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Addendum

November 21, 2022

Project# 26314

To: Noami Vogel, Washington County

From: Kristine Connolly, PE & Michael Ruiz-Leon

CC: Eric Rutledge and Bob Galati, PE, City of Sherwood
Garth Appanaitis, PE, DKS Associates

Project: Sherwood Commerce Center Phase 1 - Sherwood, Oregon

Subject: Traffic Impact Analysis Report Addendum 1

EXPIRES: 12/31/2023

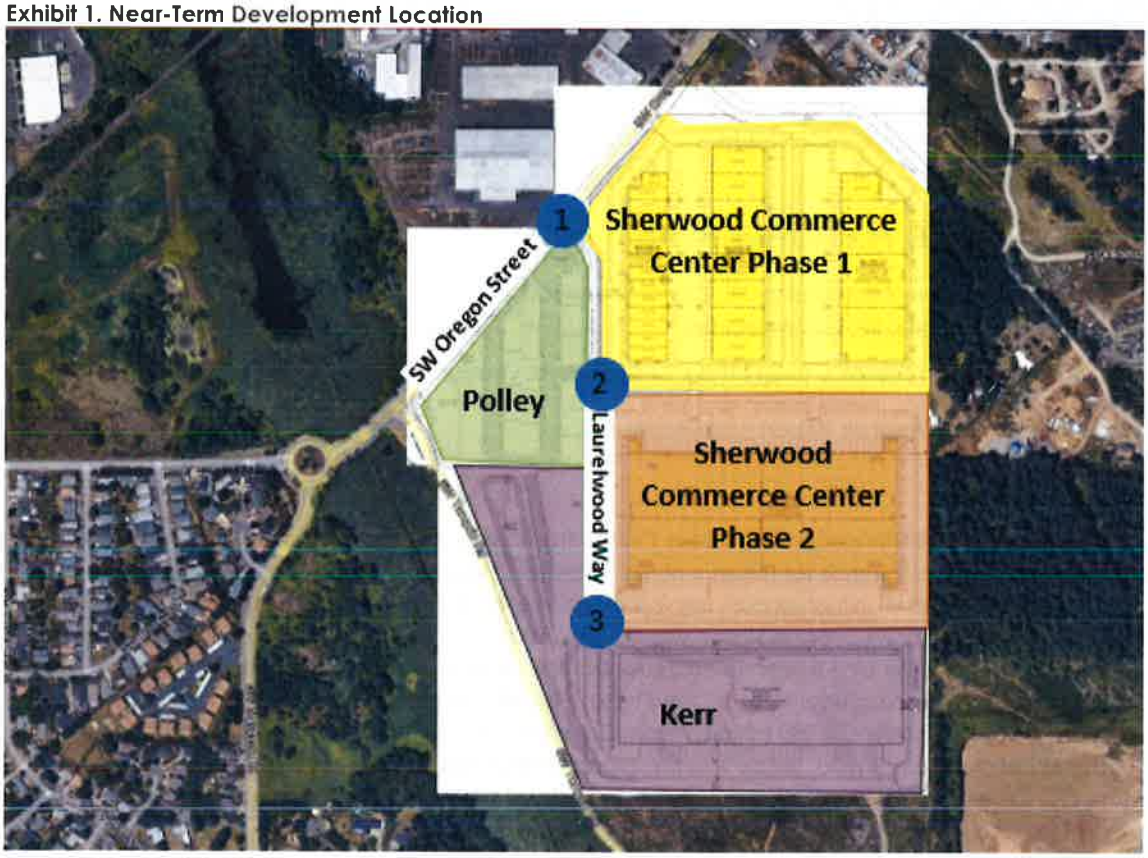
The previously submitted Sherwood Commerce Center Traffic Impact Analysis Report (Phase 1 TIA) dated 11/30/2021 analyzed the impacts for Phase 1 of the proposed Sherwood Commerce Center consisting of up to 468,000 square feet of industrial park, served by an interim access on SW Oregon Street (Site Access A) and the intersection of SW Oregon Street with the planned future Laurelwood Way (previously referred to as Tonquin Court). At the time it was determined that the location of the future Laurelwood Way may not be feasible upon opening day. As such, the Phase 1 TIA also included a supplemental analysis of opening day operations with a single interim access location (Site Access A). The Phase 1 TIA concluded that under either access scenario, Phase 1 of the proposed Sherwood Commerce Center can be developed while maintaining acceptable levels of mobility at the study intersections, assuming provision of the recommended mitigation measures.

Since submittal of the Phase 1 TIA, the Laurelwood Way connection is now anticipated to be constructed at the time of opening of Phase 1 of the Sherwood Commerce Center. Both the SW Oregon Street/Laurelwood Way intersection and interim Site Access A will operate with full turning movements until the planned east-west connector, Ice Age Drive is constructed. At that time, SW Oregon Street/Laurelwood Way will be limited to right-in/right-out movements and the interim Site Access A will be closed and replaced by direct access to Ice Age Drive, consistent with the *Sherwood Oregon Street Access Management Plan (AMP)* prepared by DKS in June of 2021. Additional access management considerations will be discussed later in this memorandum.

The Oregon Street Business Park project (herein referred to as the Polley property) to the west of the proposed Sherwood Commerce Center was also approved since submittal of the Phase 1 TIA. This memorandum provides an addendum to the turn lane analysis in the Phase 1 TIA, incorporating in-process trips for the Polley property.

This memorandum also provides traffic control guidance at the SW Oregon Street/Laurelwood Way intersection with anticipated cumulative near-term development (including the Polley property, Sherwood Commerce Center Phase 1 and Phase 2, and Kerr property to the south) prior to the planned future construction of Ice Age Drive. The locations of these near-term developments are shown in Exhibit 1.

Exhibit 1. Near-Term Development Location



TURN LANE CONSIDERATIONS

SW Oregon Street/Laurelwood Way

Trips from the approved Oregon Street Business Park TIA dated 5/23/2022 (Reference 1) were added to the analysis in the Phase 1 TIA for the purposes of updating the turn lane analysis at the future intersection of Oregon Street/Laurelwood Way. A right-turn lane warrant was conducted at SW Oregon Street/Laurelwood Way per the guidance in ODOT's *Analysis Procedures Manual* (APM – Reference 2). Left-turn lane warrants were not conducted, as the existing two-way left-turn lane on Oregon Street is proposed to be extended to Laurelwood Way. It was found that the right-turn lane warrant is met with combined trips for the Polley property and Sherwood Commerce Center Phase 1. *Appendix A includes the right-turn lane warrant worksheet.*

Washington County's transition requirements are stated in section 320.050 of the Washington County *Road Design and Construction Standards* (February 2011):

> *"When required, transitions into dedicated turn lanes and islands shall use 10 (ten) degree reverse curves, R=5729/D where R is the radius in feet and D is degree of curvature."*

Using reverse curves with 573-foot radius (per the requirement), a transition length of 165.5 feet is recommended. Queues are not anticipated in the right-turn lane as the intersection is not signalized. However, per discussion with County staff a storage length of 100 feet is recommended.

SW Oregon Street/Interim Site Access A

The Phase 1 TIA did not recommend right-turn lanes at SW Oregon Street/Interim Site Access A. However, Site Access A is located within the functional area of the future planned Ice Age Drive/Oregon Street intersection, which will have a northbound right-turn lane. As such, the design of temporary Site Access A includes the provision of a right-turn deceleration lane to be extended to Ice Age Drive (once it is constructed and the temporary access is closed). A left-turn lane warrant was not conducted as there is a two-way left-turn lane on SW Oregon Street.

Table 1 displays the anticipated queuing at the future signalized intersection of Ice Age Drive/Oregon Street, as analyzed in the AMP.

Table 1. Summary of 95th-percentile Queues

Intersection	Movement	95th-percentile Queue (feet)	
		2035 Peak Hour	
		AM	PM
Oregon Street/Ice Age Drive	NBL	25	-
	NBT	175	150
	NBR	100	75

Where: NB = Northbound, L = left-turn, T = through, and R = right-turn

As shown in Table 1, the northbound right-turn lane should provide a minimum of 100 feet of storage in order to accommodate anticipated demand. Note that the northbound through queue at the future Ice Age Drive signal is 175 feet. The ultimate design of the turn lane should provide sufficient storage to maneuver around queues for northbound through vehicles. *The queuing analysis worksheets from the APM are included in Appendix B.*

Using reverse curves with 573-foot radius (per Washington County's transition requirements), a transition length of 165.5 feet is recommended. Based on the results of the queuing analysis and Washington County transition standards, the northbound right-turn lane at Site Access A has been designed with a storage length of 100 feet and reverse curve transition length of 165.5 feet. When Ice Age Drive is constructed and the temporary Site Access A is closed, the turn lane will be extended to Ice Age Drive, increasing the storage length by approximately 200 feet. This will provide more than adequate distance to maneuver around the projected 175-foot northbound through queues. *A concept layout of the right-turn lane at Site Access A can be found in Appendix C.*

TRAFFIC CONTROL CONSIDERATIONS

The SW Oregon Street/Laurelwood Way access will serve Sherwood Commerce Center Phase 1 (up to 468,000 square feet of industrial use) and Phase 2 (up to 505,000 square feet of industrial use), as well as adjacent parcels including the Polley (up to 120,000 square feet of industrial use) and Kerr (up to 382,000 square feet of industrial use) properties. The locations of these near-term developments are shown in Exhibit 1. A traffic control analysis was conducted assuming cumulative near-term development of these properties.

Trip Generation

Trip generation for the Sherwood Commerce Center Phase 1 was included in the Phase 1 TIA. Trip generation for the Polley property was provided in the Oregon Street Business Park TIA. A trip generation estimate for future development of the Sherwood Commerce Center Phase 2 and Kerr properties was prepared based on the Institute of Transportation Engineers' (ITE) *Trip Generation Manual*, 11th Edition. Table 2 displays the anticipated trip generation for all four developments.

Table 2. Preliminary Trip Generation Estimate

Development	Land Use Category	ITE Code	Size (SF)	Total Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
					Total	In	Out	Total	In	Out
Sherwood Commerce Center Phase 1	Industrial Park	130[1]	468,000	1,577	187	151	36	187	39	148
Sherwood Commerce Center Phase 2	Industrial Park	130	505,000	1,702	172	139	33	172	38	134
Polley Property	General Light Industrial	110[2]	115,170	572	81	71	10	73	9	64
Kerr Property	Industrial Park	130	382,000	1,287	130	105	25	130	29	101

[1]The Sherwood Commerce Center Phase 1 Traffic Impact Analysis Report (TIA) dated 11/30/2021 assumed the ITE Trip Generation Manual, 10th Edition. Note that the 10th Edition reported higher rates for ITE Code 110 than the current 11th Edition Trip Generation Manual.
[2]The Oregon Street Business Park Traffic Impact Analysis Report (TIA) assumed the ITE Trip Generation Manual, 10th Edition.

Year 2024 Total Traffic Conditions

The total traffic conditions analysis identifies how the SW Oregon Street/Laurelwood Way intersection will operate with the addition of cumulative near-term development trips in 2024 (prior to construction of the planned Ice Age Drive connection). Trips for the Polley property were assigned to the SW Oregon Street/Laurelwood Way intersection based on the trip assignment developed for the Oregon Street Business Park TIA. Trips for the Kerr property and Sherwood Commerce Center were assigned based on the trip distribution developed for the Phase 1 TIA. These trips were added to year 2024 background traffic volumes developed by adding in-process development trips (for the previously approved T-S Corporate Park) and a 1.5 percent growth rate to intersection turning-movement counts collected in June of 2022. The counts were conducted on a typical mid week day during the morning (7:00-9:00 AM) and evening (4:00 -6:00 PM) peak time periods while local schools were holding classes in-person. Per direction from the City engineering staff, the observed traffic counts are representative of typical commuter peak hour traffic volumes and reflect pre-COVID-19 traffic volumes. As such, no COVID-19 related volume adjustments were applied to the collected volumes. *Appendix D contains the turning movement counts. A figure detailing the traffic volume development is included in Appendix E.*

An operational analysis was conducted at the major site access intersections along Laurelwood Way. Exhibit 1 shows the location of the three study intersections. Table 3 summarizes the results of the operational analysis. *Appendix F contains the year 2024 Total Traffic level-of-service worksheets.*

Table 3. Year 2024 Total Traffic Conditions Operational Analysis Results

#	Intersection	LOS (delay)[1]		V/C[2]		Operating Standard	Standard Met?
		AM	PM	AM	PM		
1	SW Oregon Street / Laurelwood Way	D (26.8)	F (54.5)	0.36	0.91	V/C of 0.99	Yes
2	Sherwood Commerce Center and Polley Access / Laurelwood Way	C (16.7)	C (16.2)	0.03	0.18	V/C of 0.99	Yes
3	Kerr Access/ Laurelwood Way	A (8.6)	A (9.0)	0.01	0.04	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay (in seconds) for critical movement.
[2] HCM 2000 Volume-to-Capacity ratio.

All three intersections are forecast to operate at levels which meet the jurisdictional mobility standards during both the weekday AM and PM peak hours with anticipated cumulative near-term development.

A left-turn warrant was conducted at the internal driveways along Laurelwood Way. The warrants were analyzed per the guidance in the APM. Based on the results of left-turn warrant analysis, a southbound left-turn lane is recommended at the northern site access on Laurelwood Way (Intersection #2). It is recommended the southbound left-turn lane be designed with adequate storage to accommodate a semi-truck. *Appendix G includes the turn warrant worksheets.*

Traffic Signal Warrant Considerations

A signal warrant analysis for the SW Oregon Street/Laurelwood Way intersection was conducted according to the criteria contained in the APM. With development of the Sherwood Commerce Center Phases 1 and 2, Polley and Kerr properties, traffic volumes at this intersection do not satisfy the preliminary signal warrant thresholds. A sensitivity analysis was carried out to determine how much additional industrial development could occur prior to signalization of SW Oregon Street/Laurelwood Way. This analysis showed that approximately 925,000 additional square feet could be constructed before meeting preliminary signal warrants.

To confirm the results of this analysis, a signal warrant analysis was conducted according to the criteria in the *2009 Manual on uniform Traffic Control Devices* (MUTCD). Weekday daily 24-hour volumes were estimated based on the peak hour and typical volume profiles along similar roadway facilities. The analysis assumes a right-turn on red reduction, as supported by the Oregon Department of Transportation (ODOT) traffic signal warrant procedures. This analysis indicated that approximately 350,000 additional square feet of development could occur prior to meeting preliminary signal warrants.

Appendix H includes the signal warrant worksheets.

ACCESS LOCATION AND PHASING

The locations of the interim Site Access A Laurelwood Way connections along SW Oregon Street are consistent with the AMP, while minimizing the likelihood of access relocation with future Phases. *The AMP is included as Appendix I.*

Alternative/Phase 1 of the AMP provides near-term access (interim Site Access A) for TL 600 (the proposed Sherwood Commerce Center site) to SW Oregon Street before the future Laurelwood Way and Ice Age Drive are constructed.

Additional access to the site is provided via Laurelwood Way with Alternative/Phase 2 of the AMP. As discussed above, it is unlikely that a temporary traffic signal will be warranted at the intersection of SW Oregon Street/Laurelwood Way with cumulative near-term development. However, If Laurelwood Way is signalized, turning movements at Site Access A will be limited to right-in/right-out only.

When Ice Age Drive is constructed with Alternative/Phase 3 of the AMP, the Laurelwood Way access (if constructed) will be limited to right-in/right-out only (and any potential temporary signal removed). The interim Site Access A will be closed and replaced by direct access to Ice Age Drive.

CONCLUSIONS

Based on the results of this supplemental analysis, it is recommended that northbound right-turn deceleration lanes be provided at SW Oregon Street/Laurelwood Way and SW Oregon Street/Interim Site Access A, and designed per the guidance in this memorandum. Anticipated traffic volumes with cumulative near-term development at SW Oregon Street/Laurelwood Way do not satisfy the preliminary signal warrant thresholds. The proposed site access alternatives are consistent with the *Sherwood Oregon Street Access Management Plan (AMP)* prepared by DKS in June of 2021. Please contact us if you have questions and/or if you would like to discuss the findings presented.

References

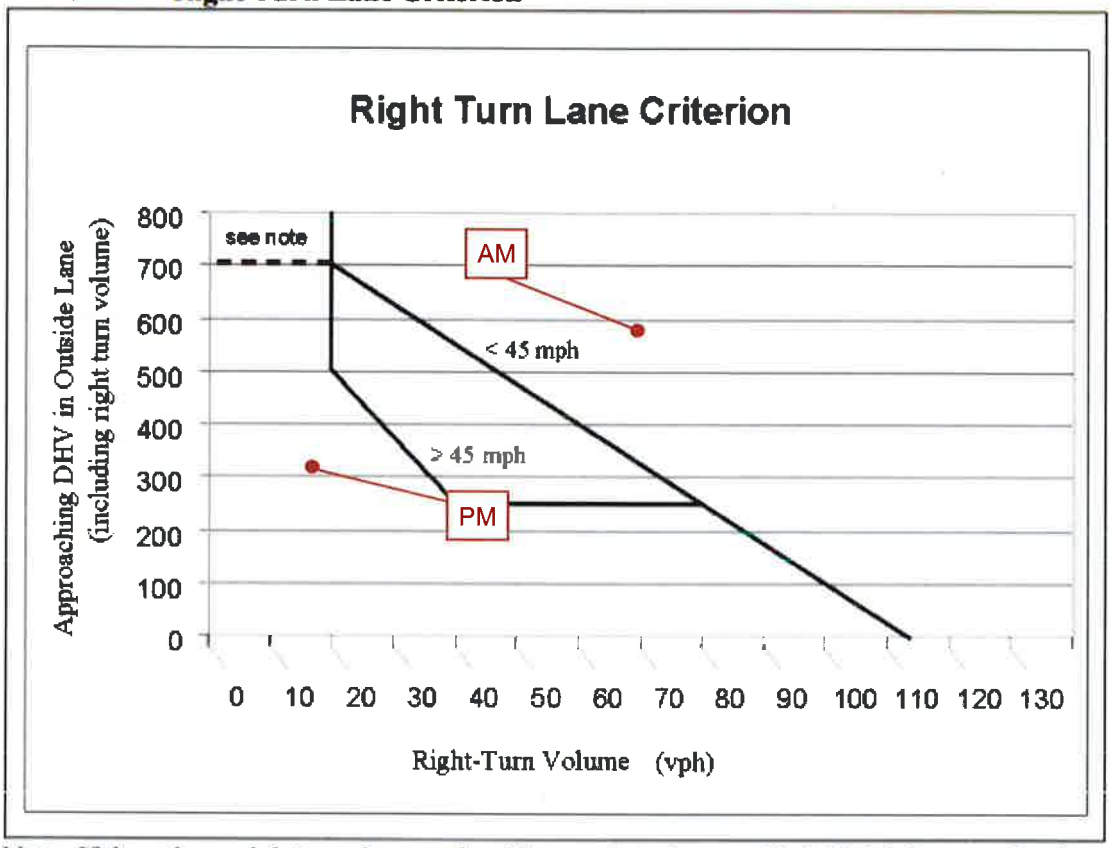
1. Lancaster Mobley. Oregon Street Business Park Transportation Impact Analysis. May 2022.
2. Oregon Department of Transportation. Analysis Procedure Manual, Version 2. February 2017.

Appendices

A. Right-Turn Lane Warrant Worksheet
B. Queueing Worksheets
C. Right-Turn Concept Layout
D. Count Data
E. Volume Development
F. Year 2024 Total Traffic Conditions Worksheets
G. Left-Turn Lane Warrant Worksheets
H. Signal Warrant Worksheets
I. Access Management Plan

Appendix A
Right-Turn Lane Warrant Worksheet

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.

Appendix B
Queueing Worksheet

Queuing and Blocking Report
Alternative 3 AM

02/25/2021

Intersection: 11: Oregon St & Allied Systems Ice Age Drive

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	L	TR	L	T	R	L	TR
Maximum Queue (ft)	34	137	31	35	178	122	93	107
Average Queue (ft)	5	62	10	7	93	48	38	47
95th Queue (ft)	26	113	32	28	159	93	73	92
Link Distance (ft)	94	269	269		449			650
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)				200		200	250	
Storage Blk Time (%)					0	0		
Queuing Penalty (veh)					0	0		

Intersection: 13: Oregon St & Blast Cleaning

Movement	WB	WB	NB	SB
Directions Served	L	R	TR	L
Maximum Queue (ft)	38	30	20	61
Average Queue (ft)	10	7	1	18
95th Queue (ft)	34	27	9	50
Link Distance (ft)	237	237	170	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				200
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 14: Oregon St & Tonquin Rd

Movement	WB	WB	NB	NB	SB	SB	B15
Directions Served	L	R	T	R	L	T	T
Maximum Queue (ft)	250	775	12	69	200	298	29
Average Queue (ft)	246	750	1	26	102	30	1
95th Queue (ft)	257	800	7	56	190	206	22
Link Distance (ft)		736	308	308		636	170
Upstream Blk Time (%)		96				1	0
Queuing Penalty (veh)		0				2	0
Storage Bay Dist (ft)	200				150		
Storage Blk Time (%)	100				10	0	
Queuing Penalty (veh)	182				21	0	

Zone Summary

Zone wide Queuing Penalty: 206

Queuing and Blocking Report
Alternative 3 PM

02/25/2021

Intersection: 11: Oregon St & Allied Systems Ice Age Drive

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	L	TR	T	R	L	TR
Maximum Queue (ft)	80	254	67	179	99	36	221
Average Queue (ft)	30	122	26	65	25	6	92
95th Queue (ft)	62	209	57	131	68	27	169
Link Distance (ft)	94	257	257	448			651
Upstream Blk Time (%)	0	0					
Queuing Penalty (veh)	0	0					
Storage Bay Dist (ft)					200	250	
Storage Blk Time (%)				0	0		0
Queuing Penalty (veh)				0	0		0

Intersection: 13: Oregon St & Blast Cleaning

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	68	73	34
Average Queue (ft)	29	34	3
95th Queue (ft)	62	57	19
Link Distance (ft)	237	237	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			250
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 14: Oregon St & Tonquin Rd

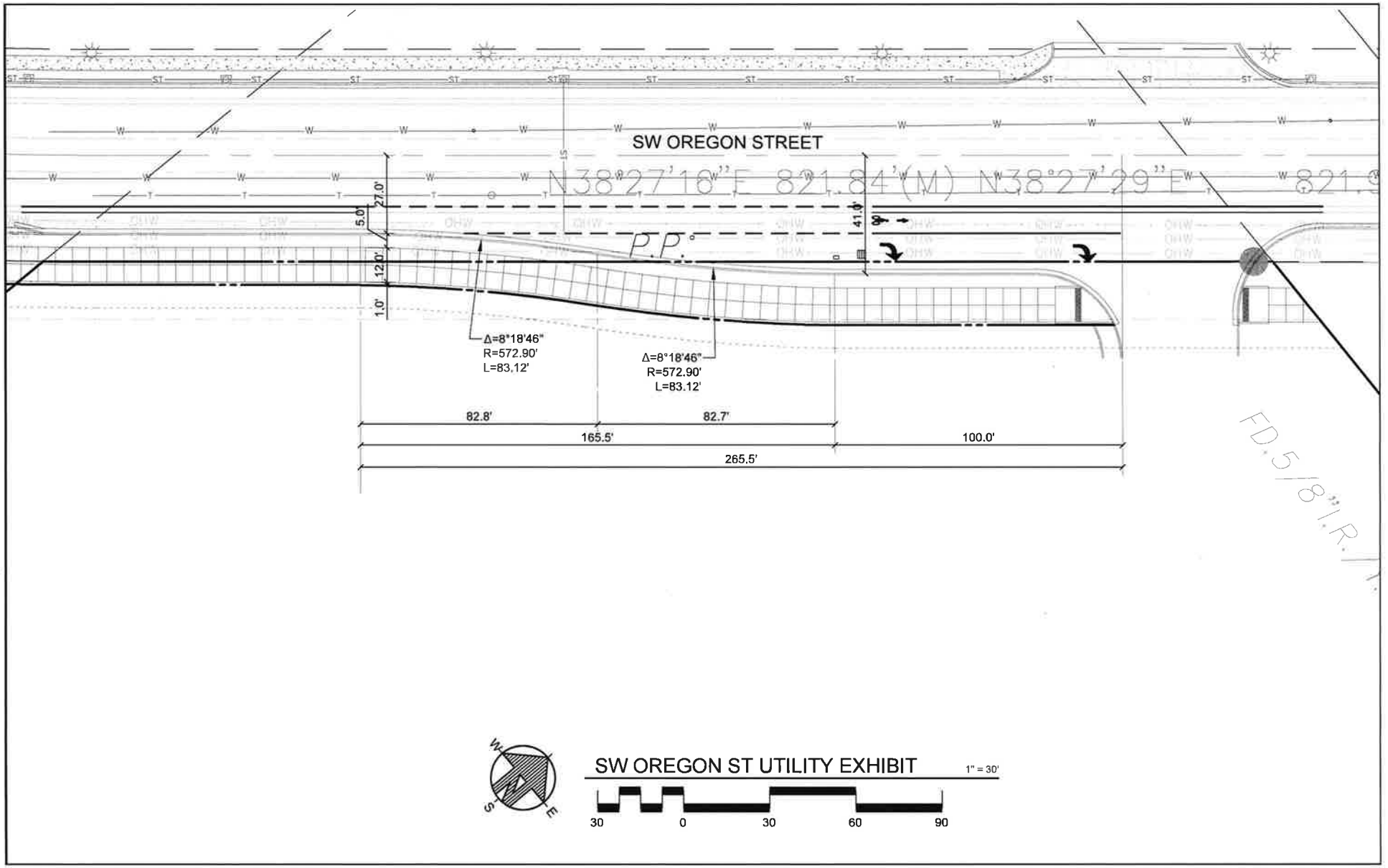
Movement	WB	WB	NB	NB	SB	SB
Directions Served	L	R	T	R	L	T
Maximum Queue (ft)	250	794	3	26	108	58
Average Queue (ft)	249	758	0	5	47	3
95th Queue (ft)	251	774	3	21	86	30
Link Distance (ft)		736	308	308		636
Upstream Blk Time (%)		100				
Queuing Penalty (veh)		0				
Storage Bay Dist (ft)	200				150	
Storage Blk Time (%)	100	0			0	0
Queuing Penalty (veh)	128	1			0	0

Zone Summary

Zone wide Queuing Penalty: 130

Appendix C
Right-Turn Concept Layouts

Exhibit A3



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Appendix D
Count Data

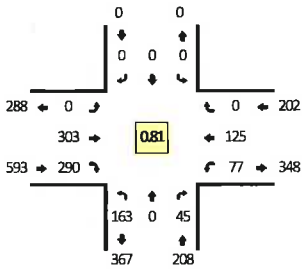
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

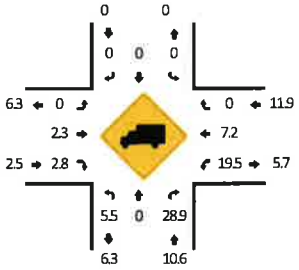
LOCATION: SW Tonquin Rd -- SW Oregon St
CITY/STATE: Sherwood, OR

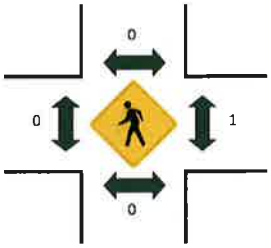
QC JOB #: 15848307
DATE: Thu, Jun 2 2022

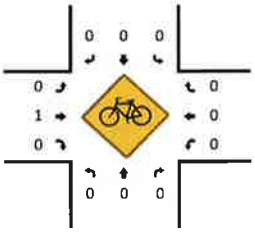
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

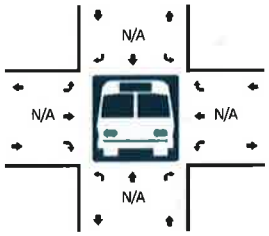


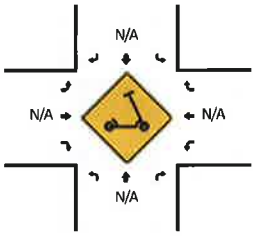
Quality Counts
DATA THAT DRIVES COMMUNITIES











15-Min Count Period Beginning At	SW Tonquin Rd (Northbound)				SW Tonquin Rd (Southbound)				SW Oregon St (Eastbound)				SW Oregon St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	22	0	16	0	0	0	0	0	0	68	46	0	15	18	0	0	185	
7:15 AM	38	0	9	0	0	0	0	0	0	71	60	0	13	20	0	0	211	
7:30 AM	40	0	8	0	0	0	0	0	0	87	70	0	19	19	0	0	243	
7:45 AM	49	0	8	0	0	0	0	0	0	92	94	0	22	43	0	0	308	947
8:00 AM	30	0	9	0	0	0	0	0	0	71	74	0	21	31	0	0	236	998
8:15 AM	44	0	20	0	0	0	0	0	0	53	52	0	15	32	0	0	216	1003
8:30 AM	26	0	14	0	0	0	0	0	0	50	45	0	25	17	0	0	177	937
8:45 AM	45	0	14	0	0	0	0	0	0	55	50	0	20	41	0	0	225	854

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	196	0	32	0	0	0	0	0	0	368	376	0	88	172	0	0	1232
Heavy Trucks	12	0	4		0	0	0		0	8	4		16	4	0		48
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 6/9/2022 1:44 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

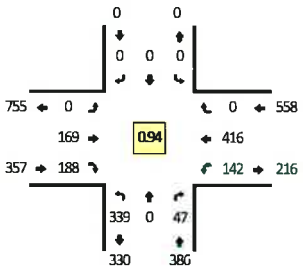
Type of peak hour being reported: Intersection Peak

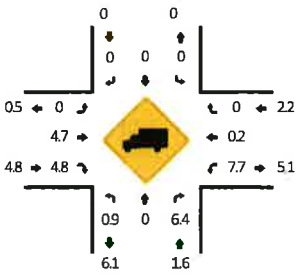
Method for determining peak hour: Total Entering Volume

LOCATION: SW Tonquin Rd -- SW Oregon St
CITY/STATE: Sherwood, OR

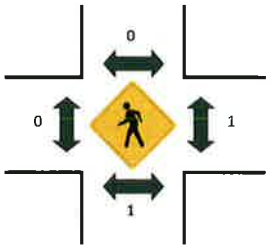
QC JOB #: 15848308
DATE: Thu, Jun 2 2022

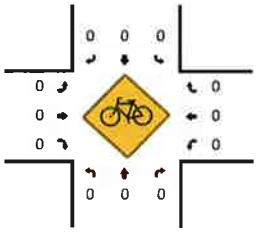
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

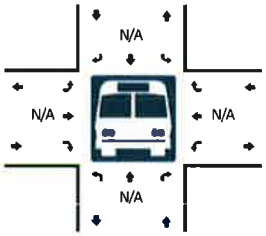


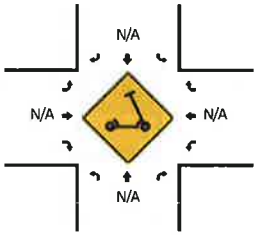


Quality Counts
DATA THAT DRIVES COMMUNITIES









15-Min Count Period Beginning At	SW Tonquin Rd (Northbound)				SW Tonquin Rd (Southbound)				SW Oregon St (Eastbound)				SW Oregon St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	51	0	18	0	0	0	0	0	0	60	43	0	32	86	0	0	290	
4:15 PM	81	0	15	0	0	0	0	0	0	47	45	0	34	70	0	0	292	
4:30 PM	75	0	10	0	0	0	0	0	0	31	62	0	34	94	0	0	306	
4:45 PM	88	0	10	0	0	0	0	0	0	44	37	0	36	92	0	0	307	1195
5:00 PM	91	0	14	0	0	0	0	0	0	48	48	0	28	116	0	0	345	1250
5:15 PM	85	0	13	0	0	0	0	0	0	46	41	0	44	114	0	0	343	1301
5:30 PM	63	0	9	0	0	0	0	0	0	37	40	0	31	98	0	0	278	1273
5:45 PM	76	0	9	0	0	0	0	0	0	38	44	0	21	82	0	0	270	1236

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	364	0	56	0	0	0	0	0	0	192	192	0	112	464	0	0	1380
Heavy Trucks	0	0	0		0	0	0		0	8	20		0	0	0		36
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 6/9/2022 1:44 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

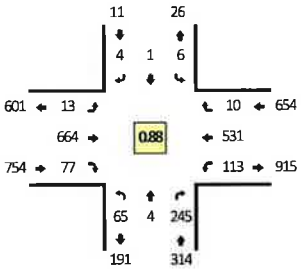
Type of peak hour being reported: Intersection Peak

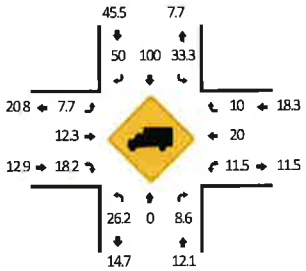
Method for determining peak hour: Total Entering Volume

LOCATION: SW Oregon St -- SW Tualatin Sherwood Rd
CITY/STATE: Sherwood, OR

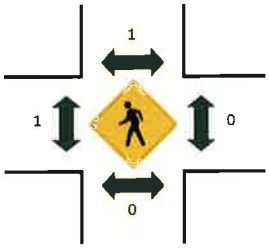
QC JOB #: 15788605
DATE: Thu, Apr 28 2022

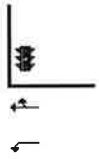
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

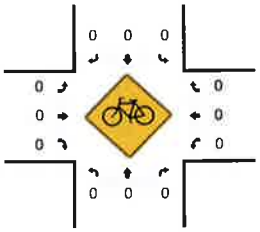


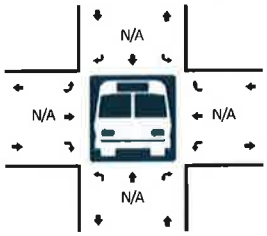


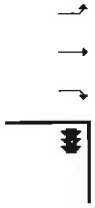
Quality Counts
DATA THAT DRIVES COMMUNITIES

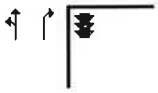


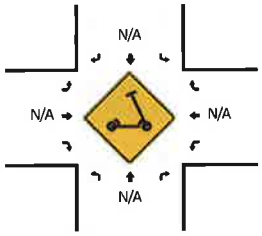












5-Min Count Period Beginning At	SW Oregon St (Northbound)				SW Oregon St (Southbound)				SW Tualatin Sherwood Rd (Eastbound)				SW Tualatin Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	16	0	0	0	0	0	0	53	5	0	8	45	1	0	128	
7:05 AM	3	1	19	0	0	0	0	0	0	37	6	0	6	34	0	0	106	
7:10 AM	4	0	23	0	0	0	0	0	1	73	7	0	7	40	0	0	155	
7:15 AM	6	0	26	0	1	0	0	0	1	36	2	0	6	37	0	0	115	
7:20 AM	0	0	25	0	1	0	0	0	0	63	8	0	5	47	1	0	150	
7:25 AM	1	0	22	0	1	0	0	0	0	45	7	0	6	42	0	0	124	
7:30 AM	6	0	22	0	2	0	0	0	0	64	5	0	8	47	0	0	154	
7:35 AM	3	0	16	0	0	0	0	0	2	60	4	0	5	57	1	0	148	
7:40 AM	4	1	19	0	2	0	0	0	0	55	3	0	9	36	0	0	129	
7:45 AM	10	0	29	0	1	0	0	0	0	59	7	0	9	57	1	0	173	
7:50 AM	0	0	23	0	0	0	0	0	1	60	9	0	17	50	0	0	160	
7:55 AM	8	3	27	0	0	0	0	0	3	51	10	0	11	41	4	0	158	1700
8:00 AM	3	0	8	0	0	1	0	0	1	56	12	0	7	33	1	0	122	1694
8:05 AM	7	0	22	0	1	0	0	0	2	55	4	0	5	34	1	0	131	1719
8:10 AM	6	0	23	0	0	0	0	0	1	48	1	0	10	29	0	0	118	1682
8:15 AM	4	0	17	0	0	0	4	0	1	61	9	0	8	51	1	0	156	1723
8:20 AM	7	0	27	0	0	0	0	0	0	42	9	1	14	43	0	0	143	1716
8:25 AM	7	0	12	0	0	0	0	0	1	53	4	0	10	53	1	0	141	1733
8:30 AM	3	0	20	0	1	0	0	0	0	57	5	0	4	31	0	0	121	1700
8:35 AM	5	1	23	0	0	0	0	0	1	47	5	0	10	52	1	0	145	1697
8:40 AM	3	0	33	0	0	0	0	0	1	50	10	0	14	46	0	0	157	1725
8:45 AM	2	0	8	0	1	0	0	0	1	43	5	0	10	46	0	0	116	1668
8:50 AM	9	0	20	0	0	0	0	0	0	62	5	0	7	31	0	0	134	1642
8:55 AM	0	0	16	0	1	0	0	0	0	44	6	0	9	67	0	0	143	1627

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	72	12	316	0	4	0	0	0	16	680	104	0	148	592	20	0	1964
Heavy Trucks	16	0	28		4	0	0		0	48	16		12	104	0		228
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 5/9/2022 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

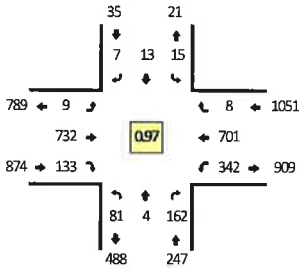
Type of peak hour being reported: Intersection Peak

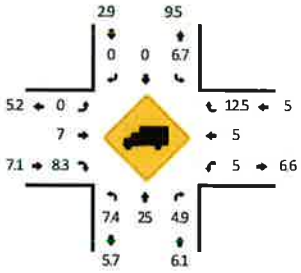
Method for determining peak hour: Total Entering Volume

LOCATION: SW Oregon St -- SW Tualatin Sherwood Rd
CITY/STATE: Sherwood, OR

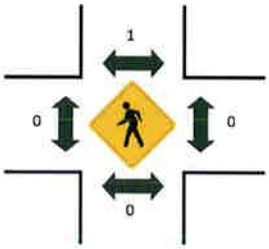
QC JOB #: 15788606
DATE: Wed, Apr 27 2022

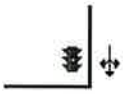
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

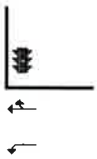


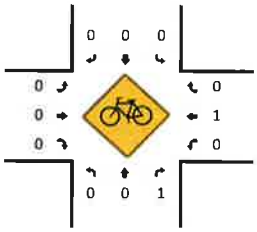


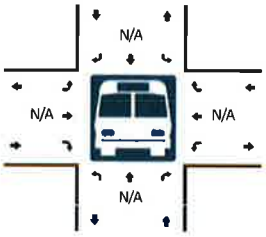
Quality Counts
DATA THAT DRIVES COMMUNITIES

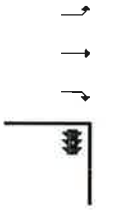


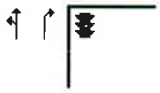


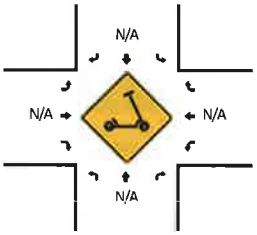












5-Min Count Period Beginning At	SW Oregon St (Northbound)				SW Oregon St (Southbound)				SW Tualatin Sherwood Rd (Eastbound)				SW Tualatin Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	1	0	11	0	1	0	2	0	0	38	12	0	21	58	1	0	145	
4:05 PM	11	0	16	0	2	1	1	0	0	51	13	0	11	54	0	0	160	
4:10 PM	4	0	12	0	2	1	1	0	0	78	12	0	22	64	0	0	196	
4:15 PM	4	0	11	0	1	3	0	0	0	60	7	0	22	53	0	0	161	
4:20 PM	6	1	14	0	2	0	1	0	0	42	10	0	31	52	0	0	159	
4:25 PM	8	0	10	0	4	1	1	0	0	62	11	0	19	50	3	0	169	
4:30 PM	7	0	8	0	1	2	0	0	0	59	6	0	31	73	0	0	187	
4:35 PM	4	0	16	0	2	1	2	0	2	70	5	0	27	62	0	0	191	
4:40 PM	10	0	11	0	1	0	1	0	3	51	13	0	28	51	1	0	170	
4:45 PM	10	0	9	0	3	1	0	0	0	55	8	0	39	54	1	0	180	
4:50 PM	7	0	13	0	1	0	0	0	0	70	13	0	33	58	3	0	198	
4:55 PM	6	0	13	0	1	0	0	0	1	76	17	0	26	50	0	0	190	2106
5:00 PM	7	1	16	0	1	2	3	0	0	49	15	0	34	44	1	0	173	2134
5:05 PM	5	0	12	0	1	1	0	0	0	59	17	0	22	53	0	0	170	2144
5:10 PM	5	2	17	0	0	3	0	0	1	63	6	0	21	61	1	0	180	2128
5:15 PM	7	1	14	0	3	1	1	0	1	56	9	0	25	67	0	0	185	2152
5:20 PM	7	0	20	0	0	2	0	0	0	65	15	0	23	69	0	0	201	2194
5:25 PM	6	0	13	0	1	0	0	0	1	59	9	0	33	59	1	0	182	2207
5:30 PM	4	0	10	0	0	0	0	0	0	54	5	0	36	56	0	0	165	2185
5:35 PM	3	1	8	0	2	0	0	0	1	53	11	0	31	60	0	0	170	2164
5:40 PM	6	0	11	0	2	0	1	0	1	65	8	0	19	78	1	0	192	2186
5:45 PM	5	0	18	0	1	0	0	0	0	68	9	0	29	49	0	0	179	2185
5:50 PM	9	0	11	0	1	0	0	0	0	47	6	0	17	64	0	0	155	2142
5:55 PM	2	0	12	0	0	0	0	0	0	49	6	0	19	36	0	0	124	2076

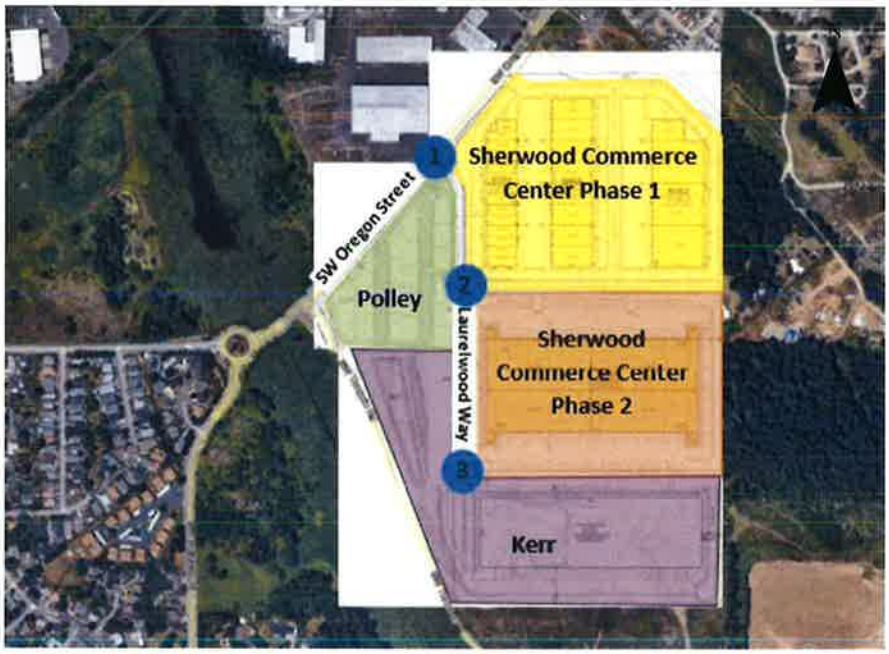
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	92	0	140	0	20	4	0	0	4	804	152	0	392	648	16	0	2272
Heavy Trucks	8	0	4		0	0	0		0	40	12		24	48	4		140
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	4	0		4
Scooters																	

Comments:

Report generated on 5/9/2022 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

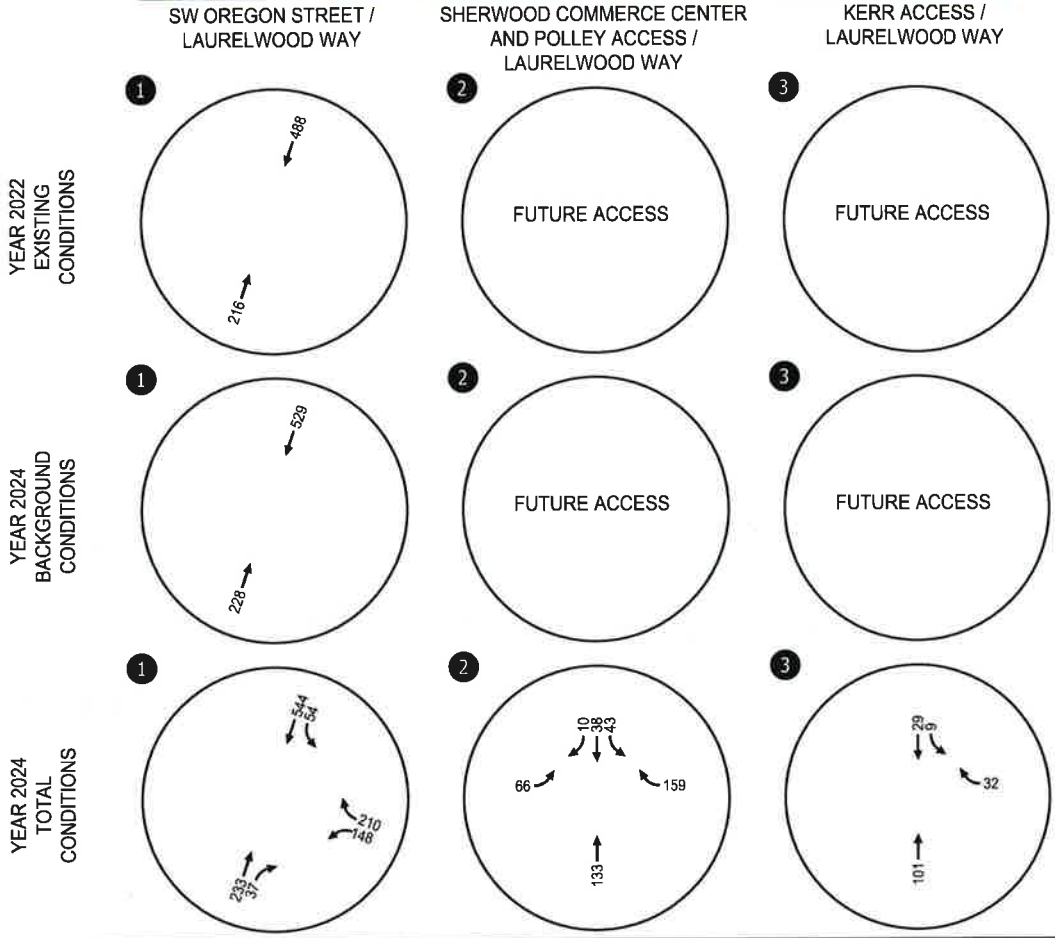
Appendix E
Volume Development



	SW OREGON STREET / LAURELWOOD WAY	SHERWOOD COMMERCE CENTER AND POLLEY ACCESS / LAURELWOOD WAY	KERR ACCESS / LAURELWOOD WAY
YEAR 2022 EXISTING CONDITIONS	1: 191, 349	2: FUTURE ACCESS	3: FUTURE ACCESS
YEAR 2024 BACKGROUND CONDITIONS	1: 202, 386	2: FUTURE ACCESS	3: FUTURE ACCESS
YEAR 2024 TOTAL CONDITIONS	1: 207, 220, 48, 33, 401, 157	2: 75, 138, 163, 10, 38, 33	3: 105, 33, 8, 25

Traffic Volume Development
Weekday AM Peak Hour
Sherwood, Oregon

Figure
E-1



Traffic Volume Development
Weekday PM Peak Hour
Sherwood, Oregon

Figure
E-2

Appendix F
Year 2024 Total Traffic Conditions Worksheets

HCM Unsignalized Intersection Capacity Analysis
102: Oregon St & Tonquin Court

11/21/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	33	48	401	157	220	207
Future Volume (Veh/h)	33	48	401	157	220	207
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	38	55	456	178	250	235
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1191	456			634	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1191	456			634	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	73	91			72	
cM capacity (veh/h)	142	582			898	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	93	456	178	485
Volume Left	38	0	0	250
Volume Right	55	0	178	0
cSH	257	1700	1700	898
Volume to Capacity	0.36	0.27	0.10	0.28
Queue Length 95th (ft)	40	0	0	29
Control Delay (s)	26.8	0.0	0.0	7.1
Lane LOS	D			A
Approach Delay (s)	26.8	0.0		7.1
Approach LOS	D			

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
201: Tonquin Court & Polley Access/SCC Access

11/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	0	0	0	0	38	0	33	0	163	138	75
Future Volume (Veh/h)	10	0	0	0	0	38	0	33	0	163	138	75
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	11	0	0	0	0	43	0	38	0	185	157	85
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	650	608	200	608	650	38	242			38		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	650	608	200	608	650	38	242			38		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	97	100	100	100	100	96	100			88		
cM capacity (veh/h)	318	348	814	356	328	1003	1263			1504		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	11	43	38	427
Volume Left	11	0	0	185
Volume Right	0	43	0	85
cSH	318	1003	1263	1504
Volume to Capacity	0.03	0.04	0.00	0.12
Queue Length 95th (ft)	3	3	0	10
Control Delay (s)	16.7	8.7	0.0	4.0
Lane LOS	C	A		A
Approach Delay (s)	16.7	8.7	0.0	4.0
Approach LOS	C	A		

Intersection Summary				
Average Delay	4.4			
Intersection Capacity Utilization	41.4%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
202: Tonquin Court & SCC Access

11/21/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	8	25	0	33	105
Future Volume (Veh/h)	0	8	25	0	33	105
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	9	28	0	38	119
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	223	28			28	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	223	28			28	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	100	99			97	
cM capacity (veh/h)	723	1016			1517	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	9	28	157
Volume Left	0	0	38
Volume Right	9	0	0
cSH	1016	1700	1517
Volume to Capacity	0.01	0.02	0.03
Queue Length 95th (ft)	1	0	2
Control Delay (s)	8.6	0.0	2.0
Lane LOS	A		A
Approach Delay (s)	8.6	0.0	2.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	24.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
102: Oregon St & Laurelwood Way

11/21/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	148	210	233	37	54	544
Future Volume (Veh/h)	148	210	233	37	54	544
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	161	228	253	40	59	591
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	962	253			293	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	962	253			293	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	39	70			95	
cM capacity (veh/h)	264	771			1235	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	389	253	40	650
Volume Left	161	0	0	59
Volume Right	228	0	40	0
cSH	429	1700	1700	1235
Volume to Capacity	0.91	0.15	0.02	0.05
Queue Length 95th (ft)	246	0	0	4
Control Delay (s)	54.5	0.0	0.0	1.3
Lane LOS	F			A
Approach Delay (s)	54.5	0.0		1.3
Approach LOS	F			

Intersection Summary				
Average Delay	16.5			
Intersection Capacity Utilization	75.0%	ICU Level of Service	D	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
201: Tonquin Court & Polley Access/SCC Access

11/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	66	0	0	0	0	159	0	133	0	43	38	10
Future Volume (Veh/h)	66	0	0	0	0	159	0	133	0	43	38	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	72	0	0	0	0	173	0	145	0	47	41	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	458	286	46	286	291	145	52			145		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	458	286	46	286	291	145	52			145		
tC, single (s)	7.2	6.5	6.2	7.2	6.5	6.3	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.6	4.0	3.4	2.2			2.3		
p0 queue free %	82	100	100	100	100	80	100			97		
cM capacity (veh/h)	394	603	1023	638	599	887	1554			1401		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	72	173	145	99
Volume Left	72	0	0	47
Volume Right	0	173	0	11
cSH	394	887	1554	1401
Volume to Capacity	0.18	0.20	0.00	0.03
Queue Length 95th (ft)	16	18	0	3
Control Delay (s)	16.2	10.0	0.0	3.8
Lane LOS	C	B		A
Approach Delay (s)	16.2	10.0	0.0	3.8
Approach LOS	C	B		

Intersection Summary				
Average Delay	6.7			
Intersection Capacity Utilization	38.8%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
202: Tonquin Court & SCC Access

11/21/2022

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	32	101	0	9	29
Future Volume (Veh/h)	0	32	101	0	9	29
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	35	110	0	10	32
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	162	110			110	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	162	110			110	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	100	96			99	
cM capacity (veh/h)	809	927			1443	

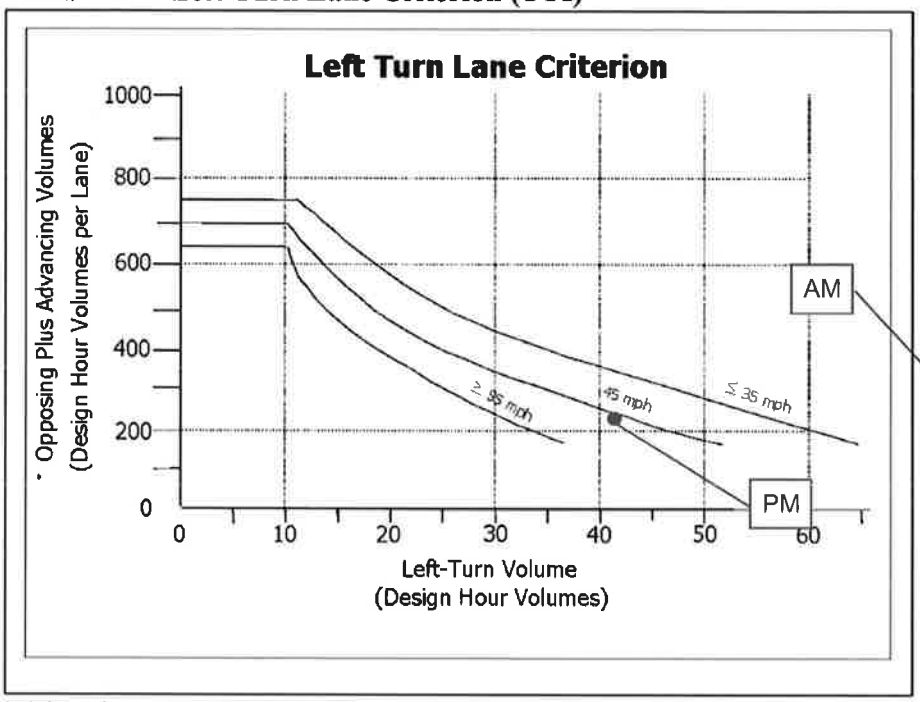
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	35	110	42
Volume Left	0	0	10
Volume Right	35	0	0
cSH	927	1700	1443
Volume to Capacity	0.04	0.06	0.01
Queue Length 95th (ft)	3	0	1
Control Delay (s)	9.0	0.0	1.8
Lane LOS	A		A
Approach Delay (s)	9.0	0.0	1.8
Approach LOS	A		

Intersection Summary				
Average Delay		2.1		
Intersection Capacity Utilization		18.7%	ICU Level of Service	A
Analysis Period (min)		15		

Appendix G
Left-Turn Lane Warrant Worksheets

2024 Left Turn Lane
Intersection #2

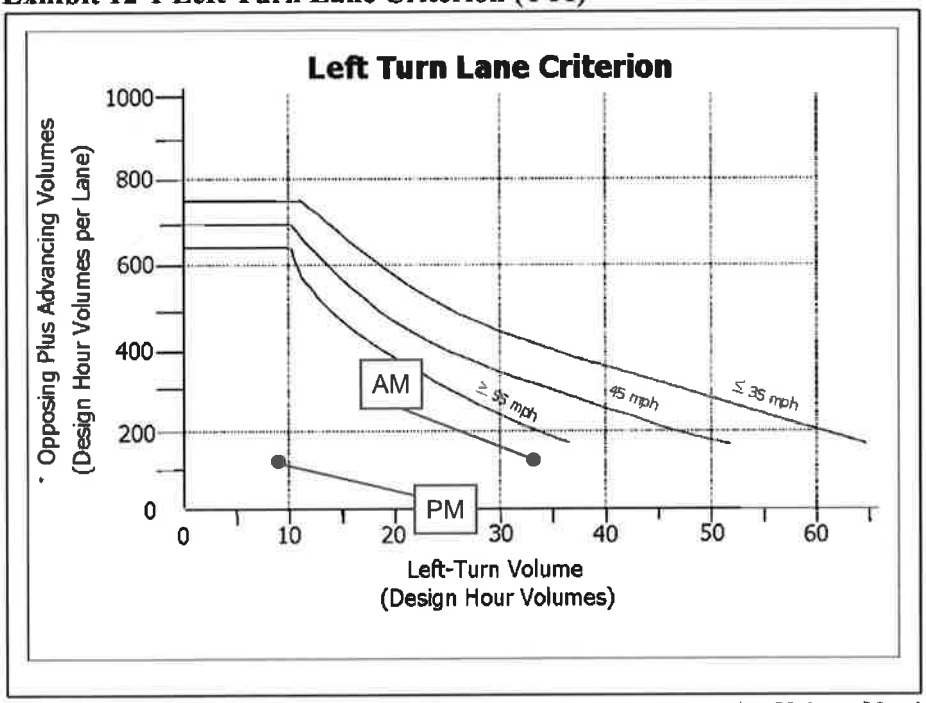
Exhibit 12-1 Left Turn Lane Criterion (TTI)



*(Advancing Volume/Number of Advancing Through Lanes) + (Opposing Volume/Number of Opposing Through Lanes)
Opposing left turns are not counted as opposing volumes

2024 Left Turn Lane
Intersection #3

Exhibit 12-1 Left Turn Lane Criterion (TTI)



*(Advancing Volume/Number of Advancing Through Lanes) + (Opposing Volume/Number of Opposing Through Lanes)
Opposing left turns are not counted as opposing volumes

Appendix H
Signal Warrant Worksheets

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	Oregon Street	**Minor Street:**	Laurelwood Way
Project:	Sherwood Commerce Center	**City/County:**	Sherwood
Year:	2022	**Alternative:**	SCC, Polley, Kerr

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	8680	N
	Minor	1	2650	1480	
Case B	Major	1	13300	8680	N
	Minor	1	1350	1480	

Analyst and Date:

Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Analysis Procedures Manual

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	Oregon Street	**Minor Street:**	Laurelwood Way
Project:	Sherwood Commerce Center	**City/County:**	Sherwood
Year:	2022	**Alternative:**	SCC Phase 1+2, Polley, Kerr, 925 KSF LUC 130

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	1	8850	9370	Y
	Minor	1	2650	2717	
Case B	Major	1	13300	9370	N
	Minor	1	1350	2717	

Analyst and Date:

Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

KITTELSON & ASSOCIATES, INC.
851 SW 6th Ave, Suite 600
Portland, Oregon 97204
(503) 228-5230

Project #: 26314
Project Name: Sherwood Commerce Center
Analyst: KMC
Date: 11/21/2022
File: H:\26\26314 - Sherwood Commerce Center\analysis\County Addendum_Analysis\Signal Warrant\[MUTCD Signal Warrant - sensitivity.xls]Data
Intersection: Oregon Street/Laurelwood Way
Scenario: 2022 SCC Phase 1 +2, Polley, Kerr + 350 KSF LI

Analysis Traffic Volumes

Hour		Major Street		Minor Street	
Begin	End	NB	SB	EB	WB
4:00 PM	5:00 PM	279	615	0	181
2nd Highest Hour		261	575	0	179
3rd Highest Hour		257	567	0	163
4th Highest Hour		250	551	0	146
5th Highest Hour		228	503	0	122
6th Highest Hour		225	495	0	120
7th Highest Hour		210	463	0	114
8th Highest Hour		196	431	0	102
9th Highest Hour		196	431	0	100
10th Highest Hour		192	423	0	98
11th Highest Hour		181	399	0	94
12th Highest Hour		170	375	0	92
13th Highest Hour		167	367	0	89
14th Highest Hour		159	351	0	89
15th Highest Hour		127	280	0	73
16th Highest Hour		120	264	0	63
17th Highest Hour		109	240	0	53
18th Highest Hour		94	208	0	41
19th Highest Hour		76	168	0	37
20th Highest Hour		36	80	0	24
21st Highest Hour		33	72	0	12
22nd Highest Hour		22	48	0	10
23rd Highest Hour		18	40	0	6
24th Highest Hour		18	40	0	6

Warrant Summary

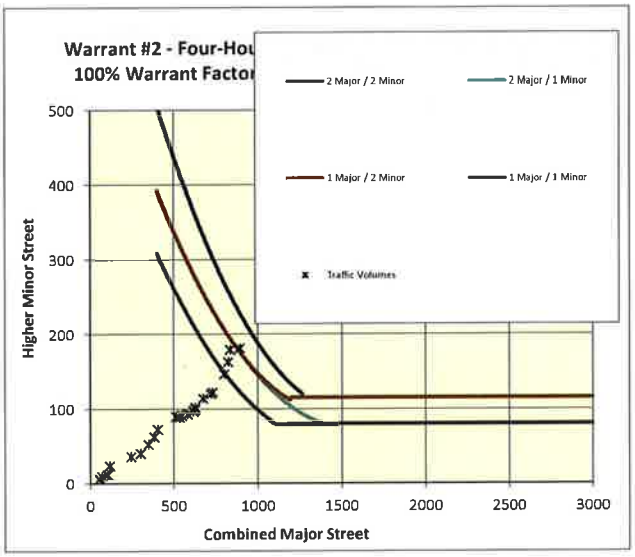
Warrant	Name	Analyzed?	Met?
#1	Eight-Hour Vehicular Volume	Yes	No
#2	Four-Hour Vehicular volume	Yes	No
#3	Peak Hour	Yes	No
#4	Pedestrian Volume	No	-
#5	School Crossing	No	-
#6	Coordinated Signal System	No	-
#7	Crash Experience	No	-
#8	Roadway Network	No	-
#9	Intersection Near a Grade Crossing	No	-

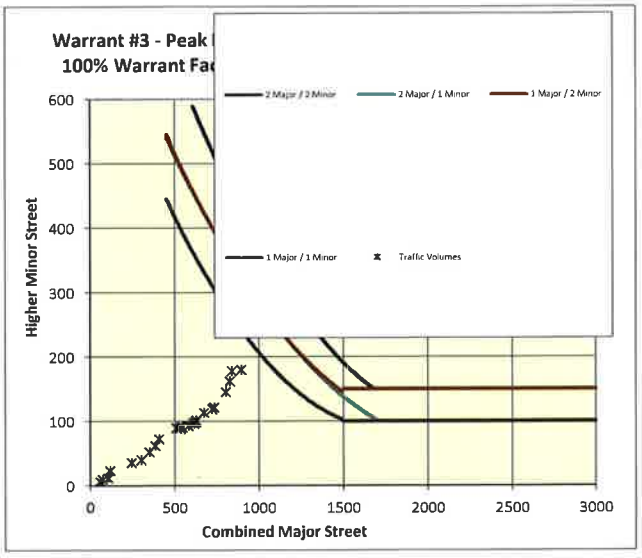
Input Parameters

Volume Adjustment Factor =	1.0
North-South Approach =	Major
East-West Approach =	Minor
Major Street Thru Lanes =	1
Minor Street Thru Lanes =	1
Speed > 40 mph?	No
Population < 10,000?	No
Warrant Factor	100%
Peak Hour or Daily Count?	Peak Hour
Major Street: 4th-Highest Hour / Peak Hour	90%
Major Street: 8th-Highest Hour / Peak Hour	70%
Minor Street: 4th-Highest Hour / Peak Hour	81%
Minor Street: 8th-Highest Hour / Peak Hour	56%

Warrant #1 - Eight Hour

Warrant Factor	Condition	Major Street Requirement	Minor Street Requirement	Hours That Condition is Met	Condition for Warrant Factor Met?	Signal Warrant Met?
100%	A	500	150	3	No	**No**
	B	750	75	4	No	
80%	A	400	120	6	No	**Yes**
	B	600	60	10	Yes	
70%	A	350	105	7	No	**Yes**
	B	525	53	13	Yes	
56%	A	280	84	14	Yes	**Yes**
	B	420	42	14	Yes	





Appendix I
Access Management Plan

DKS 720 SW WASHINGTON STREET, SUITE 500, PORTLAND, OR 97205 • 503.243.3500 • DKSASSOCIATES.COM

TECHNICAL MEMORANDUM

DATE: June 25, 2021

TO: Bob Galati | City of Sherwood

FROM: Garth Appanaitis | DKS

SUBJECT: Sherwood Oregon Street Access Management Plan (AMP) Project #16197-037

This memorandum summarizes the findings of the transportation study to address Washington County's Access Management Plan (AMP) process (CDC 501-8.5C) to analyze the potential for future roadway connections to Oregon Street between Tonquin Road and Tualatin-Sherwood Road. Oregon Street has the functional classification of arterial and Washington County CDC 501.8.5.B(4) states that arterials only have direct access from collector or other arterial roads and with a minimum access spacing of 600 feet.

The AMP process provides the framework for analyzing the traffic safety and operations of potential exceptions to the access standard, as well as the performance of future public street connections that comply with the standard. The AMP was conducted to explore the feasibility of future street connections to the south/east side of Oregon Street between Tonquin Road and the planned future extension of an east-west collector that bisects the Tonquin Employment Area (TEA). Prior planning efforts have identified the future collector connection to Oregon Street, but have not reviewed access to individual properties within the TEA.

OVERVIEW

Three access alternatives (phases) were analyzed to determine the traffic operations and safety associated with increasing levels of development and transportation improvements. These *chronological* configurations (illustrations attached) would be implemented in phases to provide access to TEA and are assumed to include:

1. Alternative 1 – Initial, direct access to Oregon Street for the two fronting properties Taxlots 2S128C000500 and 2S128C000600 (TL 500 and TL 600). The purpose of this configuration is to provide access prior to the construction of additional public street system. Development of additional parcels within the TEA is not included in this initial configuration.

This temporary alternative would not meet Washington County access spacing requirements due to direct lot access to the Oregon Street arterial.

2. Alternative 2 – Intermediate, shared access to Oregon Street for properties via a public street connection, Tonquin Court. This alternative assumes development of remaining TEA properties, with shared access to Tonquin Court. This new street also would include additional partial direct access for TL 500 and TL 600. This temporary alternative would not meet Washington County access spacing requirements due to direct lot access, as well as a local street[1] (Tonquin Count) connection, to the Oregon Street arterial.

3. Alternative 3 – Ultimate access configuration that meets Washington County access management standards. The key element of this ultimate configuration would be the construction of the new east-west collector between Oregon Street and a point to the east (likely connecting to 124th Avenue). The extension of the new collector would provide connectivity to the east, as well as a connection for Tonquin Court to provide secondary ingress/egress for properties within the TEA.

KEY FINDINGS AND RECOMMENDATIONS

The follow describes the key findings and recommended actions and triggers related to each access configuration. The three access alternatives provide an evolving approach to providing access to properties within the TEA with progressing levels of development and access needs.

1. The initial Alternative 1 (direct access for two stop-controlled driveways) would not alter traffic flow on Oregon Street and would meet City and County mobility standards. The driveways should align with existing driveways or shift existing driveways to align, but traffic queuing at driveways along Oregon Street would be minimal.

   Recommendations:

   - Provide direct full access (stop-controlled) for TL 500, locating the access on Oregon Street at the future (Alternative 2) connection for Tonquin Court. The future location of Tonquin Court (and potential alignment to address the skew with Oregon Street) will dictate the location of this interim access and will require future study.[2]

   - The existing driveway for TL 501 on the north side of Oregon Street may need to be relocated to be placed opposite of the TL 500 driveway. This driveway is not

[1] Local street functional classification is assumed since the stub roadway would serve local access only and would not be a through street to provide circulation for other trips. Future extension of the street to connect eastward to the east-west collector could change the function of the street (as in Alternative 3) and could affect consideration of functional class designation.

[2] The specific location and design of the Tonquin Court intersection will depend on several factors including sight distance on Oregon Street, placement of the roadway near property edges, approach angle and skew of the roadway approaching Oregon Street, and other topographical considerations.

currently active[3] and relocation may be deferred to the construction of Tonquin Court.

- Dedicate right of way for the future extension of Tonquin Court.
- Dedicate right of way along Oregon Street for frontage improvements including the planned shared use path and potential northbound right turn lanes at each driveway.
- Provide direct full access (stop-controlled) for TL 600 to Oregon Street. This driveway should be located opposite of the existing driveway for TL 201 to create a 4-legged intersection. Note that this driveway may be placed in the future location of the east-west collector (location to be determined).
- Provide direct full access (stop-controlled) for TL 700 to Oregon Street. This driveway should be located opposite of an existing driveway and may be the future alignment of the east-west collector (location to be determined). Future ROW for the east-west collector should be dedicated and TL 600 would take access from this location (and close initial TL 600 driveway)
- Proceed to Alternative 2 access configuration as additional lots within the TEA begin to develop and require access and/or add additional traffic that requires a traffic signal on Oregon Street at Tonquin Court.

2. The Alternative 2 intermediate access configuration would install a traffic signal at Tonquin Court as a shared access location. The back-to-back vehicle queues would dictate storage needs. However, the vehicle queues should be accommodated within available storage (center turn lane on Oregon Street). Turn restrictions (converting to right-in-right-out) at the north (TL 600) driveway would increase storage distance for this movement.

   Recommendations:

   - Extend the initial TL 500 driveway as Tonquin Court to provide access to parcels to the south, including additional access for TL 600.
   - Reconfigure access to TL 500 to connect to Tonquin Court.
   - Reconfigure access for TL 600 to modify initial Oregon Street driveway to right-in-right-out condition and add full access driveway to Tonquin Court. Modification of the Oregon Street TL 600 driveway to right-in-right-out would also impact the existing driveway for TL 201, converting it to right-in-right-out.
   - Convert traffic control at Tonquin Court / Oregon Street to a traffic signal (when warranted).

[3] Driveway is gated and is additionally blocked with parked machinery on site.

- Proceed to Alternative 3 access configuration upon completion of the east-west collector.

3. The ultimate access configuration (Alternative 3) would meet Washington County access spacing requirements and would be dependent on the completion of the new east-west collector. The specific placement of the east-west collector may vary, but would not impact the analysis findings, as long as opposite side driveways were aligned to reduce conflicts.

   Recommendations:

   - Connect the east-west collector to Oregon Street as a signalized intersection. The collector should intersect Oregon Street as a four-legged intersection opposite a driveway serving properties north of Oregon Street. The location of this intersection may require relocation of an existing driveway(s) north of Oregon Street.
   - Extend the east-west collector to the east to connect it to the existing transportation network (assumed connection to 124th Avenue).
   - Include a northbound right turn lane on Oregon Street at the east-west collector intersection.
   - Extend Tonquin Court to connect it to the east-west collector, creating a through connection that would provide local access to the east or west.
   - Remove the traffic signal at the Tonquin Court / Oregon Street intersection and restrict the intersection to right-in-right-out movements.
   - Close Oregon Street access for TL 700 and relocate access to the east-west collector (located 300 feet or more from Oregon Street). Access should be placed opposite access to TL 600.
   - Add TL 600 driveway access to the east-west collector (located 300 feet or more from Oregon Street). Access should be placed opposite access to TL 700.

ADDITIONAL CONTEXT

- Current Use and Access – Properties along both sides of Oregon Street currently have direct access to the arterial. Industrial properties on the north side of Oregon Street are generally developed, while properties on the south side have limited existing development. The existing driveways along Oregon Street generally do not meet the access spacing standard of 600 feet, and do not comply with the standard due to access type (driveway).
- Future Transportation Improvements – Several future transportation improvements have been identified in the area in Sherwood's Transportation System Plan (TSP). These projects do not have identified funding unless noted:

  - Tualatin-Sherwood Road widening to five lanes (identified funding through Washington County MSTIP) [TSP project D1]
  - New east-west collector through the TEA connecting Oregon Street to 124th Avenue [TSP project D20]
  - Traffic control (roundabout) upgrade at the intersections of Tonquin Road and Murdock Road [TSP project D3]
  - Shared use paths segments that are part of the Ice Age Tonquin Trail system [TSP projects P11, P16, P38]

- Potential TEA Land Use – The exact future land use details for each parcel are not known. However, TEA is identified as an employment/industrial area that will likely serve a range of uses. Some preliminary potential site information that has been shared with the City (type of use and estimated building area) was used to approximate overall traffic trip potential for the weekday morning and evening peak hour. While ultimately the proposed land uses and trip patterns may vary, this estimate provides an approximation of the overall level of traffic that would be served by site access configurations.

- Trip generation estimates - Trip generation for the TEA was estimated using national rates published in Institute of Transportation Engineers (ITE). Trip generation was assumed to be general light industrial (ITE 110) for sites providing equipment storage, and industrial park (ITE 130) for the remaining general speculative industrial uses. The approximate trip generation for each alternative is:
  - Alternative 1 – Approximately 300 trips during the morning and evening peak hours.
  - Alternative 2 – Approximately 500 trips during the morning and evening peak hours.
  - Alternative 3 – Approximately 500 trips during the morning and evening peak hours. However, about 300 trips would load directly to Oregon Street with the remaining traffic (approximately 40 percent) traveling to/from the east via the new east-west collector.

- Alternative 1 – Direct access driveways
  - Network Assumptions – No changes on Oregon Street. Both driveways would operate as full-access with two-way stop-control (TWSC) controlling the driveway traffic. The center turn lanes on Oregon Street would provide left turn access into the sites. TL 600 access should be located opposite of the existing Allied Systems driveway to reduce turning conflicts. TL 500 access may be located approximately 500 feet to the south (opposite secondary Allied Systems driveway) or both driveways may need to shift to accommodate the ultimate location for Tonquin Court.
  - Operations – The two driveways would meet the existing City of Sherwood and Washington County mobility standards operating at level of service (LOS) D or better.

- Potential Options – Consider the benefit of a secondary turn lane from TL 600 to reduce delay but may not have long-term utility depending on placement of east-west collector.
- Note: For properties not fronting on Oregon Street, interim access may be available via Tonquin Road. However, that has not been analyzed in this report. Coordination with Washington County will be required to establish whether and where interim access locations on Tonquin Road will be permitted.

- Alternative 2 – Intermediate shared access
  - Network Assumptions – Tonquin Court would replace the southern driveway (TL 500) and would provide shared access for all lots via a traffic signal. The northern driveway for TL 600 and Allied Systems may need to convert to a right-in-right-out only with left turns prohibited. This configuration would require modification of the existing access but would provide additional vehicle queue storage for the southbound left turn movement at Tonquin Court.
  - Trigger – A conversion to the Alternative 2 configuration would be needed as additional properties without frontage along Oregon Street develop and would require access to Tonquin Court.
  - Operations – The two driveways would meet the existing City of Sherwood and Washington County mobility standards. While the southbound left turn volume during the morning would be high for Tonquin Court, it could be served by the traffic signal and the 95th percentile queue (175 feet) would not approach the northern driveway. The southbound left turn for Coast Paving may conflict with the northbound left turn for Pride Disposal, but both driveways have low traffic volumes, operating at LOS D or better.
  - Potential Options – Consider the potential access restriction for north driveway to right-in-right-out. This would provide additional southbound left turn storage for the Tonquin Court traffic signal but would shift additional traffic to this movement. In addition, this would require modification to an existing site driveway and use.

- Alternative 3 - Ultimate Configuration
  - Network Assumptions – The completion of a new east-west collector through the TEA would provide secondary access for TEA properties to/from the east. Tonquin Court would also connect to the east-west collector. Primary access to/from Oregon Street would shift from the Alternative 2 configuration (Tonquin Court) to the east-west collector.

- The traffic signal at Tonquin Court would be removed[4] and replaced with a traffic signal at the east-west collector. The specific location of the east-west collector alignment is unknown, but it should be configured so that it is not offset with a driveway on the north side of Oregon Street.
- A northbound right turn lane should be added on Oregon Street approaching the east-west collector.

- Trigger – A conversion to the ultimate access configuration should be pursued based on the completion of both A) Connection of the east-west collector from Oregon Street to 124th Avenue, and B) Connection of Tonquin Court to the east-west collector.
- Operations (morning peak) – The high traffic flows during the morning peak would be the northbound traffic on Oregon Street and the northbound right turn at the east-west collector. The southbound left turn that was present in Alternative 2 would primarily shift to the "back door" via 124th Avenue and would not access via Oregon Street to avoid delay at the Oregon Street/Tualatin-Sherwood Road intersection. The traffic signal at the east-west collector would operate at LOS B, while Tonquin Court would operate at LOS D, but would be a low volume approach (due to improved TEA street connections).
- Operations (evening peak) – In the evening, the high traffic flow would be southbound along Oregon Street and from the westbound left turn from the east-west collector. The westbound left turn would have a 95th percentile queue of approximately 225 feet, so access to the collector would require adequate spacing from Oregon Street.[5] The intersection LOS would be similar to the morning peak, with LOS B for the east-west collector and LOS D for Tonquin Court.

ATTACHMENTS

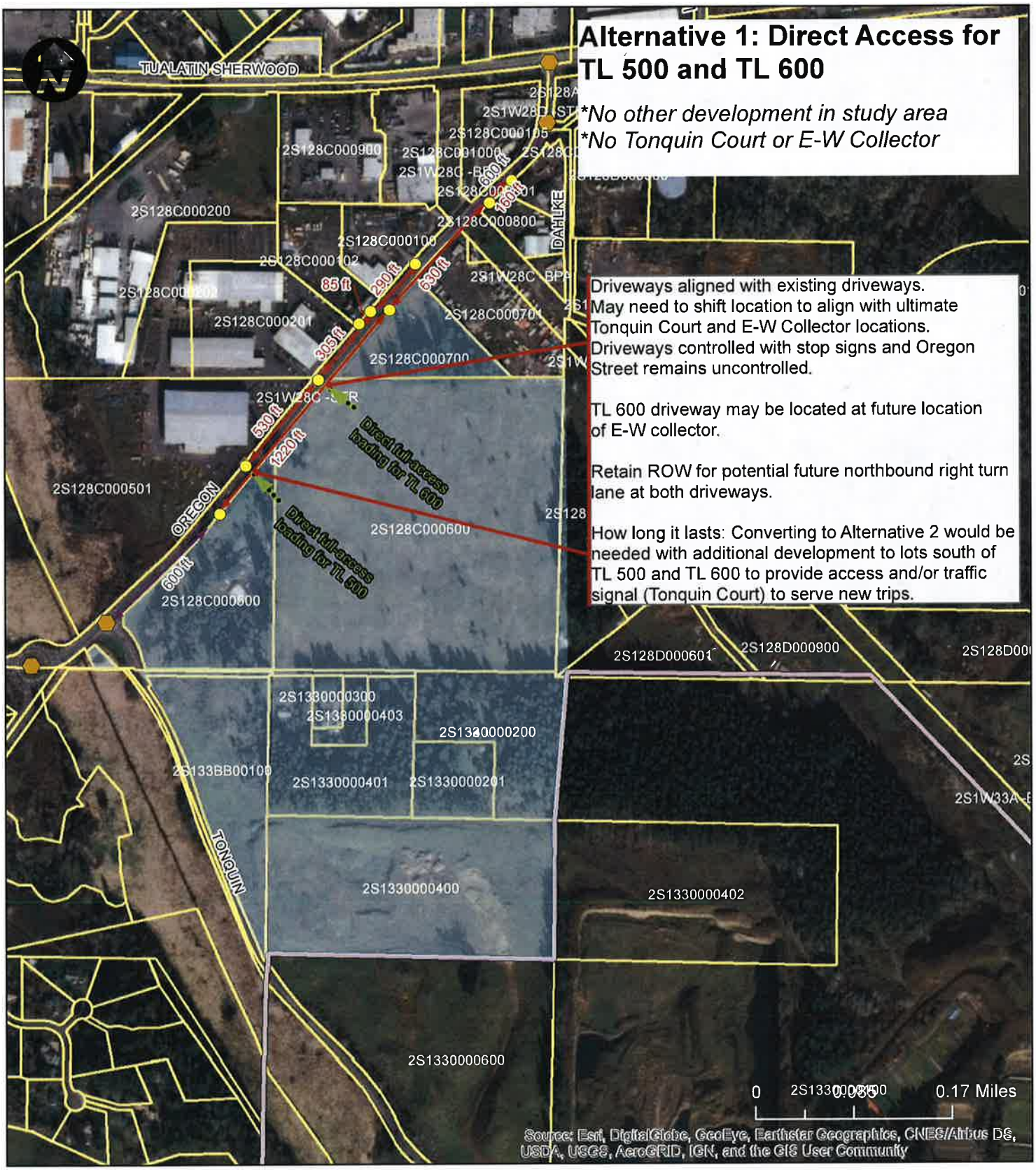
The following attachments are included:

1. Access Diagrams for Alternative 1, 2, 3
2. Traffic Operations and Vehicle Queueing

[4] Removal of the traffic signal would be needed to address two mobility strategies along the corridor: 1) reduce opportunity for traffic stopped at Tonquin Court to spill back to the future roundabout at Tonquin Road, and 2) maintain southbound traffic flow on Oregon Street for a single southbound lane approach.

[5] Preliminary site plans indicate the nearest driveway would be located approximately 400 feet from Oregon Street, which would exceed the estimated queue storage needs.

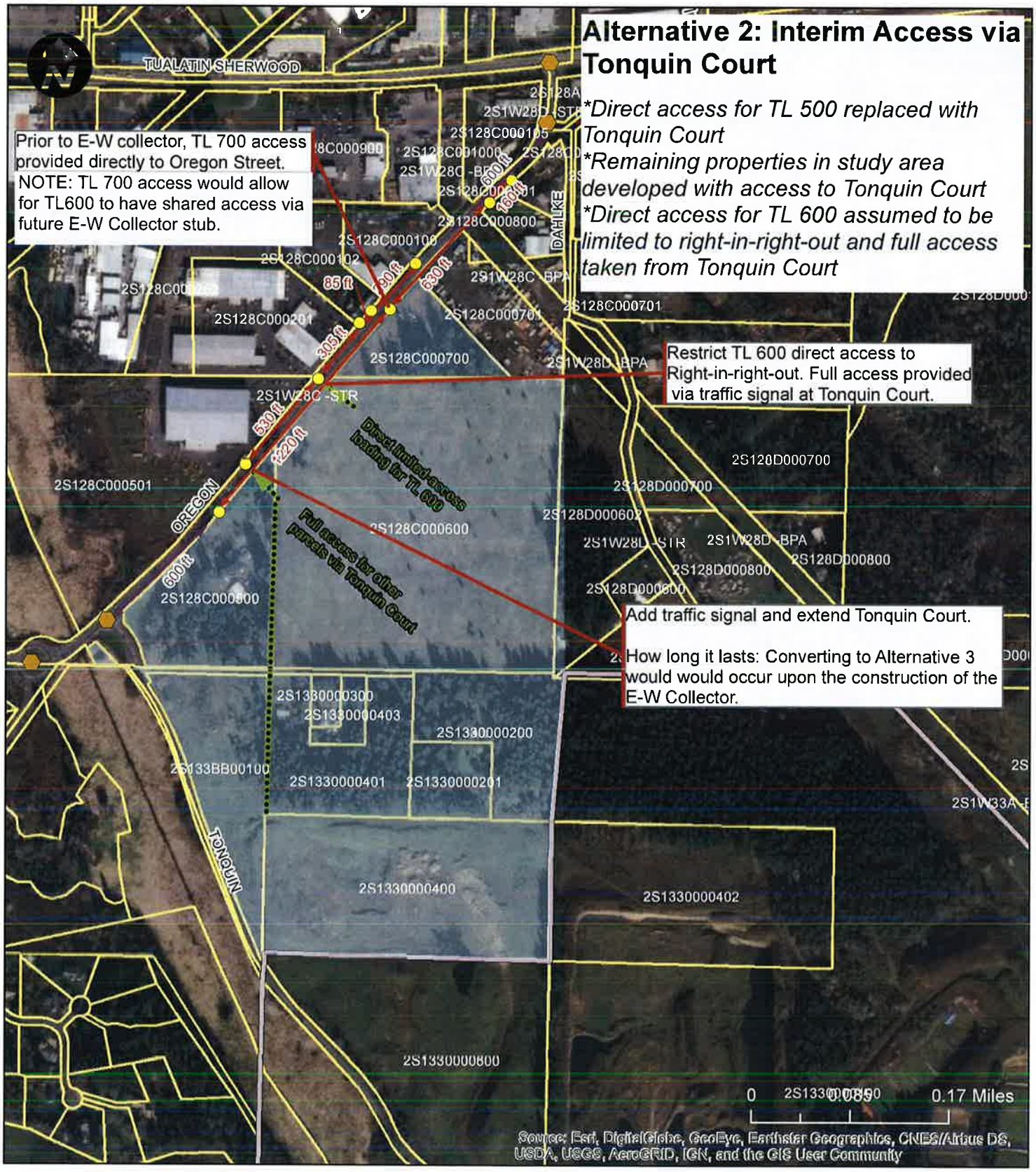
ACCESS DIAGRAMS



Legend

- Study Area Measurements
- Access Spacing Standard
- Access
- Public Access
- Private Access
- Taxlots
- Urban Growth Boundary
- Potential Parcels Connected to Proposed Tonquin Court Alignment

DKS



Legend

- Study Area Measurements
- Access Spacing Standard
- Access
- Public Access
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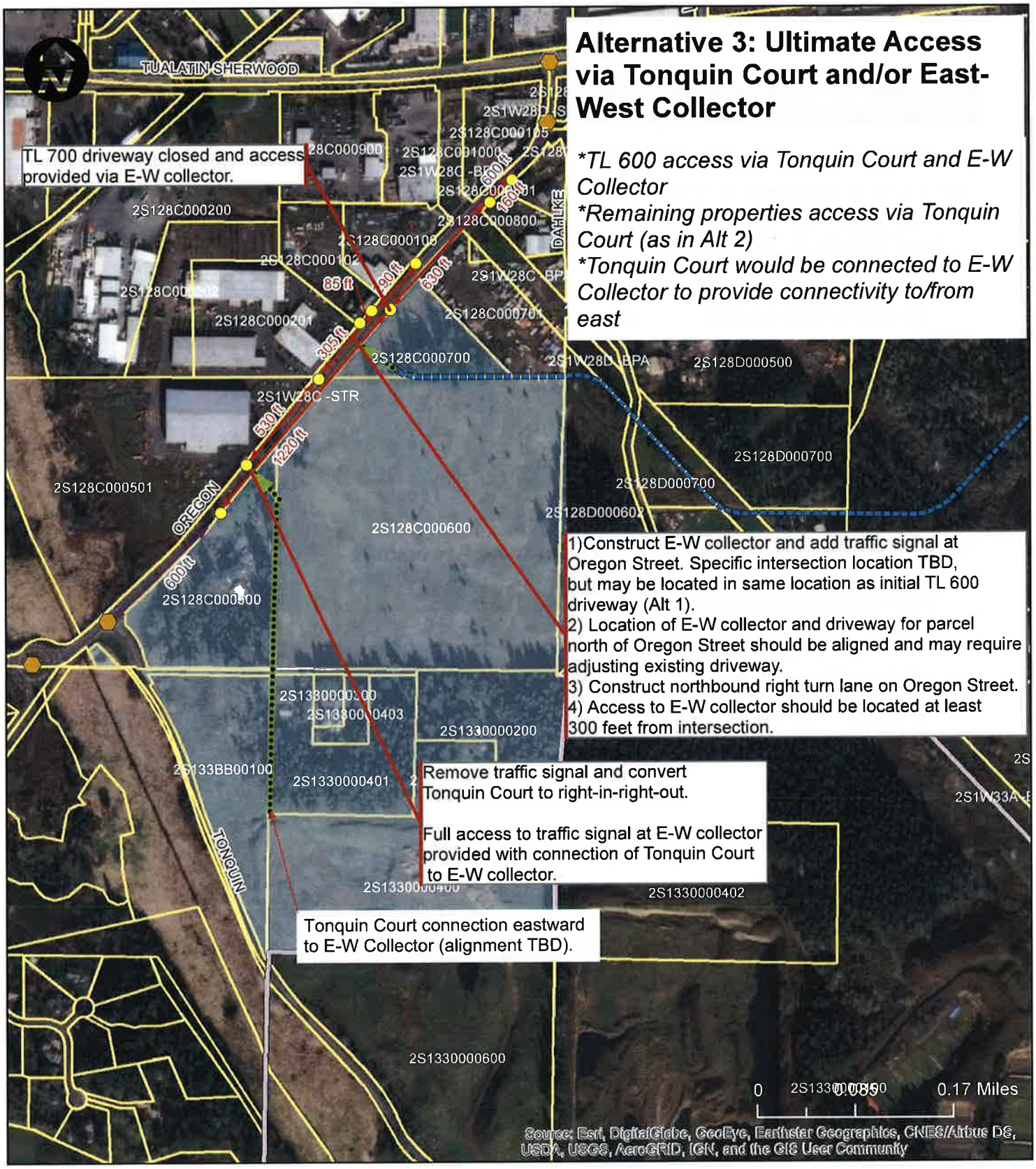
DKS



Legend

- Study Area
- Access Spacing Standard
- Access
- Potential TEA East/West Collector Alignment
- Public
- Private
- Taxlots
- Urban Growth Boundary
- Potential Parcels Connected to Proposed Tonquin Court Alignment

DKS

TRAFFIC OPERATIONS

The following tables summarize the traffic analysis conducted for each alternative.

TABLE 1: EXISTING TRAFFIC OPERATIONS – 2018 PEAK HOUR

	AM Peak			PM Peak		
NAME	Delay (s)	LOS	V/C	Delay (s)	LOS	V/C
SW Oregon St \ Heintz Excavation	8.3	A\A	0.00	0	A\A	0.00
SW Oregon St \ Pride Disposal	10.9	A\B	0.03	12.5	A\B	0.02
SW Oregon St \ Allied Systems	11.8	A\B	0.01	13.1	A\B	0.08
SW Oregon St \ Blast Cleaning	9.7	A\A	0.00	0	A\A	0.00
SW Oregon St \ Tonquin Rd	21.8	A\C	0.38	>100	A\F	**>1.0**

TABLE 2: ALTERNATIVE 1 TRAFFIC OPERATIONS – 2023 PEAK HOUR

	AM Peak			PM Peak		
NAME	Delay (s)	LOS	V/C	Delay (s)	LOS	V/C
SW Oregon St \ Heintz Excavation	8.7	A\A	0.00	0	A\A	0.00
SW Oregon St \ Pride Disposal	12.9	A\B	0.04	14.2	A\B	0.02
SW Oregon St \ Allied \ Lot 600	29.9	A\D	0.20	34.6	A\D	0.66
SW Oregon St \ Lot 500	15.1	A\C	0.04	15.3	A\C	0.13
SW Oregon St \ Tonquin Rd	36.2	B\E	0.55	>100	A\F	**>1.0**

TABLE 3: ALTERNATIVE 2 TRAFFIC OPERATIONS – 2025 PEAK HOUR

	AM Peak			PM Peak		
NAME	Delay (s)	LOS	V/C	Delay (s)	LOS	V/C
SW Oregon St \ Heintz Excavation	8.8	A\A	0.00	0	A\A	0.00
SW Oregon St \ Pride Disposal	14.4	A\B	0.04	15.3	A\C	0.02
SW Oregon St \ Allied \ Lot 600	29.1	A\D	0.07	33.5	A\D	0.25
SW Oregon St \ Lot 500 [TRAFFIC SIGNAL]	16.1	B	0.85*	8.7	A	0.69*
SW Oregon St \ Tonquin Rd	54.0	B\F	0.69	>100	A\F	**>1.0**

Note: * V/C listed as worst movement

TABLE 5: ALTERNATIVE 3 TRAFFIC OPERATIONS – 2035 PEAK HOUR

	AM Peak			PM Peak		
NAME	**Delay (s)**	**LOS**	**V/C**	**Delay (s)**	**LOS**	**V/C**
SW Oregon St \ Heintz Excavation	8.6	A\A	0.00	0	A\A	0.00
SW Oregon St \ Pride Disposal	12.5	A\B	0.03	14.6	A\B	0.02
SW Oregon St \ Allied \ E-W Collector [TRAFFIC SIGNAL]	11.2	B	0.72*	16.3	B	0.86*
SW Oregon St \ Lot 500	36.4	B/E	0.10	60.9	A\F	0.45
SW Oregon St \ Tonquin Rd	>100	C\F	**>1.0**	>100	A\F	**>1.0**

Note: * V/C listed as worst movement