Signal Warrant Study

City of Broadview Heights
Cuyahoga County, Ohio

September 2010

Prepared by:

Northeast Ohio Areawide Coordinating Agency
1299 Superior Avenue
Cleveland Ohio 44114-3204

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- Administer the area clearinghouse function, which includes providing local government with the opportunity to review a wide variety of local or state applications for federal funds.
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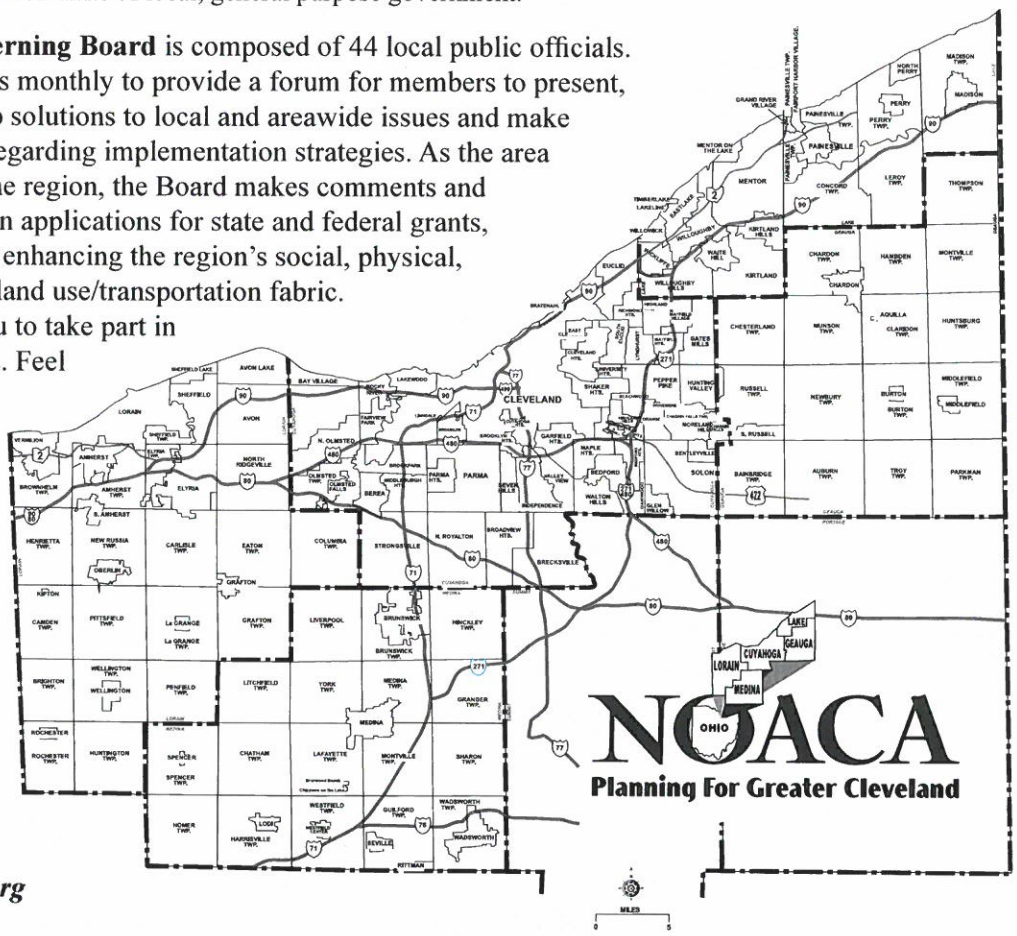

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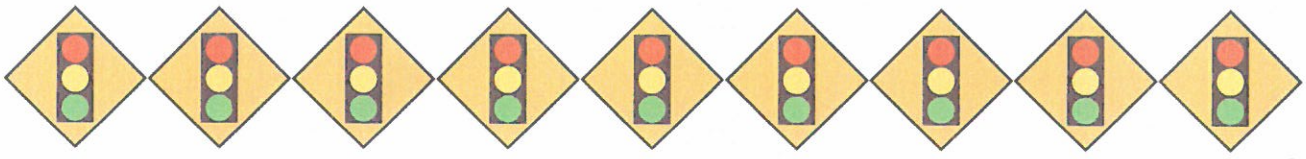
Executive Summary

These signal warrant studies were conducted by the Northeast Ohio Areawide Coordinating Agency (NOACA) as part of the Transportation Links to Communities program (TLC) for the City of Broadview Heights in Cuyahoga County. Signal warrants were examined to evaluate the need for the placement of traffic signals at the following six intersections:

1. West Wallings Road and Briarwood Drive
2. East Royalton Road and Cherry Hill Lane/ Ledgemont Drive
3. Broadview Road and Akins Road/ Faulhaber Road (City Hall Entrance)
4. Broadview Road and Valley Parkway Drive
5. Broadview Road and Macintosh Lane/ Hamilton Drive
6. Broadview Road and Boston Road

Traffic counts were collected by the Cuyahoga County Engineer's Office during the period of November through December 2009. NOACA used the signal warrant module of the most recent version of the Highway Capacity Software to analyze the data and perform the traffic signal warrants evaluation according to the guidelines and recommendations of the Ohio Manual of Uniform Traffic Control Devices (OMUTCD). Based on existing traffic volumes and existing roadway geometric conditions, traffic signals are not warranted at any of the studied intersections listed above.



Background

The signal warrant analyses are part of a traffic engineering study conducted by the Northeast Ohio Areawide Coordinating Agency (NOACA) for the city of Broadview Heights in Cuyahoga County as part of NOACA's Transportation Links to Communities (TLC) program. The signal warrant study includes six intersections that are currently controlled by two-way stop signs. The analyses are for the intersections circled in Figure 1, which are from north to south:

1. West Wallings Road and Briarwood Drive
2. East Royalton Road and Cherry Hill Lane/ Ledgemont Drive
3. Broadview Road and Akins Road/ Faulhaber Road (City Hall Entrance)
4. Broadview Road and Valley Parkway Drive
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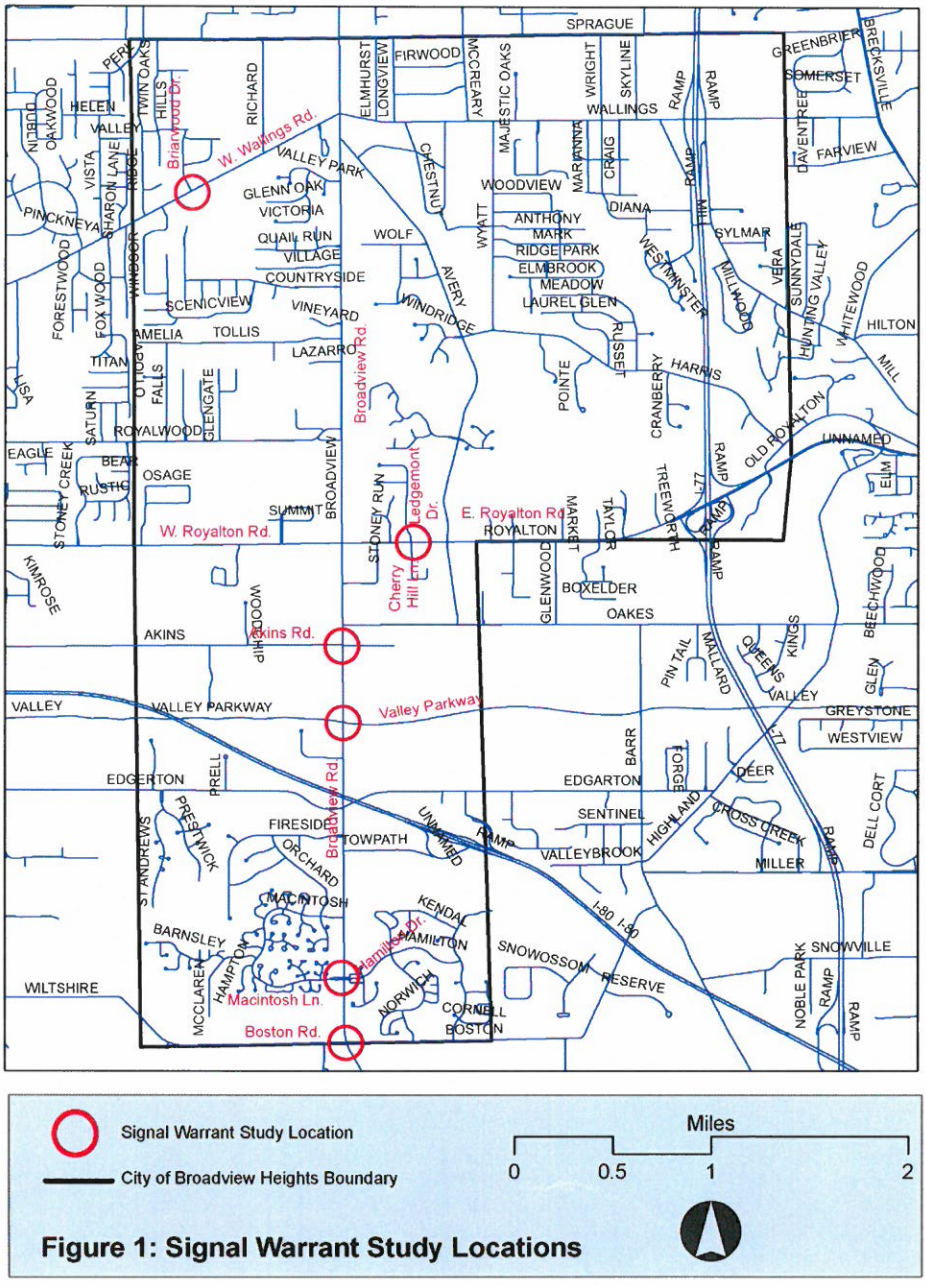


Figure 1: Signal Warrant Study Locations

Signal Warrant Analyses

Methodology

The traffic signal warrants analysis was performed according to the Ohio Manual of Uniform Traffic Control Devices (OMUTCD). A traffic signal is warranted if one or more of the following eight warrants are satisfied:

Warrant 1: Eight-Hour Vehicular Volume

Warrant 2: Four-Hour Vehicular Volume

Warrant 3: Peak Hour

Warrant 4: Pedestrian Volume

Warrant 5: School Crossing

Warrant 6: Coordinated Signal System

Warrant 7: Crash Experience

Warrant 8: Roadway Network

Warrant 1: Eight-Hour Vehicular Volume

- **Condition A**: Applied at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.
- **Condition B:** Applied at locations where condition A is not satisfied and the minor road traffic experiences high delays and conflict in entering or crossing the major road.

For each of any eight hours of an average day the total volume in vehicles per hour (vph) of the major road and the higher volume (vph) of the two approaches of the minor road should exceed the minimum threshold traffic volumes defined in the OMUTCD. The thresholds are shown in the work sheet for each intersection. Where the posted speed limit exceeds 40 mph, or the intersection lies in a community of a population of less than 10,000 people, the traffic volumes thresholds are decreased to address such areas.

Warrant 2: Four-Hour Vehicular Volume

This warrant is applied where the volume of intersecting traffic is the main reason to consider installing a traffic control signal. The volume of at least four hours should exceed the minimum threshold outlined in the OMUTCD to justify this warrant. The thresholds are also decreased to address where the posted speed limit exceeds 40 mph, or the intersection lies in a community of a population of less than 10,000 people.

Warrant 3: Peak Hour

This warrant is applied where traffic conditions are such that for at least one hour the minor road traffic suffers undue delay. The point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for one hour (any four consecutive 15-minute periods) of an average day falls above the applicable OMUTCD defined thresholds.

> For **warrants 1**, **2** and **3**, bicycles may be counted as vehicles when using the street with other vehicular traffic.

Warrant 4: Pedestrian Volume

The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street. Bicyclists using pedestrian crossings may be counted as pedestrians.

The need for a traffic control signal at an intersection or midblock crossing would be considered if:

- Pedestrian volume crossing the major street during an average day is more than 100 for any four hours or 190 during any one hour, and
- The number of adequate gaps per hour in the traffic stream is less than 60 gaps during the same hours that the volume criterion is satisfied.

Warrant 5: School Crossing

The School Crossing signal warrant is intended for application where the principal reason to consider installing a traffic control signal is schoolchildren cross the major street.

The need for a traffic control signal would be considered if the number of adequate gaps in the vehicular traffic stream during the period when children are using an established school crossing is less than the number of minutes in the same period and there are a minimum of 20 students during the highest crossing hour.

Warrant 6: Coordinated Signal System

A signal is warranted to maintain proper platooning through a coordinated signal system. A traffic control signal would be considered if the adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent signal will collectively provide a progressive operation.

This warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.

Warrant 7: Crash Experience

The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.
A signal is warranted if following three criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period.

C. For each of any eight hours of an average day, the traffic volume (vph) given in both of the 80 percent columns of **warrant 1** Condition A or Condition B must be met as defined in the OMUTCD.

Warrant 8: Roadway Network

A traffic control signal might be justified to encourage concentration and organization of traffic flow on a roadway network.

A traffic control signal would be considered if the common intersection of two or more major routes has an existing entering traffic volume and 5-year projected traffic volumes that would exceed the minimum threshold volumes defined by the OMUTCD.

Signal Warrant Analyses

Analysis and Application

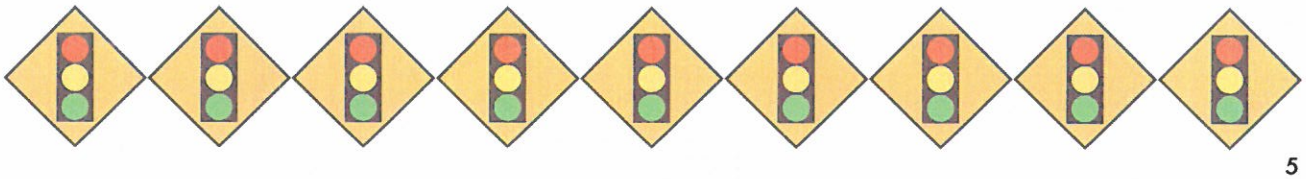
The analyses of **Warrants 1**, **2** and **3** are based on 24-hour traffic counts conducted by the Cuyahoga County Engineer's Office during the period of November 11 through December 4, 2009. Appendix A shows the traffic volumes and the seasonal adjustments used.

Warrants 4 and **5** are not applicable. None of the six intersections are close to a school or any pedestrian traffic generators. The distance to the nearest traffic controlled intersection on both sides of the intersections were taken into consideration for **warrants 6** and **8**.

The analysis of **Warrant 7** is based on the Ohio Department of Public Safety (ODPS) data for the years 2007-2009. The number and type of crashes susceptible to correction by a traffic signal was considered.

The signal warrant module of the Highway Capacity Software (HCS) was used to analyze the OMUTCD signal warrants.

The characteristics of each intersection and a summary table of the crashes for the three-year period (2007-2009) are described in the following sections. The signal warrant analysis for each intersection is summarized in a table at the end of each section.



1. West Wallings Road and Briarwood Drive Intersection

Existing Conditions

- The intersection is three-legged and is located in a residential area. Figure 2 shows the layout of the intersection. The main roadway is Wallings Road, which consists of an 11-foot lane and two-foot paved shoulder in each direction. A five-foot sidewalk runs along the north side of Wallings Road. Briarwood Drive is a two-lane, two-way street with a total width of 21 feet. Pictures 1 and 2 show different views of the intersection.
- The posted speed limit on Wallings Road is 35 mph.
- The nearest signalized intersection along the main street are 0.83 mile east and 1.45 miles west of the intersection, respectively.
- The crashes at this intersection for the period 2007-2009 are summarized in the table below.

Year	Type of Crash			Total
	Angle	Rear-End	Backing	
2007	-	1	-	1
2008	-	-	1	1
2009	-	1	-	1
Total	**-**	**2**	**1**	**3**

Signal Warrants Evaluation

- Based on the OMUTCD signal warrants and using the seasonally adjusted 24-hour traffic counts and the ODPS crash data, the intersection does not warrant a traffic signal. The analysis is summarized in Table 1. None of the eight signal warrants were satisfied by the traffic counts collected. The crash analyses show the occurrence of an average of one crash per year at the intersection. None of the reported crashes are of the type that can be avoided by installing a traffic control signal.

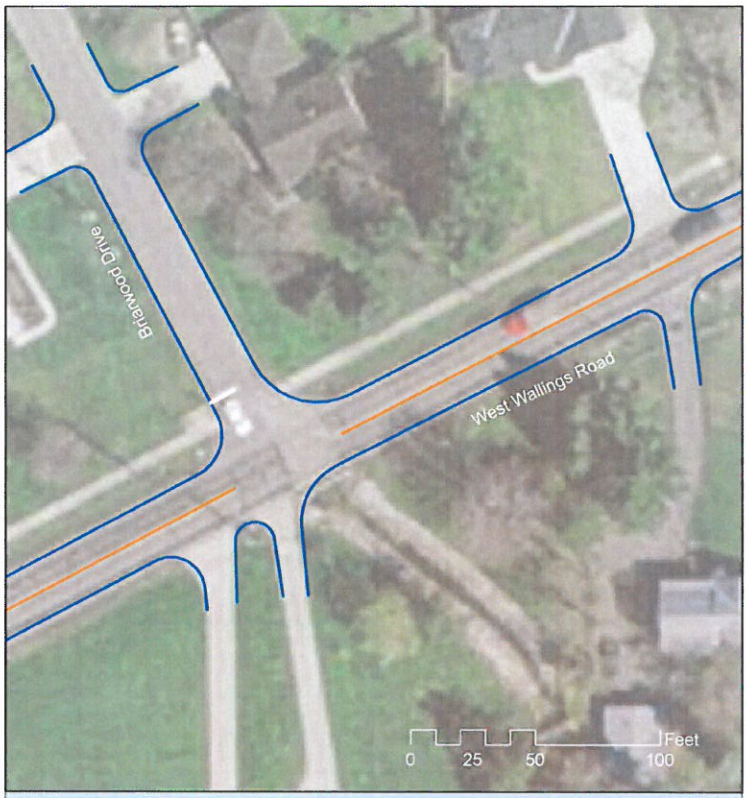


Figure 2: The intersection of Wallings Road & Briarwood Drive

Picture 1: West Wallings Road and Briarwood Drive Intersection looking south

Picture 2: West Wallings Road and Briarwood Drive Intersection looking east

SIGNAL WARRANTS EVALUATION

Intersection: Wallings Road and Briarwood Drive
Location : Broadview Heights
Number of Lanes per approach: N= 1 S=0 E= 1 W= 1
Does 70% warrant apply? No
Major Street speed limit: 35 mph

Analysis By : NOACA
Traffic count date : 11/11/2009

		Hourly volumes			WARRANT #1								WARRANT	
					Condition A				Condition B				#2	#3
Condition	No. of Lanes	Major St. 2-way	Minor St. 1-way	Minor St. 1-way	100%		80%		100%		80%		FOUR HOUR	PEAK HOUR
					Major	Minor	Major	Minor	Major	Minor	Major	Minor		
Normal	1				500	150	400	120	750	75	600	60		
	2+				600	200	480	160	900	100	720	80		
70%*	1				**350**	**105**	**280**	**84**	**525**	**53**	**420**	**42**		
	2+				420	140	336	112	630	70	504	56		
MID to 1 AM		138		5										
1 AM to 2 AM		79		4										
2 AM to 3 AM		44		0										
3 AM to 4 AM		15		2										
4 AM to 5 AM		17		1										
5 AM to 6 AM		25		2										
6 AM to 7 AM		129		6										
7 AM to 8 AM		437		16			X							
8 AM to 9 AM		796		25	X		X		X		X			
9 AM to 10 AM		748		35	X		X				X			
10 AM to 11 AM		669		21	X		X				X			
11 AM to 12 Noon		523		19	X		X							
12 Noon to 1 PM		618		12	X		X				X			
1 PM to 2 PM		569		22	X		X							
2 PM to 3 PM		609		19	X		X				X			
3 PM to 4 PM		614		28	X		X				X			
4 PM to 5 PM		815		32	X		X		X		X			
5 PM to 6 PM		923		32	X		X		X		X			
6 PM to 7 PM		1012		32	X		X		X		X			
7 PM to 8 PM		913		41	X		X		X		X			
8 PM to 9 PM		644		32	X		X				X			
9 PM to 10 PM		442		23			X							
10 PM to 11 PM		347		21										
11 PM to MID		236		10										
Hours Met					0		0		0		0		0	0
WARRANT SATISFIED					No		No		No		No		No	No

* Condition is determined by envirnoment: Use 70% values if the speed limit exceeds 40 MPH on the major road or if the location is in a build up area of an isolated community with a population of less than 10,000.

WARRANT #1 (Combination)
Conditions A & B are each met at the 80% level:..... No

WARRANT #4 (Pedestrian Volume)
Hours with 100 or more pedestrians:.....
Hours with 190 or more pedestrians:.....
Pedestrian crossing time (t):.....
Number of gaps greater than (t) during period:.....
Warrant Satisfied?..... NA

WARRANT #5 (School Crossing)
On approved school route?.....
Gap analysis made during period from.....
Pedestrian crossing time (t):.....
Number of gaps greater than (t) during period:.....
Number of vehicles during analysis period:.....
Approximate vehicular speed:.....
Number of children crossing during period:.....
Warrant Satisfied?..... NA

WARRANT #6 (COORDINATED SIGNAL SYSTEM)
Distance to nearest signal in each direction on major street:..... 0.83 mile East
1.45 mile West
Time space diagram:.....
Warrant Satisfied?..... NA

WARRANT #7 (CRASH EXPERIENCE)
Adequate trial of less restrictive measures:..... No
Number of crashes per year which could be prevented by signalization:... 0
80% of warrant #1 or #2 satisfied:.....
Will signalization disrupt progressive movement?.....
Warrant Satisfied?..... NO

WARRANT #8 (ROADWAY NETWORK)
Both streets are considered major routes:.....
At least 1000 V.P.H. during weekday peak hour:.....
5-Year projection meets Warrant 1, 2, or 3:.....
At least 1000 V.P.H. for any 5 hours on a Saturday or Sunday:.....
Meets Characteristic requirements?.....
Warrant Satisfied?..... NA

Table 1: Warrant Analysis for the Intersection of West Wallings Road and Briarwood Drive

2. East Royalton Road and Cherry Hill Lane/Ledgemont Drive Intersection

Existing Conditions

- The intersection is located in a residential area. Figure 3 shows the layout of the intersection. The main roadway is East Royalton Road (SR-82), which consists of a 12-foot lane in each direction and a 10-foot center two-way left-turn lane. The Ledgemont Drive approach consists of an exclusive 11-foot right-turn lane and a 12-foot shared through and left-turn lane. Cherry Hill Lane approach is a single 12-foot shared lane. Picture 3 shows the intersection east and west approaches.
- The nearest signal-controlled intersections east and west of the study intersection are East Royalton Road intersection with Avery Road and Broadview Road at a distance of 930 feet and 1,743 feet respectively.
- The posted speed limit on East Royalton Road is 35 mph.
- The crash data for the analysis period consisted of two angle crashes with severity of Property Damage Only (PDO).

Year	Type of Crash		Total
	Angle	Rear-End	
2007	-	1	1
2008	-	-	-
2009	-	1	1
Total	**-**	**2**	**2**

Signal Warrants Evaluation

- Based on the OMUTCD signal warrants and using the seasonally adjusted 24-hour traffic counts and the ODPS crash data, the intersection does not warrant a traffic signal. The analysis is summarized in Table 2. None of the eight signal warrants were satisfied by the traffic counts collected. The crash analyses show the occurrence of an average of one crash per year at the intersection. None of the reported crashes are of the type that can be avoided by installing a traffic control signal.

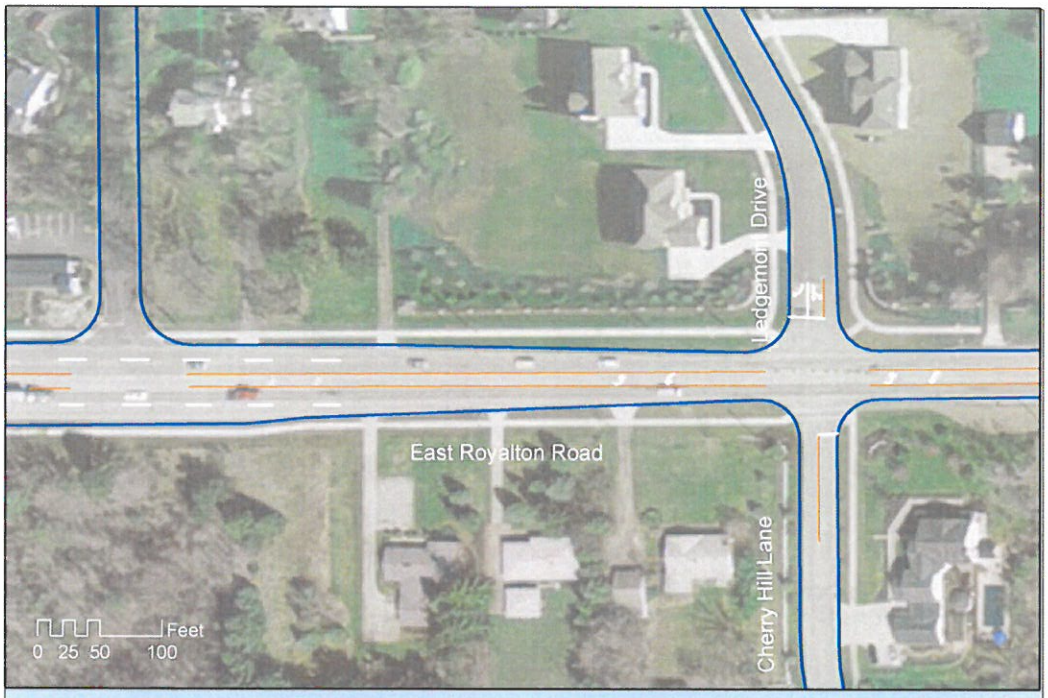


Figure 3: The Intersection of East Royalton Road and Cherry Hill Lane/Ledgemont Drive

Picture 3: East Royalton Road and Cherry Hill Lane/Ledgemont Drive Intersection looking west

SIGNAL WARRANTS EVALUATION

Intersection: Royalton and Cherry Hill/ Ledgemont
Location : Broadview Heights
Number of Lanes per approach: N= 2 S= 1 E= 1 W= 1
Does 70% warrant apply? No
Major Street speed limit: 35 mph

Analysis By : NOACA
Traffic count date : 11/19/2009

		Hourly volumes			WARRANT #1								WARRANT	
					Condition A				Condition B				#2	#3
Condition	No. of Lanes	Major St. 2-way	Minor St. 1-way	Minor St. 1-way	100%		80%		100%		80%		FOUR HOUR	PEAK HOUR
					Major	Minor	Major	Minor	Major	Minor	Major	Minor		
Normal	1		NB		500	150	400	120	750	75	600	60		
	2+			SB	600	200	480	160	900	100	720	80		
70%*	1				350	105	280	84	525	53	420	42		
	2+				420	140	336	112	630	70	504	56		
MID to 1 AM		288	2	1										
1 AM to 2 AM		165	3	0										
2 AM to 3 AM		87	0	1										
3 AM to 4 AM		78	0	0										
4 AM to 5 AM		78	1	2										
5 AM to 6 AM		127	2	4										
6 AM to 7 AM		253	3	1										
7 AM to 8 AM		816	4	6	X		X		X		X			
8 AM to 9 AM		1391	25	18	X		X		X		X			
9 AM to 10 AM		1509	24	21	X		X		X		X			
10 AM to 11 AM		1296	14	33	X		X		X		X			
11 AM to 12 Noon		1179	11	14	X		X		X		X			
12 Noon to 1 PM		1234	14	24	X		X		X		X			
1 PM to 2 PM		1338	15	22	X		X		X		X			
2 PM to 3 PM		1310	13	23	X		X		X		X			
3 PM to 4 PM		1349	15	24	X		X		X		X			
4 PM to 5 PM		1527	32	26	X		X		X		X			
5 PM to 6 PM		1615	22	33	X		X		X		X			
6 PM to 7 PM		1853	28	20	X		X		X		X			
7 PM to 8 PM		1583	19	27	X		X		X		X			
8 PM to 9 PM		1117	22	50	X		X		X		X			
9 PM to 10 PM		903	5	10	X		X		X		X			
10 PM to 11 PM		806	4	16	X		X		X		X			
11 PM to MID		497	1	6			X							
Hours Met					0		0		0		0		0	0
WARRANT SATISFIED					No		No		No		No		No	No

* Condition is determined by envirnoment: Use 70% values if the speed limit exceeds 40 MPH on the major road or if the location is in a build up area of an isolated community with a population of less than 10,000.

WARRANT #1 (Combination)
Conditions A & B are each met at the 80% level:..... No

WARRANT #4 (Pedestrian Volume)
Hours with 100 or more pedestrians:.....
Hours with 190 or more pedestrians:.....
Pedestrian crossing time (t):.....
Number of gaps greater than (t) during period:.....
Warrant Satisfied?..... NA

WARRANT #5 (School Crossing)
On approved school route?.....
Gap analysis made during period from.....
Pedestrian crossing time (t):.....
Number of gaps greater than (t) during period:.....
Number of vehicles during analysis period:.....
Approximate vehicular speed:.....
Number of children crossing during period:.....
Warrant Satisfied?..... NA

WARRANT #6 (COORDINATED SIGNAL SYSTEM)
Distance to nearest signal in each direction on major street:..... 930 ft. East
1743 ft. West
Time space diagram :.....
Warrant Satisfied?..... NA

WARRANT #7 (CRASH EXPERIENCE)
Adequate trial of less restrictive measures:.....
Number of crashes per year which could be prevented by signalization:... 1
80% of warrant #1 or #2 satisfied:.....
Will signalization disrupt progressive movement?.....
Warrant Satisfied?..... No

WARRANT #8 (ROADWAY NETWORK)
Both streets are considered major routes:.....
At least 1000 V.P.H. during weekday peak hour:.....
5-Year projection meets Warrant 1, 2, or 3:.....
At least 1000 V.P.H. for any 5 hours on a Saturday or Sunday:.....
Meets Characteristic requirements?.....
Warrant Satisfied?..... NA

Table 2: Warrant Analysis for the Intersection of Royalton Road and Cherry Hill Lane/Ledgemont Drive

3. Broadview Road and Akins Road/Faulhaber Road Intersection

Existing Conditions

- The intersection is four-legged, with Faulhaber Road (City Hall Entrance) as the east leg of the intersection and Akins Road as the west leg, as illustrated in Figure 4. Broadview Road is a two-way, two-lane roadway of 24 feet total width with a three-foot paved shoulder on each side. The Akins Road approach is a single 10-foot shared lane with a two-foot paved shoulder on each side. The westbound approach is Faulhaber Road, which consists of a 10-foot left-turn bay and an 11-foot shared through and right-turn lane. Pictures 4 and 5 show the different approaches.
- There is a six-foot wide multipurpose path on the east side of Broadview road. The path widens to a 10-foot bicycle path (two-way) 250 feet south of the intersection and continues south to Valley Parkway Drive.
- The nearest signalized intersections are Oakes Road 500 feet north of Akins and Edgerton Road 0.8 mile south.
- The posted speed limit on both Broadview and Akins Roads is 35 mph.
- Seven intersection-related crashes were reported during the period 2007-2009: three angle crashes, three rear-end crashes and one bicycle-related.

Year	Type of Crash			Total
	Angle	Rear-End	Bicycle-Related	
2007	2	-	1	3
2008	1	2	-	3
2009	-	1	-	1
Total	**3**	**3**	**1**	**7**

Signal Warrants Evaluation

- Based on the OMUTCD signal warrants and using the seasonally adjusted 24-hour traffic counts and the ODPS crash data, conditions at the intersection do not warrant a traffic signal. The analysis is summarized in Table 3. None of the eight warrants described in the OMUTCD to install a signal were met. A total of seven crashes were recorded in the three-year analysis period; three crashes were angle crashes that can be avoided by installing a signal but the threshold of five crashes per year was not met.
- Monitoring the change in the number of crashes and the change in traffic volumes to reevaluate this intersection in two years is recommended.

Figure 4: The Intersection of Broadview Road and Akins Road

Picture 4: Broadview Road and Akins Road/Faulhaber Road Intersection looking east

Picture 5: Broadview Road and Akins Road/Faulhaber Road Intersection looking south

SIGNAL WARRANTS EVALUATION

Intersection: Broadview Road and Akins Road
Location : Broadview Heights
Number of Lanes per approach: N=1 S= 1 E=2 W= 1
Does 70% warrant apply? No
Major Street speed limit: 35 mph

Analysis By : NOACA
Traffic count date : 12/4/2009

		Hourly volumes			WARRANT #1								WARRANT	
					Condition A				Condition B				#2	#3
Condition	No. of Lanes	Major St. 2-way	Minor St. 1-way	Minor St. 1-way	100%		80%		100%		80%		FOUR HOUR	PEAK HOUR
					Major	Minor	Major	Minor	Major	Minor	Major	Minor		
Normal	1		EB		500	150	400	120	750	75	600	60		
	2+			WB	600	200	480	160	900	100	720	80		
70%*	1				350	105	280	84	525	53	420	42		
	2+				420	140	336	112	630	70	504	56		
MID to 1 AM		166	8	0										
1 AM to 2 AM		92	6	0										
2 AM to 3 AM		33	4	0										
3 AM to 4 AM		29	11	3										
4 AM to 5 AM		15	5	0										
5 AM to 6 AM		33	11	0										
6 AM to 7 AM		73	30	3										
7 AM to 8 AM		248	97	17						X		X		
8 AM to 9 AM		677	144	16	X		X	X		X	X	X		
9 AM to 10 AM		956	154	22	X	X	X	X	X	X	X	X	X	
10 AM to 11 AM		770	86	55	X		X		X	X	X	X		
11 AM to 12 Noon		604	92	36	X		X			X	X	X		
12 Noon to 1 PM		693	79	98	X		X			X	X	X		
1 PM to 2 PM		660	55	58	X		X				X			
2 PM to 3 PM		640	68	33	X		X				X	X		
3 PM to 4 PM		663	68	30	X		X				X	X		
4 PM to 5 PM		865	110	92	X		X		X	X	X	X		
5 PM to 6 PM		970	95	71	X		X		X	X	X	X		
6 PM to 7 PM		1176	86	25	X		X		X	X	X	X	X	
7 PM to 8 PM		960	68	43	X		X		X		X	X		
8 PM to 9 PM		694	54	38	X		X				X			
9 PM to 10 PM		542	36	43	X		X							
10 PM to 11 PM		406	41	28			X							
11 PM to MID		284	22	11										
Hours Met					1		2		5		11		2	0
WARRANT SATISFIED					No		No		No		Yes		No	No

* Condition is determined by envirnoment: Use 70% values if the speed limit exceeds 40 MPH on the major road or if the location is in a build up area of an isolated community with a population of less than 10,000.

WARRANT #1 (Combination)
Conditions A & B are each met at the 80% level:..... No

WARRANT #4 (Pedestrian Volume)
Hours with 100 or more pedestrians:.....
Hours with 190 or more pedestrians:.....
Pedestrian crossing time (t):.....
Number of gaps greater than (t) during period:.....
Warrant Satisfied?..... NA

WARRANT #5 (School Crossing)
On approved school route?.....
Gap analysis made during period from.....
Pedestrian crossing time (t):.....
Number of gaps greater than (t) during period:.....
Number of vehicles during analysis period:.....
Approximate vehicular speed:.....
Number of children crossing during period:.....
Warrant Satisfied?..... NA

WARRANT #6 (COORDINATED SIGNAL SYSTEM)
Distance to nearest signal in each direction on major street:..... 500 ft. North
0.8 mile South
Time space diagram:.....
Warrant Satisfied?..... NA

WARRANT #7 (CRASH EXPERIENCE)
Adequate trial of less restrictive measures:..... No
Number of crashes per year which could be prevented by signalization: 2
80% of warrant #1 or #2 satisfied:..... Yes
Will signalization disrupt progressive movement?.....
Warrant Satisfied?..... No

WARRANT #8 (ROADWAY NETWORK)
Both streets are considered major routes:.....
At least 1000 V.P.H. during weekday peak hour:.....
5-Year projection meets Warrant 1, 2, or 3:.....
At least 1000 V.P.H. for any 5 hours on a Saturday or Sunday:.....
Meets Characteristic requirements?.....
Warrant Satisfied?..... NA

Table 3: Warrant Analysis for the Intersection of Broadview Road and Akins Road

4. Broadview Road and Valley Parkway Drive Intersection

Existing Conditions

- The intersection is located in a light density residential semi-rural area. Figure 5 and Pictures 6 through 8 show the layout of the intersection.
- The intersection is located on the crest of a vertical curve along Broadview Road.
- Flashing beacons are used in addition to the stop signs.
- A 10-foot wide bicycle path starts in the northeast quadrant of the intersection and extends north to Faulhaber Road (City Hall entrance).
- The main roadway is Broadview Road, which consists of a single 12-foot lane in each direction and four-foot paved shoulder on both sides of the roadway.
- Valley Parkway Drive eastbound and westbound approaches consist of a single 11-foot shared lane.
- The nearest signal controlled intersections north and south of Valley Parkway Drive are 0.42 mile and 0.48 mile respectively.
- The posted speed limit on Broadview Road and Valley Parkway Drive are 45 mph and 30 mph, respectively.
- There were eight intersection related crashes at this location during the three-year period of 2007-2009. The crash severity of seven crashes was Property Damage Only and an Injury for the 2007 rear-end crash.

Year	Type of Crash		Total
	Angle	Rear-End	
2007	2	1	3
2008	1	2	3
2009	2	-	2
Total	**5**	**3**	**8**

Signal Warrants Evaluation

- Based on the OMUTCD signal warrants and using the seasonally adjusted 24-hour traffic counts and the ODPS crash data, conditions at the intersection do not warrant a traffic signal. The analysis is summarized in Table 4. None of the eight signal warrants described in the OMUTCD were met based on the existing traffic volumes counted at the intersection. A total of eight crashes were reported at the intersection in the three-year period (2007-2009); three crashes were rear-end and five were angle crashes. The angle crashes could be prevented by installing a signal but their number does not meet the threshold of five crashes per year.
- Monitoring the change in the number of crashes and the change in traffic volumes to reevaluate this intersection in two years is recommended.

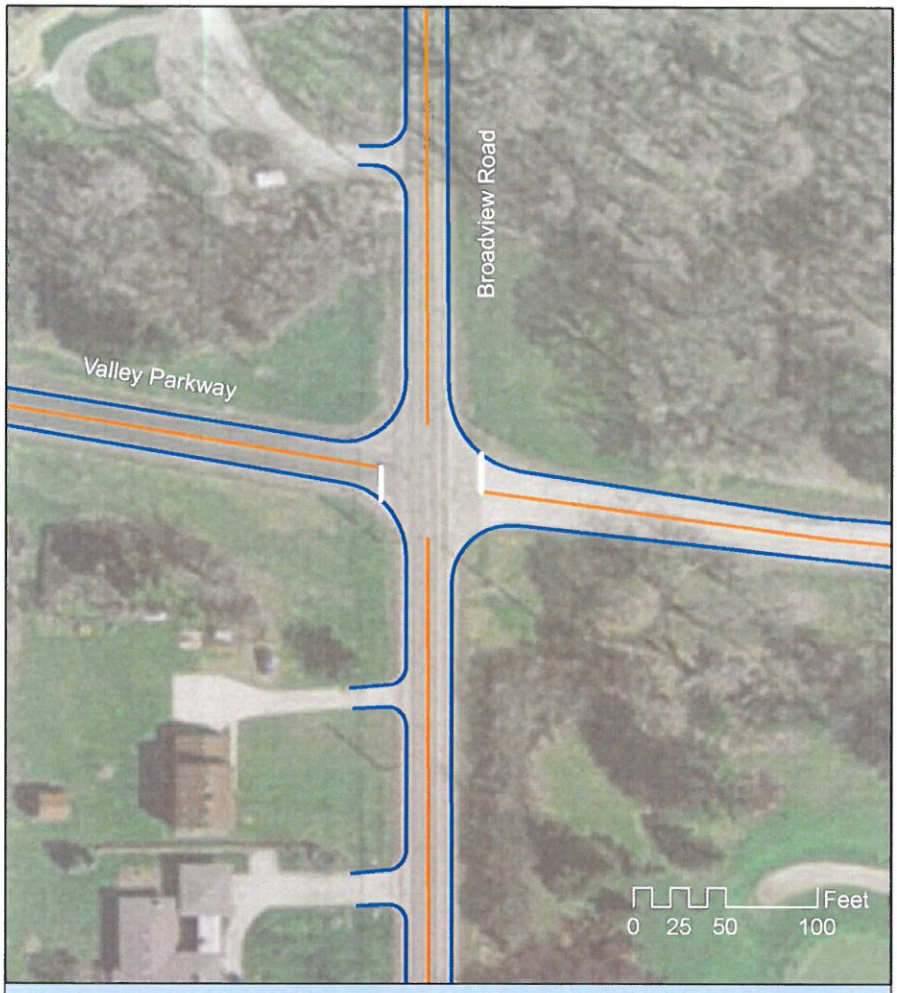


Figure 5: The Intersection of Broadview Road & Valley Parkway Drive

Picture 6: Broadview Road and Valley Parkway Drive Intersection looking north

Picture 7: Broadview Road and Valley Parkway Drive Intersection looking north

Picture 8: Broadview Road and Valley Parkway Drive Intersection looking east

SIGNAL WARRANTS EVALUATION

Intersection: Broadview Road and Valley Parkway Drive
Analysis By : NOACA
Location : Broadview Heights
Traffic count date : #####
Number of Lanes per approach: N= 1 S= 1 E= 1 W= 1
Does 70% warrant apply? No
Major Street speed limit: 35 mph

		Hourly volumes			WARRANT #1								WARRANT	
					Condition A				Condition B				#2	#3
Condition	No. of Lanes	Major St. 2-way	Minor St. 1-way	Minor St. 1-way	100%		80%		100%		80%			
					Major	Minor	Major	Minor	Major	Minor	Major	Minor	FOUR HOUR	PEAK HOUR
Normal	1				500	150	400	120	750	75	600	60		
	2+				600	200	480	160	900	100	720	80		
70%*	1				350	105	280	84	525	53	420	42		
	2+				420	140	336	112	630	70	504	56		
MID to 1 AM		82	8	1										
1 AM to 2 AM		55	4	1										
2 AM to 3 AM		29	1	1										
3 AM to 4 AM		13	2	0										
4 AM to 5 AM		23	1	2										
5 AM to 6 AM		26	6	1										
6 AM to 7 AM		129	10	1										
7 AM to 8 AM		470	49	6			X							
8 AM to 9 AM		1130	109	8	X		X		X	X	X	X	X	
9 AM to 10 AM		1227	109	18	X		X		X	X	X	X	X	
10 AM to 11 AM		862	65	13	X		X		X		X	X		
11 AM to 12 Noon		684	42	16	X		X				X			
12 Noon to 1 PM		734	38	28	X		X				X			
1 PM to 2 PM		753	36	28	X		X		X		X			
2 PM to 3 PM		657	40	29	X		X				X			
3 PM to 4 PM		655	49	28	X		X				X			
4 PM to 5 PM		716	65	40	X		X				X	X		
5 PM to 6 PM		847	54	58	X		X		X		X			
6 PM to 7 PM		920	64	47	X		X		X		X	X		
7 PM to 8 PM		809	41	23	X		X		X		X			
8 PM to 9 PM		484	30	15			X							
9 PM to 10 PM		309	18	11										
10 PM to 11 PM		249	24	8										
11 PM to MID		146	6	3										
Hours Met					0		0		2		5		2	0
WARRANT SATISFIED					No		No		No		No		No	No

* Condition is determined by envirnoment: Use 70% values if the speed limit exceeds 40 MPH on the major road or if the location is in a build up area of an isolated community with a population of less than 10,000.

WARRANT #1 (Combination)
Conditions A & B are each met at the 80% level:..... No

WARRANT #4 (Pedestrian Volume)
Hours with 100 or more pedestrians:..... ____
Hours with 190 or more pedestrians:..... ____
Pedestrian crossing time (t):..... ____
Number of gaps greater than (t) during period:..... ____
Warrant Satisfied?..... NA

WARRANT #5 (School Crossing)
On approved school route?..... ____
Gap analysis made during period from..... ____
Pedestrian crossing time (t):..... ____
Number of gaps greater than (t) during period:..... ____
Number of vehicles during analysis period:..... ____
Approximate vehicular speed:..... ____
Number of children crossing during period:..... ____
Warrant Satisfied?..... NA

WARRANT #6 (COORDINATED SIGNAL SYSTEM)
Distance to nearest signal in each direction on major street:..... 0.42 mile South
0.48 mile North
Time space diagram:..... ____
Warrant Satisfied?..... NA

WARRANT #7 (CRASH EXPERIENCE)
Adequate trial of less restrictive measures:..... ____
Number of crashes per year which could be prevented by signaliza 2
80% of warrant #1 or #2 satisfied:..... No
Will signalization disrupt progressive movement?..... ____
Warrant Satisfied?..... Nn

WARRANT #8 (ROADWAY NETWORK)
Both streets are considered major routes:..... ____
At least 1000 V.P.H. during weekday peak hour:..... ____
5-Year projection meets Warrant 1, 2, or 3:..... ____
At least 1000 V.P.H. for any 5 hours on a Saturday or Sunday:..... ____
Meets Characteristic requirements?..... ____
Warrant Satisfied?..... NA

Table 4: Warrant Analysis for the Intersection of Broadview Road and Valley Parkway Drive

5. Broadview Road and Macintosh Lane/Hamilton Drive Intersection

Existing Conditions

- The intersection is located in a residential area. Figure 6 and Picture 9 show the layout of the intersection.
- The main roadway is Broadview Road, which consists of a single 12-foot lane in each direction and 4.5-foot paved shoulder on each side.
- Macintosh Lane and Hamilton Drive approaches are a single shared lane 16-foot and 24-foot wide, respectively.
- The nearest signal controlled intersections are at Edgerton Road 0.84 mile north of Macintosh Lane and at SR-303(Center Road) 3.3 miles south.
- The posted speed limit on Broadview Road is 45 mph.
- There were five intersection related crashes at this location during the analysis period; all crash severities were PDO except the 2007 rear-end crash was an injury.

Year	Type of Crash		Total
	Angle	Rear-End	
2007	1	1	2
2008	-	2	2
2009	1	-	1
Total	**2**	**3**	**5**

Signal Warrants Evaluation

- Based on the OMUTCD signal warrants and using the seasonally adjusted 24-hour traffic counts and the ODPS crash data, the intersection does not warrant a traffic signal. The analysis is summarized in Table 5. None of the eight signal warrants described in the OMUTCD were met based on the existing traffic volumes counted at the intersection and crash data. The reported number of crashes that can be prevented by installing a signal reported is two angle crashes for the three-year analysis period, which does not meet the threshold of five crashes per year.

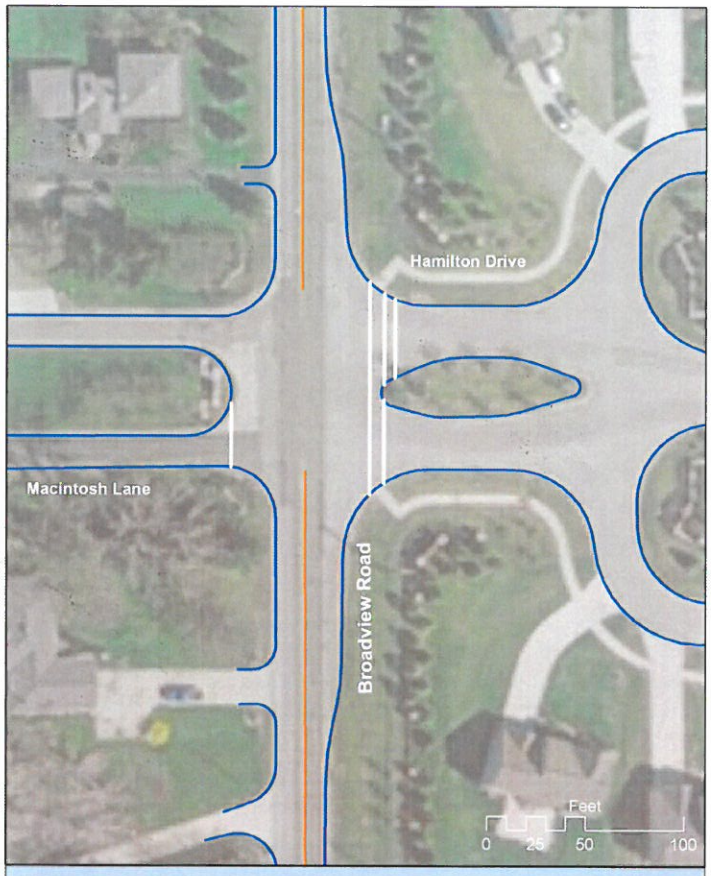


Figure 6: The Intersection of Broadview Road & Macintosh Lane/Hamilton Drive

Picture 9: Broadview Road and Macintosh Lane/Hamilton Drive Intersection looking north

SIGNAL WARRANTS EVALUATION

Intersection: Broadview Road and Macintosh Lane/Hamilton Driv
Location : Broadview Heights
Number of Lanes per approach: N= 1 S= 1 E=1 W:
Does 70% warrant apply? Yes
Major Street speed limit: 45 mph

Analysis By : NOACA
Traffic count date : 11/17 and 12/03/2009

		Hourly volumes			WARRANT #1								WARRANT	
					Condition A				Condition B				#2	#3
Condition	No. of Lanes	Major St. 2-way	Minor St. 1-way	Minor St. 1-way	100%		80%		100%		80%		FOUR HOUR	PEAK HOUR
					Major	Minor	Major	Minor	Major	Minor	Major	Minor		
Normal	1				500	150	400	120	750	75	600	60		
	2+				600	200	480	160	900	100	720	80		
70%*	1				350	105	280	84	525	53	420	42		
	2+				420	140	336	112	630	70	504	56		
MID to 1 AM		86	3	5										
1 AM to 2 AM		56	1	3										
2 AM to 3 AM		23	2	0										
3 AM to 4 AM		8	0	1										
4 AM to 5 AM		16	0	1										
5 AM to 6 AM		6	2	5										
6 AM to 7 AM		25	8	11										
7 AM to 8 AM		134	16	39										
8 AM to 9 AM		364	50	134	X	X	X	X		X		X		
9 AM to 10 AM		425	97	172	X	X	X	X		X	X	X		
10 AM to 11 AM		336	64	123		X	X	X		X		X		
11 AM to 12 Noon		299	45	72			X			X		X		
12 Noon to 1 PM		324	28	53			X			X		X		
1 PM to 2 PM		361	36	47	X		X					X		
2 PM to 3 PM		370	40	50	X		X					X		
3 PM to 4 PM		384	26	35	X		X							
4 PM to 5 PM		475	43	66	X		X			X	X	X		
5 PM to 6 PM		576	39	67	X		X		X	X	X	X		
6 PM to 7 PM		658	30	66	X		X		X	X	X	X		
7 PM to 8 PM		569	39	82	X		X		X	X	X	X		
8 PM to 9 PM		366	27	87	X		X	X		X		X		
9 PM to 10 PM		259	14	41										
10 PM to 11 PM		211	9	40										
11 PM to MID		114	6	5										
Hours Met					2		4		3		5		0	0
WARRANT SATISFIED					No		No		No		No		No	No

* Condition is determined by envirnoment: Use 70% values if the speed limit exceeds 40 MPH on the major road or if the location is in a build up area of an isolated community with a population of less than 10,000.

WARRANT #1 (Combination)
Conditions A & B are each met at the 80% level:..... No

WARRANT #4 (Pedestrian Volume)
Hours with 100 or more pedestrians:.....
Hours with 190 or more pedestrians:..... ____
Pedestrian crossing time (t):..... ____
Number of gaps greater than (t) during period:..... ____
Warrant Satisfied?..... NA

WARRANT #5 (School Crossing)
On approved school route?..... ____
Gap analysis made during period from..... ____
Pedestrian crossing time (t):..... ____
Number of gaps greater than (t) during period:..... ____
Number of vehicles during analysis period:..... ____
Approximate vehicular speed:..... ____
Number of children crossing during period:..... ____
Warrant Satisfied?..... NA

WARRANT #6 (COORDINATED SIGNAL SYSTEM)
Distance to nearest signal in each direction on major street:..... 0.84 mile North
3.3 miles South
Time space diagram:..... ____
Warrant Satisfied?..... NA

WARRANT #7 (CRASH EXPERIENCE)
Adequate trial of less restrictive measures:..... No
Number of crashes per year which could be prevented by signalizatic 1
80% of warrant #1 or #2 satisfied:..... No
Will signalization disrupt progressive movement?..... ___
Warrant Satisfied?..... NO

WARRANT #8 (ROADWAY NETWORK)
Both streets are considered major routes:..... ____
At least 1000 V.P.H. during weekday peak hour:..... ____
5-Year projection meets Warrant 1, 2, or 3:..... ____
At least 1000 V.P.H. for any 5 hours on a Saturday or Sunday:..... ____
Meets Characteristic requirements?..... ____
Warrant Satisfied?..... NA

Table 5: Warrant Analysis for the Intersection of Broadview Road and Macintosh Lane/Hamilton Drive

6. Broadview Road and Boston Road Intersection

Existing Conditions

- The intersection is located in a light density residential semi-rural area. Figure 7 and Pictures 10 through 12 show the intersection layout.
- The main roadway is Broadview Road, which consists of a single 12-foot lane in each direction and five-foot shoulder on both sides of the roadway.
- Boston Road is a two-way two-lane roadway. The lanes are 11-foot wide east of Broadview Road and 10-foot wide west of it.
- The nearest signal controlled intersections north and south of Boston Road are 1.1 miles and 3.0 miles respectively.
- The posted speed limit on Broadview Road is 45 mph.
- There were 13 reported crashes at this location during the three-year period of 2007-2009. The severity of five of the angle crashes was injury.

Year	Type of Crash		Total
	Angle	Animal	
2007	1	-	1
2008	3	2	5
2009	6	1	7
Total	**10**	**3**	**13**

Signal Warrants Evaluation

- Based on the OMUTCD signal warrants and using the seasonally adjusted 24-hour traffic counts and the ODPS crash data, the intersection does not warrant a traffic signal. The analysis is summarized in Table 6. The number of crashes during 2009 that are susceptible to correction by traffic signal is more than five but the traffic volumes do not satisfy the third criteria of Warrant 7.
- Alternatives to reduce the number of crashes should be considered such as improving warning signs and using flashing beacons for all approaches.
- Monitoring the change in the number of crashes and the change in traffic volumes to reevaluate this intersection in two years is recommended.

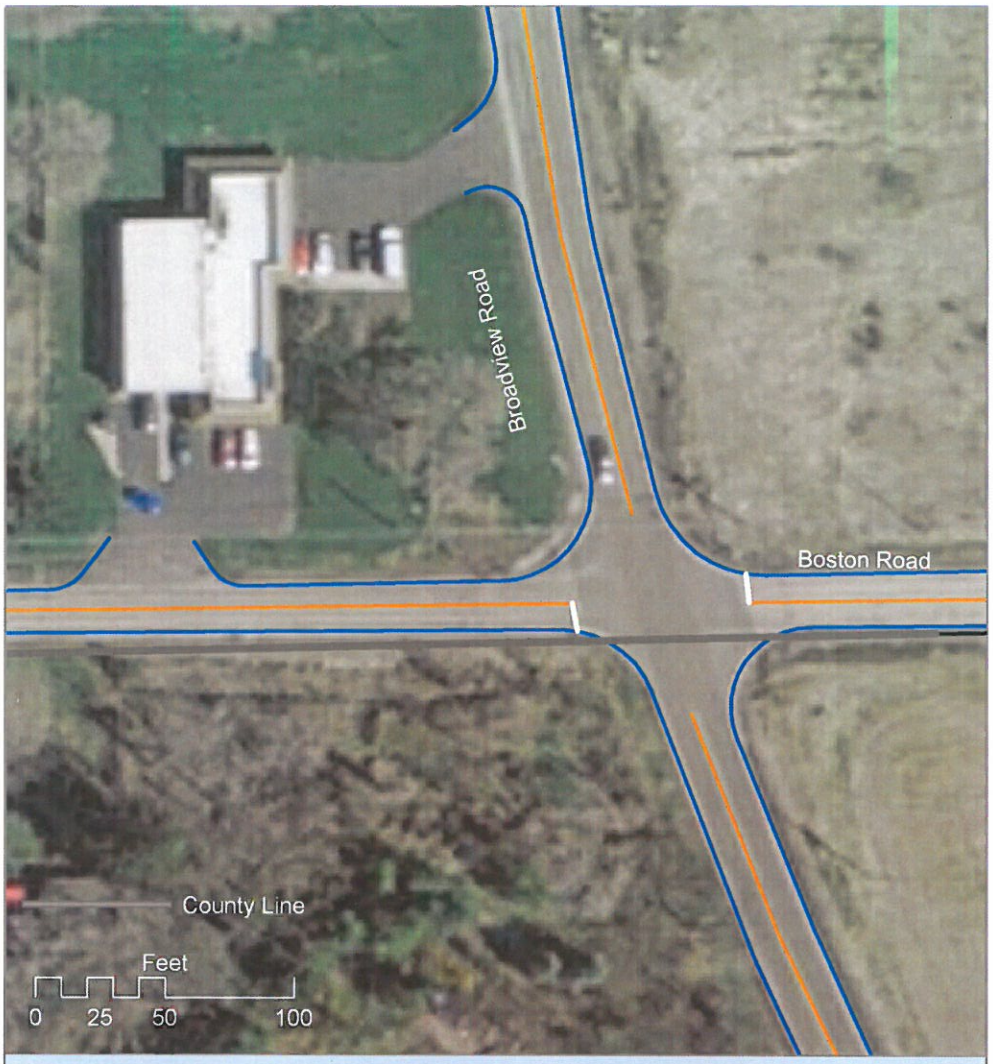


Figure 7: The Intersection of Broadview Road & Boston Road

Picture 10: Broadview Road and Boston Road Intersection looking west

Picture 11: Broadview Road and Boston Road Intersection looking east

Picture 12: Broadview Road and Boston Road Intersection looking south

SIGNAL WARRANTS EVALUATION

Intersection: Broadview Road and Boston Road
Analysis By NOACA
Location : Broadview Heights
Traffic count date : 12/2/2009
Number of Lanes per approach: N=1 S= 1 E= 1 W= 1
Does 70% warrant apply? Yes
Major Street speed limit: 45 mph

		Hourly volumes			WARRANT #1								WARRANT	
					Condition A				Condition B				#2	#3
Condition	No. of Lanes	Major St. 2-way	Minor St. 1-way	Minor St. 1-way	100%		80%		100%		80%		FOUR HOUR	PEAK HOUR
					Major	Minor	Major	Minor	Major	Minor	Major	Minor		
Normal	1				500	150	400	120	750	75	600	60		
	2+				600	200	480	160	900	100	720	80		
70%*	1				**350**	**105**	**280**	**84**	**525**	**53**	**420**	**42**		
	2+				420	140	336	112	630	70	504	56		
MID to 1 AM		47	1	10										
1 AM to 2 AM		27	2	2										
2 AM to 3 AM		13	1	2										
3 AM to 4 AM		5	0	1										
4 AM to 5 AM		14	3	0										
5 AM to 6 AM		6	4	3										
6 AM to 7 AM		32	14	11										
7 AM to 8 AM		134	62	54						X		X		
8 AM to 9 AM		354	120	88	X	X	X	X		X		X		
9 AM to 10 AM		355	136	67	X	X	X	X		X		X		
10 AM to 11 AM		268	68	39						X		X		
11 AM to 12 Noon		233	33	47								X		
12 Noon to 1 PM		265	30	51								X		
1 PM to 2 PM		268	37	37										
2 PM to 3 PM		261	41	52								X		
3 PM to 4 PM		330	25	60			X			X		X		
4 PM to 5 PM		364	47	77	X		X			X		X		
5 PM to 6 PM		448	50	125	X	X	X	X		X	X	X		
6 PM to 7 PM		516	58	144	X	X	X	X		X	X	X		
7 PM to 8 PM		402	51	78	X		X			X		X		
8 PM to 9 PM		260	41	29										
9 PM to 10 PM		189	28	24										
10 PM to 11 PM		153	13	19										
11 PM to MID		86	11	17										
Hours Met					4		4		0		2		0	0
WARRANT SATISFIED					No		No		No		No		No	No

* Condition is determined by envirnoment: Use 70% values if the speed limit exceeds 40 MPH on the major road or if the location is in a build up area of an isolated community with a population of less than 10,000.

WARRANT #1 (Combination)
Conditions A & B are each met at the 80% level:..... No

WARRANT #4 (Pedestrian Volume)
Hours with 100 or more pedestrians:.....
Hours with 190 or more pedestrians:.....
Pedestrian crossing time (t):.....
Number of gaps greater than (t) during period:.....
Warrant Satisfied?..... NA

WARRANT #5 (School Crossing)
On approved school route?.....
Gap analysis made during period from.....
Pedestrian crossing time (t):.....
Number of gaps greater than (t) during period:.....
Number of vehicles during analysis period:.....
Approximate vehicular speed:.....
Number of children crossing during period:.....
Warrant Satisfied?..... NA

WARRANT #6 (COORDINATED SIGNAL SYSTEM)
Distance to nearest signal in each direction on major street:..... 1.1 mile North
3 miles South
Time space diagram:.....
Warrant Satisfied?..... NA

WARRANT #7 (CRASH EXPERIENCE)
Adequate trial of less restrictive measures:..... No
Number of crashes per year which could be prevented by signalization:... 6
80% of warrant #1 or #2 satisfied:..... No
Will signalization disrupt progressive movement?..... No
Warrant Satisfied?..... No

WARRANT #8 (ROADWAY NETWORK)
Both streets are considered major routes:.....
At least 1000 V.P.H. during weekday peak hour:.....
5-Year projection meets Warrant 1, 2, or 3:.....
At least 1000 V.P.H. for any 5 hours on a Saturday or Sunday:.....
Meets Characteristic requirements?.....
Warrant Satisfied?..... NA

Table 6: Warrant Analysis for the Intersection of Broadview Road and Boston Road

Conclusion

Based on the Ohio Manual of Uniform Traffic Control Devices (OMUTCD) traffic signal warrants evaluation methodology, the existing geometric and traffic conditions at the six intersections do not justify the installation of traffic signals. The analyses are based on the Cuyahoga County Engineer's Office traffic counts for the period November through December 2009 and the Ohio Department of Public Safety (ODPS) crash data for the years 2007-2009.

Monitoring the change in number of crashes and the increase in traffic volumes are recommended to reevaluate the signal warrants in two years for the following locations:

- Broadview Road and Akins Intersection
- Broadview Road and Valley Parkway Drive Intersection
- Broadview Road and Boston Road Intersection

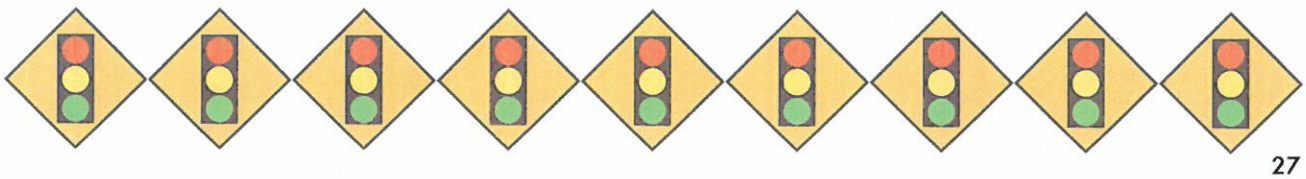
Consider alternatives to reduce the number and severity of crashes, such as improving warning signs and using flashing beacons at all approaches and/or transverse lane markings on Broadview Road to alert drivers approaching the intersection, for the following locations:

- Broadview Road and Boston Road Intersection
- Broadview Road and Macintosh Lane/ Hamilton Drive Intersection

Appendices

A: Cuyahoga County Engineer's Office Traffic Count

B: Signal Warrants Analysis: Highway Capacity Software Outputs



Appendix A: Cuyahoga County Engineer's Office Traffic Count

West Wallings Road and Briarwood Drive Intersection

Traffic Volume Summary (11/11/2009)					Adjusted Volumes	
Time	EB	WB	EB+WB	SB	EB+WB	SB
0:00	39	95	134	5	138	5
1:00	17	60	77	4	79	4
2:00	12	31	43	0	44	0
3:00	6	9	15	2	15	2
4:00	11	6	17	1	17	1
5:00	15	9	24	2	25	2
6:00	103	22	125	6	129	6
7:00	362	63	425	16	437	16
8:00	639	135	774	24	796	25
9:00	521	206	727	34	748	35
10:00	412	238	650	20	669	21
11:00	267	241	508	18	523	19
12:00	299	302	601	12	618	12
13:00	242	311	553	21	569	22
14:00	305	287	592	18	609	19
15:00	272	325	597	27	614	28
16:00	280	512	792	31	815	32
17:00	310	587	897	31	923	32
18:00	321	662	983	31	1012	32
19:00	330	557	887	40	913	41
20:00	268	358	626	31	644	32
21:00	146	284	430	22	442	23
22:00	100	237	337	20	347	21
23:00	76	153	229	10	236	10
	5,353	**5,690**		**426**		**438**

Seasonal Adjustment Factor = 1.029

Appendix A: Cuyahoga County Engineer's Office Traffic Count

East Royalton Road & Cherry Hill Lane/Ledgemont Drive Intersection

Traffic Volume Summary (11/19/2009)								Adjusted Volumes		
Time	EB	EBLT	WB	WBLT	EB+WB	NB	SB	EB+WB	NB	SB
0:00	97	0	176	3	276	2	1	288	2	1
1:00	57	1	97	3	158	3	0	165	3	0
2:00	29	2	49	3	83	0	1	87	0	1
3:00	34	1	40	0	75	0	0	78	0	0
4:00	40	0	34	1	75	1	2	78	1	2
5:00	74	0	48	0	122	2	4	127	2	4
6:00	181	0	61	0	242	3	1	253	3	1
7:00	631	1	147	3	782	4	6	816	4	6
8:00	954	1	371	6	1332	24	17	1391	25	18
9:00	945	6	488	6	1445	23	20	1509	24	21
10:00	758	4	472	7	1241	13	32	1296	14	33
11:00	642	6	477	4	1129	11	13	1179	11	14
12:00	585	8	582	7	1182	13	23	1234	14	24
13:00	586	5	688	3	1282	14	21	1338	15	22
14:00	618	5	627	5	1255	12	22	1310	13	23
15:00	628	9	645	10	1292	14	23	1349	15	24
16:00	619	11	829	4	1463	31	25	1527	32	26
17:00	610	12	920	5	1547	21	32	1615	22	33
18:00	675	7	1090	3	1775	27	19	1853	28	20
19:00	547	18	948	3	1516	18	26	1583	19	27
20:00	436	11	617	6	1070	21	48	1117	22	50
21:00	325	8	528	4	865	5	10	903	5	10
22:00	269	8	489	6	772	4	15	806	4	16
23:00	190	4	281	1	476	1	6	497	1	6
	10,530	**128**	**10,704**	**93**		**267**	**367**			

Seasonal Adjustment Factor = 1.044

Appendix A: Cuyahoga County Engineer's Office Traffic Count

Broadview Road and Akins Road/Faulhaber Road Intersection

Traffic Volume Summary (12/04/2009)							Adjusted Volumes		
Time	EB	WB	EB+WB	NB	SB	NB+SB	EB	WB	NB+SB
0:00	7	0		46	108	154	8	0	166
1:00	6	0		29	56	85	6	0	92
2:00	4	0		11	20	31	4	0	33
3:00	10	3		10	17	27	11	3	29
4:00	5	0		6	8	14	5	0	15
5:00	10	0		16	15	31	11	0	33
6:00	28	3		42	26	68	30	3	73
7:00	90	16		159	71	230	97	17	248
8:00	133	15		455	172	627	144	16	677
9:00	143	20		604	282	886	154	22	956
10:00	80	51		434	280	714	86	55	770
11:00	85	33		315	245	560	92	36	604
12:00	73	91		340	302	642	79	98	693
13:00	51	54		300	312	612	55	58	660
14:00	63	31		277	316	593	68	33	640
15:00	63	28		289	325	614	68	30	663
16:00	102	85		327	475	802	110	92	865
17:00	88	66		356	543	899	95	71	970
18:00	80	23		442	648	1090	86	25	1176
19:00	63	40		404	486	890	68	43	960
20:00	50	35		266	377	643	54	38	694
21:00	33	40		141	361	502	36	43	542
22:00	38	26		108	268	376	41	28	406
23:00	20	10		96	167	263	22	11	284
	1,325	**670**		**5,473**	**5,880**				

Seasonal Adjustment Factor = 1.079

Appendix A: Cuyahoga County Engineer's Office Traffic Count

Broadview Road and Valley Parkway Drive Intersection

Traffic Volume Summary (12/04/2009)							Adjusted Volumes		
Time	EB	WB	EB+WB	NB	SB	NB+SB	EB	WB	NB+SB
0:00	7	1		38	38	76	8	1	82
1:00	4	1		25	26	51	4	1	55
2:00	1	1		14	13	27	1	1	29
3:00	2	0		6	6	12	2	0	13
4:00	1	2		10	11	21	1	2	23
5:00	6	1		11	13	24	6	1	26
6:00	9	1		57	63	120	10	1	129
7:00	45	6		210	226	436	49	6	470
8:00	101	7		521	526	1047	109	8	1130
9:00	101	17		576	561	1137	109	18	1227
10:00	60	12		397	402	799	65	13	862
11:00	39	15		315	319	634	42	16	684
12:00	35	26		335	345	680	38	28	734
13:00	33	26		353	345	698	36	28	753
14:00	37	27		304	305	609	40	29	657
15:00	45	26		305	302	607	49	28	655
16:00	60	37		328	336	664	65	40	716
17:00	50	54		397	388	785	54	58	847
18:00	59	44		424	429	853	64	47	920
19:00	38	21		382	368	750	41	23	809
20:00	28	14		227	222	449	30	15	484
21:00	17	10		142	144	286	18	11	309
22:00	22	7		114	117	231	24	8	249
23:00	6	3		69	66	135	6	3	146
	806	**359**		**5,560**	**5,571**				

Seasonal Adjustment Factor = 1.079

Appendix A: Cuyahoga County Engineer's Office Traffic Count

Broadview Road and Macintosh Lane/Hamilton Drive Intersection

Traffic Volume Summary (11/17-12/03/2009)							Adjusted Volumes		
Time	EB	WB	EB+WB	NB	SB	NB+SB	EB	WB	NB+SB
0:00	3	5		23	57	80	3	5	86
1:00	1	3		11	41	52	1	3	56
2:00	2	0		8	13	21	2	0	23
3:00	0	1		1	6	7	0	1	8
4:00	0	1		7	8	15	0	1	16
5:00	2	5		3	3	6	2	5	6
6:00	7	10		10	13	23	8	11	25
7:00	15	36		72	52	124	16	39	134
8:00	46	124		164	173	337	50	134	364
9:00	90	159		182	212	394	97	172	425
10:00	59	114		132	179	311	64	123	336
11:00	42	67		131	146	277	45	72	299
12:00	26	49		133	167	300	28	53	324
13:00	33	44		127	208	335	36	47	361
14:00	37	46		127	216	343	40	50	370
15:00	24	32		167	189	356	26	35	384
16:00	40	61		163	277	440	43	66	475
17:00	36	62		213	321	534	39	67	576
18:00	28	61		283	327	610	30	66	658
19:00	36	76		204	323	527	39	82	569
20:00	25	81		124	215	339	27	87	366
21:00	13	38		77	163	240	14	41	259
22:00	8	37		79	117	196	9	40	211
23:00	6	5		47	59	106	6	5	114
	579	**1,117**		**2,488**	**3,485**				

Seasonal Adjustment Factor = 1.079

Appendix A: Cuyahoga County Engineer's Office Traffic Count

Broadview Road and Boston Road Intersection

Traffic Volume Summary (12/02/2009)							Adjusted Volumes		
Time	EB	WB	EB+WB	NB	SB	NB+SB	EB	WB	NB+SB
0:00	1	9		30	14	44	1	10	47
1:00	2	2		11	14	25	2	2	27
2:00	1	2		7	5	12	1	2	13
3:00	0	1		2	3	5	0	1	5
4:00	3	0		7	6	13	3	0	14
5:00	4	3		0	6	6	4	3	6
6:00	13	10		8	22	30	14	11	32
7:00	57	50		54	70	124	62	54	134
8:00	111	82		117	211	328	120	88	354
9:00	126	62		122	207	329	136	67	355
10:00	63	36		106	142	248	68	39	268
11:00	31	44		110	106	216	33	47	233
12:00	28	47		100	146	246	30	51	265
13:00	34	34		110	138	248	37	37	268
14:00	38	48		113	129	242	41	52	261
15:00	23	56		153	153	306	25	60	330
16:00	44	71		151	186	337	47	77	364
17:00	46	116		199	216	415	50	125	448
18:00	54	133		277	201	478	58	144	516
19:00	47	72		200	173	373	51	78	402
20:00	38	27		119	122	241	41	29	260
21:00	26	22		83	92	175	28	24	189
22:00	12	18		83	59	142	13	19	153
23:00	10	16		40	40	80	11	17	86
	812	**961**		**2,202**	**2,461**				

Seasonal Adjustment Factor = 1.079

Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

West Wallings Road and Briarwood Drive Intersection

Warrants Summary			
Information			
Analyst	ST	Intersection	Wallings Rd. and Briarwood Dr.
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/13/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	November 2009
East/West Street	W. Wallings Road	North/South Street	Briarwood Drive
File Name	WallingsBriarwood_8_8.xhy	Major Street	East-West
Project Description			

General				Roadway Network	
Major Street Speed (mph)	35	☐	Population < 10,000	Two Major Routes	☐
Nearest Signal (ft)	4380	☐	Coordinated Signal System	Weekend Count	☐
Crashes (per year)	1	☐	Adequate Trials of Alternatives	5-yr Growth Factor	0

Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	0	1	0	0	1	0	0	0	0	0	1	0
Lane usage		LT			TR						LTR	
Vehicle Volume Averages (vph)	0	360	0	0	374	0	0	0	0	0	26	0
Peds (ped/h) / Gaps (gaps/h)	--	/	--	--	/	--	--	/	--	--	/	--
Delay (s/veh) / (veh-hr)	--	/	--	--	/	--	--	/	--	--	/	--

Warrant 1: Eight-Hour Vehicular Volume	☐
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	☐
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	☐
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 2: Four-Hour Vehicular Volume	☐
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 3: Peak Hour	☐
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--	☐
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 4: Pedestrian Volume	☐
4 A. Pedestrian Volumes (Four hours --or-- one hour) --and--	☐
4 B. Gaps Same Period (Four hours --or-- one hour)	☐
Warrant 5: School Crossing	☐
5. Student Volumes --and--	☐
5. Gaps Same Period	☐
Warrant 6: Coordinated Signal System	☐
6. Degree of Platooning (Predominant direction or both directions)	☐
Warrant 7: Crash Experience	☐
7 A. Adequate trials of alternatives, observance and enforcement failed --and--	☐
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--	☐

Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

West Wallings Road and Briarwood Drive Intersection

Warrants Volume

Information

Analyst	ST	Intersection	Wallings Rd. and Briarwood Dr.
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/13/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	November 2009
East/West Street	W. Wallings Road	North/South Street	Briarwood Drive
File Name	WallingsBriarwood_8_8.xhy	Major Street	East-West

Project Description

Warrant 1

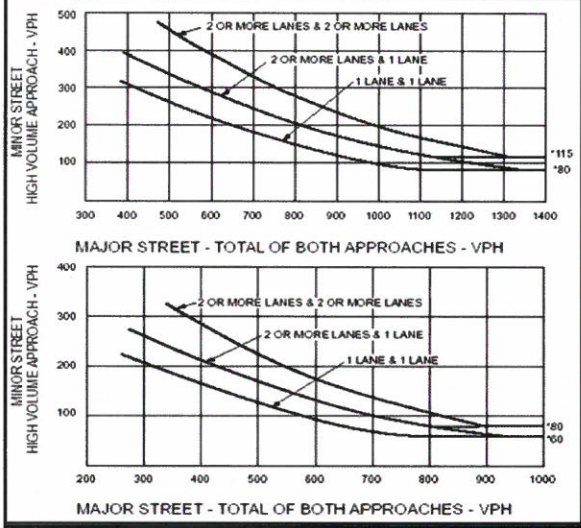
Condition A - Minimum Vehicular Volume

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

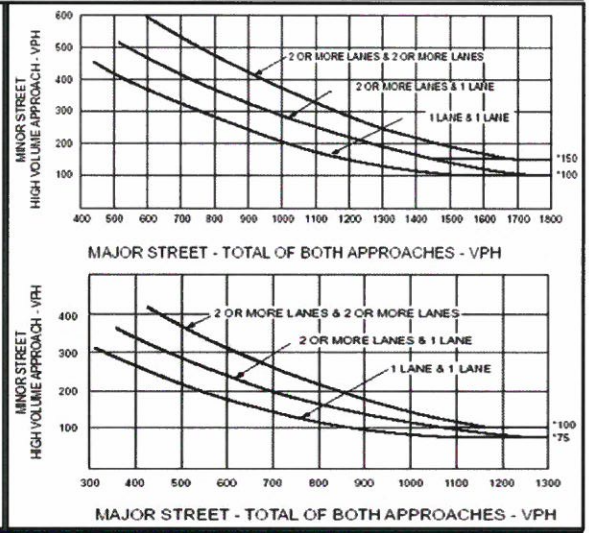
Condition B - Interruption of Continuous Traffic

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

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 1 **Speed** 35 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (100%)
08-09	797	25	822	No	No	No	No	No	No	No
09-10	748	35	783	No	No	No	No	No	No	No
10-11	669	21	690	No	No	No	No	No	No	No
11-12	523	19	542	No	No	No	No	No	No	No
12-13	619	12	631	No	No	No	No	No	No	No
13-14	570	22	592	No	No	No	No	No	No	No
14-15	609	19	628	No	No	No	No	No	No	No
15-16	614	28	642	No	No	No	No	No	No	No
16-17	815	32	847	No	No	No	No	No	No	No
17-18	923	32	955	No	No	No	No	No	No	No
18-19	1011	32	1043	No	No	No	No	No	No	No
19-20	913	41	954	No	No	No	No	No	No	No
Totals	8811	318	9129	0	0	0	0	0	0	0

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Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

East Royalton Road & Cherry Hill Lane/Ledgemont Drive Intersection

Warrants Summary

Information			
Analyst	ST	Intersection	Royalton Rd. and Ledgemont
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/2/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	November 2009
East/West Street	Royalton	North/South Street	Ledgemont Dr./Cherry Hill Ln.
File Name	RoyaltonLedgemont_8_8.xhy	Major Street	East-West

Project Description

General				Roadway Network	
Major Street Speed (mph)	35	☐	Population < 10,000	Two Major Routes	☐
Nearest Signal (ft)	930	☐	Coordinated Signal System	Weekend Count	☐
Crashes (per year)	3	☐	Adequate Trials of Alternatives	5-yr Growth Factor	0

Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	1	1	0	1	1	0	0	1	0	0	1	0
Lane usage	L	TR		L	TR			LTR			LTR	
Vehicle Volume Averages (vph)	7	710	0	5	707	0	0	19	0	0	23	0
Peds (ped/h) / Gaps (gaps/h)	--	/	--	--	/	--	--	/	--	--	/	--
Delay (s/veh) / (veh-hr)	--	/	--	--	/	--	--	/	--	--	/	--

Warrant 1: Eight-Hour Vehicular Volume	☐
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	☐
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	☐
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 2: Four-Hour Vehicular Volume	☐
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 3: Peak Hour	☐
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--	☐
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 4: Pedestrian Volume	☐
4 A. Pedestrian Volumes (Four hours --or-- one hour) --and--	☐
4 B. Gaps Same Period (Four hours --or-- one hour)	☐
Warrant 5: School Crossing	☐
5. Student Volumes --and--	☐
5. Gaps Same Period	☐
Warrant 6: Coordinated Signal System	☐
6. Degree of Platooning (Predominant direction or both directions)	☐
Warrant 7: Crash Experience	☐
7 A. Adequate trials of alternatives, observance and enforcement failed --and--	☐
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--	☐

Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

East Royalton Road & Cherry Hill Lane/Ledgemont Drive Intersection

Warrants Volume

Information

Analyst	ST	Intersection	Royalton Rd. and Ledgemont
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/2/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	November 2009
East/West Street	Royalton	North/South Street	Ledgemont Dr./Cherry Hill Ln.
File Name	RoyaltonLedgemont_8_8.xhy	Major Street	East-West

Project Description

Warrant 1

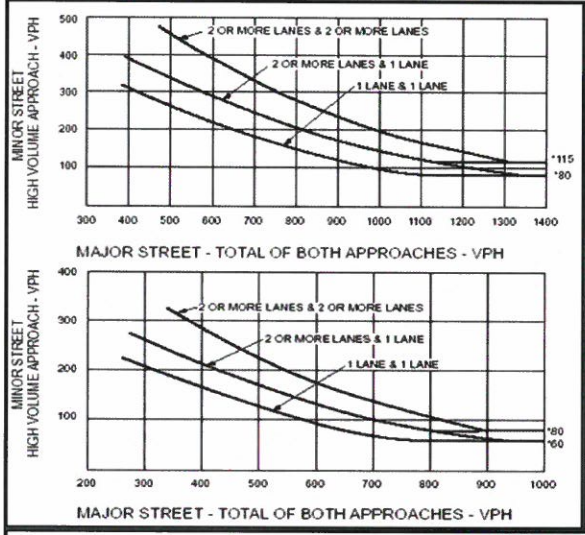
Condition A - Minimum Vehicular Volume

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

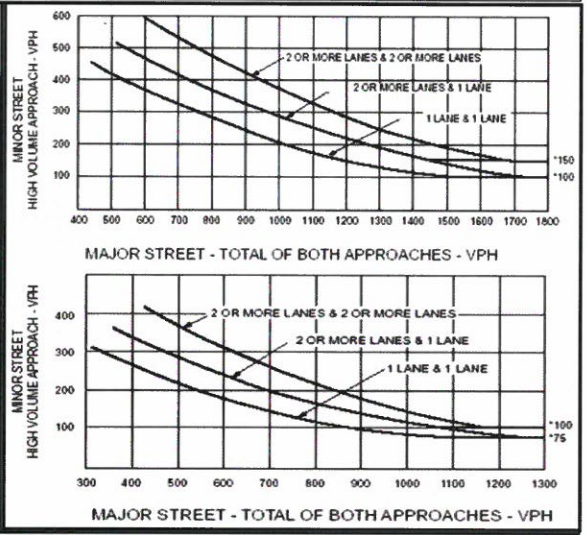
Condition B - Interruption of Continuous Traffic

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

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 2+ **Minor Street Lanes** 1 **Speed** 35 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (100%)
08-09	1390	25	1433	No	No	No	No	No	No	No
09-10	1508	24	1553	No	No	No	No	No	No	No
10-11	1295	33	1342	No	No	No	No	No	No	No
11-12	1178	14	1203	No	No	No	No	No	No	No
12-13	1234	24	1272	No	No	No	No	No	No	No
13-14	1338	22	1375	No	No	No	No	No	No	No
14-15	1310	23	1346	No	No	No	No	No	No	No
15-16	1348	24	1387	No	No	No	No	No	No	No
16-17	1526	32	1584	No	No	No	No	No	No	No
17-18	1615	33	1670	No	No	No	No	No	No	No
18-19	1853	28	1901	No	No	No	No	No	No	No
19-20	1583	27	1629	No	No	No	No	No	No	No
Totals	17178	309	17695	0	0	0	0	0	0	0

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Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

Broadview Road and Akins Road/Faulhaber Road Intersection

Warrants Summary

Information			
Analyst	ST	Intersection	Broadview Rd. and Akins Rd.
Agency/Co	NOACA		
Date Performed	4/13/2010	Jurisdiction	Broadview Heights
Project ID		Units	U.S. Customary
East/West Street	Akins Road/City Hall Driveway	Time Period Analyzed	
		North/South Street	Broadview Heights
File Name	BroadviewAkin_8_8.xhy	Major Street	North-South

Project Description

General				Roadway Network	
Major Street Speed (mph)	35	☐	Population < 10,000	Two Major Routes	☐
Nearest Signal (ft)	500	☐	Coordinated Signal System	Weekend Count	☐
Crashes (per year)	2	☐	Adequate Trials of Alternatives	5-yr Growth Factor	0

Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	0	1	0	1	1	0	0	1	0	0	1	0
Lane usage		LTR		L	TR			LTR			LTR	
Vehicle Volume Averages (vph)	0	92	0	0	48	0	0	408	0	0	397	0
Peds (ped/h) / Gaps (gaps/h)	--	/	--	--	/	--	--	/	--	--	/	--
Delay (s/veh) / (veh-hr)	--	/	--	--	/	--	--	/	--	--	/	--

Warrant 1: Eight-Hour Vehicular Volume	☐
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	☐
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	☐
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 2: Four-Hour Vehicular Volume	☐
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 3: Peak Hour	☐
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--	☐
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 4: Pedestrian Volume	☐
4 A. Pedestrian Volumes (Four hours --or-- one hour) --and--	☐
4 B. Gaps Same Period (Four hours --or-- one hour)	☐
Warrant 5: School Crossing	☐
5. Student Volumes --and--	☐
5. Gaps Same Period	☐
Warrant 6: Coordinated Signal System	☐
6. Degree of Platooning (Predominant direction or both directions)	☐
Warrant 7: Crash Experience	☐
7 A. Adequate trials of alternatives, observance and enforcement failed --and--	☐
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--	☐

Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

Broadview Road and Akins Road/Faulhaber Road Intersection

Warrants Volume

Information

Analyst	ST	Intersection	Broadview Rd. and Akins Rd.
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/13/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	
East/West Street	Akins Road/City Hall Driveway	North/South Street	Broadview Heights
File Name	BroadviewAkin_8_8.xhy	Major Street	North-South

Project Description

Warrant 1

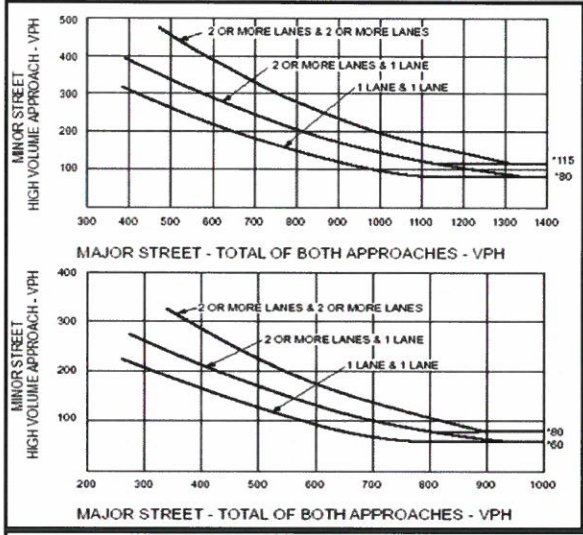
Condition A - Minimum Vehicular Volume

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

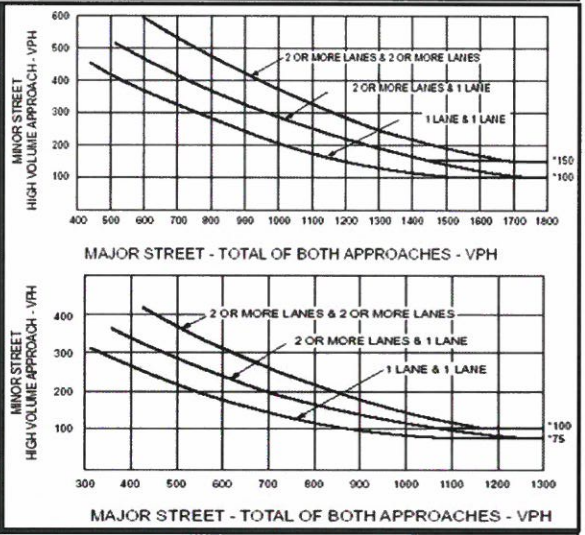
Condition B - Interruption of Continuous Traffic

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

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 2+ **Speed** 35 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (100%)
08-09	677	144	837	No	No	No	Yes	No	No	No
09-10	956	154	1132	No	No	Yes	Yes	No	No	No
10-11	770	86	911	No	No	No	Yes	No	No	No
11-12	604	92	732	No	No	No	Yes	No	No	No
12-13	729	98	906	No	No	No	Yes	No	No	No
13-14	661	58	774	No	No	No	No	No	No	No
14-15	640	68	741	No	No	No	No	No	No	No
15-16	663	68	761	No	No	No	No	No	No	No
16-17	866	110	1068	No	No	Yes	Yes	No	No	No
17-18	970	95	1136	No	No	No	Yes	No	No	No
18-19	1176	86	1287	No	No	No	Yes	No	No	No
19-20	960	68	1071	No	No	No	No	No	No	No
Totals	9672	1127	11356	0	0	2	8	0	0	0

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Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

Broadview Road and Valley Parkway Drive Intersection

Warrants Summary

Information			
Analyst	ST	Intersection	Broadview Rd & Valley Parkway
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/13/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	December 2009
East/West Street	Valley Parkway	North/South Street	Broadview Road
File Name	BroadviewValleyParkway8_8.xhy	Major Street	North-South

Project Description

General				Roadway Network	
Major Street Speed (mph)	35	☐	Population < 10,000	Two Major Routes	☐
Nearest Signal (ft)	2200	☐	Coordinated Signal System	Weekend Count	☐
Crashes (per year)	3	☐	Adequate Trials of Alternatives	5-yr Growth Factor	0

Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	0	1	0	0	1	0	0	1	0	0	1	0
Lane usage		LTR			LTR			LTR			LTR	
Vehicle Volume Averages (vph)	0	59	0	0	28	0	0	416	0	0	416	0
Peds (ped/h) / Gaps (gaps/h)	--	/	--	--	/	--	--	/	--	--	/	--
Delay (s/veh) / (veh-hr)	--	/	--	--	/	--	--	/	--	--	/	--

Warrant 1: Eight-Hour Vehicular Volume	☐
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	☐
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	☐
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 2: Four-Hour Vehicular Volume	☐
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 3: Peak Hour	☐
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--	☐
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 4: Pedestrian Volume	☐
4 A. Pedestrian Volumes (Four hours --or-- one hour) --and--	☐
4 B. Gaps Same Period (Four hours --or-- one hour)	☐
Warrant 5: School Crossing	☐
5. Student Volumes --and--	☐
5. Gaps Same Period	☐
Warrant 6: Coordinated Signal System	☐
6. Degree of Platooning (Predominant direction or both directions)	☐
Warrant 7: Crash Experience	☐
7 A. Adequate trials of alternatives, observance and enforcement failed --and--	☐
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--	☐

Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

Broadview Road and Valley Parkway Drive Intersection

Warrants Volume

Information

Analyst	ST	Intersection	Broadview Rd & Valley Parkway
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/13/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	December 2009
East/West Street	Valley Parkway	North/South Street	Broadview Road
File Name	BroadviewValleyParkway8_8.xhy	Major Street	North-South

Project Description

Warrant 1

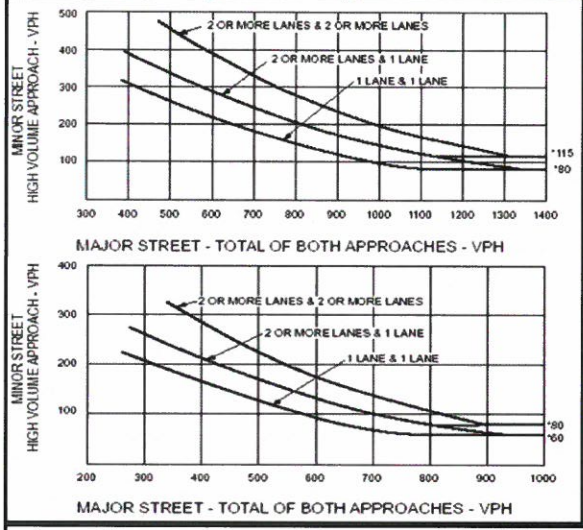
Condition A - Minimum Vehicular Volume

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

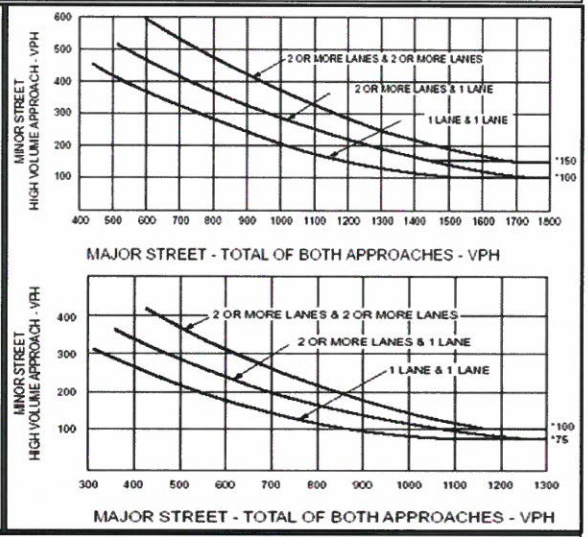
Condition B - Interruption of Continuous Traffic

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

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 1 **Speed** 35 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (100%)
08-09	1130	109	1247	No	No	Yes	Yes	Yes	No	No
09-10	1227	109	1354	No	No	Yes	Yes	Yes	No	No
10-11	862	65	940	No	No	No	Yes	No	No	No
11-12	684	42	742	No	No	No	No	No	No	No
12-13	733	38	799	No	No	No	No	No	No	No
13-14	753	36	817	No	No	No	No	No	No	No
14-15	657	40	726	No	No	No	No	No	No	No
15-16	655	49	732	No	No	No	No	No	No	No
16-17	717	65	822	No	No	No	Yes	No	No	No
17-18	847	58	959	No	No	No	No	No	No	No
18-19	920	64	1031	No	No	No	Yes	No	No	No
19-20	809	41	873	No	No	No	No	No	No	No
Totals	9994	716	11042	0	0	2	5	2	0	0

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Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

Broadview Road and Macintosh Lane/Hamilton Drive Intersection

Warrants Summary			
Information			
Analyst	ST	Intersection	Broadview Rd. & Macintosh Ln.
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/13/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	
East/West Street	Macintosh Lane/Hamilton Drive	North/South Street	Broadview Road
File Name	BroadviewMacintosh_8_8.xhy	Major Street	North-South
Project Description			

General				Roadway Network	
Major Street Speed (mph)	45	☐	Population < 10,000	Two Major Routes	☐
Nearest Signal (ft)	4400	☐	Coordinated Signal System	Weekend Count	☐
Crashes (per year)	2	☐	Adequate Trials of Alternatives	5-yr Growth Factor	0

Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	0	1	0	0	1	1	0	1	0	0	1	0
Lane usage		LTR			LT	R		LTR			LTR	
Vehicle Volume Averages (vph)	0	44	0	0	80	0	0	182	0	0	246	0
Peds (ped/h) / Gaps (gaps/h)	--	/	--	--	/	--	--	/	--	--	/	--
Delay (s/veh) / (veh-hr)	--	/	--	--	/	--	--	/	--	--	/	--

Warrant 1: Eight-Hour Vehicular Volume	☐
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	☐
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	☐
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 2: Four-Hour Vehicular Volume	☐
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 3: Peak Hour	☐
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--	☐
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 4: Pedestrian Volume	☐
4 A. Pedestrian Volumes (Four hours --or-- one hour) --and--	☐
4 B. Gaps Same Period (Four hours --or-- one hour)	☐
Warrant 5: School Crossing	☐
5. Student Volumes --and--	☐
5. Gaps Same Period	☐
Warrant 6: Coordinated Signal System	☐
6. Degree of Platooning (Predominant direction or both directions)	☐
Warrant 7: Crash Experience	☐
7 A. Adequate trials of alternatives, observance and enforcement failed --and--	☐
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--	☐

Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

Broadview Road and Macintosh Lane/Hamilton Drive Intersection

Warrants Volume

Information

Analyst	ST	Intersection	Broadview Rd. & Macintosh Ln.
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/13/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	
East/West Street	Macintosh Lane/Hamilton Drive	North/South Street	Broadview Road
File Name	BroadviewMacintosh_8_8.xhy	Major Street	North-South

Project Description

Warrant 1

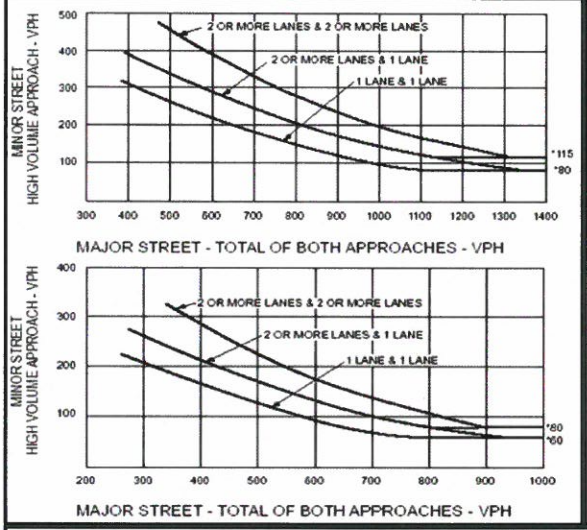
Condition A - Minimum Vehicular Volume

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

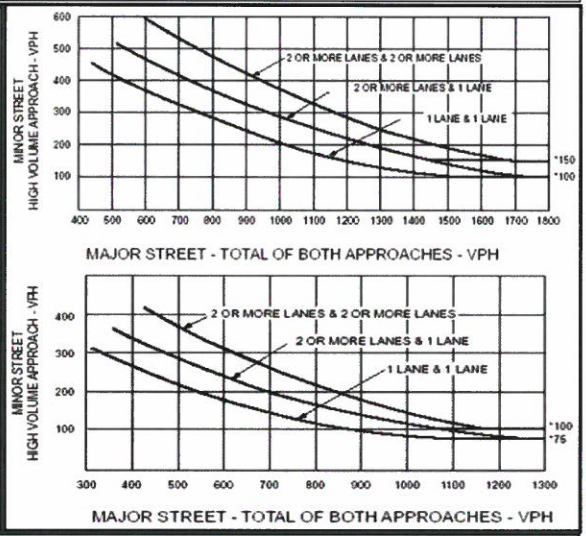
Condition B - Interruption of Continuous Traffic

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

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 2+ **Speed** 45 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
08-09	364	134	548	No	Yes	No	No	No	No	No
09-10	425	172	694	Yes	Yes	No	Yes	No	No	No
10-11	335	123	522	No	Yes	No	No	No	No	No
11-12	299	72	416	No	No	No	No	No	No	No
12-13	324	53	405	No	No	No	No	No	No	No
13-14	361	47	444	No	No	No	No	No	No	No
14-15	370	50	460	No	No	No	No	No	No	No
15-16	384	35	445	No	No	No	No	No	No	No
16-17	475	66	584	No	No	No	Yes	No	No	No
17-18	576	67	682	No	No	No	Yes	No	No	No
18-19	658	66	754	No	No	No	Yes	No	No	No
19-20	569	82	690	No	No	Yes	Yes	No	No	No
Totals	5140	967	6644	1	3	1	5	0	0	0

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Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

Broadview Road and Boston Road Intersection

Warrants Summary			
Information			
Analyst	ST	Intersection	Broadview Rd. & Boston Rd.
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/13/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	December 2009
East/West Street	Boston Road	North/South Street	Broadview Road
File Name	BroadviewBoston8_8.xhy	Major Street	North-South
Project Description			

General				Roadway Network	
Major Street Speed (mph)	45	☐	Population < 10,000	Two Major Routes	☐
Nearest Signal (ft)	5800	☐	Coordinated Signal System	Weekend Count	☐
Crashes (per year)	7	☐	Adequate Trials of Alternatives	5-yr Growth Factor	0

Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	0	1	0	0	1	0	0	1	0	0	1	0
Lane usage		LTR			LTR			LTR			LTR	
Vehicle Volume Averages (vph)	0	58	0	0	72	0	0	158	0	0	180	0
Peds (ped/h) / Gaps (gaps/h)	--	/	--	--	/	--	--	/	--	--	/	--
Delay (s/veh) / (veh-hr)	--	/	--	--	/	--	--	/	--	--	/	--

Warrant 1: Eight-Hour Vehicular Volume	☐
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	☐
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	☐
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 2: Four-Hour Vehicular Volume	☐
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 3: Peak Hour	☐
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--	☐
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	☐
Warrant 4: Pedestrian Volume	☐
4 A. Pedestrian Volumes (Four hours --or-- one hour) --and--	☐
4 B. Gaps Same Period (Four hours --or-- one hour)	☐
Warrant 5: School Crossing	☐
5. Student Volumes --and--	☐
5. Gaps Same Period	☐
Warrant 6: Coordinated Signal System	☐
6. Degree of Platooning (Predominant direction or both directions)	☐
Warrant 7: Crash Experience	☐
7 A. Adequate trials of alternatives, observance and enforcement failed --and--	☐
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--	☑

Appendix B: Signal Warrants Analysis: Highway Capacity Software Outputs

Broadview Road and Boston Road Intersection

Warrants Volume

Information

Analyst	ST	Intersection	Broadview Rd. & Boston Rd.
Agency/Co	NOACA	Jurisdiction	Broadview Heights
Date Performed	4/13/2010	Units	U.S. Customary
Project ID		Time Period Analyzed	December 2009
East/West Street	Boston Road	North/South Street	Broadview Road
File Name	BroadviewBoston8_8.xhy	Major Street	North-South

Project Description

Warrant 1

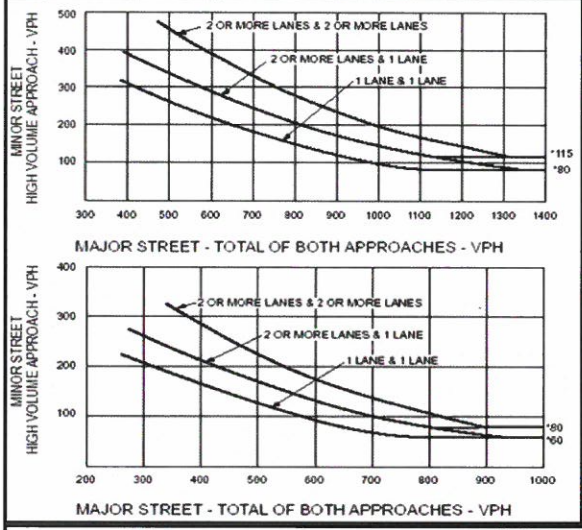
Condition A - Minimum Vehicular Volume

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

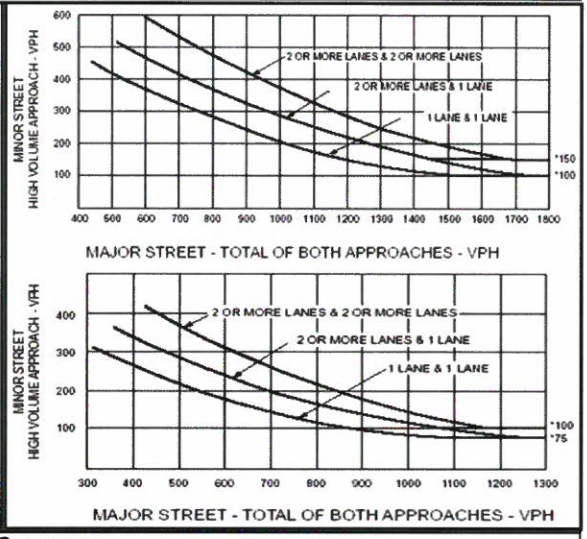
Condition B - Interruption of Continuous Traffic

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

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 1 **Minor Street Lanes** 1 **Speed** 45 **Population** 10000+

Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
08-09	354	120	562	Yes	Yes	No	No	No	No	No
09-10	355	136	558	Yes	Yes	No	No	No	No	No
10-11	267	68	374	No	No	No	No	No	No	No
11-12	233	47	313	No	No	No	No	No	No	No
12-13	266	51	347	No	No	No	No	No	No	No
13-14	268	37	342	No	No	No	No	No	No	No
14-15	261	52	354	No	No	No	No	No	No	No
15-16	330	60	415	No	No	No	No	No	No	No
16-17	364	77	488	No	No	No	No	No	No	No
17-18	448	125	623	Yes	Yes	No	Yes	No	No	No
18-19	516	144	718	Yes	Yes	No	Yes	Yes	No	No
19-20	403	78	532	No	No	No	No	No	No	No
Totals	4065	995	5626	4	4	0	2	1	0	0

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