APPENDIX D–METHODOLOGY & ASSUMPTIONS MEMORANDUM

METHODOLOGY & ASSUMPTIONS MEMORANDUM

Date:	January 20, 2025	Kittelson Project No: 27003.31
To:	Project Management Team (PMT)	
From:	Kittelson Associates	
Subject:	Methodology & Assumptions Memorandum	

Introduction

This memorandum presents the methodology and assumptions to be used in the technical analyses for the Umatilla County Transportation System Plan (TSP) Update. The methodologies are based on guidance provided in the Oregon Department of Transportation (ODOT) Analysis Procedures Manual (APM – Reference 1) and direction provided by Umatilla County and ODOT staff. The methodology and assumptions include:

a. Data collection and volume development and;

b. Traffic analysis procedure for the study intersections under existing and planning horizon (no-build and build) traffic conditions;

This information will serve as a baseline for determining a comprehensive list of transportation needs and help identify, evaluate, and prioritize potential solutions as part of the TSP Update.

Study Area

The study area for the Umatilla County TSP Update consists of the multimodal transportation network within the Umatilla County. This includes twenty-two intersections under ODOT jurisdiction. The study intersections and study segments are identified in Figure 1; Table 1 lists the study intersections and specifies their jurisdiction and traffic control. All intersections are two-way stop-controlled intersections except for OR 332/ OR 339, which is an all-way stop-controlled intersection.

Figure 1: Study intersections

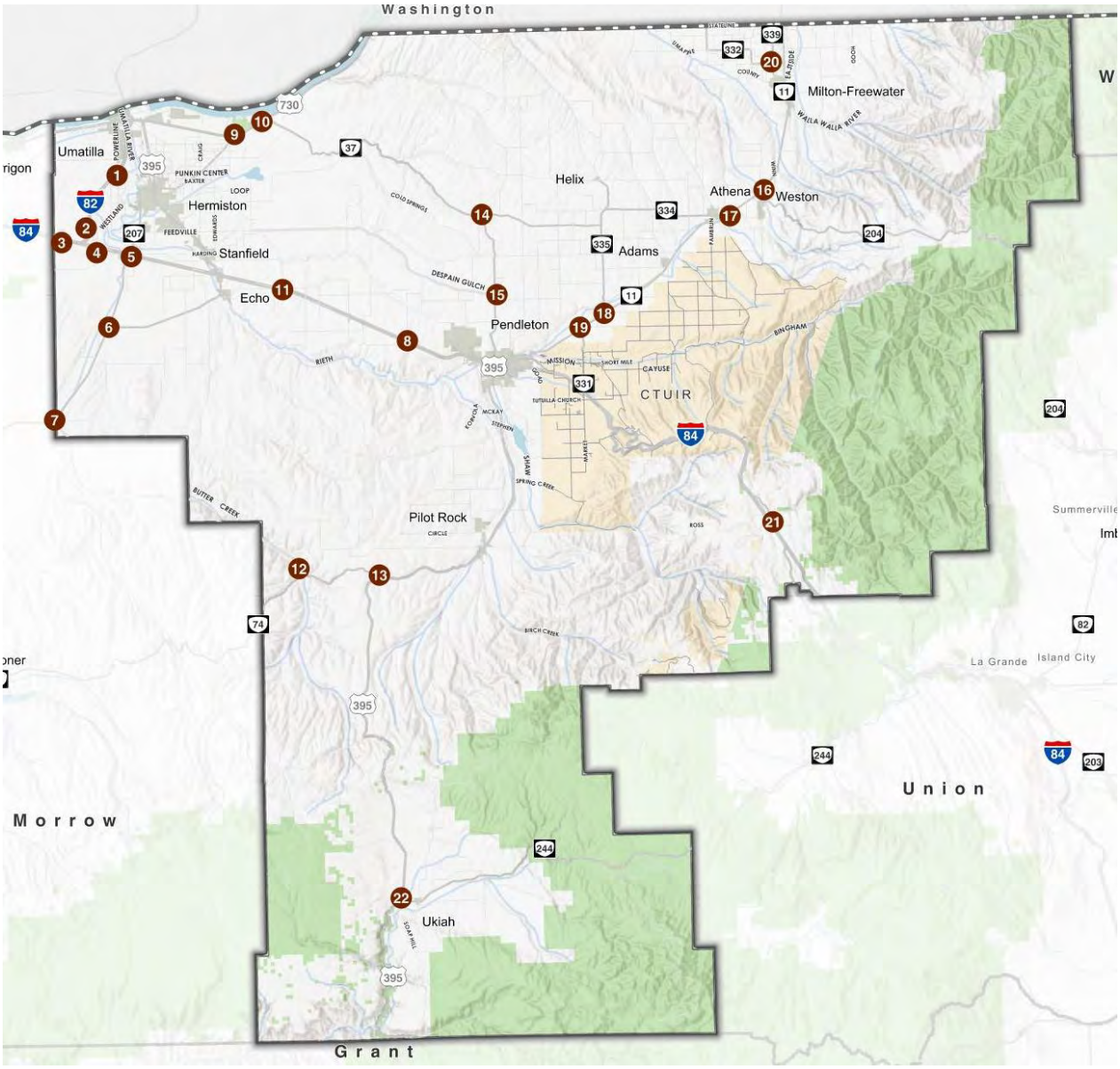


Table 1: Summary of Study Intersections

ID	Intersection	Type	Jurisdiction
1	I-82 @ Powerline Rd interchange ramp terminals	TWSC Intersection	ODOT
2	I-82 @ Lamb Rd interchange ramp terminals	TWSC Intersection	ODOT
3	I-84 @ Frontage Ln interchange ramp terminals	TWSC Intersection	ODOT
4	I-84 @ Westland Rd interchange ramp terminals	TWSC Intersection	ODOT
5	I-84 @ 0R207 (Hermiston) interchange ramp terminals	TWSC Intersection	ODOT
6	OR 207 @ HWY 320	TWSC Intersection	ODOT
7	OR 207 @ Butter Creek Rd	TWSC Intersection	ODOT
8	I-84 @ Barnhart Rd interchange ramp terminals	TWSC Intersection	ODOT
9	US 730 @ OR 207	TWSC Intersection	ODOT
10	OR 37@US 730	TWSC Intersection	ODOT
11	I-84 @ Gerome St/ Echo Rd interchange ramp terminals	TWSC Intersection	ODOT
12	OR 74 @ Butter Creek Rd	TWSC Intersection	ODOT
13	OR 74 @ US 395	TWSC Intersection	ODOT
14	OR 37 @ OR 334	TWSC Intersection	ODOT
15	OR 37 @ Despain Gulch Rd	TWSC Intersection	ODOT
16	OR 204 @ OR 11	TWSC Intersection	ODOT
17	OR 11 @ OR 334	TWSC Intersection	ODOT
18	OR 11@ OR 335	TWSC Intersection	ODOT
19	OR 11 @ OR 331	TWSC Intersection	ODOT
20	OR 332 @ OR 339	AWSC Intersection	ODOT
21	I-84 @ Old Hwy 30 (Meacham Interchange)	TWSC Intersection	ODOT
22	US 395 @ OR 244	TWSC Intersection	ODOT

Traffic Volume Development

The following sections provide information related to the traffic counts conducted at the study intersections and identify how the traffic counts will be used to develop existing and future traffic volumes.

Traffic Counts

Traffic counts were collected at the study intersections on various days in April 2022 and May 2023 by the Oregon Department of Transportation. All intersection counts were collected either over a 4-hour (2:00 to 6:00 p.m.) or a 24-hour period.

All intersection counts include the total number of pedestrians, bicyclists, and motor vehicles that entered the intersections in 15-minute intervals throughout the study periods. Table 2 summarizes the currently available information on the traffic counts.

Table 2: Details of traffic counts at study intersections

ID	Intersection	Count Date	Count Type
1	I-82 @ Powerline Rd interchange ramp terminals	5/16/2023	24 Hour
2	I-82 @ Lamb Rd interchange ramp terminals	5/16/2023	24 Hour
3	I-84 @ Frontage Ln interchange ramp terminals	5/16/2023	24 Hour
4	I-84 @ Westland Rd interchange ramp terminals	5/16/2023	24 Hour
5	I-84 @ 0R207 (Hermiston) interchange ramp terminals	5/15/2023	24 Hour
6	OR 207 @ HWY 320	5/16/2023	24 Hour
7	OR 207 @ Butter Creek Rd	5/16/2023	4-Hour
8	I-84 @ Barnhart Rd interchange ramp terminals	5/16/2023	24 Hour
9	US 730 @ OR 207	5/16/2023	4-Hour
10	OR 37@US 730	5/16/2023	4-Hour
11	I-84 @ Gerome St interchange ramp terminals	5/30/2023	24 Hour
12	OR 74 @ Butter Creek Rd	5/16/2023	4-Hour
13	OR 74 @ US 395	5/16/2023	24 Hour
14	OR 37 @ OR 334	5/16/2023	4-Hour
15	OR 37 @ Despain Gulch Rd	5/16/2023	4-Hour
16	OR 204 @ OR 11	5/16/2023	4-Hour
17	OR 11 @ OR 334	5/16/2023	4-Hour
18	OR 11@ OR 335	5/16/2023	4-Hour

ID	Intersection	Count Date	Count Type
19	OR 11 @ OR 331	5/16/2023	24 Hour
20	OR 332 @ OR 339	4/4/2022	16-Hour
21	I-84 @ Old Hwy 30 (Meacham Interchange)	5/16/2023	24 Hour
22	US 395 @ OR 244	5/22/2023	24 Hour

Seasonal Adjustment

Following the methodology outlined by ODOT's Analysis Procedures Manual (APM), seasonal adjustment factors were developed and are proposed to be applied to the traffic counts collected at the study intersections.

To determine the seasonal adjustment factor for each study intersection, the most appropriate method from the APM was selected based on the intersection's proximity to one of the ATRs and the consistency of traffic volumes between the study intersection and the ATR. Since none of the study intersections had proximity to any of the ATRs in the region, the on-site ATR method was not used.

Given the size of the study area and the numerous intersections distributed throughout it, seasonal adjustment factors were calculated using the Characteristic ATR and the Seasonal Trend methods to analyze the variation in seasonal adjustment factors across the county.

Table 3 and Table 4 presents seasonal adjustment factors based on the Characteristic ATR method. As shown in Table 3, five study intersections had corresponding characteristic ATRs based on the 2023 table. As shown in Table 4 the ADT values over the past five years (2023-2018) were used to calculate the seasonal adjustment factor. 2020 values were excluded from the analysis as the travel patterns varied greatly during the pandemic.

For intersections without a characteristic ATR, the Seasonal Trend table method was used to calculate the adjustment factors. Table 5 summarizes the seasonal adjustment factors for these study intersections based on the 2023 seasonal trend table.

Table 3: Seasonal Adjustment Factors in Umatilla County – Characteristic ATR Method

Map ID	Name	Count date	Highway AADT	Area	# Lanes	Weekly Trend	OHP Class	ATR 1	ATR 2	Seasonal Adjustment Factor
1	I-82 / Powerline Rd	5/16/2023	16149	Rural	4	WEEKDAY	INTERSTATE HWY	DNE	-	**-**
2	I-82 / Lamb Rd	5/16/2023	17648	Rural	4	WEEKEND	INTERSTATE HWY	30027	30004	**1.07**
3	I-84 / Frontage Ln	5/16/2023	20840	Rural	4	WEEKEND	INTERSTATE HWY	25008	10010	**1.11**
4	I-84 / Westland Rd	5/16/2023	17599	Rural	4	WEEKEND	INTERSTATE HWY	30027	30004	**1.07**
5	I-84 / 0R207 (Hermiston)	5/16/2023	15767	Rural	4	WEEKEND	INTERSTATE HWY	DNE	-	**-**
6	OR207 / HWY 320	5/16/2023	1237	Rural	2	WEEKDAY	REGIONAL HWY	DNE	-	**-**
7	OR207 / Butter Creek Rd	5/16/2023	1313	Rural	2	WEEKDAY	REGIONAL HWY	DNE	-	**-**
8	I84/US30/US395 / Barnhart Rd	5/16/2023	18578	Rural	4	WEEKDAY	INTERSTATE HWY	DNE	-	**-**
9	US730 / OR207	5/16/2023	4365	Rural	2	WEEKDAY	REGIONAL HWY	DNE	-	**-**
10	OR37/US730 (HWY2)	5/16/2023	632	Rural	2	WEEKDAY	REGIONAL HWY	DNE	-	**-**
11	I-84 / Gerone St	5/16/2023	18585	Rural	4	WEEKDAY	INTERSTATE HWY	DNE	-	**-**
12	OR74 / Butter Creek Rd	5/16/2023	-	Rural	2	WEEKDAY	INTERSTATE HWY	DNE	-	**-**
13	OR74 / US395	5/16/2023	149	Rural	2	WEEKDAY	STATEWIDE HWY	DNE	-	**-**
14	OR37 / OR334	5/16/2023	194	Rural	2	WEEKDAY	DISTRICT HWY	DNE	-	**-**
15	OR37 / Despain Gulch Rd	5/16/2023		Rural	2	WEEKDAY	DISTRICT HWY	DNE	-	**-**
16	OR204 (HWY330) / OR11 (HWY008)	5/16/2023	548	Rural	2	WEEKEND	STATEWIDE HWY	13001	-	**1.15**
17	OR11 / OR334	5/16/2023	6610	Rural	4	WEEKEND	STATEWIDE HWY	DNE	-	**-**
18	OR11/ OR335	5/16/2023	6090	Rural	2	WEEKDAY	STATEWIDE HWY	DNE	-	**-**
19	OR11 / OR331	5/16/2023	-	Rural	2	WEEKDAY	STATEWIDE HWY	DNE	-	**-**
20	OR332 / OR339	4/4/2022	2180	Urbanized	2	WEEKDAY	DISTRICT HWY	DNE	-	**-**
21	1-84 / Old Hwy 30 (Meacham Interchange)	5/16/2023	12337	Rural	4	WEEKEND	INTERSTATE HWY	23016	1014	**1.10**
22	US395 / OR244	5/16/2023	452	Rural	2	WEEKDAY	STATEWIDE HWY	DNE	-	**-**

Table 4: Seasonal Adjustment Factors in Umatilla County – Characteristic ATR Seasonal Factor Calculation

Year	2023	2022	2021	2019	2018	Average	Seasonal Adjustment
ATR 25-008 (Boardman Junction)							
Peak Month (July)	122	119	127	119	115	*119.93*	
Count Month (May)	110	111	110	105	103	*108.10*	1.11
ATR 30-004 (Pendleton)							
Peak Month (June)	120	116	117	114	111	115.53	
Count Month (May)	110	110	111	105	104	108.35	**1.07**
ATR 10-010 (Yoncalla)							
Peak Month (June)	119	114	116	111	112	114.09	
Count Month (May)	105	104	105	101	100	103.19	**1.11**
ATR 13-001 (Burns)							
Peak Month (June)	137	137	130	122	123	129.99	
Count Month (May)	114	112	120	106	113	113.18	**1.15**
ATR 23-016 (Huntington)							
Peak Month (June)	120	120	***	116	115	117.97	
Count Month (May)	107	111	***	107	105	107.08	**1.10**
ATR 1-014 (Weatherby)							
Peak Month (June)	123	120	121	116	116	118.82	
Count Month (May)	109	111	109	105	105	107.53	**1.10**
ATR 30-027 (OR30, Echo)							
Peak Month (June)	118	115	***	114	111	113.29	
Count Month (May)	109	109	***	105	104	105.99	**1.07**

Note: Shaded values are dropped from the average calculation per ODOT methodology. Calculations are based on the percentage of ADT from the peak month divided by the percentage of ADT from the count month.

Table 5: Seasonal Adjustment Factors in Umatilla County – Seasonal Trend ATR Method

Map ID	Name	Count date	Road 1			Road 2			Seasonal Adjustment Factor
			Seasonal Trend	Count Month	Peak Month	Seasonal Trend	Count Month	Peak Month	
1	I-82 / Powerline Rd	5/16/2023	2	0.942278	0.825988	6	0.894255	0.782185	**1.14**
5	I-84 / 0R207 (Hermiston)	5/16/2023	2	0.942278	0.825988	3	0.959356	0.937592	**1.08**
6	OR207 / HWY 320	5/16/2023	6	0.894255	0.782185	6	-	-	**1.14**
7	OR207 / Butter Creek Rd	5/16/2023	6	0.894255	0.782185	6	-	-	**1.14**
8	I84/US30/US395 / Barnhart Rd	5/16/2023	2	0.942278	0.825988	6	0.894255	0.782185	**1.14**
9	US730 / OR207	5/16/2023	6	0.894255	0.782185	6	-	-	**1.14**
10	OR37/US730 (HWY2)	5/16/2023	6	0.894255	0.782185	6	-	-	**1.14**
11	I-84 / Gerone St	5/16/2023	2	0.942278	0.825988	6	0.894255	0.782185	**1.14**
12	OR74 / Butter Creek Rd	5/16/2023	10	0.919031	0.844859	10	-	-	**1.09**
13	OR74 / US395	5/16/2023	8	1.028132	0.704711	3	0.959356	0.937592	**1.24**
14	OR37 / OR334	5/16/2023	6	0.894255	0.782185	3	0.959356	0.937592	**1.08**
15	OR37 / Despain Gulch Rd	5/16/2023	6	0.894255	0.782185	6	-	-	**1.14**
17	OR11 / OR334	5/16/2023	3	0.959356	0.937592	10	0.919031	0.844859	**1.06**
18	OR11/ OR335	5/16/2023	3	0.959356	0.937592	10	0.919031	0.844859	**1.06**
19	OR11 / OR331	5/16/2023	3	0.959356	0.937592	10	0.919031	0.844859	**1.06**
20	OR332 / OR339	4/4/2022	3	0.959356	0.937592	10	0.919031	0.844859	**1.06**
22	US395 / OR244	5/16/2023	3	0.959356	0.937592	10	0.919031	0.844859	**1.06**

As summarized in Table 6 the seasonal adjustment factors for the study intersections range from roughly 1.07 to 1.24.

Table 6: Seasonal Adjustment Factors for Study Intersections

ID	Intersection	Method	Seasonal Adjustment Factor
1	I-82 @ Powerline Rd interchange ramp terminals	Seasonal Trend	1.14
2	I-82 @ Lamb Rd interchange ramp terminals	Characteristic ATR	1.07
3	I-84 @ Frontage Ln interchange ramp terminals	Characteristic ATR	1.11
4	I-84 @ Westland Rd interchange ramp terminals	Characteristic ATR	1.07
5	I-84 @ 0R207 (Hermiston) interchange ramp terminals	Seasonal Trend	1.08
6	OR207 / HWY 320	Seasonal Trend	1.14
7	OR207 / Butter Creek Rd	Seasonal Trend	1.14
8	I-84 @ Barnhart Rd interchange ramp terminals	Seasonal Trend	1.14
9	US 730 @ OR 207	Seasonal Trend	1.14
10	OR 37@US 730	Seasonal Trend	1.14
11	I-84 @ Gerome St interchange ramp terminals	Seasonal Trend	1.14
12	OR 74 @ Butter Creek Rd	Seasonal Trend	1.09
13	OR 74 @ US 395	Seasonal Trend	1.24
14	OR37 / OR334	Seasonal Trend	1.08
15	OR37 / Despain Gulch Rd	Seasonal Trend	1.14
16	OR 204 @ OR 11	Characteristic ATR	1.15
17	OR 11 @ OR 334	Seasonal Trend	1.06
18	OR 11@ OR 335	Seasonal Trend	1.06
19	OR 11 @ OR 331	Seasonal Trend	1.06
20	OR332 / OR339	Seasonal Trend	1.06
21	I-84 @ Old Hwy 30 (Meacham Interchange)	Characteristic ATR	1.10
22	US 395 @ OR 244	Seasonal Trend	1.06

Forecast Traffic Volumes

The planning horizon for the Umatilla County TSP Update is the year 2045. There is no travel demand model that has been previously developed for Umatilla County. Therefore, future traffic volumes at the study intersections are proposed to be developed using ODOT's Future Volume Tables (FVT). The Future Volume Tables provide the base year 2023 and forecast year 2045 traffic volume projections for ODOT facilities throughout Umatilla County. The growth rates calculated using this method will be confirmed with ODOT.

Traffic Analysis

The traffic analysis will evaluate peak hour traffic operations of the study intersections under existing conditions and through the TSP planning horizon to identify potential capacity constraints and alternatives. This section summarizes the traffic analysis methodology, including applicable intersection operational standards, and analysis parameters and assumptions.

Intersection Operational Standards

All study intersections identified for the TSP are located along state highways, and therefore, are subject to ODOT intersection operating targets.

ODOT uses volume-to-capacity (v/c) ratios to assess intersection operations. Table 6 of the *Oregon Highway Plan* (OHP – Reference 2) and Table 1200-2 of the *Oregon Highway Design Manual* (HDM – Reference 3) provide maximum v/c ratios for all signalized and unsignalized intersections located outside the Portland metropolitan area. The OHP ratios are used to evaluate existing and future no-build conditions, while the HDM ratios are used to evaluate future alternatives along state highways.

Highways US 395, US 730, I-84, I-82, and OR 11 (north of OR 331) are designated as OHP Freight Routes, and relevant v/c targets will be applied to the study intersections on these corridors.

Potential solutions will be identified and evaluated for the study intersections that are found to exceed applicable v/c thresholds under existing and future traffic conditions. The v/c thresholds specific to each study intersection are identified in Table 7.

Table 7: ODOT Mobility Targets

ID	Intersection	Traffic Control	OHP Mobility Target v/c	HDM Standard v/c
1	I-82* @ Powerline Rd interchange ramp terminals	TWSC Intersection	0.70 I-82 ramps 0.75 Powerline Rd	0.60 I-82 ramps 0.70 Powerline Rd
2	I-82* @ Lamb Rd interchange ramp terminals	TWSC Intersection	0.70 I-82 ramps 0.75 Lamb Rd	0.60 I-82 ramps 0.70 Lamb Rd
3	I-84* @ Frontage Ln interchange ramp terminals	TWSC Intersection	0.70 I-84 ramps 0.75 Frontage Lane	0.60 I-84 ramps 0.70 Frontage Lane
4	I-84* @ Westland Rd interchange ramp terminals	TWSC Intersection	0.70 I-84 ramps 0.75 Westland Road	0.60 I-84 ramps 0.70 Westland Road
5	I-84* @ 0R207 (Hermiston) interchange ramp terminals	TWSC Intersection	0.70 I-84 ramps 0.70 OR 207	0.60 I-84 ramps 0.65 OR 207
6	OR 207 @ HWY 320	TWSC Intersection	0.70 OR 207 0.75 HWY 320	0.65 OR 207 0.70 HWY 320
7	OR 207 @ Butter Creek Rd	TWSC Intersection	0.70 OR 207 0.75 Butter Creek Rd	0.65 OR 207 0.70 Butter Creek Rd
8	I-84* @ Barnhart Rd interchange ramp terminals	TWSC Intersection	0.70 I-84 ramps 0.75 Barnhart Rd	0.60 I-84 ramps 0.70 Barnhart Rd

9	US 730* @ OR 207	TWSC Intersection	0.70 US 730 0.70 OR 207	0.65 US 730 0.65 OR 207
10	OR 37@US 730*	TWSC Intersection	0.75 OR 37 0.70 US 730	0.70 OR 37 0.65 US 730
11	I-84* @ Gerone St/ Echo Rd interchange ramp terminals	TWSC Intersection	0.70 I-84 ramps 0.75 Gerone St	0.60 I-84 ramps 0.70 Gerone St
12	OR 74 @ Butter Creek Rd	TWSC Intersection	0.75 OR 74 0.75 Butter Creek Rd	0.75 OR 74 0.70 Butter Creek Rd
13	OR 74 @ US 395*	TWSC Intersection	0.75 OR 74 0.70 US 395	0.70 OR 74 0.60 US 395
14	OR 37 @ OR 334	TWSC Intersection	0.75 OR 37 0.75 OR 334	0.70 OR 37 0.75 OR 334
15	OR 37 @ Despain Gulch Rd	TWSC Intersection	0.75 OR 37 0.75 Despain Gulch Rd	0.70 OR 37 0.70 Despain Gulch Rd
16	OR 204 @ OR 11*	TWSC Intersection	0.70 OR 204 0.70 OR 11	0.70 OR 204 0.60 OR 11
17	OR 11* @ OR 334	TWSC Intersection	0.70 OR 11 0.75 OR 334	0.60 OR 11 0.70 OR 334
18	OR 11*@ OR 335	TWSC Intersection	0.70 OR 11 0.75 OR 335	0.60 OR 11 0.70 OR 335
19	OR 11* @ OR 331	TWSC Intersection	0.70 OR 11 0.75 OR 331	0.60 OR 11 0.70 OR 331
20	OR 332 @ OR 339	AWSC Intersection	0.75 OR 332 0.75 OR 339	0.75 OR 332 0.70 OR 339
21	I-84* @ Old Hwy 30 (Meacham Interchange)	TWSC Intersection	0.70 I-84 ramps 0.75 Old Hwy 30	0.60 I-84 ramps 0.70 Old Hwy 30
22	US 395* @ OR 244	TWSC Intersection	0.70 US 395 0.75 OR 244	0.60 US 395 0.70 OR 244
**OHP Freight Routes*				

Analysis Parameters

The following data sources and methodologies are proposed for conducting the traffic analysis. Analysis of all state facilities will be performed according to the APM unless otherwise agreed upon by the County and ODOT.

1. **Intersection/Roadway Geometry** (e.g., number of lanes, lane configurations, cross-section elements, etc.) will be based on ODOT GIS data and confirmed through a site visit. Available as-built data may also be used to verify existing roadway geometry. The analysis models will be built on scaled roadway line work from GIS.
2. **Operational Data** (e.g., posted speeds, intersection control, transit stops, etc.) will be based on ODOT GIS data and a site visit.
3. **Peak Hour Factors** (PHF) will be calculated for each intersection with traffic count data and applied to the existing conditions analyses. Per the APM 5.9.3, the following PHFs will be applied for the year 2045 analysis:
    a. 0.95 for major arterial-major arterial;
    b. 0.92 for major arterial-minor arterial;
    c. 0.90 for minor arterial-minor arterial;
    d. 0.88 for minor arterial-collector;
    e. 0.85 for collector-collector or lower classification.

    If the existing PHF is greater than these default future values, the existing PHF will be applied.
4. **Traffic Volume Development** is described in previous sections.
5. **Traffic Operations**
    a. The methodologies identified in the Highway Capacity Manual 7th Edition (HCM – Reference 4) will be used to analyze traffic operations at the study intersections.
    b. Vistro is a software tool designed to assist with operations analyses in accordance with HCM 7th Edition methodologies; therefore, Vistro 2024 will be used to conduct the traffic operations analyses. Level-of-service (LOS), delay, v/c ratios, and 95th-percentile queue lengths will be reported at all intersections (critical movement for unsignalized intersections). Failing unsignalized intersections will be evaluated for alternatives including geometric treatments or intersection control devices based on the Manual on Uniform Traffic Control Devices (MUTCD – Reference 5) warrants.

Traffic Analysis Software & Input Assumptions

Table 8 summarizes the Vistro software input assumptions for the traffic analysis. These settings are consistent with what is listed in the ODOT APM Appendix 12A/13A.

Table 8: Vistro Operations Parameters/Assumptions

Arterial Intersection Parameters	Existing Conditions
Peak Hour Factor	From traffic counts
Conflicting Bikes and Pedestrians per Hour	From traffic counts (as available)
Area Type	Not a Central Business District
Ideal Saturation Flow Rate (All Movements)	1,750 passenger cars per hour per lane
Lane Width	12 (feet unless field observations suggest otherwise)
Percent Heavy Vehicles (All Movements)	From traffic counts (as available)
Percent Grade	ODOT Road Inventory and Classification Services (RICS)
95th-Percentile & Average Vehicle Queues	Vistro summary output

Crash Analysis

Umatilla County is currently preparing a Safe Streets and Roads for All (SS4A) safety action plan. The SS4A is being prepared under a separate contract. The results of this analysis will be incorporated into the TSP.

References

1. Oregon Department of Transportation. *Analysis Procedures Manual*, 2018.
2. Oregon Department of Transportation. *Oregon Highway Plan*, 2015.
3. Oregon Department of Transportation. *Highway Design Manual*, 2025.
4. Transportation Research Board. Highway Capacity Manual, 7th Edition, 2022.
5. Federal Highway Administration. Manual on Uniform Traffic Control Devices. 2009.