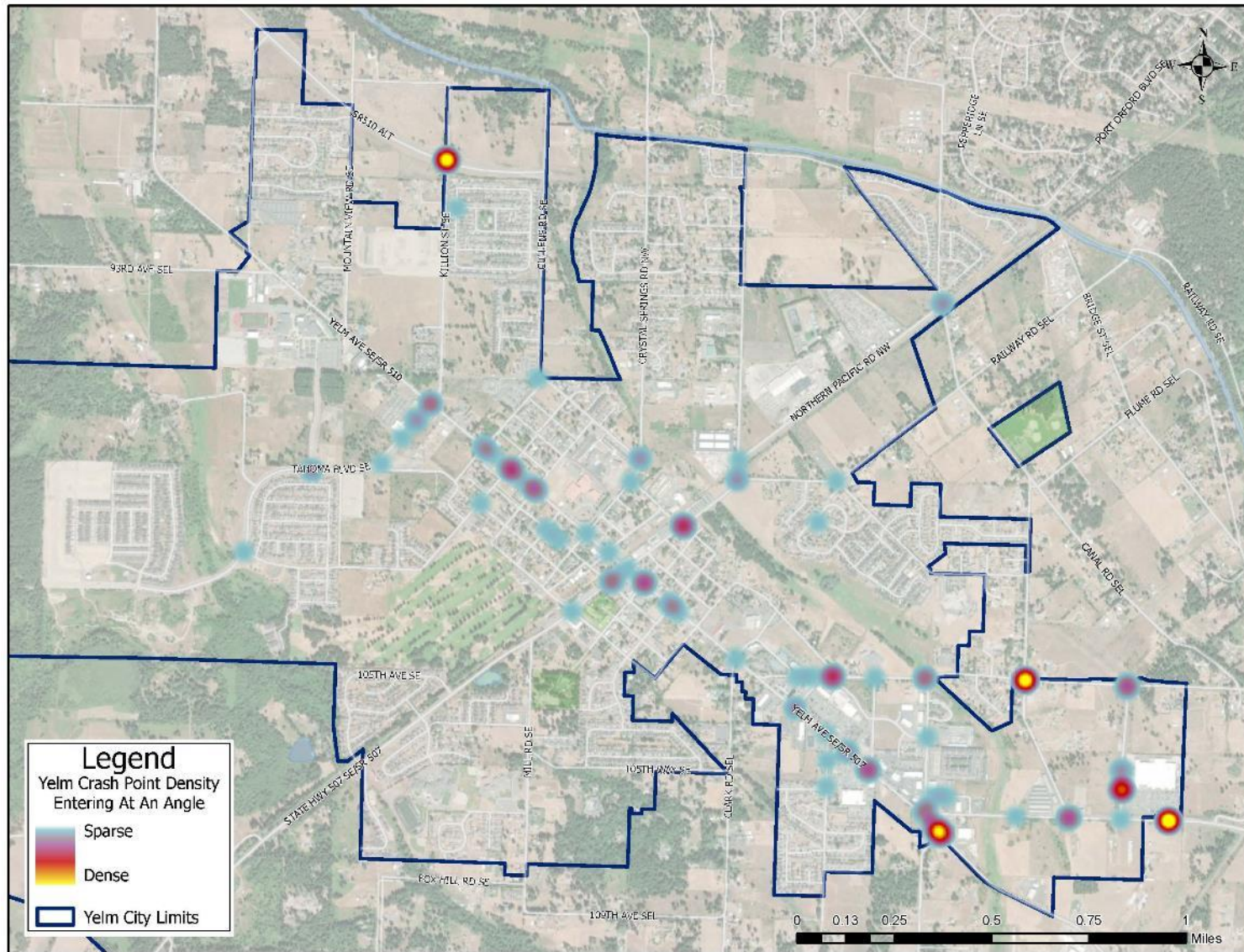
- Arterial corridors that completely lacked street lighting
- Stop controlled intersections with a history of angle crashes at all levels of severity (i.e., at least one crash per year)

Figure 8 shows the location of angle crashes at non-signalized intersections.

4.2 Priority Level 2

Because risk factors associated with pedestrian and bicycle crashes include a severe injury as well as several other injuries, and pose a significant risk to active transportation users, these types of crashes were also identified as Priority Level 2 locations. These locations include the following.

Figure 8. Angle Crash Locations



4.2.1 Pedestrian and Bicycle Crashes

As summarized in Table 2, there were seven pedestrian-related crashes in Yelm during the study period and six non-severe bicycle-related crashes. With one exception pedestrian-related crashes largely involved non-severe injuries. There were no severe bicycle-related crashes. Pedestrian and bicycle crashes that occurred during the study period included the following

- **SR 507 (E. Yelm Avenue) at Plaza Drive (#B, I and M)** – three non-severe crashes occurred at this location over the five-year study period, one of which involved a pedestrian, and two which involved bicyclists. These crashes included:
 - **#B: Pedestrian Crash** - The pedestrian crash occurred on 2/24/2017 during daylight hours when the weather was overcast and the pavement was dry. The vehicle was going straight on SR 507 and apparently failed to notice the presence of the pedestrian due to inattention. No contributing causes were assigned to the pedestrian.
 - **#I: Bicycle Crash** - A non-severe crash between a motor vehicle and a bicyclist occurred on 8/23/2018 during daylight hours when the weather was clear/partly cloudy and the pavement was dry. The vehicle was making an eastbound left turn from E. Yelm Avenue to Plaza Drive. The pedestrian was noted as failing to yield right of way to the vehicle. The intersection is stop sign-controlled on Plaza Drive.
 - **#M: Bicycle Crash** - A non-severe crash between a motor vehicle and a bicyclist occurred on 7/19/2019 during daylight hours when the weather was clear/partly cloudy and the pavement was dry. The vehicle was traveling straight from the south to the north and the bicyclist as noted as being inattentive.
- **SR 507 (E. Yelm Avenue) between Vancil Road and Plaza Drive (#5/G)** – one severe crash occurred in this highway segment over the five-year study period that involved a pedestrian. The crash occurred at milepost 28.98 at a driveway for a commercial business. This is 0.05 miles from the intersection with Vancil Road and 0.06 miles from the intersection with Plaza Drive. The crash occurred on 7/29/2018 during daylight hours when the weather was partly cloudy and the pavement was dry. The vehicle was going straight, and the pedestrian was cited as failing to yield to the motor vehicle.
- **Walmart Boulevard (170th Avenue) at Walmart Throughway (#A)** – one non-severe crash occurred in this roadway segment at the entrance to Walmart over the five-year study period that involved a pedestrian. The crash occurred on 11/12/2017 during hours of darkness and rain when the pavement was wet. The intersection was illuminated. The vehicle was going straight on SR 507 and apparently failed to notice the presence of the pedestrian due to inattention. No contributing causes were assigned to the pedestrian. It should be noted that this location will be reconstructed with a median curb as part of the SR 510 Yelm Loop phase 2 project, tentatively scheduled for 2024 construction.
- **Stevens Street at Railroad Avenue** – one non-severe pedestrian crash occurred at this intersection during the five-year study period. This crash occurred on 5/31/2019 during daylight hours when the weather was clear/partly cloudy and the pavement was dry. The vehicle was going straight on Stevens Avenue and was inattentive to the presence of a pedestrian. The

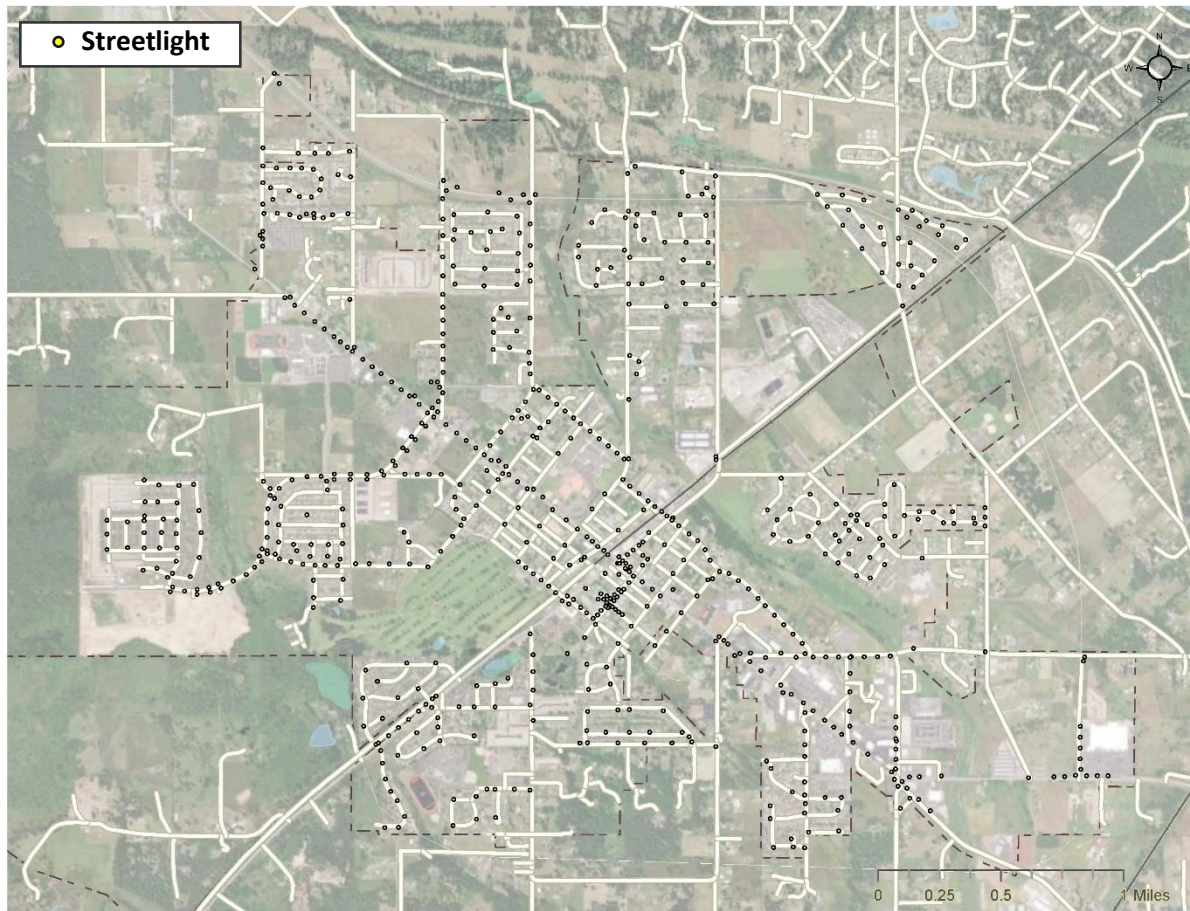
pedestrian was also noted as being inattentive. The intersection was stop-controlled on Railroad Avenue with no stops required on Stevens Avenue.

- **SR 507 (1st Street) between Mosman Avenue and E. Yelm Avenue** - one non-severe pedestrian crash occurred at this intersection during the five-year study period. This crash occurred on 10/12/2019 during hours of darkness when the weather was clear/partly cloudy and the pavement was wet. The vehicle was going straight on 1st Street, while the pedestrian was crossing while under the influence of alcohol and was inattentive to the presence of the vehicle.
- **SR 507 (E. Yelm Avenue) at 3rd Street** - one non-severe pedestrian crash occurred at this intersection during the five-year study period. This crash occurred on 5/28/2019 during daylight hours when the weather was clear/partly cloudy and the pavement was dry. The vehicle was making a right turn from 3rd Street to eastbound SR 507. The pedestrian was noted as being inattentive to the presence of the vehicle. The pedestrian was also noted as being inattentive. The intersection was stop-controlled on 3rd Street.
- **Vancil Road at Driveway south of E. Yelm Avenue** – one non-severe pedestrian crash occurred at this intersection during the five-year study period. This crash occurred on 10/27/2020 during daylight hours when the weather was clear and the pavement was dry. The vehicle traveling straight through the intersection on Vancil Road. The pedestrian was noted as failing to yield right of way to the vehicle. The intersection is traffic signal controlled.
- **View Drive Court at Crystal Springs Street** - one non-severe bicycle crash occurred at this intersection during the five-year study period. This crash occurred on 7/19/2019 during daylight hours when the weather was clear/partly cloudy and the pavement was dry. The vehicle traveling straight through the intersection on Crystal Springs Street. The bicyclist was noted as being inattentive. The intersection is stop sign-controlled on Crystal Springs Street.
- **Creek Street at Driveway north of 106th Avenue** - one non-severe bicycle crash occurred at this intersection during the five-year study period. This crash occurred on 4/1/2019 during daylight hours when the weather was clear/partly cloudy and the pavement was dry. The vehicle traveling straight east/west at the driveway. The pedestrian was noted as inattentive.
- **1st Street S at Mosman Avenue** - one non-severe bicycle crash occurred at this intersection during the five-year study period. This crash occurred on 5/7/2021 during daylight hours when the weather was clear and the pavement was dry. The vehicle was making an eastbound to southbound right turn and was hit by the bicyclist. The cyclist was noted as failing to yield right of way to the vehicle. The intersection is traffic signal controlled.

4.2.2 Roadway Streetlight Evaluation

Given the influence that sufficient lighting can have on safety for all roadway users, an assessment of the existing streetlights was performed. The city tracks its streetlight inventory in GIS and using that data **Figure 9** was prepared to depict all streetlight locations.

Figure 9. City-wide Streetlight Locations



Based on a review of the existing streetlight locations on the primary City routes, which typically provide street lighting approximately every 200 feet, several roadway segments with substandard streetlighting were identified. These are:

- SR 510 (W Yelm Avenue) from SR 510 Spur to 93rd Avenue SE
- SR 507 (S 1st Street) from Brighton Road SE to Mosman Avenue
- SR 507 (E Yelm Avenue) from 3rd Street to Clark Road SE
- SR 507 (E Yelm Avenue) from 106th Avenue SE to Walmart Boulevard SE
- 103rd Avenue SE from Creek Street SE to Walmart Boulevard SE

Some of these segments contain intermittent streetlights but do not provide the same consistent close spacing as most of the city.

4.3 Summary of Conclusions on High Priority Locations

In summary, all of the Priority Level 1 spot locations are recommended to be carried forward for further evaluation to identify appropriate solutions. In addition, review of the Priority Level 2 identifies two locations that should be carried further. Priority locations to be further studied include:

- SR 507 (E. Yelm Avenue) at or near Grove Road

- SR 510 Spur at Killion
- SR 507 (E. Yelm Avenue) at or near Walmart Entrance
- Grove Road at 103rd Avenue
- Bald Hill Road at Morris Road
- 103rd Avenue at West Road
- SR 507 (E. Yelm Avenue) at or near Plaza Drive
- Roadway segments with substandard street lighting

Other locations are not recommended as high priorities to be carried into the evaluation or countermeasures and the development of improvement recommendations. **Figure 10** illustrates the highest Priority Level 1 and Level 2 locations including both spot and potential systemic improvements, those roadway segments with substandard street lighting.

When the project locations identified in Figure 10 are compared with the demographic data presented in Chapter 2, it is clear that there is a distribution of projects throughout much of the city. In particular, there is a concentration of improvements recommended for the southeast portion of the city which includes a higher than average percentage of person of color and low income population.

Figure 10. Priority Level 1 and 2 Locations for Improvement



5 IDENTIFICATION OF COUNTERMEASURES FOR HIGH PRIORITY CORRIDORS

Chapter 5 includes a discussion and evaluation of potential countermeasures for severe crashes or bicycle/pedestrian crash risk factors where appropriate. As an introduction to this discussion it is important to note that a significant change to the transportation system in the City of Yelm is pending and may substantively alter the magnitude of crash experience as identified in this study. Phase 1 of the Yelm Loop (Bypass) has been constructed and is under operation. This bypass currently runs from Yelm Highway to Cullens Road. East of Cullens Road, many motorists are currently using a route comprised of several local streets to bypass the city center and reach destinations to the east of Yelm while waiting for the Bypass to be completed. These local streets include Cullens Road, Coates Avenue, Edwards Street, Stevens Street, 103rd Avenue and Walmart Boulevard. Several of these streets experienced either bicycle/pedestrian crashes or a significant number of angle crashes during the study period.

Analysis conducted for the Yelm Bypass project indicates that traffic volumes, particularly on these local streets, could see a potentially significant reduction when the bypass is completed. With this reduction in volumes, it is also anticipated that crash levels would decline. Earlier analysis also shows a reduction in expected traffic volumes along SR 510 (W. Yelm Avenue) and SR 507 (E. Yelm Avenue), although to a much lesser degree than on the local streets and may result in a reduction in crash experience.

Completion of the Yelm Loop bypass is not expected to affect recommendations in this report related to Yelm Avenue (including both SR 510 and SR 507) but may affect the need for improvements at several of the local street intersections. This is further discussed in the sub-sections below. Local street intersections currently experiencing high angle, bicycle or pedestrian crashes should be monitored to determine if crash potential actually reduces.

5.1 Spot Improvements

A review of each high priority crash location was performed to identify potential safety countermeasures. These countermeasures were selected based on a review of the specific crash data and existing roadway conditions, consultation with City staff, and a review of safety countermeasure resources from WSDOT and FHWA. Below is a description of each identified priority location, the issues specific to that location, and the selected countermeasures.

5.1.1 SR 507 (E. Yelm Avenue) at and near Grove Road

Figure 11 illustrates the existing layout of this intersection. Three severe crashes occurred at this location over the five-year planning period including two right turn angle crashes and one left turn angle crash. Two of the crashes involved turns from the stop-controlled side street (Grove Road) resulting from a failure to yield on the

Figure 11. SR 507 at Grove Road



part of the entering motorist. The third crash involved apparent illness. An additional non-severe injury crash involving a pedestrian occurred approximately 160 feet to the east of the intersection with Grove Road. Two of the crashes occurred during hours of darkness when it was raining and the pavement was wet. There is currently no illumination at this intersection.

5.1.1.1 Recommended Countermeasures

The following countermeasures were identified for consideration to improve safety at this intersection.

- *Install Roundabout* - The EIS prepared the properties between Grove Road and Walmart Boulevard and on both sides of Yelm Avenue identified installation of a roundabout at the intersection with Grove Road. Based on information provided by the FHWA Crash Modification Factor Clearinghouse⁸, a 42 to 51 percent reduction in existing crashes could be expected with the roundabout in comparison to the existing stop-controlled intersection. This reduction would apply to all crashes and not just to angle crashes as the data is not specific enough to make that distinction.
- *Reconfigure Intersection to Eliminate Skew* – The closest CMF to such an improvement would be related to enhancing the sight distance triangle, making it easier for a driver to see on-coming vehicles. One relevant factor was identified that applied to injury crashes. This would see a reduction of 47 percent of existing relevant crashes. If installation of the proposed roundabout proceeds to implementation, this roadway skew should be addressed and included in any approved design concept.
- *Add Illumination* – The existing intersection is not lighted and two of the severe crashes occurred during hours of darkness. Based on a review of data from the CMF Clearinghouse, the addition of illumination to a road could result in a 50 reduction in all types of crashes.
- Install pedestrian crossing protection which could include such features as ADA compliant curb cuts and tactile warning strips and high visibility pedestrian warning treatments such as the following:
 - *Active warning beacons* - no CMF has been identified for this measure. Existing studies indicate motorist yielding varies from 25 to 76 percent, with an unclear relationship to roadway characteristics. Actuated beacons are typically more effective than continuous flashing beacons.

⁸ Crash countermeasures are actions taken to reduce the danger or threat of a particular type of crash. The effectiveness of various countermeasures are identified through various Crash Modification Factors (CMFs) that indicate the proportion of crashes that would be expected to change after implementation of a countermeasure. FHWA provides an extensive database of CMFs in its online Crash Modification Factors Clearinghouse.

CMFs are expressed as a factor which is multiplied by the number of crashes of a relevant and specific type that are currently being experienced. The result would determine the magnitude of changes in the number of that type of crash that would be expected. For example, if a stop-controlled intersection experienced 5.2 crashes per year over the analysis period and traffic signal installation was considered. The CMF for installing a traffic signal was .56 for all crashes, the expected total crashes after signal installation would be $5.2 \times 0.56 = 2.9$ total crashes per year or a reduction of 44 percent.

- Crossing island/refuge - roadway treatments that provide refuge for pedestrians and bicyclists between motor vehicle travel lanes at intersections and midblock locations. CMFs for pedestrian/bicycle refuges suggest a 46 percent reduction could be experienced for all crashes and a 31 percent reduction for vehicle/pedestrian crashes where raised medians are also included.
- Rectangular rapid flashing beacons (RRFBs) – these differ from standard flashing beacons by using a rapid flash frequency (approximately 190 times per minute), brighter light intensity, and ability to aim the LED lighting. RRFBs can be passive or pedestrian actuated, and feature an irregular, eye-catching flash pattern to call attention to the presence of pedestrians. CMFs indicate a potential reduction of vehicle/pedestrian crashes of 47 percent with typically a much higher motorist yield rate than uncontrolled crossings.
- Curb extensions - Curb extensions (also known as “bulb-outs,” or “neck downs”) may enhance pedestrian safety in several ways, such as by making pedestrians, bicyclists, and motorists more visible to each other; by keeping motor vehicles from parking too close to crossings and blocking sight lines; by reducing crossing distance; and by narrowing radii at intersections, which may slow-turning traffic. A CMF has not yet been determined; initial research indicates this treatment may be effective at increasing driver yielding and improving pedestrian safety

Conclusions – Given the recommended improvement to the intersection by installation of a roundabout, it is recommended that this improvement be prioritized and that it include adequate and appropriate illumination. In addition, consideration should be given to installation of appropriate pedestrian crossing protection such as ADA compliant curb cuts and tactile warning strips, and high visibility pedestrian treatments including warning signage and/or curb extensions to narrow the street crossing distance for walkers.

5.1.2 SR 510 Spur at Killion Road

Figure 12 shows the layout of this existing intersection. One severe crash occurred at this location over the past five years which involved an angle collision. 12 other angle crashes occurred here which represented 92 percent of all crashes at the intersection.

5.1.2.1 Potential Countermeasures

The following countermeasures were identified for consideration to improve safety at this intersection

- Install roundabout – Based on information provided by the FHWA Crash Modification Factor Clearinghouse, a 42 to 51 percent reduction in existing crashes could be expected with the roundabout in comparison to the existing stop-controlled intersection. This reduction would apply to all crashes and not just to angle crashes as the data is not specific enough to make that distinction.

Figure 12. SR 510 Spur at Killion Road



- **Install signalization** – Based on CMF research for a four-legged urban intersection, a 67 percent reduction is anticipated in injury crashes resulting from angle collisions. A 54 percent reduction is anticipated in angle crashes of all severities. An increase is anticipated in rear end crashes with this CMF.

5.1.3 SR 507 (E. Yelm Avenue) at and Near Walmart Entrance

One severe crash occurred at the entrance to Walmart which involved a turning collision. A total of 13 angle crashes occurred at this driveway out of a total of 17 crashes over the five-year period.

Additionally, two severe crashes occurred within 0.06 miles (about 300 feet) to the west of this intersection. One involved a rear end collision and the other a sideswipe. A

total of nine crashes occurred in this area over the five-year study period none of which involved angle crashes.

Figure 13 shows the location of the Walmart entrance driveway and the area within which the two other severe crashes occurred. It should be noted that this location will be reconstructed with a median curb as part of the SR 510 Yelm Loop phase 2 project, tentatively scheduled for 2024 construction.

Figure 13. SR 507 at and Near Walmart Entrance



5.1.3.1 Recommended Countermeasures

The current design effort for the completion of the Yelm Loop bypass includes a roundabout at the intersection with the Walmart driveway along with access management for the entire Walmart Frontage. Additionally, the frontage along Walmart Boulevard SE between SR 507 and 103rd Avenue would also see installation of an access management strategy. Along both SR 507 and Walmart Boulevard SE, property access would be restricted to right-in/right-out traffic with a median barrier. U-turns can be made at the roundabouts that will be constructed at both the Walmart driveway and the 103rd Avenue intersections. These restrictions are expected to substantively reduce angle crashes along SR 507 in this area, as well as along Walmart Boulevard SE. This would affect both the subject intersection as well as the intersection of Walmart Boulevard SE with the Walmart driveway which was identified earlier in this report as having a non-severe pedestrian crash.

5.1.4 Grove Road at 103rd Avenue

Figure 14 illustrates the intersection of Grove Road with 103rd Avenue. One severe crash occurred at this location which involved an angle collision. This crash occurred on 2/21/2021 at 6:30 pm. It was raining and dark with streetlights on. Pavement was wet. The intersection was controlled by a four-way stop and caused by a motorist making a right turn from

Figure 14. Grove Road at 103rd Avenue



southbound to westbound. The contributing causes was cited as illness. Nineteen total crashes occurred at this intersection during the five-year study period of which 13 involved entering at an angle.

5.1.4.1 Potential Countermeasures

Potential countermeasures that could be considered at this location would involve improvement to the assignment of traffic control at the intersection. Three alternatives were identified for consideration:

- Remove stop control from 103rd Avenue – It is understood that this intersection currently experienced higher traffic levels on 103rd Avenue as a result of the Yelm Loop bypass being only partially complete. Given that this is the only location on 103rd Avenue where vehicles are required to stop, removal of the existing stop signs on the 103rd Avenue approaches could better accommodate current volumes and be a more consistent treatment for the facility. If/when the Yelm Loop bypass is completed the existing all-way stop-control may be reimplemented.
- Install roundabout – Based on information provided by the FHWA Crash Modification Factor Clearinghouse, a 42 to 51 percent reduction in existing crashes could be expected with the roundabout in comparison to the existing stop-controlled intersection. This reduction would apply to all crashes and not just to angle crashes as the data is not specific enough to make that distinction.
- Install signalization – Based on CMF research for a four-legged urban intersection, a 67 percent reduction is anticipated in injury crashes resulting from angle collisions. A 54 percent reduction is anticipated in angle crashes of all severities. An increase is expected in rear end crashes with.

5.1.5 SR 507 (E. Yelm Avenue) at and near Plaza Drive

Three non-severe crashes involving bicyclists or pedestrians occurred at the intersection of E. Yelm Avenue and Plaza Drive and one severe crash occurred in the vicinity. The severe crash occurred at milepost 28.98 at a driveway for a commercial business. This is 0.05 miles from the intersection with Vancil Road and 0.06 miles from the intersection with Plaza Drive and involved a pedestrian who was cited for failing to yield to the motor vehicle. The three crashes at Plaza Drive all occurred during daylight hours under good weather conditions. In some instances blame was attributed to the motorist and in others to the non-motorist. It should be noted that this intersection is not illuminated which could create an added safety hazard for pedestrians and bicyclists in the area. **Figure 15** shows the intersection of SR 507 with Plaza Drive and the vicinity where identified crashes occurred.

Figure 15. SR 507 at and Near Plaza Drive



5.1.5.1 Potential Countermeasures

Potential countermeasures that could be considered at this location would involve improvement to the assignment of traffic control at the intersection. Two alternatives were identified for consideration:

- *Install roundabout* – Based on information provided by the FHWA Crash Modification Factor Clearinghouse, a 42 to 51 percent reduction in existing crashes could be expected with the roundabout in comparison to the existing stop-controlled intersection. This reduction would apply to all crashes and not just to angle crashes as the data is not specific enough to make that distinction.
- *Install signalization* – Based on CMF research for a four-legged urban intersection, a 67 percent reduction is anticipated in injury crashes resulting from angle collisions. A 54 percent reduction is anticipated in angle crashes of all severities. An increase is anticipated in rear end crashes with this CMF.

Additional countermeasures for consideration could be implemented with either signalization or a roundabout and include:

- *Add Illumination* – The existing intersection is not lighted and two of the severe crashes occurred during hours of darkness. Based on a review of data from the CMF Clearinghouse, the addition of illumination to a road could result in a 50 reduction in all types of crashes.
- *Pedestrian crossing protection* – these measures could include ADA compliant curb cuts with tactile warning strips, curb extensions, active warning beacons, crossing islands or refuges, rectangular rapid flashing beacons (RRFBs) or other similar strategies many of which are described earlier in this section.

5.2 Systemic Improvements

As noted in Chapter 4, high priority systemic improvement needs were identified in response to the highest risk factors in the Yelm study area. These risk factors were associated with angle crashes, and to a lesser degree locations that lacked illumination. The latter affected a number of locations where bicycle and pedestrian crashes occurred.

Many of the spot locations discussed in Section 5.1 experienced a high number of angle crashes, and many were particularly associated with severe injuries. This section is intended to build on the foregoing discussion of angle crashes by adding locations where there has been a significant number of these crashes. Data in Figure 8 (see Chapter 4) was used to guide that review. Two locations emerged from the analysis:

- Bald Hills Road at Morris Road
- 103rd Avenue at West Road

In addition to the systemic angle crash locations, five roadway segments with substandard streetlighting were identified.

5.2.1 Bald Hills Road at Morris Road

Figure 16 presents the intersection of Bald Hills Road at Morris Road which lies just to the southeast of the intersection of SR 507 with Bald Hills Road, which is currently under design for installation of a multi-lane roundabout to address existing congestion and safety concerns.

No severe crashes occurred at the subject intersection but there were a total of 32 crashes over the five-year study period, 13 of which (or 41 percent) involved angle collisions.

5.2.1.1 Potential Countermeasures

Potential countermeasures that could be considered at this location would involve improvement to the assignment of traffic control at the intersection. Any improvement at this intersection should be coordinated with the improvement constructed at the adjacent intersection of SR 507/Bald Hills Road. Three alternatives were identified for consideration:

- Closure or Relocation of southwest bound driveway – the presence of a commercial driveway as a fourth leg to this intersection increases the complexity and number of conflict points at the intersection. Given the high-volume interaction between Morris Road SE and the west leg of Bald Hill Road SE, relocating the driveway east would simplify the intersection and create a lower volume access for the commercial development.
- Install roundabout – Installation of a roundabout at this location would continue with the same form of traffic control as is currently being designed for the nearby intersection of Bald Hills Road with SR 507. Based on information provided by the FHWA Crash Modification Factor Clearinghouse, a 42 to 51 percent reduction in existing crashes could be expected with the roundabout in comparison to the existing stop-controlled intersection. This reduction would apply to all crashes and not just to angle crashes as the data is not specific enough to make that distinction.
- Install Signalization – Based on CMF research for a four-legged urban intersection, a 67 percent reduction is anticipated in injury crashes resulting from angle collisions. A 54 percent reduction is anticipated in angle crashes of all severities. An increase is anticipated in rear end crashes with this CMF. It is unlikely that this intersection currently meets traffic signal warrants, but this should be monitored over time if signalization is the preferred countermeasure to address angle crashes.

Figure 16. Bald Hills Road at Morris Road



5.2.2 103rd Avenue at West Road

Figure 17 shows the intersection of 103rd Avenue with West Road. No severe crashes occurred at this location but there were a total of 12 crashes of which five involved angle crashes.

Figure 17. 103rd Avenue at West Road



5.2.2.1 Potential Countermeasures

Potential countermeasures that could be considered at this location would involve improvement to the assignment of traffic control at the intersection. Three alternatives were identified for consideration:

- Install all-way stop control– Currently the east and west approaches of 103rd Avenue SE operate as free approaches. However, the current traffic volume patterns indicate that most of the traffic is travelling to/from West Road and the east leg of 103rd Avenue SE. While the current traffic volume patterns persist, installation of all-way stop control would improve the operation of the high-volume southbound left turn movement.
- Install roundabout – Installation of a roundabout at this location would continue with the same form of traffic control as is currently being designed for the nearby intersection of Bald Hills Road with SR 507. Based on information provided by the FHWA Crash Modification Factor Clearinghouse, a 42 to 51 percent reduction in existing crashes could be expected with the roundabout in comparison to the existing stop-controlled intersection. This reduction would apply to all crashes and not just to angle crashes as the data is not specific enough to make that distinction.
- Install signalization – Based on CMF research for a four-legged urban intersection, a 67 percent reduction is anticipated in injury crashes resulting from angle collisions. A 54 percent reduction is anticipated in angle crashes of all severities. An increase is anticipated in rear end crashes with this CMF. It is unlikely that this intersection currently meets traffic signal warrants but this should be monitored over time if signalization is the preferred countermeasure to address angle crashes.

5.2.3 Locations with Substandard Illumination

A review of the city-wide streetlight locations was conducted to identify any roadway segments with substandard lighting. Most of the city provided street lighting at approximately 200-foot intervals and this was used to identify substandard roadway segments. The assessment was focused on high-volume roads and five roadway segments were identified:

- SR 510 (W Yelm Avenue) from SR 510 Spur to 93rd Avenue SE
- SR 507 (S 1st Street) from Brighton Road SE to Mosman Avenue
- SR 507 (E Yelm Avenue) from 3rd Street to Clark Road SE
- SR 507 (E Yelm Avenue) from 106th Avenue SE to Walmart Boulevard SE
- 103rd Avenue SE from Creek Street SE to Walmart Boulevard SE

For each of these locations additional streetlights should be designed and installed to provide 200-foot spacing.

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6 PRIORITIZED LIST OF COUNTERMEASURES

Based on the detailed evaluation of each priority corridor and local concern area the recommended systemic and spot countermeasures were assessed, and a prioritization was established. The development and prioritization of recommendations included review of city policy on transportation safety, public discussion on potential improvements, and a technical evaluation of the relative significance of each improvement in meeting the safety objectives of the community.

6.1 Public Engagement in Developing Safety Solutions

As noted in the evaluation of crash data, the dominant pattern of crashes in Yelm is related to the two existing state highways - SR 507 and SR 510. Since the early 1990's planning and design for a bypass of the community has been underway with construction of Phase 1 of this improvement completed between Yelm Highway to the west of the city and Cullens Road. As noted earlier in this report, a significant share of existing crashes over the five year study period addressed in this Safety Plan occurred along the portion of SR 510 and SR 507 that is not currently served by Phase 1 of the Yelm Loop project. Additionally, a number of crashes occurred on local streets that are currently serving to connect Phase 1 of the Yelm Loop to the existing highway alignment. With completion of Phase 2, it is expected that traffic patterns in Yelm will change as regional traffic is diverted from the existing highway and local streets onto the new Loop. This will have an effect on improving transportation safety within the community. Many of the projects identified for implementation in this Safety Plan reflect this expected traffic pattern change.

The planning and design process for the SR 510 Yelm Loop (and many of the safety improvements recommended in this plan) has included extensive public engagement which is well documented in the project's *New Alignment Phase 2, Supplemental Environmental Assessment* dated May 2021. Public engagement included a Stakeholder Advisory Group (SAG) to ensure relevant agencies⁹ stay engaged and informed. Additionally, since the Yelm Loop corridor is located in the traditional territory of the Nisqually Tribe and near the Nisqually reservation, the Tribe has been included in all project meeting invitations and documentation distribution.

Engagement of the general public for Phase 2 of the Yelm Loop project included two open houses (one in person and one online), a project website and media communications. The primary issues of concern expressed by extensive public comment included transportation service and the environment. Transportation concerns included changes in travel patterns and safety, as well as access to pedestrian and bicycle facilities in the corridor. Based on comments received intersection improvements were confirmed and additional active transportation facilities were incorporated into the project.

Specific engagement activities that were included in development of the Safety Plan included: presentation to City Council, coordination with WSDOT on improvement recommendations, and ongoing dialogue with emergency responders, particularly police. Additional outreach to the general public related to transportation safety is anticipated as part of the pending update to the City's Comprehensive Plan and Transportation System Plan.

⁹ The SAC included representation from various departments within the City of Yelm, the Thurston Regional Planning Council (TRPC), Thurston County, WSDOT and Intercity Transit.

6.2 Relationship to City Policy on Transportation Safety

As noted earlier in this report, the Safety Plan relies on the goal and policy statements provided by the existing Comprehensive Plan and Transportation System Plan for guidance in the development and implementation of improvements. Additionally, the Transportation System Plan provides strategies for reducing traffic flow through the community via the new Yelm Bypass, and the implementation of improvements through the use of development mitigation and the Six-Year Transportation Improvement Program. The recommendations of this Safety Plan will be incorporated into those documents, as appropriate, to ensure implementation in a timely manner.

6.3 Summary of Recommendations

Based on the detailed evaluation of each priority corridor and local concern area the recommended systemic and spot countermeasures were assessed, and a prioritization was established. All of the recommended countermeasures were divided into three tiers:

- Tier 1: Top Priorities (including top ranked Priority Level 1 and Level 2 needs)
- Tier 2: Additional Needs (including high ranked Priority Level 1 and Level 2 needs)
- Tier 3: Studies and Further Evaluation

This prioritization was based on the severity of the existing safety issue, the nature of the proposed countermeasure, and the cost of the proposed countermeasure. Planning level cost estimates have been prepared for each potential countermeasure. The estimates provided represent the cost of independent implementation. However, should multiple countermeasures be implemented at the same time, the collective cost would likely be lower. This grouping of improvements would apply to city-wide implementation of a single countermeasure, like advanced pedestrian signage across town, or if multiple different countermeasures were implemented at the same time in a single location. Many of the identified countermeasures would group together naturally, for example:

- High visibility pedestrian treatments, advance stop/yield lines, and advanced pedestrian signage could all group together or with any other pedestrian improvement

The summary of proposed countermeasures, including the prioritization and estimated cost, are provided in **Table 8**.

Table 8. Countermeasure Prioritization and Cost Estimates

#	Location	Improvement	Total Cost
Tier 1 – Priority Improvements			
1-A	SR 507 (E Yelm Avenue) at Grove Road	<ul style="list-style-type: none"> • Install roundabout and correct for roadway skew • Install illumination • Develop ADA-compliant curb cuts and tactile warning strips • Install high visibility pedestrian treatments 	\$3,000,000
1-B	SR 507 (E Yelm Avenue) at Plaza Drive	<ul style="list-style-type: none"> • Install roundabout • Develop ADA-compliant curb cuts and tactile warning strips 	\$2,900,000

		<ul style="list-style-type: none"> • Install high visibility pedestrian treatments 	
1-C	City-wide Streetlight installation	<ul style="list-style-type: none"> • Install additional streetlighting along main City streets where gaps in streetlights exist. 	\$900,000
Tier 2 – Additional Improvements			
2-A	SR 510 Spur at Killion Road	<ul style="list-style-type: none"> • Install roundabout • Develop ADA-compliant curb cuts and tactile warning strips • Install high visibility pedestrian treatments 	\$3,500,000
2-B	Bald Hill Road SE at Morris Road SE	<ul style="list-style-type: none"> • Install roundabout • Develop ADA-compliant curb cuts and tactile warning strips • Install high visibility pedestrian treatments 	\$2,900,000
2-C	Grove Road SE at 103 rd Avenue SE	<ul style="list-style-type: none"> • Convert All-Way Stop Control to Two-Way Stop Control 	\$45,000
2-D	103 rd Avenue SE at West Road	<ul style="list-style-type: none"> • Assess intersection control alternatives and monitor traffic volume patterns. 	\$35,000
Tier 3 – Studies and Further Evaluation			
3-A	SR 507 (E Yelm Avenue) Between Vancil Road SE and Bald Hill Road SE	<ul style="list-style-type: none"> • Assess corridor for access control alternatives and pedestrian crossings 	\$50,000
3-B	SR 507 (E Yelm Avenue) at and near Walmart Entrance	<ul style="list-style-type: none"> • Installation of access control on SR 507 to limit the Walmart driveways to right-in right-out. This improvement is planned as part of Phase 2 of the Yelm Loop (Bypass). The city should monitor the status of that project and, should it not get constructed, should study implementation of access control independent of the Yelm Loop (Bypass) project. 	\$35,000

6.4 Commitment to Implementation

Through its Comprehensive Plan and Transportation System Plan, the City of Yelm has adopted plans and policies that identify a commitment to transportation safety and implementation of safety improvements. Through the adoption of this Safety Plan, the city makes a further commitment to the goal of zero roadway fatalities and serious injuries (Target Zero) and significant progress towards that goal by 2030. This commitment will be further addressed in the pending update of the City's Comprehensive Plan and Transportation System Plan through:

- The addition of specific policies that address Target Zero
- The incorporation of safety improvements identified in this plan, as well as projects identified through subsequent monitoring and analysis into the Transportation System Plan and Six Year Transportation Improvement Program for implementation.

6.5 On-Going Monitoring of Crashes

The City will continue monitoring crash data on a regular basis, with a focus on locations identified in the Plan. Monitoring will occur through the collection of crash data at three to five year intervals to update

the identification and assessment of severe crashes. As needed, further evaluation of improvements to problem locations will be determined. On-going monitoring will be the responsibility of the city's engineering staff with assistance from the Chief of Police or designee.

Also, the City will add the safety projects in this Plan to other City documents to help accelerate their funding and construction. The Safety Plan will be posted on the city's website.

7 CONCLUSIONS AND SUMMARY

The City of Yelm is actively pursuing improvements to reduce crashes and enhance safety for its multimodal transportation system. As part of that effort, the city has prepared this *Local Road Safety Plan* (LRSP) following the risk-based, data-driven analytical procedures outlined in guidance provided by the Washington State Department of Transportation (WSDOT) Local Programs Division. This guidance is designed to support WSDOT's efforts to implement the *Target Zero – Washington State Strategic Highway Safety Plan* which relies on a data-based approach that analyzes crash trends and contributing factors in the development of successful crash reduction strategies.

The purpose of this plan is to improve safety for different modes of transportation along city streets through the analysis of crash data, identifying and prioritizing risk factors that impact safety, and establishing and prioritizing engineering countermeasures and strategies that reduce the number and severity of crashes in the city.

7.1 Existing Crash History

Of the 714 total crashes on Yelm streets in the five-year analysis period, there were no fatalities and 17 resulted in a serious injury. Serious injuries represented a total of 2.4 percent of all crashes in the city. Fatal and serious injury crashes, referred to in this report as severe crashes, are the focus of *the Local Road Safety Plan*.

An assessment of these 17 severe crashes was performed to determine what, if any, trends were present. It was determined that the most common element of these 17 severe crashes was instances of vehicles entering at an angle from a side street. This was identified as a systemic issue and other locations in the City experiencing occurrences of entering at angle crashes were identified.

Overall, the following elements were used to identify priority locations in the city:

- Location of severe crashes
- Location of bicyclist and pedestrian crashes
- Location of clustered entering at angle crashes

7.2 Priority Locations

Based on the results of the existing crash data assessment, the following locations were identified as priority locations:

- SR 507 (E. Yelm Avenue) at or near Grove Road
- SR 510 Spur at Killion
- SR 507 (E. Yelm Avenue) at or near Walmart Entrance
- Grove Road at 103rd Avenue
- Bald Hill Road at Morris Road
- 103rd Avenue at West Road
- SR 507 (E. Yelm Avenue) at or near Plaza Drive
- Roadway segments with substandard street lighting

For each priority location improvements were identified and are described in Section 5. The preferred improvement option for each priority location is identified in Section 6, which includes a prioritization of the projects and their estimated costs.

7.3 Commitment to Safety

Through its Comprehensive Plan and Transportation System Plan, the City of Yelm has adopted plans and policies that identify a commitment to transportation safety and implementation of safety improvements. Through the adoption of this Safety Plan, the city makes a further commitment to the goal of zero roadway fatalities and serious injuries (Target Zero) and significant progress towards that goal by 2030. This commitment will be further addressed in the pending update of the City's Comprehensive Plan and Transportation System Plan through:

- The addition of specific policies that address Target Zero
- The incorporation of safety improvements identified in this plan, as well as projects identified through subsequent monitoring and analysis into the Transportation System Plan and Six Year Transportation Improvement Program for implementation.

The City's will continue monitoring crash data on a regular basis, with a focus on locations identified in the Plan. Monitoring will occur through the collection of crash data at three to five year intervals to update the identification and assessment of severe crashes. As needed, further evaluation of improvements to problem locations will be determined. On-going monitoring will be the responsibility of the city's engineering staff with assistance from the Chief of Police or designee.