

Project #: 22928

DRAFT METHODOLOGY MEMORANDUM

Date:	May 4, 2020
To:	Phil Stenbeck & Matt Powlison, Jefferson County
	Don Morehouse, ODOT
From:	Ashleigh Ludwig, AICP, PE, Alyssa Loveday, PE, and Julia Kuhn, PE
Project:	Jefferson County TSP Update
Subject:	Methodology Memorandum

This memorandum documents the methodology and key assumptions to be used in preparation of the existing and future conditions and alternatives analyses for the Jefferson County Transportation System Plan (TSP) Update. The methodologies included in this memorandum are based on guidance provided in the Oregon Department of Transportation (ODOT) Transportation System Plan Guidelines and the Analysis Procedures Manual (APM), Versions 1 and 2 as they relate to rural counties in central Oregon. The methodology and assumptions described in this memorandum will be used to help identify potential gaps and deficiencies in the transportation system related to:

- Traffic operations at the TSP intersections;
- Traffic safety at the TSP intersections and along study area roadways;
- Facilities and performance of the bicycle and pedestrian network.

This information will serve as a baseline for identifying a list of needs (gaps and deficiencies) to be addressed as part of the TSP update. It will also serve as a baseline for identifying and evaluating potential solutions (projects, programs, policies, pilot projects, and studies) that address the needs, and to develop a prioritized list of improvements for the TSP update.

The remainder of this memorandum summarizes the following:

- Location of the TSP intersection and segments where safety and operations analyses will be conducted;
- Methodology for developing vehicular analyses volumes for existing and future conditions;
- Applicable vehicular performance targets and standards;
- Operational analyses parameters;
- Crash analyses procedures; and,
- Pedestrian and bicycle analyses parameters.

STUDY AREA

The study area for the TSP update includes the areas within Jefferson County that are outside the Madras Urban Growth Boundary (UGB) and the lands owned by the Confederated Tribes of Warm Springs. The Jefferson County TSP will address facilities that are under the jurisdiction of Jefferson County and ODOT. Roads on federal lands (i.e., U.S. Bureau of Land Management and the U.S. Forest Service) and lands owned by the Confederated Tribes of Warm Springs are not included in the study area and are instead under the jurisdiction of the corresponding agency.

TSP Intersections and Segments

Tables 1 and 2 list the TSP intersections and segment locations that were identified for study by ODOT and the County. Table 1 summarizes the locations where turning movement counts were conducted by ODOT whereas Table 2 summarizes the locations where 24-hour tube counts, including vehicle classification and speed data, were conducted by Quality Counts. Figure 1 shows the location of the intersections and segments. For the Existing Conditions analyses, the counts that were conducted in 2019 will be factored up to reflect 2020 conditions using the annual growth rates, as discussed in the Forecast Year Traffic Volume Development section of this memorandum on page 7.

Traffic counts are provided <u>here</u>.

Intersection	East-West Road Name	Count Time Period				
	4-hour Turning Movement Counts					
1	OR361	Iris Lane				
2	US97	Iris Lane				
3	Feather Drive	Iris Lane	August 2019			
4	Cora Drive	US97	100000 2020			
5	US26	Agency Hot Springs Road (to Kah- nee-ta)	2 PM - 6 PM			
6	US20	Suttle Lake Road				
7	US20	FS Hwy 12				
	16-hour Turning Movem	ent Counts				
8	US26/Colfax Lane	US97	Δισμςt 2019			
9	OR293	US97	August 2015			
10*	OR361 US97					
11*	US20 Camp Sherman Road		6 AM - 10 PM			

Table 1. Intersection Locations

*Traffic counts at the intersections of OR361/US97 (located south of the Madras city limits) and US20/Camp Sherman Road were not available from ODOT. Traffic counts at the OR361/D Street/US 97 intersection (located inside the Madras city limits) were provided instead. Because traffic pattens are not currently reflective of typical conditions due to school closures and "Stay Home, Stay Safe" orders associated with the COVID-19 pandemic, traffic counts cannot currently be conducted at the two missing locations. Accordingly, these two intersections will be included in the crash analysis, but there will not be operations analysis conducted.

Table 2. Segment Locations (Counts Conducted in March 2020)

Segment	East-West Road Name	North-South Road Name	Missing Data*
12	US26	Lone Pine Road	SB approach
13	Jericho Lane	US97	
14	Adams Drive	Crestview Lane	
15	Pony Butte Road	US97	
16	Jericho Lane	Feather Drive	
17	Mountain View Drive	Round Butte Drive	
18	Jordan Road	Mountain View Drive	
19	Eureka Lane	OR361	
20	Jordan/Peck Road	Frazier Drive	
21	Hilltop Lane	US97	NB approach
22	Cherry Lane	US97	NB and SB approaches
23	Bear Drive	US97	
24		US97 at MP 98.7 – 98.8	
25	Antelope Drive	Chinook Drive	WB approach
26	Club House Road	Chinook Drive	
27	Mustang Road	Shad Road	WB approach
28	US26	Dogwood Lane	
29	County Line	Quail Road	

*Missing Data indicates locations where data for an approach to the intersection is missing. This is due to tube counters that malfunctioned during data collection or that were torn up by streetsweepers. The data was collected one week prior to statewide school closures and shelter in place orders associated with the COVID-19 pandemic; therefore, traffic data could not be recollected immediately. As of May 1, 2020, schools are closed until at least Fall 2020 and businesses have yet to reopen. When businesses start to reopen at an undetermined date, it is likely that traffic patterns will not return to "normal" for at least several months. Due to these delays and the small number of locations missing data, the project team proposes to move forward using the data available as of May 1, 2020, as summarized in the tables above.



Intersection volume for intersections #10 and #11 are not available.





Figure 1

Study Intersections Jefferson County, Oregon

Seasonal Adjustment Factor

Thirtieth (30th) highest hour design volumes will be based on applicable adjustment factors consistent with the methodology identified in the APM. Version 2 of the APM identifies three methods for identifying seasonal adjustment factors for highway traffic volumes. All three methods utilize information provided by Automatic Traffic Recorders (ATR) located in select locations throughout the State Highway System that collect traffic data 24-hours a day/365 days a year. There are two permanent ATR stations (16-002 and 16-006) in Jefferson County and one station located on US20 in Deschutes County, near the Jefferson County line (09-014). ATR station 16-002 is located on US97 approximately 0.18 miles south of Madras along the Madras-Prineville Highway and had an AADT of approximately 15,200 vehicles in 2018. ATR station 16-006 is located on US26 approximately 4.54 miles northwest of the Dalles-California Highway US97 and had an AADT of approximately 8,400 vehicles in 2018. ATR station 9-014 is located on US20 near the Deschutes County/Jefferson County border and had an AADT of approximately 9,200 vehicles in 2018. There are multiple TSP intersections near these ATR stations; therefore we will use the on-site ATR method to develop seasonal adjustment factors for these locations.

Seasonal adjustment calculations are provided in Attachment A.

On-Site ATR Method

The On-Site ATR Method requires that the ATR 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.

Per the APM guidance, Table 3 summarizes the TSP intersections and segments that are located along US97, US26, and US20 within proximity to the three ATR stations. The On-Site ATR method was used to identify the seasonal adjustment factors proposed for these locations. The seasonal factors identified in Table 3 will be applied to all legs of the intersections.

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ATR Station	Intersection/ Segment ID	Intersection Name	Count Month	Weekly Traffic Trend	Seasonal Adjustment Factor
	2	US97/Iris Lane	August	Weekday	1.02
	8	US26/Colfax Lane/US97	August	Weekday	1.02
16-002	13	Jericho Lane/US97	March	Weekday	1.29
	23	Bear Drive/US97	March	Weekday	1.29
	24	US97 at MP 98.7-98.8	March	Weekday	1.29
5 16-006		US26/Agency Hot Springs Road (to Kah-nee-ta)*	August	Weekday	1.02
	28	US26/Dogwood Lane	March	Weekday	1.36
00.014	6	US20/Suttle Lake Road	August	Weekday	1.06
09-014	7	US20/FS Hwy 12	August	Weekday	1.06

Table 3. Seasonal Adjustment Factors using the On-Site ATR Method

*The estimated daily volume on US26 at this intersection is more than 10 percent lower than the AADT at ATR 16-006. However, we believe this ATR station accurately reflects the seasonal highway characteristics at the TSP intersection.

Seasonal Trend Method

The remaining TSP intersections are located on different highways, located on County roads, or have traffic volumes that are not within ten percent of the ATR volumes; therefore, the On-Site ATR method is not appropriate at these locations. For the remaining intersection locations, the Seasonal Trend Method will be applied. The ATR Characteristic Table method was considered for the state highway locations, but there were no sites that matched the appropriate characteristics (seasonal traffic trends, area type, number of travel lanes) and volume. Instead, the recommended seasonal adjustment factors using the Seasonal Trend Method are summarized in Table 4.

Trend	Intersection/ Segment ID	Intersection Name	Count Month	Seasonal Adjustment Factor
	14	Adams Drive/Crestview Lane	March	1.08
	25	Antelope Drive/Chinook Drive	March	1.08
Commuter	26	Club House Road/Chinook Drive	March	1.08
	27	Mustang Road/Shad Road	March	1.08
	29	County Line/Quail Road	March	1.08
	9	OR293/US97	August	1.03
	15	Pony Butte Road/US97	March	1.31
Summer	17	Mountain View Drive/Round Butte Drive	March	1.31
	18	Jordan Road/Mountain View Drive	March	1.31
	20	Jordan/Peck Road/Frazier Drive	March	1.31
	1	OR361/Iris Lane	August	1.00
	3	Feather Drive/Iris Lane	August	1.00
	4	Cora Drive/US97	September	1.05
Summer/Commuter	12	US26/Lone Pine Road	March	1.17
Summer/ Commuter	16	Jericho Lane/Feather Drive	March	1.17
	19	Eureka Lane/OR361	March	1.17
	21	Hilltop Lane/US97	March	1.17
	22	Cherry Lane/US97	March	1.17

Table 4. Seasonal Adjustment Factors using the Seasonal Trend Method

Peak Hour Development

Due to the large, rural nature of the County, application of a County system-wide time period for assessing 30th highest conditions is not appropriate. Instead, individual intersection peak hours will be applied, as measured between 4 and 6 PM. Table 5 indicates individual intersection PM Peak Hours to be analyzed. For study segments, the peak hour will be identified for each approach based on the total volume in both directions.

Table 5: Study Intersections Peak Hours

Intersection ID	Intersection Name	Intersection Peak Hour
1	OR361/Iris Lane	4:45-5:45 PM
2	US97/Iris Lane	4:00-5:00 PM
3	Feather Drive/Iris Lane	4:45-5:45 PM
4	Cora Drive/US97	4:00 – 5:00 PM
5	US26/Agency Hot Springs Road (to Kah-nee-ta)	5:00 – 6:00 PM
6	US20/Suttle Lake Road	4:00 – 5:00 PM
7	US20/FS Hwy 12	4:00 – 5:00 PM
8	US26/Colfax Lane/US97	4:00 – 5:00 PM
9	OR293/US97	4:00 – 5:00 PM

Forecast Year Traffic Volume Development

Twenty-year growth factors were calculated from the available historical traffic volumes using a Level I trending forecast. For state highways, the Future Volume Tables available on Transportation Planning Analysis Unit's website was used. For County facilities, the Future Volume Tables will be used because many low volume district-level state highways have similar function to County facilities.

Historical Trends Methods Using ODOT Future Volumes Tables

The ODOT APM recommends using the historical trends method, which relies on traffic volumes from previous years to develop a growth pattern for use in projecting future volumes. ODOT maintains Future Volumes Tables that summarize current and future year traffic volumes for state roadways.

Using methodology and guidance from the ODOT APM Section 6.5, Table 6 shows the annual growth rates that will be applied to each location. There are three highway corridors (US97 – Northeast of Madras, US26 – Northwest of Madras, US26 – between Madras and Prineville) without travel demand model data or a R-squared value above 0.75. For US97, northeast of Madras, the future volume table included two data points with R-squared values close to 0.75 (0.74 and 0.72); these two rates were averaged to develop the growth rate for this corridor. For US26, Northwest of Madras, an average total growth rate of US97 and US20 was taken to reflect the characteristics of the US97 corridor and the mountain pass. US26 between Madras and Prineville will use the same rate as Culver Highway as the two highway segments likely exhibit similar traffic patterns. Because County facilities likely experience traffic patterns similar to district highways, the Culver Highway annual growth rate will be applied to all County facilities in Jefferson County.

Attachment B includes the spreadsheet for developing growth rates based on the Future Volumes Table.

Table 6: Annual Growth Rates

Location	Annual Growth Rate
US97, Northeast of Madras	0.69%1
US97, South of Madras	2.20%
US20, West of Sisters	1.04%
US26, Northwest of Madras	1.62% ²
US26, between Madras and Prineville	0.91% ³
Culver Highway	0.91%
County Facilities	0.91%4

¹There were no sites with RSQ > 0.75. An average of the two rates with the highest RSQ values (0.74 and 0.72) were used to develop this rate.

²Average of US97 and US20 rates due to no data with RSQ>0.75.

³Using the same rate as Culver Highway because no RSQ values>0.75.

⁴Using same rates as Culver Highway, the only district highway in Jefferson County.

INTERSECTION OPERATIONAL STANDARDS

The following performance measures will be evaluated for the TSP intersections:

- Volume-to-capacity (v/c) ratio;
- Level-of-service (LOS);
- Delay; and,
- 95th Percentile queuing (not-simulation based).

This information will be provided in tables, figures, and/or technical appendices, but where possible will be provided in figures to give the general public a more clear and relatable understanding of the analysis results.

ODOT Facilities

ODOT assesses intersections operations based on mobility targets, as measured by the volume-tocapacity (V/C) ratio. Table 6 of the *Oregon Highway Plan* (OHP) provides mobility targets for facilities outside the Metro area. The OHP ratios are used to evaluate existing and future no-build conditions, while Table 10-2 of the ODOT 2012 Highway Design Manual (HDM) provides V/C ratios used to assist in evaluating future alternatives on state highways. Table 7 and 8 includes the mobility targets for the state facilities based on these two references.

Table 7. Oregon Highway Plan (OHP) Volume to Capacity Ratio Targets Outside Metro

		Insi	Outside UGB			
Highway/Category	STA	Non-MPO outside of STAs where nonfreeway speed <= 35 mph, or a Designated UBA	Non-MPO outside of STAs where non- freeway speed > 35 mph but < 45 mph	Non-MPO Where nonfreeway speed limit >= 45 mph	Unincorporated Communities	Rural Lands
Statewide Expressway(US97 south of Madras and small section north of Madras)	N/A	0.85 v/c	0.80 v/c	0.80 v/c	0.70 v/c	0.70 v/c
Statewide Highway (Freight Route) (US20, US97 north of Madras, US26 West of Madras)	0.90 v/c	0.85 v/c	0.80 v/c	0.80 v/c	0.70 v/c	0.70 v/c
Freight Route on a Regional Highway (US 26-Madras-Prineville)	0.95 v/c	0.90 v/c	0.85 v/c	0.85 v/c	0.75 v/c	0.70 v/c
District/Local Interest Roads (OR 361)	1.0 v/c	0.95 v/c	0.90 v/c	0.90 v/c	0.80 v/c	0.75 v/c

Table 8. 20-Year Highway Design Manual (HDM) Design Mobility Targets for State Facilities

	Inside UGB			Outside UGB	
Highway/Category	STA	Non-MPO outside of STAs where nonfreeway speed <45 mph	Non-MPO Where nonfreeway speed limit >= 45 mph	Unincorporated Communities	Rural Lands
Statewide Expressway(US97 south of Madras and small section north of Madras)	N/A	0.70 v/c	0.65 v/c	0.60 v/c	0.60 v/c
Statewide Highway (Freight Route) (US20, US97 north of Madras, US26 West of Madras)	0.85 v/c	0.70 v/c	0.70 v/c	0.60 v/c	0.60 v/c
Freight Route on a Regional Highway (US 26-Madras-Prineville)	0.95 v/c	0.75 v/c	0.75 v/c	0.70 v/c	0.65 v/c
District/Local Interest Roads (OR 361)	0.95 v/c	0.80 v/c	0.75 v/c	0.75 v/c	0.70 v/c

Table 9 summarizes the mobility targets at each TSP intersection. For the unsignalized intersections, the v/c ratio will be reported for only the critical lane group. For intersections number 12 through 29, turning movement counts are not available; instead, 24-hour segment data is available on the approaches. The v/c ratio of these segments will be analyzed.

Intersection ID	Study Intersection	Traffic Control	Mobility Target (v/c)
1	OR361/Iris Ln	TWSC	0.75 N/S 0.75 E/W
2	US97/Iris Ln	TWSC	0.70 N/S, 0.75 E/W
4	Cora Dr/ US97	TWSC	0.70 N/S, 0.75 E/W
5	US26/ Agency Hot Springs Rd (to Kah-nee-ta)	TWSC	0.75 N/S, 0.70 E/W
6	US20/Suttle Lake Rd	TWSC	0.75 N/S, 0.70 E/W
7	US20/ FS Hwy 12	TWSC	0.75 N/S, 0.70 E/W
8	US26/ US97	TWSC	0.70 N/S, 0.70 E, 0.75 W
9	OR293/US97	TWSC	0.70 N/S, 0.75 E/W
12	US26/Lone Pine Rd	TWSC	0.70 N/S, 0.75 E/W
13	Jericho Ln/ US97	TWSC	0.70 N/S, 0.75 E/W
15	Pony Butte Rd/ US97	TWSC	0.70 N/S, 0.75 E/W
19	Eureka Ln/ OR361	TWSC	0.75 N/S, 0.75 E/W
21	Hilltop Ln/US97	TWSC	0.70 N/S, 0.75 E/W
22	Cherry Ln/US97	TWSC	0.70 N/S, 0.75 E/W
23	Bear Dr/ US97	TWSC	0.70 N/S, 0.75 E/W
24	3457 US97 (MP 98.7-98.8)	TWSC	0.70 N/S, 0.75 E/W
28	US26/ Dogwood Ln	TWSC	0.70 N/S, 0.75 E/W

TWSC = Two-way stop-control

County Facilities

Section 3.3 of the County's current TSP states the County's desire to have all roads or intersections operate at LOS C or better. Per County policies, the TSP intersections that are located on County facilities will be subject to a LOS C or better as the performance threshold. The only TSP intersection that is not located on an ODOT facility is Feather Drive/Iris Lane (Intersection #3).

For study segments, the V/C ratio will be presented for County facilities, consistent with analysis for state facilities.

ANALYSIS PARAMETERS

Analysis Model Parameters

Analyses of all state facilities will be conducted according to the most-recent version of the APM, as outlined below.

1. *Intersection/Roadway Geometry* (lane numbers and arrangements, cross-section elements, etc.) will be reviewed through aerial photography and confirmed through a field review.

- 2. *Operational Data* (such as posted speeds, intersection control, parking, right-turn on red, etc.) will be collected through Google Earth and field verified as needed. Data will be reviewed and supplemented by available GIS data, aerials, photos, and the traffic count videos.
- 3. *Peak Hour Factors* (PHF) will be calculated for each intersection and applied to the existing conditions analyses. PHFs of 0.95 will be used for the future analysis for high-order facilities (arterials), with 0.90 applied to medium-order facilities (collectors) and 0.85 applied to local roads. If the existing PHF is greater than these default future values, the existing PHF will be applied.
- 4. Traffic Operations
 - **a.** Highway Capacity Manual (HCM) 6th Edition methodology will be used to analyze traffic operations at all study intersections.
 - **b.** Queuing analysis methodology will be based on Synchro 95th percentile queue lengths as appropriate. Microsimulation is not proposed as part of the long-range planning effort.

Traffic Analysis Software and Input Assumptions

Synchro software will be used for the intersection analysis. The reported results will be the level of service, intersection delay, v/c ratios, and 95th percentile queue lengths consistent with HCM 6TH Edition. None of the study intersections are signalized intersections; therefore no parameters have been provided for signal timing. Analysis assumptions are listed in Table 10.

Table 10. Synchro Operations Parameters/Assumptions

Arterial Intersection Parameters	Existing Conditions
Peak Hour Factor	From traffic counts
Conflicting Bikes and Pedestrian per Hour	From traffic counts, as available
Lane Width	12 feet unless field observations suggest otherwise
Percent Heavy Vehicles	From traffic counts by movement, as available
Bus Blockages	Not applicable
95th percentile vehicle queues	Synchro HCM summary output

CRASH ANALYSES

The most recent five years (2013 through 2017) of crash data will be reviewed at the TSP intersections and study segments. State highways in Jefferson County that are identified as a Safety Priority Index System (SPIS) site will be included in the crash data. The data will be analyzed for a variety of factors to include type, severity, general conditions, and location to identify potential crash patterns. Additional details will be provided on countywide crash trends and any issues that are identified through the overall review at the County, corridor/segment, and intersection level, and will include specific details on fatalities and crashes involving pedestrians and bicyclists. Intersection crash rates will be calculated and compared to statewide crash rate performance thresholds to determine which segments or intersections have crash rates higher than similar facilities. Performance thresholds will include critical crash rate calculations and the 90th percentile crash rates for statewide rural intersections by traffic control type as documented in Exhibit 4-1 of the APM. Crash patterns and potential countermeasures/safety improvements will be identified and presented at intersections that exceed the statewide crash rate performance threshold.

MULTIMODAL TRANSPORTATION ANALYSIS

A review of the bicycle and pedestrian facilities along collector and arterial roadways will be reviewed to identify deficiencies based on available GIS data, field observations, and online mapping. A qualitative analysis will be completed for pedestrian and bicycle mobility and will include an assessment of gaps and opportunities using key analysis factors. This will include an inventory of existing facilities and planned improvements.

Factors to assess bicycle and pedestrian facilities and conditions include:

- Availability of sidewalks and bicycle lanes
- General condition of existing sidewalks and bicycle lanes, as available in GIS and verified by the County or ODOT
- Gaps in primary routes
- Proximity to transit stops
- Bicycle Level of Traffic Stress (for study segments only)
- High Risk Crossing Locations

Tables Table 11 and 12 identify the applicable level of traffic stress criteria.

Table 11. Rural Segment Criteria with Posted Speeds 45 mph or Greater (APM Exhibit 14-16)

		Paved Shou	lder Width	
Daily Volume (vpd)	0 - < 2 feet	2 - < 4 feet	4 - < 6 feet	≥ 6 feet
<400	LTS 2	LTS 2	LTS 2	LTS 2
400-1,500	LTS 3	LTS 2	LTS 2	LTS 2
1,500-7,000	LTS 4	LTS 3	LTS 2	LTS 2
<7,000	LTS 4	LTS 4	LTS 3	LTS 3

Table 12. Unsignalized Rural Intersection Crossing with Posted Speeds 45 mph or Greater (APM Exhibit14-17)

Daily Volume (vpd)	≤ 3 lanes	4-5 lanes	≥ 6 lanes
<400	LTS 2	n/a	n/a
400-1,500	LTS 2	n/a	n/a
1,500-7,000	LTS 2	LTS 3	n/a
<7,000	LTS 3	LTS 4	LTS 4

Measuring transit level of service (LOS) will not be included as part of this TSP Update. However, transit facilities and services will be mapped and included in the existing conditions inventory to understand:

- Routes that connect Jefferson County to other Central Oregon communities
- Location of bus stops, shelters, and stations
- Frequency and span of service
- Ridership levels by route and stops
- Connectivity with other transit facilities and services
- Paratransit demand, accessibility, and community need

NEXT STEPS

We would like to request concurrence from TPAU, ODOT Region 4, and County staff, on the methodology and key assumptions outlined in this memorandum. This memorandum is being provided prior to the existing conditions analysis and conforms to the TSP scope. Please contact us at (541) 639-8615 with any questions or comments at your earliest convenience.

Attachment A: Seasonal Trend Table

					S	EASONAL	TREND TA	BLE (Upda	ted: 6/26/1	9)															Adjustment	Factors: Count Sea	Data Season Ional Factor	al Factor/Pe	ak Period
TREND	1-Jan	15-Jan	1-Feb	15-Feb	1-Mar	15-Mar	1-Apr	15-Apr	1-May	15-May	1-Jun	15-Jun	1-Jul	15-Jul	1-Aug	15-Aug	1-Sep	15-Sep	1-Oct	15-Oct	1-Nov	15-Nov	1-Dec	15-Dec	Peak Perior Seasonal Factor	d March Seasonal Adjustment	August Season Adjustr	Sept al Seas ient Adju	mber onal stment
INTERSTATE URBANIZED	1.0419	1.0728	1.0640	1.0552	1.0259	0.9966	0.9896	0.9825	0.9768	0.9711	0.9558	0.9404	0.9561	0.9718	0.9804	0.9890	0.9860	0.9830	0.9864	0.9897	1.0055	1.0213	1.0436	1.0659					
INTERSTATE NONURBANIZED	1.2583	1.3379	1.2962	1.2545	1.1572	1.0600	1.0383	1.0166	0.9863	0.9561	0.9075	0.8588	0.8422	0.8256	0.8325	0.8394	0.8806	0.9218	0.9559	0.9900	1.0158	1.0416	1.1192	1.1969					
COMMUTER	1.0577	1.1050	1.0844	1.0638	1.0406	1.0173	0.9975	0.9777	0.9711	0.9645	0.9542	0.9438	0.9544	0.9649	0.9592	0.9535	0.9637	0.9738	0.9737	0.9737	0.9976	1.0215	1.0520	1.0825	0.943	38 1.0	779 1	0103	1.0318
COASTAL DESTINATION	1.2069	1.2238	1.1889	1.1540	1.1006	1.0472	1.0504	1.0536	1.0125	0.9714	0.9394	0.9074	0.8574	0.8074	0.8100	0.8126	0.8635	0.9145	0.9648	1.0152	1.0683	1.1214	1.1636	1.2058					
COASTAL DESTINATION ROUTE	1.3738	1.4039	1.3653	1.3267	1.2268	1.1268	1.1203	1.1138	1.0308	0.9478	0.9031	0.8584	0.7781	0.6978	0.7080	0.7182	0.7932	0.8682	0.9574	1.0466	1.1248	1.2030	1.2836	1.3642					
AGRICULTURE	1.4390	1.5042	1.4606	1.4171	1.3208	1.2246	1.1445	1.0643	0.9843	0.9043	0.8736	0.8429	0.8259	0.8089	0.8114	0.8140	0.7847	0.7554	0.8267	0.8980	0.9879	1.0778	1.2559	1.4339					
RECREATIONAL SUMMER	1.6714	1.6739	1.6571	1.6403	1.4889	1.3375	1.2642	1.1909	1.0325	0.8742	0.8177	0.7611	0.7119	0.6626	0.6933	0.7239	0.7598	0.7957	0.8898	0.9838	1.1028	1.2218	1.3720	1.5221					
RECREATIONAL SUMMER WINTER	1.0752	0.9963	1.0200	1.0437	1.0500	1.0563	1.1766	1.2970	1.1496	1.0021	0.9514	0.9006	0.8005	0.7005	0.7590	0.8176	0.9133	1.0091	1.1812	1.3532	1.4605	1.5677	1.2312	0.8948					
RECREATIONAL WINTER	0.8178	0.6528	0.7315	0.8102	0.8326	0.8549	1.0558	1.2566	1.1918	1.1270	1.1295	1.1321	1.0004	0.8687	0.9344	1.0001	1.0823	1.1646	1.2984	1.4323	1.7685	2.1047	1.4326	0.7605					
SUMMER	1.2007	1.2609	1.2367	1.2125	1.1528	1.0932	1.0592	1.0252	0.9810	0.9368	0.9061	0.8753	0.8535	0.8317	0.8437	0.8557	0.8872	0.9188	0.9502	0.9816	1.0276	1.0737	1.1341	1.1945	1				
SUMMER < 2500	1 2437	1 3130	1 2858	1 2586	1 1886	1 1186	1 0667	1 0147	0.9592	0.9036	0.8816	0.8595	0.8489	0.8382	0.8564	0.8746	0.8721	0.8696	0 9094	0.9491	1 0234	1 0977	1 1930	1 2883	1				

*Seasonal Trend Table factors are based on previous year ATR data. The table is updated yearly. *Grey shading indicates months were seasonal factor is greater than or less than 30%

					s	EASONAL	TREND TA	BLE (Upda	ted: 6/26/1	9)															Adjustm Facto	ent Factors: (or/Peak Perio	Count Data : d Seasonal	Seasonal Factor
TREND	1-Jan	15-Jan	1-Feb	15-Feb	1-Mar	15-Mar	1-Apr	15-Apr	1-May	15-May	1-Jun	15-Jun	1-Jul	15-Jul	1-Aug	15-Aug	1-Sep	15-Sep	1-Oct	15-Oct	1-Nov	15-Nov	1-Dec	15-Dec	Peak Perio Seasonal Factor	March Seasonal Adjustme nt	August Seasonal Adjustme nt	Septembe Seasonal Adjustmer
INTERSTATE URBANIZED	1.0419	1.0728	1.0640	1.0552	1.0259	0.9966	0.9896	0.9825	0.9768	0.9711	0.9558	0.9404	0.9561	0.9718	0.9804	0.9890	0.9860	0.9830	0.9864	0.9897	1.0055	1.0213	1.0436	1.0659				
INTERSTATE NONURBANIZED	1.2583	1.3379	1.2962	1.2545	1.1572	1.0600	1.0383	1.0166	0.9863	0.9561	0.9075	0.8588	0.8422	0.8256	0.8325	0.8394	0.8806	0.9218	0.9559	0.9900	1.0158	1.0416	1.1192	1.1969				
COMMUTER	1.0577	1.1050	1.0844	1.0638	1.0406	1.0173	0.9975	0.9777	0.9711	0.9645	0.9542	0.9438	0.9544	0.9649	0.9592	0.9535	0.9637	0.9738	0.9737	0.9737	0.9976	1.0215	1.0520	1.0825				
COASTAL DESTINATION	1.2069	1.2238	1.1889	1.1540	1.1006	1.0472	1.0504	1.0536	1.0125	0.9714	0.9394	0.9074	0.8574	0.8074	0.8100	0.8126	0.8635	0.9145	0.9648	1.0152	1.0683	1.1214	1.1636	1.2058				
COASTAL DESTINATION ROUTE	1.3738	1.4039	1.3653	1.3267	1.2268	1.1268	1.1203	1.1138	1.0308	0.9478	0.9031	0.8584	0.7781	0.6978	0.7080	0.7182	0.7932	0.8682	0.9574	1.0466	1.1248	1.2030	1.2836	1.3642				
AGRICULTURE	1.4390	1.5042	1.4606	1.4171	1.3208	1.2246	1.1445	1.0643	0.9843	0.9043	0.8736	0.8429	0.8259	0.8089	0.8114	0.8140	0.7847	0.7554	0.8267	0.8980	0.9879	1.0778	1.2559	1.4339				
RECREATIONAL SUMMER	1.6714	1.6739	1.6571	1.6403	1.4889	1.3375	1.2642	1.1909	1.0325	0.8742	0.8177	0.7611	0.7119	0.6626	0.6933	0.7239	0.7598	0.7957	0.8898	0.9838	1.1028	1.2218	1.3720	1.5221				
RECREATIONAL SUMMER WINTER	1.0752	0.9963	1.0200	1.0437	1.0500	1.0563	1.1766	1.2970	1.1496	1.0021	0.9514	0.9006	0.8005	0.7005	0.7590	0.8176	0.9133	1.0091	1.1812	1.3532	1.4605	1.5677	1.2312	0.8948				
RECREATIONAL WINTER	0.8178	0.6528	0.7315	0.8102	0.8326	0.8549	1.0558	1.2566	1.1918	1.1270	1.1295	1.1321	1.0004	0.8687	0.9344	1.0001	1.0823	1.1646	1.2984	1.4323	1.7685	2.1047	1.4326	0.7605				
SUMMER	1.2007	1.2609	1.2367	1.2125	1.1528		1.0592	1.0252	0.9810	0.9368	0.9061	0.8753	0.8535	0.8317	0.8437		0.8872	0.9188	0.9502	0.9816	1.0276	1.0737	1.1341	1.1945	0.8317	1.3144	1.0289	1.1047
SUMMER < 2500	1.2437	1.3130	1.2858	1.2586	1.1886	1.1186	1.0667	1.0147	0.9592	0.9036	0.8816	0.8595	0.8489	0.8382	0.8564	0.8746	0.8721	0.8696	0.9094	0.9491	1.0234	1.0977	1.1930	1.2883	1			

*Seasonal Trend Table factors are based on previous year ATR data. The table is updated yearly. *Grey shading indicates months were seasonal factor is greater than or less than 30%

					SI	EASONAL	TREND TAI	BLE (Updat	ted: 6/26/19	€)															Adjustme	ent Factors: Count D Period Sease	ata Seasonal I mal Factor	Factor/Peak
TREND	1-Jan	15-Jan	1-Feb	15-Feb	1-Mar	15-Mar	1-Apr	15-Apr	1-May	15-May	1-Jun	15-Jun	1-Jul	15-Jul	1-Aug	15-Aug	1-Sep	15-Sep	1-Oct	15-Oct	1-Nov	15-Nov	1-Dec	15-Dec	Peak Period Seasonal Factor	March Seasonal Adjustment	August Seasonal Adjustment	September Seasonal t Adjustment
INTERSTATE URBANIZED	1.0419	1.0728	1.0640	1.0552	1.0259	0.9966	0.9896	0.9825	0.9768	0.9711	0.9558	0.9404	0.9561	0.9718	0.9804	0.9890	0.9860	0.9830	0.9864	0.9897	1.0055	1.0213	1.0436	1.0659				
INTERSTATE NONURBANIZED	1.2583	1.3379	1.2962	1.2545	1.1572	1.0600	1.0383	1.0166	0.9863	0.9561	0.9075	0.8588	0.8422	0.8256	0.8325	0.8394	0.8806	0.9218	0.9559	0.9900	1.0158	1.0416	1.1192	1.1969				
COMMUTER	1.0577	1.1050	1.0844	1.0638	1.0406		0.9975	0.9777	0.9711	0.9645	0.9542	0.9438	0.9544	0.9649	0.9592	0.9535	0.9637	0.9738	0.9737	0.9737	0.9976	1.0215	1.0520	1.0825				
COASTAL DESTINATION	1.2069	1.2238	1.1889	1.1540	1.1006	1.0472	1.0504	1.0536	1.0125	0.9714	0.9394	0.9074	0.8574	0.8074	0.8100	0.8126	0.8635	0.9145	0.9648	1.0152	1.0683	1.1214	1.1636	1.2058				
COASTAL DESTINATION ROUTE	1.3738	1.4039	1.3653	1.3267	1.2268	1.1268	1.1203	1.1138	1.0308	0.9478	0.9031	0.8584	0.7781	0.6978	0.7080	0.7182	0.7932	0.8682	0.9574	1.0466	1.1248	1.2030	1.2836	1.3642				
AGRICULTURE	1.4390	1.5042	1.4606	1.4171	1.3208	1.2246	1.1445	1.0643	0.9843	0.9043	0.8736	0.8429	0.8259	0.8089	0.8114	0.8140	0.7847	0.7554	0.8267	0.8980	0.9879	1.0778	1.2559	1.4339				
RECREATIONAL SUMMER	1.6714	1.6739	1.6571	1.6403	1.4889	1.3375	1.2642	1.1909	1.0325	0.8742	0.8177	0.7611	0.7119	0.6626	0.6933	0.7239	0.7598	0.7957	0.8898	0.9838	1.1028	1.2218	1.3720	1.5221				
RECREATIONAL SUMMER WINTER	1.0752	0.9963	1.0200	1.0437	1.0500	1.0563	1.1766	1.2970	1.1496	1.0021	0.9514	0.9006	0.8005	0.7005	0.7590	0.8176	0.9133	1.0091	1.1812	1.3532	1.4605	1.5677	1.2312	0.8948				
RECREATIONAL WINTER	0.8178	0.6528	0.7315	0.8102	0.8326	0.8549	1.0558	1.2566	1.1918	1.1270	1.1295	1.1321	1.0004	0.8687	0.9344	1.0001	1.0823	1.1646	1.2984	1.4323	1.7685	2.1047	1.4326	0.7605				
SUMMER	1.2007	1.2609	1.2367	1.2125	1.1528		1.0592	1.0252	0.9810	0.9368	0.9061	0.8753	0.8535	0.8317	0.8437	0.8557	0.8872	0.9188	0.9502	0.9816	1.0276	1.0737	1.1341	1.1945				
SUMMER < 2500	1.2437	1.3130	1.2858	1.2586	1.1886	1.1186	1.0667	1.0147	0.9592	0.9036	0.8816	0.8595	0.8489	0.8382	0.8564	0.8746	0.8721	0.8696	0.9094	0.9491	1.0234	1.0977	1.1930	1.2883				
*Seasonal Trend Table factors are based on previous year ATR data. The table is updated yearly. *Grey shading indicates months were seasonal factor is greater than or less than 30%	1.1292	1.1830	1.1606	1.1382	1.0967	1.0553	1.0284	1.0015	0.9761	0.9507	0.9302	0.9096	0.9040	0.8983	0.9015	0.9046	0.9255	0.9463	0.9620	0.9777	1.0126	1.0476	1.0931	1.1385	0.8983	1.1747	1.0070	1.0534

ATR 16	-002; US97	/US26 MP 9	07.11; THE	DALLES-C	ALIFORNI	A HIGHWA (US26)	Y NO. 4; 0.1	18 mile noı	rth of Madra	s-Prinevill	e Highway	No. 360
Year	January	February	March	April	Мау	June	July	August	September	October	November	December
2018	79	83	92	97	105	113	113	113	106	98	91	82
2017	66	80	91	98	107	112	118	122	108	99	90	87
2016	76	86	91	97	105	112	118	116	109	100	94	81
2015	78	87	93	97	103	111	118	112	107	101	89	84
2014	80	79	92	98	104	112	119	118	108	101	88	82
Average	77.7	83.0	91.7	97.3	104.7	112.0	118.0	115.7	107.7	100.0	90.0	82.7
Count Adj	1.52	1.42	1.29	1.21	1.13	1.05	1.00	1.02	1.10	1.18	1.31	1.43

Peak month Min/Max removed from average

ATR 16-006; MP 113.17; WARM SPRINGS HIGHWAY NO. 53; 4.54 miles northwest of The Dalles-California Highway No. 4 (US97)

Year	January	February	March	April	Мау	June	July	August	September	October	November	December
2018	73	73	85	88	101	106	111	110	103	92	89	81
2017	61	76	84	89	103	105	116	124	103	92	82	83
2016	70	81	84	90	103	104	115	113	102	90	86	74
2015	72	82	87	89	100	105	116	108	105	95	82	76
2014	74	72	86	90	102	107	119	116	104	97	83	78
Average	71.7	76.7	85.0	89.3	102.0	105.3	115.7	113.0	103.3	93.0	83.7	78.3
Count Adj	1.61	1.51	1.36	1.29	1.13	1.10	1.00	1.02	1.12	1.24	1.38	1.48

Peak month

Min/Max removed from average

		11 00-014, 0		0 1111 00.12	, oan nan		110.10, 0.0	JI South of	Didok Date	e Runen R	ouu	
Year	January	February	March	April	May	June	July	August	September	October	November	December
2018	54	54	68	71	95	111	129	119	104	83	70	63
2017	46	53	67	72	96	114	137	126	102	85	65	64
2016	50	59	68	75	94	110	130	121	105	79	68	58
2015	52	59	72	73	92	109	128	124	102	85	64	62
2014	52	48	68	71	94	108	133	130	103	84	67	63
Average	51.3	55.3	68.0	72.0	94.3	110.0	130.7	123.7	103.0	84.0	66.7	62.7
Count Adj	2.55	2.36	1.92	1.81	1.39	1.19	1.00	1.06	1.27	1.56	1.96	2.09

ATR 09-014; US20/OR126 MP 93.12; SANTIAM HIGHWAY NO.16; 0.31 south of Black Butte Ranch Road

Peak month

Min/Max removed from average

Attachment B: Future Volumes Table

											Use Date? (heard	Annual Crowth	Average Annual	
Site id	HWY	МР	DIR	HS	Description	2016	2017	2018	2038	RSO	on RSO)	Rate	Site	Study Area Location
Site iu	11 11 1	1011	DIK	115		2010	2017	2010	2000	KSQ	on RSQ)	Nate	Site	Study Area Escation
(00	00.4	01.00					2000		1200	0 7 4 2 5				
600	004	81.00	1		0.02 mile south of Old Highway 97		3800		4300	0.7435	(0.63%	o 0.69%	US97, northeast of Madras
601	004	87.78	1		0.50 mile south of NE Elm Lane		3800		4400	0.7238	(0.75%	0.69%	US97, northeast of Madras
602	004	89.60	1		0.05 mile north of NE Cherry Lane		4000		4300	0.4103	(0.36%	0.69%	US97, northeast of Madras
					Madras Automatic Traffic Recorder,									
16002	004	97.11	1		Sta. 16-002, 0.18 mile north of Madras- Prineville Highway No. 360 (US26)		15000		16000	0 4421	0	0.32%	2 20%	US97 south of Madras and north of Culver
10002	004	27.11	1		0.02 mile south of Madras-Prineville		15000		10000	0.1121	, in the second s	0.527	2.2070	(CO), south of Madras and Horn of Curver
619	004	97.31	1		Highway (US26)		10500		10800	0.2068	(0.14%	2.20%	US97, south of Madras and north of Culver
620	004	102.61	1		0.02 mile north of SW Iric Lana		11600		12200	0.2000		0.25%	2 20%	US07 couth of Moders and north of Culture
020	004	105.01	1		0.02 Inne north of 3 w fris Lane		11000		12200	0.2090		0.25%	2.2076	0397, south of Madras and north of Curver
621	004	105.63	1		0.10 mile north of Culver Highway		11100		13100	0.6288	(0.86%	2.20%	US97, south of Madras and north of Culver
622	004	105.83	1		0.10 mile south of Culver Highway		10200		15500	0.9830	0.983	2.47%	2.20%	US97, south of Culver to County Line
623	004	00.80	1		At Jefferson-Deschutes County Line	6300	12900		7400	0.9361	0.9361	1.92%	5 2.20% 1.04%	US9/, south of Culver to County Line
1510	010	90.89	1		0.02 mile east of Camp Sherman Road	7000			8600	0.7307	0.785	1.04%	1.04%	US20, west of Sisters
1510	010	70.75	1		0.02 mile cust of Cump Sherman Road	7000			0000	0.7050	0.762	1.047		0520, west of bisters
2562	053	96.48	1		At Wasco-Jefferson County Line			4500	4900	0.1882	(0.44%	1.62%	US26, northwest of Madras
					0.02 mile northwest of Assess Hat									
2563	053	103 25	1		Springs Road			4500	4600	0 1178	(0.11%	1.62%	US26 northwest of Madras
2505	055	105.25	1		Springs road			4500	4000	0.1170	,	0.117	1.0270	0520, northwest of Madaas
					0.02 mile southeast of Agency-Hot									
2564	053	103.29	1		Springs Road			6900	7600	0.1931	(0.51%	1.62%	US26, northwest of Madras
					0.52 mile north of NW Polton Dom									
2565	053	107.30	1		Road			6900	7700	0.4369	(0.58%	1.62%	US26, northwest of Madras
2000	000	10/100			rouu			0700	,,,,,,	0.1505	,	0.507		
					0.02 mile northwest of NW Columbia									
2567	053	111.76	1		Drive			7000	7800	0.2661	(0.57%	1.62%	US26, northwest of Madras
					Warm Springs Automatic Traffic Recorder Sta 16 006 4 54 miles									
					northwest of The Dalles-California									
16006	053	113.17	1		Highway No. 4 (US97)			8400	8900	0.4867	(0.30%	1.62%	US26, northwest of Madras
														,
2569	053	113.93	1		0.02 mile northwest of NW Boise Drive			7300	7800	0.1266	(0.34%	1.62%	US26, northwest of Madras
2570	053	113.97	1		0.02 mile southeast of NW Boise Drive			7600	8900	0.2838	(0.86%	1.62%	US26, northwest of Madras
2571	052	115.01	1		0.05 mile coutheast of NW Charry Lana			0200	10100	0.5180	(0.40%	1.629/	US26 northwest of Madras
2371	055	113.91	1		0.02 mile southeast of The Dalles-			9200	10100	0.5180	(0.49%	1.0270	0320, northwest of Madias
4405	360	0.23	1		California Highway (US97)			2400	2600	0.5166	(0.42%	0.91%	US26 between Madras and Prineville (REGIONAL HI
4406	360	1.17	1		0.02 mile south of SW Dover Lane			1900	2100	0.2698	(0.53%	0.91%	US26 between Madras and Prineville (REGIONAL HIC
4407	360	1.57	1		0.02 mile south of Adams Drive			2100	2400	0.4610	(0.71%	0.91%	US26 between Madras and Prineville (REGIONAL HI
4408	360	9.88	1		0.02 mile north of Ramms Road			2000	2100	0.1469	(0.25%	0.91%	US26 between Madras and Prineville (REGIONAL HIC
4409	360	9,92	1		0.02 mile south of Ramms Road			1900	2000	0.0382	(0.26%	0.91%	US26 between Madras and Prineville (REGIONAL HIC
	500	,.,2	-								1	0.207	0.9170	
4410	360	16.30	1		At Jefferson-Crook County Line			2100	2200	0.0729	(0.24%	0.91%	US26 between Madras and Prineville (REGIONAL HIC
4410	201	0.02			0.02 mile west of The Dalles-California			2400	2500	0.0140		0.120	0.010	Colore History (DISTRICT MCUNAN)
4418	561	0.02	1		rigiway (US20/US9/-NB)		l	3400	3500	0.0148		0.15%	0.91%	Curver Highway (DISTRICT HIGHWAY)

4419	361	0.07	1	0.02 mile west of The Dalles-California Highway (US26/US97-SB)	4400	4700	0 2524	0	0 34%	0.91% Culver Highway (DISTRICT HIGHWAY)
	501	0.07			1100	4700	0.2524		0.5470	
4421	361	0.35	1	0.02 mile southwest of Madison Street	4400	5200	0.7714	0.7714	0.91%	0.91% Culver Highway (DISTRICT HIGHWAY)
4422	361	0.90	1	0.02 mile south of SW Belmont Lane	5100	5600	0.4193	0	0.49%	0.91% Culver Highway (DISTRICT HIGHWAY)
4423	361	2.25	1	0.02 mile northeast of SW Colfax Lane	4000	4100	0.0003	0	0.13%	0.91% Culver Highway (DISTRICT HIGHWAY)
4424	361	2.89	1	0.02 mile north of SW Bear Drive	4100	4200	0.0001	0	0.12%	0.91% Culver Highway (DISTRICT HIGHWAY)
4425	361	2.93	1	0.02 mile southwest of SW Bear Drive	4000	4100	0.0006	0	0.13%	0.91% Culver Highway (DISTRICT HIGHWAY)
4426	361	3.82	1	0.02 mile south of SW Dover Lane	3600	3700	0.0557	0	0.14%	0.91% Culver Highway (DISTRICT HIGHWAY)
4427	361	4.33	1	0.02 mile north of 7th Street	3200	3300	0.1621	0	0.16%	0.91% Culver Highway (DISTRICT HIGHWAY)
4428	361	4.38	1	0.03 mile south of 7th Street	3100	3200	0.1130	0	0.16%	0.91% Culver Highway (DISTRICT HIGHWAY)
4429	361	4.61	1	0.02 mile south of 9th Street, south city limits of Metolius	3100	3200	0.0333	0	0.16%	0.91% Culver Highway (DISTRICT HIGHWAY)
4430	361	5.08	1	0.02 mile southwest of SW Eureka Lane	2700	2800	0.0966	0	0.19%	0.91% Culver Highway (DISTRICT HIGHWAY
4431	361	7.01	1	0.02 mile northeast of SW Ford Lane	2600	2700	0.3932	0	0.19%	0.91% Culver Highway (DISTRICT HIGHWAY)
4432	361	7.05	1	0.02 mile south of SW Ford Lane	2900	3000	0.2567	0	0.17%	0.91% Culver Highway (DISTRICT HIGHWAY)
4433	361	8.81	1	0.02 mile north of "A" Street	2600	2700	0.3305	0	0.19%	0.91% Culver Highway (DISTRICT HIGHWAY)
4434	361	8.85	1	0.02 mile south of "A" Street	2400	2500	0.5627	0	0.21%	0.91% Culver Highway (DISTRICT HIGHWAY)
4436	361	9.30	1	0.02 mile north of SW Iris Drive, south city limits of Culver	2300	2400	0.2502	0	0.22%	0.91% Culver Highway (DISTRICT HIGHWAY)
4437	361	9.44	1	0.12 mile south of SW Iris Drive	2100	2200	0.2099	0	0.24%	0.91% Culver Highway (DISTRICT HIGHWAY
4439	361	11.58	1	0.04 mile west of The Dalles-California Highway (US97)	2200	2400	0.5248	0	0.45%	0.91% Culver Highway (DISTRICT HIGHWAY)