TRAFFIC CONTROL STUDY - WARRANTS FOR TRAFFIC SIGNALS

North Dakota Department of Transportation, Planning & Programming Division
SFN 7924 (Rev. 08-2008)

Exhibit _____
Sheet ___ of ___

23 USC S409 Documents
NDDOT Reserves All Objections

Date	Prepared by	City	Analysis Year

Major Road	Speed Limit (mph)	Number of Lanes
Minor Road	**Speed Limit (mph)**	**Number of Lanes**

Minor Road right-turn traffic excluded from the analysis because there is an exclusive right turn lane and right-turn traffic enters the Major Road with minimal conflict: ☐ Yes ☐ No

1. Posted or 85th percentile speed of major road traffic is > 40 mph: ☐ Yes ☐ No
2. In built-up area of isolated community < I0,000 population: ☐ Yes ☐ No

If question 1 or 2 is answered yes than use 70% volume criteria: ☐ 70% ☐ 100%

WARRANT NO. 1 Eight-Hour Vehicular Volume:

Requirements: Either Condition A (Minimum Vehicular Volume) or Condition B (Interruption of Continuous Traffic) is satisfied to I00% of the stated volumes for each of any 8 hours of an average day,
Or: Both Condition A and Condition B are satisfied to 80% of the stated volumes for each of any 8 hours of an average day.

eck (	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%	80%	70%	100%	80%	70%
☐	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

eck (	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%	80%	70%	100%	80%	70%
☐	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

Evaluation:

8 Highest Hour Volumes								
	1	2	3	4	5	6	7	8
Both Approaches Major Road								
Highest Approach Minor Road								

Warrant No. 1

☐ is satisfied based on Condition A ☐ is satisfied based on 80% criteria
☐ is satisfied based on Condition B ☐ is not satisfied

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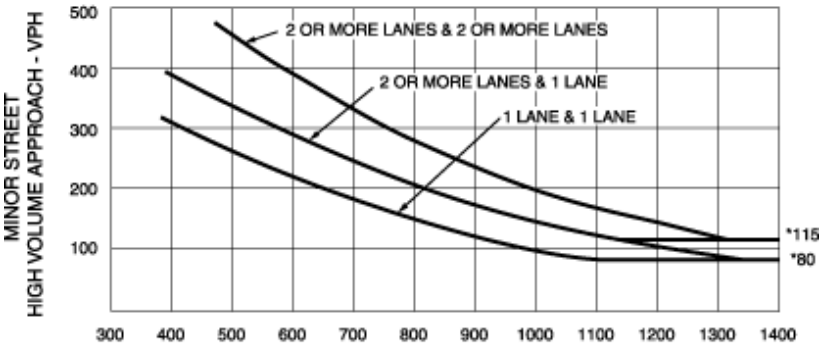
WARRANT NO. 2 Four-Hour Vehicular Volume:

Requirements: Plot four highest hour volumes on the applicable figure below. If four points lie above the applicable curve then the warrant is satisfied.

Evaluation:

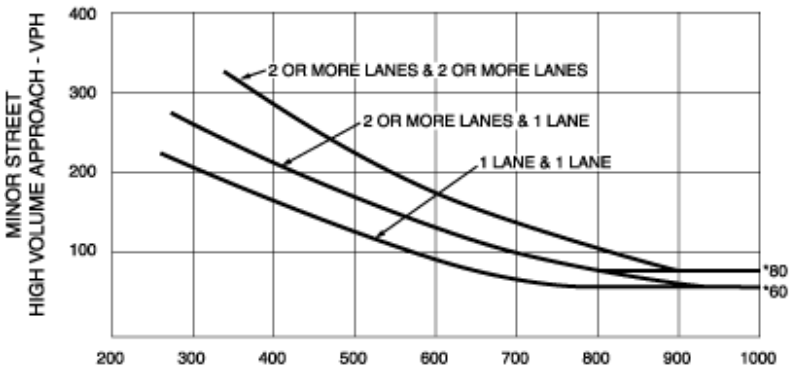
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (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.

Warrant No. 2 ☐ is satisfied ☐ is not satisfied

WARRANT NO. 3 Peak Hour:

Requirements: This signal warrant shall be applied only in unusual cases. Such cases include, but are not limited to, office complexes, manufacturing plants, industrial complexes, or high occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

Unusual Condition

Either Condition A or Condition B is satisfied.

Evaluation

Condition A: Peak Hour Delay

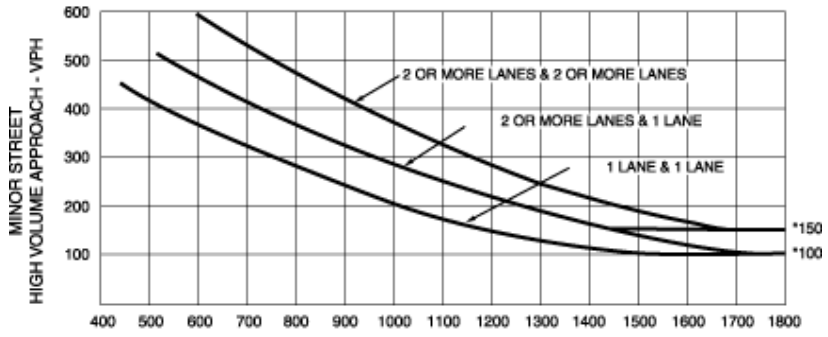
The condition is satisfied if all three of the criteria are satisfied.

Criteria	Approach Lanes (check one)		# of Approaches (check one)		Peak Hour	Satisfied	
	1 ☐	2 ☐	3 ☐	4 ☐		Yes	No
1. Delay on Minor Approach (veh-h)	4	5				☐	☐
2. Volume on Minor Approach (veh/h)	100	150				☐	☐
3. Total Entering Volume (veh/h)			650	800		☐	☐

Condition B: Peak Hour Volume:

Plot peak hour volumes on the applicable figure below. These conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day. If the point is above the appropriate line, then the warrant is satisfied.

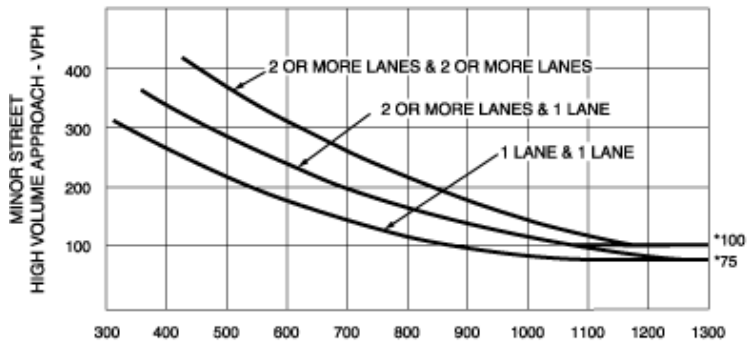
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (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.

Warrant No. 3

☐ is satisfied based on Condition A ☐ is not satisfied

☐ is satisfied based on Condition B ☐ does not apply

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WARRANT NO. 4 Pedestrian Volume:

Requirements: The warrant is satisfied if all three of the criteria are satisfied.

Evaluation

Criteria	Hour				Satisfied	
					Yes	No
1. Pedestrian volume crossing the major road during an average day is 100 ped/h or more for each of any four hours or is 190 ped/h or more during any one hour.					☐	☐
2. There are less than 60 gaps per hour in the major road traffic stream of adequate length for pedestrians to cross during the same hours as the pedestrian volume criterion is satisfied.	Gaps/hr:				☐	☐
3. The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.					☐	☐

Warrant No. 4 ☐ is satisfied ☐ is not satisfied

WARRANT NO. 5 School Crossing:

Requirements: The warrant is satisfied if all three of the criteria are satisfied.

Evaluation

Criteria	Hour	Satisfied	
		Yes	No
1. There are a minimum of 20 students during the highest crossing hour,		☐	☐
2. There are fewer adequate gaps in the major road traffic stream during the period when the children are using the crossing than the number of minutes in the same period.		☐	☐
3. The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.		☐	☐

Warrant No. 5 ☐ is satisfied ☐ is not satisfied ☐ does not apply

WARRANT NO. 6 Coordinated Signal System:

Requirements: The warrant is satisfied if either criteria is satisfied. This warrant should not be applied when the resulting signal spacing would be less than 1000 ft.

Evaluation

Criteria	Satisfied	
	Yes	No
1. On a one-way road or a road that has traffic predominantly in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.	☐	☐
2. On a two-way road, adjacent signals do not provide the necessary degree of platooning and the proposed and adjacent signals will collectively provide a progressive operation.	☐	☐

Warrant No. 6 ☐ is satisfied ☐ is not satisfied ☐ does not apply

WARRANT NO. 7 Crash Experience:

Requirements: The warrant is satisfied if all three of the criteria are satisfied.

Evaluation

Criteria		Hour				Met		Satisfied	
						Yes	No	Yes	No
1. One of the warrants to the right is met:	Warrant 4.1 at 80% of volume requirements: 80 ped/h for 4 hrs or 152 ped/h for I hr					☐	☐	☐	☐
	Warrant 1, Condition A (80% satisfied)					☐	☐		
	Warrant 1, Condition B (80% satisfied)					☐	☐		
2. Adequate trial of other remedial measures has failed to reduce crash frequence.		Measures tried:						☐	☐
3. Five or more reported crashes, of types susceptible to correction by signal control, have occurred within a 12 month period.		Number of crashes per 12 mo:						☐	☐

Warrant No. 7 ☐ is satisfied ☐ is not satisfied ☐ does not apply

WARRANT NO. 8 Roadway Network:

Requirements: The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

Evaluation

Criteria								Met		Satisfied	
								Yes	No	Yes	No
1. Both of the criteria to the right are met.	a. Total entering volume of at least 1,000 veh/h during typical weekday peak hour.	Entering volume:						☐	☐	☐	☐
	b. Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.	Warrant(s) satisfied:						☐	☐		
2. Total entering volume of at least 1,000 veh/h for each of any 5 hrs of a non-normal business day (Sat. or Sun.)							-Hour			☐	☐
							-Volume				
Characteristics of Major Route								Met		Satisfied	
								Yes	No	Yes	No
1. Part of the road or highway system that serves as the principal roadway network for through traffic flow.								☐	☐	☐	☐
2. Rural or suburban highway outside of, entering, or traversing a city.								☐	☐		
3. Appears as a major route on an official plan.								☐	☐		

Warrant No. 8 ☐ is satisfied ☐ is not satisfied ☐ does not apply

CONCLUSION

Warrants Satisfied

Signal Warranted ☐ Yes ☐ No

Remarks