KITTELSON & ASSOCIATES
851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

Technical Memorandum

February 17, 2023
[revised by Region 1 Traffic]

Project# 27358

To: Sandra Hikari, Project Manager
Oregon Department of Transportation
123 NW Flanders St
Portland, OR 97209

From: Nicholas Gross, Alice Root, Ashleigh Ludwig PE, AICP, Hermanus Steyn, PE

CC: Scott Hoelscher, Clackamas County

RE: US 26 Rhododendron Design Refinement Plan

TECHNICAL MEMORANDUM #5: DESIGN REFINEMENT AND ALTERNATIVES EVALUATION MEMORANDUM

Contents

Executive Summary

There are varying opinions for the various design element widths associated with the alternatives. The design refinement and alternatives evaluation process summarized in this memorandum, identifies a preferred alternative to be advanced into conceptual design including a site plan of the proposed improvements. The 5-lane and 3-lane alternatives have been refined based on feedback received from Clackamas County, the Mobility Advisory Committee (MAC), and ODOT, including ODOT traffic, maintenance, landscape architecture, active transportation, and technical center groups, as well as public feedback received as part of the in-person outreach event. As the project continues to advance in its refinement and design, opportunities to slow speeds and reduce the overall cross section width should be explored, consistent with the intended outcomes and corridor vision for Rhododendron.

Note: ODOT staff has raised the suggestion of exploring a 4-lane alternative (two westbound, a two-way left-turn (TWLT), and one eastbound) as a potential alternative to improve operational conditions within the study area. The 4-lane alternative was not evaluated as part of the design refinement and alternative evaluation due to scope limitations; however, if ODOT wishes to explore a 4-lane, it can be explored under a separate planning study.

Purpose

This technical memorandum describes, evaluates, and recommends a preferred alternative for the US 26 corridor in Rhododendron between mileposts 44.0 and 44.4. The project team evaluated three alternatives including a 5-Lane (with Pedestrian Refuge Island), 3-Lane (with Pedestrian Refuge Island), and 3-Lane (without Pedestrian Refuge Island)[1]. The 3-Lane and 5-Lane alternatives were developed to achieve the Refinement Plan intended outcomes of improving safety and operations on the highway for all modes. For comparison purposes, the No-Build is illustrated in the following section.

The project team gathered input to develop preliminary design ideas through the Community Drop-In Event and review of background material including but not limited to *Rhody Rising Rhododendron Village Center & Community Visioning Plan (Reference 1)*, *Rhododendron Main Street Redevelopment Concept Plan (Reference 2)*, *The Villages at Mt. Hood Pedestrian and Bikeway Implementation Plan (Reference 3)* as well as design guidance included in ODOT's 2023 Highway Design Manual (HDM). Additional public input will be solicited as part of the virtual public meeting.

US 26 Concept Development

The following section describes and illustrates the existing and proposed alternatives to address the needs and deficiencies identified along US 26 in Rhododendron. Typical sections along with concept design roll plots were produced to convey the proposed alternatives. Upon selection of a preferred alternative, further design details will be explored to identify potential constraints, challenges, and considerations.

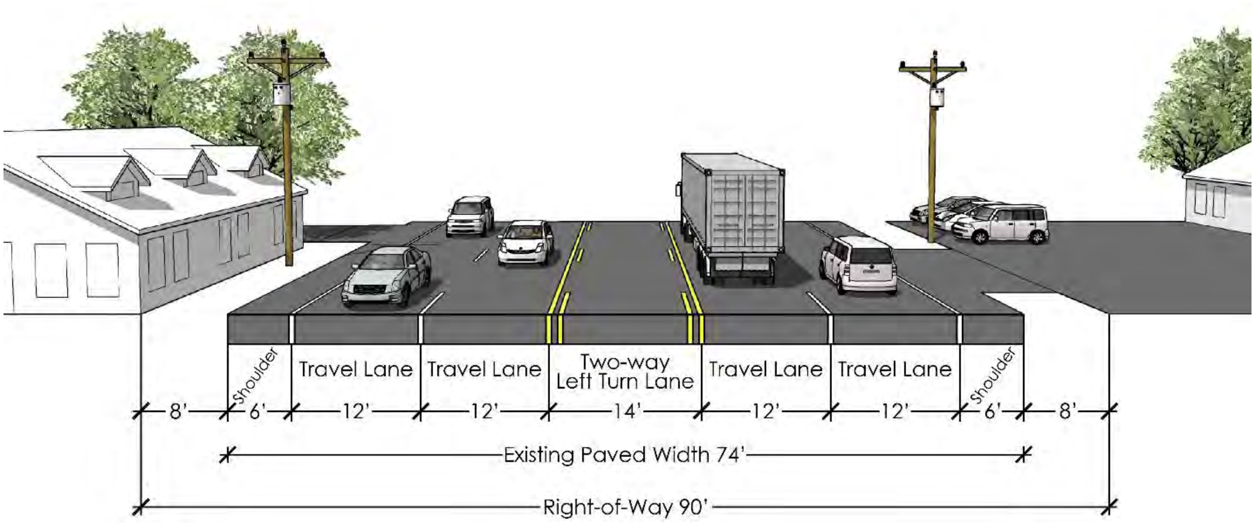
The alternatives were developed based on field observations, initial assessments by the consultant team, national and state guidance for multimodal facility selection, and input from the Project Management Team (PMT), as well as community feedback received as part of the Community Drop-In Event – conducted on August 11 from 2:00 to 4:00pm.

[1] The Existing Conditions 2022, Opening Year (2030) No Build, and Future Year (2050) No Build are summarized in TM#4

No-Build

The No-Build alternative maintains the current 5-lane cross section and makes no changes to existing conditions. The No-Build alternative cross section is illustrated in Figure 1.

Figure 1: No-Build Alternative Cross Section



As illustrated above, the No-Build cross section includes four 12-foot travel lanes, one 14-foot two-way left-turn lane (TWLTL), and two 6-foot shoulders (shoulder bikeways). The No-Build pavement width is approximately 74 feet, and the existing right-of-way (ROW) is 90 feet.

Note: Based on field observations, a building structure on the south side of US 26 just west of the Snowline Motel encroaches into the existing ROW.

Table 1 summarizes the No-Build roadway context and cross-sectional dimensions.

Table 1. No-Build Alternative – Roadway Characteristics

Number of Lanes	Lane Width	Curb-to-Curb Width	Target Speed	Posted Speed	Bicycle Facility**	Horizontal Clearance	Sidewalk
5	12 ft travel lanes, 14 ft TWLTL*	74 ft	Null	40 MPH	6 ft shoulder	74 ft	None

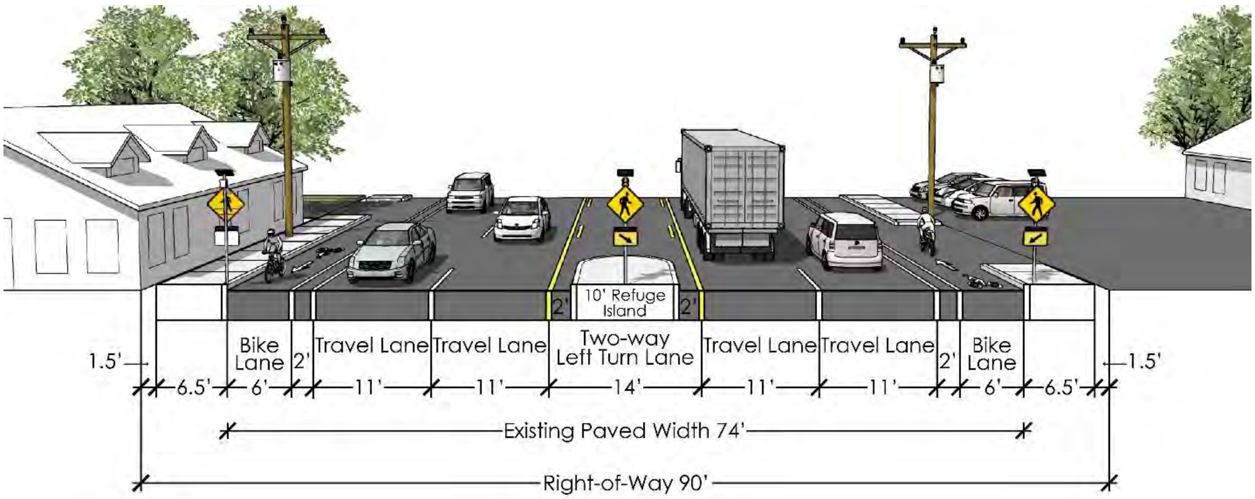
*TWLTL = Two-Way Left Turn Lane
**Bicycles are currently using the 6-foot shoulder

Note: No-Build 85th percentile speeds were recorded as 59 and 57 MPH in the east and westbound directions, respectively. There is an existing speed feedback sign for westbound traffic at the east end of Rhododendron where the 40 MPH posted speed limit begins.

5-Lane Alternative (with Pedestrian Refuge Island)

The 5-Lane Alternative (with Pedestrian Refuge Island) reduces travel lane widths from 12 feet to11 feet and includes buffered bike lanes, sidewalks, and a pedestrian refuge island at proposed crossing locations to improve access and increase safety for people crossing US26[2]. The 5-Lane Alternative (with Pedestrian Refuge Island) cross section is illustrated in Figure 2.

Figure 2: 5-Lane Alternative (with Pedestrian Refuge Island) Cross Section



As illustrated above, the 5-Lane Alternative (with Pedestrian Refuge Island) cross section includes four 11-foot travel lanes, one 14-foot TWLTL (2 feet of shy distance provided adjacent to pedestrian refuge island), and two 8-foot buffered bike lanes (6-foot bike lane and 2-foot buffer). The 5-Lane Alternative (with Pedestrian Refuge Island) maintains the existing pavement width of approximately 74 feet. No encroachment into the existing 90-foot ROW is proposed; however, utility relocation and building impacts may need to be addressed due to the installation of sidewalks. In constrained locations (e.g., building proximity), the project can consider curb-tight sidewalks, while in other areas separated sidewalks are preferred. Snow storage for this alternative is likely to impact the bike lane and/or sidewalk.

Table 2 summarizes the 5-Lane Alternative (with Pedestrian Refuge Island) roadway context and cross-sectional dimensions.

Table 2. 5-Lane Alternative (with Pedestrian Refuge Island) – Roadway Characteristics

Number of Lanes	Lane Width	Curb-to-Curb Width	Target Speed	Posted Speed	Bicycle Facility	Horizontal Clearance	Sidewalk**
5	11 ft travel lanes, 14 ft TWLTL*	74 ft	35 MPH	40 MPH	8 ft	32 ft	6 ft

*TWLTL = Two-Way Left Turn Lane
** Dimension shown in cross section figure includes 6" curb

Appendix "A" illustrates the ROW impacts and needs for the 5-Lane Alternative (with Pedestrian Refuge Island).

[2] The location of a pedestrian refuge island(s) will be informed by input received as part of Virtual Open House, past input received as part of the Community Drop-in Event, access management information and location of future transit stop (to be identified as part of US 26 Design Refinement Plan).

Enhanced Crossing (5-Lane Alternative (with Pedestrian Refuge Island))

ODOT Traffic Manual

A pedestrian crossing is proposed as part of the 5-Lane Alternative (with Pedestrian Refuge Island). Based on the cross section illustrated above, number of lanes crossed, an annual average daily traffic (AADT) range of 9,000 – 12,000 vehicles per day[3], and the anticipated operating speed[4], ODOT's Traffic Manual identifies the following treatments:

Recommended treatments:

- Continental-style crosswalk markings, parking restrictions on crosswalk approach (see Table 310.3-B), lighting according to ODOT Traffic Lighting Design Manual. Crossing warning sign(s) for school crosswalks, midblock crosswalks, or speed ≥30 mph
- Wide advance stop bar and STOP HERE FOR Pedestrian sign.
- Rectangular Rapid Flashing Beacon (RRFB)

Optional treatments:

- Curb extensions
- Traffic signal or pedestrian hybrid beacon (PHB)

Summary

Table 3 summarizes the recommended pedestrian crossing facility treatment according to ODOT's Traffic Manual including presence of a pedestrian refuge island, horizontal clearance for freight and over dimensional sized vehicles, as well as bicycle and pedestrian facility treatments.

Table 3. 5-Lane Alternative (with Pedestrian Refuge Island) – Recommended Facility Treatments

Pedestrian Crossing Facility	Refuge Island	Horizontal Clearance	Target Speed	Pedestrian Facility	Bicycle Facility
Rectangular Rapid Flashing Beacon (RRFB) [1]	Yes	32 ft	35 mph	6-foot sidewalks	8-foot bike lanes

[1] Recommendation based on FHWA guidance

Operational Performance Summary

Operationally, the 5-Lane Alternative (with Pedestrian Refuge Island) functions the same as the 5-Lane No-Build scenario, which was evaluated in Technical Memorandum #4: Safety, Operations, Active Transportation Analyses (Reference 5). The 5-lane analysis and key assumptions are summarized below.

[3] The AADT used for crossing approvals will be based on the volumes at opening day. The AADT on US 26 for 2022 is 9,800 vehicles per day, and the AADT projected for 2030 is 11,100 vehicles per day.

[4] Through discussions with ODOT technical staff and based on 85th percentile speeds exceeding the posted speed limit by approximately 20mph, the anticipated operating speed for the 5-lane and 3-lane alternatives is expected to be greater than 40mph.

Volume Development and Analysis Assumptions

A detailed summary of volume development and forecasts are provided in Technical Memorandum #4 and the Methodology Memorandum. This section summarizes key assumptions and findings from the operational analyses.

Existing Traffic Volumes

The project team collected 24-hour tube counts at two locations in Rhododendron: approximately 350 feet west of East Little Brook Lane and approximately 150 feet west of East Henry Creek Road. Counts were collected over a seven-day period between Friday, May 13, 2022, and Thursday, May 19, 2022. The tube count data includes vehicle classification, traffic volume, and vehicle speed. The project team's evaluated typical weekday conditions and peak conditions. The highest traffic volumes occurred on Sunday. For this reason, the project team selected Sunday to represent peak traffic conditions. The US 26 peak hour on Sunday occurred between 3:00 and 4:00 PM. To represent typical weekday peaks, the team considered data from Tuesday to Thursday, excluding Friday, which also showed peaking characteristics associated with recreational traffic, similar to Sunday.

The peak hour between Tuesday and Thursday occurred between 1:45 and 2:45 PM on Thursday. Based on these results, the project team found Thursday to be the most representative day of the week for mid-weekday peak hour volumes.

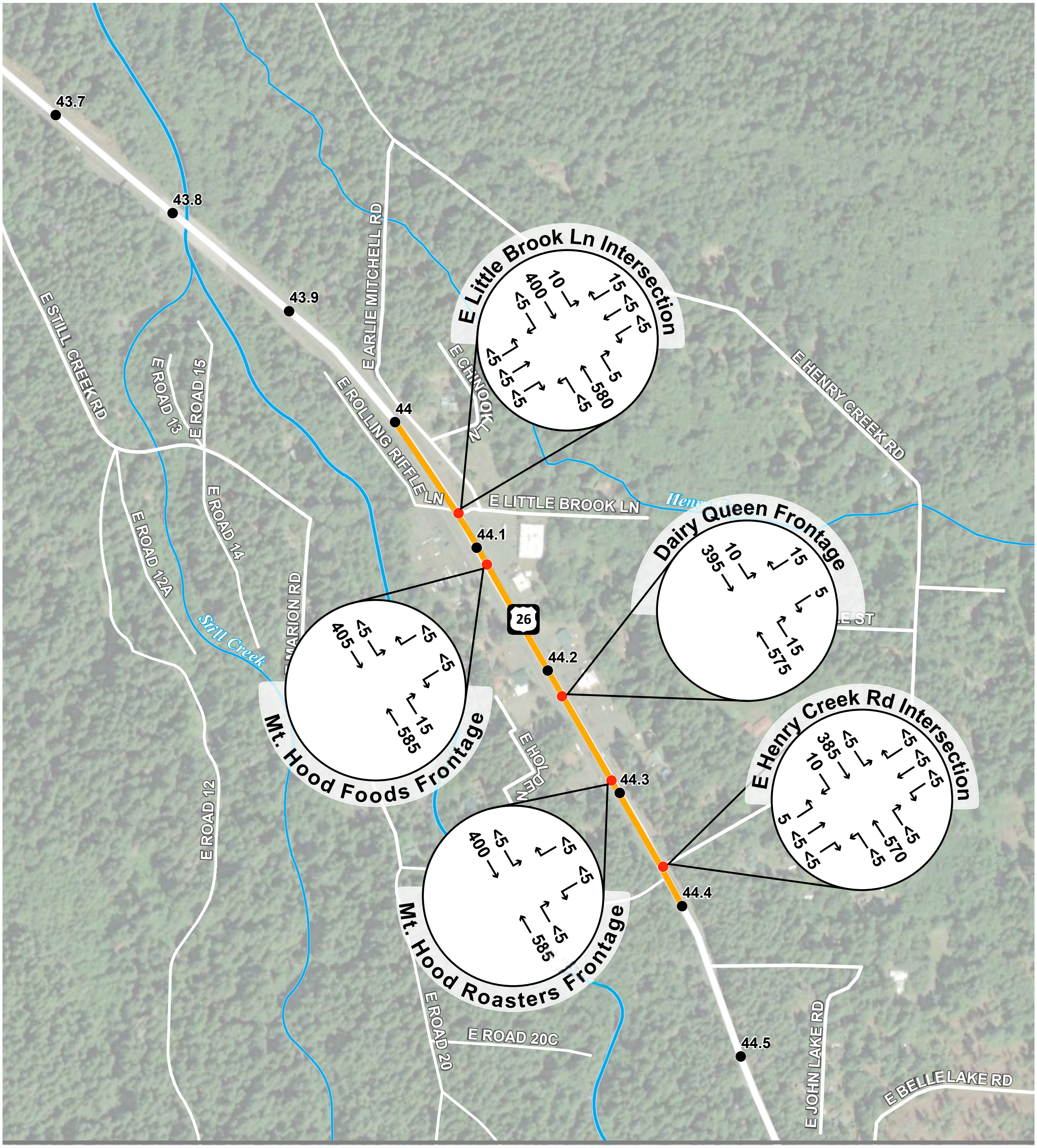
The project team collected turning movement counts (TMCs) at the study intersections on Thursday, May 12, 2022, from 2:00 – 4:00 PM[5] as well as Sunday, May 15, 2022, from 1:00 – 3:00 PM. Traffic volume from Thursday reflects typical weekday conditions, and the traffic volume from Sunday reflects peak weekend volume conditions. There were no morning TMCs collected due to relatively low volumes during that time period.

The project team completed the following adjustments to obtain analyses volumes for Existing Conditions:

- Using the On-Site ATR method, a calculated seasonal adjustment factor of 1.42 was used to adjust the traffic volumes from the count month of May to the peak month of July.
- The project team increased Sunday traffic volumes by 10 percent, because the tube counts show traffic volumes to be approximately 10 percent higher between 3:00 and 4:00 PM on Sunday, compared to the peak hour of the TMCs (2:00 – 3:00 PM), which were only conducted between 1:00 and 3:00 PM on Sunday.

Figure 3 and Figure 4 illustrate existing traffic volumes during the Thursday and Sunday peak hours, respectively.

[5] Although the tube counts showed a peak hour on US 26 mainline traffic from 1:45 to 2:45 PM on Thursday, the difference in traffic volumes on US 26 between 1:45 – 2:45 PM and 2:00 – 3:00 PM was less than one percent on the west end of town. Therefore, it was determined that the difference in traffic volumes was negligible and that the Thursday turning movement counts captured the peak hour for that day.



Mile Points

Study Corridor

Study Area Intersections

0 540 Feet

Figure 3

KITTELSON & ASSOCIATES

Existing (2022) Weekday (Thursday)
PM Traffic Volumes
Rhododendron, Oregon

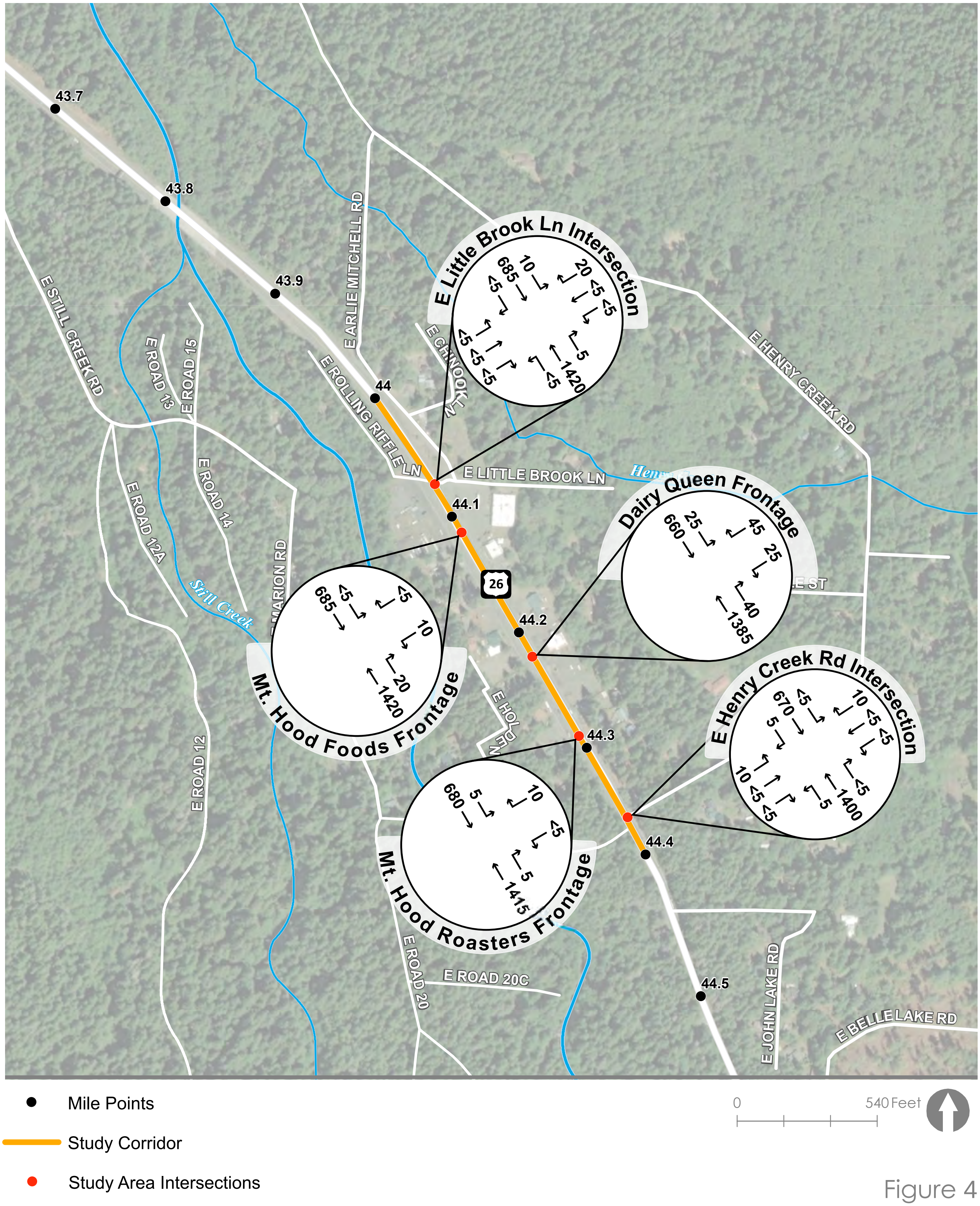


Figure 4

Existing (2022) Weekend (Sunday) Afternoon Traffic Volumes Rhododendron, Oregon

KITTELSON & ASSOCIATES

Future Volume Development

Due to the rural nature of Rhododendron, standard growth is anticipated.[6] As noted in the Methodology Memorandum, the historical trends method was used to project volume to reach the 2030 opening year and the 2050 future year volumes. An annual growth rate of 1.82 percent was applied to all movements at the study intersections.

- The project team noted that the volume projections may overestimate side street and driveway volume projections, which may grow at rates slower than that of the highway.
- The project team noted that westbound volumes exceeded the capacity of the up-stream two-lane highway section on Sunday. Based on this, the projected demand in Rhododendron cannot be realized during this time. To account for those conditions, the team completed the analyses with volume constrained to 1,700 vehicles/hour (the capacity of the up-stream two-lane highway) during the time periods when projected volume is higher than 1,700 vehicles/hour.
- Operational results presented in the operational summary tables below reflect both the analyses using the projected demand and the projected (constrained) volume.

Pedestrian and Bicycle Volumes

Weekday pedestrian and bicycle volumes were collected in May 2022 as part of the intersection TMCs. The observed pedestrian volumes during the study hours are shown in Figure 5. An increase in pedestrian volume was observed on Sunday, with five pedestrians at the E Little Brook Lane intersection and six pedestrians at the Mt Hood Foods intersection.

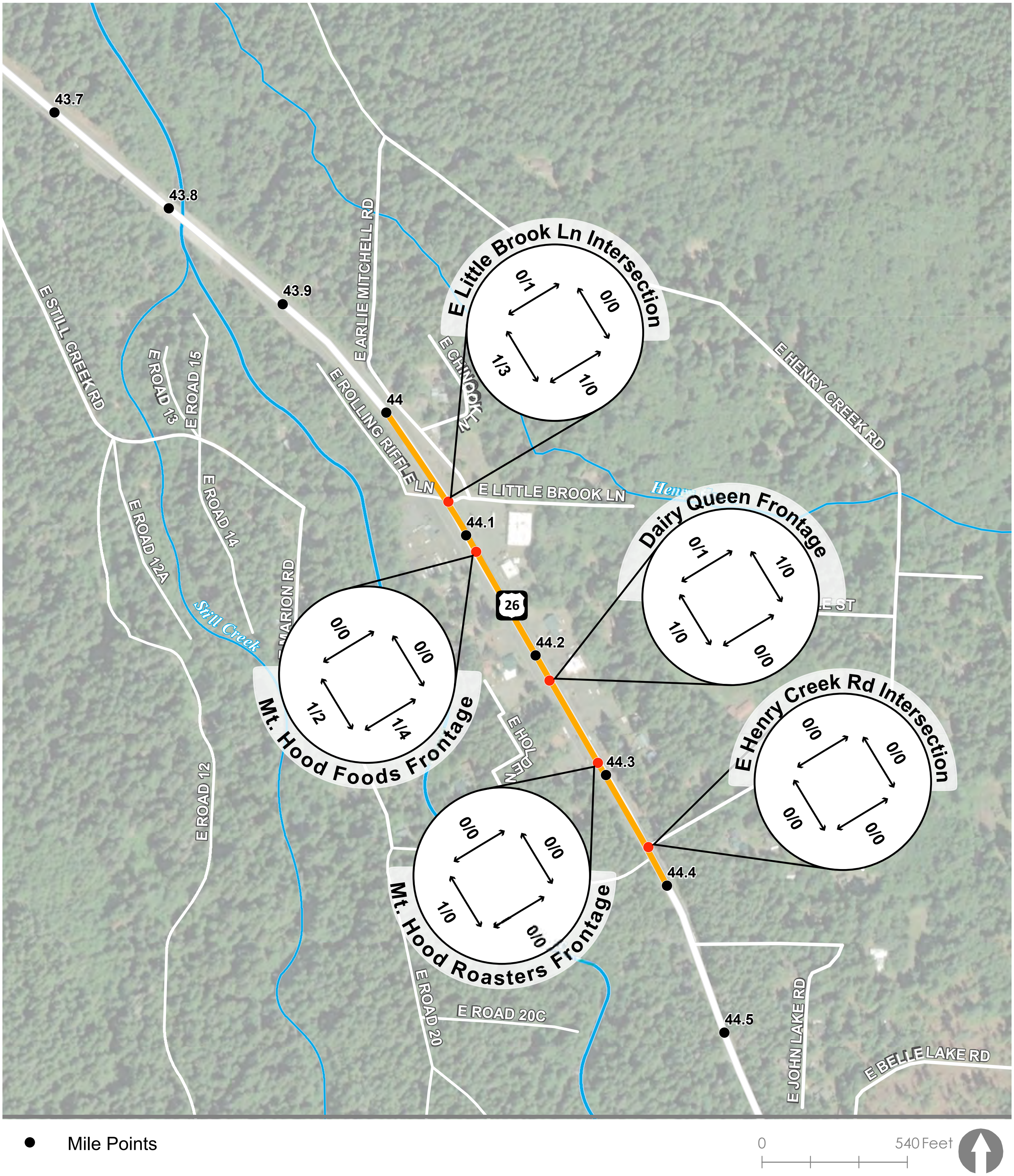
24-hour pedestrian and bicycle count volumes were collected at the US 26 and Little Brook Lane intersection on Tuesday, August 9, 2022. A total of eight cyclists and twenty pedestrians were counted at the study intersection. Seven pedestrians were counted between 5:45 am and 9:45 am, and the remaining thirteen pedestrians were counted between 1:30 pm and 7:30 pm. Cyclists were active throughout the second half of the day between 12:45 pm and 8:15 pm. Of the twenty pedestrian counts, sixteen were counted crossing US 26, eight in each direction. Table 4 summarizes the results of the 24-hour count data.

---

[6] Although additional apartments are envisioned as part of SkiBowl's plans, no specific plans or trip generation assumptions have been developed to date. Current discussions indicate visions for approximately 40 units. The future volume tables used to develop the annual growth rate accounts for standard growth in the area.

Table 4. 24-Hr Pedestrian and Bicycle Count

Ped/ Bike	Direction of travel	12AM -2AM	2AM - 4AM	4AM - 6AM	6AM - 8AM	8AM - 10AM	10AM - 12PM	12PM - 2PM	2PM - 4PM	4PM - 6PM	6PM - 8PM	8PM - 10PM	10PM - 12AM
Ped	Northbound crossing US-26	0	0	1	0	2	0	0	4	1	0	0	0
	Southbound crossing US-26	0	0	0	3	0	0	1	0	2	2	0	0
	Westbound along US-26	0	0	0	0	0	0	1	2	0	0	0	0
	Eastbound along US-26	0	0	0	1	0	0	0	0	0	0	0	0
Bike	Westbound along US-26	0	0	0	0	0	0	1	0	2	0	0	0
	Eastbound along US-26	0	0	0	0	0	0	0	1	1	0	3	0



Mile Points

Study Corridor

Study Area Intersections

Figure 5

KITTELSON & ASSOCIATES

Pedestrian Traffic Volumes
Thursday/Sunday Volumes
Rhododendron, Oregon

Intersection Operational Results

Operational analyses were conducted for the study intersections as well as the highway using the *Highway Capacity Software (HCS) 2022* to implement the *Highway Capacity Manual (HCM)*. The analyses show that intersections are expected to meet ODOT volume-to-capacity (v/c) ratio targets in 2050 Thursday and Sunday conditions, but the side street delay may exceed 50 seconds on Sundays. Side street delay is expected to remain near or under 20 seconds on the weekday (Thursday) peak.

Results for 2030 and 2050 are presented in Table 5 and Table 6 below.

Table 5. 2030 5-Lane Alternative Intersection Operations

Intersection	Critical Movement of Side Street	v/c	Meets ODOT v/c Targets?	Delay (sec)	LOS	Queue Length (ft)*
2030 (Thursday) Peak Hour - HCS						
East Little Brook Lane/US 26	SBL	0.05	Yes	13.0 s	B	50
Mount Hood Food Frontage/US 26	SBL	0.01	Yes	13.8 s	B	50
Dairy Queen Driveway/US 26	SBR	0.03	Yes	10.6 s	B	50
Mount Hood Roasters Driveway Access/US 26	SBL	0.01	Yes	12.6 s	B	50
East Henry Creek Road/Rd. 20/US 26	NBL	0.03	Yes	14.5 s	B	50
2030 (Sunday) Peak Hour - HCS						
East Little Brook Lane/US 26	SBL	0.16	Yes	30.2 s	D	75
Mount Hood Food Frontage/US 26	SBL	0.14	Yes	37.9 s	E	75
Dairy Queen Driveway/US 26	SBL	0.25	Yes	48.1 s	D	75
Mount Hood Roasters Driveway Access/US 26	SBL	0.05	Yes	20.1 s	C	75
East Henry Creek Road/Rd. 20/US 26	NBL	0.12	Yes	38.5	E	75

*Queue lengths are provided from ODOT's Queue Length Estimation for Two-Way Stop-Controlled Intersections Worksheet, per the APM. Worksheets are provided in Appendix "G".
** Intersections were reevaluated using Sunday WB volumes not exceeding the 1700 v/h, the two-lane highway capacity. Comparison (values) show original analyses using the WB demand, which exceeds 1700 v/h in these situations. Thursday WB volumes did not exceed capacity for a two-lane highway.

Table 6. 2050 5-Lane Alternative Intersection Operations

Intersection	Critical Movement of Side Street	v/c	Meets ODOT v/c Targets?	Delay (sec/veh)	LOS	Queue Length (ft)*
2050 (Thursday) Peak Hour - HCS						
East Little Brook Lane/US 26	SBL	0.08	Yes	15.4 s	C	50
Mount Hood Food Frontage/US 26	SBL	0.02	Yes	17.1 s	C	50
Dairy Queen Driveway/US 26	SBL	0.04	Yes	20.0 s	C	50
Mount Hood Roasters Driveway Access/US 26	SBL	0.02	Yes	14.1 s	B	50
East Henry Creek Road/Rd. 20/US 26	NBL	0.06	Yes	19.1 s	C	50
2050 (Sunday) Peak Hour – HCS						
East Little Brook Lane/US 26	SBL	0.24 (0.41)	Yes	36.7 s (>50 s)	E (F)	75 (100)
Mount Hood Food Frontage/US 26	SBL	0.19 (0.35)	Yes	40.8 s (>50 s)	E (F)	75 (100)
Dairy Queen Driveway/US 26	SBL	0.34 (0.60)	Yes	>50 s	D	100 (100)
Mount Hood Roasters Driveway Access/US 26	SBL	0.06 (0.10)	Yes	20.4 s (29.3 s)	C (D)	75 (100)
East Henry Creek Road/Rd. 20/US 26	NBL	0.20 (0.32)	Yes	>50 s	F	75 (100)

*Queue lengths are provided from ODOT's Queue Length Estimation for Two-Way Stop-Controlled Intersections Worksheet, per the APM. Worksheets are provided in Appendix "G".
** Intersections were reevaluated using Sunday WB volumes not exceeding the 1700 v/h, the two-lane highway capacity. Comparison (values) show original analyses using the WB demand, which exceeds 1700 v/h in these situations. Thursday WB volumes did not exceed capacity for a two-lane highway.

The project team also reviewed the delays and queues associated with left-turning movements from US 26. The analyses show the left turning movements are expected to stay below 17 seconds. Delays are lower in the westbound direction remaining near or below 10 seconds. Results for the 2030 and 2050 are presented in are summarized in Table 7.

Table 7. Delays and Queues for Turning Traffic from US 26 (5-Lane Alternative)

Intersection	US 26 Movement	5-Lane Alternative	
		Control Delay (s)	Queue Length (ft)*
2030 Opening Year Conditions (Sunday)			
East Little Brook Lane/US 26	WBL	9.3 s	50
	EBL	14.2 s	100
Mount Hood Food Frontage/US 26	EBL	14.2 s	100
Dairy Queen Driveway/US 26	EBL	14.6 s	125
Mount Hood Roasters Driveway Access/ US 26	EBL	14.0 s	100
East Henry Creek Road/Rd. 20/US 26	WBL	9.3 s	50
	EBL	13.8 s	100
2050 Opening Year Conditions (Sunday)			
East Little Brook Lane/US 26	WBL	10.3 s (10.3 s)	50 (50)
	EBL	15.0 s (20.1 s)	125 (175)
Mount Hood Food Frontage/US 26	EBL	14.9 s (19.9 s)	125 (175)
Dairy Queen Driveway/US 26	EBL	16.2 s (21.7 s)	150 (200)
Mount Hood Roasters Driveway Access/ US 26	EBL	14.7 s (19.5 s)	125 (175)
East Henry Creek Road/Rd. 20/US 26	WBL	10.3 s (10.3 s)	50 (50)
	EBL	14.6 s (18.9 s)	100 (175)

*Queue lengths are provided from ODOT's Queue Length Estimation for Two-Way Stop-Controlled Intersections Worksheet, per the APM. Worksheets are provided in Appendix "G".
** Intersections were reevaluated using Sunday WB volumes not exceeding the 1700 v/h, the two-lane highway capacity. Comparison (values) show original analyses using the WB demand, which exceeds 1700 v/h in these situations. Thursday WB volumes did not exceed capacity for a two-lane highway.

Segment Operational Results

The project team used the HCM methodology for multilane highways as implemented in HCS to conduct the segment analysis for the study area roadway. The team analyzed the five-lane multilane highway facility using the weekday and Sunday peak hours from the seven-day 24-hour tube counts.

The weekday analysis used the 1:45PM-2:45PM Thursday peak hour volumes, and the weekend analysis used the 3:00PM-4:00PM Sunday peak hour volumes. As shown below in Table 8, the 5-lane alternative is anticipated to be able to accommodate (v/c < 1.0) the projected 2050 demand, even without restrictions due to the two-lane section east of Rhododendron. However, the unconstrained v/c exceeds ODOT's HDM v/c ratio targets for Sunday WB (0.60 for Statewide Freight Routes outside UGBs).

Table 8. 5-Lane Alternative HCS Segment Analysis

West/East End of Town	Thursday/ Sunday Peak Hour	Westbound/ Eastbound	HCS v/c	Travel Time (min) [1]	Density (pc/mi/ln) [2]
2030 Opening Year Conditions					
West End of Town	Thursday	WB	0.21	0.52	7.8
		EB	0.17	0.52	6.5
	Sunday	WB	0.56 (0.56) [3]	0.52 (0.52) [3]	20.7 (20.8) [3]
		EB	0.20	0.52	7.4
East End of Town	Thursday	WB	0.20	0.52	7.4
		EB	0.17	0.52	6.3
	Sunday	WB	0.60 (0.61) [3]	0.55 (0.52) [3]	22.1 (22.3) [3]
		EB	0.20	0.52	7.5
2050 Future Year Conditions					
West End of Town	Thursday	WB	0.28	0.52	10.3
		EB	0.23	0.52	8.6
	Sunday	WB	0.56 (0.74) [3]	0.52 (0.52) [3]	20.7 (27.4) [3]
		EB	0.26	0.52	9.8
East End of Town	Thursday	WB	0.26	0.52	9.7
		EB	0.22	0.52	8.3
	Sunday	WB	0.56 (0.74) [3]	0.52 (0.52) [3]	20.9 (27.7) [3]
		EB	0.25	0.52	9.4

1. Travel times were manually calculated using average speed and corridor length of 0.4 miles.
2. Follower density is unique to two-lane highways.
3. Segments were reevaluated using Sunday WB volumes not exceeding the 1700 v/h, the two-lane highway capacity. Comparison (values) show original analyses using the WB demand, which exceeds 1700 v/h in these situations. Thursday WB volumes did not exceed capacity for a two-lane highway.

Safety Analysis

As summarized in Technical Memorandum #4, there were eight reported crashes in the study area between 2016 and 2020, with no fatal or severe injuries reported. The calculated segment crash rate is 1.12 crashes per million vehicle miles, which exceeds the average crash rate for rural principal arterials in Oregon between 2016 and 2022. Four reported crashes were sideswipe crashes, including two in wet conditions and two in snow/ice conditions. Three of the sideswipe crashes occurred on the east end of Rhododendron where the five-lane roadway transitions to a two-lane roadway. Reported crashes within the study area are shown in Table 9.

Table 9. Study Area Reported Crash History (January 1, 2016-December 31, 2020)

Study Area	Collision Type				Severity			Total Crashes	Crash Rate (per MEV[2])	90th Percentile Crash Rate
	Rear-End	Turning	Side-swipe	Fixed-Object or Other-Object Collision Type	PDO[1]	Non-Severe Injury	Fatal /Severe			
East Little Brook Lane/US 26	0	1	0	0	1	0	0	1	0.04	1.08
Mount Hood Food Frontage/US 26	0	0	0	0	0	0	0	0	0.00	0.48
Non-Intersection Crash: Between Dairy Queen and Mount Hood Foods	0	0	1	0	1	0	0	1	N/A	N/A
Dairy Queen Driveway/US 26	0	0	0	0	0	0	0	0	0.00	0.48
Mount Hood Roasters Driveway Access/US 26	0	0	0	1	0	1	0	1	0.04	0.48
East Henry Creek Road/Rd. 20/US 26	1	1	1	0	0	3	0	3	0.13	1.08
Non-Intersection Crash: East End Approach on US 26	0	0	2	0	1	1	0	2	N/A	N/A
Study Area Total	1	2	4	1	3	5	0	8	N/A	N/A

[1] PDO = Property Damage Only
[2] MEV = Million Entering Vehicles, calculated using average daily volumes from the 7-day tube counts, supplemented with side street volumes from peak-hour turning movement counts to estimate total entering vehicles at each intersection.

The 5-Lane Alternative (with Pedestrian Refuge Island) makes the following changes to the cross-section, compared to existing conditions, from a safety perspective:

- Encourages slower speeds, with a target speed of 40 mph, through cross-section changes including narrowed lanes, installation of curb and sidewalk, and defining access points to create a more urban feel, alerting drivers of the change in context from a rural corridor. Slowing speeds result in less severe crashes when crashes occur.
- Narrows travel lanes from 12-ft to 11-ft wide:
  - Although there is not a reliable CRF that is applicable for this study's context, narrowing travel lanes have proven effective at reducing speeds and therefore reducing crash severity.
- Converts the 6-ft bike shoulder to an 8-ft buffered bike lane (6-ft bike lane with a 2-ft buffer):
  - ODOT applies a 47 percent reduction in injury bicycle crashes for installation of a buffered bike lane (in urban areas). ODOT also applies a 36 percent reduction in all bicycle crashes for installation of non-buffered bike lanes (shoulder). This indicates a greater crash reduction anticipated with 8-ft buffered bike lanes compared to 6-ft shoulder bike lanes, due to the increased separation from vehicles.
- Adds 6 ft sidewalk
  - Sidewalk is anticipated to reduce crashes involving people walking along the roadway by 20 percent.
- Adds a pedestrian crossing with a refuge island and a RRFB
  - Installing a RRFB with a pedestrian refuge island is expected to reduce pedestrian and bike crashes by 56 percent.

On-Street Parking Considerations

On-street parking is not proposed with the 5-Lane Alternative for the following reasons:

- On-street parking would require additional width in the cross-section, requiring either additional right-of-way or removal of pedestrian and bicycle facilities.
- On-street parking creates additional opportunities for conflict between parking vehicles and bicyclists.
- When vehicles are using on-street parking, the parked vehicles can restrict sight distance at intersections and driveways unless adequate distance is placed between the parking areas and driveways.
- Parked vehicles can limit visibility of pedestrians waiting to cross at crosswalks, making it more challenging for drivers to see and slow for crossing pedestrians.
- On-street parking will require a wider cross section, increasing pedestrian crossing distances and exposure.
- Based on field observations, extensive off-street parking is provided for private retail and commercial uses. For this reason, on-street parking is may be underutilized and contribute to increase operating speeds on US 26 due to widened cross section.

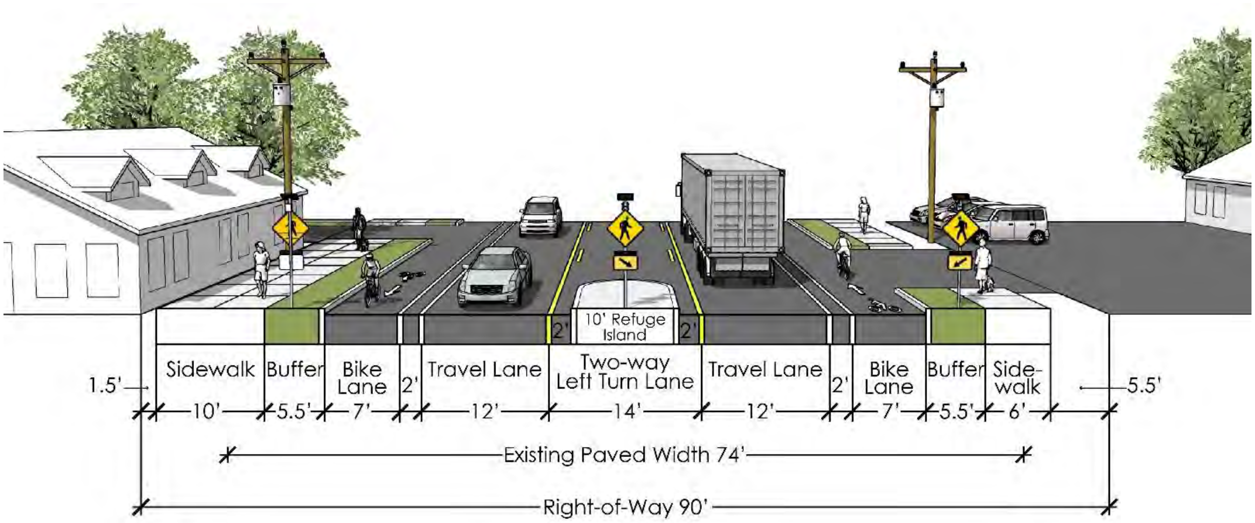
3-Lane Alternative(s)

Two 3-Lane Alternatives have been developed with varying active transportation improvements.

3-Lane Alternative (with Pedestrian Refuge Island)

The 3-Lane Alternative (with Pedestrian Refuge Island) reduces the existing cross section from 5-lanes to 3-lanes and includes buffered bike lanes, sidewalks, and a pedestrian refuge island at proposed crossing locations to improve access and increase safety for people crossing US26. The 3-Lane Alternative (with Pedestrian Refuge Island) cross section is illustrated in Figure 6.

Figure 6: 3-Lane Alternative (with Pedestrian Refuge Island) Cross Section



As illustrated above, the 3-Lane Alternative (with Pedestrian Refuge Island) cross section includes two 12-foot travel lanes, one 14-foot TWLTL (2-foot of shy distance provided adjacent to pedestrian refuge island), and two 9-foot buffered bike lanes (7-foot bike lane and 2-foot buffer). The 3-Lane Alternative (with Pedestrian Refuge Island) reduces the existing pavement width from approximately 74 feet to 56 feet.

No encroachment into the existing 90-foot ROW is proposed and no utility relocation or building impacts are anticipated. Table 10 summarizes the 3-Lane Alternative (with Pedestrian Refuge Island) roadway context and cross-sectional dimensions. There may be opportunities to move the sidewalk farther to the back of the ROW allowing for a wider landscape buffer. Snow storage for this alternative would likely occur in the landscape buffer between the sidewalk and travel lane.

Table 10. 3-Lane Alternative (with Pedestrian Refuge Island) – Roadway Characteristics

Number of Lanes	Lane Width	Curb-to-Curb Width	Target Speed**	Posted Speed***	Bicycle Facility	Horizontal Clearance	Sidewalk****
3	12 ft travel lanes, 14 ft TWLTL*	56 feet	35 MPH	*40 MPH*	9 ft	23	6 ft

*TWLTL = Two-Way Left Turn Lane, includes 2-foot shy distance
** Target speed consistent with range identified in ODOT HDM including the BUD
*** The posted speed would remain 40 MPH despite the modified cross section. Once the project is constructed, a speed study should be pursued with the goal of a lower posted speed.
**** Dimension shown in cross section figure includes 6" curb

Appendix "A" illustrates the ROW impacts and needs for with the 3-Lane Alternative (with Pedestrian Refuge Island*) as well as the proposed transition zone.*

Enhanced Crossing (3-Lane Alternative (with Pedestrian Refuge Island))

ODOT Traffic Manual

A pedestrian crossing is proposed as part of the 3-Lane Alternative (with Pedestrian Refuge Island). Based on the cross section illustrated above, number of lanes crossed, an AADT range of 9,000 – 12,000 vehicles per day[7], and the anticipated operating speed[8], ODOT's Traffic Manual identifies the following treatments:

Recommended treatments:

- Continental-style crosswalk markings, parking restrictions on crosswalk approach (see Table 310.3-B), lighting according to ODOT Traffic Lighting Design Manual. Crossing warning sign(s) for school crosswalks, midblock crosswalks, or speed ≥30 mph
- Rectangular rapid flashing beacon (RRFB)

Optional treatments:

- Curb extensions
- Traffic signal or PHB

Transition Zone

Transition zones and accompanying signage and striping modifications are required as part of the 3-Lane Alternatives to effectively manage vehicular speeds approaching Rhododendron (study area). A target speed of 35 mph is identified in the 2023 Highway Design Manual (HDM that reflects the Blueprint for Urban Design [BUD]) based on the Rural Community context. A reduction in speed is desired to meet the goals of this project, but any changes in posted speed must comply with procedures in the ODOT Speed Zoning Manual and Oregon Administrative Rules.

To the west of the study area, the current roadway cross sections is 5-lanes with a posted speed of 45mph. A stepped approach transitioning from 45mph to 35mph is recommended. A 55:1 taper (660 feet) starting immediately east of the existing Zig Zag River bridge is recommended based on ODOT's Traffic Manual – (Reference 6). Speed reduction signage should coincide with in-lane pavement markings. Speed feedback signs are recommended to accompany new speed limit signs. The first 35mph speed limit sign should be located approximately ¼ mile west of the US26/E Little Brook Lane intersection.

To the east of the study area, the current roadway cross section is 2-lanes with a posted speed of 55 mph. A stepped approach transitioning from 55mph, to 45mph, to 35mph is recommended. Speed feedback signs are recommended to accompany new speed limit signs. The first 35mph speed limit sign should be located approximately ¼ mile east of the US26/Henry Creek Road intersection.

Appendix "B" illustrates the recommended transition zone, signage, and striping.

---

[7] The AADT used for crossing approvals will be based on the volumes at opening day. The AADT on US 26 for 2022 is 9,800 vehicles per day, and the AADT projected for 2030 is 11,100 vehicles per day.

[8] Through discussions with ODOT technical staff and based on 85th percentile speeds exceeding the posted speed limit by approximately 20mph, the anticipated operating speed for the 5-lane and 3-lane alternatives is expected to be greater than 40mph.

Summary

Table 11 summarizes the recommended pedestrian crossing facility treatment according to ODOT's Traffic Manual including presence of a pedestrian refuge island, horizontal clearance for freight and over dimensional sized vehicles, as well as bicycle and pedestrian facility treatments.

Table 11. 3-Lane Alternative (with Pedestrian Refuge Island) – Recommended Facility Treatments

Pedestrian Crossing Facility	Refuge Island	Horizontal Clearance	Target Speed*	Pedestrian Facility	Landscape Buffer**	Bicycle Facility
Rectangular Rapid Flashing Beacon (RRFB)	Yes	23 ft	35 MPH	6-foot sidewalks	5.5 ft	9-foot bike lanes (includes 2-foot buffer)

* Target speed consistent with ranged identified in ODOT HDM
** In less constrained locations, a landscape buffer wider than 6 feet is recommended.

Operational Performance Summary

The study intersections and segments were analyzed for the 3-Lane Alternative under 2030 and 2050 Thursday and Sunday conditions. Traffic volume development and assumptions are discussed in the Operational Performance Summary for the 5-Lane Alternative.

As previously noted, initial analyses revealed that the forecast demand during the Sunday 2030 and 2050 peak hours will exceed capacity of the two-lane highway east of Rhododendron in the westbound direction. Based on this, the analysis presented in this section reflects the actual volume that the site will be able to serve. The two-lane section east of Rhododendron will restrict volumes that can access the study area to 1,700 vehicles per hour, resulting in a small unmet demand of less than ten vehicles per hour in the westbound direction during the Sunday 2030 peak hour and approximately 550 vehicles per hour in the westbound direction during the Sunday 2050 peak hour.

At intersections, the 3-Lane Alternative is expected to mostly meet ODOT HDM v/c ratio targets under 2030 and 2050 Thursday and Sunday conditions when considering the volume that can be served by the highway. The unconstrained demand to capacity ratios exceed ODOT HDM v/c ratio targets during the Sunday 2050 peak hour, but the conditions analyzed cannot be realized because the westbound demand cannot reach Rhododendron due to the two-lane upstream section. Table 12 provides the side-by-side 2030 operational analysis results between the 5-lane and 3-lane alternatives. Table 13 provides the side-by-side 2030 and 2050 operational analysis results between the 5-lane and 3-lane alternatives. Delays and queues were reviewed for turning movements from US 26. Delay for movements from US 26 was 16 seconds or less at all study intersections during the 2050 Sunday peak hour, and the estimated queues ranged from a minimum of two vehicles to a maximum of 6 vehicles during this time period.

The segment analyses show the westbound direction operating at capacity with a v/c ratio of 1.0 during the 2030 and 2050 Sunday conditions, exceeding ODOT HDM v/c ratio targets. During Thursday conditions, v/c ratios are expected to remain near or below 0.50 during 2030 and 2050 conditions. Table 14 provides the side-by-side 2050 operational analysis results between the 5-lane and 3-lane alternatives. Travel times and density at the east end of Rhododendron are provided in Table 15.

"Appendix C" contains the HCS segment and operations software outputs for the 5-lane and 3-Lane Alternatives.

Table 12. 2030 Intersection Operations (Side-by-Side 5-lane and 3-Lane Alternatives)

Intersection	5-Lane Alternative						3-Lane Alternative					
	Critical Movement of Side Street	v/c	Meets ODOT v/c Targets?	Delay (sec)	LOS	Queue Length (ft)*	Critical Movement of Side Street	v/c	Meets ODOT v/c Targets?	Delay (sec)	LOS	Queue Length (ft)*
Thursday Peak Hour - HCS												
East Little Brook Lane/US 26	SBL	0.05	Yes	13.0 s	B	50	SBL	0.07	Yes	15.2 s	C	50
Mount Hood Food Frontage/US 26	SBL	0.01	Yes	13.8 s	B	50	SBL	0.01	Yes	14.4 s	B	50
Dairy Queen Driveway/US 26	SBR	0.03	Yes	10.6 s	B	50	SBR	0.04	Yes	13.1 s	B	50
Mount Hood Roasters Driveway Access/US 26	SBL	0.01	Yes	12.6 s	B	50	SBL	0.01	Yes	13.8 s	B	50
East Henry Creek Road/Rd. 20/US 26	NBL	0.03	Yes	14.5 s	B	50	NBL	0.04	Yes	16.5 s	C	50
Sunday Peak Hour - HCS												
East Little Brook Lane/US 26	SBL	0.16	Yes	30.2 s	D	75	SBL	0.27	Yes	>50 s	F	75
Mount Hood Food Frontage/US 26	SBL	0.14	Yes	37.9 s	E	75	SBL	0.14	Yes	38.2 s	E	75
Dairy Queen Driveway/US 26	SBL	0.25	Yes	48.1 s	D	75	SBR	0.42	Yes	>50 s	E	100
Mount Hood Roasters Driveway Access/US 26	SBL	0.05	Yes	20.1 s	C	75	SBL	0.10	Yes	36.3 s	E	75
East Henry Creek Road/Rd. 20/US 26	NBL	0.12	Yes	38.5	E	75	NBL	0.19	Yes	>50 s	F	75

*Queue lengths are provided from ODOT's Queue Length Estimation for Two-Way Stop-Controlled Intersections Worksheet, per the APM.

Table 13. 2050 Intersection Operations (Side-by-Side 5-lane and 3-Lane Alternatives)

Intersection	5-Lane Alternative						3-Lane Alternative					
	Side Street Critical Mvmt	v/c	Meets ODOT v/c Targets?	Delay (sec)	LOS	Queue Length (ft)*	Side Street Critical Mvmt	v/c	Meets ODOT v/c Targets?	Delay (sec)	LOS	Queue Length (ft)*
Thursday Peak Hour - HCS												
East Little Brook Lane/US 26	SBL	0.08	Yes	15.4 s	C	50	SBL	0.11	Yes	19.5 s	C	50
Mount Hood Food Frontage/US 26	SBL	0.02	Yes	17.1 s	C	50	SBL	0.02	Yes	17.7 s	C	75
Dairy Queen Driveway/US 26	SBL	0.04	Yes	20.0 s	C	50	SBR	0.07	Yes	16.1 s	C	50
Mount Hood Roasters Driveway Access/US 26	SBL	0.02	Yes	14.1 s	B	50	SBL	0.02	Yes	13.8 s	C	75
East Henry Creek Road/Rd. 20/US 26	NBL	0.06	Yes	19.1 s	C	50	NBL	0.07	Yes	21.2 s	C	50
Sunday Peak Hour - HCS												
East Little Brook Lane/US 26	SBL	0.24 (0.41)	Yes	36.7 s (>50 s)	E (F)	75 (100)	SBL	0.41 (0.76)	Yes (No)	>50 s	F	75 (100)
Mount Hood Food Frontage/US 26	SBL	0.19 (0.35)	Yes	40.8 s (>50 s)	E (F)	75 (100)	SBL	0.22 (0.35)	Yes	47.5 s (>50 s)	F	100 (100)
Dairy Queen Driveway/US 26	SBL	0.34 (0.60)	Yes	>50 s	D	100 (100)	SBR	0.64 (1.11)	No (No)	>50 s	F	100 (100)
Mount Hood Roasters Driveway Access/US 26	SBL	0.06 (0.10)	Yes	20.4 s (29.3 s)	C (D)	75 (100)	SBL	0.14 (0.25)	Yes	41.7 s (>50 s)	E (F)	75 (100)
East Henry Creek Road/Rd. 20/US 26	NBL	0.20 (0.32)	Yes	>50 s	F	75 (100)	NBL	0.32 (0.61)	Yes (no)	>50 s	F	75 (100)

*Queue lengths are provided from ODOT's Queue Length Estimation for Two-Way Stop-Controlled Intersections Worksheet, per the APM.
** Intersections were reevaluated using Sunday WB volumes not exceeding the 1700 v/h, the two-lane highway capacity. Comparison (values) show original analyses using the WB demand, which exceeds 1700 v/h in these situations. Thursday WB volumes did not exceed capacity for a two-lane highway.

Table 14. 2030 & 2050 Segment Analysis (Side-by-Side 5-lane and 3-Lane Alternatives)

West/East End of Town	Thursday/ Sunday Peak Hour	Westbound/ Eastbound	5-Lane Alternative HCS v/c	3-Lane Alternative HCS v/c
2030 Opening Year Conditions				
West End of Town	Thursday	WB	0.21	0.38
		EB	0.17	0.32
	Sunday	WB	0.56 (0.56)[1]	1.00 (1.00)[1]
		EB	0.20	0.38
East End of Town	Thursday	WB	0.20	0.35
		EB	0.17	0.31
	Sunday	WB	0.60 (0.61)[1]	1.00 (1.01)[1]
		EB	0.20	0.37
2050 Future Year Conditions				
West End of Town	Thursday	WB	0.28	0.50
		EB	0.23	0.43
	Sunday	WB	0.56 (0.74)[1]	1.00 (1.32)[1]
		EB	0.26	0.51
East End of Town	Thursday	WB	0.26	0.46
		EB	0.22	0.41
	Sunday	WB	0.56 (0.74)[1]	1.00 (1.33)[1]
		EB	0.25	0.49

1. Segments were reevaluated using Sunday WB volumes not exceeding the 1700 v/h, the two-lane highway capacity. Comparison (values) show original analyses using the WB demand, which exceeds 1700 v/h in these situations. Thursday WB volumes did not exceed capacity for a two-lane highway.

Table 15. 2030 & 2050 Travel Time and Density (Side-by-Side 5-lane and 3-Lane Alternatives)

West/East End of Town	Thursday/ Sunday Peak Hour	Westbound/ Eastbound	5-Lane Alternative		3-Lane Alternative	
			Travel Time[1] (min)	Density (pc/mi/ln)	Travel Time (min)	Follower Density[2] (followers/mi/ln)
2030 Opening Year Conditions						
West End of Town	Thursday	WB	0.52	7.8	0.68	12.8
		EB	0.52	6.5	0.66	9.6
	Sunday	WB	0.52 (0.52)[4]	20.7 (20.8)[4]	0.64 (N/A[3])[4]	45.5 (N/A[3])[4]
		EB	0.52	7.4	0.68	11.5
East End of Town	Thursday	WB	0.52	7.4	0.68	11.5
		EB	0.52	6.3	0.66	9.1
	Sunday	WB	0.55 (0.52)[4]	22.1 (22.3)[4]	0.72 (N/A[3])[4]	45.5 (N/A[3])[4]
		EB	0.52	7.5	0.66	11.4
2050 Future Year Conditions						
West End of Town	Thursday	WB	0.52	10.3	0.69	18.6
		EB	0.52	8.6	0.67	14.1
	Sunday	WB	0.52 (0.52)[4]	20.7 (27.4)[4]	0.64 (N/A[3])[4]	45.5 (N/A[3])[4]
		EB	0.52	9.8	0.67	17.7
East End of Town	Thursday	WB	0.52	9.7	0.69	16.8
		EB	0.52	8.3	0.67	13.4
	Sunday	WB	0.52 (0.52)[4]	20.9 (27.7)[4]	0.64 (N/A[3])[4]	45.5 (N/A[3])[4]
		EB	0.52	9.4	0.67	16.7

1. Travel times were manually calculated using average speed and corridor length of 0.4 miles.
2. Follower density is unique to two-lane highways.
3. HCS does not provide calculations for segments over capacity (v/c >1)
4. Segments were reevaluated using Sunday WB volumes not exceeding the 1700 v/h, the two-lane highway capacity. Comparison (values) show original analyses using the WB demand, which exceeds 1700 v/h in these situations. Thursday WB volumes did not exceed capacity for a two-lane highway.

The project team also reviewed the delays and queues associated with left-turning movements from US 26. The analyses show the left turning movements are expected to stay below 17 seconds. Delays are lower in the westbound direction remaining near or below 10 seconds. Results for the 2030 and 2050 are presented in are summarized in Table 16.

Table 16. Delays and Queues for Turning Traffic from US 26 (3-Lane Alternative)

Intersection	US 26 Movement	3-Lane Alternative	
		Control Delay (s)	Queue Length (ft)*
2030 Opening Year Conditions (Sunday)			
East Little Brook Lane/US 26	WBL	9.3 s	50
	EBL	14.2 s	100
Mount Hood Food Frontage/US 26	EBL	14.2 s	100
Dairy Queen Driveway/US 26	EBL	14.6 s	125
Mount Hood Roasters Driveway Access/ US 26	EBL	14.0 s	100
East Henry Creek Road/Rd. 20/US 26	WBL	9.3 s	50
	EBL	13.8 s	100
2050 Opening Year Conditions (Sunday)			
East Little Brook Lane/US 26	WBL	10.3 s (10.3 s)	50 (50)
	EBL	15.0 s (20.1 s)	125 (175)
Mount Hood Food Frontage/US 26	EBL	14.9 s (19.9 s)	125 (175)
Dairy Queen Driveway/US 26	EBL	16.2 s (21.7 s)	150 (200)
Mount Hood Roasters Driveway Access/ US 26	EBL	14.7 s (19.5 s)	125 (175)
East Henry Creek Road/Rd. 20/US 26	WBL	10.3 s (10.3 s)	50 (50)
	EBL	14.6 s (18.9 s)	100 (175)

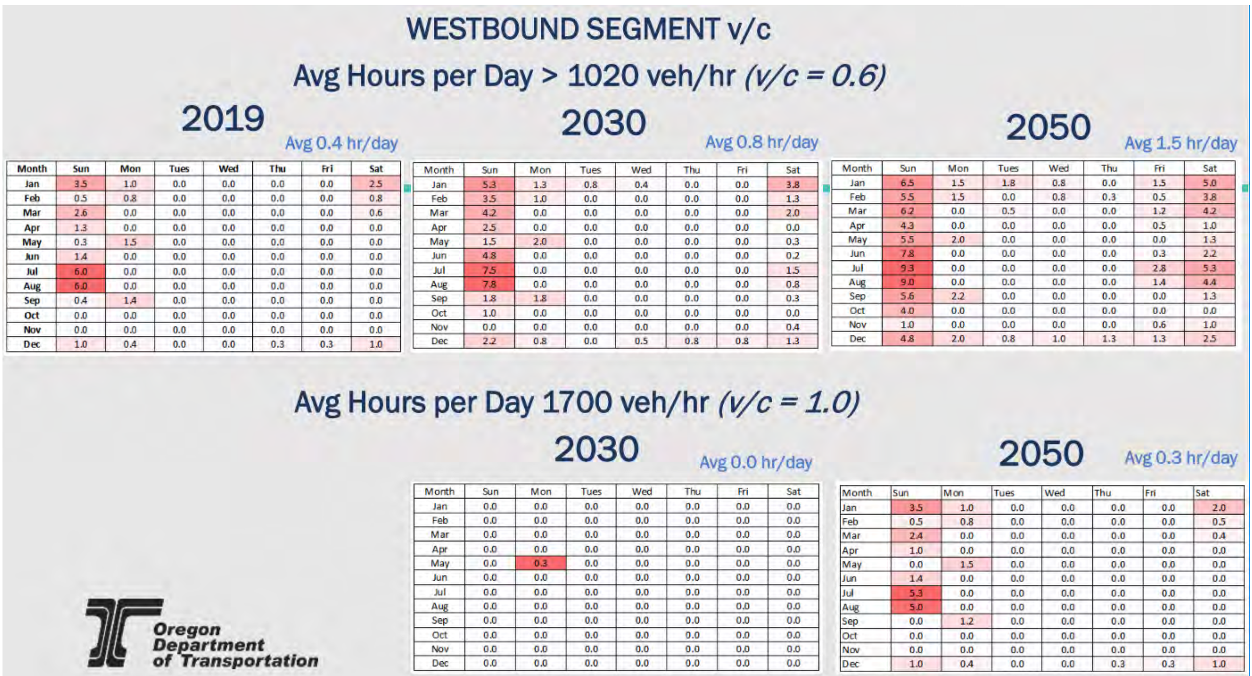
*Queue lengths are provided from ODOT's Queue Length Estimation for Two-Way Stop-Controlled Intersections Worksheet, per the APM. Worksheets are provided in Appendix "G".
** Intersections were reevaluated using Sunday WB volumes not exceeding the 1700 v/h, the two-lane highway capacity. Comparison (values) show original analyses using the WB demand, which exceeds 1700 v/h in these situations. Thursday WB volumes did not exceed capacity for a two-lane highway.

Discussion of Impact of Two-Lane Highway

As noted in the 5-Lane and 3-Lane analyses, volume projections in the westbound direction exceed capacity of the two-lane highway east of Rhododendron. In these situations, the analyses presented in this memorandum reflect the maximum volume that can reach the site.

ODOT completed an analysis to estimate how many hours per day, on average, the westbound highway would exceed capacity. Based on this analysis, shown in Figure 7 below, the westbound traffic is anticipated to exceed capacity an average of 0.3 hours per day in 2050. The segment is expected to exceed a v/c ratio of 0.6 an average of 0.8 hours per day in 2030 and an average of 1.5 hours per day in 2050.

Figure 7. **ODOT's estimate of hours per day that US 26 will exceed capacity in 2030 and 2050**



WESTBOUND SEGMENT v/c

Avg Hours per Day > 1020 veh/hr *(v/c = 0.6)*

2019 — Avg 0.4 hr/day

Month	Sun	Mon	Tues	Wed	Thu	Fri	Sat
Jan	3.5	1.0	0.0	0.0	0.0	0.0	2.5
Feb	0.5	0.8	0.0	0.0	0.0	0.0	0.8
Mar	2.6	0.0	0.0	0.0	0.0	0.0	0.6
Apr	1.3	0.0	0.0	0.0	0.0	0.0	0.0
May	0.3	1.5	0.0	0.0	0.0	0.0	0.0
Jun	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Jul	6.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug	6.0	0.0	0.0	0.0	0.0	0.0	0.0
Sep	0.4	1.4	0.0	0.0	0.0	0.0	0.0
Oct	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dec	1.0	0.4	0.0	0.0	0.3	0.3	1.0

2030 — Avg 0.8 hr/day

Month	Sun	Mon	Tues	Wed	Thu	Fri	Sat
Jan	5.3	1.3	0.8	0.4	0.0	0.0	3.8
Feb	3.5	1.0	0.0	0.0	0.0	0.0	1.3
Mar	4.2	0.0	0.0	0.0	0.0	0.0	2.0
Apr	2.5	0.0	0.0	0.0	0.0	0.0	0.0
May	1.5	2.0	0.0	0.0	0.0	0.0	0.3
Jun	4.8	0.0	0.0	0.0	0.0	0.0	0.2
Jul	7.5	0.0	0.0	0.0	0.0	0.0	1.5
Aug	7.8	0.0	0.0	0.0	0.0	0.0	0.8
Sep	1.8	1.8	0.0	0.0	0.0	0.0	0.3
Oct	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Dec	2.2	0.8	0.0	0.5	0.8	0.8	1.3

2050 — Avg 1.5 hr/day

Month	Sun	Mon	Tues	Wed	Thu	Fri	Sat
Jan	6.5	1.5	1.8	0.8	0.0	1.5	5.0
Feb	5.5	1.5	0.0	0.8	0.3	0.5	3.8
Mar	6.2	0.0	0.5	0.0	0.0	1.2	4.2
Apr	4.3	0.0	0.0	0.0	0.0	0.5	1.0
May	5.5	2.0	0.0	0.0	0.0	0.0	1.3
Jun	7.8	0.0	0.0	0.0	0.0	0.3	2.2
Jul	9.3	0.0	0.0	0.0	0.0	2.8	5.3
Aug	9.0	0.0	0.0	0.0	0.0	1.4	4.4
Sep	5.6	2.2	0.0	0.0	0.0	0.0	1.3
Oct	4.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	1.0	0.0	0.0	0.0	0.0	0.6	1.0
Dec	4.8	2.0	0.8	1.0	1.3	1.3	2.5

Avg Hours per Day 1700 veh/hr *(v/c = 1.0)*

2030 — Avg 0.0 hr/day

Month	Sun	Mon	Tues	Wed	Thu	Fri	Sat
Jan	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feb	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mar	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aug	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sep	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oct	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2050 — Avg 0.3 hr/day

Month	Sun	Mon	Tues	Wed	Thu	Fri	Sat
Jan	3.5	1.0	0.0	0.0	0.0	0.0	2.0
Feb	0.5	0.8	0.0	0.0	0.0	0.0	0.5
Mar	2.4	0.0	0.0	0.0	0.0	0.0	0.4
Apr	1.0	0.0	0.0	0.0	0.0	0.0	0.0
May	0.0	1.5	0.0	0.0	0.0	0.0	0.0
Jun	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Jul	5.3	0.0	0.0	0.0	0.0	0.0	0.0
Aug	5.0	0.0	0.0	0.0	0.0	0.0	0.0
Sep	0.0	1.2	0.0	0.0	0.0	0.0	0.0
Oct	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nov	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dec	1.0	0.4	0.0	0.0	0.3	0.3	1.0

Oregon Department of Transportation

During the time periods that the two-lane highway exceeds capacity, queues will form in the westbound direction on the two-lane section. With the 5-lane alternative, traffic will have an opportunity to begin passing when reaching Rhododendron. This may result in increased speeding and passing through Rhododendron. With the 3-lane alternative, the queues will continue through Rhododendron and begin to dissipate just west of Rhododendron where additional travel lanes are introduced.

Based on the analysis shown above, queues can be expected up to 5.3 hours per day in the summer months in 2050 and up to 3.5 hours per day in January. Based on the hourly profile of traffic counts conducted for this project, this period of congestion would likely occur during the afternoon time period. During the shoulder seasons (spring and fall), the time when queueing may be experienced is substantially shorter or none.

Note: Although not included in the study, it is hypothesized that the conditions that lead to this constraint are present starting at Government Camp – Mt. Hood SkiBowl (approximately 8 miles in advance of Rhododendron). The addition of the 0.4 mile 3-lane section through Rhododendron is not expected to substantially change the overall impact to vehicles on the US 26 corridor due to the constraints to the east of the study area.

Right-Turn Lane Analysis

Kittelson reviewed the right-turn lane criterion provided in Chapter 12 of ODOT's Analysis and Procedures Manual (APM) and the guidance provided in Section 405.1 of the ODOT Traffic Manual.

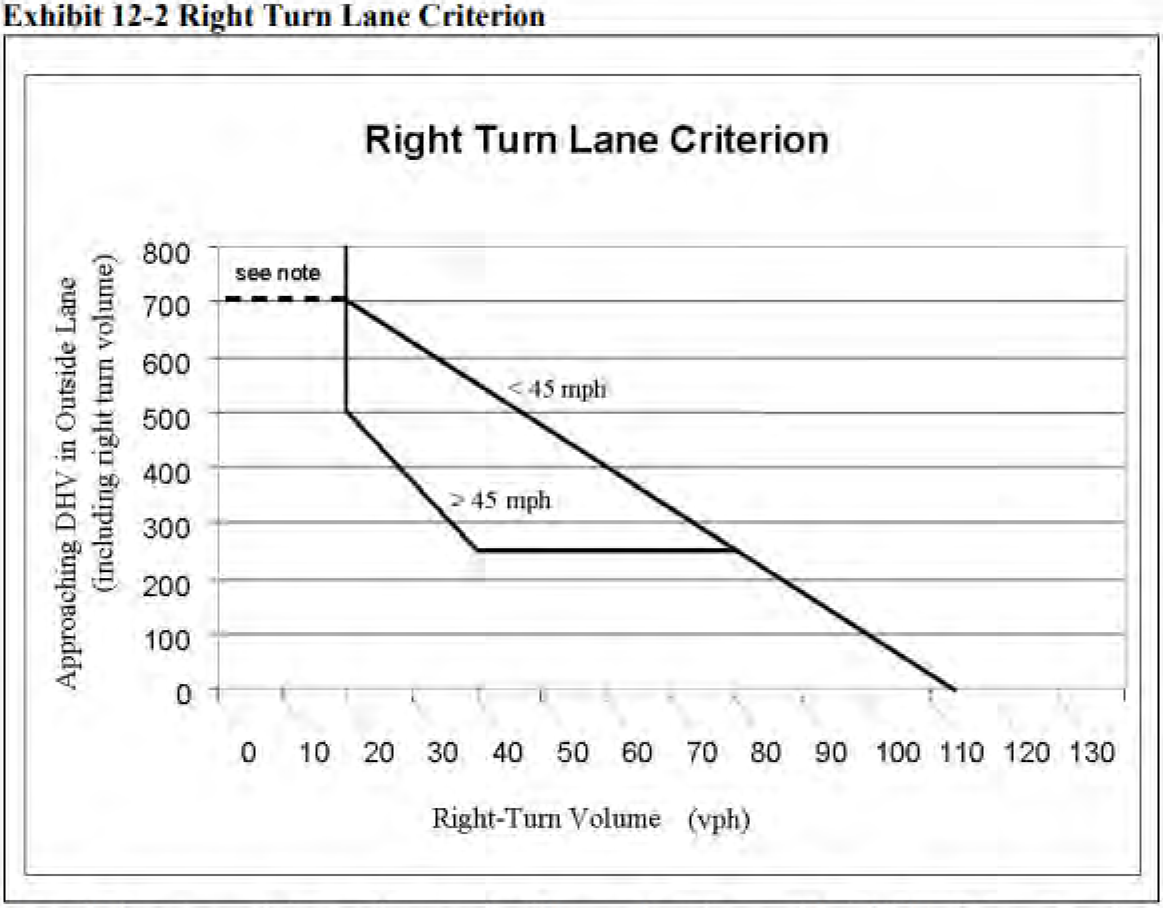
ODOT APM Guidance on Right-Turn Lanes

The APM describes the right-turn lane evaluation process as follows:

1. "A right turn lane should be installed, if criterion 1 (Volume) or 2 (Crash) or 3 (Special Cases) are met, unless a subsequent evaluation eliminates it as an option; and
2. The Region Traffic Engineer must approve all proposed right-turn lanes on state highways, regardless of funding sources; and
3. The right turn lane complies with Access Management Spacing Standards; and
4. The right turn lane conforms to applicable local, regional and state plans."

The US 26 Rhododendron study area does not include intersections that meet Criteria 2 or 3. The Dairy Queen driveway 2050 volume forecasts would meet the volume criteria for a right-turn lane, illustrated by Exhibit 12-2 from the APM as shown below. However, as previously noted, the volume projections for the private driveways are conservative and include the same seasonal adjustment and growth factors as the highway.

Exhibit 12-2 Right Turn Lane Criterion



Note: If there is no right turn lane, a shoulder needs to be provided. If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

ODOT Traffic Manual Guidance on Right-Turn Lanes

The Traffic Manual describes the review and approval process for installing right-turn lanes. As discussed in the Traffic Manual, trade-offs exist between the benefits of right-turn lanes and the impacts to other safety considerations:

"(01) Adding right-turn lanes can reduce motor vehicle crashes and the time motorists are delayed in traffic. However, right-turn lanes also lead to increased conflicts between motor vehicles and bicyclists as motor vehicles must weave across the path of bicycles as they enter the right-turn lane when a bike lane transitions from the curb or shoulder to the left of the right-turn lane in advance of the intersection. Right-turn lanes also lengthen pedestrian crossing distances and left turn movements for vehicles entering the highway from a side street.

(02) Right-turn lanes should not be installed at uncontrolled intersections in the following situations:

a. High speed highways (posted speeds of 45 mph or greater) with high traffic volumes where there are frequently insufficient gaps for side street traffic to judge whether or not they can safely cross or turn onto the main highway,
b. Low speed urban arterials with multi-modal activity such as high bicycle and pedestrian volumes and/or transit use. These can be existing or planned uses,
c. Multiple driveways or side streets are located in the right-turn lane,
d. The skew angle of the side street leads to high speed right turns, or
e. The right-turn lane contributes to a right-of-way constraint that leads to less than adequate bicycle, pedestrian, or transit facilities."

Based on the review of the APM and Traffic Manual Guidance, right-turn lanes are not appropriate within the study area on US 26 in Rhododendron for the following reasons:

- The right-turn lanes would conflict with other driveways and intersections (Item 2c from ODOT Traffic Manual 405.1);
- Multimodal activity occurs in the project area (Item 2b from ODOT Traffic Manual 405.1);
  - The right-turn lanes would increase pedestrian crossing distance;
  - The right-turn lanes may lead to increased conflicts between motor vehicles and bicyclists as motor vehicles must weave across the path of bicycles as they enter the right-turn lane when a bike lane transitions from the curb or shoulder to the left of the right-turn lane; and
- Vehicles using the right-turn lanes may block sight distance for vehicles waiting to turn from the driveway/side street.

Safety Analysis

As discussed in the five-lane section summary, there were eight reported crashes between 2016 and 2020 within the study area, with no fatalities or severe injuries reported.

The 3-Lane Alternative (with Pedestrian Refuge Island) makes the following changes to the cross-section, compared to existing conditions, from a safety perspective:

- Encourages slower speeds, with a target speed of 35 mph, through cross-section changes including reduced number of lanes and narrower cross-section, installation of curb and sidewalk with landscape buffer, and defining access points to create a more urban feel, alerting drivers of the change in context from a rural corridor. Slowing speeds result in less severe crashes, when crashes do occur. This alternative is expected to be more effective at obtaining target speed compliance, compared to the 5-Lane Alternative (with Pedestrian Refuge Island). The elimination of the second travel lane in each direction also eliminates vehicles accelerating and passing within the community.

- Reduces potential conflict points. With fewer travel lanes, the potential conflict points between vehicles at intersections and driveways is reduced.
- Converts the 6-ft bike shoulder to an 9-ft buffered bike lane (7-ft bike lane with a 2-ft buffer):
  - ODOT applies a 47 percent reduction in injury bicycle crashes for installation of a buffered bike lane (in urban areas). ODOT also applies a 36 percent reduction in all bicycle crashes for installation of non-buffered bike lanes (shoulder). This indicates a greater crash reduction anticipated with 8-ft buffered bike lanes compared to 6-ft shoulder bike lane, due to the increased separation from vehicles.
- Add sidewalks with a landscaped buffer between the roadway.
  - Sidewalk is anticipated to reduce crashes involving people walking along the roadway by 20 percent. The landscape buffer provides further separation between vehicles and people walking, reducing crash risk.
- Adds a pedestrian crossing with a refuge island and a rectangular rapid flashing beacon (RRFB).
  - Installing a RRFB with a Pedestrian Refuge Island on a 3-lane roadway is expected to reduce pedestrian crashes by 56 percent.

On-Street Parking Considerations

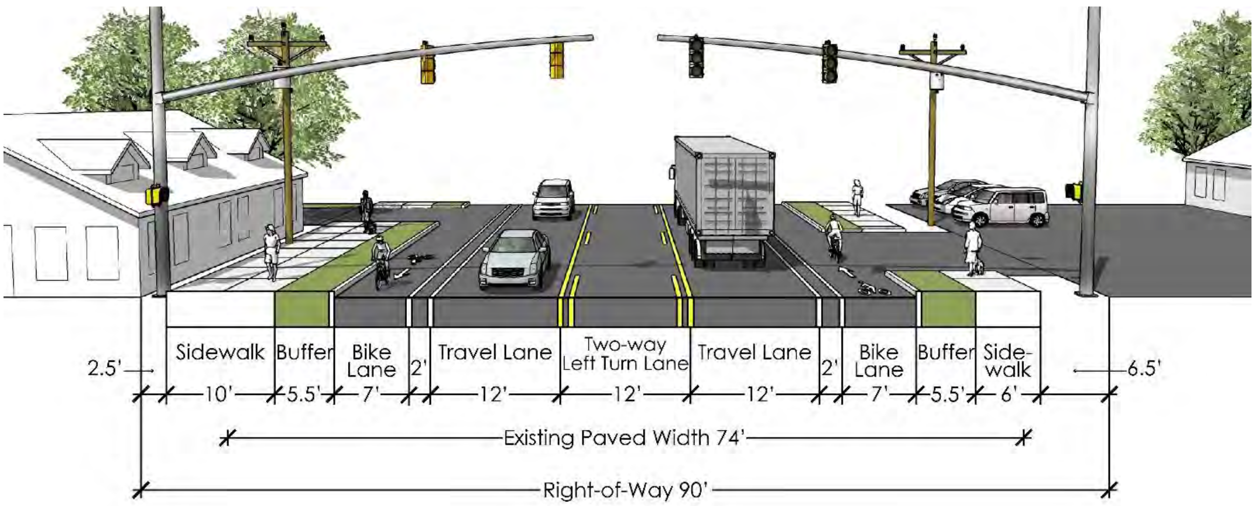
On-street parking is not proposed with the 3-Lane (with Pedestrian Refuge Island) Alternative for the following reasons:

- On-street parking would require additional width in the cross-section, using space that is allocated to the buffer, sidewalk, or bike facility width to stay within the right-of-way.
- On-street parking creates additional opportunities for conflict between parking vehicles and bicyclists.
- When vehicles are using on-street parking, the parked vehicles can restrict sight distance at intersections and driveways unless adequate distance is placed between the parking areas and driveways. Given the high number of driveways, there may not be adequate space for parking.
- On-street parking will require a wider cross section, increasing pedestrian crossing distances and exposure.
- Parked vehicles can also limit visibility of pedestrians waiting to cross at crosswalks, making it more challenging for drivers to see and slow for crossing pedestrians.
- Based on field observations, extensive off-street parking is provided for private retail and commercial uses. For this reason, on-street parking is may be underutilized and contribute to increase operating speeds on US 26 due to widened cross section.

3-Lane Alternative (without Pedestrian Refuge Island)

The 3-Lane Alternative (without Pedestrian Refuge Island) reduces the existing cross section from 5-lanes to 3-lanes and includes buffered bike lanes and sidewalks to improve access for people traveling along US26. On the south side of US26, a widened sidewalk is proposed as a consistent facility treatment with the planned and ongoing improvements west of Rhododendron along US26. The 3-Lane Alternative (without Pedestrian Refuge Island) cross section is illustrated in Figure 8.

Figure 8: 3-Lane Alternative (without Pedestrian Refuge Island) Cross Section



As illustrated above, the 3-Lane Alternative (without Pedestrian Refuge Island) cross section includes two 12-foot travel lanes (2-feet of shy distance provided adjacent to curb), and a 12-foot TWLTL. No pedestrian refuge is provided in order to maintain widened horizontal clearance for freight. The 3-Lane Alternative (without Pedestrian Refuge Island) reduces the existing pavement width from approximately 74 feet to 54 feet.

No encroachment into the existing 90-foot ROW is proposed and no utility relocation or building impacts are anticipated. Table 17 summarizes the 3-Lane Alternative (without Pedestrian Refuge Island) roadway context and cross-sectional dimensions. There may be opportunities to move the multiuse path farther to the back of the ROW allowing for a wider landscape buffer. Snow storage for this alternative would likely occur in the landscape buffer between the path and travel lane.

Table 17. 3-Lane Alternative (without Pedestrian Refuge Island) – Roadway Characteristics

Number of Lanes	Lane Width	Curb-to-Curb Width	Target Speed**	Posted Speed***	Bicycle Facility***	Horizontal Clearance	Sidewalk***
3	12 ft travel lanes, 12 ft TWLTL*	54 feet	35 MPH	*40 MPH*	9 ft	54 ft	6 ft - 10 ft

*TWLTL = Two-Way Left Turn Lane, includes 1-foot shy distance
** Target speed consistent with ranged identified in ODOT HDM
*** "Multiuse path" is intended to provide access to people walking, biking, and rolling
*** The posted speed would remain 40 MPH despite the modified cross section. Once the project is constructed, a speed study should be pursued with the goal of a lower posted speed.

Appendix "A" illustrates the ROW impacts and needs for with the 3-Lane Alternative (without Pedestrian Refuge Island*) as well as the proposed transition zone.*

Enhanced Crossing (3-Lane Alternative (without Pedestrian Refuge Island))

ODOT Traffic Manual

A pedestrian crossing is proposed as part of the 3-Lane Alternative (without Pedestrian Refuge Island). Based on the cross section illustrated above, number of lanes crossed, an AADT range of 9,000 – 12,000 vehicles per day[9], and the anticipated operating speed[10], ODOT's Traffic Manual identifies the following treatments:

Recommended treatments:

- Continental-style crosswalk markings, parking restrictions on crosswalk approach (see Table 310.3-B), lighting according to ODOT Traffic Lighting Design Manual. Crossing warning sign(s) for school crosswalks, midblock crosswalks, or speed ≥30 mph
- Pedestrian refuge island (at least 6 feet wide)
- Traffic signal or PHB[11]

Optional treatments include:

- Curb extensions

Transition Zone

Both 3-Lane Alternatives propose the same transition zone geometry, as described in the previous section for the 3-Lane (with Pedestrian Refuge Island) Alternative.

Summary

Table 18 summarizes the recommended pedestrian crossing facility treatment according to ODOT's Traffic Manual, presence of a pedestrian refuge island, horizontal clearance for freight and over dimensional sized vehicles, as well as bicycle and pedestrian facility treatments.

Table 18. 3-Lane Alternative (without Pedestrian Refuge Island) – Recommended Facility Treatments

Pedestrian Crossing Facility	Refuge Island	Horizontal Clearance	Target Speed	Pedestrian Facility	Landscape Buffer**	Bicycle Facility
Pedestrian signal	No	54 feet	35 MPH	6 ft – 10 ft	5.5 ft	9-foot bike lanes (includes 2-foot buffer)

* Target speed consistent with ranged identified in ODOT HDM including the BUD
** In less constrained locations, a landscape buffer wider than 6 feet is recommended.

[9] The AADT used for crossing approvals will be based on the volumes at opening day. The AADT on US 26 for 2022 is 9,800 vehicles per day, and the AADT projected for 2030 is 11,100 vehicles per day.
10 Through discussions with ODOT technical staff and based on 85th percentile speeds exceeding the posted speed limit by approximately 20mph, the anticipated operating speed for the 5-lane and 3-lane alternatives is expected to be greater than 40mph.
[11] Through discussions with ODOT technical staff, a pedestrian signal is recommended

Operational Performance Summary

The operational performance of the 3-Lane Alternative (without Pedestrian Refuge Island) is the same as that of the 3-Lane Alternative (with Pedestrian Refuge Island), presented in the previous section.

If selected as a preferred alternative, the placement of the Pedestrian Refuge Island will be further evaluated to determine potential impacts on turn lanes which may impact intersection performance.

Safety Analysis

The 3-Lane Alternative (without Pedestrian Refuge Island) makes the following changes to the cross-section, compared to existing conditions, from a safety perspective:

- Encourages slower speeds, with a target speed of 35 mph, through cross-section changes including reduced number of lanes and narrower cross-section, installation of curb and sidewalk with landscape buffer, and defining access points to create a more urban feel, alerting drivers of the change in context from a rural corridor. Slowing speeds result in less severe crashes, when crashes occur. This alternative is expected to be more effective at obtaining target speed compliance, compared to the 5-Lane Alternative (with Pedestrian Refuge Island). The elimination of the second travel lane in each direction also eliminates vehicles accelerating and passing within the community.
- Reduces potential conflict points. With fewer travel lanes, the potential conflict points between vehicles at intersections and driveways is reduced.
- Adds a pedestrian crossing with pedestrian signal but no pedestrian refuge island.
  - Installing a pedestrian signal is expected to reduce crashes involving people walking and biking by 55 percent.

On-Street Parking Considerations

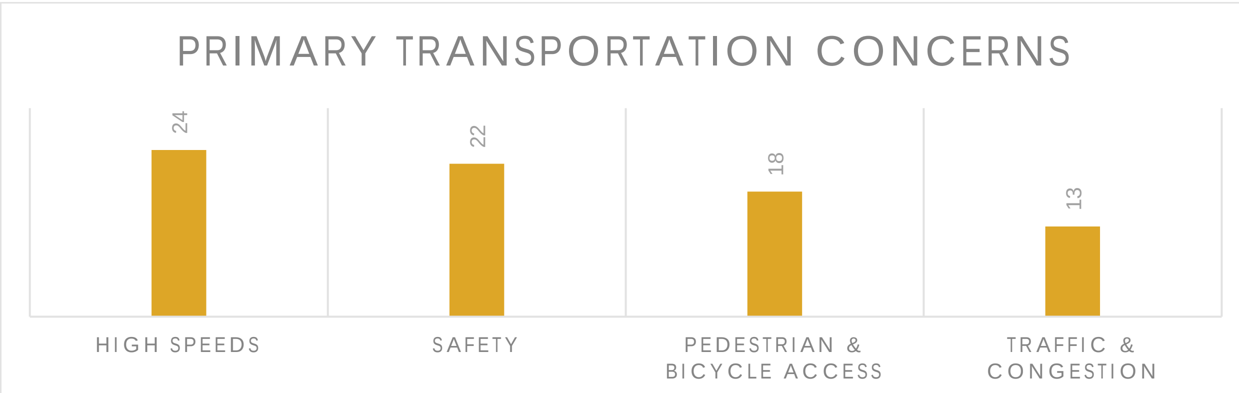
On-street parking is not proposed with the 3-Lane (without Pedestrian Refuge Island) Alternative for the following reasons:

- On-street parking would require additional width in the cross-section, using space that is allocated to the buffer or sidewalk width to stay within the right-of-way.
- On-street parking creates additional opportunities for conflict between parking vehicles and bicyclists.
- When vehicles are using on-street parking, the parked vehicles can restrict sight distance at intersections and driveways unless adequate distance is placed between the parking areas and driveways. Given the high number of driveways, there may not be adequate space for parking.
- On-street parking will require a wider cross section, increasing pedestrian crossing distances and exposure.
- Parked vehicles can also limit visibility of pedestrians waiting to cross at crosswalks, making it more challenging for drivers to see and slow for crossing pedestrians.
- Based on field observations, extensive off-street parking is provided for private retail and commercial uses. For this reason, on-street parking is may be underutilized and contribute to increase operating speeds on US 26 due to widened cross section.

Public Input & Stakeholder Feedback

Community Drop-in Outreach Event

A community drop-in outreach event was held on August 11, 2022, in Rhododendron from 2:00 to 4:00pm. The purpose of the community drop-in event was to share information on the project and solicit feedback on primary concerns within the project area. Key themes and feedback received are summarized below.



Additional transportation concerns and themes voiced at the community drop-in outreach event include:

- Concerns of no crosswalks making it difficult to safely cross US 26
- Concerns for high-speed vehicles and trucks also making it difficult to cross or turn onto US 26
- Observations of increased traffic and congestion
- Concerns of freight access to adjacent businesses and associated delay
- Support for crosswalks and use of center median as a refuge island, but concern for rectangular rapid flashing beacon (RRFB) or enhanced crossing treatment due to ability to effectively stop vehicles
- Support for reducing the total number of lanes and slowing traffic down
- Support for speed cameras to enforce speed limits and speed radars for ticketing
- Support for separated bicycle and walking paths

Appendix "D" includes a summary of feedback received as part of the community drop-in outreach event.

Stakeholder Interviews

The project team has conducted four stakeholder interviews to-date to gather feedback from varying perspectives and representation within the project area. Stakeholder groups interviewed to-date include the Clackamas County Pedestrian and Bicycle Advisory Committee (BPAC), SkiBowl Group of Companies, Clackamas County Traffic Safety Engineer, Clackamas County Mt. Hood Express Human Services Supervisor, and property owner of Alderbrook Lodge as well as Dairy Queen. Key themes and feedback received are summarized below.

- Opportunity to relocate temporary bus stop to permanent location; mountain biking is popular activity

- High speeds, lack of pedestrian crossing, overall safety are primary concerns
- General support for transition zone occurring before "west" of Rhododendron to calm traffic
- BPAC supportive of on street (buffered bike lanes) and separated bicycle facilities
- Support for electronic feedback signs and digital ticketing for exceeding speed limit
- Concern that reduction of travel lanes may impact local business
- Crossing US 26 is a primary concern for businesses and residents; people drive to cross US 26 today
- Support for traffic calming elements to reduce speed and highway noise

Appendix "E" includes the stakeholder interview summaries.

Technical Workshop

The project team conducted a technical workshop on October 27, 2022, with ODOT and Clackamas County staff as part of the design refinement and alternative evaluation process. The primary purpose of the technical workshop was to clarify the design alternatives including but not limited to cross section elements, widths, presence and location of a pedestrian refuge island, and active transportation facility treatments to help inform the refinement of the alternatives.

There are varying opinions about the widths of the various design elements associated with the alternatives. It should be noted that wider travel lanes and the lack of pedestrian refuge islands do not encourage slower speed and results in longer crossing distances for vulnerable users. This memorandum reflects the decisions made as part of feedback received during the technical workshop. As the project continues to advance in its refinement and design, opportunities to slow speeds and reduce the overall cross section width should be explored, consistent with the intended outcomes and corridor vision for Rhododendron.

Key themes and decisions made as part of the technical workshop include:

- Agreement that the 5-lane and 3-lane alternatives will not be able to successfully achieve a target speed of 35mph; as a result, the anticipated minimum operating speed is 40mph
- A 2-foot off set is recommended when a refuge island is presence; as a result, a 14-foot TWLT lane is recommended when a refuge island is presence
- When a refuge island is not present, a 12-foot TWLT is recommended, consistent with HDM
- Based on feedback from freight and maintenance staff, it was noted to proceed with 12-foot travel lanes for a 3-lane cross section and 11-foot lanes for a 5-lane cross section
- A RRFB cannot be placed without a refuge island (ODOT Traffic Manual)
- A pedestrian signal is recommended compared to a PHB due to motorist recognition
- A crossing should not be located at the eastern extents of the study area due to speeding concerns and limited sight distance approaching Rhododendron from the east along a downhill
- A crossing should not be located at the western extents of the study due to limited sight distance Approaching from the east along the horizontal curve
- ODOT maintenance's preference is for no refuge island
- Sidewalks, bike lanes, multiuse, and buffers are supported for snow removal storage in winter months
- ODOT does not have the ability to impose automated speed enforcement

Appendix "F" includes the Technical Workshop summary.

Mobility Advisory Committee (MAC)

The project team presented to the Mobility Advisory Committee (MAC) on Thursday, November 10. The presentation was held as an information only presentation with the primarily objective of early stakeholder communication to preview the transition zone alternative.

MAC feedback was positive, with the following themes and input received

- Overall support for early stakeholder engagement
- Interest further exploring freight access to local business
- Recognition of oversized freight route. Vehicles will still need an opportunity to pass large freight.
- Support for slower speeds so freight vehicles can enter and exit highway more conveniently
- Interest in extending study limits to create longer transition zone
- General support for lane reduction; recognition of traffic calming benefits

US 26 Alternatives Evaluation

Evaluation Criteria & Performance Measures

Evaluation criteria and performance measures identified in the Evaluation Criteria and Performance Measures Technical Memorandum (Reference 7) were used to assess the trade-offs of each alternative and determine which alternative most closely aligns with the project vision based on the corridor context and needs of intended users.

The corridor vision statement, defined in the Evaluation Criteria and Performance Measures Technical Memorandum is:

"Mt. Hood Highway (US26) connects the Portland Metro Area to Central Oregon and serves as Rhododendron's primary thoroughfare. It provides access to basic necessities and local services such as the post office, groceries, and restaurants. The Highway within the community promotes safe walking, biking, rolling, and driving. This includes features that promote traffic calming and reduce travel speeds. The Highway offers safe and convenient options to access businesses, trails, and transit stops. Rhododendron is also a base camp for those taking transit up the mountain where they can ski, hike and mountain bike in the Mt Hood National Forest. Rhododendron is vibrant, with unique history, natural beauty, diversity of businesses and transportation facilities that serve all ages and abilities."

The evaluation criteria below support the Corridor Vision Statement as well as the Refinement Plan intended outcomes:

- *Safety*: The project provides safety countermeasures that have the potential to reduce the frequency of fatal and severe injury crashes and encourage slower speeds, which reduces crash severity. Performance measures include:
- *Multimodal Integration:* The project provides an integrated network of comfortable facilities and services for a variety of travel modes based on the modal priority suggested for the corridor context. The "Rural Community" designation allocates the highest priority to people biking and walking, medium priority to motorists and freight, and varies in priority with transit[12].
- *Connectivity:* The project provides safe and convenient options to cross US 26, connecting users to the adjacent assets, businesses, trails, and transit stops. Project meets ODOT's operational performance targets (as specified in the *Oregon Highway Plan* and *Highway Design* Manual) and continues to serve as an important regional connection addressing "vehicle carrying capacity" needs over Mt. Hood. The project removes barriers and fills gaps for people walking, biking, and taking transit.
- *Livability:* The project supports the community's vision for increasing the sense of place, allowing for vibrant mix of development, a reduction of travel speeds, and transportation facilities meeting the needs of the "all ages and abilities" population.
- *Feasibility:* The project has no major design feasibility concerns (environmental and right-of-way concerns) and minimizes cost relative to the project benefits. Unknowns are within reasonable control and can be anticipated through contingency plans. The project is designed with consideration given to on-going and winter maintenance practices.

The scoring scale for each criterion ranges from -1 to +2, reflecting the extent to which an alternative achieves the evaluation criteria per the associated performance measures. Table 19 summarizes the scoring scale for each performance measure.

An evaluation of the alternative designs according to this scale is described below and summarized in Table 41.

[12] Consistency with modal considerations is based on the Rural Community context and guidance provided in ODOT's HDM.

Table 19. Evaluation Criterion Scoring

Evaluation Criteria	Performance Measures	Scoring			
		-1	0	+1	+2
Safety	Quantitative: Percentage of anticipated crash reductions based on CRF	Project is anticipated to increase crashes.	Project is not anticipated to reduce crashes.	Project provides a moderate value crash reduction factor.	Project provides a high value crash reduction factor.
	Quantitative: Number of Conflict Points	Project increases the number of conflict points.	Project does not change the number of conflict points.	Project reduces the number of conflict points.	Project significantly reduces the number of conflict points.
	Quantitative: Pedestrian Risk Factor	Project adds a risk factor(s).	Project does not eliminate an existing risk factor.	Project eliminates 1 existing risk factor.	Project eliminates 2 or more existing risk factors.
	Quantitative: Bicyclist Risk Factor	Project adds a risk factor(s).	Project does not eliminate an existing risk factor.	Project eliminates 1 existing risk factor.	Project eliminates 2 or more existing risk factors.
	Quantitative: Speed Reduction Effectiveness	Project includes treatments with documented effectiveness at increasing speeds.	Project includes no treatments with documented effectiveness at speed reduction.	Project includes 1-2 treatments with documented effectiveness at speed reduction.	Project includes 3 or more treatments with documented effectiveness at speed reduction.
Multimodal Integration	Qualitative: Consistency with motorist modal considerations for Rural Community context	Project reduces consistency of recommended modal considerations & priority for motorist	Project makes no change to consistency of recommended modal considerations & priority for motorist	Project improves consistency of recommended modal considerations & priority for motorist	Project significantly improves consistency of recommended modal considerations & priority for motorist
	Qualitative: Consistency with freight modal considerations for Rural Community context	Project reduces consistency of recommended modal considerations & priority for freight	Project makes no change to consistency of recommended modal considerations & priority for freight	Project improves consistency of recommended modal considerations & priority for freight	Project significantly improves consistency of recommended modal considerations & priority for freight
	Qualitative: Consistency with transit modal considerations for Rural Community context	Project reduces consistency of recommended modal considerations & priority for transit	Project makes no change to consistency of recommended modal considerations & priority for transit	Project improves consistency of recommended modal considerations & priority for transit	Project significantly improves consistency of recommended modal considerations & priority for transit
	Qualitative: Consistency with bicyclist modal considerations for Rural Community context	Project reduces consistency of recommended modal considerations & priority for bicyclist	Project makes no change to consistency of recommended modal considerations & priority for bicyclist	Project improves consistency of recommended modal considerations & priority for bicyclist	Project significantly improves consistency of recommended modal considerations & priority for bicyclist
	Qualitative: Consistency with pedestrian modal considerations for Rural Community context	Project reduces consistency of recommended modal considerations & priority for pedestrian	Project makes no change to consistency of recommended modal considerations & priority for pedestrian	Project improves consistency of recommended modal considerations & priority for pedestrian	Project significantly improves consistency of recommended modal considerations & priority for pedestrian
Connectivity	Quantitative: Consistency with crossing treatment recommendations and target pedestrian crossing spacing for roadway context	Project reduces crossing opportunities and does not meet target pedestrian crossing spacing.	Project does not change existing crossing opportunities.	Project meets recommended crossing treatments and does not meet target pedestrian crossing spacing.	Project meets recommended crossing treatment requirements and meets target pedestrian crossing spacing.
	Quantitative: ODOT operational performance targets and regional connectivity[1].	Project does not meet ODOT operational performance targets and degrades vehicle carrying capacity.	Project meets ODOT operational performance targets and degrades vehicle carrying capacity.	Project meets ODOT operational performance targets and makes no change to vehicle carrying capacity.	Project meets ODOT operational performance targets and improves vehicle carrying capacity.
	Quantitative: Vehicle Carrying Capacity (ORS 366.215)	Project reduces horizontal and/or vertical clearances of roadway	Project makes no change to horizontal and/or vertical clearances of roadway	Project makes increase horizontal and/or vertical clearances of roadway	N/A
	Qualitative: Ease of access to destination points, community trails, historic places, and transit.	Project creates barriers to access destinations.	Project makes no changes to accessing destinations.	Project improves access to destinations.	Project significantly improves access to destinations.
	Quantitative: Property access points are well defined (egress/ingress)	N/A	No change is made to existing access points.	Some access points to properties are defined.	All access points are well defined for all properties.
Livability	Qualitative: Community response based on open house and interviews	Project creates negative	Project creates mixed responses or neutral responses	Project creates positive responses	Project creates strongly positive responses
	Qualitative: Stakeholder response based on open house and interviews	Project creates negative responses	Project creates mixed responses or neutral responses	Project creates positive responses	Project creates strongly positive responses
Feasibility	Qualitative: Construction feasibility	Project poses significant construction challenges.	Project poses moderate construction challenges.	Project poses minor construction challenges.	Project poses no notable construction challenges.
	Quantitative: Expected project costs	Construction costs are comparatively high.	Construction costs are comparatively medium.	Construction costs are comparatively low.	N/A
	Qualitative: Maintenance needs and considerations	Project cannot accommodate maintenance requirements and increases maintenance needs.	Project accommodates maintenance requirements but increases maintenance needs.	Project accommodates maintenance requirements and reduces maintenance needs.	N/A

Alternatives Evaluation

Safety

The *Safety* criterion considers the alternatives opportunity to improve safety along US 26 through crash reduction factors, number of conflict points, pedestrian and bicycle risk factors, and speed reduction effectiveness.

Where possible, Crash Reduction Factors (CRFs) are noted to indicate a percentage decrease in crashes that may be anticipated with the implementation of a treatment. Unless otherwise noted, the CRFs presented are obtained from ODOT's approved list of CRFs.

5-Lane Alternative (with Pedestrian Refuge Island)

The 5-Lane Alternative (with Pedestrian Refuge Island) safety evaluation is summarized in Table 20.

Table 20. Safety Evaluation of 5-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Percentage of anticipated crash reductions based on CRF	The following elements have documented crash reduction factors: – Sidewalk: 20% reduction for crashes involving people walking – Pedestrian crossing with RRFB and refuge island: 56% reduction for crashes involving people walking or biking – Buffered bike lane: 47% reduction in injury bicycle crashes	+1 Project provides a moderate value crash reduction factor.
Number of conflict points	No change in number of conflict points since the number of lanes or driveways is not changing.	0 Project does not change the number of conflict points.
Pedestrian risk factor scoring	Project eliminates the lack of sidewalks.	+1 Project eliminates 1 existing risk factor.
Bicyclist risk factor scoring	Project eliminates the lack of bicycle lanes.	+1 Project eliminates 1 existing risk factor.
Speed Reduction Effectiveness	Includes the following elements which contribute to speed reduction: – Change in context to encourage slower speeds – Narrows travel lanes from 12 ft-to 11-ft	+1 Project includes 1-2 treatments with documented effectiveness at speed reduction.

3-Lane Alternative (with Pedestrian Refuge Island)

The 3-Lane Alternative (with Pedestrian Refuge Island) safety evaluation is summarized in Table 21.

Table 21. Safety Evaluation of 3-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Percentage of anticipated crash reductions based on CRF	The following elements have documented crash reduction factors: – Sidewalk: 20% reduction for crashes involving people walking – Pedestrian crossing with RRFB and refuge island: 56% reduction for crashes involving people walking or biking – Buffered bike lane: 47% reduction in injury bicycle crashes	+2 Project provides a high value crash reduction factor.
Number of conflict points	Reducing the number of through lanes from two to one in each direction substantially reduces the number of conflict points.	+2 Project significantly reduces the number of conflict points.
Pedestrian risk factor scoring	Project eliminates the lack of sidewalk and reduces the cross-section to less than 4 lanes.	+2 Project eliminates 2 or more existing risk factors.
Bicyclist risk factor scoring	Project eliminates the lack of bicycle lane and reduces the cross-section to less than 4 lanes.	+2 Project eliminates 2 or more existing risk factor.
Speed Reduction Effectiveness	Includes the following elements which contribute to speed reduction: – Change in context to encourage slower speeds with curb, sidewalks, bike lanes, and refuge island – Reduction in number of lanes – Reduced pavement width	+2 Project includes 3 or more treatments with documented effectiveness at speed reduction.

3-Lane Alternative (without Pedestrian Refuge Island)

The 3-Lane Alternative (without Pedestrian Refuge Island) safety evaluation is summarized in Table 22.

Table 22. Safety Evaluation of 3-Lane Alternative (without Pedestrian Refuge Island)

Performance Measures	Description	Score
Percentage of anticipated crash reductions based on CRF	The following elements have documented crash reduction factors: – Sidewalk: 20% reduction for crashes involving people walking – Pedestrian signal: 55% reduction in crashes involving people walking or biking – Buffered bike lane: 47% reduction in injury bicycle crashes	+2 Project provides a high value crash reduction factor.
Number of conflict points	Reducing the number of through lanes from two to one in each direction substantially reduces the number of conflict points.	+2 Project significantly reduces the number of conflict points.
Pedestrian risk factor scoring	Project eliminates the lack of sidewalk and reduces the cross-section to less than 4 lanes.	+2 Project eliminates 2 or more existing risk factors.
Bicyclist risk factor scoring	Project eliminates the lack of bicycle lane and reduces the cross-section to less than 4 lanes.	+2 Project eliminates 2 or more existing risk factor.
Speed Reduction Effectiveness	Includes the following elements which contribute to speed reduction: – Change in context to encourage slower speeds with curb, sidewalks, bike lanes, and pedestrian signal – Reduction in number of lanes – Reduced pavement width	+2 Project includes 3 or more treatments with documented effectiveness at speed reduction.

Safety Evaluation Summary

Table 23 describes the results of the safety evaluation scores, described above.

Table 23: Safety Evaluation

Alternative	Crash Reduction	Conflict Points	Pedestrian Risk Factors	Bicyclist Risk Factors	Speed Reduction Effectiveness	Total
5-Lane (with Pedestrian Refuge Island)	+1	0	+1	+1	+1	+4
3-Lane (with Pedestrian Refuge Island)	+2	+2	+2	+2	+2	+10
3-Lane (without Pedestrian Refuge Island)	+2	+2	+2	+2	+2	+10

Multimodal Integration

The *Multimodal* criterion considers how well the alternatives meet the needs of the modal priority set by the identified Rural Community context as part of the Highway Design Manual (HDM) which includes the BUD. According to the HDM, pedestrian and bicyclist are "high" priority modes, transit "varies", and motorist and freight are "medium."

Table 24 summarizes the recommended design guidance for priority modes based on the Rural Community context identified in the HDM.

Table 24: Recommended Modal Facility Selection for ODOT Highways

Motorist	Freight	Transit	Bicycle	Pedestrian
Start with minimum widths, wider by roadway characteristics	Design decisions should consider the presence and volumes of freight activity	Design decisions should consider the presence and volumes of transit activity	Start with separated bicycle facility, consider roadway characteristics	Continuous and buffered sidewalks, sized for desired use

5-Lane Alternative (with Pedestrian Refuge Island)

The 5-Lane Alternative (with Pedestrian Refuge Island) multimodal integration evaluation is summarized in Table 25.

Table 25. Multimodal Evaluation of 5-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Consistency with motorist modal considerations for Rural Community context	Project maintains two lanes in each direction, better defines access points, and separates bicycles and pedestrians from freight and other vehicles. Project narrows the travel lane widths to the recommended minimum width of 11 feet	0 Project generally aligns with recommended modal considerations & priority for motorist
Consistency with freight modal considerations for Rural Community context	Freight access is maintained with 32 feet of horizontal clearance provided.	0 Project makes no change to consistency of recommended modal considerations & priority for freight
Consistency with transit modal considerations for Rural Community context	Transit access is improved by the proposed sidewalks and pedestrian crossing; further refinement of the transit stop location and facility will be performed as part of the preferred alternative.	0 Project makes no change to consistency of recommended modal considerations & priority for transit
Consistency with bicyclist modal considerations for Rural Community context	Project provides a 2-foot buffer to the existing 6-foot bike lane	+1 Project improves consistency of recommended modal considerations & priority for bicyclists
Consistency with pedestrian modal considerations for Rural Community context	For people walking, 6-foot sidewalks are proposed on both sides of the road, no buffers are provided in locations with development encroaching in ROW. Some buffers may be possible in less constrained sections. A pedestrian refuge island and RRFB are recommended.	+1 Project improves consistency of recommended modal considerations & priority for pedestrians

3-Lane Alternative (with Pedestrian Refuge Island)

The 3-Lane Alternative (with Pedestrian Refuge Island) multimodal integration evaluation is summarized in Table 26.

Table 26. Multimodal Evaluation of 3-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Consistency with motorist modal considerations for Rural Community context	Project reduces the number of lanes from 5 to 3 and maintains travel lane widths at 12 feet.	-1 Project generally degrades consistency with recommended modal considerations & priority for motorist
Consistency with freight modal considerations for Rural Community context	Freight access is maintained with 23 feet of horizontal clearance provided. Freight may experience increased congestion and have less space to maneuver.	-1 Project reduces consistency of recommended modal considerations & priority for freight
Consistency with transit modal considerations for Rural Community context	Transit access is improved by the proposed sidewalks and pedestrian crossing; further refinement of the transit stop location and facility will be performed as part of the preferred alternative.	+1 Project improves consistency of recommended modal considerations & priority for transit
Consistency with bicyclist modal considerations for Rural Community context	Project provides a 2-foot buffer to the existing 7-foot bike lane. The reduction in number of travel lanes and additional of a pedestrian refuge island further encourage slower speeds.	+2 Project significantly improves consistency of recommended modal considerations & priority for bicyclists
Consistency with pedestrian modal considerations for Rural Community context	For people walking, sidewalks are proposed on both sides of the roadway with 5-foot buffers. A pedestrian refuge island and rectangular rapid flashing beacon (RRFB) facility are recommended.	+2 Project significantly improves consistency of recommended modal considerations & priority for pedestrians

3-Lane Alternative (without Pedestrian Refuge Island)

The 3-Lane Alternative (without Pedestrian Refuge Island) multimodal integration evaluation is summarized in Table 27.

Table 27. Multimodal Evaluation of 3-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Consistency with motorist modal considerations for Rural Community context	Reduces the number of lanes from 5 to 3 and maintains travel lane widths at 12 feet.	-1 Project generally degrades consistency with recommended modal considerations & priority for motorist
Consistency with freight modal considerations for Rural Community context	Freight access is maintained with 54 feet of horizontal clearance provided. Freight may experience increased congestion and have less space to maneuver.	-1 Project reduces consistency of recommended modal considerations & priority for freight
Consistency with transit modal considerations for Rural Community context	Transit access is improved by the proposed sidewalks and pedestrian crossing; further refinement of the transit stop location and facility will be performed as part of the preferred alternative.	+1 Project improves consistency of recommended modal considerations & priority for transit
Consistency with bicyclist modal considerations for Rural Community context	Project provides a 2-foot buffer to the existing 7-foot bike lane and reduces the number of travel lanes further encouraging slower speeds.	+2 Project significantly improves consistency of recommended modal considerations & priority for bicyclists
Consistency with pedestrian modal considerations for Rural Community context	For people walking, sidewalks are proposed on both sides of the roadway with 5-foot buffers. A Pedestrian signal is recommended.	+2 Project significantly improves consistency of recommended modal considerations & priority for pedestrians

Multimodal Integration Evaluation Summary

Table 28 summarizes the results of the multimodal integration evaluation scores, described above.

Table 28: Multimodal Integration Evaluation

Alternative	Motorist	Freight	Transit	Bicycle	Pedestrian	Total
5-Lane (with Pedestrian Refuge Island)	0	0	0	+1	+1	+2
3-Lane (with Pedestrian Refuge Island)	-1	-1	+1	+2	+2	+3
3-Lane (without Pedestrian Refuge Island)	-1	-1	+1	+2	+2	+3

Connectivity

The *Connectivity* criterion considers how well the alternative improves pedestrian crossings, ability to meet ODOT's operational performance targets and vehicle carrying capacity needs, ease of access to community destinations, and property access points (ingress & egress).

The evaluations below assume that existing access points would be defined with curb in each of the three scenarios since they each include curb and sidewalk or a path. Opportunities may be evaluated for access consolidation, as possible.

5-Lane Alternative (with Pedestrian Refuge Island)

The 5-Lane Alternative (with Pedestrian Refuge Island) Connectivity evaluation is summarized in Table 30.

Table 29. Connectivity Evaluation of 5-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Consistency with crossing treatment recommendations and target pedestrian crossing spacing for roadway context	Project includes a pedestrian refuge island and RRFB, achieving the target crossing spacing range identified in the HDM.	+2 Project meets recommended crossing treatments and meets target pedestrian crossing spacing.
ODOT operational performance targets and regional connectivity	ODOT's HDM v/c ratio targets are anticipated to be met in 2050 scenarios at all intersections, and for all segments when considering constrained volumes.	+1 Project meets ODOT operational performance targets.
Vehicle carrying capacity (ORS 366.215)	Vehicle carrying capacity needs are reduced due to the presence of the pedestrian refuge island	-1 Project reduces vehicle carrying capacity.
East of access to destination points, community trails, historic places, and transit facilities	The sidewalk, bike lanes, pedestrian refuge island and RRFB improves access to community destinations and transit. Sidewalks are limited to 6.5 ft wide and have no buffer; bicyclists must use the buffered bike lanes (no off-street option is available).	+1 Project improves access to destinations.
Property access points are well defined (egress/ingress)	Access points will be defined through the installation of curb and sidewalk.	+2 All access points to properties are defined.

3-Lane Alternative (with Pedestrian Refuge Island)

The 3-Lane Alternative (with Pedestrian Refuge Island) connectivity evaluation is summarized in Table 30.

Table 30. Connectivity Evaluation of 3-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Consistency with crossing treatment recommendations and target pedestrian crossing spacing for roadway context	Project includes a pedestrian refuge island and RRFB, achieving the target crossing spacing range identified in the HDM.	+2 Project meets recommended crossing treatments and meets target pedestrian crossing spacing.
ODOT operational performance targets and regional connectivity	ODOT's HDM v/c ratio targets are not met in 2030 and 2050 during the Sunday peak hours.	-1 Project does not meet ODOT operational performance targets.
Vehicle carrying capacity (ORS 366.215)	Vehicle carrying capacity is reduced due to the presence of the pedestrian refuge island.	-1 Project reduces vehicle carrying capacity.
East of access to destination points, community trails, historic places, and transit facilities	The pedestrian refuge island, RRFB, and reduced crossing distance greatly improve access to community destinations and transit.	+2 Project significantly improves access to destinations.
Property access points are well defined (egress/ingress)	Access points will be defined through the installation of curb and sidewalk.	+2 All access points to properties are defined.

3-Lane Alternative (without Pedestrian Refuge Island)

The 3-Lane Alternative (without Pedestrian Refuge Island) connectivity evaluation is summarized in Table 31.

Table 31. Connectivity Evaluation of 3-Lane Alternative (without Pedestrian Refuge Island)

Performance Measures	Description	Score
Consistency with crossing treatment recommendations and target pedestrian crossing spacing for roadway context	Project includes a pedestrian crossing with a pedestrian signal, achieving the target crossing spacing range identified in the HDM.	+2 Project meets recommended crossing treatments and meets target pedestrian crossing spacing.
ODOT operational performance targets and regional connectivity	ODOT's HDM v/c ratio targets are not met in 2030 and 2050 during the Sunday peak hours.	-1 Project does not meet ODOT operational performance targets.
Vehicle carrying capacity (ORS 366.215)	Vehicle carrying capacity is not impacted; no pedestrian refuge included in this alternative	0 Project makes no change to vehicle carrying capacity.
East of access to destination points, community trails, historic places, and transit facilities	The pedestrian signal and reduced crossing distance greatly improve access to community destinations and transit.	+2 Project significantly improves access to destinations.
Property access points are well defined (egress/ingress)	Access points will be defined through the installation of curb and shared use path.	+2 All access points to properties are defined.

Connectivity Evaluation Summary

Table 32 summarizes the results of the connectivity evaluation scores, described above.

Table 32: Connectivity Evaluation

Alternative	Pedestrian Crossing	Operational Performance	Carrying Capacity	Ease of Access	Access Management	Total
5-Lane (with Pedestrian Refuge Island)	+2	+1	-1	+1	+2	+5
3-Lane (with Pedestrian Refuge Island)	+2	-1	-1	+2	+2	+4
3-Lane (without Pedestrian Refuge Island)	+2	-1	0	+2	+2	+5

Livability

The *Livability* criterion considers how well the alternative is supported by the community and stakeholders.

5-Lane Alternative (with Pedestrian Refuge Island)

The 5-Lane Alternative (with Pedestrian Refuge Island) Livability evaluation is summarized in Table 33.

Table 33. Livability Evaluation of 5-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Community response based on open house and interviews	Project was generally not supported based on feedback received as part of the community drop-in event[13]. Travel speeds and pedestrian crossings were the two primary concerns raised by community members. Feedback received from the community suggested that the 5-Lane Alternative (with Pedestrian Refuge Island) would likely not reduce trave speeds and would maintain the difficulty of crossing the roadway due to crossing distance[3].	-1 Project creates negative responses.
Stakeholder response based on open house and interviews	The feedback received from the stakeholder interviews was consistent with the community feedback: The 5-Lane Alternative (with Pedestrian Refuge Island) does not address the primary concerns of reducing travel speed, improving connectivity for people walking and crossing US26, and improving safety for all.	-1 Project creates negative responses.

[13] See Appendix “D" for summary of community input received as part of Community Drop-In Event

3-Lane Alternative (with Pedestrian Refuge Island)

The 3-Lane Alternative (with Pedestrian Refuge Island) Livability evaluation is summarized in Table 34.

Table 34. Livability Evaluation of 3-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Community response based on open house and interviews	The 3-Lane Alternative (with Pedestrian Refuge Island) was strongly supported based on feedback received as part of the community drop-in event[3]. The pedestrian refuge island was supported and viewed as a significant improvement to increase safety for people crossing the road.	+2 Project creates significantly positive responses.
Stakeholder response based on open house and interviews	The feedback received from the stakeholder interviews was consistent with the community feedback; however, a stronger preference was voiced for curb separated bicycle facilities rather than buffered bike lanes from the Clackamas County Bicycle and Pedestrian Advisory Committee (BPAC).	+1 Project creates positive responses.

3-Lane Alternative (without Pedestrian Refuge Island)

The 3-Lane Alternative (with Pedestrian Refuge Island) Livability evaluation is summarized in Table 35.

Table 35. Livability Evaluation of 3-Lane Alternative (without Pedestrian Refuge Island)

Performance Measures	Description	Score
Community response based on open house and interviews	The 3-Lane Alternative (with Pedestrian Refuge Island) was supported based on feedback received as part of the community drop-in event3. As described above, the desire for a pedestrian refuge island to increase safety for people crossing US 26 was voiced as a strong priority. The lack of pedestrian refuge island makes the 3-Lane Alternative (without Pedestrian Refuge Island) less supported compared to the 3-Lane Alternative (with Pedestrian Refuge Island).	0 Project creates mixed responses or neutral responses.
Stakeholder response based on open house and interviews	The feedback received from the stakeholder interviews was consistent with the community feedback; however, a stronger preference was voiced for curb separated bicycle facilities, as shown in this alternative, rather than buffered bike lanes from the Clackamas County Bicycle and Pedestrian Advisory Committee (BPAC).	+2 Project creates strongly positive responses.

Livability Evaluation Summary

Table 36 summarizes the results of the livability evaluation scores, described above.

Table 36: Livability Evaluation

Alternative	Community Support	Stakeholders Support	Total
5-Lane (with Pedestrian Refuge Island)	-1	-1	-2
3-Lane (with Pedestrian Refuge Island)	+2	+1	+3
3-Lane (without Pedestrian Refuge Island)	0	+2	+2

Feasibility

The *Feasibility* criterion considers the construction feasibility (including right-of-way needs) of the alternative as well as the project cost and maintenance considerations.

Planning level cost estimates have not yet been developed. The scores reflect engineering judgment on the relative differences between key elements of the alternatives, including pedestrian crossing type and cross-section width. A planning level cost estimate will be developed for the preferred alternative and can be used for ODOT staff to further develop the basis for alternative cost comparison as part of next steps.

5-Lane Alternative (with Pedestrian Refuge Island)

The 5-Lane Alternative (with Pedestrian Refuge Island) feasibility evaluation is summarized in Table 37.

Table 37. Feasibility Evaluation of 5-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Construction feasibility	The 5-Lane Alternative (with Pedestrian Refuge Island) widens the overall cross section based on the proposed sidewalk improvements (adding impervious surface) on both sides of the roadway. Based on field observations, sidewalks improvements, particularly on the south side of US26 are likely to require relocation utilities and may impact adjacent buildings (see Appendix "A").	-1 Project poses significant construction challenges.
Expected project costs	As a result of anticipated impacts to adjacent buildings and the wider cross section, the 5-Lane Alternative (with Pedestrian Refuge Island) is expected to result in a high-level cost compared to the 3-Lane Alternatives.	-1 Construction costs are comparatively high.
Maintenance needs and considerations	Based on feedback received from ODOT maintenance staff, a raised pedestrian refuge island is not supportive.	+1 Project accommodates maintenance requirements and reduces maintenance needs.

3-Lane Alternative (with Pedestrian Refuge Island)

The 3-Lane Alternative (with Pedestrian Refuge Island) feasibility evaluation is summarized in Table 38.

Table 38. Feasibility Evaluation of 3-Lane Alternative (with Pedestrian Refuge Island)

Performance Measures	Description	Score
Construction feasibility	The 3-Lane Alternative (with Pedestrian Refuge Island) reduces the overall cross section, providing curbs on both sides of the roadway. No utility or right-of-way impacts are anticipated for the 3-Lane Alternative (with Pedestrian Refuge Island).	+1 Project poses minor construction challenges.
Expected project costs	The 3-Lane Alternative (with Pedestrian Refuge Island) is expected to result in a medium-level cost compared to the 5-Lane Alternative (with Pedestrian Refuge Island) and relatively equal compared to the 3-Lane without Pedestrian Refuge Island) due to pedestrian crossing infrastructure	0 Construction costs are comparatively medium.
Maintenance needs and considerations	Based on feedback received from ODOT maintenance staff, a reduced cross section and raised pedestrian refuge island are not supported.	-1 Project cannot accommodate maintenance requirements and increases maintenance needs.

3-Lane Alternative (without Pedestrian Refuge Island)

The 3-Lane Alternative (without Pedestrian Refuge Island) Feasibility evaluation is summarized in Table 39.

Table 39. Feasibility Evaluation of 3-Lane Alternative (without Pedestrian Refuge Island)

Performance Measures	Description	Score
Construction feasibility	The 3-Lane Alternative (without Pedestrian Refuge Island) reduces the overall cross section, providing curbs on both sides of the roadway. No utility or right-of-way impacts are anticipated for the 3-Lane Alternative (without Pedestrian Refuge Island).	+1 Project poses minor construction challenges.
Expected project costs	The 3-Lane Alternative (without Pedestrian Refuge Island) is expected to result in a medium-level cost compared to the 5-Lane Alternatives and relatively equal compared to the 3-Lane with Pedestrian Refuge Island) due to pedestrian crossing infrastructure	0 Construction costs are comparatively medium.
Maintenance needs and considerations	Based on feedback received from ODOT maintenance staff, a reduced cross section maintenance of a multiuse path is not supported; however, an alternative without a pedestrian refuge island is supported.	0 Project accommodates maintenance requirements but increases maintenance needs.

Feasibility Evaluation Summary

Table 40 summarizes the results of the feasibility evaluation scores, described above.

Table 40: Feasibility Evaluation

Alternative	Utility/ROW	Cost*	Maintenance	Total
5-Lane (with Pedestrian Refuge Island)	-1	-1	+1	-1
3-Lane (with Pedestrian Refuge Island)	+1	0	-1	0
3-Lane (without Pedestrian Refuge Island)	+1	0	0	+1

Evaluation Criteria Scoring Summary

Table 41 presents the evaluation criteria and performance measures scoring summary.

Table 41: Evaluation Criteria and Performance Measures Scoring Summary

Evaluation Criteria	Performance Measure	5-Lane Alternative (with Pedestrian Refuge Island)	3-Lane Alternative (with Pedestrian Refuge Island)	3-Lane Alternative (without Pedestrian Refuge Island)
Safety	Crash Reduction Factors	+1	+2	+2
	Number of Conflict Points	0	+2	+2
	Pedestrian Risk Factors	+1	+2	+2
	Bicycle Risk Factors	+1	+2	+2
	Speed Reduction Effectiveness	+1	+2	+2
Multimodal Integration	Consistency with Motorist Considerations	0	-1	-1
	Consistency with Freight Considerations	0	-1	-1
	Consistency with Transit Considerations	0	+1	+1
	Consistency with Bicycle Considerations	+1	+2	+2
	Consistency with Pedestrian Considerations	+1	+2	+2
Connectivity	Pedestrian Crossing	+2	+2	+2
	Operations Performance	+1	-1	-1
	Carrying Capacity	-1	-1	0
	Ease of Access	+1	+2	+2
	Access Management	+2	+2	+2
Livability	Community Feedback	-1	+2	0
	Stakeholder Feedback	-1	+1	+2
Feasibility	Utility/Right-of-Way Impacts	-1	+1	+1
	Cost	-1	0	0
	Maintenance	+1	-1	0
Total Score		8	20	21

US 26 Consultant Team Preliminary Recommendation

Based on the results of the evaluation criteria, the 3-Lane alternatives score highest and are most consistent with the corridor vision and intended outcomes of the project.

Kittelson recommends advancing the 3-lane alternative as the preferred alternative for site plan and concept development layout.

Note: ODOT will need to verify the acceptance of a pedestrian refuge island before Kittelson begins drafting the site plan layout.

Next Steps

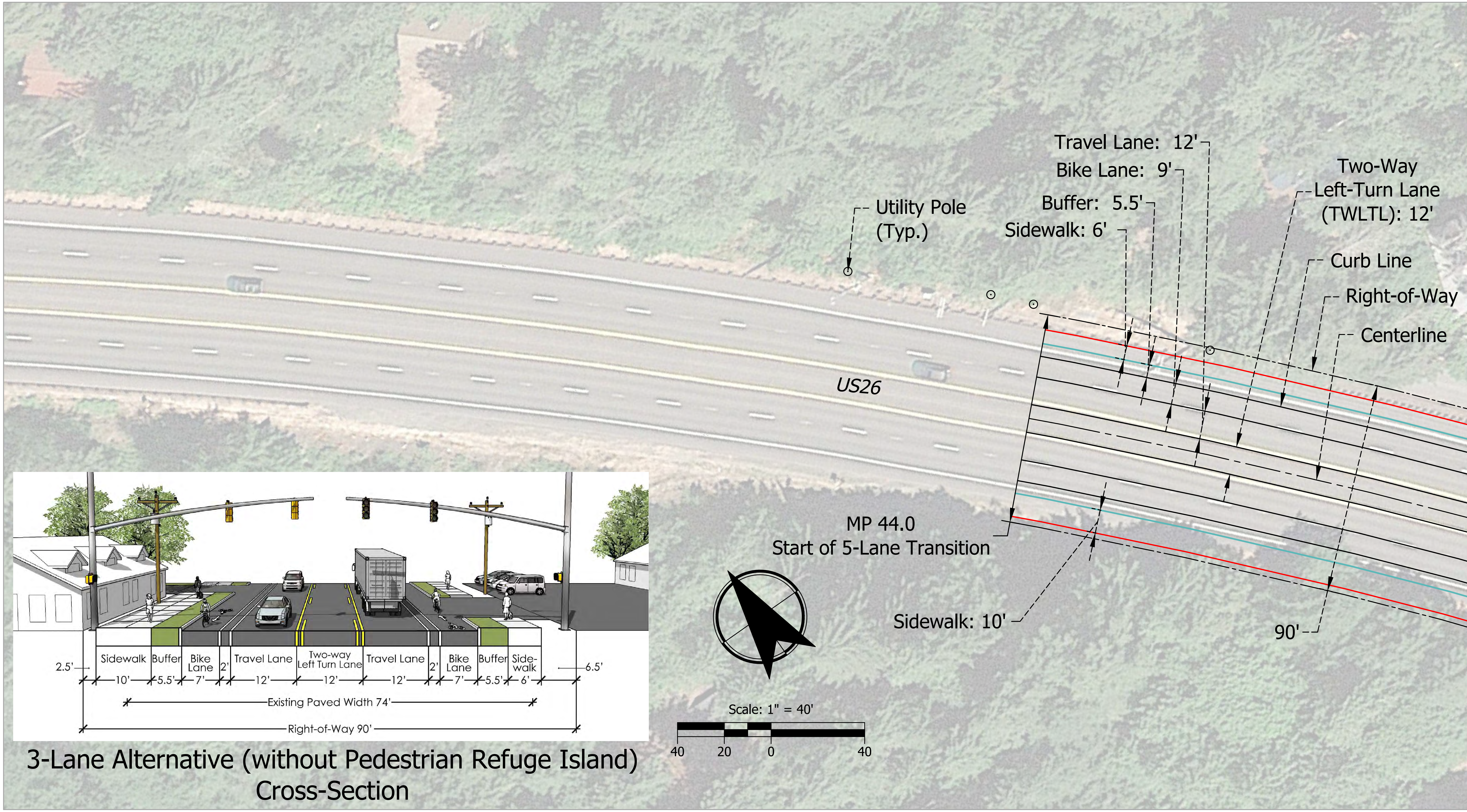
ODOT project manager will review the recommended preferred alternative and provide confirmation for the consultant team to advance a single, preferred alternative as part of the Rhododendron US26 Design Refinement Plan including the site plan layout.

As the project continues to advance in its refinement and design, opportunities to slow speeds and reduce the overall cross section width should be explored, consistent with the intended outcomes and corridor vision for Rhododendron.

Appendix A

ROW Impacts & Needs

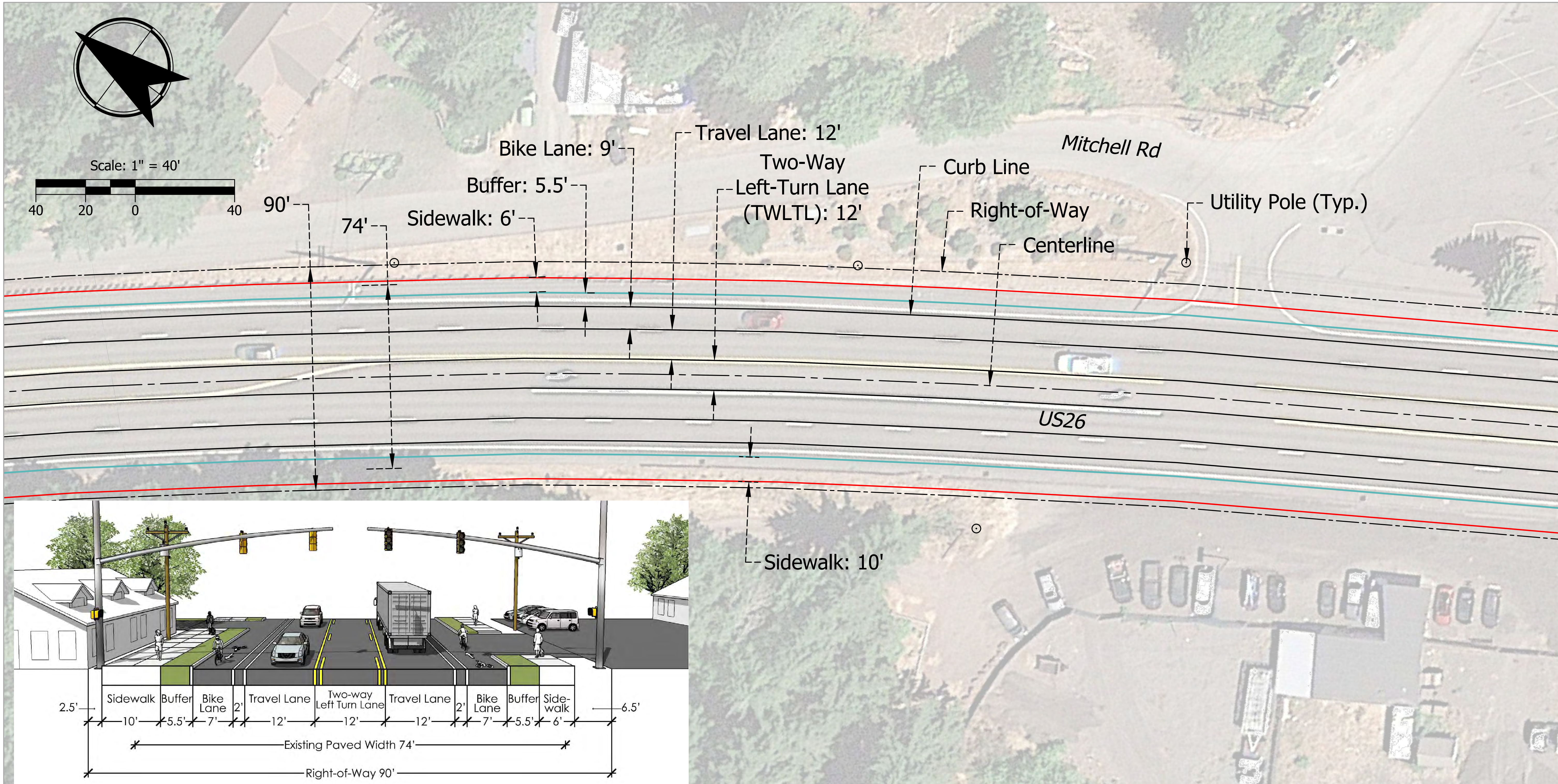
***3-Lane** Alternative without Refuge Island*



3-Lane Alternative (without Pedestrian Refuge Island)
Cross-Section

3-Lane Alternative (without Pedestrian Refuge Island)
Community of Rhododendron

Figure
A3-1



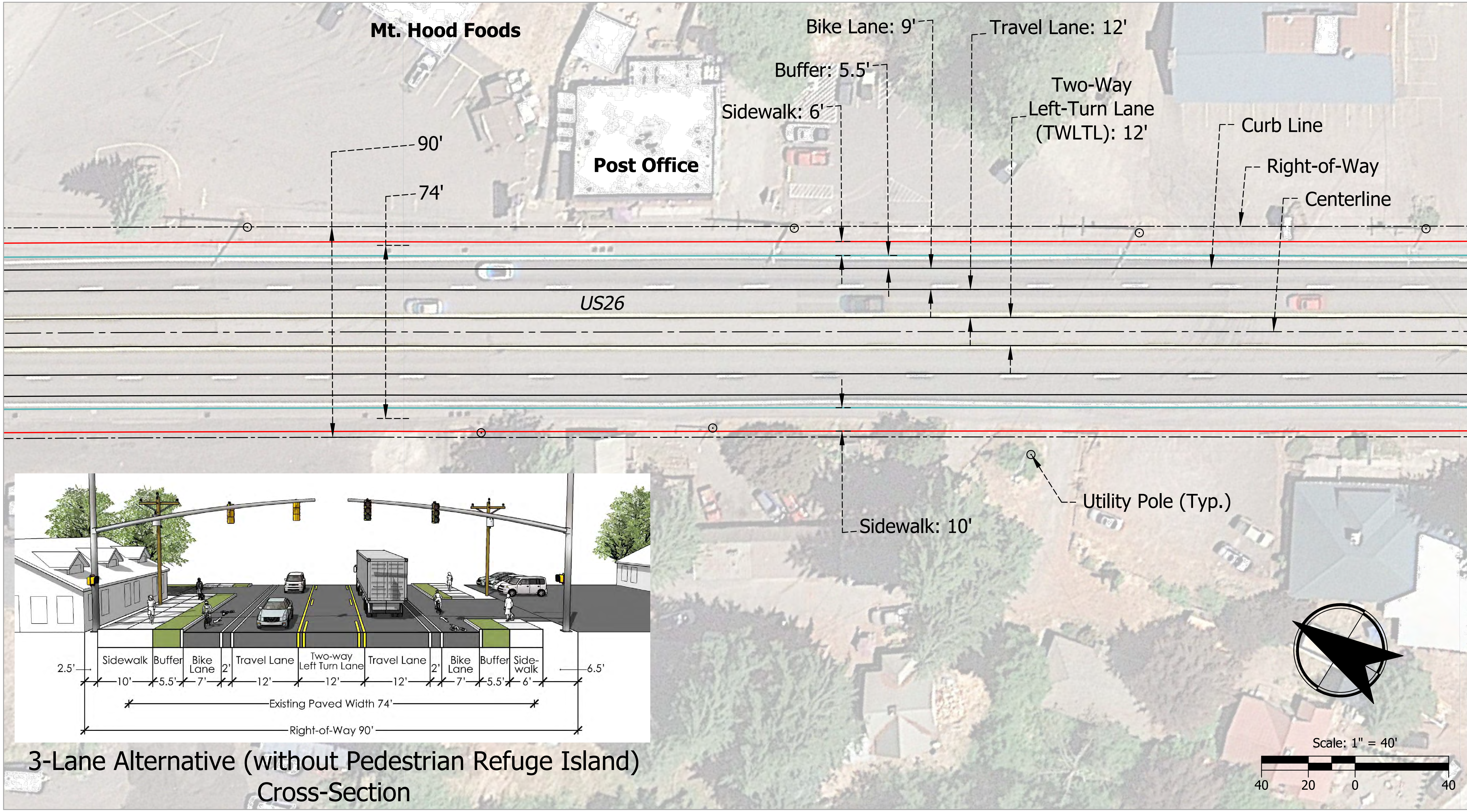
3-Lane Alternative (without Pedestrian Refuge Island)
Cross-Section

3-Lane Alternative (without Pedestrian Refuge Island)
Community of Rhododendron

Figure
A3-2

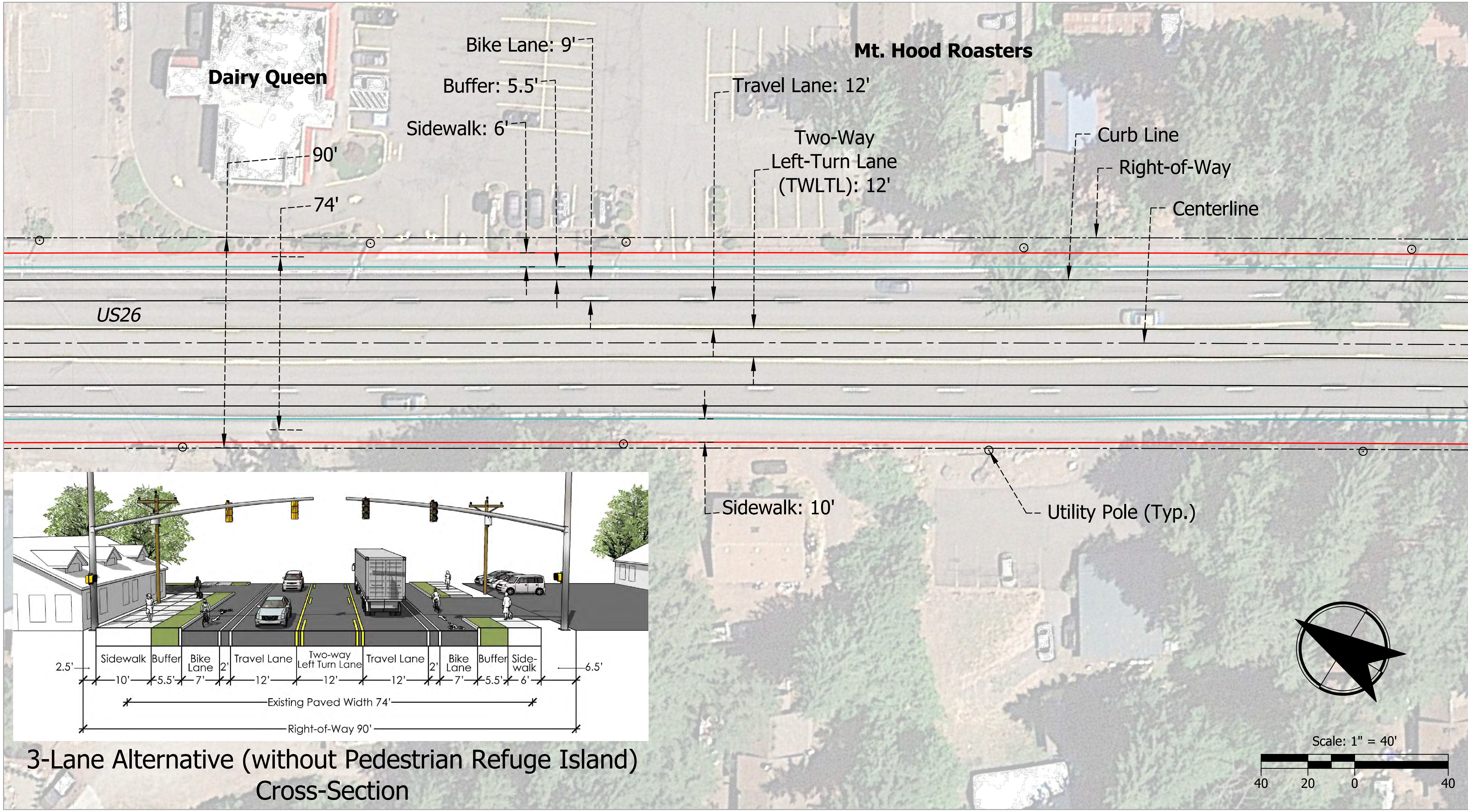
C:\Users\aroot\appdata\local\temp\AcPublish_32464\27358-3LnNoMedianAlt.dwg Dec 16, 2022 - 6:43am - aroot Layout Tab: Fg2

KITTELSON & ASSOCIATES



3-Lane Alternative (without Pedestrian Refuge Island)
Community of Rhododendron

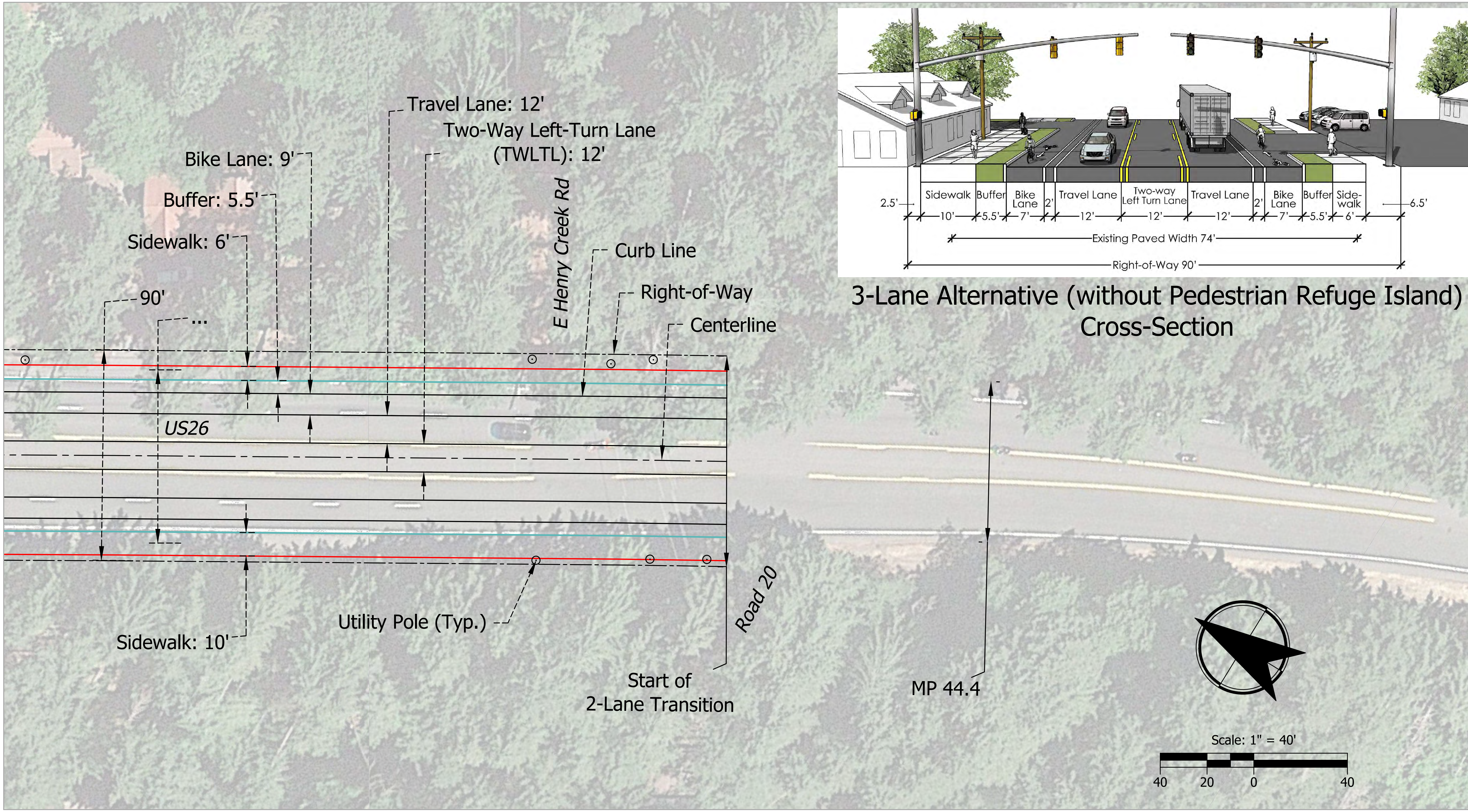
Figure
A3-3



3-Lane Alternative (without Pedestrian Refuge Island) Cross-Section

3-Lane Alternative (without Pedestrian Refuge Island)
Community of Rhododendron

Figure A3-4

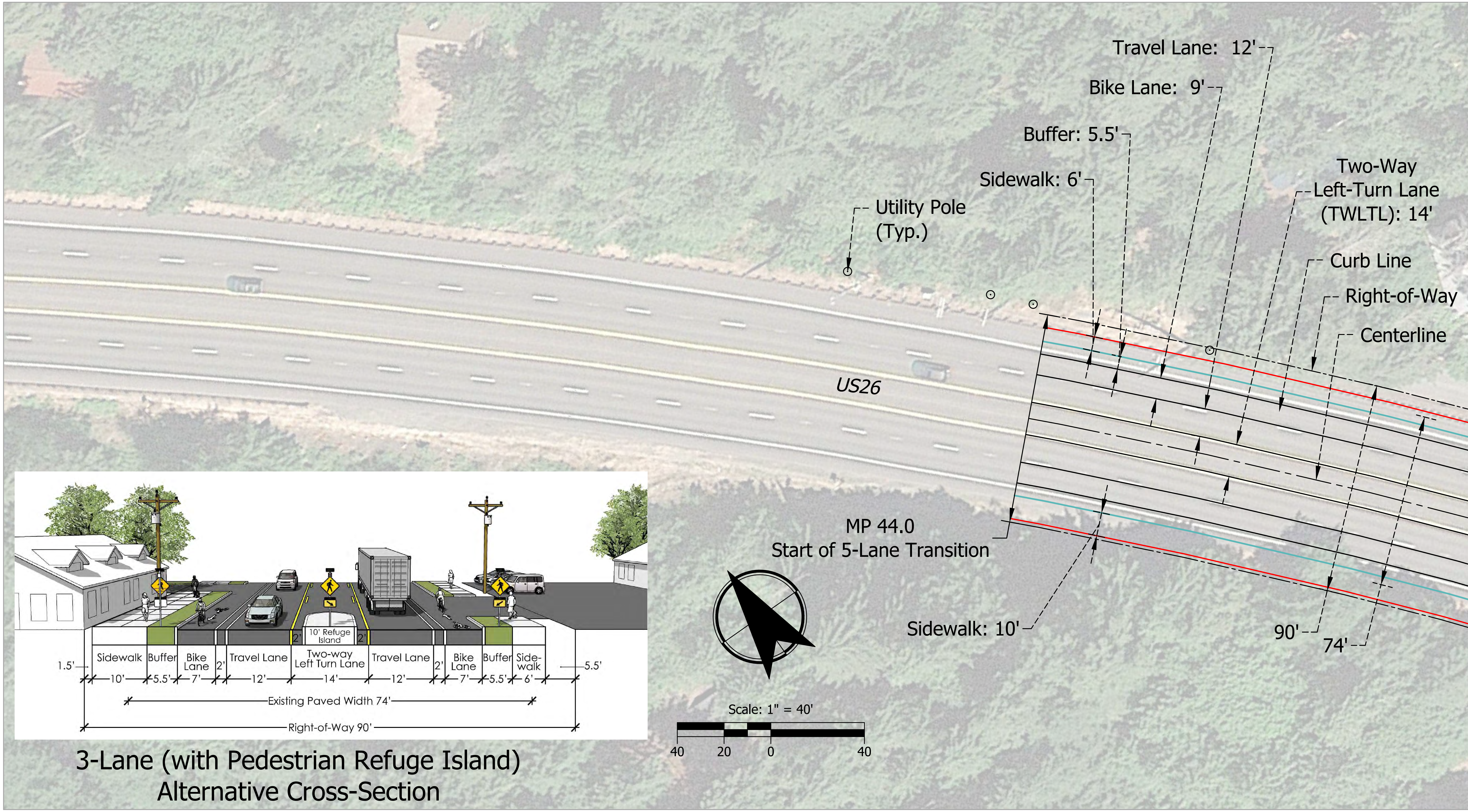


3-Lane Alternative (without Pedestrian Refuge Island)
Community of Rhododendron

Figure
....

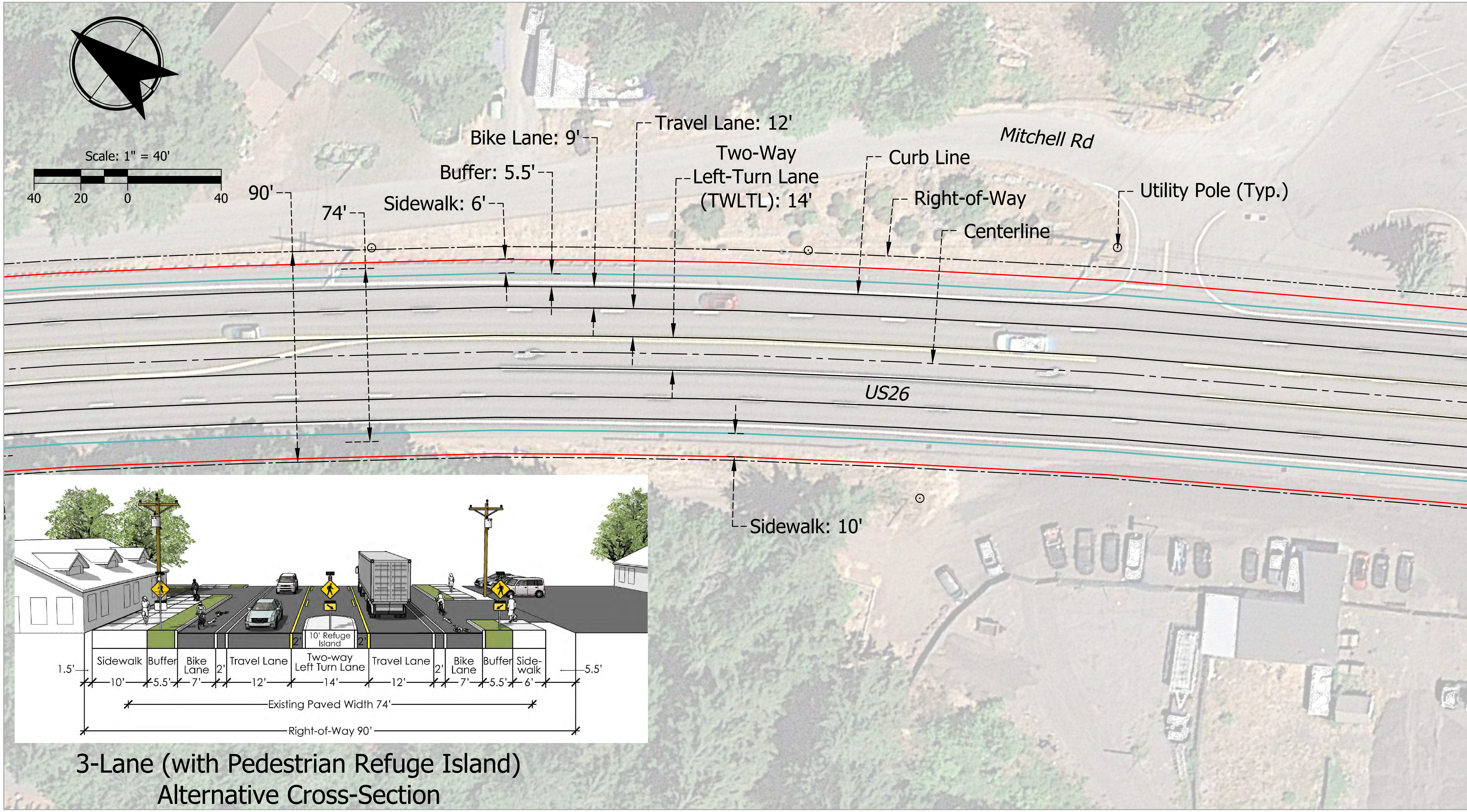
KITTELSON & ASSOCIATES

3-Lane *Alternative with Refuge Island*



3-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

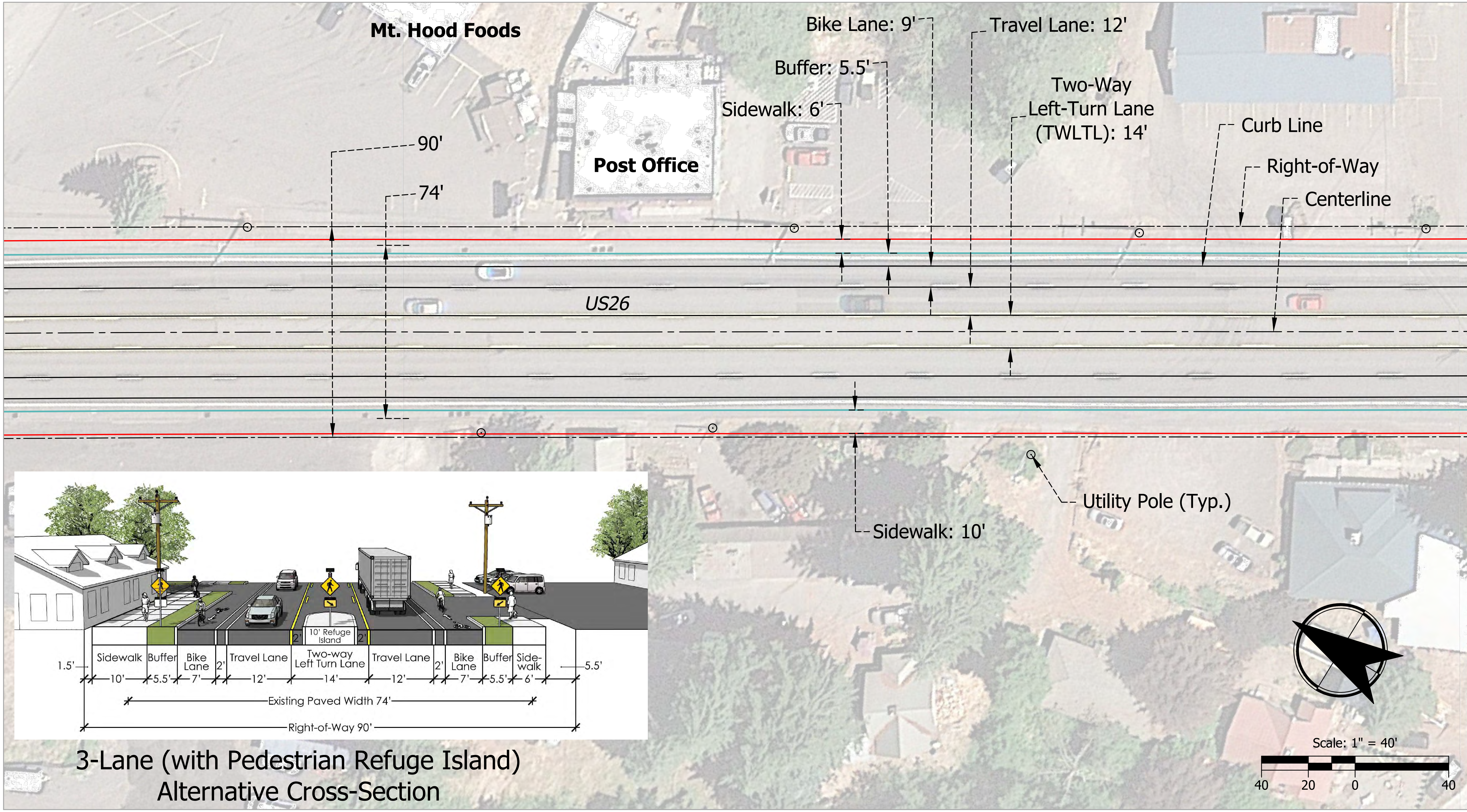
Figure
A2-1



3-Lane (with Pedestrian Refuge Island)
Alternative Cross-Section

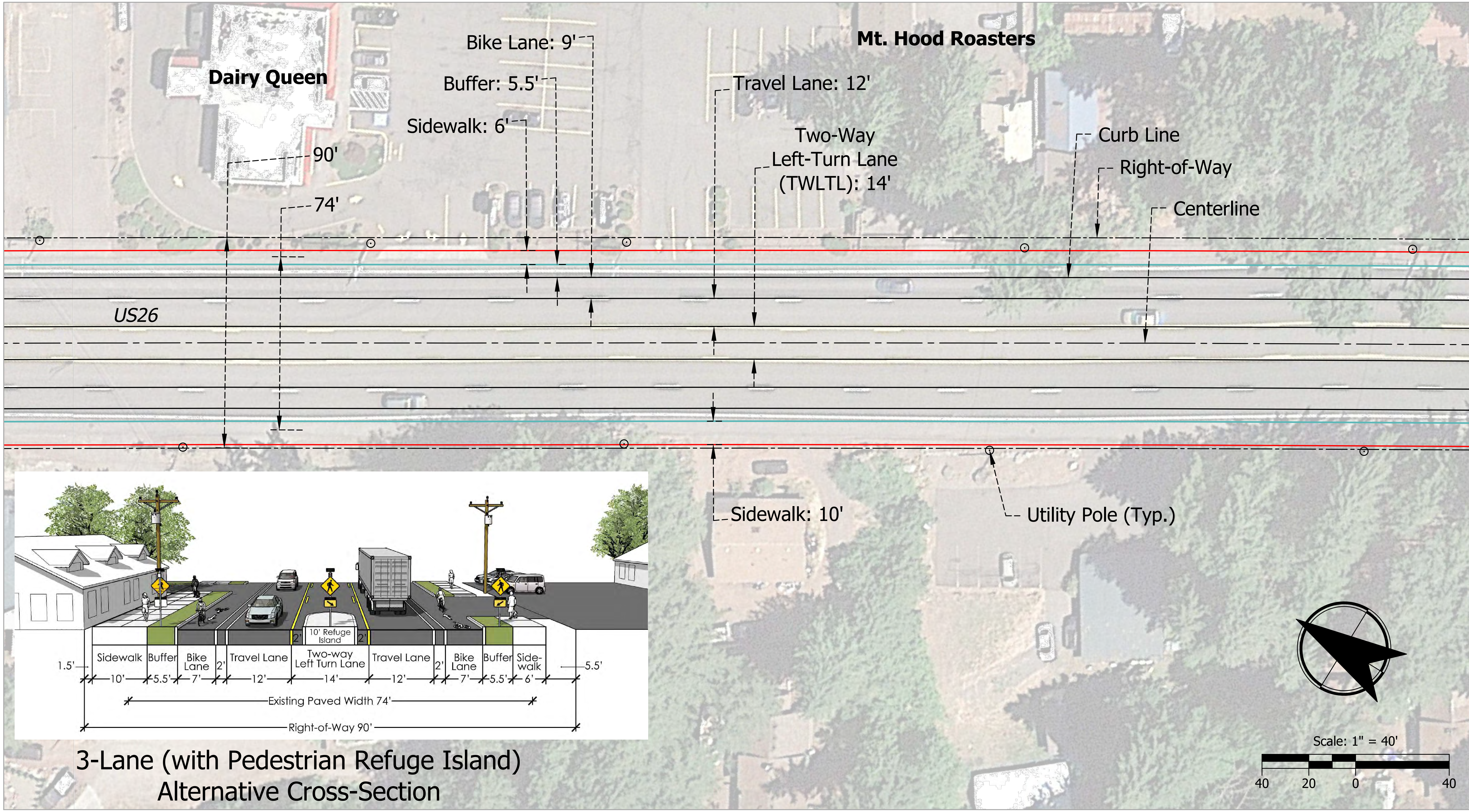
3-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

Figure A2-2



3-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

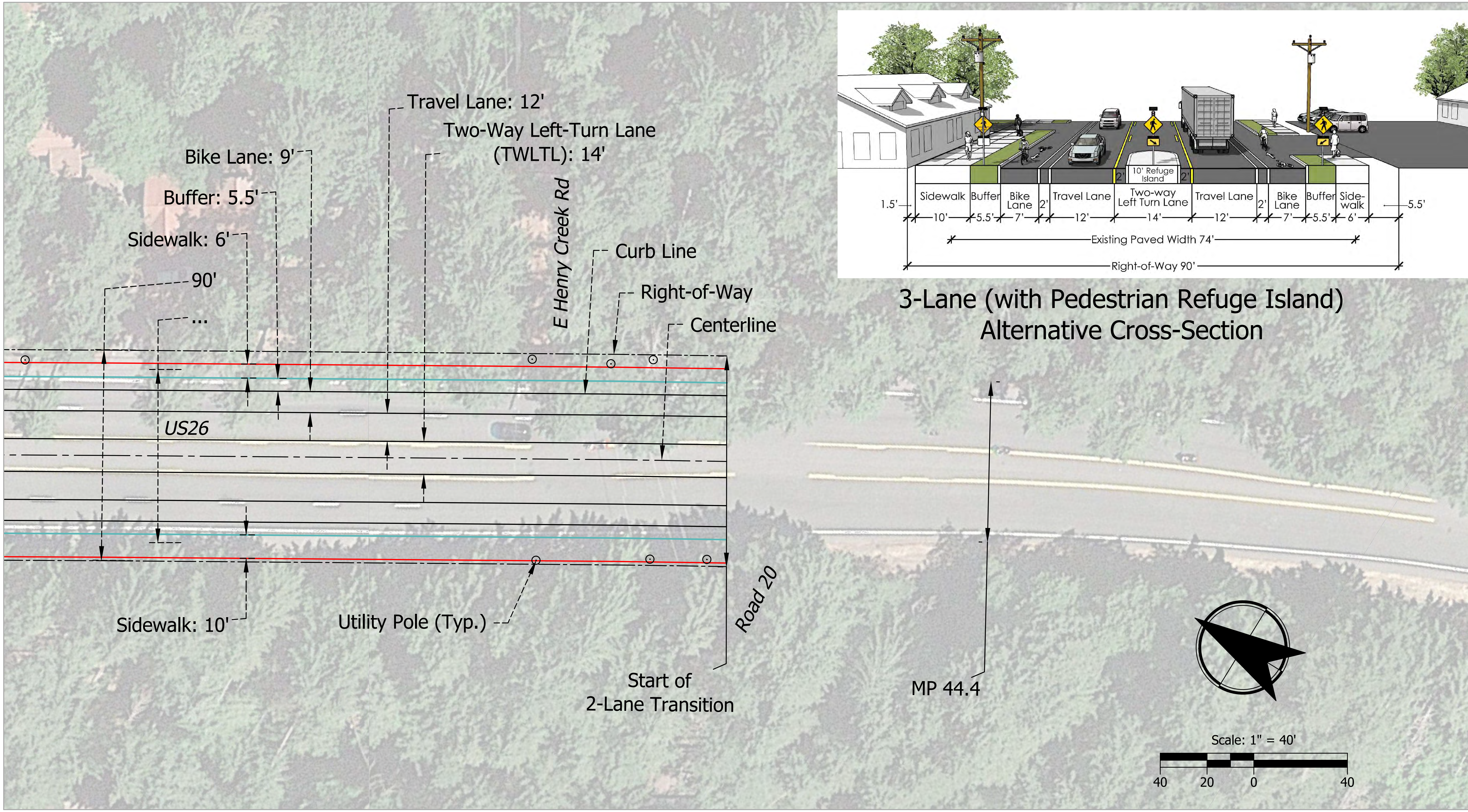
Figure
A2-3



3-Lane (with Pedestrian Refuge Island)
Alternative Cross-Section

3-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

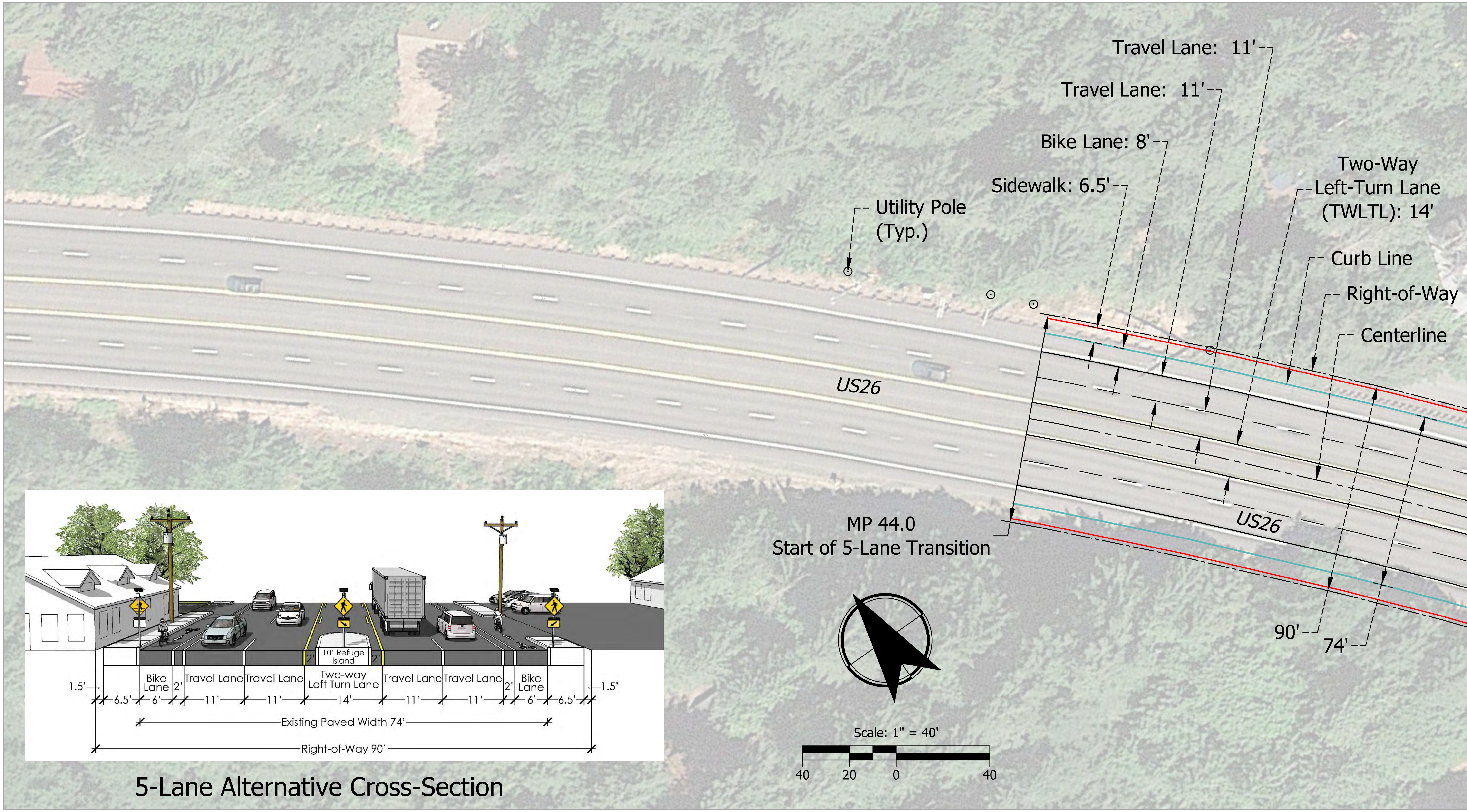
Figure
A2-4



3-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

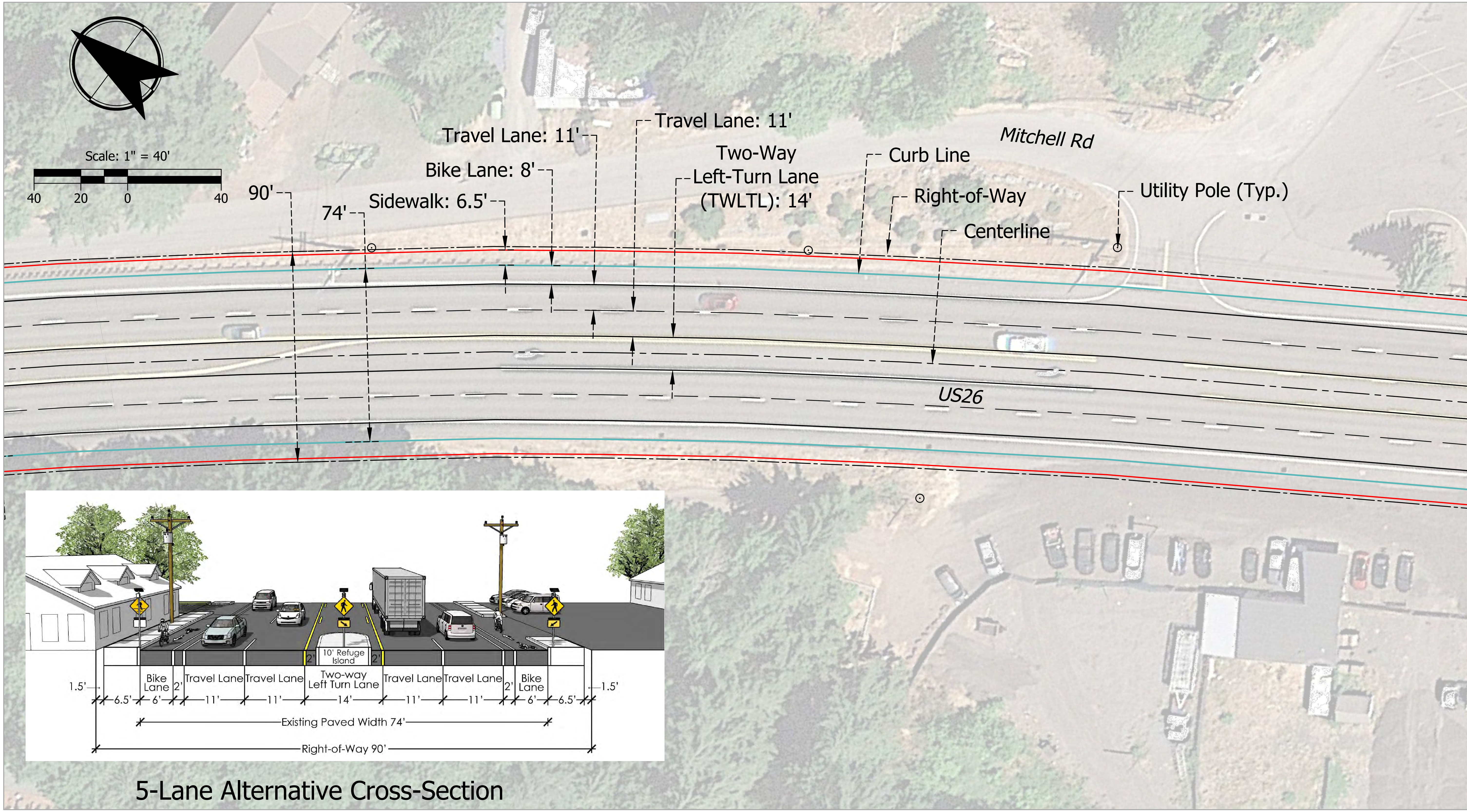
Figure
A2-5

***5-Lane** Alternative*



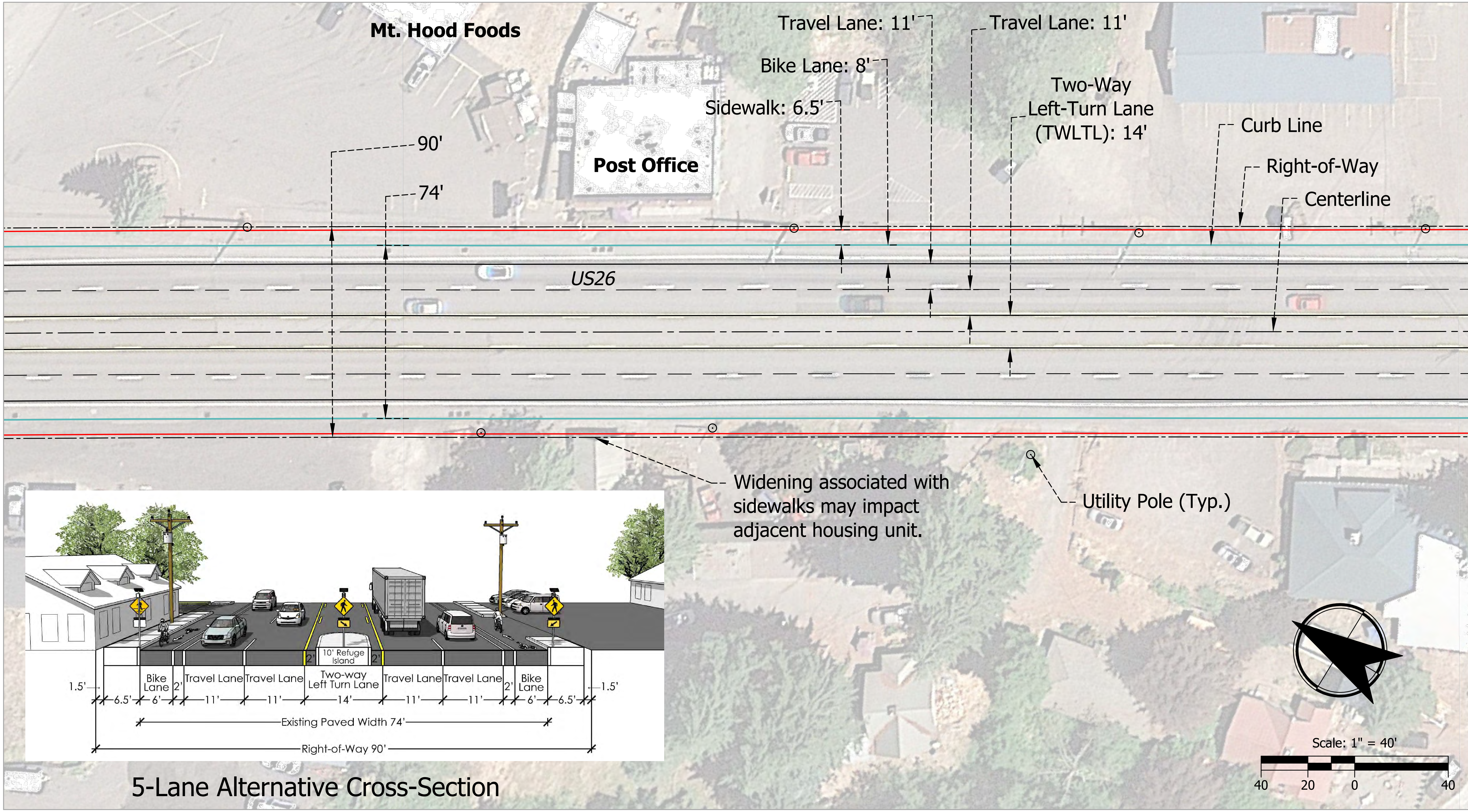
5-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

Figure
A1-1



5-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

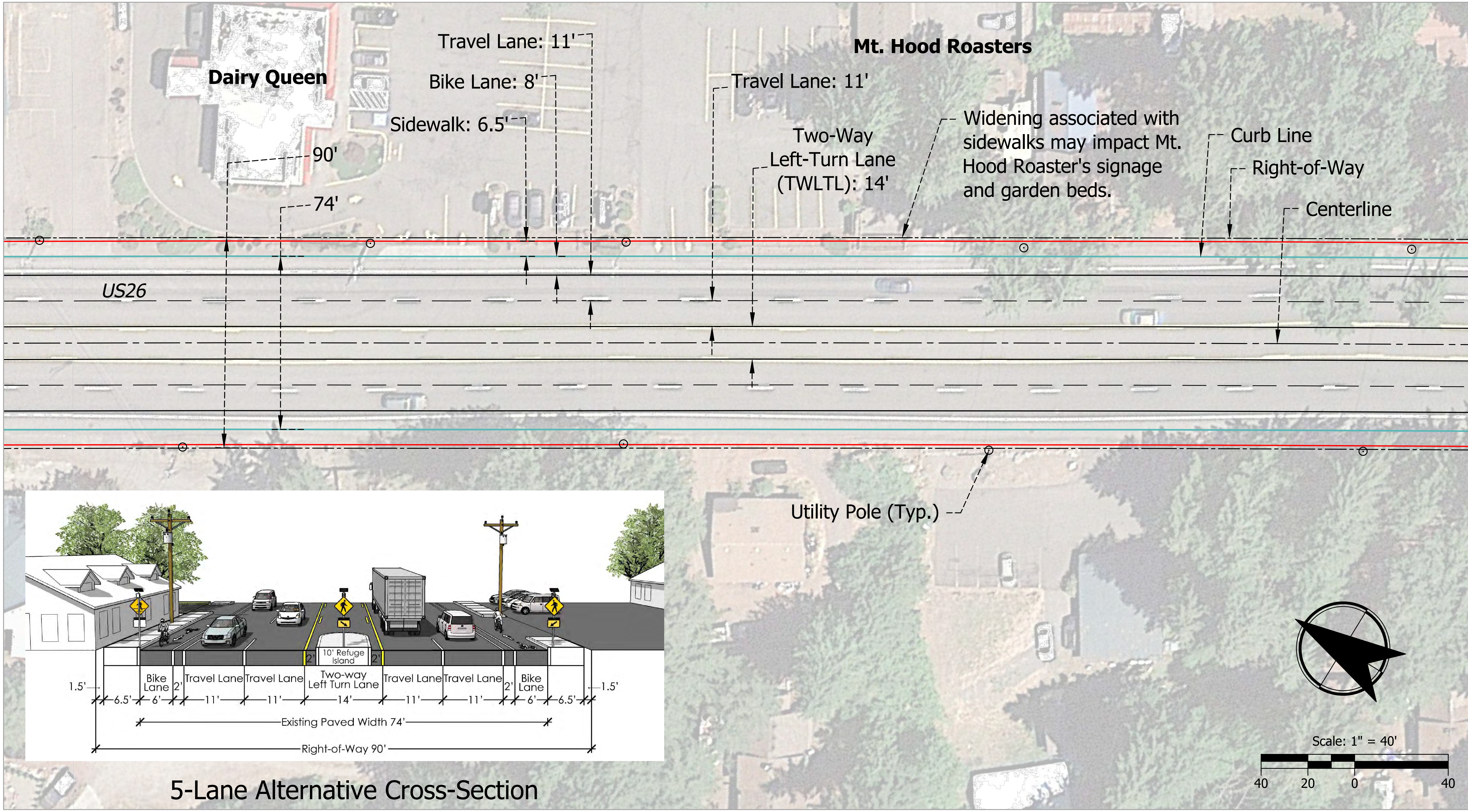
Figure A1-2



5-Lane Alternative Cross-Section

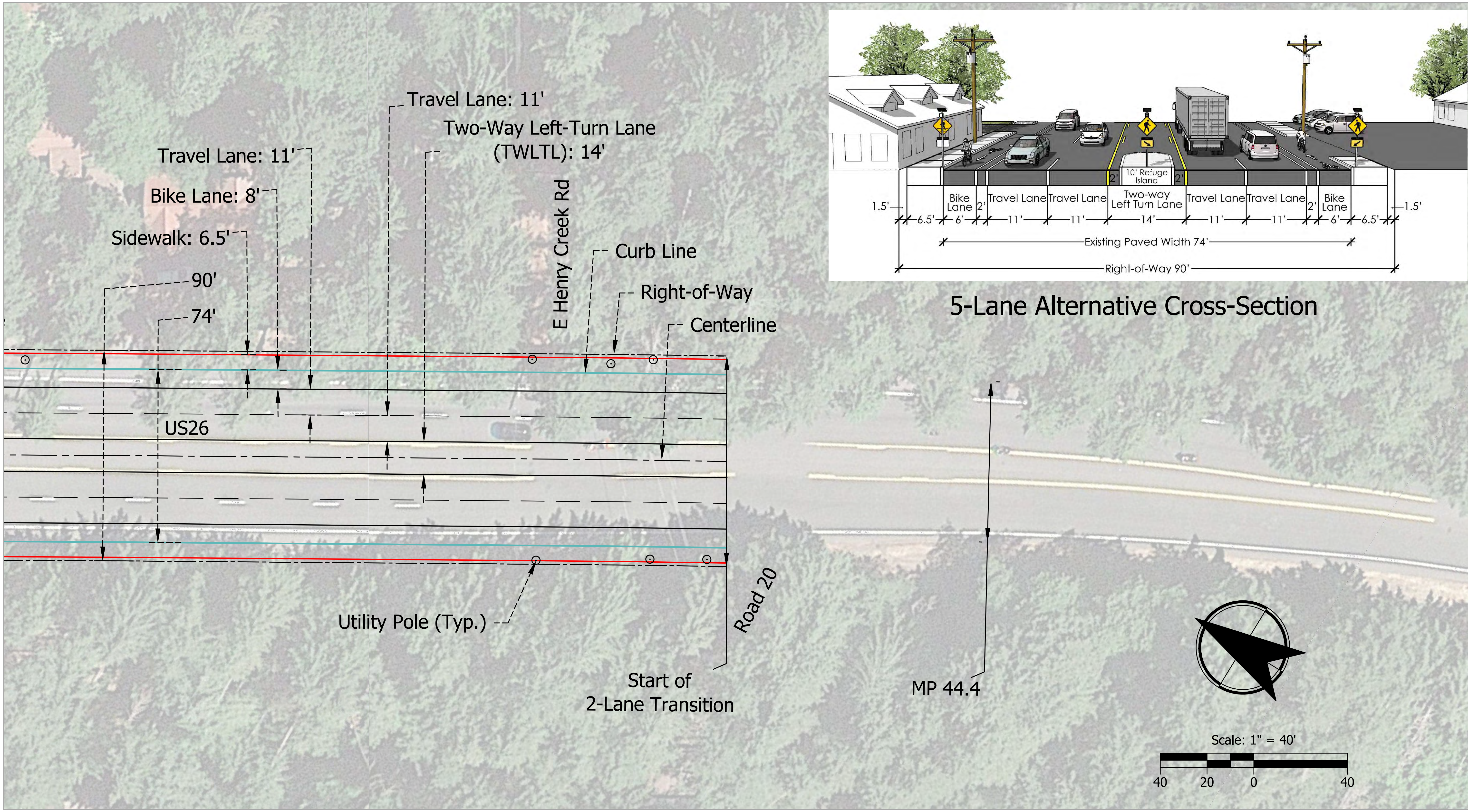
5-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

Figure
A1-3



5-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

Figure
A1-4

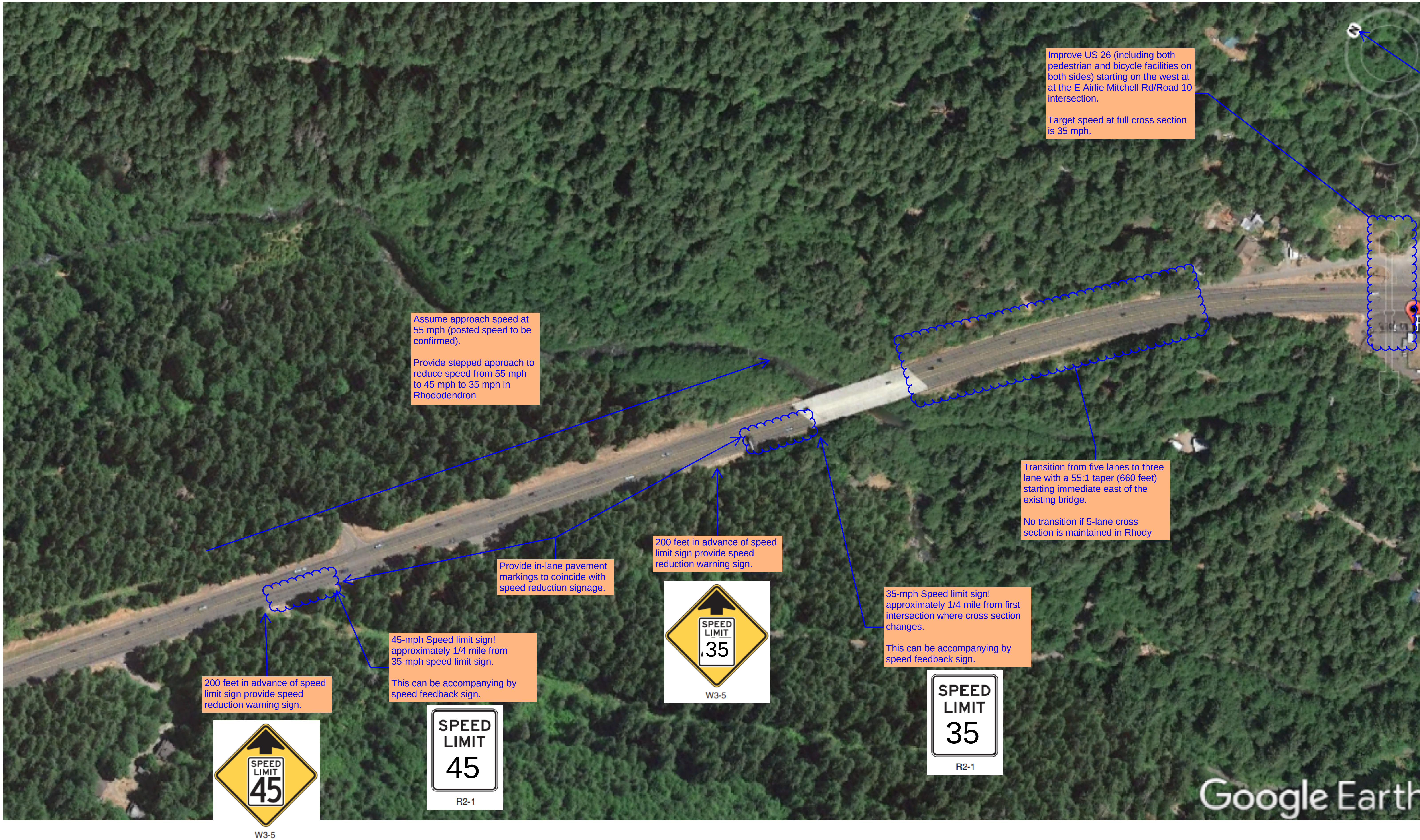


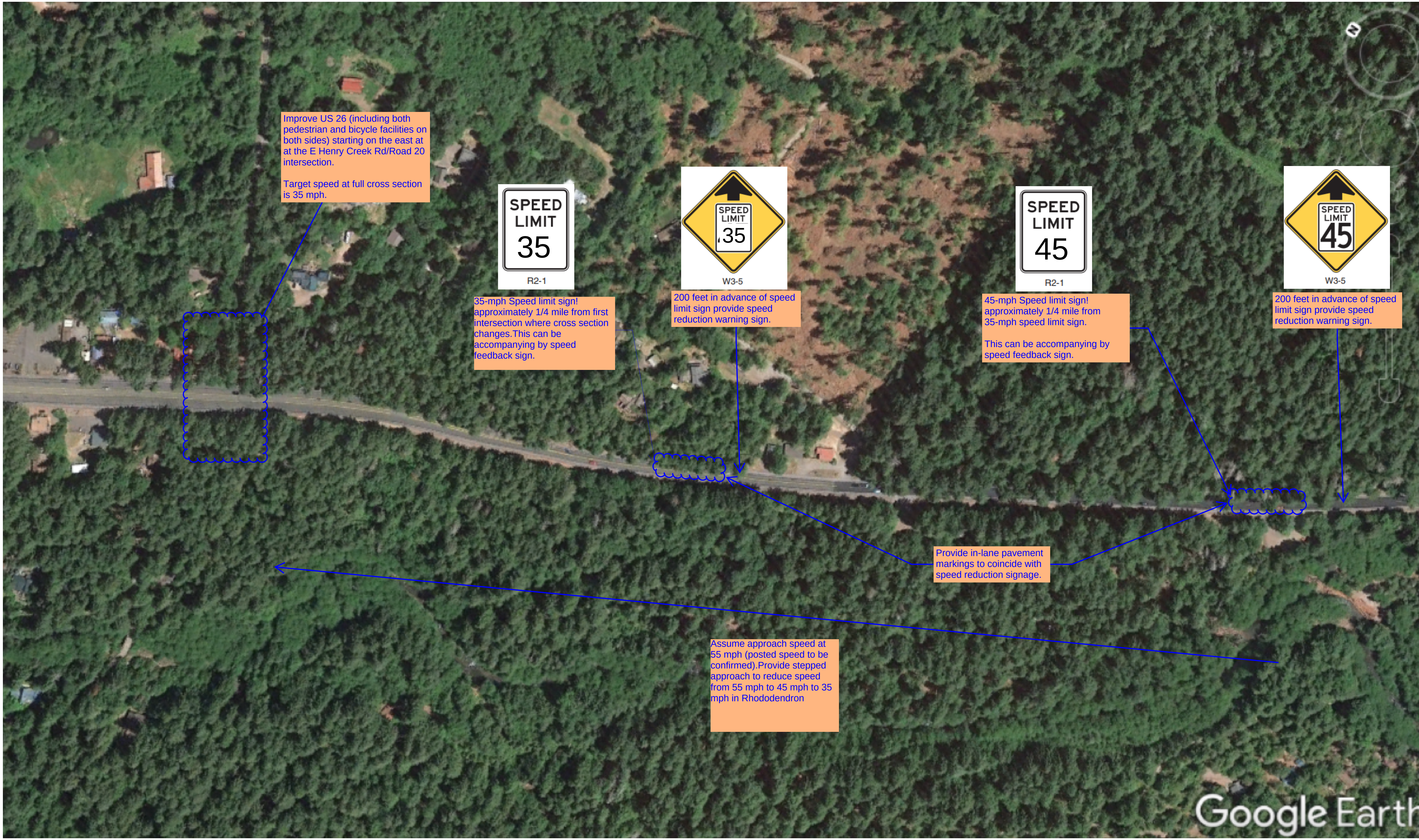
5-Lane Alternative (with Pedestrian Refuge Island)
Community of Rhododendron

Figure
A1-5

Appendix B

Recommended Transition Zone Signage and Striping


Improve US 26 (including both pedestrian and bicycle facilities on both sides) starting on the west at at the E Airlie Mitchell Rd/Road 10 intersection.
Target speed at full cross section is 35 mph.
Assume approach speed at 55 mph (posted speed to be confirmed).
Provide stepped approach to reduce speed from 55 mph to 45 mph to 35 mph in Rhododendron
Transition from five lanes to three lane with a 55:1 taper (660 feet) starting immediate east of the existing bridge.
No transition if 5-lane cross section is maintained in Rhody
Provide in-lane pavement markings to coincide with speed reduction signage.
200 feet in advance of speed limit sign provide speed reduction warning sign.
SPEED LIMIT 35
W3-5
35-mph Speed limit sign! approximately 1/4 mile from first intersection where cross section changes.
This can be accompanying by speed feedback sign.
SPEED LIMIT 35
R2-1
45-mph Speed limit sign! approximately 1/4 mile from 35-mph speed limit sign.
This can be accompanying by speed feedback sign.
SPEED LIMIT 45
R2-1
200 feet in advance of speed limit sign provide speed reduction warning sign.
SPEED LIMIT 45
W3-5
Google Earth


Improve US 26 (including both pedestrian and bicycle facilities on both sides) starting on the east at at the E Henry Creek Rd/Road 20 intersection.
Target speed at full cross section is 35 mph.
SPEED LIMIT 35
R2-1
35-mph Speed limit sign! approximately 1/4 mile from first intersection where cross section changes.This can be accompanying by speed feedback sign.
SPEED LIMIT 35
W3-5
200 feet in advance of speed limit sign provide speed reduction warning sign.
SPEED LIMIT 45
R2-1
45-mph Speed limit sign! approximately 1/4 mile from 35-mph speed limit sign.
This can be accompanying by speed feedback sign.
SPEED LIMIT 45
W3-5
200 feet in advance of speed limit sign provide speed reduction warning sign.
Provide in-lane pavement markings to coincide with speed reduction signage.
Assume approach speed at 55 mph (posted speed to be confirmed).Provide stepped approach to reduce speed from 55 mph to 45 mph to 35 mph in Rhododendron
Google Earth

Appendix C

Operations Summary and Software Outputs

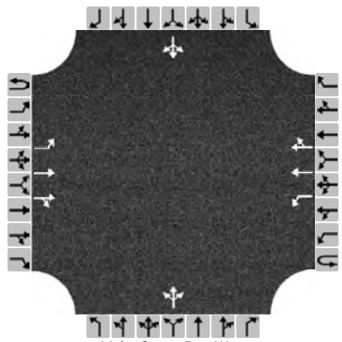
HCS 2022
***5-Lane** Alternatives **Segment** Analysis*

**Segment Analysis Results remained the same between HCS 7 and recent version upgrade HCS 2022.*

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Little Brook Ln/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	E Little Brook Ln
Time Analyzed	Thursday	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 1 - Future Thursday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	11	459	3	0	2	665	8		2	2	3		5	2	18
Percent Heavy Vehicles (%)	0	0			0	0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

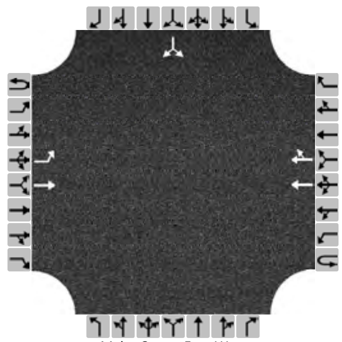
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				2					7				25	
Capacity, c (veh/h)		926				1110					360				475	
v/c Ratio		0.01				0.00					0.02				0.05	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.2	
Control Delay (s/veh)		8.9				8.2					15.2				13.0	
Level of Service (LOS)		A				A					C				B	
Approach Delay (s/veh)	0.2				0.0				15.2				13.0			
Approach LOS									C				B			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Food Fronta
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Mt Hood Food Frontage
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 2 - Future Thursday 2030 - TWLTL		

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		0	1	0
Configuration		L	T				T	TR							LR	
Volume (veh/h)	0	2	465				673	15						3		2
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

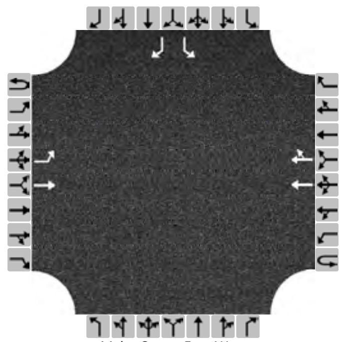
	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		2													5	
Capacity, c (veh/h)		914													413	
v/c Ratio		0.00													0.01	
95% Queue Length, Q_{95} (veh)		0.0													0.0	
Control Delay (s/veh)		8.9													13.8	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.0												13.8			
Approach LOS													B			

 HCS™ TWSC Version 7.9.5 Generated: 9/1/2022 10:42:56 PM
int-2-2030Thur- TWSC-TWLTL -.xtw

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Dairy Queen
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Dairy Queen
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 3 - Future Thursday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	10	452				659	15						7		18
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

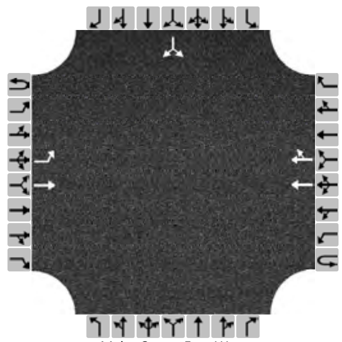
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		10												7		18
Capacity, c (veh/h)		925												333		663
v/c Ratio		0.01												0.02		0.03
95% Queue Length, Q_{95} (veh)		0.0												0.1		0.1
Control Delay (s/veh)		8.9												16.0		10.6
Level of Service (LOS)		A												C		B
Approach Delay (s/veh)	0.2												12.1			
Approach LOS													B			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Roaster Dwy
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Mt Hood Roaster Dwy
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 4 - Future Thursday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		0	1	0
Configuration		L	T				T	TR							LR	
Volume (veh/h)	0	2	457				670	2						2		3
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

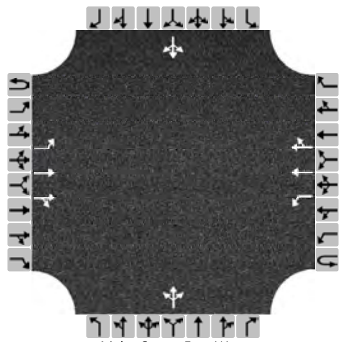
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2													5	
Capacity, c (veh/h)		926													478	
v/c Ratio		0.00													0.01	
95% Queue Length, Q_{95} (veh)		0.0													0.0	
Control Delay (s/veh)		8.9													12.6	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.0												12.6			
Approach LOS													B			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Henry Creek Road/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	E Henry Creek Rd
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 5 - Future Thursday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	2	442	10	0	2	652	2		8	2	3		2	2	3
Percent Heavy Vehicles (%)	0	0			0	0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

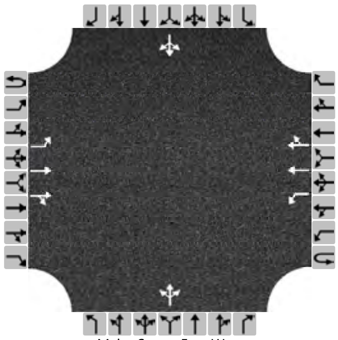
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2				2					13				7	
Capacity, c (veh/h)		943				1119					392				353	
v/c Ratio		0.00				0.00					0.03				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		8.8				8.2					14.5				15.4	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.0				0.0				14.5				15.4			
Approach LOS									B				C			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Little Brook Ln/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	E Little Brook Ln
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 1 - Future Sunday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	11	786	2	0	2	1625	5		2	2	2		2	2	23
Percent Heavy Vehicles (%)	0	0			0	0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

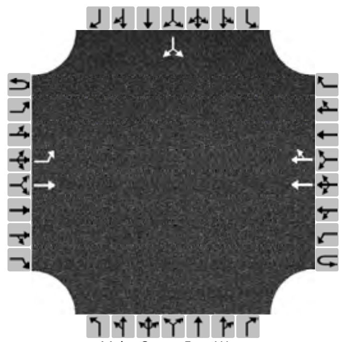
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				2					6				27	
Capacity, c (veh/h)		402				840					74				169	
v/c Ratio		0.03				0.00					0.08				0.16	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.3				0.6	
Control Delay (s/veh)		14.2				9.3					57.6				30.2	
Level of Service (LOS)		B				A					F				D	
Approach Delay (s/veh)	0.2				0.0				57.6				30.2			
Approach LOS									F				D			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Food Fronta
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Mt Hood Food Frontage
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 2 - Future Sunday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		0	1	0
Configuration		L	T				T	TR							LR	
Volume (veh/h)	0	4	785				1628	25						14		4
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

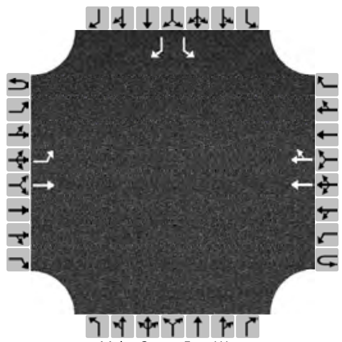
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		4													18	
Capacity, c (veh/h)		394													127	
v/c Ratio		0.01													0.14	
95% Queue Length, Q_{95} (veh)		0.0													0.5	
Control Delay (s/veh)		14.2													37.9	
Level of Service (LOS)		B													E	
Approach Delay (s/veh)	0.1												37.9			
Approach LOS													E			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Dairy Queen
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Dairy Queen
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 3 - Future Sunday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	29	759				1587	47						27		54
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

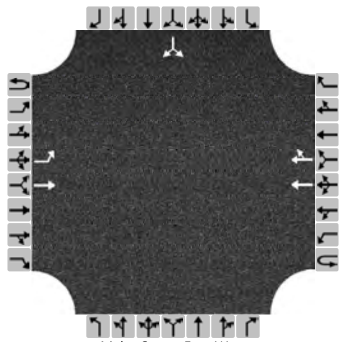
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		29												27		54
Capacity, c (veh/h)		402												110		323
v/c Ratio		0.07												0.25		0.17
95% Queue Length, Q_{95} (veh)		0.2												0.9		0.6
Control Delay (s/veh)		14.6												48.1		18.4
Level of Service (LOS)		B												E		C
Approach Delay (s/veh)	0.5												28.3			
Approach LOS													D			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Roaster Dwy
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Mt Hood Roaster Dwy
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 4 - Future Sunday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		0	1	0
Configuration		L	T				T	TR							LR	
Volume (veh/h)	0	5	780				1623	5						2		11
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		5													13	
Capacity, c (veh/h)		405													251	
v/c Ratio		0.01													0.05	
95% Queue Length, Q_{95} (veh)		0.0													0.2	
Control Delay (s/veh)		14.0													20.1	
Level of Service (LOS)		B													C	
Approach Delay (s/veh)	0.1												20.1			
Approach LOS													C			

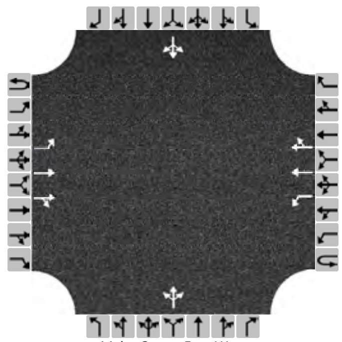
 HCS™ TWSC Version 7.9.5 Generated: 9/1/2022 10:27:20 PM

Int-4-2030Sun - TWSC-TWLTL.xtw

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Henry Creek Road/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	E Henry Creek Rd
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 5 - Future Sunday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	2	769	5	0	5	1605	2		11	2	2		2	2	9
Percent Heavy Vehicles (%)	0	0			0	0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

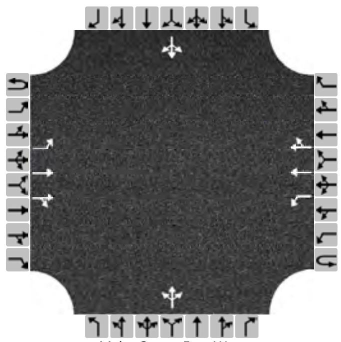
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2				5					15				13	
Capacity, c (veh/h)		412				851					122				120	
v/c Ratio		0.00				0.01					0.12				0.11	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.4				0.4	
Control Delay (s/veh)		13.8				9.3					38.5				38.6	
Level of Service (LOS)		B				A					E				E	
Approach Delay (s/veh)	0.0				0.0				38.5				38.6			
Approach LOS									E				E			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Little Brook Ln/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	E Little Brook Ln
Time Analyzed	Thursday	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 1 - Future Thursday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	15	605	4	0	2	877	11		2	2	4		6	2	24
Percent Heavy Vehicles (%)	0	0			0	0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

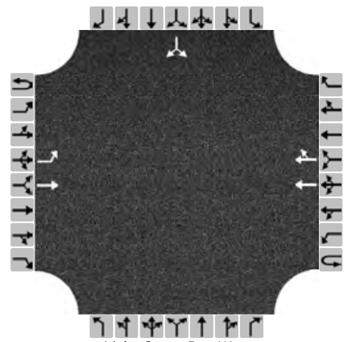
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		15				2					8				32	
Capacity, c (veh/h)		770				979					267				378	
v/c Ratio		0.02				0.00					0.03				0.08	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.1				0.3	
Control Delay (s/veh)		9.8				8.7					18.9				15.4	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	0.2				0.0				18.9				15.4			
Approach LOS									C				C			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Food Fronta
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Mt Hood Food Frontage
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 2 - Future Thursday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		0	1	0
Configuration		L	T				T	TR							LR	
Volume (veh/h)	0	2	613				887	19						4		2
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

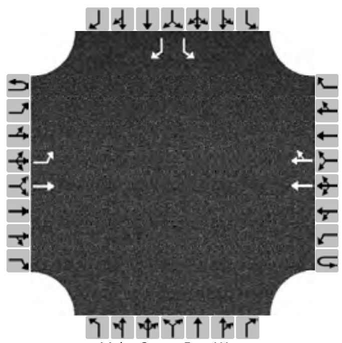
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2													6	
Capacity, c (veh/h)		758													303	
v/c Ratio		0.00													0.02	
95% Queue Length, Q_{95} (veh)		0.0													0.1	
Control Delay (s/veh)		9.8													17.1	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	0.0												17.1			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Dairy Queen
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Dairy Queen
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 3 - Future Thursday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	13	596				869	19						9		24
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

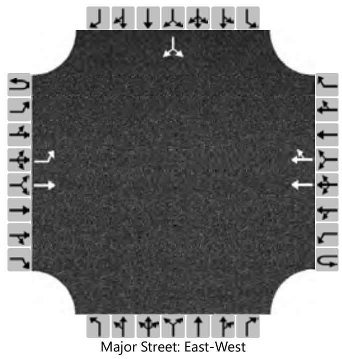
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		13												9		24
Capacity, c (veh/h)		770												248		566
v/c Ratio		0.02												0.04		0.04
95% Queue Length, Q_{95} (veh)		0.1												0.1		0.1
Control Delay (s/veh)		9.8												20.0		11.6
Level of Service (LOS)		A												C		B
Approach Delay (s/veh)	0.2												13.9			
Approach LOS													B			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Roaster Dwy
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Mt Hood Roaster Dwy
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 4 - Future Thursday 2050 - TWLTL		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		0	1	0
Configuration		L	T				T	TR							LR	
Volume (veh/h)	0	2	602				883	2						2		4
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

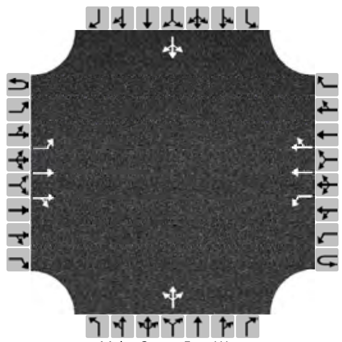
	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		2													6	
Capacity, c (veh/h)		772													400	
v/c Ratio		0.00													0.02	
95% Queue Length, Q_{95} (veh)		0.0													0.0	
Control Delay (s/veh)		9.7													14.1	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.0												14.1			
Approach LOS													B			

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	AIR	Intersection	E Henry Creek Road/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	E Henry Creek Rd
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 5 - Future Thursday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	2	583	13	0	2	860	2		11	2	4		2	2	4
Percent Heavy Vehicles (%)	0	0			0	0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

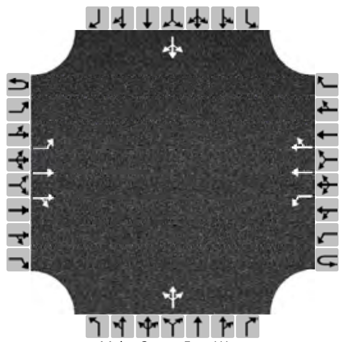
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		2				2					17				8	
Capacity, c (veh/h)		789				990					304				264	
v/c Ratio		0.00				0.00					0.06				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.1	
Control Delay (s/veh)		9.6				8.6					17.6				19.1	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	0.0				0.0				17.6				19.1			
Approach LOS									C				C			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Little Brook Ln/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	E Little Brook Ln
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 1 - Future Sunday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	14	1035	2	0	2	2141	7		2	2	2		2	2	31
Percent Heavy Vehicles (%)	0	0			0	0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

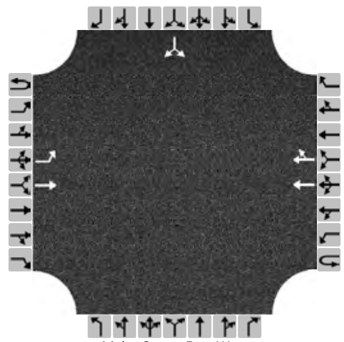
Flow Rate, v (veh/h)		14				2					6				35	
Capacity, c (veh/h)		253				678					25				86	
v/c Ratio		0.06				0.00					0.24				0.41	
95% Queue Length, Q_{95} (veh)		0.2				0.0					0.7				1.6	
Control Delay (s/veh)		20.1				10.3					190.9				72.5	
Level of Service (LOS)		C				B					F				F	
Approach Delay (s/veh)	0.3				0.0				190.9				72.5			
Approach LOS									F				F			

HCS™ TWSC Version 7.9.5
Int-1-2050Sun - TWSC-TWLTL.xtw
Generated: 9/1/2022 9:12:43 PM

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Food Fronta
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Mt Hood Food Frontage
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 2 - Future Sunday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		0	1	0
Configuration		L	T				T	TR							LR	
Volume (veh/h)	0	5	1035				2146	33						19		5
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

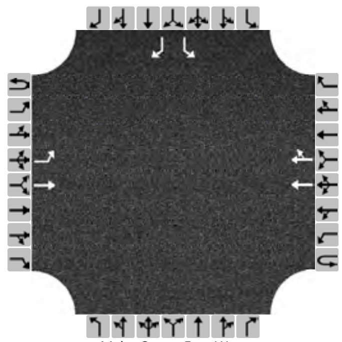
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		5													24	
Capacity, c (veh/h)		247													68	
v/c Ratio		0.02													0.35	
95% Queue Length, Q_{95} (veh)		0.1													1.3	
Control Delay (s/veh)		19.9													83.8	
Level of Service (LOS)		C													F	
Approach Delay (s/veh)	0.1												83.8			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Dairy Queen
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Dairy Queen
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 3 - Future Sunday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	38	1000				2092	61						35		71
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

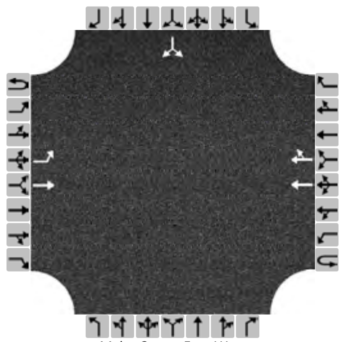
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		38												35		71
Capacity, c (veh/h)		253												59		217
v/c Ratio		0.15												0.60		0.33
95% Queue Length, Q_{95} (veh)		0.5												2.4		1.4
Control Delay (s/veh)		21.7												132.8		29.4
Level of Service (LOS)		C												F		D
Approach Delay (s/veh)	0.8												63.5			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Roaster Dwy
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Mt Hood Roaster Dwy
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 4 - Future Sunday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	2	0		0	0	0		0	1	0
Configuration		L	T				T	TR							LR	
Volume (veh/h)	0	7	1028				2139	7						2		14
Percent Heavy Vehicles (%)	0	0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.10												6.80		6.90
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

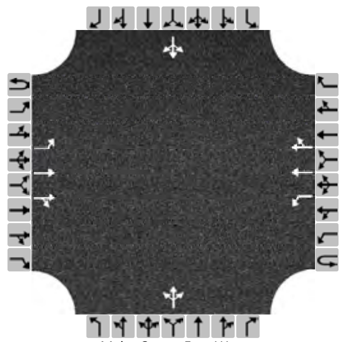
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		7													16	
Capacity, c (veh/h)		255													164	
v/c Ratio		0.03													0.10	
95% Queue Length, Q_{95} (veh)		0.1													0.3	
Control Delay (s/veh)		19.5													29.3	
Level of Service (LOS)		C													D	
Approach Delay (s/veh)	0.1												29.3			
Approach LOS													D			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Henry Creek Road/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	7/21/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	E Henry Creek Rd
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Int 5 - Future Sunday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume (veh/h)	0	2	1014	7	0	7	2115	2		14	2	2		2	2	12
Percent Heavy Vehicles (%)	0	0			0	0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2				7					18				16	
Capacity, c (veh/h)		262				688					56				56	
v/c Ratio		0.01				0.01					0.32				0.29	
95% Queue Length, Q_{95} (veh)		0.0				0.0					1.1				1.0	
Control Delay (s/veh)		18.9				10.3					96.8				93.3	
Level of Service (LOS)		C				B					F				F	
Approach Delay (s/veh)	0.0				0.0				96.8				93.3			
Approach LOS									F				F			

 HCS™ TWSC Version 7.9.5 Generated: 9/1/2022 10:34:35 PM
Int-5-2050Sun - TWSC-TWLTL.xtw

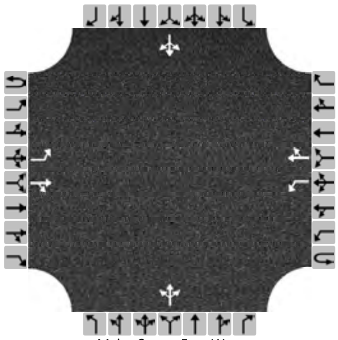
HCS 2022

***3-Lane** Alternative **Intersection** Analysis*

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Little Brook Ln/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	E Little Brook Ln
Time Analyzed	Thursday	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 1 - Future Thursday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		11	459	3		2	665	8		2	2	3		5	2	18
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

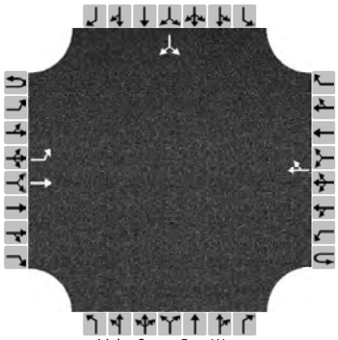
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				2					7				25	
Capacity, c (veh/h)		926				1110					316				379	
v/c Ratio		0.01				0.00					0.02				0.07	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.2	
Control Delay (s/veh)		8.9				8.2					16.6				15.2	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	0.2				0.0				16.6				15.2			
Approach LOS	A				A				C				C			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Food Fronta
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Mt Hood Food Frontage
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 2 - Future Thursday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		2	465				673	15						3		2
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

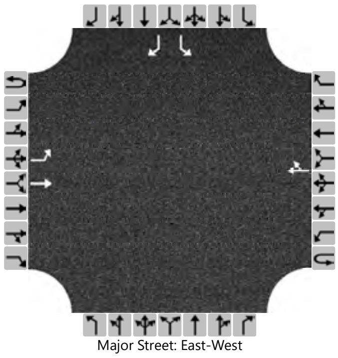
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2													5	
Capacity, c (veh/h)		914													388	
v/c Ratio		0.00													0.01	
95% Queue Length, Q_{95} (veh)		0.0													0.0	
Control Delay (s/veh)		8.9													14.4	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.0												14.4			
Approach LOS	A												B			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Dairy Queen
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Dairy Queen
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 3 - Future Thursday 2030 - TWLTL		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume (veh/h)		10	452				659	15						7		18
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

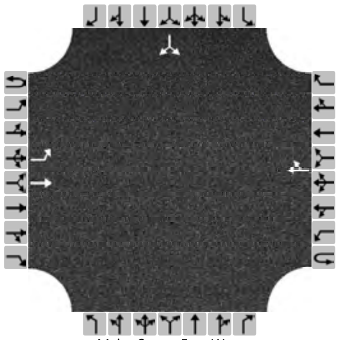
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		10												7		18
Capacity, c (veh/h)		925												357		462
v/c Ratio		0.01												0.02		0.04
95% Queue Length, Q_{95} (veh)		0.0												0.1		0.1
Control Delay (s/veh)		8.9												15.3		13.1
Level of Service (LOS)		A												C		B
Approach Delay (s/veh)	0.2												13.7			
Approach LOS	A												B			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Roaster Dwy
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Mt Hood Roaster Dwy
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 4 - Future Thursday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		2	457				670	2						2		3
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

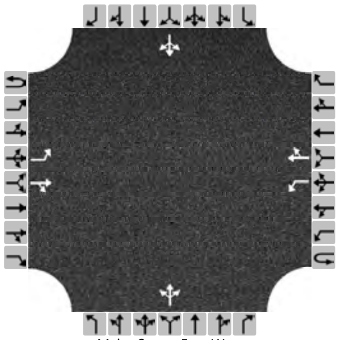
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2													5	
Capacity, c (veh/h)		926													413	
v/c Ratio		0.00													0.01	
95% Queue Length, Q_{95} (veh)		0.0													0.0	
Control Delay (s/veh)		8.9													13.8	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.0												13.8			
Approach LOS	A												B			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Henry Creek Road/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	E Henry Creek Rd
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 5 - Future Thursday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		2	442	10		2	652	2		8	2	3		2	2	3
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

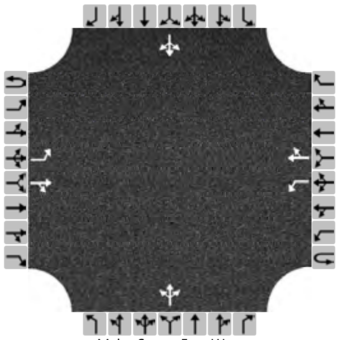
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2				2					13				7	
Capacity, c (veh/h)		943				1119					326				315	
v/c Ratio		0.00				0.00					0.04				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		8.8				8.2					16.5				16.7	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	0.0				0.0				16.5				16.7			
Approach LOS	A				A				C				C			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Little Brook Ln/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	E Little Brook Ln
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 1 - Future Sunday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		11	786	2		2	1625	5		2	2	2		2	2	23
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

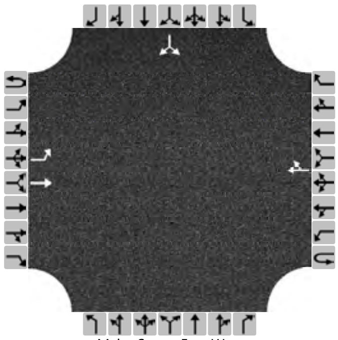
Flow Rate, v (veh/h)		11				2					6				27	
Capacity, c (veh/h)		402				840					60				100	
v/c Ratio		0.03				0.00					0.10				0.27	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.3				1.0	
Control Delay (s/veh)		14.2				9.3					71.1				53.7	
Level of Service (LOS)		B				A					F				F	
Approach Delay (s/veh)	0.2				0.0				71.1				53.7			
Approach LOS	A				A				F				F			

HCS Two-Way Stop-Control Report

General Information

Analyst	AIR	Intersection	US 26/Mt Hood Food Fronta
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Mt Hood Food Frontage
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 2 - Future Sunday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		4	785				1628	25						14		4
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)		4													18	
Capacity, c (veh/h)		394													126	
v/c Ratio		0.01													0.14	
95% Queue Length, Q_{95} (veh)		0.0													0.5	
Control Delay (s/veh)		14.2													38.2	
Level of Service (LOS)		B													E	
Approach Delay (s/veh)	0.1												38.2			
Approach LOS	A												E			

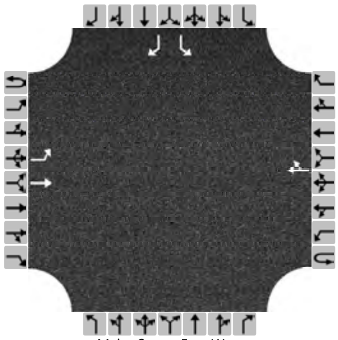
HCS Two-Way Stop-Control Report

General Information

Analyst	AIR	Intersection	US 26/Dairy Queen
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Dairy Queen
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 3 - Future Sunday 2030 - TWLTL		

Site Information

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume (veh/h)		29	759				1587	47						27		54
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

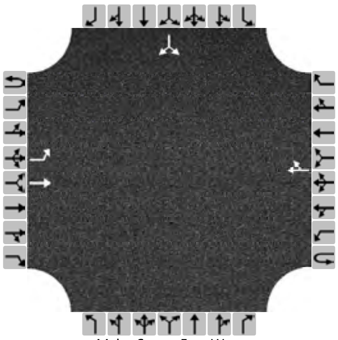
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		29												27		54
Capacity, c (veh/h)		402												127		130
v/c Ratio		0.07												0.21		0.42
95% Queue Length, Q_{95} (veh)		0.2												0.8		1.8
Control Delay (s/veh)		14.6												40.7		51.1
Level of Service (LOS)		B												E		F
Approach Delay (s/veh)	0.5												47.6			
Approach LOS	A												E			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Roaster Dwy
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	Mt Hood Roaster Dwy
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 4 - Future Sunday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		5	780				1623	5						2		11
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

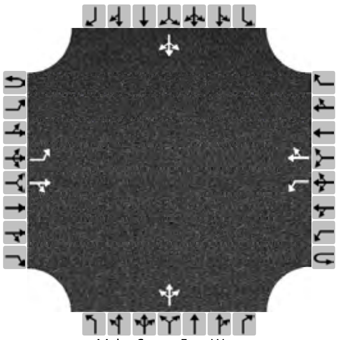
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)		5													13	
Capacity, c (veh/h)		405													128	
v/c Ratio		0.01													0.10	
95% Queue Length, Q_{95} (veh)		0.0													0.3	
Control Delay (s/veh)		14.0													36.3	
Level of Service (LOS)		B													E	
Approach Delay (s/veh)	0.1												36.3			
Approach LOS	A												E			

HCS™ TWSC Version 2022
Alt3_Int-4-2030Sun - TWSC-TWLTL.xtw
Generated: 9/27/2022 11:12:38 AM

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Henry Creek Road/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2030	North/South Street	E Henry Creek Rd
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt 3_Int 5 - Future Sunday 2030 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		2	769	5		5	1605	2		11	2	2		2	2	9
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

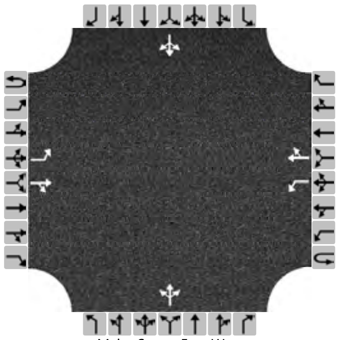
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2				5					15				13	
Capacity, c (veh/h)		412				851					78				87	
v/c Ratio		0.00				0.01					0.19				0.15	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.7				0.5	
Control Delay (s/veh)		13.8				9.3					61.5				53.3	
Level of Service (LOS)		B				A					F				F	
Approach Delay (s/veh)	0.0				0.0				61.5				53.3			
Approach LOS	A				A				F				F			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Little Brook Ln/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	E Little Brook Ln
Time Analyzed	Thursday	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 1 - Future Thursday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		15	605	4		2	877	11		2	2	4		6	2	24
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

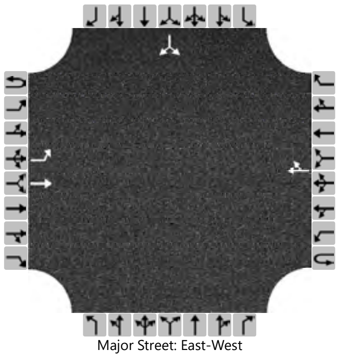
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		15				2					8				32	
Capacity, c (veh/h)		770				979					228				281	
v/c Ratio		0.02				0.00					0.04				0.11	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.1				0.4	
Control Delay (s/veh)		9.8				8.7					21.4				19.5	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	0.2				0.0				21.4				19.5			
Approach LOS	A				A				C				C			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Food Fronta
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Mt Hood Food Frontage
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 2 - Future Thursday 2050 - TWLTL		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		2	613				887	19						4		2
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

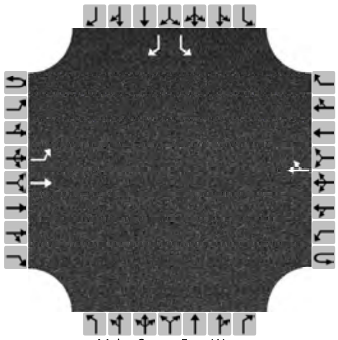
Flow Rate, v (veh/h)		2													6	
Capacity, c (veh/h)		758													289	
v/c Ratio		0.00													0.02	
95% Queue Length, Q_{95} (veh)		0.0													0.1	
Control Delay (s/veh)		9.8													17.7	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	0.0												17.7			
Approach LOS	A												C			

HCS™ TWSC Version 2022
Alt3_int-2-2050Thur- TWSC-TWLTL.xtw
Generated: 9/27/2022 11:23:41 AM

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Dairy Queen
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Dairy Queen
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 3 - Future Thursday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume (veh/h)		13	596				869	19						9		24
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

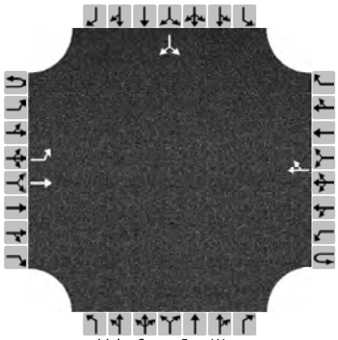
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		13												9		24
Capacity, c (veh/h)		770												270		349
v/c Ratio		0.02												0.03		0.07
95% Queue Length, Q_{95} (veh)		0.1												0.1		0.2
Control Delay (s/veh)		9.8												18.8		16.1
Level of Service (LOS)		A												C		C
Approach Delay (s/veh)	0.2												16.8			
Approach LOS	A												C			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Roaster Dwy
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Mt Hood Roaster Dwy
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 4 - Future Thursday 2050 - TWLTL		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		2	602				883	2						2		4
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

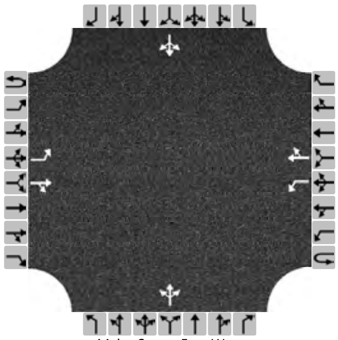
Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)		2													6	
Capacity, c (veh/h)		772													318	
v/c Ratio		0.00													0.02	
95% Queue Length, Q_{95} (veh)		0.0													0.1	
Control Delay (s/veh)		9.7													16.5	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	0.0												16.5			
Approach LOS	A												C			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Henry Creek Road/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	E Henry Creek Rd
Time Analyzed	Thursday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 5 - Future Thursday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		2	583	13		2	860	2		11	2	4		2	2	4
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

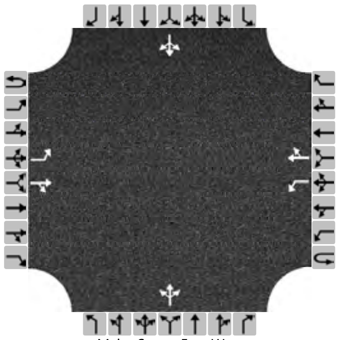
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2				2					17				8	
Capacity, c (veh/h)		789				990					239				227	
v/c Ratio		0.00				0.00					0.07				0.04	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.1	
Control Delay (s/veh)		9.6				8.6					21.2				21.5	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	0.0				0.0				21.2				21.5			
Approach LOS	A				A				C				C			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Little Brook Ln/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	E Little Brook Ln
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt 3_Int 1 - Future Sunday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		14	1035	2		2	2141	7		2	2	2		2	2	31
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

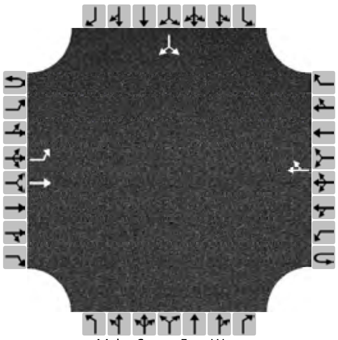
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		14				2					6				35	
Capacity, c (veh/h)		253				678					14				46	
v/c Ratio		0.06				0.00					0.43				0.76	
95% Queue Length, Q_{95} (veh)		0.2				0.0					1.1				3.0	
Control Delay (s/veh)		20.1				10.3					388.0				202.4	
Level of Service (LOS)		C				B					F				F	
Approach Delay (s/veh)	0.3				0.0				388.0				202.4			
Approach LOS	A				A				F				F			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Food Fronta
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Mt Hood Food Frontage
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt 3_Int 2 - Future Sunday 2050 - TWLTL		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		5	1035				2146	33						19		5
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

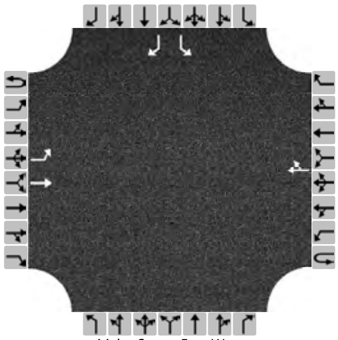
Flow Rate, v (veh/h)		5													24	
Capacity, c (veh/h)		247													69	
v/c Ratio		0.02													0.35	
95% Queue Length, Q_{95} (veh)		0.1													1.3	
Control Delay (s/veh)		19.9													83.5	
Level of Service (LOS)		C													F	
Approach Delay (s/veh)	0.1												83.5			
Approach LOS	A												F			

HCS™ TWSC Version 2022
Alt3_int-2-2050Sun - TWSC-TWLTL.xtw
Generated: 9/27/2022 11:01:52 AM

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Dairy Queen
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Dairy Queen
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 3 - Future Sunday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume (veh/h)		38	1000				2092	61						35		71
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		38												35		71
Capacity, c (veh/h)		253												71		64
v/c Ratio		0.15												0.49		1.11
95% Queue Length, Q_{95} (veh)		0.5												2.0		5.6
Control Delay (s/veh)		21.7												97.3		256.3
Level of Service (LOS)		C												F		F
Approach Delay (s/veh)	0.8												203.8			
Approach LOS	A												F			

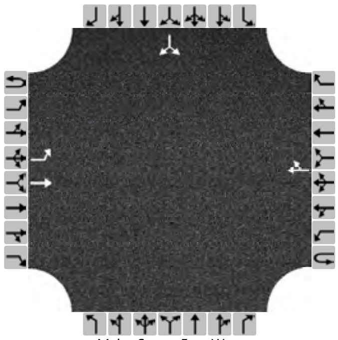
HCS™ TWSC Version 2022
Atl3_Int-3-2050Sun - TWSC-TWLTL.xtw

Generated: 9/27/2022 11:04:23 AM

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	US 26/Mt Hood Roaster Dwy
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	Mt Hood Roaster Dwy
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 4 - Future Sunday 2050 - TWLTL		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		7	1028				2139	7						2		14
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

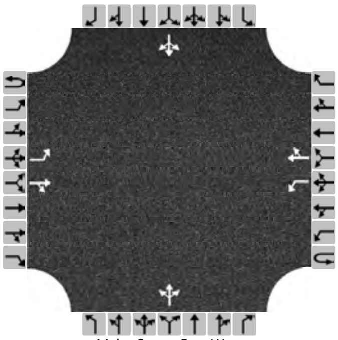
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		7													16	
Capacity, c (veh/h)		255													63	
v/c Ratio		0.03													0.25	
95% Queue Length, Q_{95} (veh)		0.1													0.9	
Control Delay (s/veh)		19.5													80.0	
Level of Service (LOS)		C													F	
Approach Delay (s/veh)	0.1												80.0			
Approach LOS	A												F			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	AIR	Intersection	E Henry Creek Road/US 26
Agency/Co.	ODOT	Jurisdiction	Rhododendron
Date Performed	09/27/2022	East/West Street	US 26
Analysis Year	2050	North/South Street	E Henry Creek Rd
Time Analyzed	Sunday Peak	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Alt3_Int 5 - Future Sunday 2050 - TWLTL		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		2	1014	7		7	2115	2		14	2	2		2	2	12
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2				7					18				16	
Capacity, c (veh/h)		262				688					30				39	
v/c Ratio		0.01				0.01					0.61				0.41	
95% Queue Length, Q_{95} (veh)		0.0				0.0					2.0				1.4	
Control Delay (s/veh)		18.9				10.3					240.7				152.7	
Level of Service (LOS)		C				B					F				F	
Approach Delay (s/veh)	0.0				0.0				240.7				152.7			
Approach LOS	A				A				F				F			

Segment Analysis Adjusted Volumes						
Alternative	Year	Day	Segment End		Original Volume	Updated Capped Volumes
3 ln	2030	Sun	West		1708	1700
3 ln	2030	Sun	East		1715	1700
5 ln	2030	Sun	West		1708	1700
5 ln	2030	Sun	East		1715	1700
3 ln	2050	Sun	West		2251	1700
3 ln	2050	Sun	East		2259	1700
5 ln	2050	Sun	West		2251	1700
5 ln	2050	Sun	East		2259	1700

HCS 7*

***5-Lane** Alternatives **Segment** Analysis*

Using Original Volumes Over Capacity

**Segment Analysis Results remained the same between HCS 7 and recent version upgrade HCS 2022.*

HCS7 Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	Thursday- West end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume(V) veh/h	551	Heavy Vehicle Adjustment Factor (f_{HV})	0.918
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	300
Total Trucks, %	7.67	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.17

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	6.5
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	276	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	4.20
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	D

Direction 2 Geometric Data			
Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors			
Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity			
Volume(V) veh/h	646	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	365
Total Trucks, %	7.56	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.21

Direction 2 Speed and Density			
Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	7.8
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS			
Flow Rate in Outside Lane (v_{OL}),veh/h	276	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	4.20
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	D

HCS7 Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	Sun-West end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume(V) veh/h	652	Heavy Vehicle Adjustment Factor (f_{HV})	0.955
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	342
Total Trucks, %	3.24	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.20

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	7.4
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	326	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.09
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Direction 2 Geometric Data

Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity

Volume(V) veh/h	1708	Heavy Vehicle Adjustment Factor (f_{HV})	0.881
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	970
Total Trucks, %	7.81	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.56

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	20.8
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	326	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.09
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

HCS7 Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	Thursday- East end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume(V) veh/h	532	Heavy Vehicle Adjustment Factor (f_{HV})	0.918
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	290
Total Trucks, %	7.65	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.17

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	6.3
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	266	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	4.18
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	D

Direction 2 Geometric Data

Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity

Volume(V) veh/h	599	Heavy Vehicle Adjustment Factor (f_{HV})	0.870
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	344
Total Trucks, %	9.51	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.20

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	7.4
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	266	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	4.18
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	D

HCS7 Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	Sun-East end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	All Unfamiliar	Final Speed Adjustment Factor (SAF)	0.863
Driver Population SAF	0.863	Final Capacity Adjustment Factor (CAF)	0.852
Driver Population CAF	0.852		

Direction 1 Demand and Capacity

Volume(V) veh/h	626	Heavy Vehicle Adjustment Factor (f_{HV})	0.955
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	328
Total Trucks, %	3.24	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1619
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.20

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	43.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	7.5
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	313	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.07
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Direction 2 Geometric Data			
Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors			
Driver Population	All Unfamiliar	Final Speed Adjustment Factor (SAF)	0.863
Driver Population SAF	0.863	Final Capacity Adjustment Factor (CAF)	0.852
Driver Population CAF	0.852		

Direction 2 Demand and Capacity			
Volume(V) veh/h	1715	Heavy Vehicle Adjustment Factor (f_{HV})	0.874
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	981
Total Trucks, %	8.35	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1619
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.61

Direction 2 Speed and Density			
Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	44.0
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	22.3
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS			
Flow Rate in Outside Lane (v_{OL}),veh/h	313	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.07
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

HCS7 Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	Thursday- West end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume(V) veh/h	727	Heavy Vehicle Adjustment Factor (f_{HV})	0.918
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	396
Total Trucks, %	7.67	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.23

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	8.6
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	364	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	4.34
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	D

Direction 2 Geometric Data			
Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors			
Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity			
Volume(V) veh/h	851	Heavy Vehicle Adjustment Factor (f_{HV})	0.885
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	481
Total Trucks, %	7.56	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.28

Direction 2 Speed and Density			
Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	10.3
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS			
Flow Rate in Outside Lane (v_{OL}),veh/h	364	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	4.34
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	D

HCS7 Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	Sun-West end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume(V) veh/h	860	Heavy Vehicle Adjustment Factor (f_{HV})	0.955
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	450
Total Trucks, %	3.24	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.26

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	9.8
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	430	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.23
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Direction 2 Geometric Data

Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity

Volume(V) veh/h	2251	Heavy Vehicle Adjustment Factor (f_{HV})	0.881
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	1278
Total Trucks, %	7.81	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.74

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	27.4
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	D
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	430	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.23
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

HCS7 Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	Thursday- East end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume(V) veh/h	701	Heavy Vehicle Adjustment Factor (f_{HV})	0.918
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	382
Total Trucks, %	7.65	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.22

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	8.3
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	350	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	4.32
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	D

Direction 2 Geometric Data			
Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors			
Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity			
Volume(V) veh/h	789	Heavy Vehicle Adjustment Factor (f_{HV})	0.870
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	454
Total Trucks, %	9.51	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.26

Direction 2 Speed and Density			
Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	9.7
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS			
Flow Rate in Outside Lane (v_{OL}),veh/h	350	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	4.32
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	D

HCS7 Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	Sun-East end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume(V) veh/h	825	Heavy Vehicle Adjustment Factor (f_{HV})	0.955
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	432
Total Trucks, %	3.24	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.25

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	9.4
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	412	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.21
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Direction 2 Geometric Data

Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity

Volume(V) veh/h	2259	Heavy Vehicle Adjustment Factor (f_{HV})	0.874
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	1292
Total Trucks, %	8.35	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.74

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	27.7
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	D
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	412	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.21
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Segment Analysis Adjusted Volumes						
Alternative	Year	Day	Segment End		Original Volume	Updated Capped Volumes
3 ln	2030	Sun	West		1708	1700
3 ln	2030	Sun	East		1715	1700
5 ln	2030	Sun	West		1708	1700
5 ln	2030	Sun	East		1715	1700
3 ln	2050	Sun	West		2251	1700
3 ln	2050	Sun	East		2259	1700
5 ln	2050	Sun	West		2251	1700
5 ln	2050	Sun	East		2259	1700

HCS 2022

***5-Lane** Alternatives **Segment** Analysis (Sunday Only)*

Using volumes not exceeding the Capacity (1700 veh)

HCS Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	Sun-West end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	5280	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume (V) veh/h	652	Heavy Vehicle Adjustment Factor (f_{HV})	0.955
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	342
Total Trucks, %	3.24	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.20

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	7.4
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}), veh/h	326	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.09
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Direction 2 Geometric Data			
Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	5280	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors			
Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity			
Volume (V) veh/h	1700	Heavy Vehicle Adjustment Factor (f_{HV})	0.881
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	965
Total Trucks, %	7.81	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.56

Direction 2 Speed and Density			
Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	20.7
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS			
Flow Rate in Outside Lane (v_{OL}), veh/h	326	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.09
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

HCS Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	Sun-East end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	5280	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	All Unfamiliar	Final Speed Adjustment Factor (SAF)	0.863
Driver Population SAF	0.863	Final Capacity Adjustment Factor (CAF)	0.852
Driver Population CAF	0.852		

Direction 1 Demand and Capacity

Volume (V) veh/h	626	Heavy Vehicle Adjustment Factor (f_{HV})	0.955
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	328
Total Trucks, %	3.24	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1619
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.20

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	43.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	7.5
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}), veh/h	313	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.07
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Direction 2 Geometric Data

Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	5280	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors

Driver Population	All Unfamiliar	Final Speed Adjustment Factor (SAF)	0.863
Driver Population SAF	0.863	Final Capacity Adjustment Factor (CAF)	0.852
Driver Population CAF	0.852		

Direction 2 Demand and Capacity

Volume (V) veh/h	1700	Heavy Vehicle Adjustment Factor (f_{HV})	0.874
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	972
Total Trucks, %	8.35	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1619
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.60

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	44.0
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	22.1
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}), veh/h	313	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicycle LOS Score (BLOS)	3.07
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

HCS Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	Sun-West end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	5280	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume (V) veh/h	860	Heavy Vehicle Adjustment Factor (f_{HV})	0.955
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	450
Total Trucks, %	3.24	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.26

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	9.8
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}), veh/h	430	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.23
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Direction 2 Geometric Data

Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	5280	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity

Volume (V) veh/h	1700	Heavy Vehicle Adjustment Factor (f_{HV})	0.881
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	965
Total Trucks, %	7.81	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.56

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	20.7
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}), veh/h	430	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.23
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

HCS Multilane Highway Report

Project Information

Analyst	AIR	Date	7/24/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	Sun-East end Rhododendron	Units	U.S. Customary

Direction 1 Geometric Data

Direction 1	EB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	5280	Percent Grade, %	-3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	30.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	50.5		

Direction 1 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 1 Demand and Capacity

Volume (V) veh/h	825	Heavy Vehicle Adjustment Factor (f_{HV})	0.955
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	432
Total Trucks, %	3.24	Capacity (c), pc/h/ln	1922
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1726
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.25

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.1
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	9.4
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	7.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}), veh/h	412	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.21
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Direction 2 Geometric Data

Direction 2	WB		
Number of Lanes (N), ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	5280	Percent Grade, %	3.00
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.40
Base Free-Flow Speed (BFFS), mi/h	58.0	Access Point Density, pts/mi	28.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	6
Median Type	TWLTL	Total Lateral Clearance (TLC), ft	12
Free-Flow Speed (FFS), mi/h	51.0		

Direction 2 Adjustment Factors

Driver Population	Mostly Unfamiliar	Final Speed Adjustment Factor (SAF)	0.913
Driver Population SAF	0.913	Final Capacity Adjustment Factor (CAF)	0.898
Driver Population CAF	0.898		

Direction 2 Demand and Capacity

Volume (V) veh/h	1700	Heavy Vehicle Adjustment Factor (f_{HV})	0.874
Peak Hour Factor	1.00	Flow Rate (V_p), pc/h/ln	972
Total Trucks, %	8.35	Capacity (c), pc/h/ln	1932
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	1735
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.56

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	46.6
Total Lateral Clearance Adj. (f_{LLC})	0.0	Density (D), pc/mi/ln	20.9
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	7.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}), veh/h	412	Effective Speed Factor (S_t)	4.17
Effective Width of Volume (W_v), ft	18	Bicyle LOS Score (BLOS)	3.21
Average Effective Width (W_e), ft	24	Bicycle Level of Service (LOS)	C

Segment Analysis Adjusted Volumes						
Alternative	Year	Day	Segment End		Original Volume	Updated Capped Volumes
3 ln	2030	Sun	West		1708	1700
3 ln	2030	Sun	East		1715	1700
5 ln	2030	Sun	West		1708	1700
5 ln	2030	Sun	East		1715	1700
3 ln	2050	Sun	West		2251	1700
3 ln	2050	Sun	East		2259	1700
5 ln	2050	Sun	West		2251	1700
5 ln	2050	Sun	East		2259	1700

HCS 2022

3-Lane *Alternatives* ***Segment*** *Analysis (2030*

Using Original Volumes Over Capacity

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	3 Ln Alt_Thur-West end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	646	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	7.56
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.38

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	3.58097	Speed Power Coefficient (p)	0.41622
PF Slope Coefficient (m)	-1.57529	PF Power Coefficient (p)	0.66030
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	12.8
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.0

Vehicle Results

Average Speed, mi/h	35.0	Percent Followers, %	69.3
Segment Travel Time, minutes	0.68	Follower Density (FD), followers/mi/ln	12.8
Vehicle LOS	D		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	646	Bicycle Effective Width, ft	23
Bicycle LOS Score	4.49	Bicycle Effective Speed Factor	4.17
Bicycle LOS	D		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	64	0.14	12.8	D

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	3 Ln Alt_Thur-West end of Rhod - EB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	551	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	7.67
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.32

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	2.56792	Speed Power Coefficient (p)	0.41674
PF Slope Coefficient (m)	-1.46056	PF Power Coefficient (p)	0.67887
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	9.6
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.9

Vehicle Results

Average Speed, mi/h	35.9	Percent Followers, %	62.3
Segment Travel Time, minutes	0.66	Follower Density (FD), followers/mi/ln	9.6
Vehicle LOS	C		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	551	Bicycle Effective Width, ft	23
Bicycle LOS Score	4.45	Bicycle Effective Speed Factor	4.17
Bicycle LOS	D		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	55	0.07	9.6	C

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-West end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1708	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	7.81
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.00

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	75.0
Speed Slope Coefficient (m)	0.00000	Speed Power Coefficient (p)	0.00000
PF Slope Coefficient (m)	0.00000	PF Power Coefficient (p)	0.00000
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	0.0
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	75.0

Vehicle Results

Average Speed, mi/h	75.0	Percent Followers, %	0.0
Segment Travel Time, minutes	0.00	Follower Density (FD), followers/mi/ln	0.0
Vehicle LOS	F		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	1708	Bicycle Effective Width, ft	23
Bicycle LOS Score	5.06	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	0	0.00	0.0	A

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-West end of Rhod - EB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	652	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	3.24
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.38

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	37.9
Speed Slope Coefficient (m)	2.57592	Speed Power Coefficient (p)	0.41674
PF Slope Coefficient (m)	-1.46135	PF Power Coefficient (p)	0.67890
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	12.1
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.9

Vehicle Results

Average Speed, mi/h	35.9	Percent Followers, %	66.5
Segment Travel Time, minutes	0.67	Follower Density (FD), followers/mi/ln	12.1
Vehicle LOS	D		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	652	Bicycle Effective Width, ft	23
Bicycle LOS Score	3.33	Bicycle Effective Speed Factor	4.17
Bicycle LOS	C		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/mi/ln	LOS
1	65	0.10	12.1	D

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	3 Ln Alt_Thur-East end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	599	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	9.50
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.35

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	3.58619	Speed Power Coefficient (p)	0.41622
PF Slope Coefficient (m)	-1.57320	PF Power Coefficient (p)	0.66121
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	11.5
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.0

Vehicle Results

Average Speed, mi/h	35.0	Percent Followers, %	67.4
Segment Travel Time, minutes	0.68	Follower Density (FD), followers/mi/ln	11.5
Vehicle LOS	D		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	599	Bicycle Effective Width, ft	23
Bicycle LOS Score	5.09	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/mi/ln	LOS
1	60	0.12	11.5	D

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	3 Ln Alt_Thur-East end of Rhod - EB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	532	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	7.70
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.31

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	2.56787	Speed Power Coefficient (p)	0.41674
PF Slope Coefficient (m)	-1.46055	PF Power Coefficient (p)	0.67887
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	9.1
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.9

Vehicle Results

Average Speed, mi/h	35.9	Percent Followers, %	61.4
Segment Travel Time, minutes	0.66	Follower Density (FD), followers/mi/ln	9.1
Vehicle LOS	C		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	532	Bicycle Effective Width, ft	23
Bicycle LOS Score	4.44	Bicycle Effective Speed Factor	4.17
Bicycle LOS	D		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	53	0.07	9.1	C

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-East end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1715	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	8.35
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.01

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	75.0
Speed Slope Coefficient (m)	0.00000	Speed Power Coefficient (p)	0.00000
PF Slope Coefficient (m)	0.00000	PF Power Coefficient (p)	0.00000
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	0.0
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	75.0

Vehicle Results

Average Speed, mi/h	75.0	Percent Followers, %	0.0
Segment Travel Time, minutes	0.00	Follower Density (FD), followers/mi/ln	0.0
Vehicle LOS	F		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	1715	Bicycle Effective Width, ft	23
Bicycle LOS Score	5.24	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/mi/ln	LOS
1	0	0.00	0.0	A

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-East end of Rhod - EB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	626	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	3.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.37

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	37.9
Speed Slope Coefficient (m)	2.57635	Speed Power Coefficient (p)	0.41674
PF Slope Coefficient (m)	-1.46140	PF Power Coefficient (p)	0.67891
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	11.4
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.9

Vehicle Results

Average Speed, mi/h	35.9	Percent Followers, %	65.5
Segment Travel Time, minutes	0.66	Follower Density (FD), followers/mi/ln	11.4
Vehicle LOS	D		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	626	Bicycle Effective Width, ft	23
Bicycle LOS Score	3.25	Bicycle Effective Speed Factor	4.17
Bicycle LOS	C		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	62	0.09	11.4	D

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	3 Ln Alt_Thur-West end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	851	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	7.56
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.50

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	3.58097	Speed Power Coefficient (p)	0.41622
PF Slope Coefficient (m)	-1.57529	PF Power Coefficient (p)	0.66030
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	18.6
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	34.6

Vehicle Results

Average Speed, mi/h	34.6	Percent Followers, %	75.7
Segment Travel Time, minutes	0.69	Follower Density (FD), followers/mi/ln	18.6
Vehicle LOS	E		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	851	Bicycle Effective Width, ft	23
Bicycle LOS Score	4.63	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/mi/ln	LOS
1	85	0.21	18.6	E

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	3 Ln Alt_Thur-West end of Rhod - EB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	727	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	7.67
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.43

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	2.56792	Speed Power Coefficient (p)	0.41674
PF Slope Coefficient (m)	-1.46056	PF Power Coefficient (p)	0.67887
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	14.1
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.6

Vehicle Results

Average Speed, mi/h	35.6	Percent Followers, %	69.2
Segment Travel Time, minutes	0.67	Follower Density (FD), followers/mi/ln	14.1
Vehicle LOS	D		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	727	Bicycle Effective Width, ft	23
Bicycle LOS Score	4.59	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	72	0.11	14.1	D

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-East end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	2251	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	7.81
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.32

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	75.0
Speed Slope Coefficient (m)	0.00000	Speed Power Coefficient (p)	0.00000
PF Slope Coefficient (m)	0.00000	PF Power Coefficient (p)	0.00000
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	0.0
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	75.0

Vehicle Results

Average Speed, mi/h	75.0	Percent Followers, %	0.0
Segment Travel Time, minutes	0.00	Follower Density (FD), followers/mi/ln	0.0
Vehicle LOS	F		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	2251	Bicycle Effective Width, ft	23
Bicycle LOS Score	5.20	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	0	0.00	0.0	A

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-West end of Rhod - EB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	860	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	3.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.51

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	37.9
Speed Slope Coefficient (m)	2.57635	Speed Power Coefficient (p)	0.41674
PF Slope Coefficient (m)	-1.46140	PF Power Coefficient (p)	0.67891
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	17.7
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.6

Vehicle Results

Average Speed, mi/h	35.6	Percent Followers, %	73.3
Segment Travel Time, minutes	0.67	Follower Density (FD), followers/mi/ln	17.7
Vehicle LOS	E		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	860	Bicycle Effective Width, ft	23
Bicycle LOS Score	3.42	Bicycle Effective Speed Factor	4.17
Bicycle LOS	C		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/mi/ln	LOS
1	86	0.15	17.7	E

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	3 Ln Alt_Thur-East end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	789	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	8.35
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.46

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	3.58310	Speed Power Coefficient (p)	0.41622
PF Slope Coefficient (m)	-1.57444	PF Power Coefficient (p)	0.66067
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	16.8
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	34.7

Vehicle Results

Average Speed, mi/h	34.7	Percent Followers, %	74.0
Segment Travel Time, minutes	0.69	Follower Density (FD), followers/mi/ln	16.8
Vehicle LOS	E		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	789	Bicycle Effective Width, ft	23
Bicycle LOS Score	4.84	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/mi/ln	LOS
1	78	0.18	16.8	E

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Thursday 1:45-2:45
Project Description	3 Ln Alt_Thur-East end of Rhod - EB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	701	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	3.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.41

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	37.9
Speed Slope Coefficient (m)	2.57635	Speed Power Coefficient (p)	0.41674
PF Slope Coefficient (m)	-1.46140	PF Power Coefficient (p)	0.67891
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	13.4
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.8

Vehicle Results

Average Speed, mi/h	35.8	Percent Followers, %	68.3
Segment Travel Time, minutes	0.67	Follower Density (FD), followers/mi/ln	13.4
Vehicle LOS	D		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	701	Bicycle Effective Width, ft	23
Bicycle LOS Score	3.31	Bicycle Effective Speed Factor	4.17
Bicycle LOS	C		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	70	0.11	13.4	D

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-East end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	2259	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	8.35
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.33

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	75.0
Speed Slope Coefficient (m)	0.00000	Speed Power Coefficient (p)	0.00000
PF Slope Coefficient (m)	0.00000	PF Power Coefficient (p)	0.00000
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	0.0
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	75.0

Vehicle Results

Average Speed, mi/h	75.0	Percent Followers, %	0.0
Segment Travel Time, minutes	0.00	Follower Density (FD), followers/mi/ln	0.0
Vehicle LOS	F		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	2259	Bicycle Effective Width, ft	23
Bicycle LOS Score	5.38	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	0	0.00	0.0	A

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-East end of Rhod - EB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	825	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	3.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.49

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	37.9
Speed Slope Coefficient (m)	2.57635	Speed Power Coefficient (p)	0.41674
PF Slope Coefficient (m)	-1.46140	PF Power Coefficient (p)	0.67891
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	16.7
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	35.6

Vehicle Results

Average Speed, mi/h	35.6	Percent Followers, %	72.3
Segment Travel Time, minutes	0.67	Follower Density (FD), followers/mi/ln	16.7
Vehicle LOS	E		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	825	Bicycle Effective Width, ft	23
Bicycle LOS Score	3.39	Bicycle Effective Speed Factor	4.17
Bicycle LOS	C		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	82	0.14	16.7	E

Segment Analysis Adjusted Volumes						
Alternative	Year	Day	Segment End		Original Volume	Updated Capped Volumes
3 ln	2030	Sun	West		1708	1700
3 ln	2030	Sun	East		1715	1700
5 ln	2030	Sun	West		1708	1700
5 ln	2030	Sun	East		1715	1700
3 ln	2050	Sun	West		2251	1700
3 ln	2050	Sun	East		2259	1700
5 ln	2050	Sun	West		2251	1700
5 ln	2050	Sun	East		2259	1700

HCS 2022

***3-Lane** Alternatives **Segment** Analysis (Sunday Only)*

Using volumes not exceeding the Capacity (1700 veh)

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-West end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1700	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	7.81
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.00

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	3.58164	Speed Power Coefficient (p)	0.41622
PF Slope Coefficient (m)	-1.57502	PF Power Coefficient (p)	0.66042
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	45.5
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	33.4

Vehicle Results

Average Speed, mi/h	33.4	Percent Followers, %	89.3
Segment Travel Time, minutes	0.71	Follower Density (FD), followers/mi/ln	45.5
Vehicle LOS	E		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	1700	Bicycle Effective Width, ft	23
Bicycle LOS Score	5.06	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/mi/ln	LOS
1	169	0.58	45.5	E

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2030
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-TwoLanehwy (east End) - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1700	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	8.35
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.00

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	3.58310	Speed Power Coefficient (p)	0.41622
PF Slope Coefficient (m)	-1.57444	PF Power Coefficient (p)	0.66067
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	45.5
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	33.4

Vehicle Results

Average Speed, mi/h	33.4	Percent Followers, %	89.3
Segment Travel Time, minutes	0.72	Follower Density (FD), followers/mi/ln	45.5
Vehicle LOS	E		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	1700	Bicycle Effective Width, ft	23
Bicycle LOS Score	5.23	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	169	0.59	45.5	E

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-West end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1700	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	7.81
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.00

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	3.58164	Speed Power Coefficient (p)	0.41622
PF Slope Coefficient (m)	-1.57502	PF Power Coefficient (p)	0.66042
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	45.5
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	33.4

Vehicle Results

Average Speed, mi/h	33.4	Percent Followers, %	89.3
Segment Travel Time, minutes	0.71	Follower Density (FD), followers/mi/ln	45.5
Vehicle LOS	E		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	1700	Bicycle Effective Width, ft	23
Bicycle LOS Score	5.06	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/ mi/ln	LOS
1	169	0.58	45.5	E

HCS Two-Lane Highway Report

Project Information

Analyst	AIR	Date	9/27/2022
Agency	ODOT	Analysis Year	2050
Jurisdiction	Rhododendron	Time Analyzed	Sunday 3:00-4:00
Project Description	3 Ln Alt_Sun-East end of Rhod - WB	Units	U.S. Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2100
Lane Width, ft	11	Shoulder Width, ft	6
Speed Limit, mi/h	40	Access Point Density, pts/mi	28.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1700	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	1.00	Total Trucks, %	8.35
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	1.00

Intermediate Results

Segment Vertical Class	2	Free-Flow Speed, mi/h	37.7
Speed Slope Coefficient (m)	3.58310	Speed Power Coefficient (p)	0.41622
PF Slope Coefficient (m)	-1.57444	PF Power Coefficient (p)	0.66067
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	45.5
%Improvement to Percent Followers	0.0	%Improvement to Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2100	-	-	33.4

Vehicle Results

Average Speed, mi/h	33.4	Percent Followers, %	89.3
Segment Travel Time, minutes	0.72	Follower Density (FD), followers/mi/ln	45.5
Vehicle LOS	E		

Bicycle Results

Percent Occupied Parking	0	Pavement Condition Rating	4
Flow Rate Outside Lane, veh/h	1700	Bicycle Effective Width, ft	23
Bicycle LOS Score	5.23	Bicycle Effective Speed Factor	4.17
Bicycle LOS	E		

Facility Results

T	VMT veh-mi/p	VHD veh-h/p	Follower Density, followers/mi/ln	LOS
1	169	0.59	45.5	E

Appendix D

Community Drop-in Outreach Event

Summary

KITTELSON & ASSOCIATES
851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

Memorandum

September 19, 2022 — Project #27358

To: Sandra Hikari, Project Manager
Oregon Department of Transportation
123 NW Flanders St. Portland, OR 97209

From: Nicholas Gross, Alice Root, Hermanus Steyn

CC: Scott Hoelscher

RE: US 26 Rhododendron Design Refinement Plan

TWO-PAGE DROP-IN OUTREACH EVENT SUMMARY MEMORANDUM

Purpose

The purpose of this summary is to document feedback received from the project site visit and community drop-in outreach event. The information summarized in this memorandum will be used to inform the development of the alternatives and decision making as part of *TM#5 Design Refinement and Alternatives Evaluation Memorandum.*

Site Visit Summary

The project management team (PMT) and ODOT staff conducted a site visit of the Rhododendron project area on Thursday, August 11, 2022. The site visit attendees included:

- Sandra Hikari, ODOT
- Hope Estes, ODOT
- Shawn Stevens, ODOT
- Jim Peterson, ODOT
- Bill Ewing, ODOT
- Kerrie Franey, ODOT
- Magnus Bernhardt, ODOT
- Canh Lam, ODOT
- Ben Chaney, ODOT
- Scott Hoelscher, Clackamas County
- Nicholas Gross, Kittelson & Associates, Inc.
- Alice Root, Kittelson & Associates, Inc.

The group started the site visit at the Dairy Queen parking lot, heading east along US 26 toward the East Henry Creek Road intersection. The group crossed US 26 at the East Henry Creek Road intersection and continued west along US 26 on the south side. The group crossed US 26 at the grocery store and continued east to Dairy Queen along the north side of US 26. The group stopped at multiple location sites to discuss the existing roadway conditions, vehicle traffic, and pedestrian and cyclist activity. The group made the following observations:

- The bus stop located across the street from the grocery store has a limited sight distance to the west.
- Access to the pedestrian trails at the swinging bridge and at the back of the former Flavorbus restaurant parking lot are not easily visible from the US 26.

  - Opportunities to relocate the current & temporary bus stop to the former Flavorbus restaurant parking lot should be explored by the consultant team
- At the east end of Rhododendron, the consultant team observed the radar speed sign reporting consistent vehicle speeds exceeding 50 mph.
  - It was noted that vehicles were likely traveling at slowly speeds due to the presence of the group in high visibility vests.
- The consultant team observed smoke from the brakes of large vehicle trucks trying to slow down through Rhododendron. Braking and the ability to stop heavy freight coming downhill should be considered when planning for an enhanced pedestrian crossing.
  - Advance warning and signage should be incorporated to any proposed crossing, particularly in the westbound direction for vehicles coming downhill.
- During the span of the site visit, the project team observed eight people biking traveling west, four people biking east, and three pedestrians crossing US 26.
- Dozens of people mountain biking were observed boarding/alighting the Mt. Hood express to the top of Timberline; those same people biking were observed later in the day returning to their vehicles parked at the transit stop.
- Noted the roadway storm drain locations in front of the Mt Hood Holdings property at the west end of Rhododendron on the eastbound shoulder. The storm drains are present starting at this location and to the west, but not to the east.

Drop-in Outreach Event Summary

In July, ODOT staff publicized the drop-in event through ODOT's and Clackamas County's website, through community bulletin boards, in the local newspaper and through a targeted mailer to the approximately 300 community residents. Information provided in the drop-in event included:

- A project overview, schedule, and area map
- Project vision statement
- Prior project area concept and vision plans
- Existing conditions technical memorandum

Public participants were able to offer input through:

- Written survey
- Annotations on a large area base map
- One-on-one conversations with the project team and ODOT staff

The two-hour event drew strong participation over 40 people attending the drop-in event in-person, and 25 comment response surveys returned. Many people stayed to ask additional questions and express their opinions with the project team and ODOT staff, and to identify areas of concern on the project area base map. The results of the survey are quantitatively summarized below:

The resident characteristics for the surveyed responses were:

- 74% (20 people) full time residents
- 15% (4 people) part time residents
- 11% (3 people) business owners in addition to being full time or part time residents
- 4% (1 person) visitor

Approximately half the survey respondents walked to the event and the other half drove. The most identified key destinations include the post office, grocery store, restaurants, and coffee shop.

The primary transportation concerns for the surveyed responses are:

- 89% (24 people) high speeds
- 85% (22 people) safety
- 67% (18 people) pedestrian and bicycle access
- 48% (13 people) traffic/congestion

Many participants added written comments, identifying similar transportation concerns:

- Concerns of no crosswalks making it difficult to safely cross US 26
- Concerns for high-speed vehicles and trucks also making it difficult to cross or turn onto US 26
- Observations of increased traffic and congestion
- Support for crosswalks and use of center median as a refuge island
- Support for reducing the total number of lanes and slowing traffic down
- Support for radar to enforce speed limits
- Support for bicycle and walking paths

Appendix E

Stakeholder Interview Summaries

Stakeholder Interview #1 – Brett Fisher, Mt. Hood SkiBowl. 7/20/22

Introductions

Nick Gross, Kittelson & Associates, Inc. Senior Planner. Consultant Project Manager.
Sandra Hikari, Oregon Department of Transportation. ODOT Project Manager.

Key action information, themes, and feedback are shown below in bold

QUESTION 1

Q: Please explain your role at Mt. Hood SkiBowl. How many employees do you have? Where do they live? How do they access Mt. Hood SkiBowl?

A: I'm involved with everything at Mt. Hood SkiBowl, from Rhody to Government Camp. More planning forward. Lodging development. I've worked with Kittelson on development projects. We are the owner of Snowline Motel property. We also lease the **property next to Snowline Motel, "Always Towing".** Worked with Steve Graper at the CPO in past. There are apartments being built in Welches that we have looked at in potentially replicating for Rhody.

QUESTION 1

Q: What is your relation to the community of Rhododendron (resident [full/part time], business owner, renter, visitor, passing by)?

A: Property owner. We own the two sites noted previously. We used to own a mountain bike/ski rental shop adjacent to the "Always Towing" site. Now we primarily use Rhody as a place fore storage.

QUESTION 2

Q: What is your primary mode of transportation when traveling in Rhododendron?

A: Vehicle. I used to ride trails on my mountain bike. Mountain biking was a big component of bus stop; the bus stop is located on the property that we lease. At the time of locating the bus stop, me, and the owner of SkiBowl allowed it but we didn't want it there. We were concerned the bus stop would become permanent, **and we wouldn't have control over.**

QUESTION 3

Q: What are your primary transportation concerns in Rhododendron? (High speeds, safety, pedestrian and bicycle facilities, highway traffic?)

A: High speeds, lack of pedestrian crossings, overall safety. People heading eastbound, coming around the corner before the Swinging Bridge speed up to get around semi-trucks before it transitions to 2-lanes. Accessing properties with excessive speeds makes it really difficult and dangerous, particularly turning into the Snowline property. I have about 10-12 employees housed at Snowline Motel. We've converted the motel into long-term housing. Those residents use grocery store, get DQ, get coffee. Makes a lot of sense to make conversion to 2-lane back further and slow people down through Rhody. Public parking is loosely defined.

It would be nice to see added sidewalk and streetlamps to create ped, bike, community, natural and features. I have two key employees at the managerial level I can pass on their contact information to you: Jasmin Burns, Stephanie Baxter. Wifi at the Snowline Motel is individual by individual.

QUESTION 4

Q: What are the primary destinations in Rhododendron that you frequent? How do you get there? What transportation barriers do you face (i.e., high speeds, lack of facilities, dangerous crossings, ADA accessibility, parking)?

A: The post office is a main attraction/destination. The primarily barriers are getting on/off highway to access bus stop, bikes are in no **man's** land. There is no defined bike route through or around Rhody. Add bike hub/fix-it station?

QUESTION 5

Q: Community input received as part of the Rhododendron Main Street Redevelopment Plan noted the lack of designated highway crossings creating significant challenges. Do you think a pedestrian crossing should be installed across the US 26? If yes, where, and why?

A: Best location for a pedestrian crossing would be somewhere central so it has good sight distance. If traffic is slower, you'll have more options. The post office is central and has easy access east and west. Suggest somewhere near the post office.

QUESTION 6

Q: As part of the Rhododendron Main Street Redevelopment Plan, 69% of survey respondents identified highway traffic, speed, and noise as their top concerns facing Rhododendron. What solutions do you think could reduce highway traffic, speed, and noise?

A: Create the transition zone west of the Swinging Bridge area, slow traffic through Rhody. It will solve a lot of not all the problems. Noise is a big issue, it's really loud.

QUESTION 7

Q: US-26 has 2 lanes east of Rhododendron, shifting to 3-lanes near Henry Creek Road, then becoming 5-lanes in Rhododendron. This change in number of lanes also changes the feeling or "context" of the roadway. What suggestions do you have to improve the roadway context to fit more of the community's needs?

A: I see two options. Expand the highway to 4 lanes up and down the mountain or change the transition zone. There is always going to be traffic regardless. Holiday period is a nightmare. Part of the traffic problem is that people don't know how-to drive-in snow. Number of lanes isn't going to change perceived traffic.

QUESTION 8

Q: Is there anything else you would like to discuss or information you would like to provide to the project team?

A: I want to bring up the bus stop pull-off and parking again. I think it will be a major hurdle to overcome. Mountain biking will continue to grow in this area. The vision of a park n ride for mountain biking stationed out of Rhody should be incorporated into this project, particularly how parking to access the bus fits in. Our long-term goal is to develop our Rhody site into something useful and something that we can attract people to.

Stakeholder Interview #2 – Clackamas Count Pedestrian and Bicycle Advisory Committee 8/2/22

Introductions

Nick Gross, Kittelson & Associates, Inc. Senior Planner. Consultant Project Manager.
Brett Setterfield, Pete Ihrig, Bruce Parker (Chair), Richard Weber, Thelma Haggenmiller, Scott Hoelscher. Del Scharffenberg, Joe Edge, Kelli Grover Steve Adams, Hans Sutschersich, Dave Weber. Tonia Williamson

Key action information, themes, and feedback are shown below in bold

DISCUSSION: HOW TO SLOW TRAFFIC DOWN?

- Hashed marks on pavement that get closer and closer. The bridge on SW Barbur Blvd is good example.
- Road texture improvements
- Get things as close to the roadway without encroaching into "hole in the air"
- Electronic speed feedback/indicators
- 4 traffic lanes vs. 3 lanes less
- Wider and smoother bike lanes. Rather than mixing bicycling with pedestrian on path.
- Rumble strips for vehicles. Don't put rumble strips in bike lane, keep right at line.
- Enforcement: No reliability with sheriff or police to slow down
- Supportive of dual multiuse path and bike lane on street
- Create a narrow corridor
- Paint lanes as narrow as possible. Add buffer to bike lanes.
- Add vertical objectives (off the road)

DISCUSSION: PREFERRED BICYCLE FACILITY

- Multiuse paths
- Wayfinding and signage are really important. Sunriver good example.
- Has thought been given to linking Zig Zag, Rhody, and Welches through network of multiuse paths?
    - Yes, 6 years ago that was looked at as part of Mt. Hood PedBike Implementation Plan.
- Bike path and multiuse path
- Underpass, rather than on-street crossing?
- Repaving may be faster

ATTACHMENT A: WRITTEN COMMENTS RECEIVED FOLLOWING PRESENTATION

Scott,

I would like to weigh in on the Rhododendron project so if you could pass this along to Nick I would appreciate it.

For Nick Gross

It is my opinion that the optimal design for bike/ped passage through the Rhododendron project would be a shared multi-use path elevated or separated from the roadway and on-roadway bike lanes for through riders. Ideally the shared use path would have different a different colors for the bike and ped sides. Also at crosswalks there should be buttons on both sides of the shared paths so the bike riders do not have to encroach on the pedestrian side of the path.

Stakeholder Interview #3 – Joe Marek, Kristina Babcock. 8/3/22

Introductions

Nick Gross, Kittelson & Associates, Inc. Senior Planner. Consultant Project Manager.
Sandra Hikari, Oregon Department of Transportation. ODOT Project Manager.

Key action information, themes, and feedback are shown below in bold

QUESTION 1

Q: Please explain your role at Clackamas County?

J: Transportation Safety Program Manager. Traffic Engineer. Been with County for 31 years. Work in corridor entire career.

K: Been around handful of years. Demand response elderly, last mile shuttles, mt. hood shuttles.

J: Long history of safety issues. Steadily building of safety back to the 90's.

QUESTION 2

Q: What is your relation to the community of Rhododendron (resident [full/part time], business owner, renter, visitor, passing by)?

J: driver, winter and summer sports. On and off rode biking.

K: not a lot of experience. Dealing more of day-to-day operations

QUESTION 3

Q: What are your primary transportation concerns in Rhododendron? (High speeds, safety, pedestrian and bicycle facilities, highway traffic?)

J: speeding on US26, crashes, lack of pedestrian crossings, non-motorized users to get across 26. Recreational surges. Mixed in with freight corridor. Perception of safe speed. Sad lack of enforcement.

K: similar. Lack of pedestrian crossings. We stop with villages shuttle and mt. hood express. Long-term bus stop location. Rhody we pull off on the side of the road. Mt. hood foods (wb) and eastbound gravel lot. Safely pull off the highway. RRFB.

QUESTION 4

Q: What are your primary destinations in Rhododendron that you frequent? How do you get there? What transportation barriers do you face (i.e. high speeds, lack of facilities, dangerous crossings, ADA accessibility, parking?)

K: cant tell you why Rhody is such a popular stop. Mtn. bikers come down mtn. Pioneer Bridal Trail. Very popular spot. Parking area for mtn. bikers (cars). No park n ride. % of people riding bus? We don't track ridership into great detail. Villages shuttle "around town" Bike trailer to hold 20 – 25 bikes. 38' bus with a 20 foot trailer.

J: Trails for mtn. bikers.

QUESTION 5

Q: Community input received as part of the Rhododendron Main Street Redevelopment Plan noted the lack of designated highway crossings creating significant challenges. Do you think a pedestrian crossing should be installed across the US 26? If yes, where, and why?

J: sense of location?

K: as close to transit stop as possible. Just west of Mt. Hood Foods.

QUESTION 6

Q: As part of the Rhododendron Main Street Redevelopment Plan, 69% of survey respondents identified highway traffic, speed, and noise as their top concerns facing Rhododendron. What solutions do you think could reduce highway traffic, speed, and noise?

J: reducing traffic: work that Kristina is doing. Stronger parking management. Hard topic to cover. I think a lot about changing the context. People come off the 2-lane section and speed up into the 5-lane section. Change context of highway. Looks and smells like a lower speed facility. 3 lane transition.

J: curbed sidewalks, visual cues. Automated enforcement. Staff shortages for 30-year in the transportation department. Balance of freight needs, safety, and change of context.

J: Interested to be invited to that MAC meeting. Good familiarity with safety and freight. Maybe just listen. Compiling crash history, delay, and looking at options to reduce options and how that might improve delay time.

J: Reducing traffic: no park n ride lots in corridor?

K: City of Sandy Operational Center, Dormant Center (Subway), Hoodland Senior Center.

J: Improving park n ride presence.

K: Not well used and County not happy about maintaining.

QUESTION 7

Q: US-26 has 2 lanes east of Rhododendron, shifting to 3-lanes near Henry Creek Road, then becoming 5-lanes in Rhododendron. This change in number of lanes also changes the feeling or "context" of the roadway. What suggestions do you have to improve the roadway context to fit more of the community's needs?

J: gateway treatments. Tough when you travel along the road, difficult to maintain. Roundabouts. You are entering a different place. Come into Sisters from the east – good example.

K: Sisters is a great example.

QUESTION 8

Q: Is there anything else you would like to discuss or information you would like to provide to the project team?

J: Potential solutions, stratified list of solutions, low cost and medium cost and high-cost solutions. Near term safety improvements. Vulnerable users trying to use transit.

K: how to provide more parking for people in Rhody, park n ride, or general parking.

Stakeholder Interview #4: Zach & Angela Harrell, Dairy Queen (DQ) and Shelby Reid, Alderbrook Lodge. –9/22/22

Introductions

Nick Gross, Kittelson & Associates, Inc. Senior Planner. Consultant Project Manager.
Sandra Hikari, Oregon Department of Transportation. ODOT Project Manager.

Key action information, themes, and feedback are shown below in bold

QUESTION 1

Q: Please explain your respective roles at the Alderbrook Lodge and Dairy Queen. How many employees do you have? Where do they live? How do they access your business/property?

Zach Harrell (ZH): My wife and I are third generation DQ owners. We've lived in "Rhododendron" for about 10 years, more specifically we live in Welches. We have 13 employees (10 active right now), all live between Sandy and Rhody. Most live in Welches. A couple employees drive, others carpool and some use public transportation.

Shelby Reid (SR): I am here representing the Reid Family and Alderbrook Lodge. The Alderbrook Lodge is on the National Historic Register. It has been in the family for over 100 years. I am a part-time resident. When I'm not living in Rhododendron I live in Flagstaff, Arizona.

QUESTIONS 2

Q: What is the peak period for DQ:

ZH: Weekends when school is out is very busy. Once the mountain opens, it is very busy in the mornings. We see traffic back up to the Thirftway. Winter traffic peaks and summer traffic is a constant flow.

QUESTION 3

Q: What is your primary mode of transportation when traveling in Rhododendron?

ZH: Personal vehicle. Once we are at Dairy Queen we walk to the store, coffee shop, post office, etc.

SR: When I am living in Rhody, I am primarily a pedestrian or bicycle. Representing the rest of the family, most of them have to drive to cross US26. My mother has to drive across US26 to get to the grocery store.

QUESTION 4

Q: What are your primary transportation concerns in Rhododendron? (High speeds, safety, pedestrian and bicycle facilities, highway traffic?)

ZH: Traffic backing up in front of DQ heading east. When traffic slows down, we slow down. The speed limit changes to 40 through town. People speed to get ahead of others traveling up the mountain. We have an employee who walks to work from across the street. Sometimes it takes them 10 to 15 minutes to cross the street.

SR: My concerns are safe egress and ingress. The speeds are high, people need to slow down and turn quickly into adjacent properties. Safety is primary. Noise from transportation impacts our property. I want to increase the community feel. Right now it's difficult to enjoy local businesses. As a cyclist, I would like a well-marked and easily accessible bus stop to take my bike up the mountain.

QUESTION 5

Q: What are the primary destinations in Rhododendron that you frequent? How do you get there? What transportation barriers do you face (i.e., high speeds, lack of facilities, dangerous crossings, ADA accessibility, parking)?

ZH: Luckily for us, we are on the same side of highway as store, coffee, post office. Walking is all on the same side.

SR: Trails are my primary destination, walking along Henry Creek. It's a challenge to get across the highway. Secondary destinations are the post office, restaurant, and DQ. Sometimes I decide not to go because it's too dangerous. Width of highway, high speeds, lack of pedestrian crossings. More lanes mean faster speeds.

QUESTION 6

Q: Community input received as part of the Rhododendron Main Street Redevelopment Plan noted the lack of designated highway crossings creating significant challenges. Do you think a pedestrian crossing should be installed across the US 26? If yes, where, and why?

ZH: I am supportive of a pedestrian crossing. Especially for people on the south side. Maintaining curbing during winter is a full-time job. Curbs for a pedestrian refuge island might be more dangerous. Last thing I want to see is someone stuck in the middle of the highway. Supportive of crossings, lighting would increase safety for pedestrians.

SR: I am very supportive of 5 to 3 lanes transition. The center lane can serve ingress/egress. Putting a pedestrian refuge island in center island would be great. Traffic calming elements are supported. A pedestrian island needs to be built at a width that accommodates plows. Would like to see a crosswalk and a pedestrian refuge.

QUESTION 7

Q: As part of the Rhododendron Main Street Redevelopment Plan, 69% of survey respondents identified highway traffic, speed, and noise as their top concerns facing Rhododendron. What solutions do you think could reduce highway traffic, speed, and noise?

ZH: Noise is going to be hard to mitigate. Freight has to move. Freight coming down the mountain is the loudest. Speed can be reduced but without enforcement there will be no change.

Angela Harrell (AH): It is important to consider traffic during the winter months. Anytime before 10am, traffic backs up to Skyway, sometimes all the way to Thriftway. We feel narrowing cross section would cause more traffic and lengthen the traffic line already there.

SR: In terms of how to deal with traffic… Safety is the priority and a pedestrian crossing with a pedestrian refuge would help. Reducing speed through Rhody, like through Welches. There are signals down the road in Welches, freight vehicles have to stop for those. To address noise, I recommend instituting an engine breaking prohibition i.e., "No j-brake, or no engine brake". Reducing speed also reduces noise.

QUESTION 8

Q: US-26 has 2 lanes east of Rhododendron, shifting to 3-lanes near Henry Creek Road, then becoming 5-lanes in Rhododendron. This change in number of lanes also changes the feeling or "context" of the roadway. What suggestions do you have to improve the roadway context to fit more of the community's needs?

SR: I agree with the outlined improvements of the 3 lane alternative. If you take the outside lanes and create pedestrian and bicycle space, it could activate the place. Desire to see bus stops across from each other with a pedestrian crossing and refuge island connecting them.

ZH: Enforcing speed is the best. 3-lanes would be difficult with egress and ingress. There have been events in Rhody that have required 3-lanes; during those events we've sent people home early because we have no business. We thrive on people coming in/out/through the community.

QUESTION 9

Q: Is there anything else you would like to discuss or information you would like to provide to the project team?

ZH: Regarding traffic, I don't want to see lane reduction but understand safety issues. I'm not sure about sidewalks, but I am supportive of a crosswalk and increased lighting.

SR: When the ZigZag bridge was widen and the lanes were expanded, there was a loss of the frontage road and barrier of trees. We were promised that a lot of those trees would be replanted. That never happened. Nice to see restoration as part of this project.

Appendix F

Technical Workshop Summary

Meeting Notes

US 26 Rhododendron Design Refinement Plan

Technical Workshop

Thursday, October 27| 3:00 PM– 5:00 PM

1. Attendance

    a. Kittelson: Nick Gross, Hermanus Steyn, Ashleigh Ludwig, Alice Root.

    b. ODOT: Sandra Hikari, Rian Windsheimer, Kristen Stallman, Katie Bell, Jeffrey Hayes, Magnus Bernhardt, Shane Jansen, Shawn Stephens, Will Ewing, Neelam Dorman, Christopher Basil, Paul Scarlett, Kerrie Franey, Canh Lam, Ben Chaney.

    c. Clackamas County: Joe Marek, Scott Hoelscher.

2. Discussion: General

    a. As highlighted in ODOT's multimodal decision-making framework, we need to verify that our decisions address the intended outcomes of the project as we discuss the various design elements (Nick).

    b. From a tort liability perspective, we need to document our decisions and show how we meet and address the project outcomes. If we cannot do that, then we need to justify why not, and if needed potentially change the project vision and goals (Hermanus).

    c. The taper of the transition on the west side for the 3-lane alternatives should occur before the bridge to avoid further bridge deterioration (Joe).

        i. Project team to evaluate location – moving the taper too far before entering the community may not accomplish the speed reduction messaging into town.

3. Discussion: 5-Lane with Refuge Island

    a. Right-of-way (ROW) will create significant impacts and costs (Jeff).

        i. The intent is to have all the improvements within the existing ROW. However, there may be impacts to entities encroaching into the existing ROW.

    b. Clarification that widening is only associated with the sidewalks (still within existing ROW) and most impacts are related to the utility conflicts (Cahn).

4. Discussion: 3-Lane with or without Refuge Island

    a. For the two 3-lane alternatives, the discussion quickly focuses on the potential challenges associated with a refuge island (Shane).

    b. Since we are removing a travel lane in each direction, it appears to have flexibility in exploring wider travel lane dimensions (Kristen).

5. Discussion: Two-Way Left-Turn Lane (TWLTL)
    a. ODOT's primary request for 14' two-way left-turn lane (TWLTL) conflicts with the HDM's (Highway Design Manual) recommended 11'-12'
    b. Considerations for lane width:
        i. Rhododendron is one of the only places where trucks can easily stop along and turn off US 26. Trucks currently turn in and out using the middle lane (TWLTL) (Shane).
    c. A 14' TWLT lane should be provided when a refuge island is present. Without a refuge island, use a 12' TWLT consistent with HDM (Cahn).
    d. When presenting to mobility, instead of setting lane widths, provide a lane width (TWLTL or refuge island with shy distances) range such as 12'-14' (Cahn).
        i. See discussion about refuge island.
    e. It appears that the wider 14' TWLTL for the 3-lane alternatives could be feasible (Kristen).
    f. Verify our decisions:
        i. Does a 14' TWLTL encourage slower speeds? Do we still address our project goal to slow traffic through the community? Do we minimize crossing distance – vulnerable user exposure)?
6. Discussion: Travel Lane
    a. Maintenance prefers wider lanes to accommodate freight traffic (Shane).
    b. Snow conditions create roadway issues. Lanes become more difficult to see in the snow and vehicles need more room to avoid potential side-swipe crashes (Joe).
    c. Maintenance equipment for removing snow has 14' wide pressure blades on the front (Shane).
    d. It appears that the wider 14' travel lanes can fit within the 3-lane alternatives. There is ample room (Kristin).
    e. Verify our decisions:
        i. Do 12' travel lanes encourage slower speeds? Do we still address our project goal to slow traffic through the community? Do we minimize crossing distance – vulnerable user exposure?
7. Discussion: Travel Speed
    a. A 35-mph target speed for the 3-lane alternative does not seem realistic unless enforced. The current conditions appear vehicles driving 70-mph through the 5-lane

section of the corridor. Eastbound vehicles tend to slow down to 50-mph at the east end where the corridor narrows to 2-lanes (Shane).

b. The community would need to find a way to obtain automated enforcement. Automated enforcement would require legislative change (Joe).

   i. *There was community interest in traffic cameras (Magnus).*

   ii. *Would like to share with the larger group: Speed enforcement cameras have proven very effective in reducing speed and improving roadway safety (worldwide). This is a low impact tool and requires only minor modification to the physical environment and works with all alternatives. Is this something that we could consider as part of this project? This project would make a great pilot/test project. (Magnus).*

   iii. *Legislative change needed to use photo enforcement in Clackamas County - would love to have the options available (Joe). Need a legislative champion to make the change happen.*

   iv. *Current law only allows Cities to operate automated enforcement (Ben).*

c. ODOT does not have the ability to impose automated enforcement.

d. It is unrealistic that the 3-lane alternative would achieve a 35-mph target speed or that the 5-lane alternative would achieve a 40-mph target speeds even with geometric changes, signing, or striping. ODOT cannot change the posted speed to be less than 40-mph (Jeff, Cahn).

e. *Suggest wider lanes in the 3-lane section and narrower in the 5-lane section. The 3-lane section will in general help slow the speed with the greater volumes (Jeff).*

f. *Context and automated enforcement will encourage slower speeds (Joe).*

g. Verify our decisions:

   i. The intent is to reduce the current 85-percentile speed through the community. Getting speed to the posted speed would result in an approximately 15-mph reduction meeting the project goals.

8. <u>Discussion: Refuge Island & Crossing Treatment</u>

a. A rectangular rapid-flashing beacon (RRFB) cannot be placed without a refuge island (ODOT Traffic Manual). ODOT would recommend including a red device (signal or pedestrian hybrid beacon [PHB]) for an overhead treatment. Most visitors would recognize a signal over an PHB (Jeff).

b. Considerations for Refuge Island:

   i. Any refuge island or median above ground is detrimental to maintenance (Joe, Will).

   ii. Warm Springs has a refuge island that gives the appearance of a median but remains flush with the asphalt allowing vehicles to drive over (Will).

iii. It is worth considering other options that do not require a refuge island such as an enhanced crossing or pedestrian signal (Jeff).

iv. US 97 through La Pine was improved by converting a 5-lane cross section to a 3-lane cross section with pedestrian refuge islands (Shawn). Maintenance to follow-up with ODOT staff overseeing La Pine.

c. Verify our decisions:

i. Not having a refuge island, does the road encourage slower speeds? Do we still address our project goal to provide an enhanced crossing for vulnerable users in a slower speed environment?

9. Discussion: Crossing Location

a. A crossing should not be located at the east end due to speeding issues and limited sight line coming from the east (downhill westbound traffic) (Shane, Shawn)

b. A crossing should be avoided on both ends of Rhododendron due to poor sight distance on the west end around the curve and speeding vehicles on a downward grade on the east end. (Cahn).

c. Referring to the map showing potential crossing locations: Combine all three of the specified locations (on the west end) into one general crossing location. The specific location of the crossing will be guided by design elements such as access to sidewalks or access to adjacent properties (Jeff).

d. Verify our decisions:

i. Providing an enhanced crossing in the community will accomplish a project goal.

10. Discussion: Multiuse Path and Sidewalks

a. ODOT Maintenance would not be responsible for clearing the sidewalk or multiuse paths.

b. The buffer space within the cross section would provide an area for snow storage. If sidewalks are included in the design, properties owners would be responsible for removing the snow (Shane)

c. Sand in the road does not normally get removed until after the winter season (Basil, Shawn).

d. Worst case, sidewalks and multiuse paths may not be accessible during snow conditions, but people walking and biking will have a facility for most of the year (Jeff).

e. A multiuse path on the south side of US26 is already being built west of US26 as part of the STIP project: K21599 – US 26 Salmon Rv to Zigzag. The multiuse path is set back and separated from the highway between 10-20 feet (Jeff).

f. ODOT does not encourage including multiuse paths where there are many driveways (Cahn).

g. Verify our decisions:

    i. Providing a multiuse path on the south side of US 26 is consistent with ongoing ODOT efforts to provide a facility along US 26.

    ii. Providing sidewalk and multiuse path within the community addresses community needs and project goals. We understand maintenance will have to be addressed.

11. <u>Snow Storage & Maintenance</u>

    a. Snow plowing is weather dependent. Sometimes maintenance will use a vehicle lane for snow storage if the edge of roadway does not provide enough space. A wide multiuse path could serve as snow storage (Shane).

    b. La Pine has similar snow and roadway conditions with wide lanes and wide buffered bike lanes. It would be worth it to reach out to the maintenance group that takes care of the La Pine area. (Kristin, Sandra)

    c. Verify our decisions:

        i. Maintenance agreements may have to be established with the community.

12. <u>Operations Analysis</u>

    a. 5-lane alternative meets operational targets, but the 3-lane alternative shows some side streets that do not meet operational targets in 2050.

    b. For the segment analysis, the capacity is exceeded (volume-to-capacity [v/c] over 1) less than 1 hour per day in 2030, and an average of 0.3 hours per day in 2050. (Ashleigh).

    c. Through internal discussion at ODOT, it may be more useful to focus on travel time differences instead of v/c ratios. The v/c ratio has limitations that do not reflect the impacts of the two-lane sections to the east. Ben Chaney will coordinate with Kittelson to focus on using travel time differences instead of v/c ratios (Katie).

    d. ODOT's analysis shows no days would be over capacity in 2019, 1 hour a month would be over capacity in 2030, and variation of hours one day a week in July and August would be over capacity in 2050 (Katie).

    e. ODOT is still looking for clarity about the design exception. ODOT is looking for examples where design exceptions are required on a private driveway or public approach on a two-way stop. (Katie, Jeff, Cahn)

    f. ODOT would like to consider sharing the delay results at the two-way stop with the community to get their feedback on the delay differences between the alternatives (Katie).

    g. ODOT would like to consider comparing queuing results with the actual capacity for queueing in the parking lots (Katie).

h. From a safety perspective, there were several crashes reported within the community that are likely related to the additional lane per direction (5-lane section). We have seen similar crash data along US 199 in Region 3 where there are more crashes in communities with passing lanes.

i. Verify our decisions:

    i. The 3-lane alternative will experience more congestion, but will slow traffic through the community.

    ii. The 3-lane cross section addresses the crashes associated with the extra lanes.

13. <u>Other topics</u>

    a. Truck drivers are using the Grocery parking to park trucks. Consider using extra wide ROW along the grocery store for truck parking. (Joe)

    b. Consider including a transit stop if including truck parking (Kristin).

    c. A separate truck lane could allow trucks to pull off the roadway, but the lane could also be abused by vehicles trying to pass (Cahn).

    d. Verify our decisions:

        i. This was not a need that was identified by the community and noted in the project goals.

14. <u>Summary of discussion</u>

    a. Include a 14’ width for a TWLTL when a refuge island is included and a 12’ width for a TWLTL without a refuge island.

    b. Travel lane widths should range between 11’ to 12’ depending on the context; 12’ width is preferable for snowy conditions and freight needs.

    c. Do not include 35-mph target speed in alternative plans; assume 40-mph target speeds matching the currently posted speed.

    d. A RRFB should be designed with a raised refuge island, and a pedestrian signal should be designed if a refuge island cannot be included. An alternative consideration is a refuge island flush with the asphalt which would likely be designed with a pedestrian signal.

    e. Snow storage is a priority. A buffer space would be the preference for snow storage.

    f. A sidewalk or multi-use path would not be maintained by the Maintenance group.

Microsoft Teams Chat

WINDSHEIMER Rian M (External) 10/27 3:11 PM 👍 1
Looking forward to seeing you Shane, Will and Shawn on Monday. I'm bringing up a special guest too.

10/27 3:11 PM 👍 2
Spoiler alert, its Paul Scarlett

STALLMAN Kristen (External) 10/27 3:34 PM
The 14' two-way left turn will fit in the 3 lane cross section option. We have ample room with that alternative.

Marek, Joe (External) 10/27 3:34 PM
What is the current width?

HAYES Jeffrey D (External) 10/27 3:35 PM
It is 14' today

Marek, Joe (External) 10/27 3:36 PM
Thanks

BERNHARDT Magnus U (External) 10/27 3:47 PM 👍 1
I've brought this up before but would like to share with the larger group: Speed enforcement cameras have proven very effective in reducing speed and improving roadway safety (worldwide). This is a low impact tool and requires only minor modification to the physical environment and works with all alternatives. Is this something that we could consider as part of this project? This project would make a great pilot/test project.

Marek, Joe (External) 10/27 3:48 PM ❤️ 2 👍 1
Legislative change needed to use photo enforcement in Clackamas County - would love to have the options available

BERNHARDT Magnus U (External) 10/27 3:49 PM 👍 1
There was community interest in traffic cameras.

Marek, Joe (External) 10/27 3:50 PM
Need a legislative champion to make the change happen. County can't lead process.

HAYES Jeffrey D (External) 10/27 3:52 PM 👍 2
would suggest wider lanes in the 3 lane section and narrower in the 5 lane. The 3 lane section will in general help slow the speed with the greater volumes.

Marek, Joe (External) 10/27 3:59 PM 👍 1
context and automated enforcement

Hoelscher, Scott (External) 10/27 4:00 PM 👍 1
sorry, I need to leave for another meeting

WINDSHEIMER Rian M (External) 10/27 4:02 PM
What Jeff Said. Clackamas County would not likely do it

CHANEY Benjamin *Ben (External) 10/27 4:03 PM 👍 1
As Jeff/Joe mentioned, current law only allows Cities to operate automated enforcement.

HAYES Jeffrey D (External) 10/27 4:05 PM 👍 1
As a note that is posted, not target

10/27 4:05 PM 👍 1
so 40 Mph is what you should use

WINDSHEIMER Rian M (External) 10/27 4:09 PM
Pedestrian Hybrid Beacon seems reasonable. Anything in the roadway may get plowed ...

STALLMAN Kristen (External) 10/27 4:10 PM 👍 2
I reached out to the project leader for the Warm Springs Safety project for more info.

STEPHENS Shawn A (External) 10/27 4:11 PM
Anything in the roadway would be an issue.

STALLMAN Kristen (External) 10/27 4:13 PM 👍 1
Transit Stops would also be nice.

JM **Marek, Joe (External)** 10/27 4:14 PM 👍 1

Truck parked as seen from google street view

FK **FRANEY Kerrie (External)** 10/27 4:16 PM
Yes, I would be curious to see what can be done for a "refuge island" that is flush. It appears there are some good examples in Missouri. Agree we wouldn't want to put anything permanent on the island.

JM **Marek, Joe (External)** 10/27 4:17 PM
Another truck....

SA **STEPHENS Shawn A (External)** 10/27 4:17 PM
Thank you Kerrie

JM **Marek, Joe (External)** 10/27 4:17 PM 👍 1

Did you see many people coming across the ped bridge on the south side of Hwy 26?

HY **HIKARI Sandra Y (External)** 10/27 4:19 PM
Not many but a couple.

SA STEPHENS Shawn A (External) 10/27 4:20 PM
I think there were only 2 when we were out there in Aug.

JM Marek, Joe (External) 10/27 4:20 PM
The numbers may ebb a bit depending on who's renting the houses

BU BERNHARDT Magnus U (External) 10/27 4:23 PM
Why can't a raised median be delineated with snow stakes during winter?

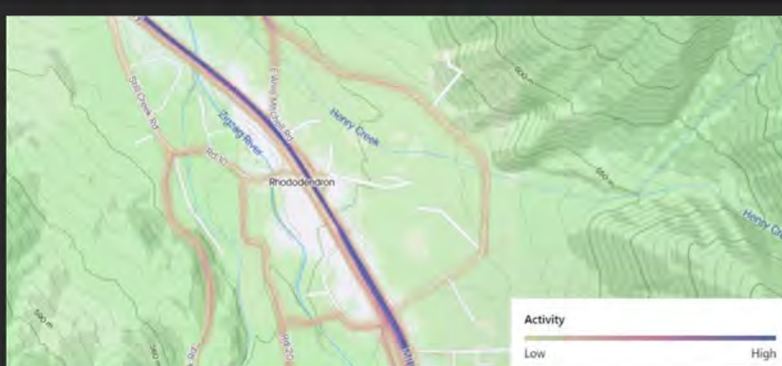
JM Marek, Joe (External) 10/27 4:23 PM 👍 1

There is a little wider ROW that might be helpful for ped crossing

SA STEPHENS Shawn A (External) 10/27 4:24 PM
Cleaning a raised median is also a concern. We don't have the ability to keep this clean.

JM Marek, Joe (External) 10/27 4:25 PM
sidwalks are responsibility of adjacent property owner

CB CHANEY Benjamin *Ben (External) 10/27 4:26 PM 👍 2
Marek, Joe Strava data supports that the ped bridge is used:



BE **BELL Katherine E (External)** 10/27 4:26 PM
brb

back

JM **Marek, Joe (External)** 10/27 4:29 PM

HD **HAYES Jeffrey D (External)** 10/27 4:31 PM 👍 1
K21599 - US26: Salmon Rv to Zigzag is building a MUP on the south side of US26.

CB **CHANEY Benjamin *Ben (External)** 10/27 4:31 PM 👍 1
As Jeff alluded to, I believe there's a drainage ditch between the MUP and the highway for K21599

10/27 4:32 PM 👍 1
As Cahn alluded to, the MUP in K21599 connects to a signal. Fire dept. access signal, being modified to include a pedestrian phase.

JE **JANSEN Shane E (External)** 10/27 4:33 PM
Do they have plans for maintenance on the new sidewalk at the east end of Sandy?

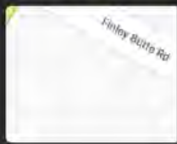
BU **BERNHARDT Magnus U (External)** 10/27 4:35 PM 👍 1
Less surface area to plow with 3-lane.

LT **LAM Canh T (External)** 10/27 4:36 PM Edited 👍 1
I would call it as a wide sidewalk. However folks use it it's up to them. Would not encourage to state it as a path.

CB **CHANEY Benjamin *Ben (External)** 10/27 4:41 PM
Of note re: the Government Camp snow removal, the sidewalks in their central district are flush with the roadway. (to my recollection)

SK **STALLMAN Kristen (External)** 10/27 4:44 PM 👍 1

LaPine Finley Butte Rd - Google Maps



Google Maps
Find local businesses, view maps and get driving directions in Google Maps.
www.google.com

HY **HIKARI Sandra Y (External)** 10/27 4:45 PM 👍 1

> STALLMAN Kristen 10/27/2022 4:44 PM
> LaPine Finley Butte Rd - Google Maps

The view shows 5-lane and when you click to move forward, the updated 3-lane pops up.

SK **STALLMAN Kristen (External)** 10/27 4:54 PM

TWTL 14' wide in 3 lane cross section

BU **BERNHARDT Magnus U (External)** 10/27 4:55 PM

The ped island in LaPine has yellow candle sticks.

Hermanus Steyn 10/27 4:56 PM

BU **BERNHARDT Magnus U (External)** 10/27 4:57 PM

SA **STEPHENS Shawn A (External)** 10/27 4:57 PM 😮 1

Even with candle sticks, I'm pretty sure this has been struck by plows.

10/27 4:58 PM 👍 2

I know the manager for that area and I can ask for his input of maintaining the area around the refuge.

MA **MARTISAK Deborah A *Debbie (External)** 10/27 5:00 PM

Please keep on considerIOM

Appendix G

Queuing Output Worksheets

5-Lane Alternative
Queue Analysis Worksheets
APM
2030 Thursday

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / East Little Brook Lane		
East/West Street:	US 26		
North/South Street:	E Little Brook Lane		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLTR	27	13.0%	926	0	0	**32**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Mt Hood Foods Frontage		
East/West Street:	US 26		
North/South Street:	Mt Hood Foods Frontage		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	6	0.0%	1150	0	0	**30**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Dairy Queen Driveway		
East/West Street:	US 26		
North/South Street:	Dairy Queen Driveway		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNL	8	0.0%	1139	0	1	**48**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Mt Hood Roasters		
East/West Street:	US 26		
North/South Street:	Mt Hood Roasters		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							**Results**
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	6	0.0%	1132	0	0	**29**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / E Henry Creek Road		
East/West Street:	US 26		
North/South Street:	E Henry Creek Road		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							**Results**
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLTR	8	0.0%	883	0	0	**21**

Intersection Analysis Adjusted Volumes						
Alternative	Year	Day	Intersection		Original Volume	Updated Capped Volumes
3 ln	2030	Sun	1	WBT	1625	Below 1700
3 ln	2030	Sun	2	WBT	1628	Below 1700
3 ln	2030	Sun	3	WBT	1587	Below 1700
3 ln	2030	Sun	4	WBT	1623	Below 1700
3 ln	2030	Sun	4	WBT	1605	Below 1700
5 ln	2030	Sun	1	WBT	1625	Below 1700
5 ln	2030	Sun	2	WBT	1628	Below 1700
5 ln	2030	Sun	3	WBT	1587	Below 1700
5 ln	2030	Sun	4	WBT	1623	Below 1700
5 ln	2030	Sun	4	WBT	1605	Below 1700
3 ln	2050	Sun	1	WBT	2141	1700
3 ln	2050	Sun	2	WBT	2146	1700
3 ln	2050	Sun	3	WBT	2092	1700
3 ln	2050	Sun	4	WBT	2139	1700
3 ln	2050	Sun	4	WBT	2115	1700
5 ln	2050	Sun	1	WBT	2141	1700
5 ln	2050	Sun	2	WBT	2146	1700
5 ln	2050	Sun	3	WBT	2092	1700
5 ln	2050	Sun	4	WBT	2139	1700
5 ln	2050	Sun	4	WBT	2115	1700

5-Lane Alternative
Queue Analysis Worksheets
APM
2030 Sunday

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / East Little Brook Lane		
East/West Street:	US 26		
North/South Street:	E Little Brook Lane		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

- Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes
- Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)
- Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input / Results

Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLTR	27	13.0%	2048	0	0	**55**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Mt Hood Foods Frontage		
East/West Street:	US 26		
North/South Street:	Mt Hood Foods Frontage		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

- Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes
- Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)
- Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input / Results

Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	18	0.0%	2434	0	0	**64**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Dairy Queen Driveway		
East/West Street:	US 26		
North/South Street:	Dairy Queen Driveway		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNL	27	0.0%	2428	0	1	**79**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Mt Hood Roasters		
East/West Street:	US 26		
North/South Street:	Mt Hood Roasters		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	13	0.0%	2416	0	0	**64**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / E Henry Creek Road		
East/West Street:	US 26		
North/South Street:	E Henry Creek Road		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLTR	13	0.0%	2006	0	0	**42**

5-Lane Alternative
Queue Analysis Worksheets
APM
2050 Thursday

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / East Little Brook Lane		
East/West Street:	US 26		
North/South Street:	E Little Brook Lane		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLTR	36	13.0%	1220	0	0	**41**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Mt Hood Foods Frontage		
East/West Street:	US 26		
North/South Street:	Mt Hood Foods Frontage		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							**Results**
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	7	0.0%	1514	0	0	**37**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Dairy Queen Driveway		
East/West Street:	US 26		
North/South Street:	Dairy Queen Driveway		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNL	10	0.0%	1501	0	1	**56**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Mt Hood Roasters		
East/West Street:	US 26		
North/South Street:	Mt Hood Roasters		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	8	0.0%	1490	0	0	**37**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / E Henry Creek Road		
East/West Street:	US 26		
North/South Street:	E Henry Creek Road		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLTR	10	0.0%	1162	0	0	**26**

Intersection Analysis Adjusted Volumes						
Alternative	Year	Day	Intersection		Original Volume	Updated Capped Volumes
3 ln	2030	Sun	1	WBT	1625	Below 1700
3 ln	2030	Sun	2	WBT	1628	Below 1700
3 ln	2030	Sun	3	WBT	1587	Below 1700
3 ln	2030	Sun	4	WBT	1623	Below 1700
3 ln	2030	Sun	4	WBT	1605	Below 1700
5 ln	2030	Sun	1	WBT	1625	Below 1700
5 ln	2030	Sun	2	WBT	1628	Below 1700
5 ln	2030	Sun	3	WBT	1587	Below 1700
5 ln	2030	Sun	4	WBT	1623	Below 1700
5 ln	2030	Sun	4	WBT	1605	Below 1700
3 ln	2050	Sun	1	WBT	2141	1700
3 ln	2050	Sun	2	WBT	2146	1700
3 ln	2050	Sun	3	WBT	2092	1700
3 ln	2050	Sun	4	WBT	2139	1700
3 ln	2050	Sun	4	WBT	2115	1700
5 ln	2050	Sun	1	WBT	2141	1700
5 ln	2050	Sun	2	WBT	2146	1700
5 ln	2050	Sun	3	WBT	2092	1700
5 ln	2050	Sun	4	WBT	2139	1700
5 ln	2050	Sun	4	WBT	2115	1700

5-Lane Alternative
Queue Analysis Worksheets
APM
2050 Sunday
Original Volumes Over Capacity
Volumes not exceeding the Capacity (1700 veh)

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR - 5 LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / East Little Brook Lane		
East/West Street:	US 26		
North/South Street:	E Little Brook Lane		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNLTR	35	0.0%	3217	0	0	**86**
NB	MNLTR	6	0.0%	3219	0	0	**80**
WBL	MJL	2	0.0%	1037	0	1	**49**
EBL	MJL	14	0.0%	2151	0	1	**168**
SB	MNLTR	35	0.0%	2776	0	0	**70**
NB	MNLTR	6	0.0%	2778	0	0	**62**
WBL	MJL	2	0.0%	1037	0	1	**49**
EBL	MJL	14	0.0%	1710	0	1	**106**
				VOLUMES CAPPED AT 1700			

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR - 5 LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Mt Hood Foods Frontage		
East/West Street:	US 26		
North/South Street:	Mt Hood Foods Frontage		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNL	19	0.0%	2696	0	1	**81**
SB	MNR	5	0.0%	1092	0	1	**29**
EB	MJL	5	0.0%	2181	0	1	**164**
SB	MNL	19	0.0%	2250	0	1	**73**
SB	MNR	5	0.0%	869	0	1	**27**
EB	MJL	5	0.0%	1735	0	1	**103**
				VOLUMES CAPPED AT 1700			

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR - 5 LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Dairy Queen Driveway		
East/West Street:	US 26		
North/South Street:	Dairy Queen Driveway		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input / Results

Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNL	35	0.0%	2699	0	1	**87**
SB	MNR	71	0.0%	1078	0	1	**124**
EB	MJL	38	0.0%	2153	0	1	**193**
SB	MNL	35	0.0%	2307	0	1	**80**
SB	MNR	71	0.0%	882	0	1	**106**
EB	MJL	38	0.0%	1761	0	1	**129**
				VOLUMES CAPPED AT 1700			

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR - 5 LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Mt Hood Roasters		
East/West Street:	US 26		
North/South Street:	Mt Hood Roasters		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input / Results

Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNL	2	0.0%	2671	0	1	**74**
SB	MNR	14	0.0%	1073	0	1	**42**
EB	MJL	7	0.0%	2146	0	1	**160**
SB	MNL	2	0.0%	2232	0	1	**66**
SB	MNR	14	0.0%	854	0	1	**38**
EB	MJL	7	0.0%	1707	0	1	**101**
				VOLUMES CAPPED AT 1700			

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR - 5 LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / E Henry Creek Road		
East/West Street:	US 26		
North/South Street:	E Henry Creek Road		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input / Results

Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNLTR	14	0.0%	3155	0	0	**79**
NB	MNLTR	18	0.0%	3153	0	0	**80**
WB	MJL	7	0.0%	1021	0	1	**50**
EB	MJL	2	0.0%	2117	0	1	**151**
SB	MNLTR	14	0.0%	2740	0	0	**63**
NB	MNLTR	18	0.0%	2738	0	0	**64**
WB	MJL	7	0.0%	1021	0	1	**50**
EB	MJL	2	0.0%	1702	0	1	**98**

VOLUMES CAPPED AT 1700

3-Lane Alternative
Queue Analysis Worksheets
APM
2030 Thursday

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / East Little Brook Lane		
East/West Street:	US 26		
North/South Street:	E Little Brook Lane		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLTR	27	13.0%	1156	0	0	**36**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Mt Hood Foods Frontage		
East/West Street:	US 26		
North/South Street:	Mt Hood Foods Frontage		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	6	0.0%	1152	0	0	**30**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Dairy Queen Driveway		
East/West Street:	US 26		
North/South Street:	Dairy Queen Driveway		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							**Results**
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNR	21	25.0%	668	0	1	**47**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Mt Hood Roasters		
East/West Street:	US 26		
North/South Street:	Mt Hood Roasters		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							**Results**
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	6	0.0%	1133	0	0	**30**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / E Henry Creek Road		
East/West Street:	US 26		
North/South Street:	E Henry Creek Road		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
NB	MNLTR	15	0.0%	1108	0	0	**26**

Intersection Analysis Adjusted Volumes						
Alternative	Year	Day	Intersection		Original Volume	Updated Capped Volumes
3 ln	2030	Sun	1	WBT	1625	Below 1700
3 ln	2030	Sun	2	WBT	1628	Below 1700
3 ln	2030	Sun	3	WBT	1587	Below 1700
3 ln	2030	Sun	4	WBT	1623	Below 1700
3 ln	2030	Sun	4	WBT	1605	Below 1700
5 ln	2030	Sun	1	WBT	1625	Below 1700
5 ln	2030	Sun	2	WBT	1628	Below 1700
5 ln	2030	Sun	3	WBT	1587	Below 1700
5 ln	2030	Sun	4	WBT	1623	Below 1700
5 ln	2030	Sun	4	WBT	1605	Below 1700
3 ln	2050	Sun	1	WBT	2141	1700
3 ln	2050	Sun	2	WBT	2146	1700
3 ln	2050	Sun	3	WBT	2092	1700
3 ln	2050	Sun	4	WBT	2139	1700
3 ln	2050	Sun	4	WBT	2115	1700
5 ln	2050	Sun	1	WBT	2141	1700
5 ln	2050	Sun	2	WBT	2146	1700
5 ln	2050	Sun	3	WBT	2092	1700
5 ln	2050	Sun	4	WBT	2139	1700
5 ln	2050	Sun	4	WBT	2115	1700

3-Lane Alternative
Queue Analysis Worksheets
APM
2030 Sunday

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / East Little Brook Lane		
East/West Street:	US 26		
North/South Street:	E Little Brook Lane		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLTR	27	13.0%	2444	0	0	**67**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Mt Hood Foods Frontage		
East/West Street:	US 26		
North/South Street:	Mt Hood Foods Frontage		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	18	0.0%	2440	0	0	**64**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Dairy Queen Driveway		
East/West Street:	US 26		
North/South Street:	Dairy Queen Driveway		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNR	54	25.0%	1612	0	1	**160**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Mt Hood Roasters		
East/West Street:	US 26		
North/South Street:	Mt Hood Roasters		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	13	0.0%	2416	0	0	**64**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2030
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / E Henry Creek Road		
East/West Street:	US 26		
North/South Street:	E Henry Creek Road		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
NB	MNLTR	15	0.0%	2392	0	0	**52**

3-Lane Alternative
Queue Analysis Worksheets
APM
2050 Thursday

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / East Little Brook Lane		
East/West Street:	US 26		
North/South Street:	E Little Brook Lane		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLTR	36	13.0%	1524	0	0	**47**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Mt Hood Foods Frontage		
East/West Street:	US 26		
North/South Street:	Mt Hood Foods Frontage		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	7	0.0%	1516	0	0	**38**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Dairy Queen Driveway		
East/West Street:	US 26		
North/South Street:	Dairy Queen Driveway		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							**Results**
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNR	28	25.0%	880	0	1	**63**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / Mt Hood Roasters		
East/West Street:	US 26		
North/South Street:	Mt Hood Roasters		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
SB	MNLR	8	0.0%	1491	0	0	**37**

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AJG	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	8/26/2022	Analysis Year:	2050
Analysis Time Period:	Thursday, PM		
Intersection:	US 26 / E Henry Creek Road		
East/West Street:	US 26		
North/South Street:	E Henry Creek Road		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example							
NB	MNLTR	20	0.0%	1459	0	0	**34**

Intersection Analysis Adjusted Volumes						
Alternative	Year	Day	Intersection		Original Volume	Updated Capped Volumes
3 ln	2030	Sun	1	WBT	1625	Below 1700
3 ln	2030	Sun	2	WBT	1628	Below 1700
3 ln	2030	Sun	3	WBT	1587	Below 1700
3 ln	2030	Sun	4	WBT	1623	Below 1700
3 ln	2030	Sun	4	WBT	1605	Below 1700
5 ln	2030	Sun	1	WBT	1625	Below 1700
5 ln	2030	Sun	2	WBT	1628	Below 1700
5 ln	2030	Sun	3	WBT	1587	Below 1700
5 ln	2030	Sun	4	WBT	1623	Below 1700
5 ln	2030	Sun	4	WBT	1605	Below 1700
3 ln	2050	Sun	1	WBT	2141	1700
3 ln	2050	Sun	2	WBT	2146	1700
3 ln	2050	Sun	3	WBT	2092	1700
3 ln	2050	Sun	4	WBT	2139	1700
3 ln	2050	Sun	4	WBT	2115	1700
5 ln	2050	Sun	1	WBT	2141	1700
5 ln	2050	Sun	2	WBT	2146	1700
5 ln	2050	Sun	3	WBT	2092	1700
5 ln	2050	Sun	4	WBT	2139	1700
5 ln	2050	Sun	4	WBT	2115	1700

3-Lane Alternative
Queue Analysis Worksheets
APM
2050 Sunday

Original Volumes Over Capacity

Volumes not exceeding the Capacity (1700 veh)

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR 3LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / East Little Brook Lane		
East/West Street:	US 26		
North/South Street:	E Little Brook Lane		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNLTR	35	0.0%	3217	0	0	**86**
NB	MNLTR	6	0.0%	3219	0	0	**80**
WBL	MJL	2	0.0%	1037	0	1	**49**
EBL	MJL	14	0.0%	2151	0	1	**168**
SB	MNLTR	35	0.0%	2776	0	0	**70**
NB	MNLTR	6	0.0%	2778	0	0	**62**
WBL	MJL	2	0.0%	1037	0	1	**49**
EBL	MJL	14	0.0%	1710	0	1	**106**
				VOLUMES CAPPED AT 1700			

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR 3LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Mt Hood Foods Frontage		
East/West Street:	US 26		
North/South Street:	Mt Hood Foods Frontage		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNL	19	0.0%	3214	0	1	**90**
SB	MNR	5	0.0%	2165	0	1	**36**
EB	MJL	5	0.0%	2181	0	1	**164**
SB	MNL	19	0.0%	2768	0	1	**82**
SB	MNR	5	0.0%	1719	0	1	**33**
EB	MJL	5	0.0%	1735	0	1	**103**
				VOLUMES CAPPED AT 1700			

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR 3LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Dairy Queen Driveway		
East/West Street:	US 26		
North/South Street:	Dairy Queen Driveway		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :

MJL	1	Major street separate left turn lane / TWLT
MNLTR	2	Minor street shared left, through and right lane
MNLR	3	Minor street shared left, and right lane
MNL	4	Minor street separate left turn lane
MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNL	35	0.0%	3199	0	1	**96**
SB	MNR	71	0.0%	2124	0	1	**223**
EB	MJL	38	0.0%	2153	0	1	**193**
SB	MNL	35	0.0%	2807	0	1	**89**
SB	MNR	71	0.0%	1732	0	1	**186**
EB	MJL	38	0.0%	1761	0	1	**129**
				VOLUMES CAPPED AT 1700			

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR 3LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / Mt Hood Roasters		
East/West Street:	US 26		
North/South Street:	Mt Hood Roasters		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input							Results
Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNL	2	0.0%	3185	0	1	**83**
SB	MNR	14	0.0%	2143	0	1	**62**
EB	MJL	7	0.0%	2146	0	1	**160**
SB	MNL	2	0.0%	2746	0	1	**75**
SB	MNR	14	0.0%	1704	0	1	**54**
EB	MJL	7	0.0%	1707	0	1	**101**
				VOLUMES CAPPED AT 1700			

Queue Length Estimation at Two-Way STOP Controlled Intersection

Project Information

Analyst:	AIR 3LN ALT	Agency/Co.:	KAI
Jurisdiction:	ODOT	Project ID:	27358
Date Performed:	1/12/2023	Analysis Year:	2050
Analysis Time Period:	Sunday, PM		
Intersection:	US 26 / E Henry Creek Road		
East/West Street:	US 26		
North/South Street:	E Henry Creek Road		

Instructions

Step 1 Identify Lane Groups and its corresponding code from below

Lane Group Code :			
	MJL	1	Major street separate left turn lane / TWLT
	MNLTR	2	Minor street shared left, through and right lane
	MNLR	3	Minor street shared left, and right lane
	MNL	4	Minor street separate left turn lane
	MNR	5	Minor street separate right turn lane

Step 2 Calculate Input Parameters

Calculate Lane Group Volumes, % Heavy Vehicles, and Conflicting Volumes

Identify the presence of an upstream signal within 1/4 mile on major approches (Signal)

Identify the presence of a separate LT lane / TWLT on major street approaches (LT)

Step 3 Verify the input ranges to feed into the models (see QueueLengthsModels sheet)

Step 4 **Input** the information and obtain queue lengths in feet from **Results** column

Note: ***Round off queue lengths to the next highest 25 feet when reporting***

Input / Results

Approach	Lane Group, Code	Volume, veh/hr	% Heavy Vehicles	Conflicting Volume,veh/hr	Signal (0 or 1)	Left Turn Lane (0 or 1)	Queue Length Feet
Example				*VOLUMES ABOVE CAPACITY*			
SB	MNLTR	14	0.0%	3155	0	0	**79**
NB	MNLTR	18	0.0%	3153	0	0	**80**
WB	MJL	7	0.0%	1021	0	1	**50**
EB	MJL	2	0.0%	2117	0	1	**151**
SB	MNLTR	14	0.0%	2740	0	0	**63**
NB	MNLTR	18	0.0%	2738	0	0	**64**
WB	MJL	7	0.0%	1021	0	1	**50**
EB	MJL	2	0.0%	1702	0	1	**98**

VOLUMES CAPPED AT 1700