

APPENDIX G
Intersection Warrant Analyses

MUTCD Signal Warrant Analysis

No	Warrant	Description
1	Eight-Hour Vehicular Volume <ul style="list-style-type: none"> - 1A-Minimum Vehicular volume - 1B-Interruption of Continuous Traffic 	The volumes of traffic on the major and minor streets meet specified minimum amounts for at least 8 hours of an average weekday. Either of conditions 1A or 1B must be met.
2	Four-Hour Vehicular Volume	For any four hours of an average day, the points representing major and minor street volumes plot above a specified curve.
3	Peak Hour	For at least one hour of an average day, minor street traffic exceeds a minimum volume and suffers at least a specified amount of total delay, or the points representing major and minor street volumes plot above a specified curve. This warrant only applies to unusual cases involving large traffic generators.
4	Pedestrian Volume	The volume of pedestrian traffic crossing a major street at an intersection or mid-block location must meet minimum values for either a single hour or any four hours of an average weekday.
5	School Crossing	The frequency and adequacy of gaps in the traffic stream must not otherwise be sufficient for the number of children crossing.
6	Coordinated Signal System	Signalized control is required to maintain proper grouping of vehicles in a coordinated, progressive signal system.
7	Crash Experience	Five or more reported crashes of type susceptible to control by a traffic signal have occurred at the location within a 12-month period. Other less restrictive remedies and enforcements have failed to reduce accidents. Either warrant 1 or 2 is at least 80% met. A signal will not seriously disrupt traffic flow.
8	Roadway Network	An intersection of two major routes has either high five-year projected peak-hour traffic volumes or high volumes for at least five hours on an average non-normal business day (Saturday or Sunday).

MUTCD Signal Warrant 1: Eight-Hour Vehicular Volume
US 81 and SH 37, Minco

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A – Minimum Vehicular Volume							
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)		
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	100% ^a	80% ^b	70% ^c
1	1	500	400	350	150	120	105
2 or more	1	600	480	420	150	120	105
2 or more	2 or more	600	480	420	200	160	140
1	2 or more	500	400	350	200	160	140

Condition B – Interruption of Continuous Traffic							
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)		
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	100% ^a	80% ^b	70% ^c
1	1	750	600	525	75	60	53
2 or more	1	900	720	630	75	60	53
2 or more	2 or more	900	720	630	100	80	70
1	2 or more	750	600	525	100	80	70

^a Basic minimum hourly volume.

^b Used for combination of conditions A and B after adequate trial of other remedial measures.

^c May be used when the major street speed exceeds 70 km/h (40 mph) or in an isolated community with a population of less than 10,000.

Evaluation of Warrant 1 - Condition 1A

HOUR	Major Volume (420 req'd)	Minor Volume (105 req'd)	Meets Warrant?
12:00 - 1:00	46	14	No
1:00 - 2:00	20	12	No
2:00 - 3:00	21	16	No
3:00 - 4:00	30	0	No
4:00 - 5:00	43	30	No
5:00 - 6:00	107	32	No
6:00 - 7:00	276	80	No
7:00 - 8:00	417	158	No
8:00 - 9:00	401	96	No
9:00 - 10:00	379	103	No
10:00 - 11:00	317	87	No
11:00 - 12:00	345	176	No
12:00 - 13:00	368	148	No
13:00 - 14:00	290	69	No
14:00 - 15:00	372	84	No
15:00 - 16:00	429	125	Yes
16:00 - 17:00	434	169	Yes
17:00 - 18:00	440	189	Yes
18:00 - 19:00	351	134	No
19:00 - 20:00	166	50	No
20:00 - 21:00	125	57	No
21:00 - 22:00	78	41	No
22:00 - 23:00	80	27	No
23:00 - 24:00	45	18	No

8 hours met - Condition 1A is not met.

Evaluation of Warrant 1 - Condition 1B

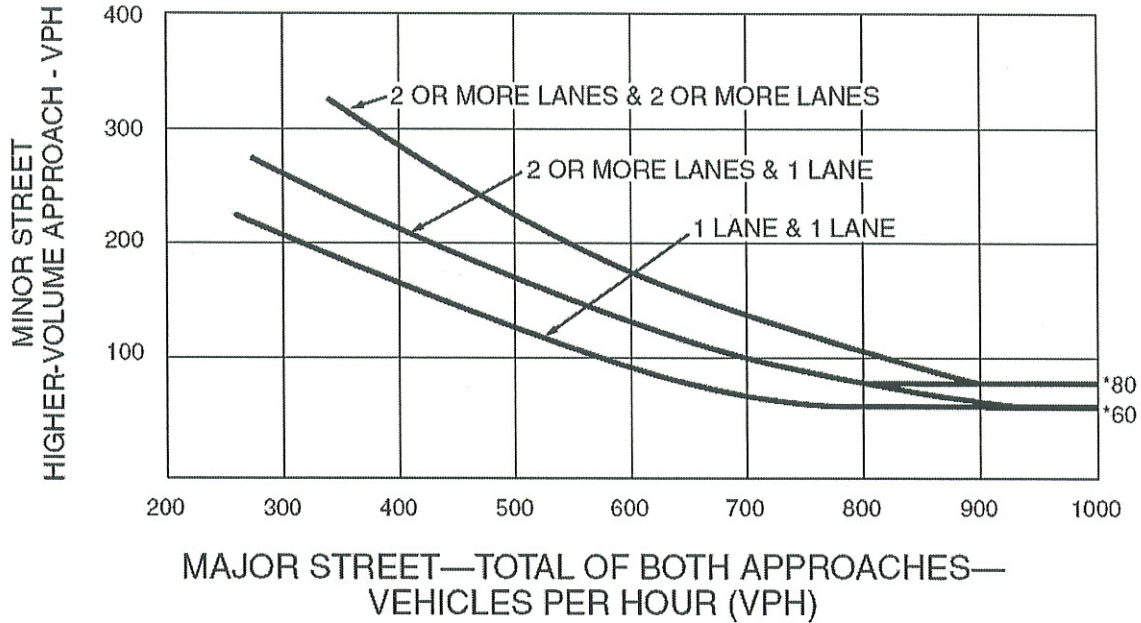
HOUR	Major Volume (630 req'd)	Minor Volume (53 req'd)	Meets Warrant?
12:00 - 1:00	46	14	No
1:00 - 2:00	20	12	No
2:00 - 3:00	21	16	No
3:00 - 4:00	30	0	No
4:00 - 5:00	43	30	No
5:00 - 6:00	107	32	No
6:00 - 7:00	276	80	No
7:00 - 8:00	417	158	No
8:00 - 9:00	401	96	No
9:00 - 10:00	379	103	No
10:00 - 11:00	317	87	No
11:00 - 12:00	345	176	No
12:00 - 13:00	368	148	No
13:00 - 14:00	290	69	No
14:00 - 15:00	372	84	No
15:00 - 16:00	429	125	No
16:00 - 17:00	434	169	No
17:00 - 18:00	440	189	No
18:00 - 19:00	351	134	No
19:00 - 20:00	166	50	No
20:00 - 21:00	125	57	No
21:00 - 22:00	78	41	No
22:00 - 23:00	80	27	No
23:00 - 24:00	45	18	No

8 hours met - Condition 1B is not met.

Warrant 1 is Not Met

MUTCD Signal Warrant 2: Four-Hour Vehicular Volume
US 81 and SH 37, Minco

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(Community less than 10,000 Population or above 40 mph on Major Street)



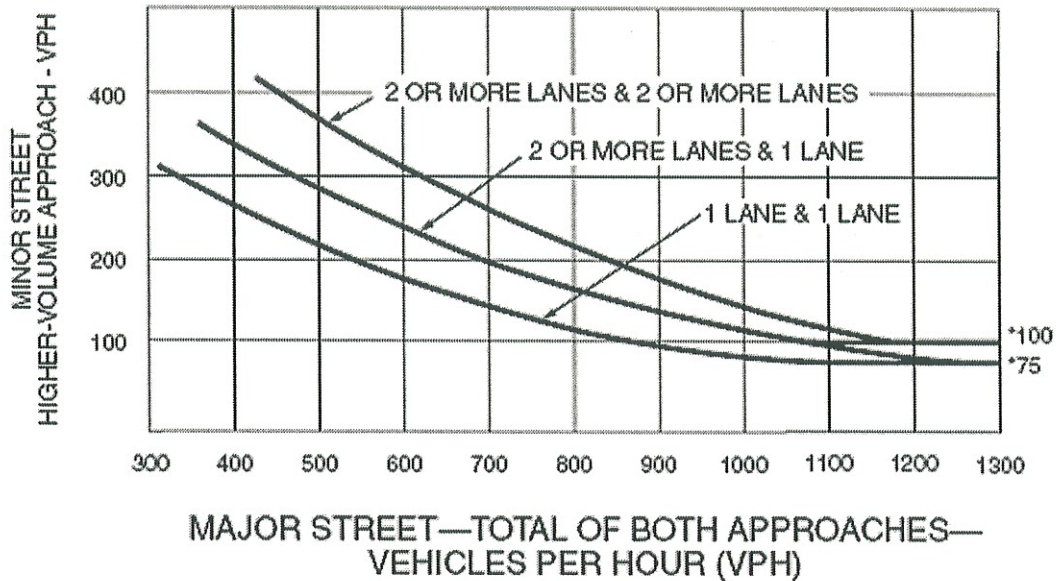
*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Hour	Major Street Total of Both Approaches	Minor Street High Volume Approach	Meets Warrant?
12:00 - 1:00	46	14	No
1:00 - 2:00	20	12	No
2:00 - 3:00	21	16	No
3:00 - 4:00	30	0	No
4:00 - 5:00	43	30	No
5:00 - 6:00	107	32	No
6:00 - 7:00	276	80	No
7:00 - 8:00	417	158	No
8:00 - 9:00	401	96	No
9:00 - 10:00	379	103	No
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11:00 - 12:00	345	176	No
12:00 - 13:00	368	148	No
13:00 - 14:00	290	69	No
14:00 - 15:00	372	84	No
15:00 - 16:00	429	125	No
16:00 - 17:00	434	169	No
17:00 - 18:00	440	189	No
18:00 - 19:00	351	134	No
19:00 - 20:00	166	50	No
20:00 - 21:00	125	57	No
21:00 - 22:00	78	41	No
22:00 - 23:00	80	27	No
23:00 - 24:00	45	18	No

Warrant 2 is Not Met

MUTCD Signal Warrant 3: Peak-Hour
US 81 and SH 37, Minco

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)
(Community less than 10,000 Population or above 40 mph on Major Street)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Hour	Major Street Total of Both Approaches	Minor Street High Volume Approach	Meets Warrant?
12:00 - 1:00	46	14	No
1:00 - 2:00	20	12	No
2:00 - 3:00	21	16	No
3:00 - 4:00	30	0	No
4:00 - 5:00	43	30	No
5:00 - 6:00	107	32	No
6:00 - 7:00	276	80	No
7:00 - 8:00	417	158	No
8:00 - 9:00	401	96	No
9:00 - 10:00	379	103	No
10:00 - 11:00	317	87	No
11:00 - 12:00	345	176	No
12:00 - 13:00	368	148	No
13:00 - 14:00	290	69	No
14:00 - 15:00	372	84	No
15:00 - 16:00	429	125	No
16:00 - 17:00	434	169	No
17:00 - 18:00	440	189	No
18:00 - 19:00	351	134	No
19:00 - 20:00	166	50	No
20:00 - 21:00	125	57	No
21:00 - 22:00	78	41	No
22:00 - 23:00	80	27	No
23:00 - 24:00	45	18	No

Warrant 3 is Not Met

MUTCD Signal Warrant 1: Eight-Hour Vehicular Volume
US 81 and SH 152, Union City

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A – Minimum Vehicular Volume							
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)		
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	100% ^a	80% ^b	70% ^c
1	1	500	400	350	150	120	105
2 or more	1	600	480	420	150	120	105
2 or more	2 or more	600	480	420	200	160	140
1	2 or more	500	400	350	200	160	140

Condition B – Interruption of Continuous Traffic							
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)		
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	100% ^a	80% ^b	70% ^c
1	1	750	600	525	75	60	53
2 or more	1	900	720	630	75	60	53
2 or more	2 or more	900	720	630	100	80	70
1	2 or more	750	600	525	100	80	70

^a Basic minimum hourly volume.

^b Used for combination of conditions A and B after adequate trial of other remedial measures.

^c May be used when the major street speed exceeds 70 km/h (40 mph) or in an isolated community with a population of less than 10,000.

Evaluation of Warrant 1 - Condition 1A

HOUR	Major Volume (420 req'd)	Minor Volume (105 req'd)	Meets Warrant?
12:00 - 1:00	50	14	No
1:00 - 2:00	20	16	No
2:00 - 3:00	32	16	No
3:00 - 4:00	57	5	No
4:00 - 5:00	75	18	No
5:00 - 6:00	146	16	No
6:00 - 7:00	440	75	No
7:00 - 8:00	616	160	Yes
8:00 - 9:00	589	142	Yes
9:00 - 10:00	457	139	Yes
10:00 - 11:00	495	128	Yes
11:00 - 12:00	548	132	Yes
12:00 - 13:00	541	107	Yes
13:00 - 14:00	516	132	Yes
14:00 - 15:00	491	206	Yes
15:00 - 16:00	716	255	Yes
16:00 - 17:00	668	297	Yes
17:00 - 18:00	757	393	Yes
18:00 - 19:00	530	249	Yes
19:00 - 20:00	295	119	No
20:00 - 21:00	246	112	No
21:00 - 22:00	272	59	No
22:00 - 23:00	96	39	No
23:00 - 24:00			
	103	46	No

8 hours met - Condition 1A is met.

Evaluation of Warrant 1 - Condition 1B

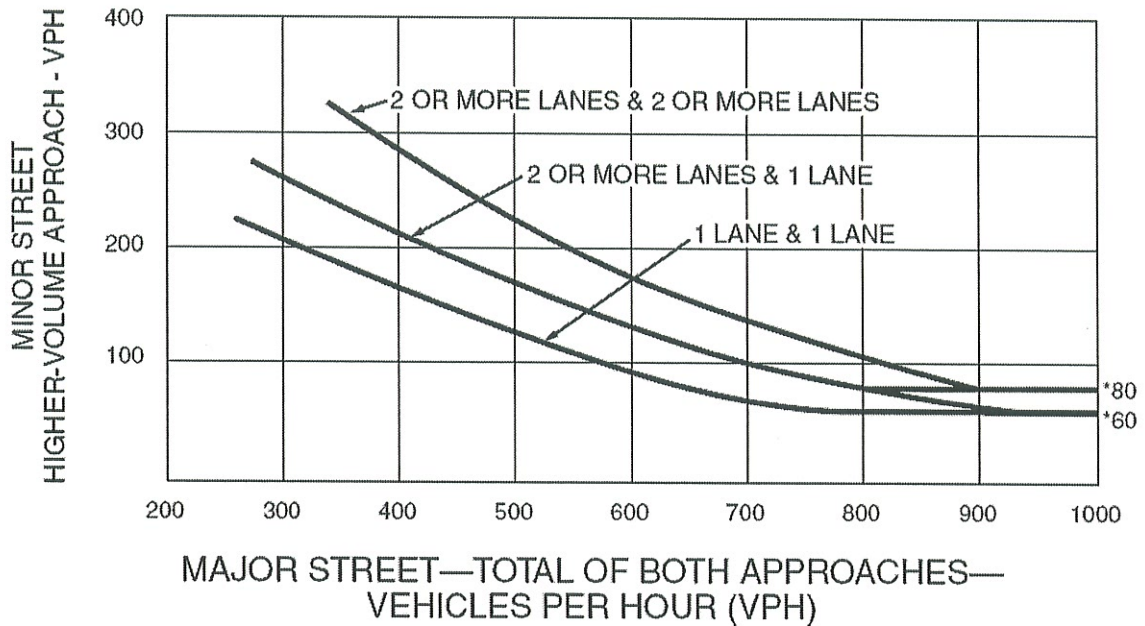
HOUR	Major Volume (630 req'd)	Minor Volume (53 req'd)	Meets Warrant?
12:00 - 1:00	50	14	No
1:00 - 2:00	20	16	No
2:00 - 3:00	32	16	No
3:00 - 4:00	57	5	No
4:00 - 5:00	75	18	No
5:00 - 6:00	146	16	No
6:00 - 7:00	440	75	No
7:00 - 8:00	616	160	No
8:00 - 9:00	589	142	No
9:00 - 10:00	457	139	No
10:00 - 11:00	495	128	No
11:00 - 12:00	548	132	No
12:00 - 13:00	541	107	No
13:00 - 14:00	516	132	No
14:00 - 15:00	491	206	No
15:00 - 16:00	716	255	Yes
16:00 - 17:00	668	297	Yes
17:00 - 18:00	757	393	Yes
18:00 - 19:00	530	249	No
19:00 - 20:00	295	119	No
20:00 - 21:00	246	112	No
21:00 - 22:00	272	59	No
22:00 - 23:00	96	39	No
23:00 - 24:00			
	103	46	No

8 hours met - Condition 1B is not met.

Warrant 1, Condition A is Met

MUTCD Signal Warrant 2: Four-Hour Vehicular Volume
US 81 and SH 152, Union City

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(Community less than 10,000 Population or above 40 mph on Major Street)



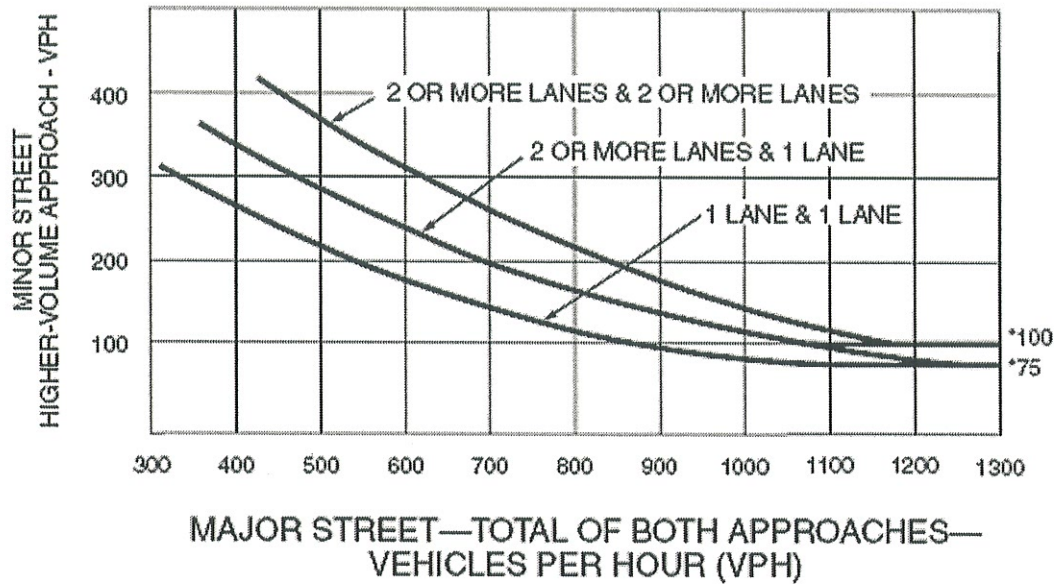
*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

HOUR	Major Street Total of Both Approaches	Minor Street High Volume Approach	Meets Warrant?
12:00 - 1:00	50	14	No
1:00 - 2:00	20	16	No
2:00 - 3:00	32	16	No
3:00 - 4:00	57	5	No
4:00 - 5:00	75	18	No
5:00 - 6:00	146	16	No
6:00 - 7:00	440	75	No
7:00 - 8:00	616	160	Yes
8:00 - 9:00	589	142	Yes
9:00 - 10:00	457	139	No
10:00 - 11:00	495	128	No
11:00 - 12:00	548	132	No
12:00 - 13:00	541	107	No
13:00 - 14:00	516	132	No
14:00 - 15:00	491	206	Yes
15:00 - 16:00	716	255	Yes
16:00 - 17:00	668	297	Yes
17:00 - 18:00	757	393	Yes
18:00 - 19:00	530	249	Yes
19:00 - 20:00	295	119	No
20:00 - 21:00	246	112	No
21:00 - 22:00	272	59	No
22:00 - 23:00	96	39	No
23:00 - 24:00	103	46	No

Warrant 2 is Met

**MUTCD Signal Warrant 3: Peak-Hour
US 81 and SH 152, Union City**

**Figure 4C-4. Warrant 3, Peak Hour (70% Factor)
(Community less than 10,000 Population or above 40 mph on Major Street)**



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

HOUR	Major Street Total of Both Approaches	Minor Street High Volume Approach	Meets Warrant?
12:00 - 1:00	50	14	No
1:00 - 2:00	20	16	No
2:00 - 3:00	32	16	No
3:00 - 4:00	57	5	No
4:00 - 5:00	75	18	No
5:00 - 6:00	146	16	No
6:00 - 7:00	440	75	No
7:00 - 8:00	616	160	Yes
8:00 - 9:00	589	142	Yes
9:00 - 10:00	457	139	No
10:00 - 11:00	495	128	No
11:00 - 12:00	548	132	No
12:00 - 13:00	541	107	No
13:00 - 14:00	516	132	No
14:00 - 15:00	491	206	Yes
15:00 - 16:00	716	255	Yes
16:00 - 17:00	668	297	Yes
17:00 - 18:00	757	393	Yes
18:00 - 19:00	530	249	Yes
19:00 - 20:00	295	119	No
20:00 - 21:00	246	112	No
21:00 - 22:00	272	59	No
22:00 - 23:00	96	39	No
23:00 - 24:00	103	46	No

Warrant 3, Condition B is Met