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TECHNICAL MEMORANDUM #3

DATE: August 12, 2020

TO: Rick Williams | ODOT

FROM: John Bosket, PE; Kayla Fleskes, EI | DKS Associates
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SUBJECT: US 97 North Bend Interchange Study:
Current Transportation Systems Operations

Project #20092-000

This memorandum summarizes existing traffic operations, safety, and active transportation conditions for the US 97 North Bend Interchange study area. This information, along with the assessment of future (year 2040) "No Build" transportation conditions to be included in Technical Memorandum #4, will be used to establish a baseline from which the impacts on the transportation system from alternative interchange solutions will be evaluated.

SUMMARY OF KEY FINDINGS

- US 97 through the study area and vicinity area is classified a Statewide Highway and has been designated as a part of the National Highway System, a Federally Designated Truck Route, a State Freight Route and Reduction Review Route, and an Expressway.
- Speed limits on US 97 range between 45 mph and 65 mph with an annual average daily traffic volume of approximately 39,600 vehicles per day.
- All study intersections currently meet the volume-to-capacity (V/C) ratio mobility targets during the weekday pm peak hour, with US 97/Cooley Road as the only intersection operating right at the target.
- The majority of crashes at study intersections were at the intersection of US 97 and Cooley Road, which is a location that will be modified by the funded North Parkway improvements.
- There was one fatal and two serious injury (A) crashes on US 97 from 2014 to 2018. The fatal crash occurred on US 97 between Bowery Lane and Grandview Drive and involved a pedestrian.
- None of the study intersections had observed crash rates exceeding the statewide 90th percentile crash rates.
- A higher percentage of crashes were of rear-end collisions, which typically occurred at intersections and driveways.

- There are significant sidewalk gaps in the vicinity area on US 97 and Cooley Road, particularly east of US 97. Where sidewalks are provided, they are generally curb-tight on facilities with high vehicle speeds.
- While bike lanes exist on Cooley Road and US 97 in the vicinity area, these facilities are high-stress and are comfortable only for experienced bicyclists. The highway, railroad, and Cooley Road divide the vicinity area into four quadrants, making it difficult to comfortably cross between quadrants.

STUDY AREA

Figure 1 shows the study intersections being evaluated for traffic operations. The study intersections are focused along US 97 and along Cooley Road. An elementary school and middle school are located by 18th Street and Cooley Road. There is also a large commercial development south of Cooley Road between US 20 and US 97 (also known as the Golden Triangle).

A Burlington Northern Santa Fe (BNSF) railroad line runs north-south through the study area to the east of US 97. BSNF and Union Pacific operate manifest trains (which carry a variety of boxcars, tanker cars, lumber, etc.) through the study area. The rail track is regulated under the Federal Railroad Administrations Class 1, 2, 3 and 4 track standards with no weight or dimensional restrictions for freight movement.[1] Both US 97 and the railroad pose a barrier for east-west connectivity in the vicinity of the study area, with Cooley Road providing the first opportunity for southbound vehicles entering the City of Bend to cross US 97 and the railroad (both are at-grade crossings).

[1] City of Bend Draft Transportation System Plan, Volume 2, Existing Conditions and Needs Memorandum, July 2018.

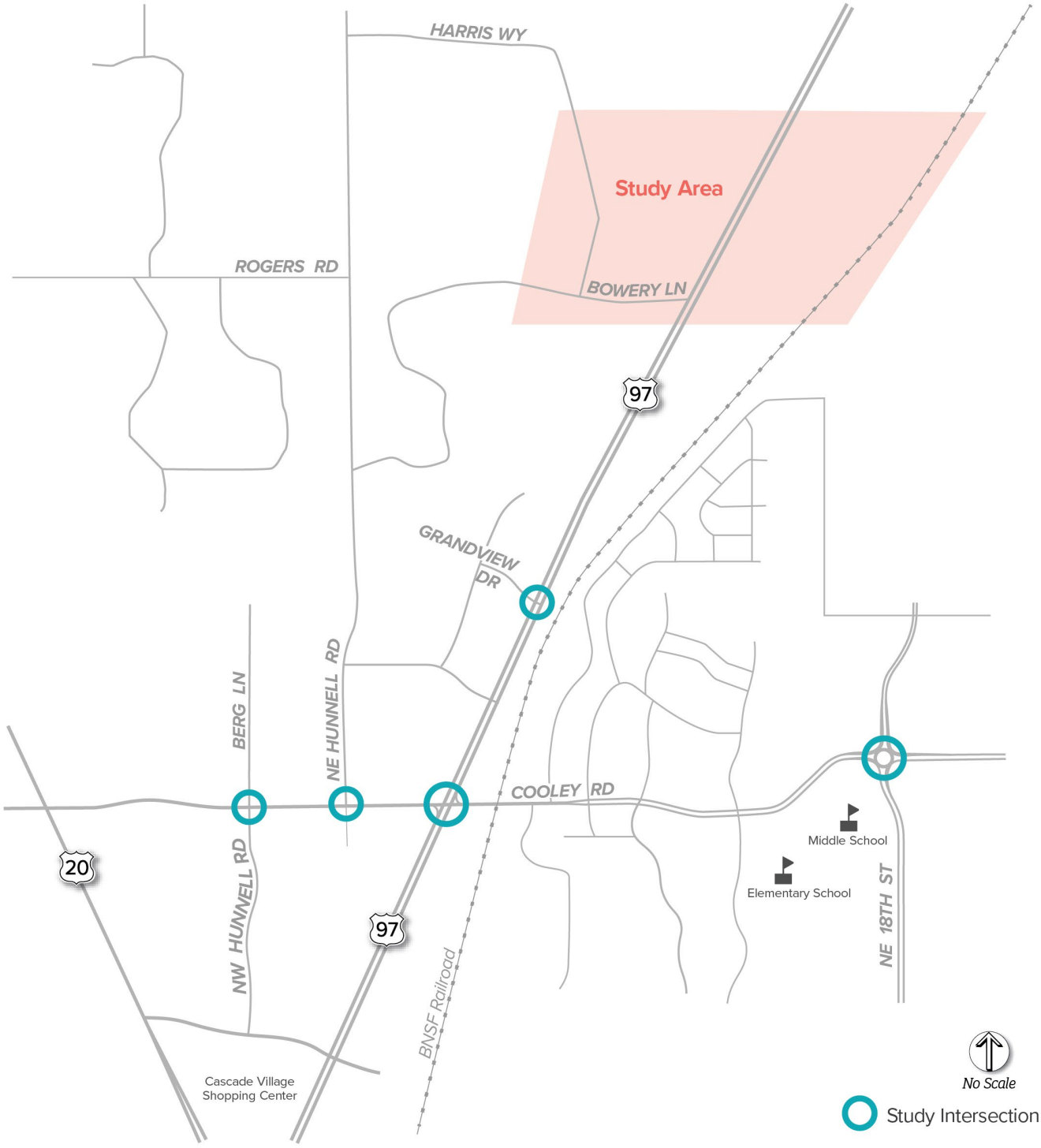


FIGURE 1. STUDY INTERSECTIONS FOR TRAFFIC OPERATIONS

Table 1 lists characteristics of significant roadways in the study area. US 97 is classified as a Statewide Highway and Expressway and has a posted speed ranging from 65 miles per hour (mph) near Bowery Lane, 55 mph approaching the Bend city limits and 45 mph south of the city limits. US 97 is also designated as part of the National Highway System, is a Federally Designated Truck Route, a State Freight Route and Reduction Review Route. The remaining roadways are City facilities with posted speeds ranging from 25 to 40 mph.

TABLE 1: ROADWAY CHARACTERISTICS

ROADWAY	JURISDICTION	FUNCTIONAL CLASSIFICATION	AADT[A] (VEHICLES PER DAY)	POSTED SPEED
US 97	ODOT	Statewide Highway/ Expressway	39,600	45 – 65 MPH
COOLEY ROAD	City	Minor Arterial	6,000-6,600	35 MPH
NE HUNNELL ROAD	City	Collector	1,200	25 MPH
NW HUNNELL ROAD	City	Minor Arterial	3,200	35 MPH
18TH STREET	City	Minor Arterial	3,250	40 MPH
GRANDVIEW DRIVE	City	Local	NA	25 MPH

[A] Annual Average Daily Traffic (AADT) accessed from ODOT Transgis (https://gis.odot.state.or.us/transgis/), except 18th Street which is based on an 18-hour bi-directional tube count.

TRAFFIC VOLUMES

Traffic volumes were counted in July and August of 2019.[2] These counts represent 30th highest annual hour traffic volumes (30 HV), which are equivalent to typical summer weekday pm peak hour volumes. Figure 2 shows the balanced motor vehicle, pedestrian and bicycle volumes at each study intersection, as well as lane configurations and the type of traffic control present. Traffic counts are included in Appendix A.

[2] Except for the intersection of Cooley Road/18th Street, where intersection turning movement volumes were based on bi-directional tube counts from 2016 and Cooley Road/NE Hunnell Road, where a 2014 count was balanced to the newer counts at Cooley Road/NW Hunnell Road and US 97/Cooley Road.

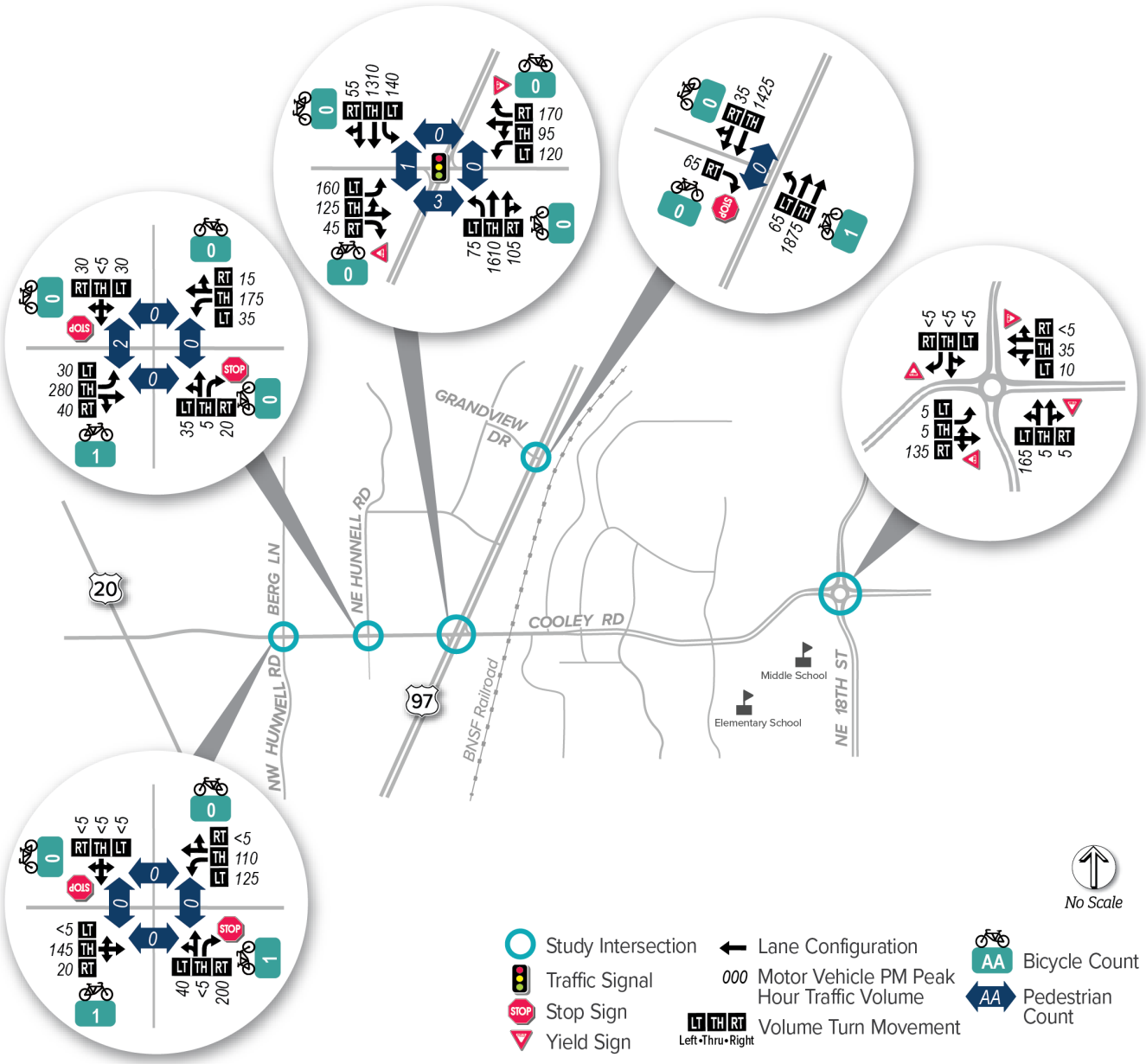


FIGURE 2. EXISTING (2019) 30TH HIGHEST ANNUAL HOUR TRAFFIC VOLUMES

OPERATIONS ANALYSIS

Intersection operations were analyzed using Synchro software and the Highway Capacity Manual (HCM) methodologies (HCM 2000 at signalized intersections, HCM 6th edition at unsignalized intersections). The analysis was conducted at all study intersections using the 30 HV traffic volumes representing the year 2019 conditions shown in Figure 2. Performance measures used for this analysis include volume-to-capacity (V/C) ratios, seconds of control delay and levels of service (LOS). Table 1 summarizes the results of this analysis, with each intersection's performance compared to the adopted mobility target.[3] HCM reports are included in Appendix B. All study intersections currently meet the V/C ratio mobility targets during the weekday pm peak hour, with US 97/Cooley Road as the only intersection operating right at the target.

TABLE 2: EXISTING (2019) 30TH HIGHEST ANNUAL HOUR TRAFFIC OPERATIONS AT STUDY INTERSECTIONS

STUDY INTERSECTION	CONTROL	JURISDICTION	MOBILITY TARGET	V/C [a]	LOS	DELAY (SEC)
US 97 / GRANDVIEW DR	Two-way stop control	ODOT	v/c ≤ 0.80 (major) v /c ≤ 0.95 (minor)	0.16 / 0.19	B / C	15 / 18
US 97 / COOLEY RD	Signalized	ODOT	v/c ≤ 0.85	0.85	D	52
COOLEY RD / NE HUNNELL RD	Two-way stop control	City	v/c ≤ 1.0	0.03 / 0.19	A / C	8 / 17
COOLEY RD / NW HUNNELL RD	Two-way stop control	City	v/c ≤ 1.0	0.10 / 0.38	A / B	8 / 13
COOLEY RD / 18TH ST	Roundabout	City	v/c ≤ 1.0	0.14	A	4

[a] V/C ratio, LOS and delay are reported as overall intersection at signalized intersections, major street/minor street at two-way stop-controlled intersections and worst approach lane at roundabouts.

[3] Mobility targets for ODOT facilities obtained from the 1999 Oregon Highway Plan. Mobility standards for City facilities based on City of Bend Development Code 4.7.500.

SAFETY ANALYSIS

Methods from the ODOT Analysis Procedures Manual (APM)[4], were used to identify the crash frequency, severity, type, and contributing factors at the study locations. The state Safety Priority Index System (SPIS)[5] was also consulted and documented.

The most recent five-year crash data available (2014 to 2018) were obtained from ODOT[6]. The safety analysis considered US 97 between Fort Thompson Lane in the north to Robal Road in the south and Cooley Road from NW Hunnell Road to E 18th Street. The study intersections are:

1. US 97/Fort Thompson Lane,
2. US 97/Bowery Lane,
3. US 97/Grandview Drive,
4. US 97/Cooley Road,
5. Cooley Road/NE Hunnell Road,
6. Cooley Road/NW Hunnell Road, and
7. Cooley Road/18th Street.

The study segments are the segments of US 97 and Cooley Road split between the study intersections as shown in Figure 3. According to ODOT's 2018 Motor Vehicle Traffic Crash Analysis and Code Manual,[7] legally reportable motor vehicle traffic crashes are those involving loss of $2,500 effective 1st January 2018 and prior the limit was $1,500. The following summarizes the results of the intersection and segment safety analysis.

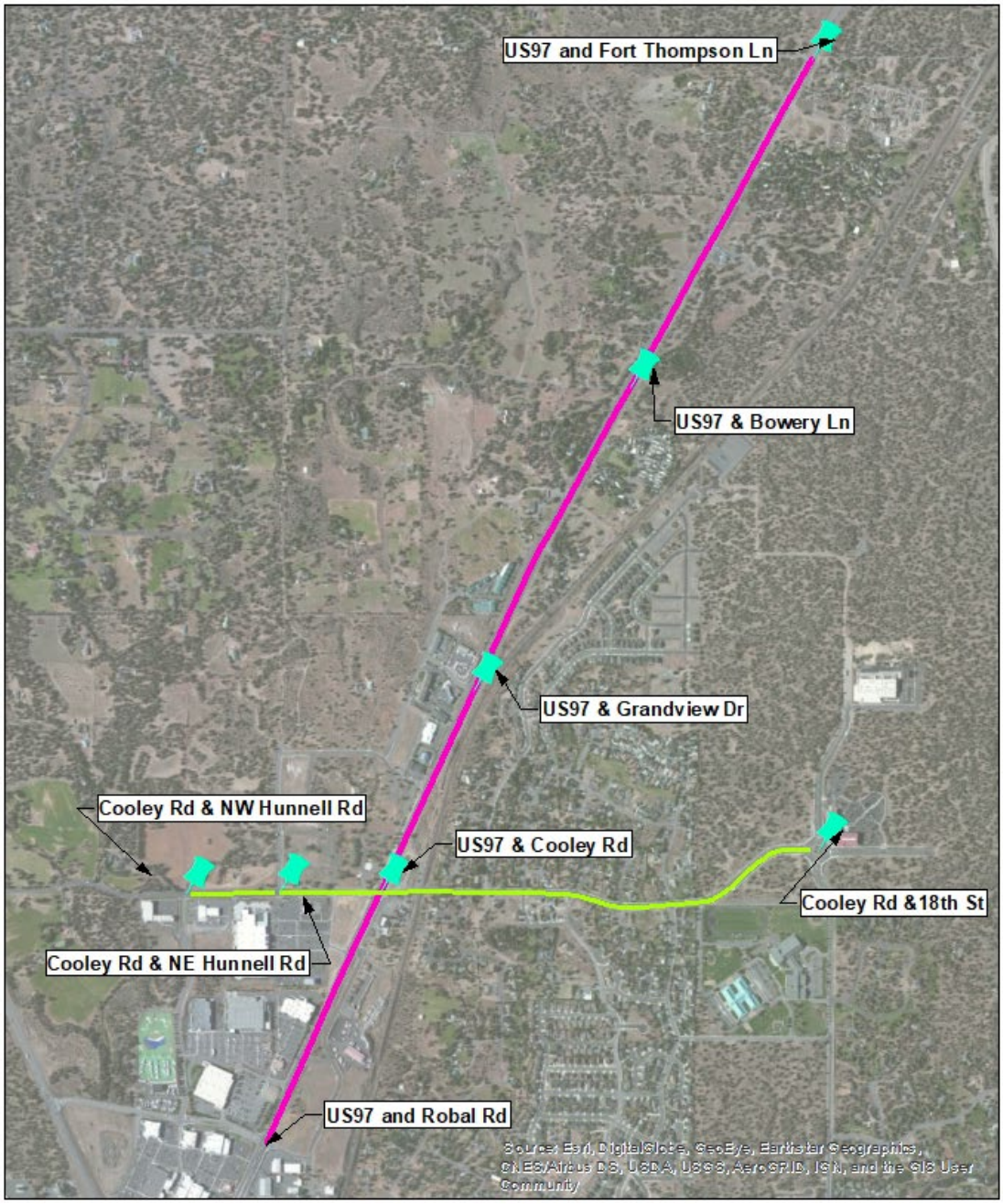
[4] Analysis Procedure Manual (APM Version 2), Chapter 4-Safety, Oregon Department of Transportation

[5] 2018 Safety Priority Index System (SPIS)

[6] ODOT TransGIS

[7] 2018 Motor Vehicle Traffic Crash Analysis and Code Manual

FIGURE 3: STUDY INTERSECTIONS AND SEGMENTS FOR SAFETY ANALYSIS



Legend

Intersections

US 97

Cooley Road

INTERSECTION CRASHES

For this analysis, intersection-related crashes are defined as crashes that occurred within 250 feet of the intersection.

CRASH FREQUENCY AND SEVERITY

Table 3 presents the crash frequency and severity at the study intersections for the five-year analysis period (2014-2018). The intersection of US 97 and Cooley Road had the highest number of observed crashes. At the intersection of US 97 and Cooley Road, 98 percent of the crashes occurred on US 97. The north leg of this intersection is in the top 5% of the 2018 Safety Priority Index System (SPIS)[4] list. The safety issue at this intersection is anticipated to be addressed by a planned improvement that will include grade separation of Cooley Road from US 97[8].

Overall, the severity of crashes at the study intersections was relatively low, with no crashes resulting in fatalities or serious injuries.

TABLE 3: SUMMARY OF FIVE-YEAR (2014-2018) CRASH FREQUENCY BY SEVERITY AT STUDY INTERSECTIONS

CRASH SEVERITY	US 97/ FORT THOMP-SON LN	US 97/ BOWERY LN	US 97/ GRAND-VIEW DR	US 97/ COOLEY RD	COOLEY RD/ 18TH ST	COOLEY RD/ NE HUNNELL RD	COOLEY RD/ NW HUNNELL RD	TOTAL
FATAL (K)	0	0	0	0	0	0	0	0
SERIOUS INJURY (A)	0	0	0	0	0	0	0	0
MINOR INJURY (B)	0	1	0	6	0	0	0	7
POSSIBLE INJURY (C)	1	4	6	21	0	1	0	33
PROPERTY DAMAGE ONLY (O)	3	6	6	20	3	0	2	40
TOTAL	**4**	**11**	**12**	**47**	**3**	**1**	**2**	**80**

[8] US 97 Bend North Corridor Project, Completing the US 97 Bend Parkway

COLLISION TYPE

Table 4 presents the crash frequency by collision type at the study intersections. Overall, rear-end crashes are the most frequent collision type. Two pedestrian-related crashes were observed, one each at the intersection of US 97/Cooley Road and US 97/Bowery Lane.

TABLE 4: SUMMARY OF FIVE-YEAR (2014-2018) CRASH FREQUENCY BY COLLISION TYPE AT STUDY INTERSECTIONS

COLLISION TYPE	US 97/ FORT THOMP-SON LN	US 97/ BOWERY LN	US 97/ GRAND-VIEW DR	US 97/ COOLEY RD	COOLEY RD/ 18TH ST	COOLEY RD/ NE HUNNELL RD	COOLEY RD/ NW HUNNELL RD	TOTAL
REAR-END	2	3	8	39	0	0	1	53
FIXED OBJECT	1	0	1	1	2	0	0	5
TURNING MOVEMENT	0	0	1	2	0	0	1	4
PEDESTRIAN	0	1	0	1	0	0	0	2
HEAD-ON	1	1	0	1	0	0	0	3
SIDESWIPE-OVERTAKING AND MEETING	0	3	2	2	0	0	0	7
OTHER	0	3	0	1	1	1	0	6
TOTAL	**4**	**11**	**12**	**47**	**3**	**1**	**2**	**80**

CONTRIBUTING FACTORS

Table 5 presents the crash frequency by contributing factor. The most frequent contributing factor was "Failed to avoid vehicle ahead" and "Following too closely". It is notable that these were the most common contributing factor (70 percent) associated with rear-end. In addition, all the crashes with careless driving (9 crashes) resulted in rear-end collision type.

TABLE 5: SUMMARY OF FIVE-YEAR (2014-2018) CRASH FREQUENCY BY CRASH CAUSE AT STUDY INTERSECTIONS

CONTRIBUTING FACTORS	US 97/ FORT THOMP-SON LN	US 97/ BOWERY LN	US 97/ GRAND-VIEW DR	US 97/ COOLEY RD	COOLEY RD/ 18TH ST	COOLEY RD/ NE HUNNELL RD	COOLEY RD/ NW HUNNELL RD	TOTAL
FAILED TO AVOID VEHICLE AHEAD	0	0	1	17	0	0	1	19
FOLLOWED TOO CLOSELY	1	2	4	13	0	0	0	20
CARELESS DRIVING	0	1	2	6	0	0	0	9
TOO FAST FOR CONDITIONS (NOT EXCEED POSTED SPEED)	2	1	3	4	1	0	0	11
OTHER	1	7	2	7	2	1	1	21
TOTAL	**4**	**11**	**12**	**47**	**3**	**1**	**2**	**80**

Table 6 presents the comparison of crash rates with the statewide 90th percentile crash rates for comparable intersections referenced from the ODOT Analysis Procedures Manual (APM), Exhibit 4-1[9]. ODOT does not have a 90th percentile crash rate for intersections with roundabout traffic control, therefore the intersection of Cooley Road/18th street was not considered in this analysis. The crash rates of the study intersections are lower than the statewide 90th percentile rates.

[9] Analysis Procedure Manual (APM Version 2), Chapter 4-Safety, Oregon Department of Transportation

TABLE 6: COMPARISON OF CRASH RATES PER MEV WITH STATEWIDE CRASH RATE REFERENCES

	US 97/ FORT THOMPSON LN	US 97/ BOWERY LN	US 97/ GRAND-VIEW DR	US 97/ COOLEY RD	COOLEY RD/ NE HUNNELL RD	COOLEY RD/ NW HUNNELL RD
CRASH RATE	0.06	0.15	0.16	0.55	0.08	0.17
STATEWIDE 90TH PERCENTILE CRASH RATE	0.41	0.29	0.29	0.86	0.41	0.29

AADT's for the crash rate analysis were compiled as follows:

- Peak hour intersection turning movement counts were available at the intersections of US 97/Cooley Road, Cooley Road/Hunnell Road and US 97/Grandview Drive. It was assumed that the peak hour volume is equal to ten percent of AADT.
- Peak hour turning movement counts were not available for the intersections of US 97 with Thompson Lane and Bowery Lane. Due to the limited connectivity to other areas, traffic volumes at these locations were assumed to be very low. The intersection crash rate analysis was conducted using the AADT on US 97. The AADT for US 97 was obtained from ODOT TransGIS.

SEGMENT CRASHES

This section summarizes the crashes that occurred on US 97 from Fort Thompson Lane in the north to Robal Road in the south and Cooley Road from NW Hunnell Road in the west to NE 18th Street in the east. The analysis focusses on crashes on the roadway segment; crashes at the study intersections were excluded on these study segments.

CRASH FREQUENCY AND SEVERITY

Table 7 presents the five-year crash summary by severity at the study segments. There was one fatal crash (K) and two serious injury (A) crashes in the study area during the study period. The fatal crash occurred on US 97 between Bowery Lane and Grandview Drive. This was a pedestrian fatality. The serious injury crashes occurred on US 97 between Fort Thompson Lane and Bowery Lane and between Grandview Drive and Cooley Road. These crashes involved only motor vehicles.

The highest frequency of crashes occurred on US 97 between Bowery Lane and Grandview Drive, Grandview Drive and Cooley Road, and between Cooley Road south to Robal Road. The segment south to Robal Road is largely out of the project study area but the frequency and type of crashes shows the transition to the retail/urban land use context.

TABLE 7: SUMMARY OF FIVE-YEAR (2014-2018) CRASH FREQUENCY BY SEVERITY AT STUDY SEGMENTS

CRASH SEVERITY	US 97: FORT THOMPSON LN TO BOWERY LN	US 97: BOWERY LN TO GRAND-VIEW DR	US 97: GRAND-VIEW DR TO COOLEY RD	US 97: COOLEY RD TO ROBAL RD	COOLEY RD: NW HUNNELL RD TO US 97	COOLEY RD: US 97 TO 18TH ST	TOTAL
FATAL (K)	0	1	0	0	0	0	1
SERIOUS INJURY (A)	1	0	1	0	0	0	2
MINOR INJURY (B)	4	3	3	1	0	1	12
POSSIBLE INJURY (C)	2	3	8	4	0	1	18
PROPERTY DAMAGE ONLY (O)	4	10	7	16	2	4	43
TOTAL	**11**	**17**	**19**	**21**	**2**	**6**	**76**

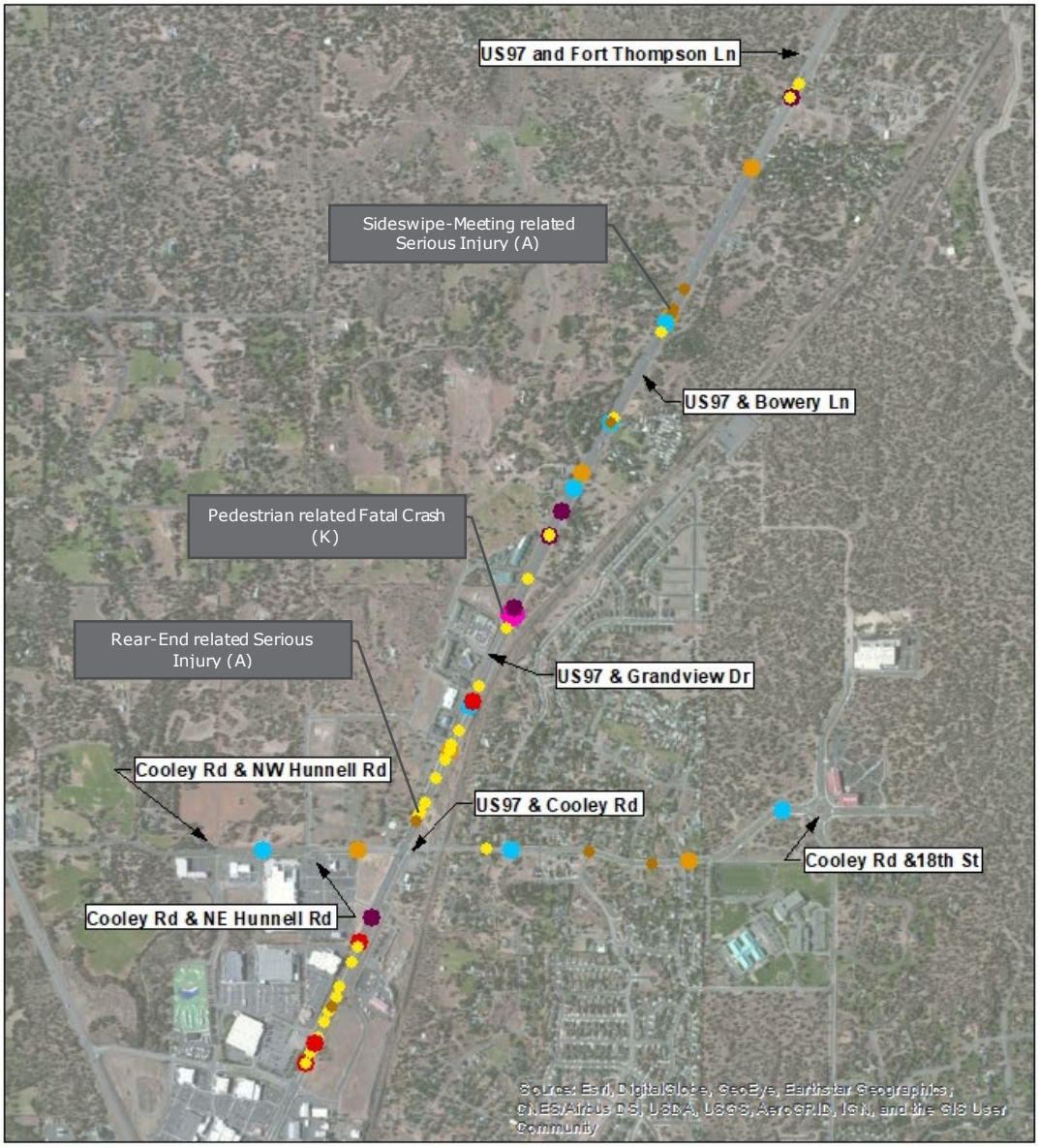
Table 8 summarizes the segment crashes by collision types. As mentioned, the pedestrian collision was the fatal crash. The serious injury crashes were rear-end and sideswipe-meeting.

TABLE 8: SUMMARY OF FIVE-YEAR (2014-2018) CRASH FREQUENCY BY COLLISION TYPE AT STUDY SEGMENTS

COLLISION TYPE	US 97: FORT THOMPSON LN TO BOWERY LN	US 97: BOWERY LN TO GRAND-VIEW DR	US 97: GRAND-VIEW DR TO COOLEY RD	US 97: COOLEY RD TO ROBAL RD	COOLEY RD: NW HUNNELL RD TO US 97	COOLEY RD: US 97 TO 18TH ST	TOTAL
REAR-END	4	6	15	16	0	1	42
TURNING MOVEMENT	2	2	1	1	1	1	8
FIXED OBJECT OR OTHER OBJECT	1	2	1	0	1	2	7
HEAD-ON	1	3	0	1	0	0	5
PEDESTRIAN	0	1	0	0	0	0	1
SIDESWIPE - OVERTAKING AND MEETING	2	2	1	3	0	0	8
OTHER	1	1	1	0	0	2	5
TOTAL	**11**	**17**	**19**	**21**	**2**	**6**	**76**

Figure 4 presents the distribution of crashes by collision type at the study segments. The most frequent crash type is rear-end crashes, which were observed to be in the vicinity of driveways – particularly between Grandview Drive and Robal Road.

FIGURE 4: CRASHES (2014-2018) BY COLLISION TYPE AT STUDY SEGMENTS



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Five-Year Crashes (2014-2018) by Collision Type - Segments

- Other
- Rear-End
- Fixed Object or Other Object
- Sideswipe - Overtaking
- Turning movement
- Pedestrian
- Head-On

CONTRIBUTING FACTORS

Table 9 presents the distribution of crashes by crash cause on the study segments. Similar to the intersection crash trends, "Failed to avoid vehicle ahead" and "Following too closely" were the major causes of crashes on US 97.

TABLE 9: SUMMARY OF FIVE-YEAR (2014-2018) CRASH FREQUENCY BY CRASH CAUSE AT STUDY SEGMENTS

CRASH SEVERITY	US 97: FORT THOMPSON LN TO BOWERY LN	US 97: BOWERY LN TO GRANDVIEW DR	US 97: GRANDVIEW DR TO COOLEY RD	US 97: COOLEY RD TO ROBAL RD	COOLEY RD: NW HUNNELL RD TO US 97	COOLEY RD: US 97 TO 18TH ST	TOTAL
FAILED TO AVOID VEHICLE AHEAD	1	3	5	6	0	0	15
FOLLOWED TOO CLOSELY	2	4	6	4	0	1	17
CARELESS DRIVING	1	1	2	3	0	0	7
DID NOT YIELD RIGHT-OF-WAY	0	1	1	1	1	2	6
TOO FAST FOR CONDITIONS (NOT EXCEED POSTED SPEED)	3	2	1	2	0	2	10
IMPROPER CHANGE OF TRAFFIC LANES	0	1	1	3	0	0	5
OTHER	4	5	3	2	1	1	16
TOTAL	**11**	**17**	**19**	**21**	**2**	**6**	**76**

Table 10 presents the crash rates for the US 97 segments computed using the crashes (2014-2018) and the AADT. The crash rates on US 97 between Grandview Drive and Cooley Road is higher than the statewide average. As mentioned earlier, the grade separation planned at Cooley Road may address these crashes[5]. The crash rates of the other three segments are lower than the statewide average crash rates.

TABLE 10: COMPARISON OF CRASH RATES WITH THE STATEWIDE CRASH RATES FOR SEGMENTS OF US 97

	US 97: FORT THOMPSON LN TO BOWERY LN	US 97: BOWERY LN TO GRANDVIEW DR	US 97: GRANDVIEW DR TO COOLEY RD	US 97: COOLEY RD TO ROABL RD
CRASH RATE*	0.37	0.86	**2.52**	1.35
STATEWIDE AVERAGE CRASH RATE FOR "OTHER PRINCIPAL ARTERIAL" **	1.60	1.60	1.60	1.60

Bold and Red indicates crash rate exceeding the statewide average.

* 2018 Crash Rate Table II Five-Year Comparison of State Highway Crash Rates

** The statewide average crash rates include segment and intersection crashes.

SAFETY SUMMARY

There were no high severity (fatal or serious injury) crashes at the study intersections. There were three high severity crashes on the study segments in the area: a pedestrian fatality on US 97 between Bowery Lane and Grandview Drive (fatal pedestrian crash); a serious injury crash on US 97 between Fort Thompson Lane and Bowery Lane (serious injury motor vehicle crash); and between Grandview Drive to Cooley Road (serious injury motor vehicle crash). The crash rate of the study intersections was lower than the statewide 90th percentile crash rate for comparable intersections[10]. Overall, the most common crash type was rear-end crashes.

[10] Analysis Procedure Manual (APM Version 2), Chapter 4-Safety, Oregon Department of Transportation

ACTIVE TRANSPORTATION CONDITIONS

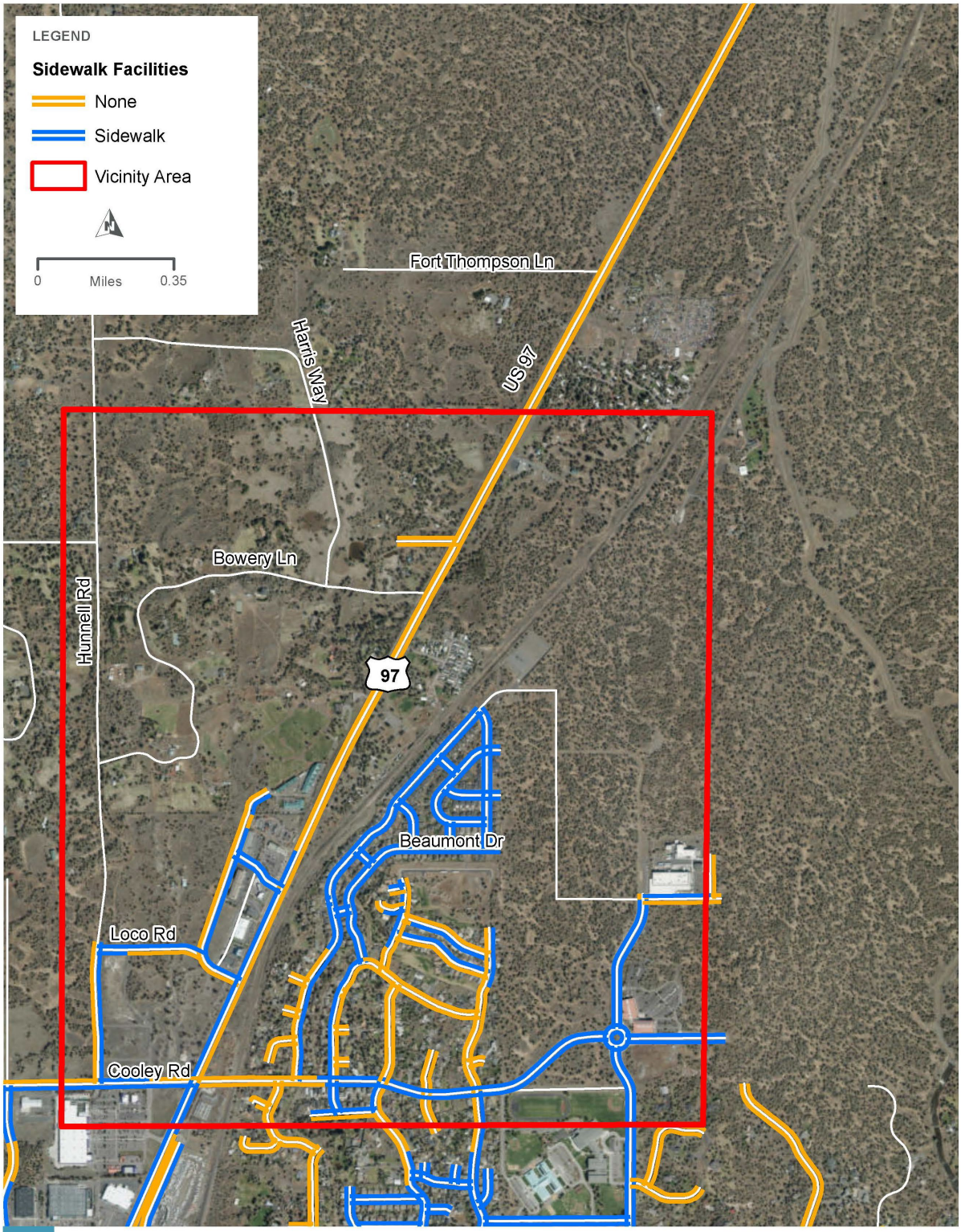
The following describes the existing conditions for people walking and bicycling in the vicinity of the project area. As there are few existing facilities in the project area, a larger vicinity area was used as the basis for this analysis, rather than the project area. In addition to providing an inventory of the existing pedestrian and bicycle infrastructure, this memorandum includes a bicycle level of traffic stress (LTS) analysis, using the methodology in the Oregon Department of Transportation (ODOT) Analysis Procedures Manual. Furthermore, the memorandum identifies gaps in the pedestrian and bicycle networks and includes an analysis of intersection operations for people on foot or bicycle.

INVENTORY OF EXISTING PEDESTRIAN AND BICYCLE FACILITIES

PEDESTRIAN FACILITIES

Sidewalks accommodate pedestrian travel on many of the roadways in the vicinity area, though sidewalks are not consistently provided on all streets. There are significant gaps in the network, which include both local streets and arterial streets. Most notably, access to the only signalized intersection in the vicinity area along Cooley Road is limited, with missing connections to the east. Cooley Road east of Hunters Circle provides a combination of curb-tight and curb-separated sidewalks, providing pedestrian routes to and from the roundabout at 18th Street, which accommodates pedestrians traveling north and south. Existing sidewalks along local streets are generally curb-tight and often only present on one side, though local streets developed more recently typically include sidewalks on both sides with planted buffers (Figure 5). A number of local streets in the area lack curb and gutter, along with any formalized pedestrian facilities.

FIGURE 5. PEDESTRIAN FACILITIES MAP

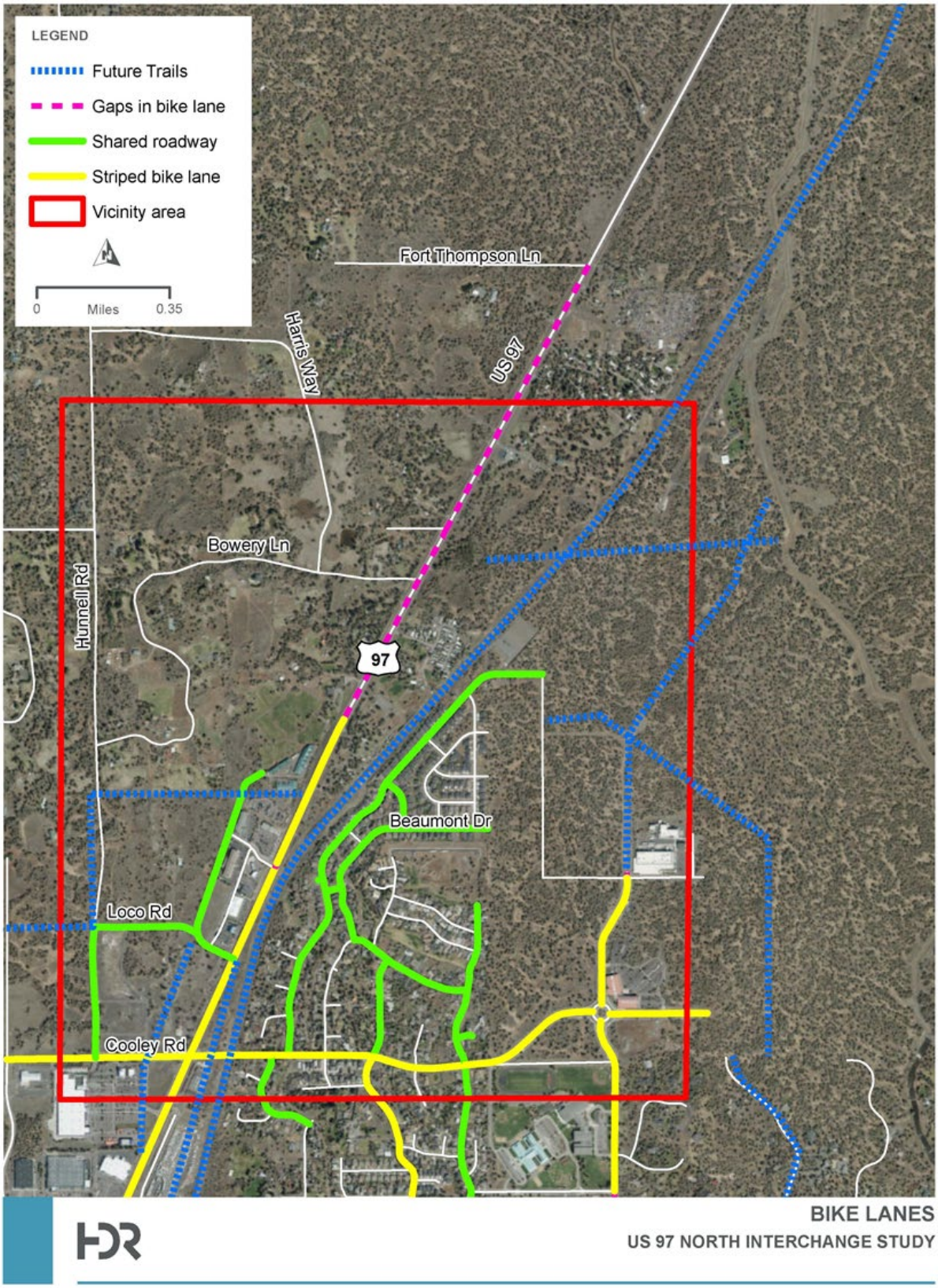


BICYCLE FACILITIES

Bicycle traffic in the vicinity area is generally accommodated utilizing two types of facilities: striped bike lanes on arterial streets and along US 97, and shared roadway designations on lower-volume collector streets and select local streets. There is severely limited network connectivity, with designated bike routes forming a dendritic system that funnels most trips to arterial streets. Bike trips rely on the US 97/Cooley Road intersection as the only signalized crossing opportunity within the vicinity area, and the only east-west connection across US 97 (Figure 6). While a number of additional north-south connections exist along Cooley Road, none are signalized, and some are offset, requiring bicyclists to ride along Cooley Road for a distance.

The City's Transportation System Plan (TSP) identifies additional future bike facilities that would improve network connectivity through additional streets with bike lanes or shared roadway designations. The TSP also identifies a north-south multi-use path that would provide off-street connections to the larger trail system.

FIGURE 6. BIKE FACILITIES



BICYCLE LEVEL OF TRAFFIC STRESS (LTS) ANALYSIS

INTRODUCTION AND METHODOLOGY

Bicycle LTS analysis gauges the level of comfort for people bicycling on select streets within the project vicinity area. The analysis uses the posted speed limit, the number of travel lanes, bicycle facilities, and conditions at intersections. This analysis follows the methodology in the ODOT Analysis Procedures Manual.

LTS assesses the roadway along three different areas: the segment, the intersection approach, and the crossing.

- Segment: Each segment is given a score based on factors that contribute to describing the experience of what it is like to travel by bicycle along the roadway.
- Intersection Approach: As the segment approaches an intersection, a score is assigned based on the characteristics of the roadway and the presence of a right-turn lane or bike lane.
- Crossing: A score is assigned based on what it is like to travel across this roadway.

The ODOT methodology classifies road segments into one of four levels of traffic stress based on these factors.

- LTS 1 represents roadways where bicyclists of all ages and abilities would feel comfortable riding.
- LTS 2 represents slightly less comfortable roads, where most adults would be comfortable bicycling.
- Streets with LTS 3 or LTS 4 are much more stressful and are comfortable only for experienced bicyclists.

LTS RESULTS

The bicycle LTS throughout the vicinity area is dominated by US 97 and Cooley Road subdividing the area into four relatively disconnected islands. The northeast quadrant presents the largest low stress network, including a variety of low speed and low volume local streets. While Cooley Road provides bike lanes, crossing the arterial at numerous unsignalized crossings is fairly high stress due to the traffic speeds. As stated above, the only signalized crossing in the vicinity area is at US 97 and Cooley Road.

Table 10 provides an overview of key criteria of vicinity area roadways relevant for the LTS analysis. Table 11 identifies the segment LTS for each roadway, which is also illustrated in Figure 7. Table 11 also identifies the approach LTS for cyclists traveling along Cooley Road approaching the intersections with US 97 and 18th Street, and along 18th Street approaching Cooley Road, as well as the crossing LTS, identifying the level of stress crossing the roadway.

TABLE 6: OVERVIEW OF VICINITY AREA ROADWAY CHARACTERISTICS

STREET	FUNCTIONAL CLASSIFICATION	NUMBER OF LANES	ADT	POSTED SPEED	BICYCLE FACILITY
US 97	Primary Highway	2 lanes per direction	39,600	45 mph	Striped bike lanes
COOLEY RD	Arterial	1 lane per direction	6,000-6,600	35 mph	Striped bike lanes
18TH ST	Arterial	1 lane per direction	1,200	35 mph	Striped bike lanes
HUNNELL RD (BETWEEN COOLEY RD AND LOCO RD)	Collector	Unmarked centerline	1,200	25 mph	Shared roadway
LOCO RD/CLAUSEN DR (BETWEEN HUNNELL RD AND US 97)	Collector	1 lane per direction	-	25 mph	Shared roadway
CLAUSEN DR (NORTH OF LOCO RD)	Local	1 lane per direction	-	25 mph	Shared roadway
HUNTERS CIR (SOUTH OF COOLEY RD)	Local	1 lane per direction	-	-	Shared roadway
BOYD ACRES RD (SOUTH OF COOLEY RD)	Local	1 lane per direction	-	25 mph	Striped bike lanes
RANCH VILLAGE DR (SOUTH OF COOLEY RD)	Local	Unmarked centerline	-	-	Shared roadway
HUNTERS CIR (BETWEEN COOLEY RD AND GLEN FALLS PL)**; GLEN FALLS PL** (BETWEEN HUNTERS CIR AND BEAUMONT DR)**; BEAUMONT DR** (NORTH OF WAGONTIRE WAY)**; STANLEY WAY** (BETWEEN HUNTERS CIR AND BEAUMONT DR)**; HUNTERS CIR** (NORTH OF STANLEY WAY)**; WAGONTIRE WAY; BOYD ACRES RD** (NORTH OF COOLEY RD)**; RANCH VILLAGE DR** (NORTH OF COOLEY RD)	Local	Unmarked centerline	-	-	Shared roadway

Source: City of Bend GIS data; ODOT GIS data.

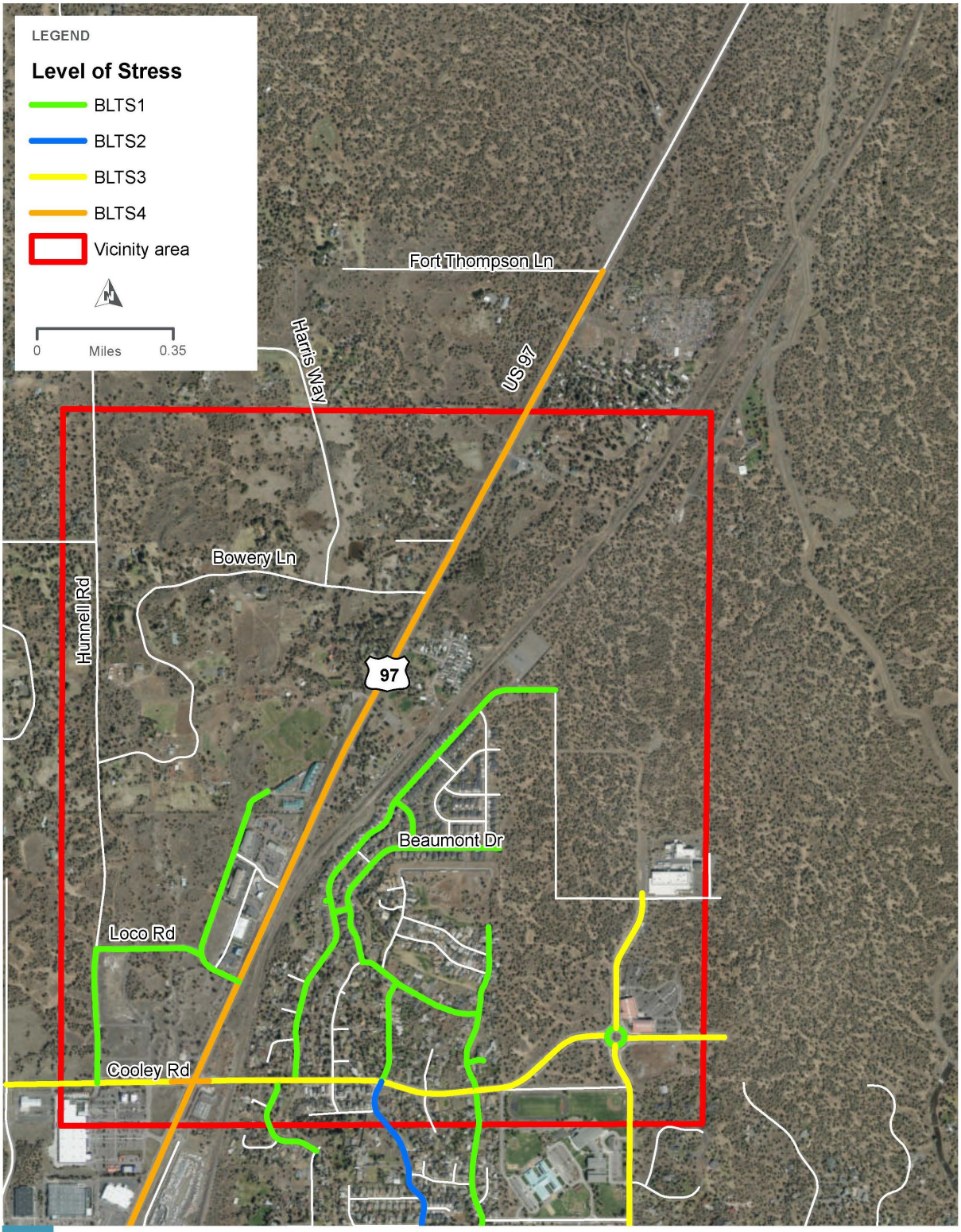
TABLE 7: OVERVIEW OF VICINITY AREA ROADWAY BICYCLE LTS

STREET	SEGMENT LTS	APPROACH LTS	CROSSING LTS
US 97	BLTS 4	N/A	At Cooley Rd: BLTS 1
COOLEY RD	BLTS 3	At US 97: BLTS 4 At 18th St: BLTS 1	At US 97: BLTS 1 At 18th St: BLTS 1 Other: BLTS 3
18TH ST	BLTS 3	At Cooley Rd: BLTS 1	At Cooley Rd: BLTS 1
HUNNELL RD (BETWEEN COOLEY RD AND LOCO RD)	BLTS 1	N/A	BLTS 1
LOCO RD/CLAUSEN DR (BETWEEN HUNNELL RD AND US 97)	BLTS 1	N/A	BLTS 1
CLAUSEN DR (NORTH OF LOCO RD)	BLTS 1	N/A	BLTS 1
HUNTERS CIR (SOUTH OF COOLEY RD)	BLTS 1	N/A	BLTS 1
BOYD ACRES RD (SOUTH OF COOLEY RD)	BLTS 2	N/A	BLTS 1
RANCH VILLAGE DR (SOUTH OF COOLEY RD)	BLTS 1	N/A	BLTS 1
HUNTERS CIR (BETWEEN COOLEY RD AND GLEN FALLS PL)**; GLEN FALLS PL** (BETWEEN HUNTERS CIR AND BEAUMONT DR)**; BEAUMONT DR** (NORTH OF WAGONTIRE WAY)**; STANLEY WAY** (BETWEEN HUNTERS CIR AND BEAUMONT DR)**; HUNTERS CIR** (NORTH OF STANLEY WAY)**; WAGONTIRE WAY; BOYD ACRES RD** (NORTH OF COOLEY RD)**; RANCH VILLAGE DR** (NORTH OF COOLEY RD)	BLTS 1	N/A	BLTS 1

Source: HDR LTS analysis.

Note: LTS analysis is based on assumed conditions where no data was available

FIGURE 7. LEVEL OF STRESS ANALYSIS



GAPS ANALYSIS

PEDESTRIAN GAPS

The following is a summary of the key identified gaps in the pedestrian network, consisting of lacking or substandard facilities along stretches of the roadway network. Shortcomings in crossing opportunities are discussed in the following section. Figure 5 above shows both the existing sidewalks and identifies stretches without.

- Cooley Road: There is a significant gap in the sidewalk network between just east of US 97 and just east of Hunters Circle, exceeding 800 feet in length. This gap includes access to and from the only signalized intersection in the vicinity area, thus severely limiting safe east/west pedestrian travel. It also includes the railroad crossing, which currently does not allow for safe pedestrian passage. West of US 97 there is a sidewalk gap along the north side extending about 400 feet.
- US 97: There is no pedestrian accommodation along the east side north of Cooley Road. The sidewalk on the west side is curb tight between Cooley Road and Clausen Road, providing little comfort for pedestrians along this high speed and high-volume roadway.
- Hunnell Road/Loco Road/Clausen Road: Sidewalks are generally provided on one side only, often curb-tight.
- Local streets: Several of the local streets in the quadrant east of US 97 lack sidewalks on one or both sides. Where present, sidewalks are often curb tight.

BICYCLE GAPS

While the existing network provides continuous bicycle facilities along arterials and US 97 and shared roadways on most local and collectors streets, the level of protection provided on Cooley Road and particularly along US 97 does not adequately accommodate bicyclists except for the most experienced and fearless riders. The limited network permeability also heavily relies on cyclists utilizing the high stress facilities – Cooley Road and US 97 – to ride from one quadrant of the vicinity area to another. Crossing challenges are discussed in the following section.

INTERSECTION ANALYSIS

As stated above, only one signalized intersection in the vicinity area provides north/south and east/west connectivity for pedestrians and bicyclists attempting to cross US 97 or Cooley Road. A roundabout at Cooley Road and 18th Street includes marked crosswalks on all four legs and provides slip lanes for bicyclists to navigate the roundabout off-street. Other intersections along US 97 or the Cooley Road corridor do not provide any marked crossings, except a marked crosswalk with median refuge across Cooley Road at the Lava Ridge Elementary School access drive.

SIGNALIZED INTERSECTION AT US 97 AND COOLEY ROAD

Westbound/Eastbound

- Pedestrians: The northern leg of the intersection does not provide an east/west crossing, requiring people attempting to cross US 97 to proceed to the south side of Cooley Road. While the crosswalk across US 97 is signal controlled, the crosswalk lands on a "pork chop" on the west side, separating Cooley Road from a right turn slip lane. The leg across the right turn slip lane is unsignalized, posing a risk for pedestrians attempting to cross.
- Bicyclists: Striped bike lanes continue to the stop bar to the left of right turning vehicles, eliminating the risk for right-hook crashes at the intersections. Right turning vehicles cross the bike lanes approaching the intersection approximately 150 to 250 feet in advance, where the bike lanes are marked as such with dashed striping.

Northbound/Southbound

- Pedestrians: Crossings across Cooley Road are provided on both sides of US 97. While the crosswalks across the through lanes are signal controlled, the crosswalks land on "pork chops" separating Cooley Road from right turn slip lanes. The legs across the right turn slip lanes are unsignalized, posing a risk for pedestrians attempting to cross.
- Bicyclists: Right turning vehicles turning from US 97 onto Cooley Road have to cross the bike lane during a shared signal phase, posing a right-hook crash risk to bicyclists attempting to proceed on US 97. Additionally, right turns from Cooley Road onto US 97 are yield controlled and may pose a risk to bicyclists on US 97 proceeding straight through the intersection.

ROUNDABOUT AT COOLEY ROAD AND 18TH STREET

The roundabout has comparable conditions on all four legs, with minor differences in exit lane configurations. On the north and west legs of the roundabout two travel lanes each enter and exit the roundabout, whereas at the south and east side, two travel lanes enter the roundabout but only one lane exits.

- Pedestrians: Sidewalks are provided on all sides of the roundabout, separated from the roadway by landscaped buffers. Pedestrian crossings are located offset from the travel lanes and include a median refuge in the roundabout approach. As a result, pedestrians crossing the street need to cross one or two lanes of one-way traffic at a time.
- Bicyclists: Striped bike lanes end near the roundabout approaches. Bicyclists have two options navigating the roundabout, depending on their level of comfort. They may merge into the travel lanes and navigate the roundabout in the same way a motor vehicle would. Alternatively, slip ramps at the end of the striped bike lanes provide access to a shared walkway/bike path around the intersection, allowing bicyclists to utilize the crosswalks to reach the appropriate roundabout leg; upon exiting the roundabout slip lanes provide access to the striped bike lanes.

UNSIGNALIZED INTERSECTIONS ALONG COOLEY ROAD

Along Cooley Road there is a series of unsignalized intersections with local streets and collector streets to the north and south. While these are generally four-legged, there are a few instances of

three-legged or offset intersections. With two exceptions, these intersections require pedestrians or bicyclists to cross three lanes of traffic – including left turn lanes. Due to the lack of formalized crossings, the presence of left turn lanes at most intersections, and the posted speed limit of 35 mph on Cooley Road, these crossing movements maybe challenging for some pedestrians and bicyclists.

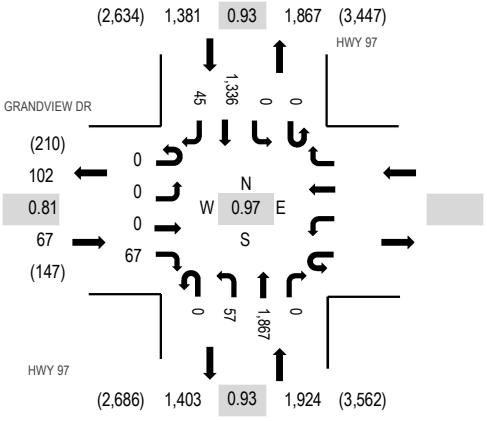
APPENDIX A: TRAFFIC COUNTS

All Traffic Data Services Inc.
(303) 216-2439
www.alltrafficdata.net

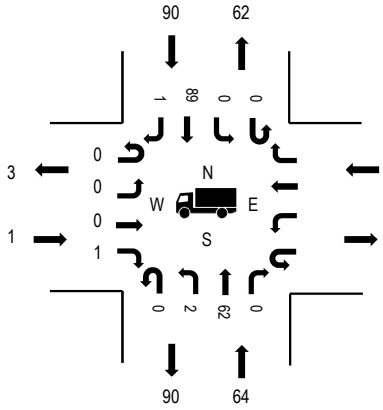
Location: HWY 97 & GRANDVIEW DR PM
Date: Tuesday, July 31, 2018
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 05:30 PM - 05:45 PM

Peak Hour

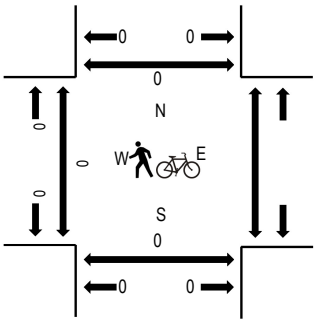
All Vehicles



Heavy Vehicles



Pedestrians/Bicycles in Crosswalk



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	1.5%	0.81
WB		
NB	3.3%	0.93
SB	6.5%	0.93
All	4.6%	0.97

Traffic Counts - All Vehicles

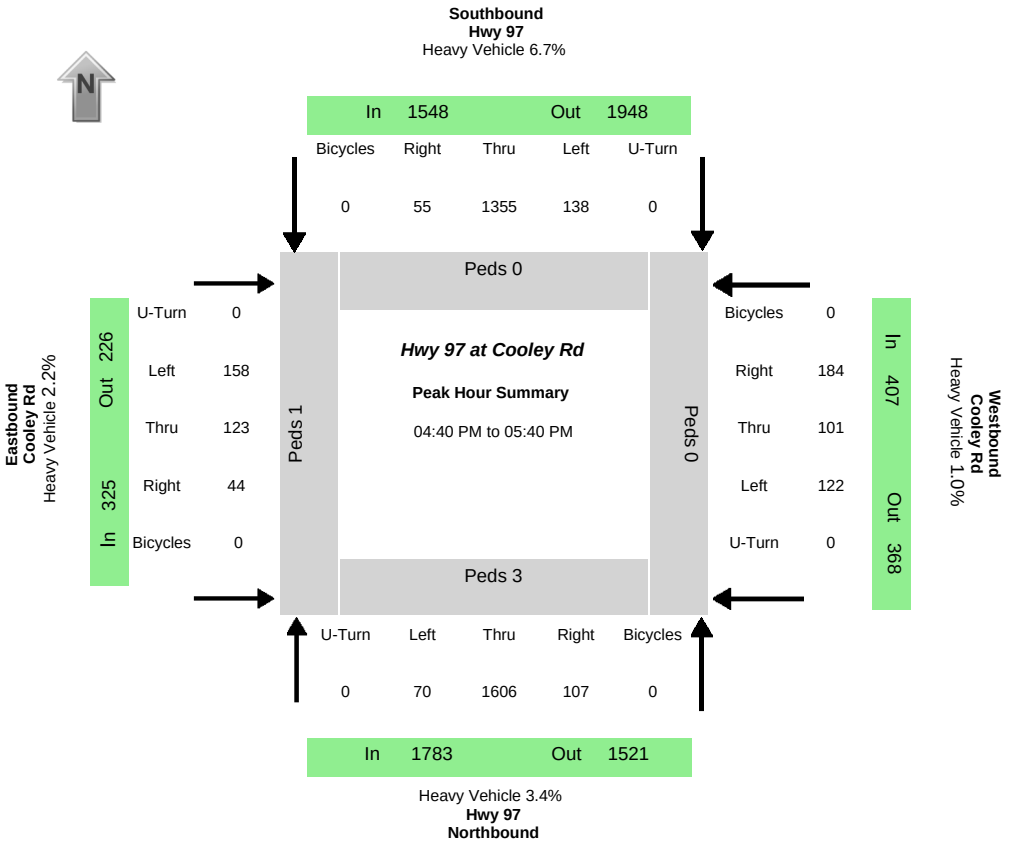
Interval Start Time	GRANDVIEW DR Eastbound				Westbound				HWY 97 Northbound				HWY 97 Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	0	0	17					0	19	395	0	0	0	300	16	747	3,075
4:15 PM	0	0	0	18					0	9	395	0	0	0	332	9	763	3,168
4:30 PM	0	0	0	21					0	17	417	0	0	0	286	17	758	3,260
4:45 PM	0	0	0	17					0	14	434	0	0	0	326	16	807	3,372
5:00 PM	0	0	0	25					0	10	462	0	0	0	335	8	840	3,268
5:15 PM	0	0	0	12					0	10	508	0	0	0	314	11	855	
5:30 PM	0	0	0	13					0	23	463	0	0	0	361	10	870	
5:45 PM	0	0	0	24					0	13	373	0	0	0	285	8	703	
Count Total	0	0	0	147					0	115	3,447	0	0	0	2,539	95	6,343	
Peak Hour	0	0	0	67					0	57	1,867	0	0	0	1,336	45	3,372	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles in Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	21		16	37	4:00 PM	0	0		0	0	4:00 PM	0	0		0	0
4:15 PM	0	24		26	50	4:15 PM	0	2		0	2	4:15 PM	0	0		0	0
4:30 PM	2	12		20	34	4:30 PM	0	0		1	1	4:30 PM	0	0		0	0
4:45 PM	1	14		21	36	4:45 PM	0	0		0	0	4:45 PM	0	0		0	0
5:00 PM	0	20		24	44	5:00 PM	0	1		0	1	5:00 PM	0	0		0	0
5:15 PM	0	16		21	37	5:15 PM	0	0		0	0	5:15 PM	0	0		0	0
5:30 PM	0	14		24	38	5:30 PM	0	0		0	0	5:30 PM	0	0		0	0
5:45 PM	0	9		18	27	5:45 PM	0	0		0	0	5:45 PM	0	0		1	1
Count Total	3	130		170	303	Count Total	0	3		1	4	Count Total	0	0		1	1
Peak Hour	1	64		90	155	Peak Hour	0	1		0	1	Peak Hour	0	0		0	0

K-D-N
KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	*Hwy 97*
E/W street	*Cooley Rd*
City, State	Bend OR
Site Notes	
Location	44.109312 - -121.295092
Start Date	Thursday, July 25, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:40:00 PM
Peak 15 Min Start	05:10:00 PM
PHF (15-Min Int)	0.94



Peak-Hour Volumes (PHV)

Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
70	1606	107	0	138	1355	55	0	158	123	44	0	122	101	184	0	1783	1548	325	407	1521	1948	226	368

Percent Heavy Vehicles

4.3%	3.3%	3.7%	0.0%	5.8%	6.8%	7.3%	0.0%	2.5%	2.4%	0.0%	0.0%	1.6%	1.0%	0.5%	0.0%	3.4%	6.7%	2.2%	1.0%	6.2%	3.0%	3.5%	4.1%

PHV- Bicycles

Northbound				Southbound				Eastbound				Westbound				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	**Sum**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PHV - Pedestrians

in Crosswalk				
NB	SB	EB	WB	**Sum**
3	0	1	0	4

All Vehicle Volumes

	Northbound Hwy 97				Southbound Hwy 97				Eastbound Cooley Rd				Westbound Cooley Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
04:00:00 PM	4	125	3	0	14	105	2	0	7	10	3	0	9	8	23	0		
04:05:00 PM	4	142	10	0	17	142	6	0	13	4	2	0	6	5	8	0		
04:10:00 PM	9	139	9	0	6	127	0	0	17	13	2	0	15	8	13	0	1030	
04:15:00 PM	7	119	3	0	13	83	6	0	14	15	5	0	8	6	16	0	1012	
04:20:00 PM	3	168	10	0	10	138	7	0	7	5	1	0	6	3	11	0	1022	
04:25:00 PM	10	133	7	0	4	105	3	0	20	17	2	0	8	7	10	0	990	
04:30:00 PM	10	107	6	0	12	90	3	0	20	8	2	0	12	2	11	0	978	
04:35:00 PM	10	149	5	0	8	151	2	0	9	2	5	0	0	2	6	0	958	
04:40:00 PM	0	141	9	0	3	113	3	0	13	11	5	0	10	15	23	0	978	
04:45:00 PM	0	95	7	0	19	113	2	0	12	13	2	0	10	14	12	0	994	
04:50:00 PM	7	154	7	0	20	139	4	0	11	8	2	0	7	8	17	0	1029	
04:55:00 PM	9	139	9	0	12	104	2	0	14	10	4	0	12	9	8	0	1015	4013
05:00:00 PM	0	88	4	0	14	76	8	0	13	13	3	0	7	8	19	0	969	3953
05:05:00 PM	8	149	10	0	14	134	5	0	9	7	2	0	10	5	18	0	956	3965
05:10:00 PM	6	142	8	0	6	114	5	0	25	10	4	0	15	10	24	0	993	3976
05:15:00 PM	8	120	10	0	15	82	4	0	17	13	3	0	11	7	20	0	1050	3991
05:20:00 PM	9	164	8	0	14	154	2	0	8	7	8	0	7	3	16	0	1079	4022
05:25:00 PM	10	134	14	0	9	99	8	0	7	12	5	0	19	11	8	0	1046	4032
05:30:00 PM	7	103	10	0	7	104	5	0	21	14	2	0	10	7	15	0	1041	4054
05:35:00 PM	6	177	11	0	5	123	7	0	8	5	4	0	4	4	4	0	999	4063
05:40:00 PM	4	147	8	0	4	95	1	0	14	14	5	0	8	8	11	0	982	4036
05:45:00 PM	6	109	5	0	12	78	2	0	16	13	4	0	10	1	14	0	947	4007
05:50:00 PM	3	122	10	0	8	117	2	0	5	6	1	0	7	2	12	0	884	3918
05:55:00 PM	7	115	9	0	5	110	3	0	9	9	0	0	7	7	8	0	854	3875

Type of peak hour being reported: System Peak

Method for determining peak hour: Total Entering Volume

LOCATION: ~~OB Riley Rd~~ -- Cooley Rd

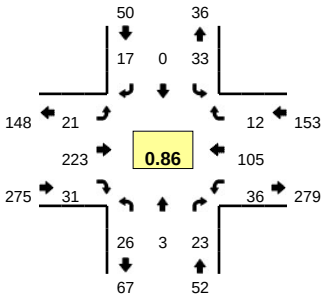
CITY/STATE: Bend, ~~OR~~ NE Hunnell Rd

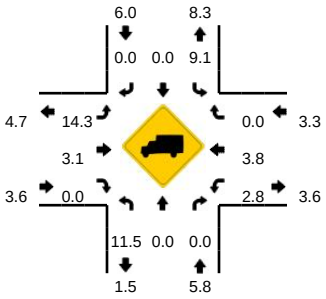
QC JOB #: 13127114

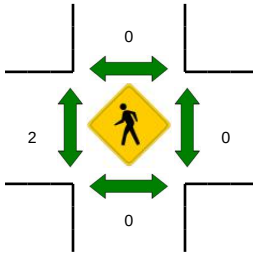
DATE: Thu, Oct 23 2014

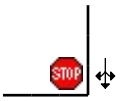
Peak-Hour: 4:40 PM -- 5:40 PM

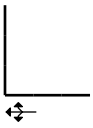
Peak 15-Min: 5:15 PM -- 5:30 PM

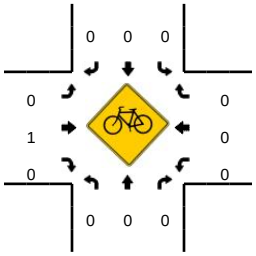


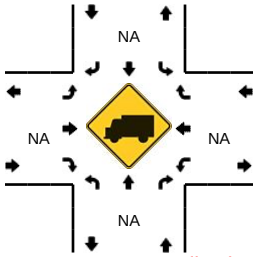


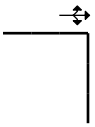


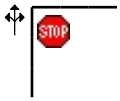


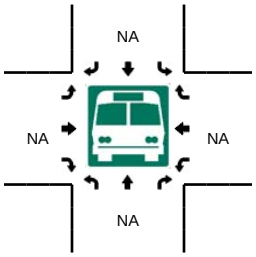












NE Hunnell Rd

NE Hunnell Rd

5-Min Count Period Beginning At	~~OB Riley Rd~~ (Northbound)				~~OB Riley Rd~~ (Southbound)				Cooley Rd (Eastbound)				Cooley Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	2	0	1	0	1	0	2	0	3	14	1	0	6	5	1	0	36	
4:05 PM	2	0	2	0	2	0	2	0	3	13	1	0	6	10	1	0	42	
4:10 PM	3	0	0	0	2	0	3	0	2	13	3	0	1	7	0	0	34	
4:15 PM	0	0	2	0	5	0	5	0	3	18	3	0	2	8	0	0	46	
4:20 PM	1	0	1	0	1	0	4	0	2	17	1	0	2	4	2	0	35	
4:25 PM	1	0	1	0	2	1	2	0	3	14	2	0	5	10	0	0	41	
4:30 PM	2	0	0	0	3	0	5	0	4	13	3	0	2	9	1	0	42	
4:35 PM	2	0	5	0	2	0	2	0	2	22	7	0	2	11	1	0	56	
4:40 PM	1	0	3	0	1	0	0	0	2	21	2	0	6	6	2	0	44	
4:45 PM	1	0	3	0	0	0	1	0	1	13	5	0	4	8	2	0	38	
4:50 PM	2	0	2	0	5	0	3	0	1	17	3	0	3	7	1	0	44	
4:55 PM	6	0	5	0	2	0	1	0	1	13	3	0	3	9	0	0	43	501
5:00 PM	0	2	2	0	4	0	1	0	2	16	0	0	2	9	2	0	40	505
5:05 PM	2	0	1	0	6	0	0	0	0	20	0	0	2	6	0	0	37	500
5:10 PM	1	0	0	0	3	0	1	0	3	17	2	0	3	8	0	0	38	504
5:15 PM	1	0	2	0	2	0	3	0	3	23	4	0	0	12	0	0	50	508
5:20 PM	2	0	0	0	1	0	1	0	5	29	2	0	3	11	1	0	55	528
5:25 PM	1	0	1	0	2	0	2	0	2	24	4	0	3	8	2	0	49	536
5:30 PM	6	1	1	0	3	0	4	0	1	17	5	0	3	10	2	0	53	547
5:35 PM	3	0	3	0	4	0	0	0	0	13	1	0	4	11	0	0	39	530
5:40 PM	0	1	1	0	4	0	0	0	0	21	2	0	2	5	0	0	36	522
5:45 PM	0	1	2	0	2	0	2	0	1	14	2	0	0	7	0	0	31	515
5:50 PM	3	0	3	0	3	1	2	0	2	7	0	0	4	6	0	0	31	502
5:55 PM	2	0	1	0	1	0	2	0	3	15	3	0	4	4	0	0	35	494

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	0	12	0	20	0	24	0	40	304	40	0	24	124	12	0	616
Heavy Trucks	0	0	0		4	0	0		8	4	0		4	4	0		24
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

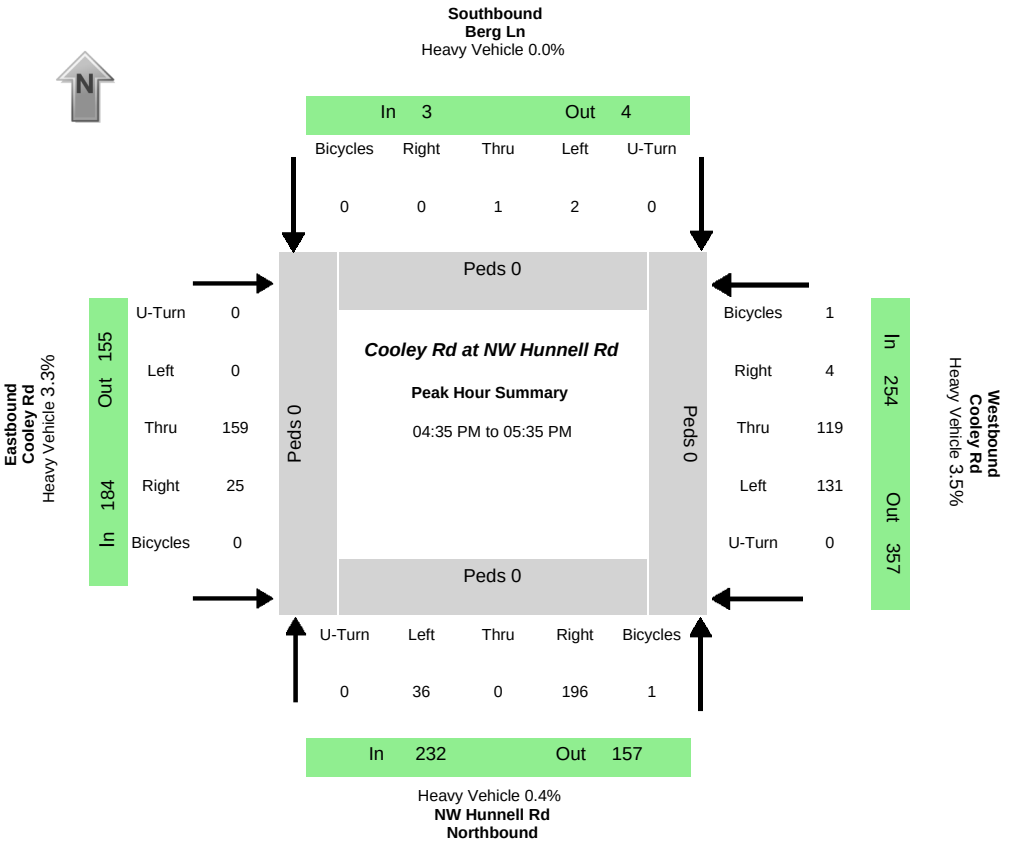
Comments:

Report generated on 11/3/2014 10:19 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

K-D-N
KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	*NW Hunnell Rd*
E/W street	*Cooley Rd*
City, State	Bend OR
Site Notes	
Location	44.091033 - -121.281058
Start Date	Wednesday, July 24, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:35:00 PM
Peak 15 Min Start	05:00:00 PM
PHF (15-Min Int)	0.89



Peak-Hour Volumes (PHV)

Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
36	0	196	0	2	1	0	0	0	159	25	0	131	119	4	0	232	3	184	254	157	4	155	357

Percent Heavy Vehicles

0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	0.0%	3.8%	3.4%	0.0%	0.0%	0.4%	0.0%	3.3%	3.5%	3.2%	0.0%	2.6%	2.0%

PHV- Bicycles

Northbound				Southbound				Eastbound				Westbound				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	**Sum**
0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2

PHV - Pedestrians

in Crosswalk				
NB	SB	EB	WB	**Sum**
0	0	0	0	0

All Vehicle Volumes

	Northbound NW Hunnell Rd				Southbound Berg Ln				Eastbound Cooley Rd				Westbound Cooley Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
04:00:00 PM	2	0	18	0	1	0	0	0	0	5	1	0	6	4	0	0		
04:05:00 PM	3	0	24	0	0	0	0	0	0	9	0	0	5	10	0	0		
04:10:00 PM	3	0	10	0	0	0	0	0	0	12	3	0	9	12	0	0	137	
04:15:00 PM	2	0	17	0	0	0	0	0	0	15	2	0	11	9	0	0	156	
04:20:00 PM	5	0	20	0	0	0	0	0	0	16	2	0	4	6	0	0	158	
04:25:00 PM	3	0	16	0	0	0	0	0	0	11	1	0	11	6	1	0	158	
04:30:00 PM	2	0	15	0	0	0	0	0	0	10	2	0	3	3	0	0	137	
04:35:00 PM	1	0	17	0	0	0	0	0	0	12	3	0	11	9	0	0	137	
04:40:00 PM	2	0	10	0	0	0	0	0	0	15	1	0	8	8	0	0	132	
04:45:00 PM	2	0	14	0	0	1	0	0	0	11	1	0	5	9	0	0	140	
04:50:00 PM	6	0	16	0	0	0	0	0	0	15	2	0	6	12	0	0	144	
04:55:00 PM	4	0	25	0	0	0	0	0	0	11	2	0	10	12	0	0	164	591
05:00:00 PM	5	0	17	0	0	0	0	0	0	11	4	0	10	10	0	0	178	611
05:05:00 PM	4	0	14	0	1	0	0	0	0	13	3	0	17	12	2	0	187	626
05:10:00 PM	2	0	15	0	0	0	0	0	0	23	1	0	14	10	0	0	188	642
05:15:00 PM	3	0	13	0	0	0	0	0	0	13	0	0	17	11	0	0	188	643
05:20:00 PM	3	0	21	0	0	0	0	0	0	7	2	0	13	10	0	0	178	646
05:25:00 PM	3	0	19	0	0	0	0	0	0	14	4	0	6	9	0	0	168	652
05:30:00 PM	1	0	15	0	1	0	0	0	0	14	2	0	14	7	2	0	167	673
05:35:00 PM	1	0	14	0	0	0	0	0	0	8	0	0	7	4	0	0	145	654
05:40:00 PM	3	0	15	0	0	0	0	0	0	4	1	0	5	5	0	0	123	643
05:45:00 PM	3	1	24	0	0	0	0	0	0	4	1	0	8	13	0	0	121	654
05:50:00 PM	1	0	10	0	1	2	0	0	0	2	2	0	7	4	1	0	117	627
05:55:00 PM	4	0	16	0	0	0	0	0	0	9	2	0	7	10	0	0	132	611

QUALITY COUNTS REPORT
==========

Type: Volume Data
Location: #57 Cooley Rd west of 18th St
Specific Lo #57 Cooley Rd west of 18th St
City/State: Bend OR
QCJobNo: 13814853
Direction: EB
Comments:

'==========

Start Time	Mon	Tue	Wed	Thu	Fri	Average W	Sat	Sun	Average Week Hourly Traffic
				########					
12:00 AM				5		5			5
1:00 AM				1		1			1
2:00 AM				0		0			0
3:00 AM				3		3			3
4:00 AM				22		22			22
5:00 AM				20		20			20
6:00 AM				102		102			102
7:00 AM				320		320			320
8:00 AM				151		151			151
9:00 AM				105		105			105
10:00 AM				86		86			86
11:00 AM				85		85			85
12:00 PM				110		110			110
1:00 PM				117		117			117
2:00 PM				156		156			156
3:00 PM				178		178			178
4:00 PM				164		164			164
5:00 PM				145		145			145
6:00 PM				160		160			160
7:00 PM				69		69			69
8:00 PM				47		47			47
9:00 PM				25		25			25
10:00 PM				12		12			12
11:00 PM				6		6			6
Day Total				2089		2089			2089
ADT				2089		2089			2089
%Weekday Average				100.00%					
%Week Average				100.00%		100.00%			
AM Peak				7:00 AM		7:00 AM			7:00 AM
Volume				320		320			320
PM Peak				3:00 PM		3:00 PM			3:00 PM
Volume				178		178			178

QUALITY COUNTS REPORT
==========

Type: Volume Data
Location: #57 Cooley Rd west of 18th St
Specific Lo #57 Cooley Rd west of 18th St
City/State: Bend OR
QCJobNo: 13814853
Direction: WB
Comments:

'==========

Start Time	Mon	Tue	Wed	Thu	Fri	Average W	Sat	Sun	Average Week Hourly Traffic
				########					
12:00 AM				4		4			4
1:00 AM				2		2			2
2:00 AM				1		1			1
3:00 AM				3		3			3
4:00 AM				4		4			4
5:00 AM				20		20			20
6:00 AM				30		30			30
7:00 AM				123		123			123
8:00 AM				77		77			77
9:00 AM				60		60			60
10:00 AM				73		73			73
11:00 AM				103		103			103
12:00 PM				135		135			135
1:00 PM				92		92			92
2:00 PM				132		132			132
3:00 PM				196		196			196
4:00 PM				193		193			193
5:00 PM				288		288			288
6:00 PM				117		117			117
7:00 PM				76		76			76
8:00 PM				43		43			43
9:00 PM				41		41			41
10:00 PM				9		9			9
11:00 PM				4		4			4
Day Total				1826		1826			1826
ADT				1826		1826			1826
%Weekday Average				100.00%					
%Week Average				100.00%		100.00%			
AM Peak				7:00 AM		7:00 AM			7:00 AM
Volume				123		123			123
PM Peak				5:00 PM		5:00 PM			5:00 PM
Volume				288		288			288

QUALITY COUNTS REPORT
==========

Type: Volume Data
Location: #58 NE 18th St south of Cooley Rd
Specific Lo: #58 NE 18th St south of Cooley Rd
City/State: Deschutes OR
QCJobNo: 13814854
Direction: NB
Comments:

'==========

Start Time	Mon	Tue	Wed	Thu	Fri	Average W	Sat	Sun	Average Week Hourly Traffic
				########					
12:00 AM				3		3			3
1:00 AM				2		2			2
2:00 AM				1		1			1
3:00 AM				3		3			3
4:00 AM				8		8			8
5:00 AM				20		20			20
6:00 AM				44		44			44
7:00 AM				171		171			171
8:00 AM				75		75			75
9:00 AM				49		49			49
10:00 AM				64		64			64
11:00 AM				84		84			84
12:00 PM				102		102			102
1:00 PM				90		90			90
2:00 PM				114		114			114
3:00 PM				124		124			124
4:00 PM				127		127			127
5:00 PM				159		159			159
6:00 PM				87		87			87
7:00 PM				68		68			68
8:00 PM				41		41			41
9:00 PM				39		39			39
10:00 PM				7		7			7
11:00 PM				3		3			3
Day Total				1485		1485			1485
ADT				1485		1485			1485
%Weekday Average				100.00%					
%Week Average				100.00%		100.00%			
AM Peak				7:00 AM		7:00 AM			7:00 AM
Volume				171		171			171
PM Peak				5:00 PM		5:00 PM			5:00 PM
Volume				159		159			159

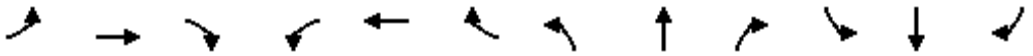
QUALITY COUNTS REPORT
==========

Type: Volume Data
Location: #58 NE 18th St south of Cooley Rd
Specific Lo: #58 NE 18th St south of Cooley Rd
City/State: Deschutes OR
QCJobNo: 13814854
Direction: SB
Comments:

'==========

Start Time	Mon	Tue	Wed	Thu	Fri	Average W	Sat	Sun	Average Week Hourly Traffic
				########					
12:00 AM				7		7			7
1:00 AM				1		1			1
2:00 AM				0		0			0
3:00 AM				3		3			3
4:00 AM				9		9			9
5:00 AM				16		16			16
6:00 AM				69		69			69
7:00 AM				187		187			187
8:00 AM				96		96			96
9:00 AM				89		89			89
10:00 AM				74		74			74
11:00 AM				94		94			94
12:00 PM				91		91			91
1:00 PM				92		92			92
2:00 PM				142		142			142
3:00 PM				155		155			155
4:00 PM				173		173			173
5:00 PM				172		172			172
6:00 PM				144		144			144
7:00 PM				66		66			66
8:00 PM				45		45			45
9:00 PM				27		27			27
10:00 PM				12		12			12
11:00 PM				7		7			7
Day Total				1771		1771			1771
ADT				1771		1771			1771
%Weekday Average				100.00%					
%Week Average				100.00%		100.00%			
AM Peak				7:00 AM		7:00 AM			7:00 AM
Volume				187		187			187
PM Peak				4:00 PM		4:00 PM			4:00 PM
Volume				173		173			173

APPENDIX B: HCM REPORTS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	125	45	120	95	170	75	1610	105	140	1310	55
Future Volume (vph)	160	125	45	120	95	170	75	1610	105	140	1310	55
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0		5.0	4.0	
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00	1.00	*1.00		1.00	*1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected	0.95	0.99	1.00	0.95	0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1608	1667	1479	1593	1651	1500	1710	3460		1613	3396	
Flt Permitted	0.95	0.99	1.00	0.95	0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1608	1667	1479	1593	1651	1500	1710	3460		1613	3396	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	165	129	46	124	98	175	77	1660	108	144	1351	57
RTOR Reduction (vph)	0	0	41	0	0	159	0	2	0	0	2	0
Lane Group Flow (vph)	144	150	5	109	113	16	77	1766	0	144	1406	0
Confl. Peds. (#/hr)			1				1		1			
Heavy Vehicles (%)	1%	2%	2%	2%	3%	2%	0%	4%	2%	6%	6%	6%
Parking (#/hr)												0
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		1	6		5	2	
Permitted Phases			8			4						
Actuated Green, G (s)	20.2	20.2	20.2	16.5	16.5	16.5	29.7	106.3		16.0	92.6	
Effective Green, g (s)	20.2	20.2	20.2	16.5	16.5	16.5	29.7	108.3		16.0	94.6	
Actuated g/C Ratio	0.11	0.11	0.11	0.09	0.09	0.09	0.16	0.60		0.09	0.53	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0		5.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	180	187	165	146	151	137	282	2081		143	1784	
v/s Ratio Prot	0.09	c0.09		0.07	c0.07		0.05	c0.51		c0.09	0.41	
v/s Ratio Perm			0.00			0.01						
v/c Ratio	0.80	0.80	0.03	0.75	0.75	0.12	0.27	0.85		1.01	0.79	
Uniform Delay, d1	77.9	78.0	71.2	79.7	79.7	75.1	65.7	29.2		82.0	34.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.06	1.15		1.00	1.00	
Incremental Delay, d2	21.9	21.4	0.1	18.6	18.2	0.4	0.3	2.5		77.1	3.6	
Delay (s)	99.8	99.3	71.3	98.3	97.9	75.4	69.7	35.9		159.1	38.2	
Level of Service	F	F	E	F	F	E	E	D		F	D	
Approach Delay (s)		95.7			88.1			37.3			49.4	
Approach LOS		F			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	51.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	65	65	1875	1425	35
Future Vol, veh/h	0	65	65	1875	1425	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	370	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	1	4	3	7	2
Mvmt Flow	0	67	67	1933	1469	36

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	753	1505	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.92	4.18	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.31	2.24	-	-	-
Pot Cap-1 Maneuver	0	354	431	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	354	431	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.5	0.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	431	-	354	-	-
HCM Lane V/C Ratio	0.155	-	0.189	-	-
HCM Control Delay (s)	14.9	-	17.5	-	-
HCM Lane LOS	B	-	C	-	-
HCM 95th %tile Q(veh)	0.5	-	0.7	-	-

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	145	20	125	110	5	40	5	200	5	5	0
Future Vol, veh/h	0	145	20	125	110	5	40	5	200	5	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10	10	10	10	10	10	10
Mvmt Flow	0	158	22	136	120	5	43	5	217	5	5	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	180	0	0	566	566	169	675	575	123
Stage 1	-	-	-	-	-	-	169	169	-	395	395	-
Stage 2	-	-	-	-	-	-	397	397	-	280	180	-
Critical Hdwy	-	-	-	4.2	-	-	7.2	6.6	6.3	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Follow-up Hdwy	-	-	-	2.29	-	-	3.59	4.09	3.39	3.59	4.09	3.39
Pot Cap-1 Maneuver	0	-	-	1349	-	-	423	423	855	357	418	907
Stage 1	0	-	-	-	-	-	814	744	-	614	591	-
Stage 2	0	-	-	-	-	-	613	590	-	710	736	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	1349	-	-	386	380	855	243	376	907
Mov Cap-2 Maneuver	-	-	-	-	-	-	386	380	-	243	376	-
Stage 1	-	-	-	-	-	-	814	744	-	614	531	-
Stage 2	-	-	-	-	-	-	546	530	-	526	736	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4.1	13.3	17.7
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	699	-	-	1349	-	-	295
HCM Lane V/C Ratio	0.381	-	-	0.101	-	-	0.037
HCM Control Delay (s)	13.3	-	-	8	-	-	17.7
HCM Lane LOS	B	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1.8	-	-	0.3	-	-	0.1

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	30	280	40	35	175	15	35	5	20	30	0	30
Future Vol, veh/h	30	280	40	35	175	15	35	5	20	30	0	30
Conflicting Peds, #/hr	0	0	0	0	0	0	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	14	3	0	3	4	0	12	0	0	10	0	0
Mvmt Flow	35	326	47	41	203	17	41	6	23	35	0	35

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	220	0	0	373	0	0	733	722	350	728	737	214
Stage 1	-	-	-	-	-	-	420	420	-	294	294	-
Stage 2	-	-	-	-	-	-	313	302	-	434	443	-
Critical Hdwy	4.24	-	-	4.13	-	-	7.22	6.5	6.2	7.2	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.22	5.5	-	6.2	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.22	5.5	-	6.2	5.5	-
Follow-up Hdwy	2.326	-	-	2.227	-	-	3.608	4	3.3	3.59	4	3.3
Pot Cap-1 Maneuver	1281	-	-	1180	-	-	324	355	698	329	348	831
Stage 1	-	-	-	-	-	-	592	593	-	697	673	-
Stage 2	-	-	-	-	-	-	677	668	-	585	579	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1281	-	-	1180	-	-	295	333	698	299	327	830
Mov Cap-2 Maneuver	-	-	-	-	-	-	295	333	-	299	327	-
Stage 1	-	-	-	-	-	-	576	577	-	678	649	-
Stage 2	-	-	-	-	-	-	625	645	-	545	563	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	1.3	17	14.7
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	370	1281	-	-	1180	-	-	440
HCM Lane V/C Ratio	0.189	0.027	-	-	0.034	-	-	0.159
HCM Control Delay (s)	17	7.9	-	-	8.2	-	-	14.7
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.7	0.1	-	-	0.1	-	-	0.6

USER REPORT FOR SITE

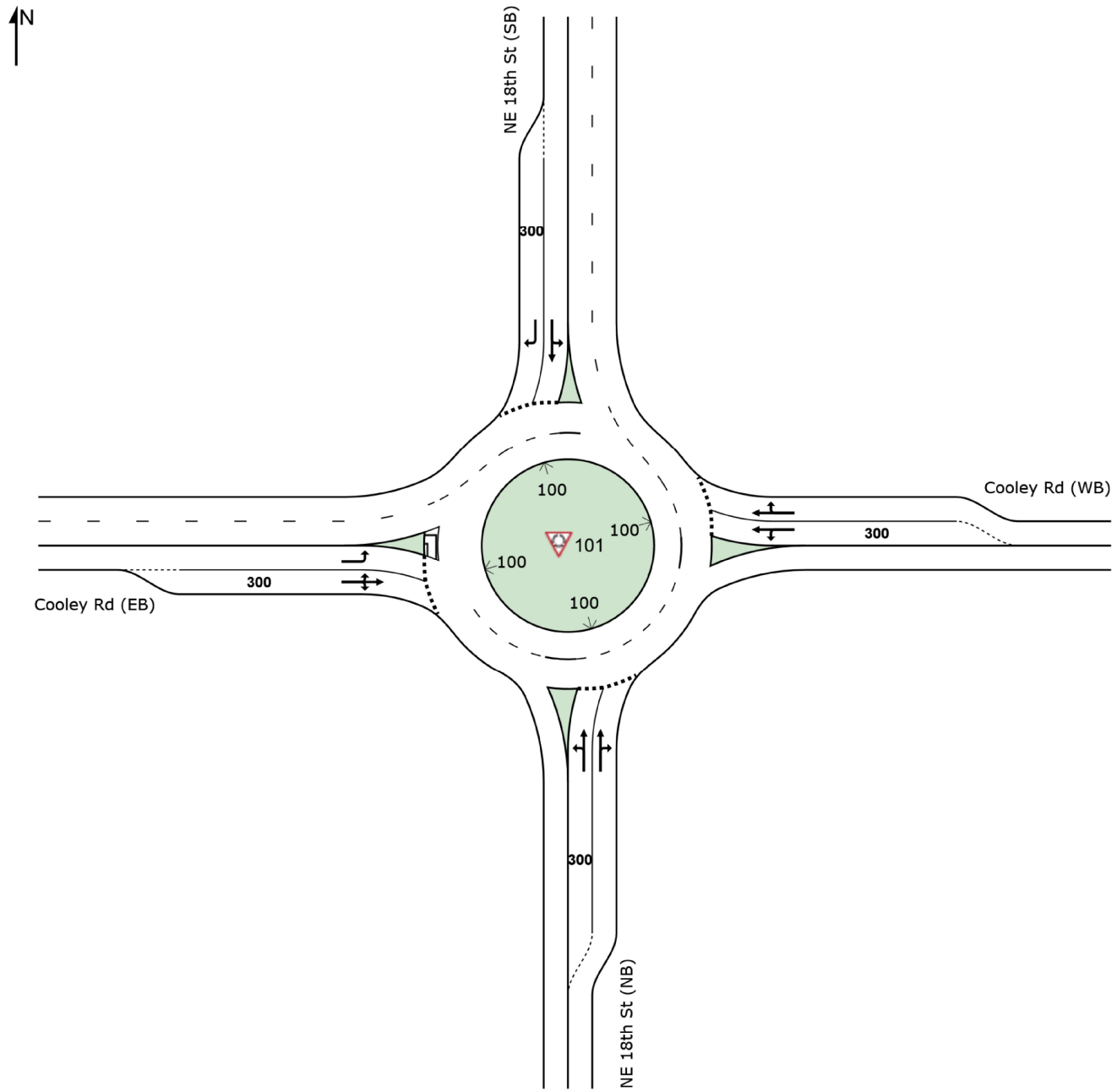
Project: North_Interchange_2019_PM

Template: Default Site User Report

Site: 101 [Cooley/18th 2019 PM]

New Site
Site Category: (None)
Roundabout

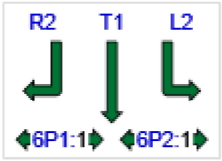
Site Layout



Input Volumes

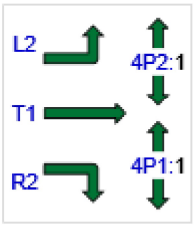
Volume Display Method: Total and %

	R2	T1	L2
Tot	90	25	1
LV	99%	99%	100%
HV	1%	1%	0%

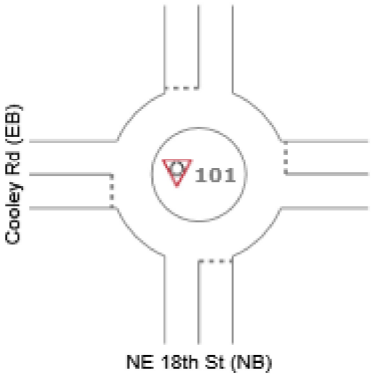


NE 18th St (SB)

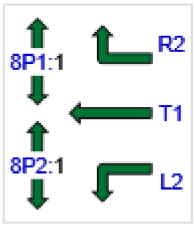
HV	LV	Tot	
0%	100%	5	L2
0%	100%	5	T1
1%	99%	135	R2



Cooley Rd (EB)

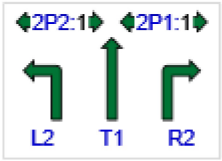


Cooley Rd (WB)



	Tot	LV	HV
R2	1	100%	0%
T1	35	99%	1%
L2	10	100%	0%

NE 18th St (NB)



	L2	T1	R2
Tot	165	5	5
LV	99%	100%	100%
HV	1%	0%	0%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: NE 18th St (NB)	175	173	2
E: Cooley Rd (WB)	46	46	0
N: NE 18th St (SB)	116	115	1
W: Cooley Rd (EB)	145	144	1
Total	482	478	5

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: NE 18th St (NB)													
Lane 1[d]	183	1.0	1307	0.140	100	3.9	LOS A	0.5	12.3	Short	300	0.0	NA
Lane 2	11	0.0	1320	0.008	6[5]	2.8	LOS A	0.0	0.6	Full	1600	0.0	0.0
Approach	194	0.9		0.140		3.8	LOS A	0.5	12.3				
East: Cooley Rd (WB)													
Lane 1	25	0.6	1140	0.022	100	3.3	LOS A	0.1	1.7	Short	300	0.0	NA
Lane 2[d]	25	1.0	1136	0.022	100	3.4	LOS A	0.1	1.7	Full	1600	0.0	0.0
Approach	50	0.8		0.022		3.3	LOS A	0.1	1.7				
North: NE 18th St (SB)													
Lane 1	28	1.0	1103	0.026	100	3.5	LOS A	0.1	2.0	Full	1600	0.0	0.0
Lane 2[d]	98	1.0	1103	0.089	100	4.0	LOS A	0.3	7.2	Short	300	0.0	NA
Approach	126	1.0		0.089		3.9	LOS A	0.3	7.2				
West: Cooley Rd (EB)													
Lane 1	5	0.0	1292	0.004	4[5]	2.8	LOS A	0.0	0.3	Full	1600	0.0	0.0
Lane 2[d]	152	1.0	1280	0.119	100	3.8	LOS A	0.4	10.2	Short	300	0.0	NA
Approach	158	0.9		0.119		3.8	LOS A	0.4	10.2				
Intersection	528	0.9		0.140		3.8	LOS A	0.5	12.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach