

Highway Capacity Manual, 2000

Signalized intersection level of service (LOS) is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria are stated in terms of average delay per vehicle during a specified time period (for example, the PM peak hour). Vehicle delay is a complex measure based on many variables, including signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. Table 1 shows LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* (Transportation Research Board, Special Report 209, 2000).

Table 6. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (sec/veh)	General Description (Signalized Intersections)
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop-controlled and two-way stop-controlled. All-way, stop-controlled intersection LOS is expressed in terms of the average vehicle delay of all of the movements, much like that of a signalized intersection. Two-way, stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its performance overall. For this reason, LOS for a two-way, stop-controlled intersection is defined in terms of its individual movements. With this in mind, total average vehicle delay (i.e., average delay of all movements) for a two-way, stop-controlled intersection should be viewed with discretion. Table 2 shows LOS criteria for unsignalized intersections (both all-way and two-way, stop-controlled).

Table 7. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

Appendix B-2: PM Peak Hour Intersection Levels of Service
Summaries, 2009, 2018 Forecast, 2028 Forecast

Appendix B2

Int #	Intersection	Control ¹	Existing 2008			2018 Baseline			2018 Dual NB-LT at Maiden & Frontage Road		
			LOS ¹	Delay ²	V/C or WM ⁴	LOS	Delay	V/C or WM	LOS	Delay	V/C or WM
1	Penny Rd / Lower Sunnyslope Rd	TWSC	A	8.7	WB	A	9.0	WB	A	9.0	WB
2	SR 2 / School St	TWSC	B	13.7	SB	C	12.8	NB	B	12.8	NB
3	Melody Ln / School St	TWSC	A	9.8	WB	B	11.2	WB	B	11.2	WB
4	Peters St / School St	TWSC	A	9.2	WB	B	10.3	WB	B	10.3	WB
5	Easy St / School St	TWSC	B	11.8	NB	C	18.5	NB	C	18.5	NB
6	Peters St / Easy St	TWSC	B	14.9	WB	C	16.5	WB	C	16.4	WB
7	Ohme Garden Rd / Easy St	TWSC	E	45.5	WB	F	55.6	WB	F	55.9	WB
8	SR 2 / Easy St	Signal	C	30.3	0.54	C	34.7	0.70	D	50.5	0.82
9	Penny Rd / Easy St (SR 285 Off-Ramp)	Signal	C	22.7	0.63	C	27.3	0.72	B	15.5	0.56
10	Horan Rd / SR 285 Off-Ramp	TWSC	No LOS/Merge Lane			No LOS/Merge Lane			C	15.4	WB
11	Cordell Ave / Penny Rd (SR 285 On-Ramp)	Signal	A	6.2	0.31	A	9.6	0.40	A	9.6	0.40
12	Peters St / Burch Mountain Rd	TWSC	A	9.0	SB	A	8.9	SB	A	9.5	SB
13	Peters St / Ohme Garden Rd	TWSC	No side street volumes			A	9.8	EB	A	9.8	EB
14	Ohme Garden Rd / Ohme Rd	TWSC	B	10.2	NB	B	10.5	NB	B	10.5	NB
15	Gunn Rd / Euclid Ave	TWSC	C	20.3	EBL	D	30.0	EBL	D	30.3	EBL
16	Penny Rd / Euclid Ave	TWSC	C	16.7	NB	C	23.0	NB	C	21.7	NB
17	Horselake Rd / Wenatchee Ave	Signal	B	16.2	0.78	C	22.4	0.92	B	19.5	0.78
19	Maiden Ln / Wenatchee Ave	Signal	C	25.3	0.77	D	41.7	0.91	C	29.5	0.87
21	Hawley St / Wenatchee Ave	Signal	B	18.0	0.69	C	23.3	0.73	C	23.9	0.71
23	McKittrick St / Wenatchee Ave	TWSC	F	100.0	EBL	E	48.5	EBL	B	18.6	0.63
25	Maple St / Wenatchee Ave	Signal	C	21.0	0.65	C	21.4	0.65	B	19.0	0.59
26	Wenatchee Ave / Miller St	Signal	B	12.4	0.66	B	15.5	0.69	C	25.3	0.77
28	Mission St / Miller St (Albertsons Dwy)	Signal	B	19.2	0.54	C	20.1	0.60	C	20.1	0.61
29	Springwater St / Miller St	Signal	B	18.8	0.66	C	20.0	0.69	B	19.4	0.68
30	9th St / Chelan Ave	Signal	B	14.6	0.56	B	14.6	0.56	B	14.5	0.56
31	5th St / Chelan Ave	Signal	B	15.6	0.80	B	15.5	0.81	B	15.6	0.81
32	9th St / Mission St	Signal	A	7.3	0.48	A	7.0	0.51	A	6.9	0.51
33	5th St / Mission St	Signal	C	23.9	0.74	D	39.3	0.80	D	39.9	0.80
34	9th St / Wenatchee Ave	Signal	B	12.5	0.41	B	11.6	0.44	B	12.4	0.44
35	5th St / Wenatchee Ave	Signal	B	12.8	0.40	B	12.7	0.39	B	12.2	0.41
36	Walla Walla Ave / Miller St	TWSC	B	11.4	WB	B	13.0	WB	B	12.7	WB
37	5th St / Pierce St	TWSC	C	15.9	SB	B	13.3	SB	B	13.5	SB
38	Walnut St / Pine St	TWSC	A	9.6	NB	B	11.2	NB	B	11.2	NB
39	McKittrick St / Pine St	TWSC	B	10.2	SB	B	13.0	SB	B	13.2	SB
40	Maple St / Princeton Ave	TWSC	C	18.9	SB	D	27.7	NBL	D	25.8	NBL
41	Springwater St / Princeton Ave	TWSC	D	27.1	SBL	E	45.7	SBL	E	44.7	SBL
42	9th St / Princeton Ave	TWSC	B	13.8	SB	C	15.7	SB	B	14.8	NB
43	5th St / Princeton Ave	TWSC	D	26.7	SB	D	28.2	SB	D	27.9	SB
45	5th St / Miller St	Signal	D	37.1	0.69	D	38.8	0.71	D	38.5	0.71
46	9th St / Miller St	Signal	A	7.7	0.42	A	7.7	0.43	A	7.7	0.42
47	Maiden Ln / WalMart-Home Depot Dwy	Signal	B	18.4	0.29	B	16.3	0.35	A	8.4	0.34
48	Maiden Ln / Dawn Terr	TWSC	B	11.6	SB	B	13.0	SB	B	12.4	SB
49	Maiden Ln / Western Ave	TWSC	C	19.4	EBL	C	23.5	EBL	C	24.4	EBL
50	Walnut St / Western Ave	TWSC	C	19.4	WBL	D	25.6	WBL	D	25.9	WBL
51	McKittrick St / Western Ave	TWSC	C	23.8	WB	D	34.0	WB	E	35.7	WB
52	Maple St / Western Ave	TWSC	E	49.1	WBL	F	157.7	WBL	F	144.6	WBL
53	Springwater St / Western Ave	TWSC	D	35.0	WB	A	10.0	0.68	B	10.0	0.65
54	9th St / Western Ave	Signal	B	11.4	0.52	B	13.5	0.52	B	13.6	0.53
55	5th St / Western Ave	Signal	C	34.3	0.78	D	42.8	0.77	D	41.4	0.72
57	Euclid / WB US 2 On-Ramp	Signal	A	8.1	NBL	A	7.8	NBL	A	7.8	NBL
58	Euclid / WB US 2 Off-Ramp	Signal	B	12.4	WB	B	12.1	WB	B	12.1	WB
63	Euclid / EB US 2 IC	Signal	C	21.1	EB	A	8.8	EB	A	8.8	EB

Table Notes:

- 1) Intersection Control: TWSC = two-way stop-controlled, AWSC = all-way stop-controlled, Signalized.
- 2) Level of service, based on 2000 Highway Capacity Manual methodology.
- 3) Average delay in seconds per vehicle.
- 4) Volume-to-capacity ratio reported for signalized intersections.
- 5) The worst operating intersection movement is reported for two-way stop controlled intersections. Not applicable (NA) for all-way stop controlled intersections.

LOS Key

- D = LOS is D, E, or F
- E = primary analyses intersection
- F = potential key analyses intersection

Appendix B2

Int #	Intersection	Control ¹	Existing 2008			2028 Baseline			Comments	2028 With Proposed Improvements			
			LOS ¹	Delay ²	V/C ³ or WM ⁴	LOS	Delay	V/C or WM		LOS	Delay	V/C or WM	Comments
Existing Intersections													
1	Penny Rd / Lower Sunnyslope Rd	TWSC	A	8.7	WB	A	9.4	WB		A	8.8	WB	
2	SR 2 / School St	TWSC	B	13.7	SB	C	18.4	SB		B	14.2	NB	
3	Melody Ln / School St	TWSC	A	9.8	WB	B	11.9	WB		A	7.3	SB	
4	Peters St / School St	TWSC	A	9.2	WB	B	10.8	WB		A	9.3	WB	
5	Easy St / School St	TWSC	B	11.8	NB	F	51.5	NB	AWSC = LOS B	C	24.5	SB	
6	Peters St / Easy St	TWSC	B	14.9	WB	C	22.6	WB		C	19.4	WB	
7	Ohme Garden Rd / Easy St	TWSC	E	45.5	WB	F	67.2	WB		C	19.6	EB	
8	SR 2 / Easy St	Signal	C	30.3	0.54	D	46.7	0.75		-	-	-	Does not exist with preferred improvements
9	Penny Rd / Easy St (SR 285 Off-Ramp)	Signal	C	22.7	0.63	C	30.8	0.75		C	25.0	0.84	
10	Horan Rd / SR 285 Off-Ramp	TWSC	No LOS/Merge Lane			No LOS/Merge Lane				No LOS/Merge Lane			
11	Cordell Ave / Penny Rd (SR 285 On-Ramp)	Signal	A	6.2	0.31	B	11.8	0.48		B	12.6	0.53	
12	Peters St / Burch Mountain Rd	TWSC	A	9.0	SB	A	9.2	SB		B	10.4	SB	
13	Peters St / Ohme Garden Rd	TWSC	No side street volumes			A	9.7	EB		A	9.3	EB	
14	Ohme Garden Rd / Ohme Rd	TWSC	B	10.2	NB	B	10.4	NB		B	11.7	NB	
15	Gunn Rd / Euclid Ave	TWSC	C	20.3	EBL	E	49.3	EBL		F	56.3	EB	
16	Penny Rd / Euclid Ave	TWSC	C	16.7	NB	D	30.5	NB		C	33.2	0.82	With free SB-RT LOS C (31.8 sec)
17	Horselake Rd / Wenatchee Ave	Signal	B	16.2	0.78	D	35.0	0.89		B	15.5	0.67	
19	Maiden Ln / Wenatchee Ave	Signal	C	25.3	0.77	D	49.9	0.97		B	17.4	0.72	
21	Hawley St / Wenatchee Ave	Signal	B	18.0	0.69	C	27.5	0.80		C	22.3	0.71	
23	McKittrick St / Wenatchee Ave	TWSC	F	100.0	EBL	A	7.7	0.59		B	15.2	0.62	
25	Maple St / Wenatchee Ave	Signal	C	21.0	0.65	C	22.5	0.70		B	18.0	0.56	
26	Wenatchee Ave / Miller St	Signal	B	12.4	0.66	B	18.3	0.73		C	33.1	0.91	
28	Mission St / Miller St (Albertsons Dwy)	Signal	B	19.2	0.54	C	20.3	0.63		C	23.4	0.67	
29	Springwater St / Miller St	Signal	B	18.8	0.66	C	22.0	0.75		C	20.9	0.75	
30	9th St / Chelan Ave	Signal	B	14.6	0.56	B	15.0	0.60		B	14.7	0.58	
31	5th St / Chelan Ave	Signal	B	15.6	0.80	B	17.3	0.85		B	17.0	0.85	
32	9th St / Mission St	Signal	A	7.3	0.48	A	7.0	0.54		A	6.8	0.56	
33	5th St / Mission St	Signal	C	23.9	0.74	D	52.6	0.83		E	59.0	0.85	
34	9th St / Wenatchee Ave	Signal	B	12.5	0.41	B	11.7	0.45		B	12.5	0.48	
35	5th St / Wenatchee Ave	Signal	B	12.8	0.40	B	12.5	0.45		B	12.2	0.37	
36	Walla Walla Ave / Miller St	TWSC	B	11.4	WB	C	15.0	WB		-	-	-	Does not exist with preferred improvements
37	5th St / Piere St	TWSC	C	15.9	SB	B	13.8	SB		B	13.8	SB	
38	Walnut St / Pine St	TWSC	A	9.6	NB	B	12.8	NB		B	12.2	NB	
39	McKittrick St / Pine St	TWSC	B	10.2	SB	B	14.4	SB		A	9.7	SB	
40	Maple St / Princeton Ave	TWSC	C	18.9	SB	E	38.2	NBL		F	>200	SB	LOS A with signal.
41	Springwater St / Princeton Ave	TWSC	D	27.1	SBL	F	111.7	SBL		B	10.1	0.57	
42	9th St / Princeton Ave	TWSC	B	13.8	SB	C	17.1	SB		D	26.3	SB	
43	5th St / Princeton Ave	TWSC	D	26.7	SB	E	38.8	NB		E	45.7	SB	
45	5th St / Miller St	Signal	D	37.1	0.69	D	40.1	0.72		D	39.0	0.73	
46	9th St / Miller St	Signal	A	7.7	0.42	A	8.0	0.44		A	8.6	0.46	
47	Maiden Ln / WalMart-Home Depot Dwy	Signal	B	18.4	0.29	B	16.2	0.36		B	13.6	0.34	
48	Maiden Ln / Dawn Terr	TWSC	B	11.6	SB	C	14.3	SB		B	11.7	SB	
49	Maiden Ln / Western Ave	TWSC	C	19.4	EBL	D	27.7	EBL		C	23.0	EBL	
50	Walnut St / Western Ave	TWSC	C	19.4	WBL	E	36.5	WBL		D	29.8	WBL	
51	McKittrick St / Western Ave	TWSC	C	23.8	WB	F	50.9	WB		E	41.1	WB	LOS A with signal.
52	Maple St / Western Ave	TWSC	E	49.1	WBL	F	>200	WBL		F	154.7	WBL	LOS A with signal.
53	Springwater St / Western Ave	TWSC	D	35.0	WB	B	14.3	0.80		B	11.7	0.74	
54	9th St / Western Ave	Signal	B	11.4	0.52	B	14.2	0.61		B	12.8	0.61	
55	5th St / Western Ave	Signal	C	34.3	0.78	D	46.6	0.82		D	40.3	0.77	
57	Euclid / WB US 2 On-Ramp	Signal	A	8.1	NBL	A	8.0	NB-LT		-	-	-	Does not exist with preferred improvements
58	Euclid / WB US 2 Off-Ramp	Signal	B	12.4	WB	B	14.9	WB		C	26.8	0.73	
63	Euclid / EB US 2 IC	Signal	C	21.1	EB	A	9.1	EB		D	36.8	0.90	
New Intersections													
70	Maple St/Miller St												
71	WB SR 97 Ramp/SR 285 Ramps (2-Phase)	Signal								A	9.2	0.55	
72	Euclid Ave-Conf. Pkwy/Technology Center Way	Signal								B	12.9	0.64	
73	Hawley St/Miller ST	Signal								C	20.0	0.86	
74	New Rd/Easy St	Signal								A	8.9	0.66	

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