



Technical Memorandum #7

Appendix

[Synchro Intersection Operations Reports](#)

[ODOT Preliminary Signal Warrant Worksheets](#)

Philomath TSP Update
Technical Memorandum #7: Future Transportation System Performance

Appendix



Synchro Intersection Operations Reports

Intersection	
Int Delay, s/veh	4.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	375	25	265	495	30	160
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Stop
Storage Length	-	-	220	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	10	0	1	5	7	3
Mvmt Flow	395	26	279	521	32	168
















Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	421
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.11
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.209
Pot Cap-1 Maneuver	-	-	1144
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1144
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.2	19.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	101	641	-	-	1144	-
HCM Lane V/C Ratio	0.313	0.263	-	-	0.244	-
HCM Control Delay (s)	56.1	12.6	-	-	9.2	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	1.2	1.1	-	-	1	-

HCM Signalized Intersection Capacity Analysis
2: S 9th Street/N 9th Street & US 20/OR 34
















2015 Philomath TSP Update
Design Hour Volumes - Future 2040 Conditions

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	30	760	50	15	40	0	0	25	85
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)					4.0			4.0			4.0	
Lane Util. Factor					0.95			1.00			1.00	
Frbp, ped/bikes					1.00			1.00			0.99	
Flpb, ped/bikes					1.00			1.00			1.00	
Frt					0.99			1.00			0.90	
Flt Protected					1.00			0.99			1.00	
Satd. Flow (prot)					3163			1726			1528	
Flt Permitted					1.00			0.87			1.00	
Satd. Flow (perm)					3163			1518			1528	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	32	800	53	16	42	0	0	26	89
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	0	0	77	0
Lane Group Flow (vph)	0	0	0	0	881	0	0	58	0	0	38	0
Confl. Peds. (#/hr)	5					5	1					1
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	6%	4%	0%	0%	0%	0%	0%	0%	2%
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					6			4			8	
Permitted Phases				6			4					
Actuated Green, G (s)					28.6			5.4			5.4	
Effective Green, g (s)					29.6			5.9			5.9	
Actuated g/C Ratio					0.68			0.14			0.14	
Clearance Time (s)					5.0			4.5			4.5	
Vehicle Extension (s)					6.0			2.5			2.5	
Lane Grp Cap (vph)					2152			205			207	
v/s Ratio Prot											0.02	
v/s Ratio Perm					0.28			c0.04				
v/c Ratio					0.41			0.28			0.18	
Uniform Delay, d1					3.1			16.9			16.7	
Progression Factor					1.00			1.00			1.00	
Incremental Delay, d2					0.4			0.6			0.3	
Delay (s)					3.4			17.5			17.0	
Level of Service					A			B			B	
Approach Delay (s)		0.0			3.4			17.5			17.0	
Approach LOS		A			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			5.7		HCM 2000 Level of Service					A		
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			43.5		Sum of lost time (s)					8.0		
Intersection Capacity Utilization			42.0%		ICU Level of Service					A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 3: S 13th Street/N 13th Street & US 20/OR 34



















2015 Philomath TSP Update
 Design Hour Volumes - Future 2040 Conditions

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	70	780	55	45	40	0	0	45	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)					4.0			4.0			4.0	
Lane Util. Factor					0.95			1.00			1.00	
Frbp, ped/bikes					1.00			1.00			1.00	
Flpb, ped/bikes					1.00			1.00			1.00	
Frt					0.99			1.00			0.97	
Flt Protected					1.00			0.97			1.00	
Satd. Flow (prot)					3135			1678			1685	
Flt Permitted					1.00			0.80			1.00	
Satd. Flow (perm)					3135			1379			1685	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	74	821	58	47	42	0	0	47	16
RTOR Reduction (vph)	0	0	0	0	6	0	0	0	0	0	14	0
Lane Group Flow (vph)	0	0	0	0	947	0	0	89	0	0	49	0
Confl. Peds. (#/hr)	3					3	1		7	7		1
Confl. Bikes (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	3%	5%	0%	3%	0%	0%	0%	0%	0%
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					6			4			8	
Permitted Phases				6			4					
Actuated Green, G (s)					23.8			4.8			4.8	
Effective Green, g (s)					24.3			5.3			5.3	
Actuated g/C Ratio					0.65			0.14			0.14	
Clearance Time (s)					4.5			4.5			4.5	
Vehicle Extension (s)					6.0			2.5			2.5	
Lane Grp Cap (vph)					2026			194			237	
v/s Ratio Prot											0.03	
v/s Ratio Perm					0.30			c0.06				
v/c Ratio					0.47			0.46			0.21	
Uniform Delay, d1					3.4			14.8			14.3	
Progression Factor					1.00			1.00			1.00	
Incremental Delay, d2					0.5			1.3			0.3	
Delay (s)					3.9			16.1			14.6	
Level of Service					A			B			B	
Approach Delay (s)		0.0			3.9			16.1			14.6	
Approach LOS		A			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			5.5		HCM 2000 Level of Service					A		
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			37.6	Sum of lost time (s)					8.0			
Intersection Capacity Utilization			47.1%	ICU Level of Service					A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: S 13th Street & Applegate Street

2015 Philomath TSP Update
Design Hour Volumes - Future 2040 Conditions

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		 						 			 		
Volume (vph)	15	590	45	0	0	0	0	70	55	40	75	0	
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	
Total Lost time (s)		4.0						4.0			4.0		
Lane Util. Factor		0.95						1.00			1.00		
Frbp, ped/bikes		1.00						1.00			1.00		
Flpb, ped/bikes		1.00						1.00			1.00		
Frt		0.99						0.94			1.00		
Flt Protected		1.00						1.00			0.98		
Satd. Flow (prot)		3111						1607			1687		
Flt Permitted		1.00						1.00			0.85		
Satd. Flow (perm)		3111						1607			1454		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	16	621	47	0	0	0	0	74	58	42	79	0	
RTOR Reduction (vph)	0	6	0	0	0	0	0	38	0	0	0	0	
Lane Group Flow (vph)	0	678	0	0	0	0	0	94	0	0	121	0	
Confl. Peds. (#/hr)			7	7				3				3	
Confl. Bikes (#/hr)			4										
Heavy Vehicles (%)	0%	6%	0%	0%	0%	0%	0%	2%	3%	0%	3%	0%	
Turn Type	Perm	NA						NA		Perm	NA		
Protected Phases		2						4			8		
Permitted Phases	2									8			
Actuated Green, G (s)		18.1						7.8			7.8		
Effective Green, g (s)		19.1						8.3			8.3		
Actuated g/C Ratio		0.54						0.23			0.23		
Clearance Time (s)		5.0						4.5			4.5		
Vehicle Extension (s)		4.0						4.0			4.0		
Lane Grp Cap (vph)		1678						376			340		
v/s Ratio Prot								0.06					
v/s Ratio Perm		0.22									c0.08		
v/c Ratio		0.40						0.25			0.36		
Uniform Delay, d1		4.8						11.0			11.3		
Progression Factor		1.00						1.00			1.00		
Incremental Delay, d2		0.2						0.5			0.9		
Delay (s)		5.0						11.5			12.2		
Level of Service		A						B			B		
Approach Delay (s)		5.0			0.0			11.5			12.2		
Approach LOS		A			A			B			B		
Intersection Summary													
HCM 2000 Control Delay			6.9									HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.39										
Actuated Cycle Length (s)			35.4									Sum of lost time (s)	8.0
Intersection Capacity Utilization			44.8%									ICU Level of Service	A
Analysis Period (min)			15										

c Critical Lane Group

Intersection

Intersection Delay, s/veh 7.7
Intersection LOS A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	5	70	5	0	20	70	5	0	5	5	10	0	5	5	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	7	0	2	0	7	16	0	0	7	34	0	0	7	0	0	0
Mvmt Flow	0	5	74	5	0	21	74	5	0	5	5	11	0	5	5	5
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.5	7.9	7.8	7.3
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	25%	6%	21%	33%
Vol Thru, %	25%	88%	74%	33%
Vol Right, %	50%	6%	5%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	20	80	95	15
LT Vol	5	5	20	5
Through Vol	5	70	70	5
RT Vol	10	5	5	5
Lane Flow Rate	21	84	100	16
Geometry Grp	1	1	1	1
Degree of Util (X)	0.027	0.094	0.12	0.018
Departure Headway (Hd)	4.559	4.015	4.311	4.203
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	773	887	829	857
Service Time	2.658	2.065	2.351	2.203
HCM Lane V/C Ratio	0.027	0.095	0.121	0.019
HCM Control Delay	7.8	7.5	7.9	7.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.3	0.4	0.1























Intersection																
Intersection Delay, s/veh	9.5															
Intersection LOS	A															
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	30	45	35	0	25	25	105	0	15	125	15	0	55	130	55
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	7	0	3	0	7	0	0	2	7	0	3	0	7	0	2	0
Mvmt Flow	0	32	47	37	0	26	26	111	0	16	132	16	0	58	137	58
Number of Lanes	0	0	1	0	0	0	1	0	0	1	1	0	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	9.1	9.1	9.7	9.8
HCM LOS	A	A	A	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	27%	16%	100%	0%
Vol Thru, %	0%	89%	41%	16%	0%	70%
Vol Right, %	0%	11%	32%	68%	0%	30%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	15	140	110	155	55	185
LT Vol	15	0	30	25	55	0
Through Vol	0	125	45	25	0	130
RT Vol	0	15	35	105	0	55
Lane Flow Rate	16	147	116	163	58	195
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.026	0.222	0.161	0.214	0.094	0.28
Departure Headway (Hd)	5.946	5.417	5.017	4.721	5.849	5.169
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	597	657	709	754	608	689
Service Time	3.731	3.201	3.092	2.789	3.627	2.946
HCM Lane V/C Ratio	0.027	0.224	0.164	0.216	0.095	0.283
HCM Control Delay	8.9	9.8	9.1	9.1	9.2	10
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.1	0.8	0.6	0.8	0.3	1.1

HCM Signalized Intersection Capacity Analysis
 7: 19th Street & US 20/OR 34

2015 Philomath TSP Update
 Design Hour Volumes - Future 2040 Conditions

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Volume (vph)	165	535	40	95	655	50	120	85	65	105	115	180
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.94		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1568	3166		1660	3215		1628	1585		1658	1555	
Flt Permitted	0.21	1.00		0.42	1.00		0.41	1.00		0.63	1.00	
Satd. Flow (perm)	352	3166		732	3215		704	1585		1105	1555	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	174	563	42	100	689	53	126	89	68	111	121	189
RTOR Reduction (vph)	0	6	0	0	7	0	0	25	0	0	53	0
Lane Group Flow (vph)	174	599	0	100	735	0	126	132	0	111	257	0
Confl. Peds. (#/hr)	7		5	5		7	3		4	4		3
Confl. Bikes (#/hr)			1			2			4			3
Heavy Vehicles (%)	6%	4%	0%	0%	2%	3%	2%	2%	3%	0%	0%	2%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4				8
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	42.0	31.8		32.8	27.1		23.0	23.0		23.0	23.0	
Effective Green, g (s)	42.0	32.8		33.8	28.1		23.5	23.5		23.5	23.5	
Actuated g/C Ratio	0.56	0.44		0.45	0.38		0.32	0.32		0.32	0.32	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.5	6.0		2.5	6.0		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	368	1393		409	1212		222	499		348	490	
v/s Ratio Prot	c0.07	0.19		0.02	c0.23			0.08				0.17
v/s Ratio Perm	0.20			0.09			c0.18			0.10		
v/c Ratio	0.47	0.43		0.24	0.61		0.57	0.26		0.32	0.53	
Uniform Delay, d1	9.6	14.4		11.8	18.7		21.3	19.0		19.4	20.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.6		0.2	1.5		2.7	0.2		0.4	0.8	
Delay (s)	10.3	15.0		12.1	20.3		24.0	19.2		19.8	21.7	
Level of Service	B	B		B	C		C	B		B	C	
Approach Delay (s)		14.0			19.3			21.3			21.2	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	74.5	Sum of lost time (s)	12.5
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection

Int Delay, s/veh 2.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	90	25	35	275	375	245
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	75	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	0	0	2	2	1
Mvmt Flow	95	26	37	289	395	258

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	887	524	653 0
Stage 1	524	-	- -
Stage 2	363	-	- -
Critical Hdwy	6.42	6.2	4.1 -
Critical Hdwy Stg 1	5.42	-	- -
Critical Hdwy Stg 2	5.42	-	- -
Follow-up Hdwy	3.518	3.3	2.2 -
Pot Cap-1 Maneuver	315	557	943 -
Stage 1	594	-	- -
Stage 2	704	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	300	557	943 -
Mov Cap-2 Maneuver	300	-	- -
Stage 1	594	-	- -
Stage 2	671	-	- -

Approach	EB	NB	SB
HCM Control Delay, s	20.1	1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	943	-	300	557	-	-
HCM Lane V/C Ratio	0.039	-	0.316	0.047	-	-
HCM Control Delay (s)	9	0	22.4	11.8	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	1.3	0.1	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	755	40	55	875	15	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	0	0	3	0	0
Mvmt Flow	795	42	58	921	16	32

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	837
Stage 1	-	-	816
Stage 2	-	-	1037
Critical Hdwy	-	4.1	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	-	2.2	3.5
Pot Cap-1 Maneuver	-	806	82
Stage 1	-	-	438
Stage 2	-	-	345
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	806	70
Mov Cap-2 Maneuver	-	-	70
Stage 1	-	-	438
Stage 2	-	-	294

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	38.7
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	153	-	-	806	-
HCM Lane V/C Ratio	0.31	-	-	0.072	-
HCM Control Delay (s)	38.7	-	-	9.8	0
HCM Lane LOS	E	-	-	A	A
HCM 95th %tile Q(veh)	1.2	-	-	0.2	-

Intersection

Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	15	30	25	0	10	45	10	0	30	30	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	7	0	0	7	7	7	0	0	7	7	7	7
Mvmt Flow	0	16	32	26	0	11	47	11	0	32	32	5
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.6	7.8	7.9
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	46%	21%	15%	11%
Vol Thru, %	46%	43%	69%	53%
Vol Right, %	8%	36%	15%	37%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	65	70	65	95
LT Vol	30	15	10	10
Through Vol	30	30	45	50
RT Vol	5	25	10	35
Lane Flow Rate	68	74	68	100
Geometry Grp	1	1	1	1
Degree of Util (X)	0.083	0.086	0.084	0.111
Departure Headway (Hd)	4.495	4.178	4.408	4.103
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	802	862	817	879
Service Time	2.495	2.18	2.411	2.103
HCM Lane V/C Ratio	0.085	0.086	0.083	0.114
HCM Control Delay	7.9	7.6	7.8	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.3	0.3	0.4

Intersection

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	10	50	35
Peak Hour Factor	0.95	0.95	0.95	0.95
Heavy Vehicles, %	7	0	7	0
Mvmt Flow	0	11	53	37
Number of Lanes	0	0	1	0

Approach SB

Opposing Approach NB

Opposing Lanes 1

Conflicting Approach Left WB

Conflicting Lanes Left 1

Conflicting Approach Right EB

Conflicting Lanes Right 1

HCM Control Delay 7.6

HCM LOS A

Lane

Intersection

Intersection Delay, s/veh 9.8
 Intersection LOS A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	55	25	10	0	200	35	35	0	10	10	200	0	30	5	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	7	0	8	0	7	2	4	0	7	0	0	0	7	6	0	0
Mvmt Flow	0	58	26	11	0	211	37	37	0	11	11	211	0	32	5	0
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	8.8	10.7	9.3	8.9
HCM LOS	A	B	A	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	50%	0%	61%	74%	86%
Vol Thru, %	50%	0%	28%	13%	14%
Vol Right, %	0%	100%	11%	13%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	20	200	90	270	35
LT Vol	10	0	55	200	30
Through Vol	10	0	25	35	5
RT Vol	0	200	10	35	0
Lane Flow Rate	21	211	95	284	37
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.033	0.278	0.13	0.377	0.056
Departure Headway (Hd)	5.714	4.756	4.956	4.769	5.502
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	624	752	719	750	646
Service Time	3.469	2.51	3.019	2.818	3.575
HCM Lane V/C Ratio	0.034	0.281	0.132	0.379	0.057
HCM Control Delay	8.7	9.4	8.8	10.7	8.9
HCM Lane LOS	A	A	A	B	A
HCM 95th-tile Q	0.1	1.1	0.4	1.8	0.2

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	110	35	45	115	145	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	5	7	0	0	0
Mvmt Flow	116	37	47	121	153	137

Major/Minor	Minor2	Major1		Major2
Conflicting Flow All	437	221	289	0
Stage 1	221	-	-	-
Stage 2	216	-	-	-
Critical Hdwy	6.42	6.25	4.17	-
Critical Hdwy Stg 1	5.42	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-
Follow-up Hdwy	3.518	3.345	2.263	-
Pot Cap-1 Maneuver	577	811	1245	-
Stage 1	816	-	-	-
Stage 2	820	-	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	554	811	1245	-
Mov Cap-2 Maneuver	554	-	-	-
Stage 1	816	-	-	-
Stage 2	787	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13	2.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1245	-	600	-	-
HCM Lane V/C Ratio	0.038	-	0.254	-	-
HCM Control Delay (s)	8	0	13	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	1	-	-

Intersection

Int Delay, s/veh 3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	25	95	85	45	40	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	4	5	4	8	0
Mvmt Flow	26	100	89	47	42	42

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	137	0	266
Stage 1	-	-	113
Stage 2	-	-	153
Critical Hdwy	4.1	-	6.48
Critical Hdwy Stg 1	-	-	5.48
Critical Hdwy Stg 2	-	-	5.48
Follow-up Hdwy	2.2	-	3.572
Pot Cap-1 Maneuver	1459	-	710
Stage 1	-	-	897
Stage 2	-	-	861
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1459	-	697
Mov Cap-2 Maneuver	-	-	697
Stage 1	-	-	897
Stage 2	-	-	845

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1459	-	-	-	802
HCM Lane V/C Ratio	0.018	-	-	-	0.105
HCM Control Delay (s)	7.5	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

Intersection

Int Delay, s/veh 4.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	85	40	85	45	35	65
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	7	2	0	0	3
Mvmt Flow	89	42	89	47	37	68

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	256	114	0 0 138 0
Stage 1	114	-	- - - -
Stage 2	142	-	- - - -
Critical Hdwy	6.4	6.27	- - 4.1 -
Critical Hdwy Stg 1	5.4	-	- - - -
Critical Hdwy Stg 2	5.4	-	- - - -
Follow-up Hdwy	3.5	3.363	- - 2.2 -
Pot Cap-1 Maneuver	737	925	- - 1458 -
Stage 1	916	-	- - - -
Stage 2	890	-	- - - -
Platoon blocked, %			- - - -
Mov Cap-1 Maneuver	717	924	- - 1458 -
Mov Cap-2 Maneuver	717	-	- - - -
Stage 1	915	-	- - - -
Stage 2	867	-	- - - -

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	2.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 772	1458	-
HCM Lane V/C Ratio	-	- 0.17	0.025	-
HCM Control Delay (s)	-	- 10.6	7.5	0
HCM Lane LOS	-	- B	A	A
HCM 95th %tile Q(veh)	-	- 0.6	0.1	-

Philomath TSP Update
Technical Memorandum #7: Future Transportation System Performance

Appendix



ODOT Preliminary Signal Warrant Worksheets

Oregon Department of Transportation
Transportation Development Branch
Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis¹

Major Street: US 20 / OR 34	Minor Street: 26th Street
Project: Philomath TSP	City/County: Philomath
Year: 2040	Alternative: 2040 No-Build

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	Percent of standard warrants 70	Percent of standard warrants 100	Percent of standard warrants 70

Case A: Minimum Vehicular Traffic

Major Street	Minor Street	Percent of standard warrants 100	Percent of standard warrants 70	Percent of standard warrants 100	Percent of standard warrants 70
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

Major Street	Minor Street	Percent of standard warrants 100	Percent of standard warrants 70	Percent of standard warrants 100	Percent of standard warrants 70
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

100 percent of standard warrants

X 70 percent of standard warrants²

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	7400	17250	N
	Minor	1	1850	150	
Case B	Major	2	11100	17250	N
	Minor	1	950	150	

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.

Oregon Department of Transportation
Transportation Development Branch
Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis¹

Major Street: US 20	Minor Street: OR 34
Project: Philomath TSP	City/County: Philomath
Year: 2040	Alternative: 2040 No-Build

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	Percent of standard warrants 70	Percent of standard warrants 100	Percent of standard warrants 70

Case A: Minimum Vehicular Traffic

Major Street	Minor Street	Percent of standard warrants 100	Percent of standard warrants 70	Percent of standard warrants 100	Percent of standard warrants 70
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

100 percent of standard warrants

X 70 percent of standard warrants²

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	7400	11600	N
	Minor	1	1850	300	
Case B	Major	2	11100	11600	N
	Minor	1	950	300	

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.