Oregon
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Date: January 21, 2025
To: Project Management Team | Marion County
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Subject 2D-22 Marion County TSP Crash Analysis

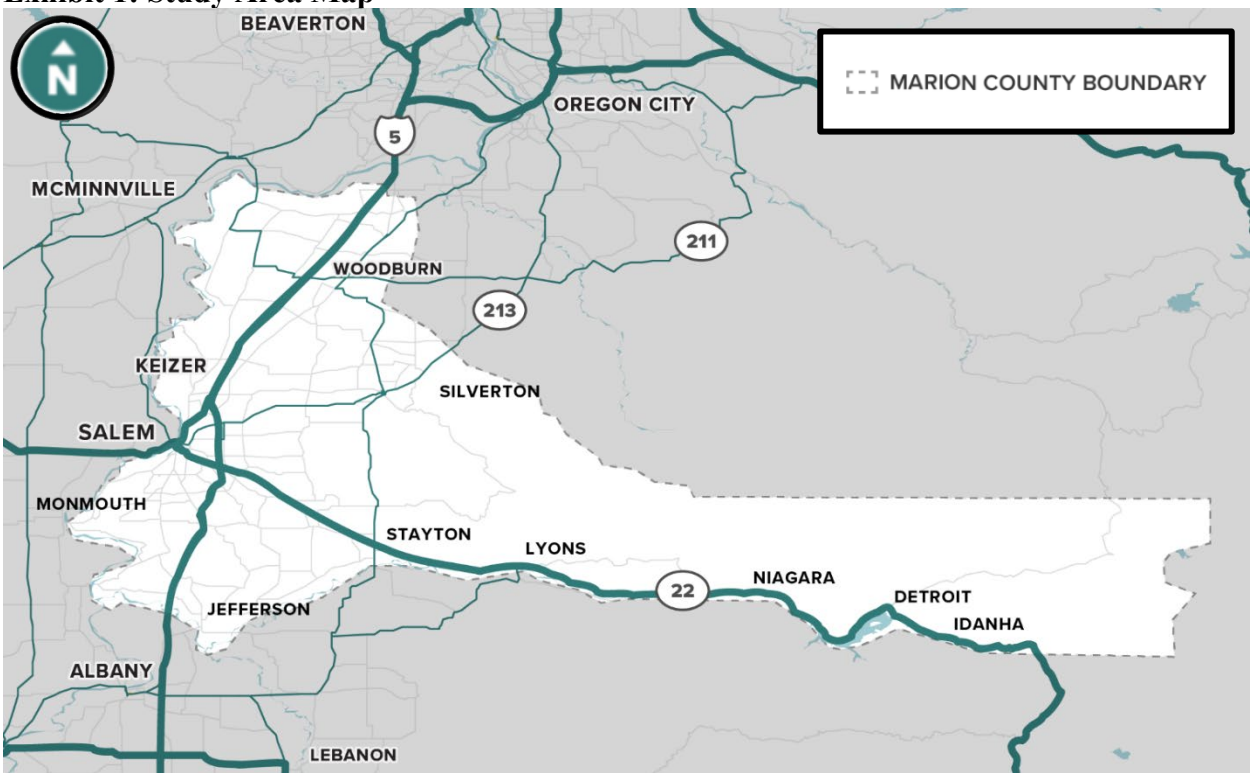
KAGAWA Leia Digitally signed by KAGAWA Leia Date: 2025.06.25 02:38:28 -07'00'

The purpose of this memorandum is to document existing safety issues on roadways in the Marion County Rural Transportation System Plan (TSP), (study area) particularly study intersections, see Exhibit 1. The 66 identified study area intersections where the first 40 (#1 to #40) are to be further analyzed by the TSP consultant and the remaining 26 (#1-C to #26-C) by Marion County, see Appendix C.

## Crash Analysis

Crash deficiencies should be addressed within the build alternatives. The crash analysis is based off the official reported crashes submitted to ODOT's Crash Analysis and Reporting Unit (CARU) for the study for 2017, 2018, 2019, and 2022 (analyzed years). Note that data from 2020-2021 are excluded. The COVID-19 pandemic impacted travel patterns most between 2020-2021. The impacts result in abnormal traffic volumes, destinations and trends that should not be factored in typical crash analysis.

**Exhibit 1: Study Area Map**



## Crash Types

The crashes in the study area represent typical crashes for rural or urban-fringe areas with an interstate with high truck volumes, see Appendix A.
Rear-ends in rural areas are generally caused by motorists' inattention and colliding into a vehicle at an intersection. At interstate ramps, rear-end collisions are generally caused queues extending from the ramps to the mainline.

Turning and angle collisions are caused by motorists taking improper gaps in traffic or failing to yield the right-of-way.

Overtaking sideswipe collisions often caused by motorist's inattention such as not using mirrors or following too closely. However, at interstate ramps, these kinds of collisions are generally caused by merging on or off a congested ramp.

Roadway departures are often caused by motorists' s inattention, loss of control due to speeding or other risky behaviors such as alcohol or substance abuse. In the study area 1,303 (14%) of crashes were flagged for roadway departures while 74 (12%) of study intersection crashes were flagged.

The ongoing Marion County Transportation Safety Action Plan (TSAP)[1] identifies potential countermeasures for roadway departures and intersection crashes and should be referenced in developing build alternatives.

## Crash Analysis Summary

The following sections show the summarized crash analysis statistics the study area.
For the analyzed years, there were 9,206 reported crashes in Marion County with, 4,551 in the study area. Within the study area 1,284 were in the urban fringe and 642 (14%) were associated with the 66 study intersections. These crashes mostly occurred in dry, daytime conditions, see Table 1.

**Table 1: Study Intersections – Fair Conditions**

| Fair Condition | Study Intersections | | Study Area | |
|---|---|---|---|---|
| | Count | Percent | Count | Percent |
| Clear or Cloudy Weather | 529 | 82% | 3,631 | 80% |
| Dry Road Surface | 498 | 78% | 3,331 | 73% |
| Daylight | 397 | 62% | 3,016 | 66% |

There are several ODOT Safety Priority Index System (SPIS) sites in the study area, see Appendix B. SPIS scores are based on three years of crash data[2]. To avoid the over-representation of a crash at a location, SPIS scores over multiple years should be compared. Table 2 lists locations that are identified multiple times as a top five and ten percent for analysis

[1] *Marion County Transportation Safety Action Plan*
[2] *Safety Priority Index System (SPIS), Oregon Adjustable Safety Index (OASIS), and Crash Summary Reports (CSR) System User Guide*

years 2017-2018 and 2022. As noted in the table, all five of the reoccurring SPIS site locations are at intersections with four of them being study intersections.

**Table 2: Top 5% and 10% SPIS Sites in the Study Area**

| | Road* | Brooklake | Ehlen | OR 214 | OR 213 | OR 214 |
|---|---|---|---|---|---|---|
| | **Study Intersection** | **#21-C** I-5 NB Ramp/ Brooklake Rd | **#12-C** I-5 SB Ramp/ Ehlen Rd | **#n/a** *(OR 214/Elliott Prairie Rd NE)* | **#14** OR 213/Mt Angel Scotts Mill Rd | **#15** OR 214/ Cascade Highway SE |
| **2017 **** | **ADT** | - | - | - | **5,201** | 1,682 |
| | **%** | - | - | - | **95*** ** | 90 |
| | **Score** | - | - | - | **61.63** | 52.53 |
| | **Crash** | - | - | - | **12** | 6 |
| | **Fatal & A** | - | - | - | **1** | 1 |
| **2018** | **ADT** | 9,600 | 11,800 | - | 4,833 | **1,600** |
| | **%** | 90 | 90 | - | 90 | **95*** ** |
| | **Score** | 56.94 | 55.16 | - | 56.37 | **63.29** |
| | **Crash** | 12 | 18 | - | 10 | **9** |
| | **Fatal & A** | 1 | 0 | - | 1 | **1** |
| **2019** | **ADT** | 9,300 | **11,500** | 5,944 | 4,455 | 1,100 |
| | **%** | 90 | **95*** ** | 90 | 90 | 95 |
| | **Score** | 51.84 | **78.33** | 54.8 | 54.04 | 63.73 |
| | **Crash** | 10 | **23** | 10 | 9 | 8 |
| | **Fatal & A** | 1 | **1** | 1 | 1 | 1 |
| **2022** | **ADT** | - | - | 5,944 | 4,244 | - |
| | **%** | - | - | 90 | 90 | - |
| | **Score** | - | - | 48.92 | 58.62 | - |
| | **Crash** | - | - | 8 | 12 | - |
| | **Fatal & A** | - | - | 1 | 1 | - |

**Mile Points (MP) for SPIS segments in order, left to right: Brooklake (263.48-263.63), Ehlen (278.63-278.72), OR 214 (41.44-41.58), OR 213 (24.68-24.88), and OR 214 (15.5-15.69)*

***The calculation of SPIS calculation differs as it includes property damage only (PDO)*

**** Bolded values associated with 5% SPIS sites*

Table 3 shows the crash and year summary for the analyzed study intersections. Rear-ends, angle, or turning collisions at intersections were the most represented crash types. Overall, the number of crashes has remained steady over the analyzed period.

The northbound and southbound ramps of I-5 and Ehlen Road accounted for 33% of all rear-ends and 27% of all study intersection crashes. The ramps at this interchange experience significant

congestion due to long-haul truck amenities and previous roadway geometry. A new interchange configuration is currently in construction and projected to be completed in 2027[3].

**Table 3: Study Intersection Crash Type and Year Table**

| Crash Type | 2017 Count (%) | 2018 Count (%) | 2019 Count (%) | 2022 Count (%) | Total Count & % | Fatal/ Injury A |
|---|---|---|---|---|---|---|
| Miscellaneous | **1** (1%) | 0 (0%) | **1** (1%) | **1** (1%) | 3 | 0 |
| Backing | 0 (0%) | 0 (0%) | **1** (1%) | **1** (1%) | 2 | 0 |
| Pedestrian | 0 (0%) | **1** (1%) | 0 (0%) | **1** (1%) | 2 | 2 |
| Angle | **21** (14%) | **32** (19%) | **28** (17%) | **25** (16%) | 106 | 9 |
| Head-on | **2** (1%) | **3** (2%) | 0 (0%) | **3** (2%) | 8 | 2 |
| Rear-End | **56** (37%) | **61** (36%) | **54** (34%) | **59** (37%) | 230 | 1 |
| Sideswipe Meeting* | **2** (1%) | **3** (2%) | **2** (1%) | **3** (2%) | 10 | 1 |
| Sideswipe Overtaking | **4** (3%) | **4** (2%) | **9** (6%) | **4** (3%) | 21 | 1 |
| Turning | **43** (28%) | **47** (28%) | **47** (29%) | **47** (29%) | 184 | 4 |
| Parking | **2** (1%) | **1** (1%) | 0 (0%) | 0 (0%) | 3 | 0 |
| Non-Collision | 0 (0%) | **1** (1%) | **2** (1%) | **2** (1%) | 5 | 1 |
| Object (Fixed) | **22** (14%) | **15** (9%) | **17** (11%) | **14** (9%) | 68 | 9 |
| **Subtotal:** | **153** | **168** | **161** | **160** | **642** | **30** |

**Sideswipe-meeting are collisions of two vehicles traveling in the opposite directions that are not a head-on crash.*

There were 30 reported fatalities and severe injuries (type A) at the study intersections. Of these, 17% occurred during typical morning commuting hours (6-9 AM) and 40% during typical evening commuting hours (3-6 PM). Most (88%) crashes with reported speed limits[4] occurred on high-speed routes, >=55 MPH. Approximately 30% of crashes were roadway departures with collisions with a fixed object.

The 30 crashes with fatalities or severe injuries occurred at 19 locations and are detailed below:

Golf Club Rd/Sublimity Rd – One crash with a fatality and three with serious injuries

All four crashes were angle collisions due to not yielding right-of-way or passing a stop sign. Three were mid-morning and one in the afternoon. These crashes all occurred on clear or cloudy days on dry pavement.

I-5 NB Ramp/Ehlen Rd – Two crashes with a fatality and two with serious injuries

All four crashes occurred on clear or cloudy days.

- Around midnight, a head-on collision due to a vehicle going the wrong way
- One night, a pedestrian fatality due to the pedestrian illegally in the roadway
- One a morning, a sideswiping (overtaking) collision occurred due to careless driving.
- One afternoon, a rear-end collision due to following too closely

[3] *ODOT project K22505 "Aurora-Donald Interchange Phase 2"*

[4] All crash records include time, date, crash type, number of persons suspected involved and severity of injury, but may not have all other data fields complete

OR 213/Mt Angel Scotts Mill Rd – Three crashes with serious injuries

All three crashes occurred on clear days on dry pavement.

- One morning, a head-on collision due to improper driving
- One afternoon, a turning collision due to not yielding right-of-way
- One afternoon, a vehicle drove off into a ditch due to a vehicle indirectly involved in the crash.

French Prairie Rd/McKay Rd – Two crashes with serious injuries

Both crashes were angle collisions on clear days on dry pavement.

- One mid-morning, due to careless driving
- One afternoon, due to inattention

OR 214/Cascade Highway SE – Two crashes with serious injuries

Both crashes were angle collisions due to not yielding right-of-way.

- One in the morning on a clear day on dry pavement.
- One in the afternoon on a cloudy day on wet pavement.

OR 99E/Howell Prairie Rd NE – One crash with a fatality and one with serious injuries

- One night, a ped was injured due to the pedestrian illegally in the roadway. It was a clear day and the pavement was dry.
- One morning, a turning collision due to inappropriate speed for the conditions. It was a cloudy day and the pavement was wet.

Arndt Rd/Airport Rd – One crash with serious injuries

One evening, an angle collision occurred due to the motorist disregarding the traffic signal. It was a cloudy day and the pavement was dry.

Donald Rd/Yergen Rd – One crash with a fatality

One afternoon, a vehicle drove into a utility pole then shrubbery due to speeding. It was a clear day and the pavement was dry.

Howell Prairie Rd/Labish Center Rd – One crash with serious injuries

One afternoon, a vehicle drove into a utility pole due to inattention. It was a cloudy day and the pavement was dry.

Howell Prairie Rd/Hazelgreen Rd – One crash with serious injuries

One evening, a vehicle drove into a ditch then overturned due to reckless driving. It was a clear day and the pavement was dry.

I-5 SB Ramp/Ehlen Rd – One crash with serious injuries

One afternoon, a vehicle overturned due to excessive speed for the conditions. It was a clear day and the pavement was dry.

Meridian Rd/Downs Rd/Abiqua Rd – One crash with serious injuries

One evening, a vehicle drove into a ditch due inattention. It was raining and the pavement was wet.

Mt Angel Highway/Hobart Rd – One crash with serious injuries

One afternoon, a turning collision occurred due to not yielding right-of-way. It was a clear day and the pavement was dry.

OR 214/Shaw Highway SE – One crash with serious injuries

One afternoon, a vehicle drove into a ditch due to improper driving. It was a cloudy day and the pavement was wet.

OR 219 (River Rd NE)/McKay Rd – One crash with serious injuries

One night, a vehicle drove through a ditch and into a fence due to a drowsy driver. It was a clear day and the pavement was dry.

OR 99E/Boones Ferry Rd – One crash with a fatality

One evening, a vehicle drove into a ditch and overturned due to excessive speed for the conditions. It was a clear day and the pavement was dry.

Parrish Gap Rd/Delaney Rd – One crash with serious injuries

One morning, a turning collision occurred due to not yielding right-of-way. It was a cloudy day and the pavement was dry.

River Rd/Orville Rd – One crash with serious injuries

One afternoon, a sideswipe, though nearly head-on, collision occurred due to inattention. It was a clear day and the pavement was dry.

Wheatland Rd/ Brooklake – One crash with serious injuries

One evening, a vehicle drove through a ditch into shrubbery due to passing the stop sign. It was a clear day and the pavement was dry.

For the overall study area there were 328 reported fatalities and severe injuries. Of these, 12% occurred during typical morning commuting hours and 31% during typical evening commuting hours. Most (93%) crashes with reported speed limits occurred on high-speed routes. Over 40% of crashes were collisions with fixed objects involving a single vehicle, and of those crashes, 38% of crashes were off roadway collisions.

There were five reported crashes with pedestrian fatalities. Two off I-5, one on OR22 by Idanha, on Lakeside Dr between Labish Village and Labish Center, and one at the intersection of OR99E and Carl Rd north of Woodburn.

There was one reported crash with a cyclist fatality. The collision was due to the motorist's inattention. The crash occurred on a clear day on Lakeside Dr just east of OR 99E.

## Crash Type Analysis

Crash types were analyzed to identify over-represented through the excess proportion (EP) of specific crash types method[5]. Half-mile segments were used for this analysis due to side street frequency, and segments with two or less crashes were excluded. Tables 4 and 5 flag segments in the study area and study intersections. Excess proportion suggests the "likelihood that the site will benefit with a countermeasure targeted at the collision type under consideration."[6] Turning and rear end crash types are identified in both segment and intersection analysis as common crash types locations with excess proportions.

[5] Highway Safety Manual (HSM) 2010 4-52
[6] Highway Safety Manual (HSM) 2010 4-58

**Table 4 Excess Proportion Flagged 0.5 mile Segments**

| Crash Type | Road | Mile Points | Reference Population | Crash Count | Probability | Excess Proportion |
|---|---|---|---|---|---|---|
| Object (Fixed) | River Rd S | 3.34-3.84 | Rural Minor Arterial* | 5 | 1.00 | 0.68 |
| Turn | OR 99E | 34.97-35.47 | | 9 | 1.00 | 0.30 |
| | OR 211 | 1.54-2.04 | | 3 | 1.00 | 0.43 |
| Rear | OR 99E | 39.91-40.41 | | 6 | 0.99 | 0.35 |
| | OR 99E | 38.39-38.89 | | 6 | 0.98 | 0.28 |

** Only the Rural Minor Arterial function class/reference population had more than one identified flagged segment*

**Table 5 Excess Proportion Flagged Study Intersections**

| Crash Type | ID | Study Intersection | Ref. Pop. | Crash Count | Prob. | Excess Prop. |
|---|---|---|---|---|---|---|
| Angle | 17-C | Boones Ferry Rd/ Ehlen Rd | 3ST | 8 | 1.00 | 0.46 |
| | 15 | OR 214/Cascade Hwy | 4ST | 17 | 1.00 | 0.44 |
| | 16-C | Bents Rd/Ehlen Rd | 4SG | 2 | 0.99 | 0.17 |
| | 14-C | Butteville Rd/Ehlen Rd | 4ST | 8 | 0.98 | 0.30 |
| Sideswipe Overtaking | 21-C | I-5 NB Ramp/Brooklake Rd | 3ST | 3 | 0.96 | 0.11 |
| Turn | 24-C | Golf Club Rd/Sublimity Rd | 4ST | 10 | 1.00 | 0.17 |
| | 1 | OR 22/ North Fork Rd | 4ST | 2 | 1.00 | 0.30 |
| | 14 | OR 213/ Mt Angel Scotts Mill Rd | 4ST | 5 | 1.00 | 0.13 |
| | 9 | Parrish Gap Rd/Delaney Rd | 3ST | 5 | 1.00 | 0.62 |
| | 8-C | Witzel Rd/Aumsville Hwy | 3ST | 3 | 0.98 | 0.62 |
| | 10 | OR 214.Shaw Hwy | 3ST | 4 | 0.98 | 0.42 |
| | 21 | OR 99E/Quail Street | 3ST | 4 | 0.98 | 0.42 |
| | 27 | OR 99E/ Howell Prairie Rd NE | 3ST | 7 | 0.97 | 0.26 |
| | 36 | Arndt Rd/Airport Rd | 4SG | 14 | 0.97 | 0.16 |
| | 5 | Howell Prairie Rd/Monitor-McKee Rd | 3ST | 2 | 0.96 | 0.62 |
| | 22 | OR 99E/ Quinaby Rd | 3ST | 2 | 0.96 | 0.62 |
| | 19 | Mt Angel Highway/Hobart Rd | 3ST | 3 | 0.95 | 0.37 |
| | 16-C | Bents Rd/Ehlen Rd | 4SG | 5 | 0.95 | 0.30 |
| | 26 | OR 99E/ Boones Ferry Rd | 3ST | 9 | 0.93 | 0.15 |
| Rear | 25 | OR 99E/Waconda Rd | 4ST | 12 | 1.00 | 0.39 |
| | 18 | OR 551/ Ehlen Rd | 4SG | 34 | 1.00 | 0.19 |
| | 6 | Howell Prairie Rd/Silverton Rd | AWSC | 2 | 0.99 | 0.81 |
| | 20-C | I-5 NB Ramp/Ehlen Rd | 3ST | 37 | 0.99 | 0.15 |
| | 31 | OR 99E/Keene Rd | 4ST | 6 | 0.99 | 0.34 |
| | 35 | OR 551/Arndt Rd | 4SG | 6 | 0.99 | 0.45 |
| | 33 | OR 219/McKay Rd | 3ST | 14 | 0.98 | 0.22 |

| Crash Type | ID | Study Intersection | Ref. Pop. | Crash Count | Prob. | Excess Prop. |
|---|---|---|---|---|---|---|
| Rear | 12 | OR 214/ Woodburn-Monitor Rd | 3ST | 2 | 0.91 | 0.55 |
| | 3-C | Meridian Rd/Downs Rd/Abiqua Rd | 3ST | 2 | 0.91 | 0.55 |
| | 23 | OR 99E/ Perkins Street | 3ST | 3 | 0.91 | 0.30 |

## Crash Rate Flagged Segments and Intersections

Critical crash rates were calculated for half mile segments, with more than two crashes, in the study area and at each of the study intersections to flag intersections with an over-representation of crashes, see Tables 6 and 7. These crash rates are compared to their respective reference populations and Statewide Crash Rate tables for segments and published 90th percentile crash ratees for intersections, see Appendix A.

**Table 6: Crash Rate Flagged 0.5 Mile Segments**

| Road | MP | Reference Pop. | FATAL | Inj A | Inj B | Inj C | PDO | CARU Crash Rate[7] | Critical Crash Rate | Critical Crash Rate (Fatal/A) |
|---|---|---|---|---|---|---|---|---|---|---|
| OR 99E | 34.97-35.47 | Rural Minor Arterial* | 0 | 0 | 4 | 9 | 6 | OVER | Under | Under |
| OR 214 | 40.01-40.51 | | 0 | 1 | 1 | 2 | 4 | OVER | Under | Under |
| OR 214 | 43.78-44.28 | | 0 | 0 | 3 | 4 | 1 | OVER | Under | Under |
| OR 164 | 1.91-2.41 | | 0 | 1 | 3 | 0 | 4 | OVER | OVER | OVER |
| Airport Rd | 3.34-3.84 | | 0 | 1 | 1 | 1 | 2 | OVER | Under | Under |

** Only the Rural Minor Arterial function class/reference population had more than one identified segment*

**Table 7: Crash Rate Flagged Study Intersections**

| ID | Study Intersection | Ref. Pop. | FATAL | Inj A | Inj B | Inj C | PDO | State 90% Crash Rate[8] | Critical Crash Rate | Critical Crash Rate (Fatal/A) |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Parrish Gap Rd/Delaney Rd | 3ST | 0 | 1 | 2 | 2 | 1 | OVER | Under | Under |
| 10 | OR 214/Shaw Highway SE | 3ST | 0 | 1 | 2 | 1 | 2 | OVER | OVER | Under |
| 12 | OR 214/Woodburn-Monitor Rd | 3ST | 0 | 0 | 2 | 2 | 3 | OVER | Under | Under |
| 13 | Battle Creek Rd/Delaney Rd | 3ST | 0 | 0 | 0 | 0 | 4 | OVER | Under | Under |
| 19 | Mt Angel Highway/Hobart Rd | 3ST | 0 | 1 | 1 | 2 | 0 | OVER | Under | Under |
| 26 | OR 99E/Boones Ferry Rd | 3ST | 1 | 0 | 3 | 10 | 6 | OVER | Under | Under |

[7] https://www.oregon.gov/odot/Data/Documents/Crash_Rate_Table_II_2018-2022.pdf
[8] Analysis Procedures Manual, Chapter 4, Exhibit 4-1

| ID | Study Intersection | Ref. Pop. | FATAL | Inj A | Inj B | Inj C | PDO | State 90% Crash Rate[8] | Critical Crash Rate | Critical Crash Rate (Fatal/ A) |
|---|---|---|---|---|---|---|---|---|---|---|
| 27 | OR 99E/Howell Prairie Rd NE | 3ST | 1 | 1 | 2 | 4 | 3 | **OVER** | Under | Under |
| 33 | OR 219/McKay Rd | 3ST | 0 | 1 | 3 | 6 | 14 | **OVER** | Under | Under |
| 34 | River Rd/Orville Rd | 3ST | 0 | 1 | 0 | 2 | 4 | **OVER** | Under | Under |
| 7-C | Wheatland Rd/Brooklake Rd | 3ST | 0 | 1 | 2 | 0 | 0 | **OVER** | Under | Under |
| 8-C | Witzel Rd/Aumsville Hwy | 3ST | 0 | 0 | 0 | 3 | 0 | **OVER** | Under | Under |
| 17-C | Boones Ferry Rd/Ehlen Rd | 3ST | 0 | 0 | 5 | 6 | 7 | **OVER** | **OVER** | Under |
| 19-C | I-5 SB Ramp/Ehlen Rd | 3ST | 0 | 1 | 15 | 36 | 32 | **OVER** | **OVER** | Under |
| 20-C | I-5 NB Ramp/Ehlen Rd | 3ST | 2 | 2 | 14 | 20 | 27 | **OVER** | **OVER** | **OVER** |
| 21-C | I-5 NB Ramp/Brooklake Rd | 3ST | 0 | 2 | 2 | 12 | 5 | **OVER** | Under | Under |
| 22-C | I-5 SB Ramp/Brooklake Rd | 3ST | 0 | 0 | 3 | 12 | 7 | **OVER** | Under | Under |
| 14 | OR 213/Mt Angel Scotts Mill Rd | 4ST | 0 | 3 | 4 | 7 | 6 | Under | **OVER** | **OVER** |
| 15 | OR 214/Cascade Highway SE | 4ST | 0 | 2 | 4 | 8 | 5 | Under | **OVER** | OVER |
| 25 | OR 99E/Waconda Rd | 4ST | 0 | 0 | 4 | 13 | 6 | Under | **OVER** | Under |
| 24-C | Golf Club Rd/Sublimity Rd | 4ST | 1 | 3 | 10 | 7 | 6 | Under | **OVER** | **OVER** |
| 2 | Culver Drive/Deer Park Rd | AWSC | 0 | 0 | 2 | 4 | 2 | n/a | **OVER** | Under |
| 32 | River Rd/Quinaby Rd | AWSC | 0 | 1 | 5 | 10 | 7 | n/a | **OVER** | Under |
| 18 | OR 551/Ehlen Rd | 4SG | 0 | 0 | 10 | 19 | 18 | **OVER** | **OVER** | Under |
| 28 | OR 99E/Mt Angel-Gervais Rd | 4SG | 0 | 0 | 5 | 13 | 2 | **OVER** | Under | Under |
| 36 | Arndt Rd/Airport Rd | 4SG | 0 | 1 | 8 | 10 | 10 | **OVER** | **OVER** | **OVER** |

All the flagged segments and intersections identified in this report are considered safety issue areas, see Table 8 for a summary, and should be further investigated and countermeasures identified. Mile points 1.91-2.41 of OR 164 and study intersections have the most flagged safety concerns. Exhibit 2 examines representative crashes at three of the most flagged locations according to Table 8.

The Marion County TSAP may be a starting point in countermeasure identification. Ultimately, identified countermeasures should be from ODOT's All Road Transportation Safety (ARTS) Program Crash Reduction Factor Manual[9] to streamline future project funding and programming.

[9] https://www.oregon.gov/odot/Engineering/ARTS/CRF-Manual.pdf

**Exhibit 2 – Representative Crashes at most flagged locations**

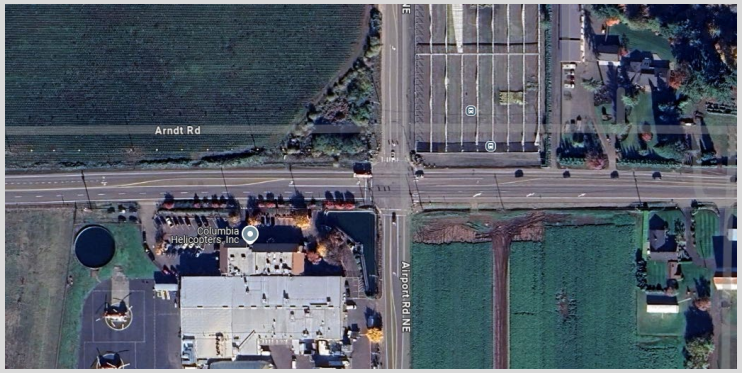
| Location Layout | Representative Crash |
|---|---|
|  | On OR 164 at approximately MP 1.92, crash #1739755 occurred on Friday 10/20/2017 around 10 AM in cloudy, daylight conditions. The pavement was wet.<br><br>The head-on collision of two vehicles occurred despite a double solid yellow centerline in this segment. This segment is in a curve with several driveways to residential and agricultural properties. There are limited gravel shoulders with deep ditches on each side. |
|  | At the signalized intersection of Arndt Rd/Airport Rd, crash #1722447 occurred on Tuesday 3/21/2017 around 4 PM in clear, daylight conditions. The pavement was dry.<br><br>The collision was due improperly yielding of one of two vehicles going in opposite directions, one turning left and the other straight (Turn Crash). There were no fatalities or serious injuries, but there were at least two possibly injured. |
|  | At stop controlled I-5 NB Ramp/Ehlen Rd off ramp, crash #1729320 occurred on Monday 6/26/2017 around 5 PM in clear, daylight conditions. The pavement was dry.<br><br>The collision consisted of two vehicles and was due rear-end due to queueing from the off ramp onto Ehlen Rd. There were no fatalities or injuries. |

**Table 8 Safety Issue Area Summary**

| ID | Location | Ref. Pop. | CARUC Rate | State 90% Crash Rate | Crit. Crash Rate | Crit. Crash Rate (Fatal/A) | EP Angle Crash | EP Side-swipe, Over-taking | EP Object (Fixed) | EP Turn | EP Rear |
|---|---|---|---|---|---|---|---|---|---|---|---|
| n/a | OR 99E (34.97-35.47) | Rural Minor Arterial | ✓ | | | | | | | ✓ | |
| n/a | OR 99E (39.91-40.41) | | | | | | | | | | ✓ |
| n/a | OR 99E (38.39-38.89) | | | | | | | | | | ✓ |
| n/a | OR 211 (1.54-2.04) | | | | | | | | | ✓ | |
| n/a | OR 214 (40.01-40.51) | | ✓ | | | | | | | | |
| n/a | OR 214 (43.78-44.28) | | ✓ | | | | | | | | |
| n/a | OR 164 (1.91-2.41) | | ✓ | | ✓ | ✓ | | | | | |
| n/a | Airport Rd (3.34-3.84) | | ✓ | | | | | | | | |
| n/a | River Rd S (3.34-3.84) | | | | | | | | ✓ | | |
| 1 | OR 22/ North Fork Rd | 4ST | | | | | | | | ✓ | |
| 2 | Culver Drive/Deer Park Rd | AWSC | | | ✓ | | | | | | |
| 5 | Howell Prairie Rd/Monitor-McKee Rd | 3ST | | | | | | | | ✓ | |
| 6 | Howell Prairie Rd/Silverton Rd | AWSC | | | | | | | | | ✓ |
| 9 | Parrish Gap Rd/Delaney Rd | 3ST | | ✓ | | | | | | ✓ | |
| 10 | OR 214/Shaw Highway SE | 3ST | | ✓ | ✓ | | | | | ✓ | |
| 12 | OR 214/Woodburn-Monitor Rd | 3ST | | ✓ | | | | | | | ✓ |
| 13 | Battle Creek Rd/Delaney Rd | 3ST | | ✓ | | | | | | | |
| 14 | OR 213/Mt Angel Scotts Mill Rd | 4ST | | | ✓ | ✓ | | | | ✓ | |
| 15 | OR 214/Cascade Highway SE | 4ST | | | ✓ | ✓ | ✓ | | | | |
| 18 | OR 551/Ehlen Rd | 4SG | | ✓ | ✓ | | | | | | ✓ |
| 19 | Mt Angel Highway/Hobart Rd | 3ST | | ✓ | | | | | | ✓ | |
| 21 | OR 99E/Quail Street | 3ST | | | | | | | | ✓ | |
| 22 | OR 99E/ Quinaby Rd | 3ST | | | | | | | | ✓ | |
| 23 | OR 99E/ Perkins Street | 3ST | | | | | | | | | ✓ |
| 25 | OR 99E/Waconda Rd | 4ST | | | ✓ | | | | | | ✓ |
| 26 | OR 99E/Boones Ferry Rd | 3ST | | ✓ | | | | | | ✓ | |
| 27 | OR 99E/Howell Prairie Rd NE | 3ST | | ✓ | | | | | | ✓ | |
| 28 | OR 99E/Mt Angel-Gervais Rd | 4SG | | ✓ | | | | | | | |
| 31 | OR 99E/Keene Rd | 4ST | | | | | | | | | ✓ |
| 32 | River Rd/Quinaby Rd | AWSC | | | ✓ | | | | | | |
| 33 | OR 219/McKay Rd | 3ST | | ✓ | | | | | | | ✓ |
| 34 | River Rd/Orville Rd | 3ST | | ✓ | | | | | | | |
| 35 | OR 551/Arndt Rd | 4SG | | | | | | | | | ✓ |
| 36 | Arndt Rd/Airport Rd | 4SG | | ✓ | ✓ | ✓ | | | | ✓ | |
| 3-C | Meridian Rd/Downs Rd/Abiqua Rd | 3ST | | | | | | | | | ✓ |
| 7-C | Wheatland Rd/Brooklake Rd | 3ST | | ✓ | | | | | | | |
| 8-C | Witzel Rd/Aumsville Hwy | 3ST | | ✓ | | | | | | ✓ | |
| 14-C | Butteville Rd/Ehlen Rd | 4SG | | | | | ✓ | | | | |
| 16-C | Bents Rd/Ehlen Rd | 3ST | | | | | ✓ | | | ✓ | |
| 17-C | Boones Ferry Rd/Ehlen Rd | 3ST | | ✓ | ✓ | | ✓ | | | | |
| 19-C | I-5 SB Ramp/Ehlen Rd | 3ST | | ✓ | ✓ | | | | | | |
| 20-C | I-5 NB Ramp/Ehlen Rd | 3ST | | ✓ | ✓ | ✓ | | | | | ✓ |
| 21-C | I-5 NB Ramp/Brooklake Rd | 3ST | | ✓ | | | | ✓ | | | |
| 22-C | I-5 SB Ramp/Brooklake Rd | 3ST | | ✓ | | | | | | | |
| 24-C | Golf Club Rd/Sublimity Rd | 4ST | | | ✓ | ✓ | | | | ✓ | |