

Route 236 Corridor Study

Kittery-Eliot-S.Berwick

January 9, 2007

- Traffic signals are often considered the panacea for traffic problems at intersections.
- The most misleading and common belief is that a traffic signal is safer than any other form of traffic control.
- This belief is not supported by facts.

- Intersections experiencing the highest frequency of crashes are very likely operated by a signal.
- Highest crash rates are at signals.
- Rte 236/101 Highest with 24 (3yrs)
- In some cases, the most severe and damaging accidents occur at traffic control signalized intersections.

Advantages of Signals

- Provide orderly movement of traffic.
- Increase intersection capacity.
- Reduce certain types of crashes.
- Progression
- Interrupt heavy traffic at intervals to permit other traffic to cross.

Disadvantages of Signals

- Excessive Delay.
- Excessive disobedience of the signal indications.
- Avoid traffic signals.
- Significant increase in frequency of collisions.

Signal Justified when:

- One or more Warrants are met.
- Signal will improve the overall Operation and/or Safety.
- Other Alternatives have not been effective or are not feasible.
- Signal will not seriously disrupt progressive traffic flow, now or in the future.

Signal Warrants

1. Eight-Hour Vehicular Volume
2. Four-Hour Vehicular Volume
3. Peak Hour
4. Pedestrian Volume
5. School Crossing
6. Coordinated Signal System
7. Crash Experience
8. Roadway Network

Warrant 1 Eight-Hour Veh. Vol.

(volumes in veh/hr)	Minimum Requirements (80% Shown second row)				12 Hour Data											
					1		2 or more		6-7 am	7-8 am	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm
	100%	70%	100%	70%												
Both Approaches on Major Street	500	350	600	420	892	1191	1175	887	887	967	920	900	978	1384	1484	1328
Highest Approach on Minor Street	150	105	200	140	14	10	10	18	18	15	12	11	9	6	6	0
Total Hours:				0	0	0	0	0	0	0	0	0	0	0	0	0
(volumes in veh/hr)	Minimum Requirements (80% Shown second row)				12 Hour Data											
					1		2 or more		6-7 am	7-8 am	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm
	100%	70%	100%	70%												
Both Approaches on Major Street	750	525	900	630	892	1191	1175	887	887	967	920	900	978	1384	1484	1328
Highest Approach on Minor Street	750	53	100	70	14	10	10	18	18	15	12	11	9	6	6	0
Total Hours:				0	0	0	0	0	0	0	0	0	0	0	0	0

Warrant 1 Eight-Hour Veh. Vol.

(volumes in veh/hr)	Minimum Requirements (80% Shown second row)				12 Hour Data											
					6-7 am	7-8 am	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm
	Approach Lanes	1		2 or more												
Volume Level	100%	56%	100%	70%												
Both Approaches on Major Street	500	280	600	420	892	1191	1175	887	887	967	920	900	978	1384	1484	1328
Highest Approach on Minor Street	150	84	200	140	14	10	10	18	18	15	12	11	9	6	6	0
Total Hours:					0	0	0	0	0	0	0	0	0	0	0	0
Condition is 80% satisfied if bottom volumes are met for 8 hours.																
Condition B - Interruption of Continuous Traffic																
Condition B is intended for application where the traffic volume is so heavy that traffic on the minor street suffers excessive delay.																
80% Satisfied: ° Yes ° No																

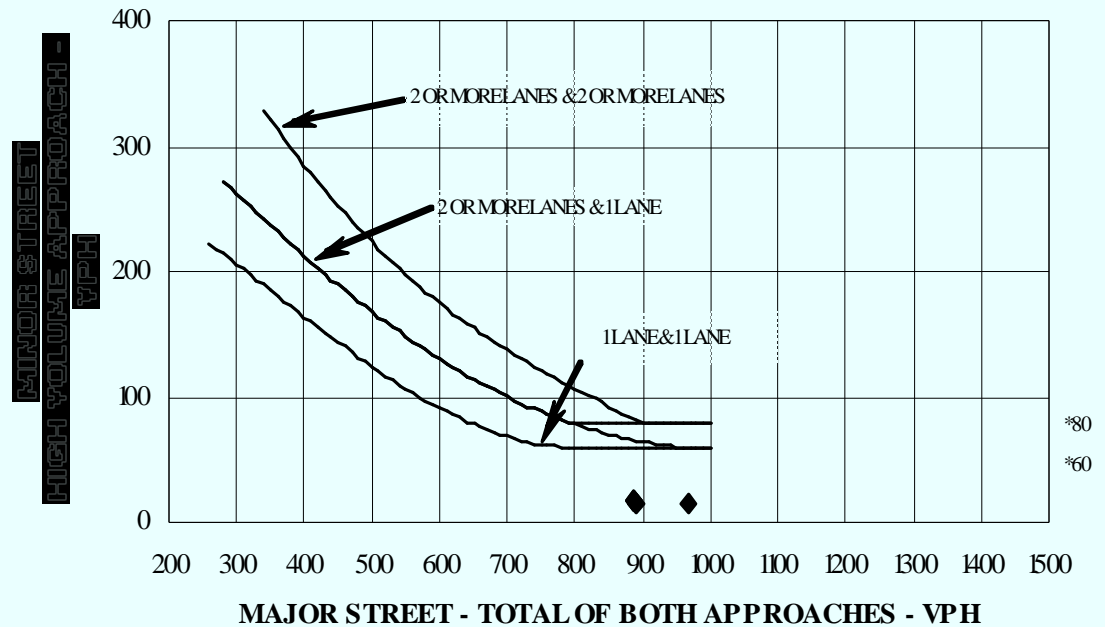
(volumes in veh/hr)	Minimum Requirements (80% Shown second row)				12 Hour Data											
					6-7 am	7-8 am	8-9 am	9-10 am	10-11 am	11-12 pm	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm
	Approach Lanes	1		2 or more												
Volume Level	100%	56%	100%	70%												
Both Approaches on Major Street	750	420	900	630	892	1191	1175	887	887	967		900	978	1384	1484	1328
Highest Approach on Minor Street	750	42	100	70	14	10	10	18	18	15	12	11	9	6	6	0
Total Hours:					0	0	0	0	0	0	0	0	0	0	0	0

Warrant 2 Four-Hour Veh. Volume

Four Highest Hours	Volumes	
	Major Street	Minor Street
10-11 am	887	18
9-10 am	887	18
11-12 pm	967	15
6-7 am	892	14

FIGURE 4C-2: Criteria for "70%" Volume Level

(Community Less than 10,000 population or above 70 km/hr (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 threshold for a minor street approach with one lane.

Warrant 3 Peak Hour

- This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.
- The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

Warrant 3 Peak Hour

A. If all three of the following conditions exist for the same 1 hour of an average day.

A1. The total stopped delay experienced by the traffic on one Minor-Street approach controlled by a STOP sign equals or exceeds 4 vehicle-hours for a one-lane approach, and

- 18 vph. each vehicle 13.3 min./veh.

Warrant 3 Peak Hour

A.2 The volume on the same minor-street approach equals or exceeds 100 vph for one lane of traffic, and

- Only 18 vehicles on Minor Street –fail

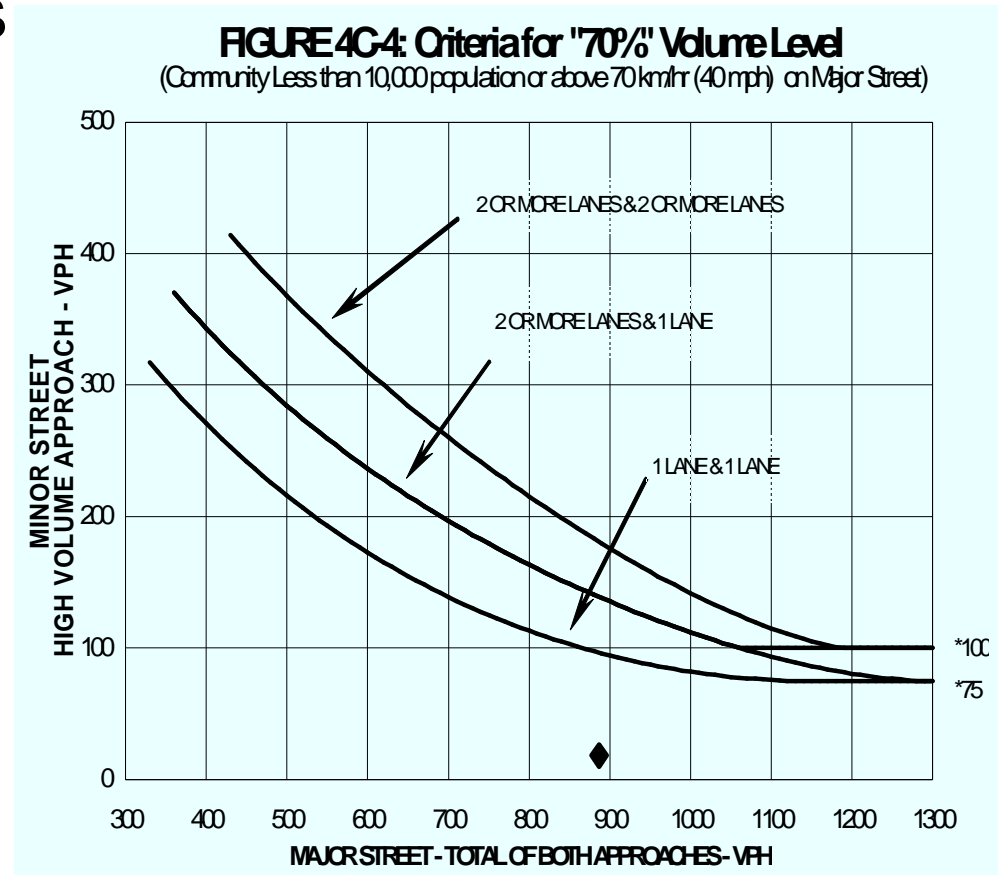
A.3 The total entering volume serviced during the hr exceeds 800 vph with four or more approaches.

- $887 \text{ vph} + 18 \text{ vph} = 905 > 800 \text{ vph}$ Met

Warrant 3 Peak Hour

B. The plotted point falls above the applicable curve.

- Not Met



Warrant 4 Pedestrian Volume

- The Pedestrian volume crossing the major street is 100 or more for each of four hours or 190 or more during any 1 hour.
- Total Pedestrian crossing for 12 hrs was 8
- Not met

Warrant 5 School Crossing

- School children cross a major is the principal reason to consider installing a traffic signal. One of the requirements is that 20 students cross the major street during the highest crossing hour.

Warrant 6 Coordinated Signal System

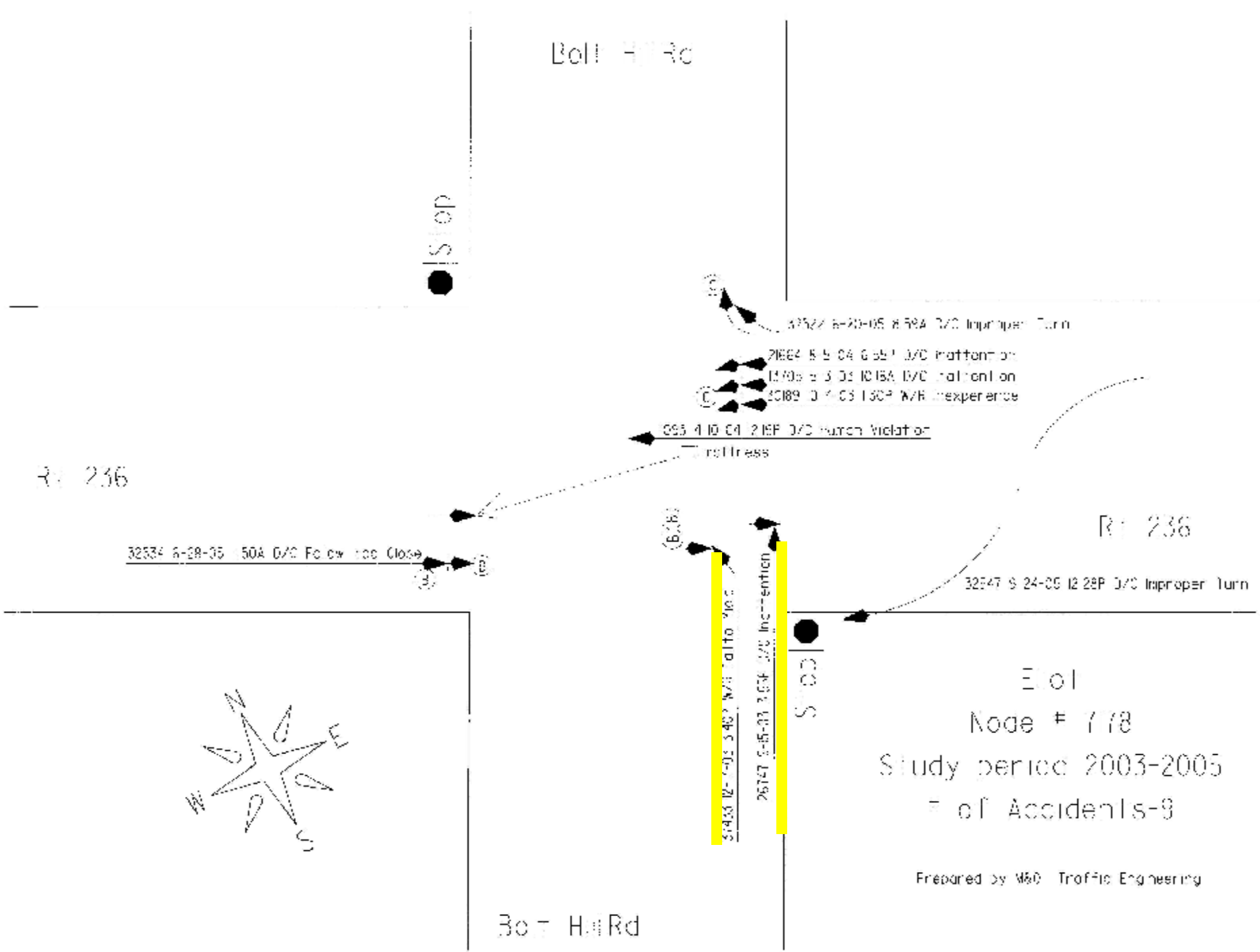
- This is applied where adjacent traffic signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Warrant 7 Crash Experience

- The crash experience warrant conditions are intended for applications where severity and frequency of crashes are the principal reasons.
- Must meet all 3 conditions:
 1. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

Warrant 7 Crash Experience

2. Five or more reported crashes, of types susceptible to correction by a traffic control signal, having occurred within a 12-month period, each crash involving personal injury or property damage; and.
 - There were 2 correctable crashes – Not Met
3. The Volumes in Warrant 1 Condition B (56% of the Volume) – Not Met

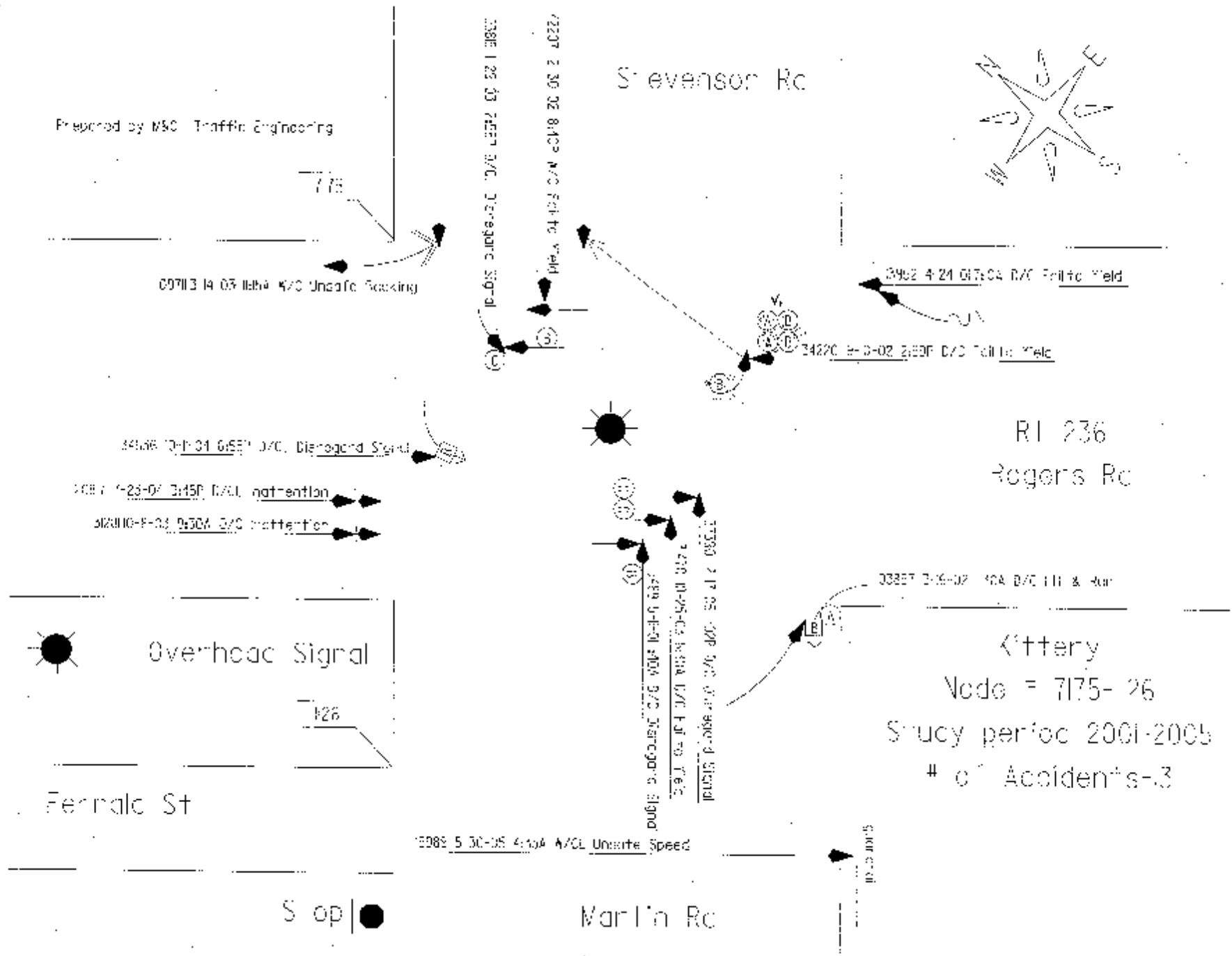


Warrant 8 Roadway Network

- This warrant requires the intersection of two or more major routes.
- This is not applicable at this location.

Route 236 / Martin

Route 236 / Martin & Stevenson Rd		
Start Time	Lefts from North	Lefts from South
6:00 A.M.	13	2
7:00 A.M.	36	4
8:00 A.M.	39	12
9:00 A.M.	31	5
10:00 A.M.	34	11
11:00 A.M.	42	10
Noon	27	14
1:00 P.M.	19	11
2:00 P.M.	33	25
3:00 P.M.	28	20
4:00 P.M.	36	23
5:00 P.M.	35	32
12 Hr Total	373	169
Apprch %	4.90%	2.50%
Total %	2.40%	1.10%
Pcars	362 (97%)	166 (98.2%)
SUTrucks	10 (2.7%)	3 (1.8%)
Tractor Trailer	1 (0.3%)	0



Rte 236/Martin Mobility B/C

Inputs :

Pk-Hr Entering Vehicles	1870	vehicles
Travel Time (Delay) Reduction per Vehicle	-1.2	seconds/veh
Pk-Hr % of 24-Hr Volume	8.61	%
Factor Group [1, 2, 3, 4 (I+II), or 5 (II+III)]	1	
% Heavy Vehicles	3.2	%
Value of Time for Heavy Vehicles	39	\$/veh-hr
Value of Time for Passenger Vehicles	10	\$/veh-hr
Design Life of Improvement	5	years
Cost of Improvement	\$ 10000	
Discount Rate	6	%

Outputs :

Pk-Hr Time Savings	-0.62	veh-hrs
Mobility Benefit Multiplier	1350.2	
Annual Time Savings	-842	veh-hrs
Annual Mobility Benefit	\$ -9197	
Annualized Cost of Improvement	\$ 2374	
Benefit/Cost Ratio	-3.87	

Safety & Mobility B/C

Severity	# of Injury Crashes	# of Injuries or Vehicles	Study Period Changes in Injuries	Annual Changes in Injuries	Cost per Injury	Annual Benefit
Fatal	0				\$ 2,600,000	
Injury (A)	0	2	1.40	0.28	\$ 180,000	\$50,400
Injury (B)	0	3	2.10	0.42	\$ 36,000	\$15,120
Injury (C)	0	0			\$ 19,000	
P.D.O.	0	0			\$ 2,000	
Total	0	5				\$ 65,520

Safety	\$ 65,520
Mobility	\$ (9,197)
Combined	\$ 56,323

$$B/C = 23.725$$

Using equivalent uniform annual costs

$$B = \$ \underline{56,323}$$

$$C = \$ 2,374$$