TECHNICAL MEMORANDUM #4

METHODOLOGY AND ASSUMPTIONS MEMORANDUM

Date: May 21, 2024

To: Oregon Department of Transportation (ODOT), Region 3

From: Angela Rogge, PE, Janet Jones, PE, and Michael Bronsen, EIT – David Evans and Associates, Inc.

Subject: I-5 Exits 124/125 Interchange Area Management Plan & Garden Valley Corridor Plan

This memorandum documents the methodology and key assumptions to be used in the transportation analyses of the I-5 exits 124/125 Interchange Area Management Plan (IAMP) and the Garden Valley Corridor Plan (GVCP) under existing and future conditions. Analyses will include assessment of traffic operations, safety, and multimodal conditions. The Oregon Department of Transportation's (ODOT's) current Analysis Procedures Manual, Version 2 (APM) will guide methodologies and assumptions for this analysis.

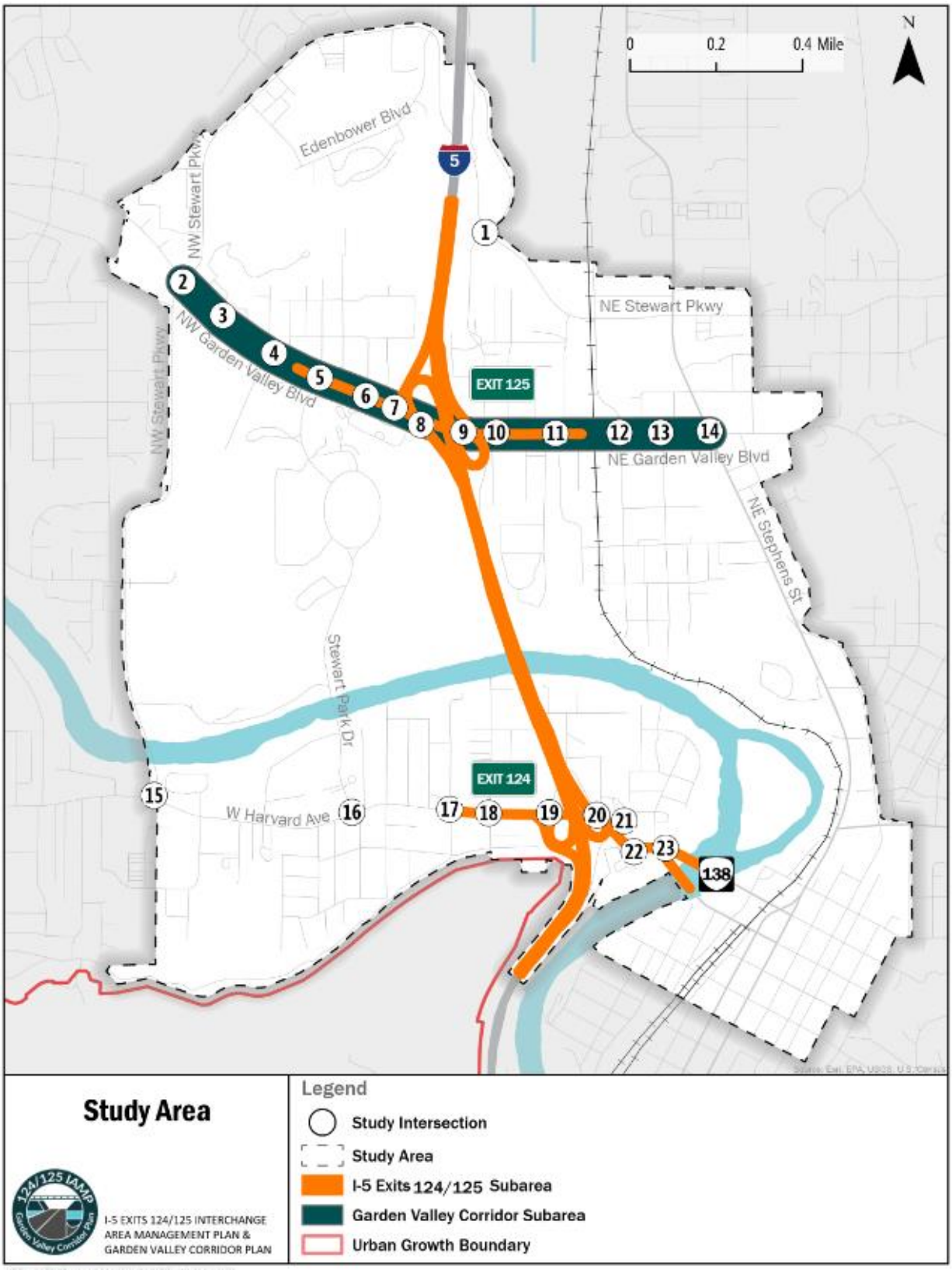
1 STUDY AREA

To help define the extent of the land use and transportation review for this study effort, a study area has been drafted as depicted in Figure 1. As the figure shows, the study area has been drawn to include those areas within the vicinity of the two interchanges that have or are expected to have a direct impact on the daily function of the Exit 124 and Exit 125 interchanges, as well as the Garden Valley corridor.

This study area includes two distinct subareas for detailed operational and access analysis:

- I-5 Exits 124/125 Interchange Subarea: Includes roads/accesses within a ¼-mile of the ramp terminals and the merge, diverge and weaving area of the I-5 mainline.
- Garden Valley Corridor (GVC) Subarea: Garden Valley Boulevards between and including the intersections with Stewart Parkway and Stephens Street.

FIGURE 1. STUDY AREA



2 STUDY INTERSECTIONS / TRAFFIC DATA COLLECTION

The transportation and traffic analysis will be based on counts collected in 2023 and 2024 and adjusted to year 2024 30th highest hour volumes (30HV). The project study area includes 23 intersections as shown above in Figure 1 and listed in Table 1.

Traffic counts provided by ODOT will serve as the basis for volume development. All counts include traffic by mode (vehicle, pedestrian, and bicycle movements), are summarized in 15-minute intervals, and include vehicle classifications. Table 1 summarizes the traffic count dates and time periods for each study intersection. Traffic turning movement counts for the free-flowing ramp movements at intersections 9 and 20 will be developed by balancing inbound and outbound traffic at adjacent intersections.

TABLE 1. STUDY INTERSECTIONS AND TRAFFIC COUNTS

ID	INTERSECTION	COUNT DATE	COUNT TIME
1	Stewart Pkwy at Mulholland Dr / Aviation Dr	4/12/2023	0600-2200
2	Garden Valley Blvd at Stewart Pkwy	4/10/2023	0600-2200
3	Garden Valley Blvd at Sizzler entrance	4/17/2024	1400-1800
4	Garden Valley Blvd at Goetz St / Duck Pond St	4/12/2023	1400-1800
5	Garden Valley Blvd at Estelle St / Veterans Way	4/5/2023	0600-2200
6	Garden Valley Blvd at Garden Valley Shopping Center / BLM	4/5/2023	0600-2200
7	Garden Valley Blvd at Southbound Exit Ramp	4/18/2023	0600-2200
8	Garden Valley Blvd at Southbound Entrance Ramps	4/16/2023	0600-2200
9	Garden Valley Blvd at Northbound Entrance Ramps	N/A	
10	Garden Valley Blvd at Northbound Exit Ramp/NW Mulholland Dr	4/5/2023	0600-2200
11	Garden Valley Blvd at Highland St	4/26/2023	1400-1800
12	Garden Valley Blvd at Airport Rd/Cedar St	4/5/2023	0600-2200
13	Garden Valley Blvd at Walnut St	4/26/2023	0600-2200
14	Garden Valley Blvd at Stephens St	4/5/2023	0600-2200
15	Harvard Ave at Stewart Pkwy	4/10/2023	0600-2200
16	Harvard Ave at Stewart Park Dr	4/10/2023	0600-2200
17	Harvard Ave at Harrison St	4/12/2023	1400-1800
18	Harvard Ave at Umpqua St	4/12/2023	0600-2200
19	Harvard Ave at Southbound Ramps / Bellows St	4/18/2023	0600-2200
20	Harvard Ave at Northbound Entrance Ramps	4/18/2023	0600-2200
21	Harvard Ave at Northbound exit ramp / Roseburg High School	4/17/2024	0600-2200
22	Harvard Ave at Corey Ct	4/12/2023	1400-1800
23	Harvard Ave at Madrone St	4/12/2023	0600-2200

Traffic counts on limited-access, continuous flow facilities include ramp tube classification counts at the locations summarized in Table 2.

TABLE 2. INTERSTATE RAMP AND MAINLINE

ID	INTERSECTION	COUNT DATES	COUNT TIME
1	Exit 125 westbound to southbound loop entrance ramp	4/16/2023–4/18/2023	2030-2030
2	Exit 125 eastbound to northbound loop entrance ramp	4/16/2023–4/18/2023	2130-2130
3	Exit 125 westbound to northbound entrance ramp	4/16/2023–4/18/2023	2000-2000
4	Exit 125 eastbound to southbound entrance ramp	5/2/2023–5/4/2023	0445-0445
5	Exit 124 eastbound to southbound entrance ramp	4/16/2023–4/18/2023	2045-2045
6	Exit 124 westbound to northbound entrance ramp	4/16/2023–4/22/2023	0445-0445
7	Exit 124 eastbound to northbound loop entrance ramp	5/2/2023–5/4/2023	0500-0500

3 VOLUME DEVELOPMENT

3.1 DESIGN HOUR VOLUMES – EXISTING CONDITIONS (2023)

Data for existing weekday counts will be reviewed to determine which hour is the highest traffic demand hour for the study area. Turning movements, peak hour factors, vehicle classification, and other data describing demand in the study area will be derived for this peak hour for all intersections, links, and freeway segments.

Consistent with the APM, 16-hour counts were obtained at the ramp terminal intersections, other arterial/arterial intersections, and unsignalized intersections that may need to be signalized. Traffic counts were collected in April 2023 over several days for most intersections. Entrance ramp counts were collected in April 2023, and two intersection counts are being collected in April 2024. All counts will summarize non-motorized transportation movements by volume, type, and direction for every location.

3.1.1 Seasonal Adjustment Factors

Since traffic counts were taken during various times of the year, data from varying months will need to be converted to peak month equivalents using calculated seasonal adjustment factors (SAFs). The Transportation Planning and Analysis (TPAU) unit at ODOT has established three methods for developing seasonal factors, all of which rely on data collected using Automatic Traffic Recorders (ATRs): 1) On-Site ATR Method; 2) ATR Characteristic Table Method; and 3) ATR Seasonal Trend Table Method. To accommodate the varying road types within the study area, different methods were used to develop seasonal factors for I-5 Ramps and all other streets. This is similar to the methodology used in the previous 2019 TSP update and IAMPs 124, 125, and 127.

There are no ATRs that meet all of ODOT's recommendations for utilizing the on-site ATR method. The on-site ATR method requires the ATR to be located within or near the project area. If the ATR is located outside the project area, there should be no major intersections between the ATR and the project area, and the Average Annual Daily Traffic (AADT) collected by the ATR must be within 10 percent of the AADT near the project area. This

memorandum calculates the seasonal factors for the count month of April. The traffic volumes will be adjusted using the appropriate seasonal factor by time of year to determine the 30th highest hour volumes.

3.1.1.1 I-5 Seasonal Adjustment Factor

The Characteristic Table Method requires the ATR to be located on a facility that shares similar characteristics with the facility to be adjusted, such as seasonal traffic trends, area type, and number of lanes. There are no ATRs that perfectly meet the guidelines for using the Characteristic Table Method, so the SAFs for I-5 will be developed by combining data from both the Characteristic Table Method and the Seasonal Trend Table. Based on the characteristics of I-5 through the study area (Interstate Highway and Small Urban Area), two ATRs were selected to develop seasonal factors: 1) ATR 10-005, and 2) ATR 09-020.

ATR 10-005 is located along I-5, 0.53 miles north of the Winchester interchange and north of Roseburg. ATR 09-020 is located along US-97, 0.79 miles south of SW Yew Avenue in Redmond. US-97 is classified as a State Highway in an Urbanized area and is part of the National Highway System. Although ATR 10-005 is not within 10% of the study area AADT, its location on I-5 and proximity to the study area reflects the conditions of I-5 mainline and ramp traffic in the study area.

ATR 09-020 provides a more similar weekday, commuter traffic trend in a small urban fringe area. Although ATR 09-020 is not within 10% of the study area AADT, it is representative of the more commuter-like trend that is found for travelers on I-5 between exits 124 and 125 in Roseburg.

The SAFs calculated from each ATR will also be averaged with the SAF calculated from the seasonal trend table to ensure a well-moderated factor is reached. The information used in choosing the ATRs is summarized in Table 2 along with the SAF calculated for each one.

TABLE 3. CHARACTERISTICS OF STUDY AREA AND CHOSEN ATRS.

	STUDY AREA	ATR 10-005	ATR 09-020
Location	I-5, MP 123.3 – MP 125.9	I-5, MP 130.1, 4.2 miles north of Study Area	US-97, MP 124.4, 0.79 miles south of Yew Ave.
Season Traffic Trend		Interstate Non-Urban	Commuter
Area Type	Small Urban	Small Urban Fringe	Small Urban Fringe
Weekly Traffic Trend		Weekend	Weekday
Number of Lanes	4/5	4	4
2022 AADT	46,894	33,700	37,600
OHP Classification	Interstate Highway	Interstate Highway	Statewide Highway
County	Douglas	Douglas	Deschutes
Peak Month		July	August
Seasonal Adjustment Factor		1.12	1.07

Source: ODOT

Based on historical traffic data provided by the ATRs, the Peak Month generally occurs in June or July. The trends 'Interstate Urbanized' and 'Commuter' from the seasonal trend table were both explored. Table 3 summarizes the calculations of the average SAF based on the count dates and the seasonal trend table.

TABLE 4. INTERSTATE SEASONAL ADJUSTMENT FACTOR – SEASONAL TREND TABLE METHOD

	INTERSTATE URBANZED			COMMUTER			
DATE	COUNT DATE FACTOR	PEAK PERIOD FACTOR	SAF	COUNT DATE FACTOR	PEAK PERIOD FACTOR	SAF	AVERAGE SAF
April 1	0.9995	0.9443	-	0.9959	0.9500	-	-
April 5	0.9985	0.9443	1.057	0.9936	0.9500	1.046	1.052
April 15	0.9962	0.9443	-	0.9879	0.9500	-	-
April 16*	0.9958	0.9443	1.055	0.9875	0.9500	1.040	1.047
April 17*	0.9954	0.9443	1.054	0.9871	0.9500	1.039	1.047
April 18*	0.9950	0.9443	1.054	0.9867	0.9500	1.039	1.046
April 21*	0.9939	0.9443	1.053	0.9855	0.9500	1.037	1.045
April 22*	0.9935	0.9443	1.052	0.9851	0.9500	1.037	1.045
April 24*	0.9927	0.9443	1.051	0.9843	0.9500	1.036	1.044
April 25*	0.9924	0.9443	1.051	0.9839	0.9500	1.036	1.043
May 1	0.9901	0.9443	-	0.9814	0.9500	-	-
May 2*	0.9896	0.9443	1.048	0.9810	0.9500	1.033	1.040
May 3*	0.9892	0.9443	1.048	0.9805	0.9500	1.032	1.040
May 15	0.9840	0.9443	-	0.9749	0.9500	-	-
Averaged SAFs across count dates:			1.052			1.037	1.045

*Factors for count date are linearly interpolated from the factors given for dates in ODOT's seasonal trend table.

From the seasonal adjustment factors calculated from ATRs 10-005 and 09-020, 1.12 and 1.07 respectively, and the averaged factor calculated from the seasonal trend table, 1.04, **the average seasonal adjustment factor that will be applied to the I-5 traffic volumes is 1.08.**

3.1.1.2 Local Street Network Seasonal Adjustment Factor

The SAFs for traffic on the local street network were calculated based on the count date using the ATR Seasonal Trend Method for a commuter route. These factors will be applied to the non-freeway study area intersections. **For counts collected on April 5, the seasonal adjustment factor is 1.05. For counts collected between April 10 and April 26, the seasonal adjustment factor is 1.04.**

TABLE 5. LOCAL STREET SEASONAL ADJUSTMENT FACTOR – SEASONAL TREND TABLE METHOD

DATE	COMMUTER COUNT DATE FACTOR	COMMUTER PEAK PERIOD FACTOR	COMMUTER SAF
April 1	0.9959	0.9500	-
April 5*	0.9936	0.9500	1.046
April 10*	0.9908	0.9500	1.043
April 12*	0.9896	0.9500	1.042
April 15	0.9879	0.9500	-
April 16*	0.9875	0.9500	1.040
April 18*	0.9867	0.9500	1.039
April 26*	0.9834	0.9500	1.035
May 1	0.9814	0.9500	-

*Factors for count date are linearly interpolated from the factors given for dates in ODOT's seasonal trend table.

3.1.2 Growth Factors

Traffic counts for this project were collected in April 2023 and April 2024. The baseline year will be 2024 as this is the most current year of data and growth factors will be applied accordingly to all counts taken before 2024.

The current Roseburg TSP uses ODOT's most current Future Volume Table and assumes linear growth. If more than one growth factor applies to a study area intersection, the factors will be averaged and applied to all movements of the study intersection. If growth factors are used, the factors will be submitted to ODOT for approval and the calculations will be available as an amendment to this document.

The growth rate of the I-5 mainline and ramps in the study area has been erratic over the last five years which leads to the need to use the Future Highway Volume Table. Site ID 45 (HWY 1, MP 124.78) was used as it sits in the middle of the study area, in between Exits 124 and 125. The annual growth rate calculated for this site, rounded to the nearest half a percent, is 0.5%. This growth rate will be applied to all 2023 mainline and ramp counts to grow them to the baseline year of 2024.

The growth rate for OR-138/Harvard Avenue was also calculated using the Future Highway Volume Table. Site ID 4781 (HWY 138, MP -0.70) was used, just west of Madrone St. A growth rate of 1% was calculated and will be applied to all 2023 counts performed on Harvard Ave. Garden Valley Boulevard is not a designated Oregon Highway and therefore does not appear on the Future Highway Volume Table. Since the Garden Valley Boulevard is in close proximity to and in the same urban area as Harvard Ave. the same growth factor will be assumed, 1%. This growth factor will be applied to all 2023 counts performed on Garden Valley Blvd.

3.2 FUTURE CONDITION VOLUMES

Future year 2045 traffic volumes will be obtained from the Roseburg Travel Demand Model. The model uses a 2019 base year model and a 2045 future year model to forecast traffic volumes in the Roseburg area. Because the study area lies entirely within the area modeled by the Roseburg Travel Demand Model, there should be no need to make adjustments using the ODOT Statewide Integrated Model. The post-processing procedures will follow APM and the National Cooperative Highway Research Program (NCHRP) Report 765 guidelines to convert model volumes to design hour volumes.

3.2.1 Balancing and Rounding

The 30HV will be rounded to the nearest five vehicles and the volumes will be entered in Synchro and balanced accordingly. As a conservative measure, it is preferable to add traffic to the system instead of removing it; this approach will be taken whenever possible. Volume imbalances between intersections will be managed to represent the volumes into and out of residential areas and commercial lots between study area intersections, whenever applicable.

4 TRAFFIC EVALUATION

Below is a summary of the methods, tools and parameters to be used for evaluating traffic operations.

4.1 TRAFFIC MOBILITY TARGETS

For State facilities, the Oregon Highway Plan (OHP) and the Highway Design Manual (HDM) will be used in the assessment of intersection/ramp terminal and segment operations on state facilities. Both documents base their mobility performance on the calculation of volume-to-capacity (v/c). However, the standards in the HDM are based on higher performance levels than those in the OHP. The mobility targets from the OHP will be applied to the existing and future baseline (no-build) analyses while the standards from the HDM will be applied to the evaluation of future modernization/build alternatives.

For City facilities, operations will be evaluated based on v/c and level of service (LOS) with a peak hour factor (PHF) of 1.0. The mobility targets for each study intersection are summarized in Table 6.

TABLE 6. STUDY AREA MOBILITY TARGETS

ID	INTERSECTION	JURISDICTION	EXISTING/NO-BUILD MOBILITY TARGET	BUILD MOBILITY TARGET
1	Stewart Pkwy at Mulholland Dr / Aviation Dr	Roseburg	0.95, LOS E	0.95, LOS E
2	Garden Valley Blvd at Stewart Pkwy	Roseburg	0.95, LOS E	0.95, LOS E
3	Garden Valley Blvd at Sizzler entrance	Roseburg	0.95, LOS E	0.95, LOS E
4	Garden Valley Blvd at Goetz St / Duck Pond St	Roseburg	0.95, LOS E	0.95, LOS E
5	Garden Valley Blvd at Estelle St / Veterans Way	Roseburg	0.95, LOS E	0.95, LOS E
6	Garden Valley Blvd at Garden Valley Shopping Center / BLM	Roseburg	0.95, LOS E	0.95, LOS E
7	Garden Valley Blvd at Southbound Exit Ramp	ODOT	0.85	0.75
8	Garden Valley Blvd at Southbound Entrance Ramps	ODOT	0.85	0.75
9	Garden Valley Blvd at Northbound Entrance Ramps	ODOT	0.85	0.75
10	Garden Valley Blvd at Northbound Exit Ramp/NW Mulholland Dr	ODOT	0.85	0.75
11	Garden Valley Blvd at Highland St	Roseburg	0.95, LOS E	0.95, LOS E
12	Garden Valley Blvd at Airport Rd/Cedar St	Roseburg	0.95, LOS E	0.95, LOS E
13	Garden Valley Blvd at Walnut St	Roseburg	0.95, LOS E	0.95, LOS E
14	Garden Valley Blvd at Stephens St	Roseburg	0.95, LOS E	0.95, LOS E
15	Harvard Ave at Stewart Pkwy	Roseburg	0.95, LOS E	0.95, LOS E
16	Harvard Ave at Stewart Park Dr	Roseburg	0.95, LOS E	0.95, LOS E
17	Harvard Ave at Harrison St	Roseburg	0.95, LOS E	0.95, LOS E
18	Harvard Ave at Umpqua St	Roseburg	0.95, LOS E	0.95, LOS E

ID	INTERSECTION	JURISDICTION	EXISTING/NO-BUILD MOBILITY TARGET	BUILD MOBILITY TARGET
19	Harvard Ave at Southbound Ramps / Bellows St	ODOT	0.85	0.75
20	Harvard Ave at Northbound Entrance Ramps	ODOT	0.85	0.75
21	Harvard Ave at Northbound Exit Ramp / Roseburg High School	ODOT	0.85	0.75
22	Harvard Ave at Corey Ct	ODOT	0.90	0.75
23	Harvard Ave at Madrone St	ODOT	0.90	0.75

Table 6 presents the mobility standards for study intersections. The v/c target ratio of 0.80 will be used for merge, diverge, weaving, and mainline sections for Interstate Highways outside Metro and within an Urban Growth Boundary (UGB).

4.2 INTERSECTION TRAFFIC OPERATIONS

The operational analysis will evaluate v/c ratios and LOS at ramp terminals and intersections using the Synchro software (Version 12 or newer). The Synchro network will be modeled using ODOT's current Synchro template. The files will be saved in a compatible version for ODOT review. The overall v/c will be manually calculated for signalized intersections using the HCM6 outputs. Throughout the analysis process, TPAU and Region 3 Traffic staff will review modeling assumptions, analysis settings, and other assumptions to help ensure consistency of data with other studies under way.

4.2.1 Traffic Operations Analysis Procedures

In conjunction with reviewing v/c and LOS, a microsimulation analysis will be conducted using SimTraffic software to determine 95th percentile queues and evaluate corridor delays.

A select-link or zone analysis (to be determined by Agency) using the Roseburg travel demand model will be conducted to further investigate local travel patterns. Analysis will tag specific links or zones in the model, run the traffic simulations, and display traffic by direction/movement and volume. This analysis will help inform improvements that may be necessary in the future.

4.2.2 Traffic Signals

Traffic signal timing information will be obtained from ODOT Region 3 Traffic Section as needed. Signalized intersections will use HCM6 methods for obtaining intersection volume-to-capacity ratios. For study intersections where HCM6 methods have limitations to generate the capacity result, the analysis will follow the procedures in Chapter 13 of the APM.

An assessment of the addition or removal of traffic signals may be needed. Any assessments of new traffic signals will be reviewed using ODOT's ADT-based preliminary signal warrants and the Manual on Uniform Traffic Control Devices (MUTCD Warrant 1).

4.3 FREEWAY OPERATIONS

The freeway analysis will be compatible with HCM6 methods and use Oregon defaults per the APM. An evaluation of merge, diverge, weaving, and mainline analysis for segments one-half mile north, between, and one-half mile south of the interchange ramps will be conducted using HCS7 software.

4.4 ANALYSIS PARAMETERS

Parameters for traffic analysis will be gathered using varying sources and methodologies. Table 7 lists some of the possible sources that will be used on specific parameters.

If any parameters are not available from field visits or traffic count data, APM defaults will be used unless a different value is agreed upon with ODOT TPAU and Region 3 Traffic staff.

TABLE 7. ANALYSIS PARAMETERS

PARAMETER	DESCRIPTION	SOURCE
Intersection/Roadway Geometry	# of lanes, lane configuration, cross-sectional information, multimodal facilities	Roseburg TSP, TransGIS, field measurements, site visit, aerial images, GIS, ODOT Digital Video Log
Operational Data	Posted speeds, intersection control, parking, transit, access spacing, turn storage, lane capacity, rail crossing	Roseburg TSP, TransGIS, field measurements, local knowledge, site visit, APM, ODOT Digital Video Log
Peak Hour Factor	Peak Hour Factor	Calculated from new counts
Saturation Flow Rate	Ideal Saturation Flow Rate (for all movements)	1,750 passenger cars per hour green per lane
Traffic Volumes	30HV, AADT, Percent Heavy Vehicles	Calculated from new counts, ODOT
Traffic Operations	V/C, LOS	Calculated using HCM 6 (Synchro 11 or newer, Sidra v8))
Queuing	95th percentile queue lengths	Synchro 11 or newer, Sidra v8
Conceptual Alternatives Geometry	Applicable geometric and design elements of conceptual alternatives (lane configuration, storage, traffic control)	Consultant team, ODOT
Signal Timing	Signal timing plans	ODOT

5 CRASH ANALYSIS AND ACCESS SAFETY

Crash data for this project area will be obtained from the ODOT Crash Analysis and Reporting Unit for the most recent five complete years. The most recent Safety Priority Index System (SPIS) data will be obtained as well for the top 10% of SPIS sites. Data will be requested for the study area roads.

The study area evaluation will include an analysis of the most recent five-year crash history on state and non-state roadways at study area intersections. Where applicable, Consultant shall calculate the segment, intersection, and critical crash rates for the study area intersections. Intersection crash rates will be compared against the published 90th Percentile rates in the APM Table 4-1. Segment crash rates will be compared with the ODOT Crash Rate Table II which documents crash rates for mainline state highways by urban and rural area and by highway classification for the most recent five years of complete data. Any crash involving a fatality (or severe injury, Type K and A respectively according to the KABCO scale defined in APM Chapter 4) will also be analyzed and documented. Any pedestrian and/or bicycle crashes within the study area in the five-year evaluation period will be identified and documented.

Locations flagged as a concern in the development of this task may inform development of countermeasures or safety improvements in the development of Project alternatives. Consultant shall perform HSM Part C predictive analysis for within ¼-mile of the ramp terminals for locations exceeding segment or critical rates for the existing conditions. Consultant shall map locations of these safety issue areas and the SPIS sites.

Consultant shall determine if existing access, intersection and interchange spacing meets the OHP spacing requirements.

6 BICYCLE, PEDESTRIAN, AND TRANSIT ANALYSIS

The project will analyze bicycle, pedestrian, and transit operations in the study area using the Qualitative Assessment for transit and the Level of Traffic Stress for pedestrians and bicycles on study area roadways classified as collector or above. Both methodologies are outlined in Chapter 14 of the APM. The analysis for the aforementioned modes will be completed by segment. The segments will be created based on where logical breaks in the system exist (intersections with arterials, change in speed limit, etc.) The multi-modal evaluation will use the best available data and will be augmented by City and ODOT staff observations.