

Appendix F: Mission Street/SR 285 Lane Assignment Memo

MEMORANDUM

Date: June 15, 2022 **TG:** 1.21200.00

To: Riley Shewak, CDTC

From: Brent Turley, PE - Transpo Group

cc:

Subject: Traffic Operations Analysis: Mission Street & Stevens Street Intersection

The purpose of this memorandum is to document the traffic operations evaluation of the Mission Street/Stevens Street intersection in the southern part of Wenatchee, WA. At the request of the City of Wenatchee and CDTC, the intersection was evaluated with a slight change in channelization on the south leg of the intersection. The operations analysis and findings are presented below.

Intersection Traffic Operations

The future traffic volume forecasts for the Mission Street/Stevens Street intersection were developed as part of CDTC’s *South Wenatchee Connectivity Study* (Transpo Group, June 2022). These forecasts represent weekday PM peak hour volumes during the 2045 horizon year.

The 2045 Baseline scenario represents 2045 conditions with existing lane configurations at the study intersection. On the northbound approach, this Baseline scenario has one northbound through lane and two northbound right-turn lanes. The Alternative scenario **converts the center lane to a shared through-right-turn lane**.

PM peak hour traffic operations were evaluated at the study intersections based on level of service (LOS). The LOS analysis method was based on procedures identified in the *Highway Capacity Manual* (6th Edition), and evaluated using Synchro version 11.0.

At signalized intersections, LOS is measured in average control delay per vehicle and is typically reported using the intersection delay. Traffic operations for an intersection can be described alphabetically with a range of levels of service (LOS A through F), with LOS A indicating free-flowing traffic and LOS F indicating extreme congestion and long vehicle delays. The City of Wenatchee has established LOS E as the LOS standard for city street intersections and WSDOT uses LOS D as its standard for state highway intersections. The study intersection is a state highway intersection. Table 1 summarizes the weekday PM peak hour LOS at study intersections. The detailed LOS worksheets are included in as attachments.

Table 1. Intersection LOS Summary - PM Peak Hour

	2045 Baseline		2045 Alternative ³	
	LOS ¹	Delay ²	LOS	Delay
Mission Street/ Stevens Street	D	43.7	E	56.0

















Source: Transpo Group, 2022

1. Level of Service (LOS), based on *Highway Capacity Manual* (6th Edition) methodology.
2. Average delay in seconds per vehicle.
3. The Alternative Scenario is based on the 2000 *Highway Capacity Manual* due to the unusual south leg channelization.

Findings

As shown in Table 1, the Alternative scenario would degrade traffic operations from LOS D to LOS E. This is primarily due to the removal of the northbound right-turn overlap signal phase which runs concurrent with the westbound left-turn phase. In the Alternative scenario, this phase would not be allowed, so right-turning traffic would need to come to a stop before proceeding to turn-on-red. This reduced capacity for the northbound right-turn movements increases overall average signal delay to an unacceptable level. The Alternative scenario northbound-through movements do have more capacity compared to the Baseline scenario, but northbound-through traffic volumes are only 30% of the northbound right-turn traffic volume level. The existing lane configuration appears to provide the best available capacity to the movements in most need of the capacity.

HCM 6th Signalized Intersection Summary
2: S Mission St & SR 285

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 	 		 	 	
Traffic Volume (veh/h)	610	1240	220	720	1980	350
Future Volume (veh/h)	610	1240	220	720	1980	350
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	656	1333	237	774	2129	376
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	581	2067	255	850	1979	1403
Arrive On Green	0.17	0.17	0.14	0.14	0.96	1.00
Sat Flow, veh/h	3456	2790	1870	2790	3456	1870
Grp Volume(v), veh/h	656	1333	237	774	2129	376
Grp Sat Flow(s),veh/h/ln	1728	1395	1870	1395	1728	1870
Q Serve(g_s), s	18.5	0.0	13.8	7.4	63.0	0.0
Cycle Q Clear(g_c), s	18.5	0.0	13.8	7.4	63.0	0.0
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	581	2067	255	850	1979	1403
V/C Ratio(X)	1.13	0.64	0.93	0.91	1.08	0.27
Avail Cap(c_a), veh/h	581	2067	255	850	1979	1403
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.67	1.67
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.73	0.73
Uniform Delay (d), s/veh	45.8	7.1	47.0	28.7	2.4	0.0
Incr Delay (d2), s/veh	78.1	0.7	40.7	15.6	41.8	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.2	6.6	9.3	11.3	12.6	0.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	123.8	7.8	87.7	44.3	44.2	0.3
LnGrp LOS	F	A	F	D	F	A
Approach Vol, veh/h	1989		1011			2505
Approach Delay, s/veh	46.0		54.4			37.6
Approach LOS	D		D			D
Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	67.5	19.5			87.0	23.0
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5
Max Green Setting (Gmax), s	63.0	15.0			82.5	18.5
Max Q Clear Time (g_c+I1), s	65.0	15.8			2.0	20.5
Green Ext Time (p_c), s	0.0	0.0			2.6	0.0
Intersection Summary						
HCM 6th Ctrl Delay			43.7			
HCM 6th LOS			D			

HCM Signalized Intersection Capacity Analysis
2: S Mission St & SR 285



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	610	1240	220	720	1980	350
Future Volume (vph)	610	1240	220	720	1980	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	0.88	0.91	0.91	0.97	1.00
Frt	1.00	0.85	0.91	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	2787	3075	1441	3433	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	2787	3075	1441	3433	1863
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	656	1333	237	774	2129	376
RTOR Reduction (vph)	0	42	219	219	0	0
Lane Group Flow (vph)	656	1291	406	169	2129	376
Turn Type	Prot	pt+ov	NA	Perm	Prot	NA
Protected Phases	3	3 1	2		1	6
Permitted Phases				2		
Actuated Green, G (s)	18.5	86.0	15.0	15.0	63.0	82.5
Effective Green, g (s)	18.5	86.0	15.0	15.0	63.0	82.5
Actuated g/C Ratio	0.17	0.78	0.14	0.14	0.57	0.75
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	577	2178	419	196	1966	1397
v/s Ratio Prot	c0.19	0.46	c0.13		c0.62	0.20
v/s Ratio Perm				0.12		
v/c Ratio	1.14	0.59	0.97	0.86	1.08	0.27
Uniform Delay, d1	45.8	4.9	47.3	46.5	23.5	4.3
Progression Factor	1.00	1.00	1.00	1.00	0.72	0.69
Incremental Delay, d2	81.3	0.4	36.6	35.9	45.2	0.4
Delay (s)	127.0	5.3	83.9	82.4	62.2	3.3
Level of Service	F	A	F	F	E	A
Approach Delay (s)	45.5		83.3			53.4
Approach LOS	D		F			D

Intersection Summary

HCM 2000 Control Delay	56.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	98.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group