# I-5 Exits 40 and 43 (Gold Hill)
# Interchange Area Management Plans

# DRAFT Technical Memorandum #4
# Existing Conditions Analysis

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## June 2013

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# 4. EXISTING CONDITIONS ANALYSIS

This memorandum summarizes the existing traffic conditions for I-5 Exits 40 and 43. It also identifies potential constraints found within the interchange management study area (IMSA). The IMSAs, shown in Figure 4-1, generally encompass the existing interchanges and the surrounding areas they serve.

The assessment of traffic conditions includes development of existing traffic volumes, assessment of traffic operations, a review of historical crash patterns, and a summary of operational and geometric deficiencies.

## 4.1. Average Daily Traffic Volumes

The average daily traffic (ADT) volumes for the I-5 mainline and interchange ramps are currently available for the year 2011 and are summarized in Table 4-1. As the primary access to the City of Gold Hill, ramp volumes at Exit 40 are higher than Exit 43.

**Table 4-1. Average Daily Traffic Volumes (2011)**

| Location Description | Volume |
|---|---|
| ***Interstate 5*** | |
| North of I-5 Exit 43 | 33,100 vpd |
| Between I-5 Exits 40 and 43 | 32,800 vpd |
| South of I-5 Exit 40 | 33,900 vpd |
| ***I-5 Exit 40*** | |
| Northbound Off-Ramp | 1,780 vpd |
| Northbound On-Ramp | 1,320 vpd |
| Southbound Off-Ramp | 1,140 vpd |
| Southbound On-Ramp | 1,800 vpd |
| ***I-5 Exit 43*** | |
| Northbound Off-Ramp | 310 vpd |
| Northbound On-Ramp | 480 vpd |
| Southbound Off-Ramp | 410 vpd |
| Southbound On-Ramp | 310 vpd |

vpd = vehicles per day

*Source: 2011 Transportation Volume Tables, Oregon Department of Transportation*

## 4.2. Turning Movement Counts

Traffic volume data collected for this project consisted of 16-hour turning movement classification counts[1] collected at 15-minute intervals during the 6:00 to 9:00 AM and 2:00 to

[1] The classification counts included full Federal Highway Administration (FHWA) 13-class vehicle classifications.

6:00 PM periods and hourly intervals the remainder of the time. Table 4-2 below provides a list of all intersection count locations, the type of count and the date they were collected.

Traffic counts at the five Interchange 40 management area intersections were conducted on October 24 and November 14, 2012. Traffic counts at the six Interchange 43 management area intersections were conducted on October 22 and 23, 2012 and January 8, 2013.

**Table 4-2. Vehicle Count Locations and Types**

| Location | Type of Count | Count Date |
|---|---|---|
| ***I-5 Exit 40*** | | |
| Access Rd & Blackwell Rd (OR 99) | 16-hour (06:00 - 22:00), turning movement, classification | 10/24/2012 |
| Access Rd & Lampman Rd | 16-hour (06:00 - 22:00), turning movement, classification | 10/24/2012 |
| Access Rd & I-5 NB Ramps | 16-hour (06:00 - 22:00), turning movement, classification | 11/14/2012 |
| Access Rd & I-5 SB Ramps | 16-hour (06:00 - 22:00), turning movement, classification | 10/24/2012 |
| Access Rd & Old Stage Rd | 16-hour (06:00 - 22:00), turning movement, classification | 10/24/2012 |
| ***I-5 Exit 43*** | | |
| OR 99/OR 234 & N. River Rd | 16-hour (06:00 - 22:00), turning movement, classification | 10/23/2012 |
| OR 99/OR 234 & Lampman Rd | 16-hour (06:00 - 22:00), turning movement, classification | 1/8/2013 |
| OR 99/OR 234 & Main St | 16-hour (06:00 - 22:00), turning movement, classification | 10/22/2012 |
| Main St & I-5 NB Ramps | 16-hour (06:00 - 22:00), turning movement, classification | 10/22/2012 |
| Main St & I-5 SB Ramps | 16-hour (06:00 - 22:00), turning movement, classification | 10/22/2012 |
| Main St & Profetta Ln | 16-hour (06:00 - 22:00), turning movement, classification | 10/22/2012 |

The traffic volume data from both interchange management areas was examined to determine a common peak hour for all of the intersections at each interchange, which is the one-hour period when the sum of volumes entering at all management area intersections is highest. The common peak hour for both IMSAs was found to occur between 3:30 and 4:30 pm. The peak hour at each intersection may or may not correspond to the common peak hour but were generally within 15 minutes of the common peak.

## 4.3. Design Hourly Volumes

ODOT generally requires that transportation facilities be analyzed under design hourly volumes (DHVs), known as 30th highest hour volumes. The 30th highest hour volumes are used in traffic operations analysis so that results are valid for all but a few hours of the year. The procedure for determining 30$^{th}$ highest hour volumes is specified in ODOT's Analysis Procedures Manual (APM)[2] and briefly described below.

The 30th highest hour traffic volumes are calculated by multiplying the peak hour volumes by a seasonal factor. The seasonal factor for I-5 mainline volumes was derived from on-site

[2] Analysis Procedures Manual, Oregon Department of Transportation, Transportation Development Division Planning Section, Transportation Planning and Analysis Unit, Salem, Oregon, April, 2006, Section 4.3.

automatic traffic recorder (ATR) data from station 15-001 located between I-5 Exits 40 and 43. Local road seasonal factors were derived from a combination of data from ATRs for comparable facilities (stations 36-005 and 22-012) since no appropriate sources were available in the study area. Ramp-related movements used a combination of mainline factors and local road factors calculated from on-site and characteristic ATR data. The data used in calculating the seasonal factors is included in Appendix A (available upon request).

Peak hour count data was seasonally adjusted and volumes were balanced to achieve a uniform dataset for analysis. Because all but one count was conducted in 2012 (the baseline analysis year), an annual growth adjustment was not applied. The one intersection count collected in January 2013 was balanced to match the other data collected in the fall of 2012. Figure 4-2 shows the existing balanced PM peak hour volumes developed for this project.

## 4.4. Operational Criteria

Transportation engineers have established various methods for measuring traffic operations of roadways and intersections. Most jurisdictions use either volume-to-capacity (v/c) ratio or level of service (LOS) to establish performance criteria. Both the LOS and v/c ratio concepts require consideration of factors that include traffic demand, capacity of the intersection or roadway, delay, frequency of interruptions in traffic flow, relative freedom for traffic maneuvers, driving comfort, convenience, and operating cost.

### Volume-to-Capacity (V/C) Ratio

A comparison of traffic volume demand to intersection capacity is one method of evaluating how well an intersection is operating. This comparison is presented as a v/c ratio. A v/c ratio of less than 1.00 indicates that the volume is less than capacity. When it is closer to 0, traffic conditions are generally good, with little congestion and low delays for most intersection movements. As the v/c ratio approaches 1.00, traffic becomes more congested and unstable, with longer delays.

### Level of Service (LOS)

Level of service is also a widely recognized and accepted measure and descriptor of traffic operations. At both stop-controlled and signalized intersections, LOS is a function of control delay, which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Six standards have been established, ranging from LOS A, where there is little or no delay, to LOS F, where there is delay of more than 50 seconds at unsignalized intersections, or more than 80 seconds at signalized intersections.

It should be noted that, although delays can sometimes be long for some movements at a STOP-controlled intersection, the v/c ratio may indicate that there is adequate capacity to process the demand for that movement. For this reason, it is important to examine both v/c ratio and LOS when evaluating overall intersection operations. Both are reported in the following section.

### 95th Percentile Queues

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

## 4.5. Operational Standards

The OHP has established several policies that enforce general objectives and approaches for maintaining highway mobility. Of these policies, the Highway Mobility Policy (1F) establish maximum v/c ratio targets[3] for peak hour operating conditions for all highways in Oregon based on the location and classification of the highway segment being examined. The OHP policy also specifies that the v/c ratio targets be maintained for ODOT facilities through a 20-year horizon.

The three state highways within the study area are all are located within the recently formed Middle Rogue Metropolitan Planning Organization (MPO): I-5 (interstate highway), OR 234 Spur/Access Road (district level highway), and Main Street (local interest road). The ODOT v/c ratio target assumed for I-5 and the ramp terminals is 0.85 while the target for OR 234 Spur/Access Road and Main Street is 0.95.

Jackson County has also established performance standards based on v/c ratio. These standards are outlined in the Jackson County TSP (0.95 inside the MPO boundary and 0.85 outside the MPO boundary). The County TSP language states that "where one or more approaches is maintained by a city or ODOT, the more restrictive of the County's or other agency's performance standards will be applied." Since the management area intersections are assumed to be within the MPO boundary, the state target for district and local roads (0.95) is equivalent to the County standard. However, at the ramp terminals the more restrictive ramp terminal target (0.85) will be applied. Table 4-3 presents the applicable jurisdictional performance measures.

[3] Oregon Highway Plan Policy 1F Revisions (Adopted December 21, 2011), ODOT, Table 6: Volume to Capacity Ratio Targets for Peak Hour Operating Conditions

**Table 4-3. Performance Measures**

| Location | Applicable Jurisdictional Performance Measures | |
|---|---|---|
| | ODOT[1] | Jackson County[2] |
| ***I-5 Exit 40*** | | |
| Access Rd & Blackwell Rd (OR 99) | Not applicable | V/C <= 0.95 |
| Access Rd & Lampman Rd | Not applicable | V/C <= 0.95 |
| I-5 NB Ramp Terminal | V/C <= 0.85 | V/C <= 0.95 |
| I-5 SB Ramp Terminal | V/C <= 0.85 | V/C <= 0.95 |
| Access Rd & Lampman Rd | Not applicable | V/C <= 0.95 |
| ***I-5 Exit 43*** | | |
| OR 99/OR 234 & N. River Rd | V/C <= 0.95 | V/C <= 0.95 |
| OR 99/OR 234 & Lampman Rd | V/C <= 0.95 | V/C <= 0.95 |
| OR 99/OR 234 & Main St | V/C <= 0.95 | V/C <= 0.95 |
| I-5 NB Ramp Terminal | V/C <= 0.85 | V/C <= 0.95 |
| I-5 SB Ramp Terminal | V/C <= 0.85 | V/C <= 0.95 |
| Main St & Profetta Ln | Not Applicable | V/C <= 0.95 |

Notes:

1. Table 6: Volume to Capacity Ratio Targets for Peak Hour Operating Conditions, 1999 Oregon Highway Plan, Mobility Policy Revisions, 2011.
2. Jackson County Transportation System Plan.

## 4.6. Traffic Operations Analysis Procedures

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

Synchro is a macroscopic model similar to the Highway Capacity Software (HCS), and like the HCS, is based on the 2010 HCM. The Synchro model evaluates traffic operations for signalized and unsignalized intersections under coordinated and uncoordinated traffic control . The v/c ratios and LOS presented in this report are based on the Synchro model output. None of the intersections are currently signalized.

SimTraffic animates traffic flow based on input volumes and signal timing and allows viewing of traffic flow under saturated traffic conditions where traffic may spill over from one intersection to another. It is particularly effective at evaluating closely spaced intersections. The SimTraffic model was run multiple times using different arrival patterns to determine how sensitive traffic operations are to subtle variations in traffic flows. The 95$^{th}$ percentile queues from the SimTraffic model are presented in this report.

As noted above, the results from both Synchro and SimTraffic are reported in this document. Because these programs evaluate operations using different methodologies, the analysis results

sometimes vary; however, the differences are generally minor unless saturated or congested conditions are present. Under saturated conditions, SimTraffic queuing and delays present results that reflect how congested intersections impact each other, while Synchro represents intersection performance in isolation and may reflect better performance results.

## 4.7. Existing Traffic Operations

Existing (2012) PM peak hour traffic operations were evaluated at the management area intersections and for the freeway segments where ramp traffic is entering (i.e., merging) or exiting (i.e., diverging) the mainline traffic stream. Operations are described in the following sections and the detailed analysis worksheets are presented in Appendix B (available upon request).

### *4.7.1. Intersection Operations*

Table 4-4 summarizes the results of the traffic operations analysis and Figure 4-3 presents v/c ratios and LOS performance by lane group for the area intersections. While all lane groups are shown in the figure, only the controlling movement[4] is shown in the table. Controlling movements at unsignalized intersections are typically the minor-street left turns or, in the case of single-lane approaches, the minor street approaches. These movements are required to yield to all other movements at the intersection and thus are subject to the longest delays and have the least capacity. Left turns from the major street are also subject to delays, since motorists making these maneuvers must also yield to oncoming major-street traffic.

Analysis for the PM peak period shows that all of the intersections in both the Exit 40 and 43 IMSAs currently meet applicable mobility thresholds.

Based on the SimTraffic simulation, none of the 95$^{th}$ percentile queues exceed available storage or extend beyond the nearest upstream intersection at any of the IMSA intersections. The lane group with the most significant queuing is the northbound approach to the intersection of Access Road and Blackwell Road (OR 99) near Exit 40. For this lane group, the 95$^{th}$ percentile queue extends 125 feet, short of the nearest public access with Access Road (300 feet south of the intersection). Existing storage on interchange ramps provides adequate distance for safe stopping sight distance based on the 95$^{th}$ percentile queues. The ramp with the longest queuing is the southbound off-ramp at Exit 43 with queues extending 75 ft.

[4] The movement with the worst v/c ratio

**Table 4-4. I-5 Exit 40 Existing (Year 2012) PM Peak Hour Traffic Operations**

| Intersection | Controlling Movement[1] | V/C Ratio[2] | LOS[2] | Operational Targets[3] |
|---|---|---|---|---|
| ***I-5 Exit 40*** | | | | |
| Access Rd at Blackwell Rd (OR 99) | NB L/R | 0.55 | C | V/C <= 0.95 |
| Access Rd at Lampman Rd | EB L/R | 0.06 | B | V/C <= 0.95 |
| Access Rd at I-5 NB Ramps | WB L/T/R | 0.29 | B | V/C <= 0.85 |
| Access Rd at I-5 SB Ramps | EB L/T/R | 0.20 | B | V/C <= 0.85 |
| Access Rd at Old Stage Rd | EB L/R | 0.07 | B | V/C <= 0.95 |
| ***I-5 Exit 43*** | | | | |
| OR 99/OR 234 at N. River Rd [4] | EB T/R | 0.05 | A | V/C <= 0.95 |
| OR 99/OR 234 at Lampman Rd | SB L/R | 0.02 | A | V/C <= 0.95 |
| OR 99/OR 234 at Main St [4,5] | NB L/R | 0.09 | A | V/C <= 0.95 |
| Main St at I-5 NB Ramps | WB L/T/R | 0.03 | A | V/C <= 0.85 |
| Main St at I-5 SB Ramps | EB L/T/R | 0.07 | A | V/C <= 0.85 |
| Main St at Profetta Ln | EB L/T | 0.02 | A | V/C <= 0.95 |

Acronyms: EB = eastbound; WB = westbound; NB = northbound; and SB = southbound. L = left; T = through; and R = right.

Notes:

1. At unsignalized intersections the results are reported for the movement with the worst v/c ratio.
2. The v/c ratios and LOS are based on the results of the macrosimulation analysis using Synchro, which cannot account for the influence of adjacent intersection operations.
3. The Jackson County Transportation System Plan (TSP) designates the traffic operations standard as the more restrictive of County and ODOT targets for intersections with one or more approaches maintained by ODOT.
4. .Intersection operations analyzed with alternative geometric configurations to meet HCM methodology.
5. Intersection operations based on HCM 2000 methodology.

*Source: David Evans and Associates, Inc.*

## Preliminary Signal Warrants

Although there are no existing operational deficiencies, preliminary signal warrants were evaluated at the two locations whose volumes approached the 70% warrant volume level: Access Road at Blackwell Road (OR 99) and Access Road at the I-5 Northbound Ramps. Neither location satisfied the preliminary signal warrants.

### *4.7.2. Merge and Diverge Operations*

It is also important to evaluate how the interchange ramps interact with the mainline freeway traffic on I-5 through an analysis of the points where traffic enters, or merges, onto the highway and where it exits, or diverges, from the highway. Analyses of freeway sections at both interchanges were conducted in accordance with the methodology prescribed in ODOT's APM to determine v/c ratio performance for the design hour between 3:30 and 4:30 PM.

Table 4-5**Error! Reference source not found.** summarizes the results of the freeway operations analysis for both interchanges**.** The merge and diverge analyses show that the freeway and the merge and diverge points associated with the both interchanges are currently operating well below the mobility target of 0.85.

**Table 4-5. Existing (Year 2012) Freeway Operations**

| I-5 Northbound | | I-5 Southbound | |
|---|---|---|---|
| **Direction/Location** | **V/C Ratio[1,2]** | **Direction/Location** | **V/C Ratio[1,2]** |
| ***I-5 Exit 40*** | | | |
| Mainline: South of Exit 40 | 0.34 | Mainline: North of Exit 40 | 0.28 |
| Diverge: Exit 40 Northbound Off Ramp | 0.09 | Diverge: Exit 40 Southbound Off Ramp | 0.29 |
| Mainline: Between Exit 40 Ramps | 0.30 | Mainline: Between Exit 40 Ramps | 0.02 |
| Merge: Exit 40 Northbound On Ramp | 0.33 | Merge: Exit 40 Southbound On Ramp | 0.28 |
| Mainline : North of Exit 40 | 0.32 | Mainline: South of Exit 40 | 0.29 |
| ***I-5 Exit 43*** | | | |
| Mainline : South of Exit 43 | 0.32 | Mainline: North of Exit 43 | 0.29 |
| Diverge: Exit 43 Northbound Off Ramp | 0.01 | Diverge: Exit 43 Southbound Off Ramp | 0.02 |
| Mainline: Between Exit 43 Ramps | 0.31 | Mainline: Between Exit 43 Ramps | 0.28 |
| Merge: Exit 40 Northbound On Ramp | 0.33 | Merge: Exit 43 Southbound On Ramp | 0.29 |
| Mainline: North of Exit 43 | 0.32 | Mainline: South of Exit 43 | 0.28 |

Notes:
1. The v/c ratios for the merge/diverge analysis are calculated based on the methodologies outlined in ODOT's Analysis Procedures Manual.
2. The design hour is the hour between 3:30 and 4:30 PM, which coincides with non-freeway system peaking.

*Source: David Evans and Associates, Inc.*

## 4.8. Safety Analysis

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

### *4.8.1. Crash History*

The crash analysis included a review of crash history data supplied by the ODOT Crash Analysis and Reporting Unit for the period between January 1, 2007, and December 31, 2011, which were the five most recent full years for which crash data were available at the time of the analysis. The reports are contained in Appendix C (available upon request).

#### I-5 Exit 40

There were 39 crashes reported within in the Exit 40 IMSA during the 5-year analysis period as summarized in Table 4-6. Two of the reported crashes resulted in a fatality, one resulted in a serious injury, and 19 resulted in a minor injury(s). Very few (2) of the reported crashes were attributed to alcohol, but approximately one-third of crashes were attributed to speed.

**Table 4-6. I-5 Exit 40 IMSA Crash Summary (2007-2011)**

| Intersection | Total | % of Total | Severity | | | Crash Type | | | | | | | | Intersection or Segment Crash Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Property Damage Only | Minor Injury Crashes | Fatal & Serious Injury | Rear End | Fixed Object | Other | Turning | Sideswipe - Opposite | Sideswipe - Meeting | Head On | Non-Collision | |
| ***Intersections*** | | | | | | | | | | | | | | |
| Access Rd & Blackwell Rd | 4 | 10% | 1 | 3 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 1 | 0.32 |
| Access Rd & Lampman Rd | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Access Rd & I-5 NB Ramps | 7 | 18% | 3 | 3 | 1[2] | 2 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0.61 |
| Access Rd & I-5 SB Ramps | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Access Rd & Old Stage Rd | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| *Subtotal* | *11* | *28%* | *4* | *6* | *1* | *2* | *5* | *0* | *3* | *0* | *0* | *0* | *1* | - |
| ***Segments*** | | | | | | | | | | | | | | |
| Between Blackwell & Lampman Rd | 2 | 5% | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1.66 |
| ***I-5 Northbound*** | | | | | | | | | | | | | | |
| Mainline south of I-5 NB Off Ramp | 6 | 15% | 4 | 1 | 1 | 2 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | - |
| I-5 NB Off Ramp | 5 | 13% | 1 | 4 | 0 | 2 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | - |
| Mainline between Off & On Ramp | 1 | 3% | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | - |
| I-5 NB On Ramp | 1 | 3% | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Mainline north of I-5 NB Ramp | *0* | *0%* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | - |
| *Subtotal* | *13* | *33%* | *7* | *5* | *1* | *4* | *5* | *2* | *0* | *2* | *0* | *0* | *0* | *0.50* |
| ***I-5 Southbound*** | | | | | | | | | | | | | | |
| Mainline north of I-5 SB Off Ramp | 1 | 3% | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | - |
| I-5 SB Off Ramp | 1 | 3% | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Mainline between Off & On Ramp | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| I-5 SB On Ramp | 3 | 8% | 2 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Mainline south of I-5 On Ramp | 8 | 21% | 3 | 5 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| *Subtotal* | *13* | *33%* | *5* | *7* | *1* | *1* | *11* | *1* | *0* | *0* | *0* | *0* | *0* | *0.56* |
| **Totals** | **39** | **100%** | **17** | **19** | **3** | **7** | **22** | **3** | **4** | **2** | **0** | **0** | **1** | **-** |
| **Percent of Total Crashes** | | | **44%** | **49%** | **8%** | **18%** | **56%** | **8%** | **10%** | **5%** | **0%** | **0%** | **3%** | **-** |

Notes:

1. Highway Safety Manual Part B methodology was used to calculate critical crash rates for signalized and unsignalized intersections. Where the observed rate exceeds the critical crash rate, the observed rate is shaded.
2. A serious injury crash occurred and is combined with fatal crashes due to the severity.

*Source: ODOT Transportation Development Division, Transportation Data Section, Crash Analysis and Reporting Unit*

Only two of the study area intersections had reported crashes during the 5-year analysis period: Access Road at Blackwell Road (4 crashes) and Access Road at I-5 Northbound Ramps (7 crashes). One crash resulted in a severe (debilitating) injury and six others resulted in minor injuries. Crash types varied at both intersections with no consistent patterns.

The segment of Access Road between Blackwell Road and Lampman Road was the only stretch of roadway with crashes between intersections. The calculated crash rate for this segment is

1.66 crashes per million vehicle miles of travel. While only 2 crashes occurred on this segment, the higher rate is large due to the short distance and relatively low volumes of traffic between Blackwell Road and Lampman Road.

Along I-5 within the IMSA, there was a relatively low frequency of crashes. In the 5-year analysis period, there were 26 freeway crashes, 13 in the northbound direction, and 13 in the southbound. The 5-year crash rate for the northbound freeway segment is 0.50 crashes per million vehicle miles traveled (crashes/mvmt), and the southbound segment is 0.56 crashes/mvmt. These crash rates are comparable with the statewide average crash rates for interstate freeways of 0.40 crashes/mvmt; however, higher rates are typically expected adjacent to ramp connections when compared to mainline segments. The most common crash type reported for mainline crashes was fixed object collisions (62%). Eleven of the fixed object crashes occurred in the southbound direction, with the remaining 5 occurring in the northbound direction. Four of these fixed object crashes occurred during icy conditions, five were attributed to excessive speed for roadway conditions, and two involved both ice and excessive speed. One fatal injury, fixed object crash occurred just past the southbound off ramp, which was attributed to driver fatigue. Another fatal injury, rear-end crash occurred south of the northbound off ramp. Neither of the fatal injury crashes was alcohol related.

## *I-5 Exit 43*

There were 32 crashes reported within in the IMSA during the 5-year analysis period. Table 4-7 summarizes the crash data for I-5 Exit 43. One of the reported crashes resulted in a serious injury, and 8 resulted in a minor injury(s). Similar to I-5 Exit 40, approximately one-third of crashes were attributed to speed.

None of the intersection had reported crashes in the 5-year analysis period.

Only one non-freeway segment, OR 99/OR 234 between Lampman Road and N. River Road, had 2 reported fixed object crashes. The calculated crash rate for this segment is 3.72 crashes per million vehicle miles of travel. While only 2 crashes occurred on this segment, the higher rate is large due to the short distance and relatively low volumes of traffic on this segment. The two crashes occurred at the bridge, with no injuries reported.

## Table 4-7. I-5 Exit 43 IMSA Crash Summary (2007-2011)

| Intersection | Total | % of Total | Severity | | | Crash Type | | | | | | | | | Intersection or Segment Crash Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Property Damage Only | Minor Injury Crashes | Fatal & Serious Injury [2] | Rear End | Fixed Object | Angle | Other | Backing | Turning | Sideswipe - Opposite | Sideswipe - Meeting | Non-Collision | |
| ***Intersections*** | | | | | | | | | | | | | | | |
| OR 99/OR 234 & N. River Rd | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| OR 99/OR 234 & Lampman Rd | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| OR 99/OR 234 & Main St | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Main St & I-5 NB Ramp Terminal | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Main St & I-5 SB Ramp Terminal | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Main St & Profetta Ln | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| *Subtotal* | *0* | *0%* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | - |
| ***Segments*** | | | | | | | | | | | | | | | |
| Between N. River & Lampman Rd | 2 | 6% | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.72 |
| ***I-5 Northbound*** | | | | | | | | | | | | | | | |
| Mainline south of I-5 NB Off Ramp | 8 | 25% | 6 | 2 | 0 | 1 | 3 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | - |
| I-5 NB Off Ramp | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Mainline between Off & On Ramp | 3 | 9% | 2 | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | - |
| I-5 NB On Ramp | 3 | 9% | 2 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Mainline north of I-5 NB Ramp | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| *Subtotal* | *14* | *44%* | *10* | *3* | *1* | *2* | *6* | *0* | *3* | *0* | *0* | *3* | *0* | *0* | *0.34* |
| ***I-5 Southbound*** | | | | | | | | | | | | | | | |
| Mainline north of I-5 SB Off Ramp | 2 | 6% | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| I-5 SB Off Ramp | 4 | 13% | 2 | 2 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | - |
| Mainline between Off & On Ramp | 1 | 3% | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| I-5 SB On Ramp | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Mainline south of I-5 On Ramp | 9 | 28% | 7 | 2 | 0 | 3 | 2 | 0 | 2 | 0 | 0 | 1 | 0 | 1 | - |
| *Subtotal* | *16* | *50%* | *3* | *5* | *0* | *4* | *6* | *0* | *3* | *0* | *0* | *2* | *0* | *1* | *0.44* |
| **Totals** | **32** | **100%** | **15** | **8** | **1** | **6** | **14** | **0** | **6** | **0** | **0** | **5** | **0** | **1** | **-** |
| **Percent of Total Crashes** | | | **47%** | **25%** | **3%** | **19%** | **44%** | **0%** | **19%** | **0%** | **0%** | **16%** | **0%** | **3%** | **-** |

Notes:

Highway Safety Manual Part B methodology was used to calculate critical crash rates for signalized and unsignalized intersections. Where the observed rate exceeds the critical crash rate, the observed rate is shaded

A serious injury crash occurred and is combined with fatal crashes due to the severity.

*Source: ODOT Transportation Development Division, Transportation Data Section, Crash Analysis and Reporting Unit*

Along Interstate 5 within the IMSA, there was a low frequency crashes. In the 5-year analysis period, there were 30 freeway crashes with 14 in the northbound direction, and 16 in the southbound. This translates to 6 freeway crashes per year, both directions combined. The 5-year crash rate for the northbound freeway segment is 0.34 crashes per million vehicle miles traveled (crashes/mvmt), and the southbound segment is 0.44 crashes/mvmt. These crash rates are comparable with the statewide average crash rates for interstate freeways of 0.40 crashes/mvmt; however, higher rates are typically expected adjacent to ramp connections when compared to mainline segments. Fixed object collisions were the most common crash type among mainline crashes (40%). Six fixed object crashes occurred in each of the southbound and northbound directions. Three of these fixed object crashes occurred during icy conditions, and 4 were attributed to excessive speed for roadway conditions or reckless behavior. One serious injury, fixed object crash occurred near the northbound off ramp.

### *4.8.2. Network Screening of Crash Sites*

The Highway Safety Manual (HSM) provides guidance on how to identify crash sites within a study area that have greatest potential "to realize a reduction in crash frequency with implementation of a countermeasure." A variety of network screening techniques are provided for study areas. These techniques rely on grouping crash sites by general characteristics (intersection, segment) and by specific features, such as traffic control (signal versus STOP sign) number of approaches, or travel lanes. Once grouped, the various screening techniques rank the individual locations using statistical analysis of the data within that specific sample of crash sites. The selection of the applicable screening process depends on a variety of data factors but most screening options provide similar results.

The two interchanges have relatively small sets of crash data with 39 crashes in the entire Exit 40 IMSA and 32 crashes in the entire Exit 43 IMSA. Most of these crashes occurred on mainline freeway or on the freeway ramps. At Exit 40, two intersections had a combined 11 crashes and one segment had 2 crashes. At Exit 43, one segment had 2 crashes. No other locations had reported crashes.

With this small number of crash sites, the network screening methods cannot effectively be applied because, once sorted, there are too few locations with similar characteristics to effectively apply the formulas. Therefore, application of countermeasures will be considered for all of the reported crash sites as well as locations with other identified safety deficiencies.

### *4.8.3. Safety Priority Index System (SPIS)*

The SPIS is a method used in Oregon to identify safety problem areas along state highways. Highways are evaluated in approximately one-tenth mile increments (often grouped into larger segments). Each year these segments are ranked by assigning a SPIS score based on the frequency and severity of crashes observed, while taking traffic volume into account. When a segment is ranked in the worst (top) 10% of the index, a crash analysis is typically warranted and corrective actions are considered. There are no segments of Interstate 5 within the IMSA that are identified in the worst 10% of the most recent (2011) SPIS rankings.

## 4.9. Summary of Existing Deficiencies

Existing deficiencies identified through the operational and safety analyses are summarized in Table 4-8.

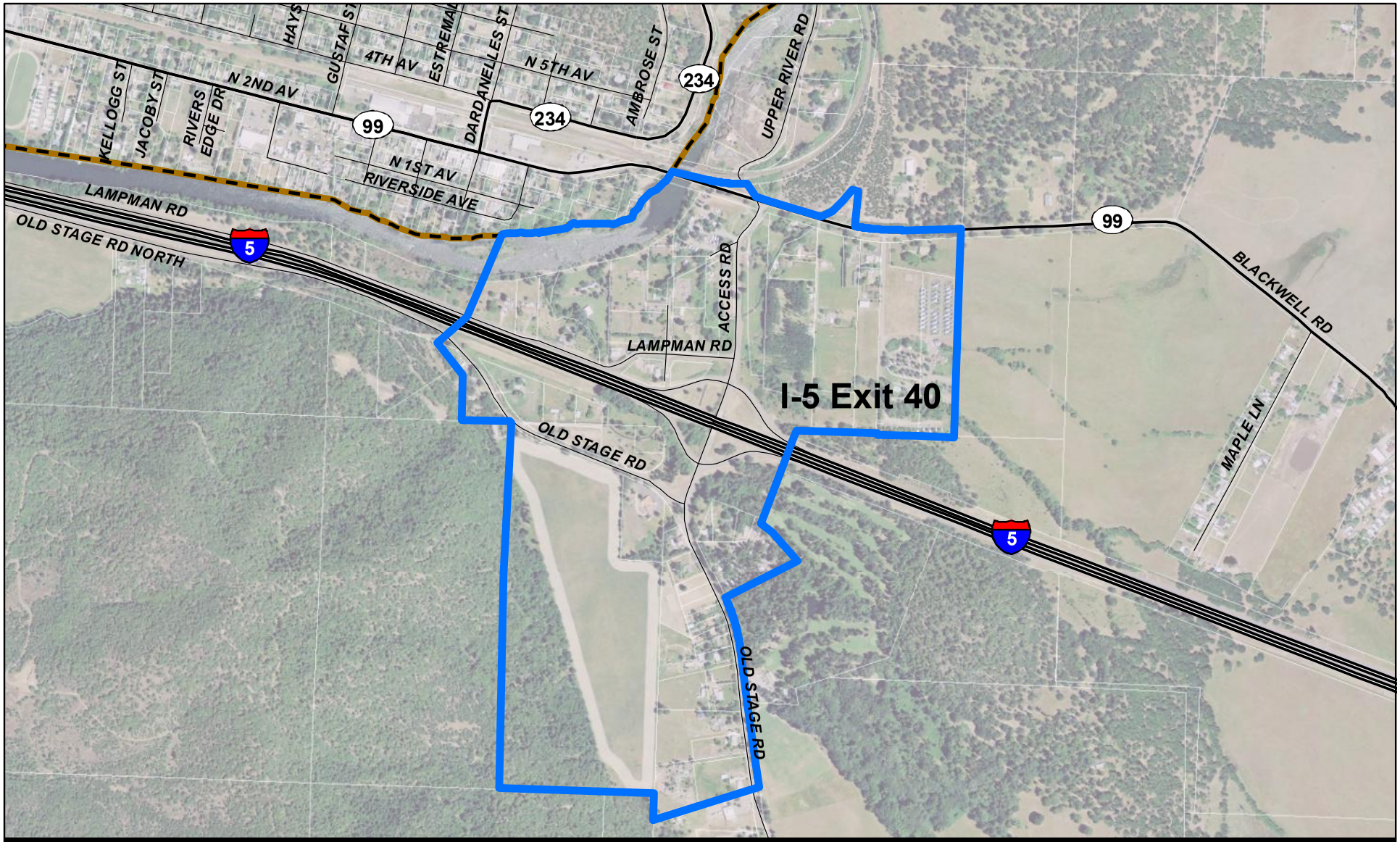
**Table 4-8. Summary of Existing Deficiencies**

| Deficiency | Location | Related Goals |
|---|---|---|
| **Safety** | | |
| Safety | ***I-5 Exit 40***<br>▪ 4 fixed object crashes on the I-5 Northbound off ramp, one resulting in a serious injury crash during the 5-year analysis period<br>▪ 8 fixed object crashes occurred south of the I-5 Southbound on ramp during the 5-year analysis period:<br>▪ Highest crash segments/Intersections:<br>- I-5 mainline south of I-5 Southbound on ramp (8 crashes)<br>- I-5 mainline south of I-5 Northbound off ramp (6 crashes – 1 fatal)<br>- I-5 Northbound Ramp Terminal intersection with Access Road(7 crashes)<br>***I-5 Exit 43***<br>▪ Highest crash segments/Intersections:<br>- I-5 mainline south of I-5 Northbound off ramp (8 crashes)<br>- I-5 mainline south of I-5 Southbound on ramp (9 crashes) | ▪ Safety |

*Attachments:*
*Figure 4-1. Interchange Management Study Area*
*Figure 4-2. Existing Conditions (2012) PM Peak Hour Volumes*
*Figure 4-3. Existing Conditions (2012) Traffic Operations and Lane Configurations*

*Appendix A. Traffic Seasonal Factor**
*Appendix B. Traffic Operations Worksheets**
*Appendix C. ODOT Crash Analysis Reports (January 1, 2007 through December 31, 20011)**

**Available upon request*




**I-5 Exits 40 and 43 Interchange Area Management Plans**

1,000 500 0 1,000
Feet

**Source Data:** ESRI, Jackson County, NAIP 2009

**Legend**

- Interchange Management Study Area (IMSA)
- Urban Growth Boundary (UGB)
- Taxlot Boundaries indicated in white
- Interstate
- Highway
- Local Road

**DRAFT Figure 4-1a**
***Project Vicinity and Study Area***
***I-5 Exit 40***

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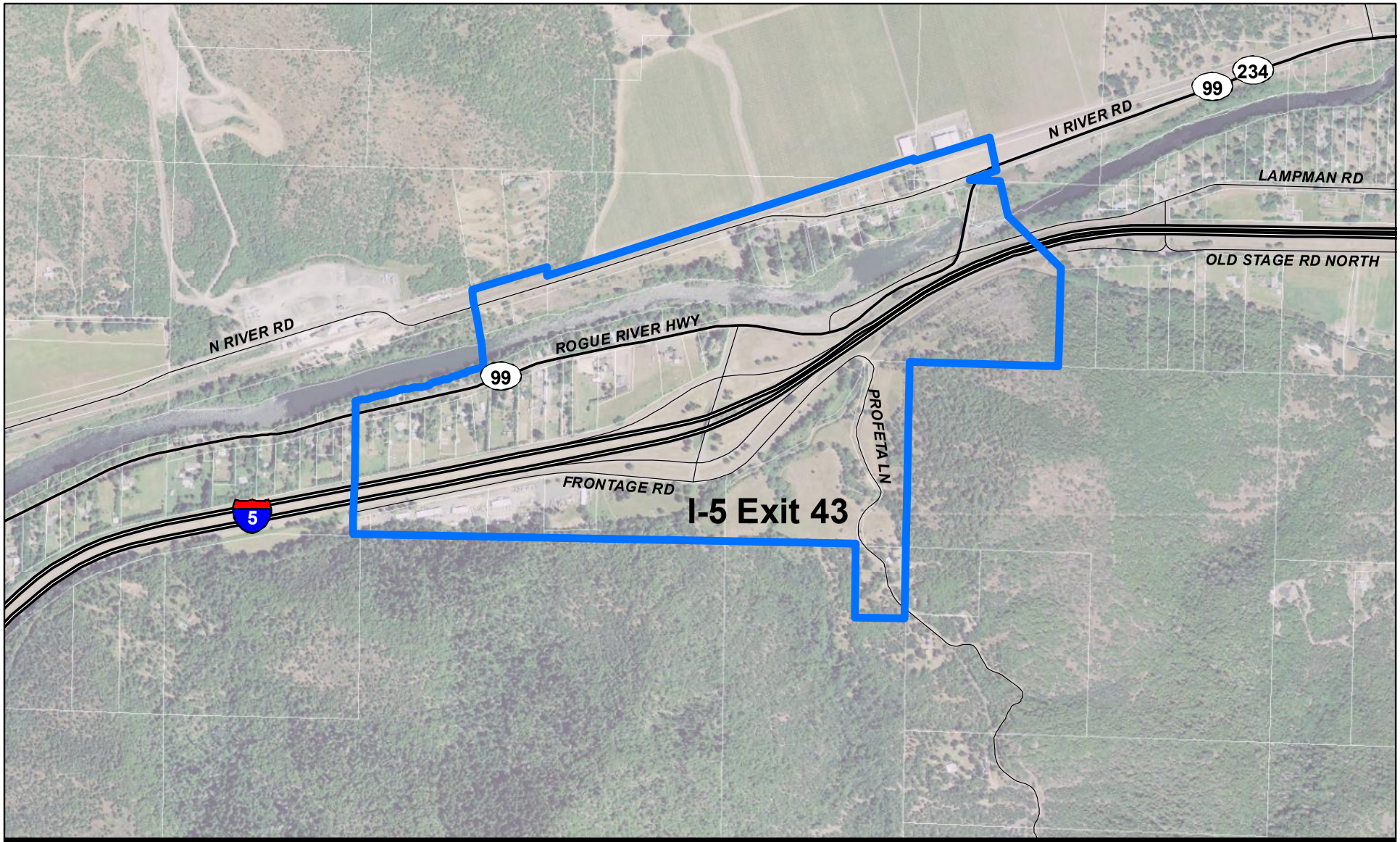


## I-5 Exits 40 and 43 Interchange Area Management Plans

1,000 500 0 1,000

Feet

**Source Data:** ESRI, Jackson County, NAIP 2009

**Legend**

- Interchange Management Study Area (IMSA)
- Urban Growth Boundary (UGB)
- Taxlot Boundaries indicated in white
- Interstate
- Highway
- Local Road

**DRAFT Figure 4-1b**
***Project Vicinity and Study Area***
***I-5 Exit 43***

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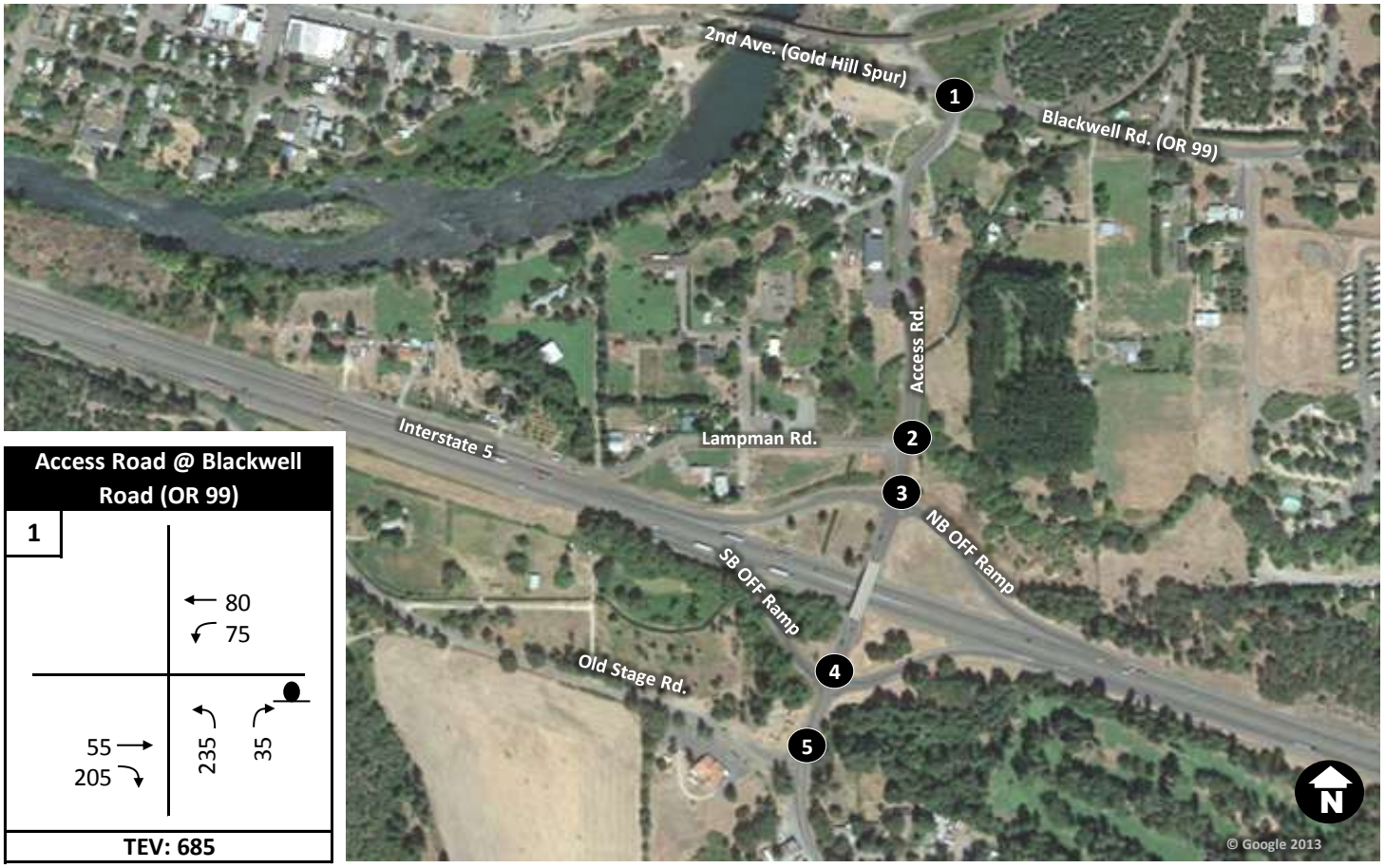



**Access Road @ Blackwell Road (OR 99)**

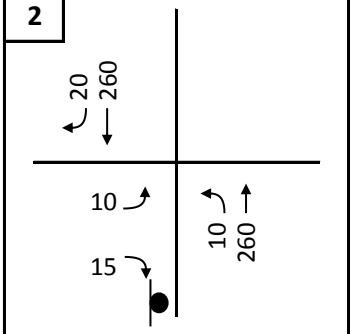
1




TEV: 685

**Access Road @ Lampman Road**

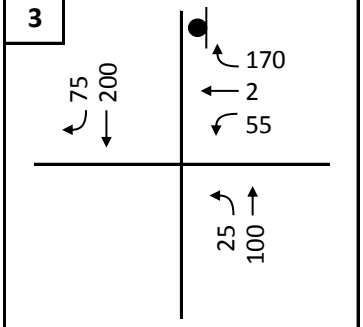
2




TEV: 575

**Access Road @ I-5 NB Ramps**

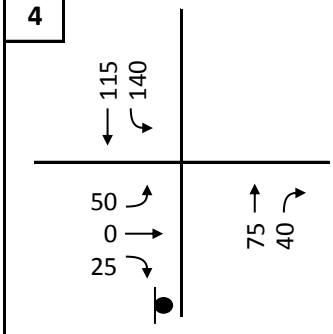
3




TEV: 627

**Access Road @ I-5 SB Ramps**

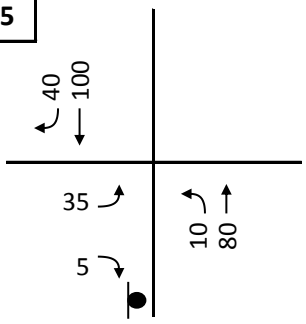
4




TEV: 445

**Access Road @ Old Stage Road**

5




TEV: 270

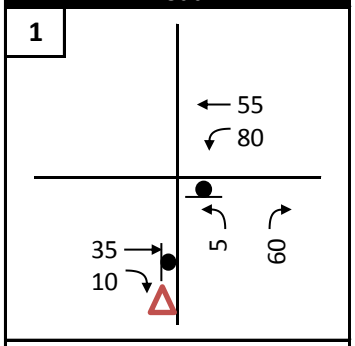
## I-5 Exits 40 and 43 Interchange Area Management Plans

**Legend**

- Allowable Movement
- TEV: Total Entering Volume
- ### PM Peak Hour Turning Movement Volume
- STOP Controlled Approach
- Yield Controlled Movement

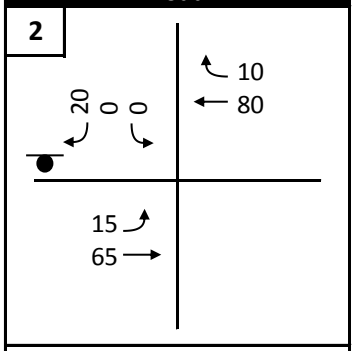
**DRAFT Figure 4-2a**
*Existing (2012)*
*PM Peak Hour Volumes*
*I-5 Exit 40*

## OR 99/OR 234 @ N. River Road



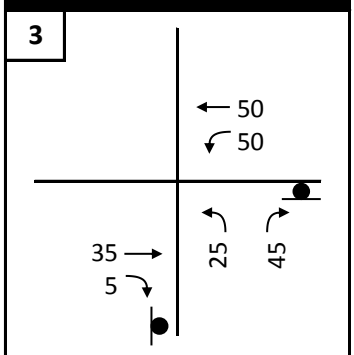

TEV: 230

## OR 99/OR 234 @ Lampman Road



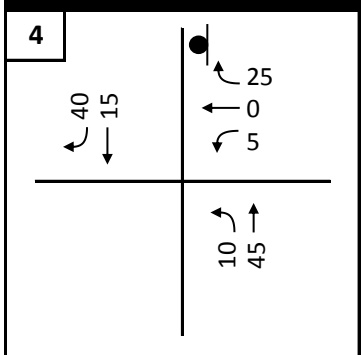

TEV: 190


## Main Street @ OR 99/OR 234



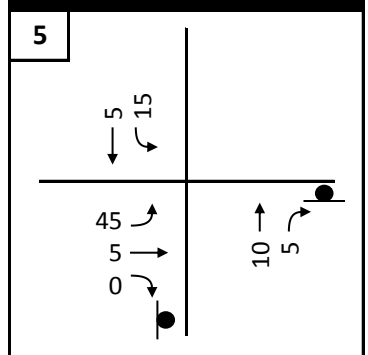

TEV: 210

## Main Street @ I-5 NB Ramps



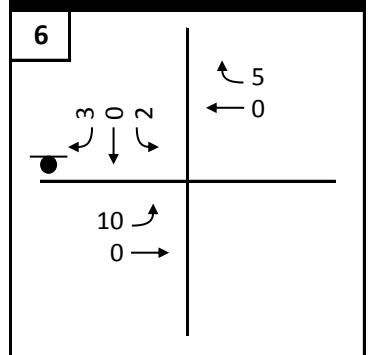

TEV: 140

## Main Street @ I-5 SB Ramps




TEV: 85

## Main Street @ Profetta Lane



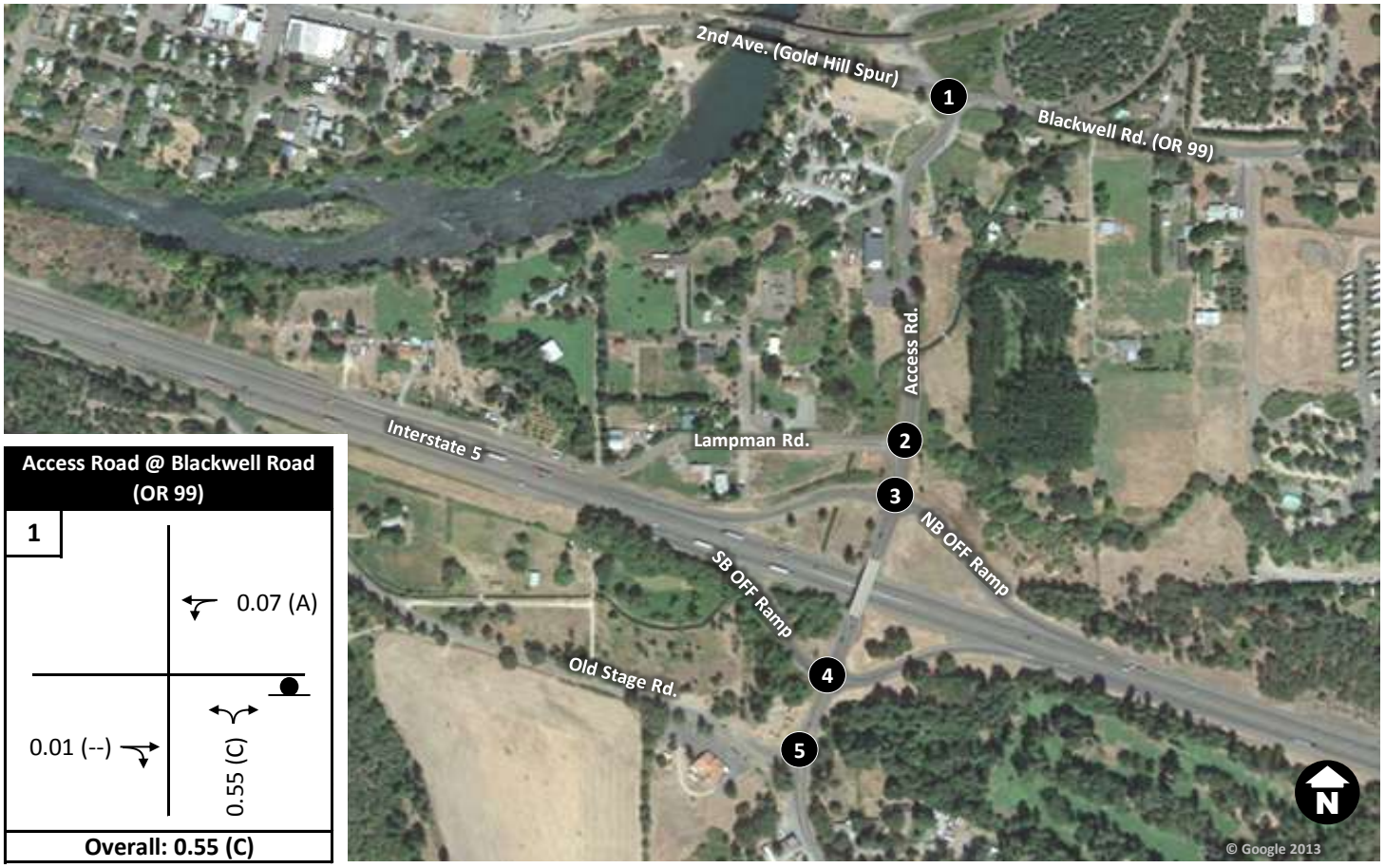

TEV: 20

**I-5 Exits 40 and 43 Interchange Area Management Plans**

**Legend**

- Allowable Movement
- STOP Controlled Approach
- TEV: Total Entering Volume
- Yield Controlled Movement
- ### PM Peak Hour Turning Movement Volume

**DRAFT Figure 4-2b**
*Existing (2012)*
*PM Peak Hour Volumes*
*I-5 Exit 43*




**Access Road @ Blackwell Road (OR 99)**

1

0.07 (A)

0.01 (--)

0.55 (C)

**Overall: 0.55 (C)**

**Access Road @ Lampman Road**

2

0.01 (--)

0.06 (B)

0.01 (A)

**Overall: 0.06 (B)**

**Access Road @ I-5 NB Ramps**

3

0.01 (--)

0.29 (B)

0.02 (A)

**Overall: 0.29 (B)**

**Access Road @ I-5 SB Ramps**

4

0.12 (A)

0.20 (B)

0.01 (--)

**Overall: 0.20 (B)**

**Access Road @ Old Stage Road**

5

0.01 (--)

0.07 (B)

0.01 (A)

0.01 (--)

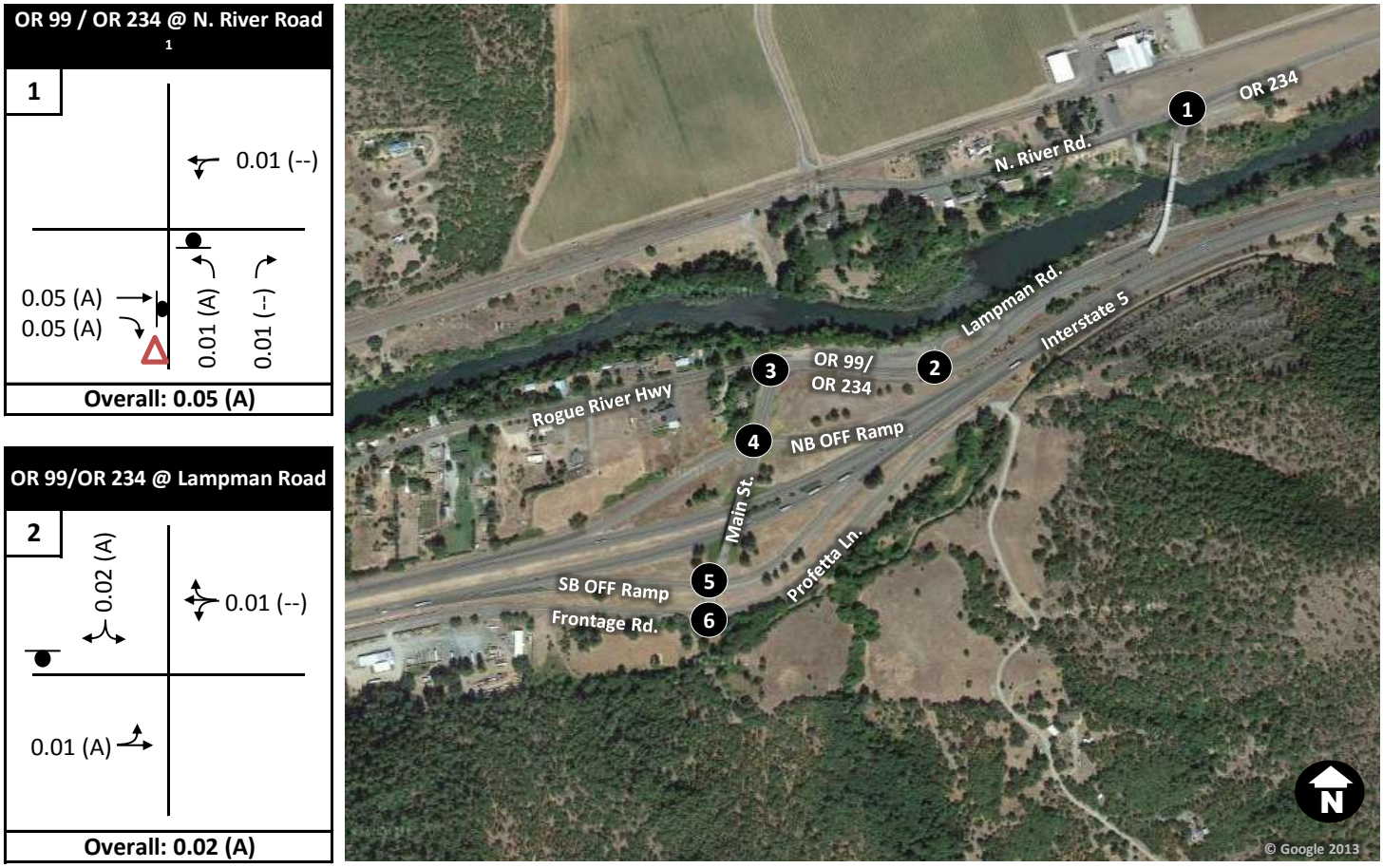
**Overall: 0.07 (B)**

## I-5 Exits 40 and 43 Interchange Area Management Plans

**Legend**

- Lane Configuration
- 0.01 (A) Lane Group V/C (LOS)
  *Volume-to-Capacity Ratio (Level of Service)*
- (--) LOS only reported for stopped or yielding movement
- STOP Controlled Approach
- Yield Controlled Movement

**DRAFT Figure 4-3a**
*Existing (2012)*
*PM Peak Hour Operations*
*I-5 Exit 40*




## I-5 Exits 40 and 43 Interchange Area Management Plans

**Legend**

- Lane Configuration
- 0.01 (A) Lane Group V/C (LOS)
  *Volume-to-Capacity Ratio (Level of Service)*
- (--) LOS only reported for stopped or yielding movement
- STOP Controlled Approach
- Yield Controlled Movement

*1 Intersection operations analyzed with alternative geometry*

*2 Intersection operations based on HCM 2000 Methodology*

**DRAFT Figure 4-3b**
*Existing (2012)*
*PM Peak Hour Operations*
*I-5 Exit 43*