



MEMO

PROFESSIONAL SERVICES

TRANSPORTATION • MUNICIPAL
DEVELOPMENT • ENVIRONMENTAL

To: City of Windsor Heights
From: Erin Katopodis, MSA Professional Services & Nichole Sungren, P.E., MSA
Professional Services
CC: Tony Gustafson, Iowa Department of Transportation
Subject: 63rd Street and College Avenue Signal Analysis
Date: July 12, 2016

I. INTRODUCTION & STUDY OBJECTIVES

At the request of the City of Windsor Heights, MSA has completed an analysis of the existing traffic conditions at the intersection of 63rd Street and College Avenue to provide recommendations for potential safety improvements to the school/pedestrian crossing located on the north leg of the intersection. The crossing primarily is utilized by students walking to and from Cowles Montessori School, located on the north side of College Avenue approximately 375 feet west of the study intersection. To provide a comprehensive analysis, improvement warrants and guidelines were considered from a federal to local level. This memorandum includes a summary of the data collected and the viable improvements warranted for the intersection.

I. EXISTING CONDITIONS

The study intersection of 63rd Street and College Avenue is a “T-Intersection” with one lane in each direction. The speed limit on 63rd Street is 30 MPH. The existing school/pedestrian crossing is located on the north leg of the intersection, crossing 63rd Street. The crossing is not a painted crosswalk. The corporate boundary between the City of Des Moines and the City of Windsor Heights is the center of 63rd Street. Therefore, since 63rd Street is also Highway 28, the roadway is under the joint jurisdiction of the Iowa Department of Transportation, the City of Des Moines, and the City of Windsor Heights.

The location of the existing crosswalk provides adequate sight distance for users of the crosswalk due to the flat vertical alignment of the roadway. Sidewalk exists on the east side of 63rd Street and on the west side of 63rd Street north of College Ave. Sidewalk exists on the north side of College Avenue, bringing pedestrians to and from the entrance of the school.

A school crossing review study was conducted by the City of Des Moines in July 2015. This study recommended to add school crossing signage at the crosswalk and in advance of the crosswalk due to the concerning traffic volumes on 63rd Street during the AM and PM peak hours. Since the City’s study, these signs have been installed in the study area. Figure 1 below shows recent photos of the existing signage.



Figure 1: Existing School Crossing Signage

II. EXISTING PEDESTRIAN AND VEHICLE DATA

Manual traffic and pedestrian counts were collected by MSA on multiple days at the study intersection during the morning and afternoon peak hours. Counts were collected on three weekdays with a typical school-day schedule with average weather conditions. Table 1 summarizes the collected volume data of the total amount of vehicles crossing the crosswalk at the intersection. A summary of the raw data is shown in Table 1.

Table 1: 2016 Collected Pedestrian and Vehicular Volume Data at 63rd Street and College Avenue

Time	Pedestrians Crossing 63 rd Street	Southbound Vehicles	Northbound Through Vehicles	Eastbound Left-Turning Vehicles
5/24/2016 2:30 – 3:30 PM	0	512	581	16
5/24/2016 3:30 – 4:30 PM	1	607	801	19
5/26/2016 7:00 – 8:00 AM	2	778	306	14
5/26/2016 8:00 – 9:00 AM	1	634	388	6
5/26/2016 2:30 – 3:30 PM	8	445	521	8
5/26/2016 3:30 – 4:30 PM	0	459	536	10
5/27/2016 7:00 – 8:00 AM	2	636	374	8

Crash data for the study intersection was obtained from the Iowa DOT for the past three years (2012-2015) and any additional crashes reported in the past twelve months. In the past twelve months, three crashes were reported. The data shows no incidents involving pedestrians at the intersection nor any that could have been corrected by a signal. Appendix A provides a summary of the crash reports provided by Iowa DOT.

III. PEDESTRIAN CROSSING IMPROVEMENT REVIEW

To provide a comprehensive analysis, MSA reviewed the Manual on Uniform Traffic Control Devices (MUTCD), the Iowa DOT Traffic and Safety Manual, Iowa Statewide Urban Design and Specification (SUDAS) Manual, and the City of Des Moines Manual for School Crossing Control. Using the existing conditions and volume data of the study intersection, the warrants and recommendations from each manual were reviewed to search for guidance affirming the installation of pedestrian crossing improvements. Below outlines the findings from each manual from a federal to a local level.

a. *Manual on Uniform Traffic Control Devices (MUTCD)*

i. Signal Warrants

The MUTCD was reviewed to specifically analyze the six “warrants” that are minimum level of criteria to justify the consideration of a traffic signal installation at an intersection. Using this data, the eight-hour vehicular volume (Warrant 1), four-hour vehicular volume (Warrant 2), peak hour volume (Warrant 3), pedestrian volume (Warrant 4), and school crossing (Warrant 5) were the main warrants evaluated to determine if a traffic signal could be installed at the intersection.

The warrant analysis for the 63rd Street & College Avenue was performed using the 100 percent volume level because the population of the community includes the Des Moines Metro, which is greater than 10,000 residents. The volume data used for the warrant analysis are from the Thursday, May 26, 2016 counts. Since the vehicular volume collected on each day are comparable during the peak hours, this day was used due to the higher pedestrian volume.

The warrants indicated that the volume on the major road (63rd Street) surpass the minimum level of criteria, but the minor road (College Avenue) volume do not. Both criteria for the major and minor road must be met in order to justify traffic signal consideration.

For the pedestrian and school warrants, the MUTCD states that there must be a minimum of 20 school children during the highest crossing hour with inadequate gaps on the major road to provide safe crossing time. Since the number of pedestrians during the peak hour is less than 20 and pedestrians appear to have adequate gaps in traffic, the pedestrian and school crossing warrants were not met. Therefore, the findings show that the existing traffic volume at the intersection do not warrant the consideration of a traffic signal. A summary of the warrant analysis is provided in Appendix B.

ii. Portable/Part-time STOP signs



Figure 2: Portable Stop-Sign

In addition to signal warrant analysis, Chapter 2B of the MUTCD was also reviewed to analyze the application of temporary regulatory signs. The MUTCD advises to only install portable or part-time STOP signs for emergency and temporary traffic control zone purposes. Part-time STOP signs are typically implemented on local roadways. Since 63rd Street is partially controlled by Iowa DOT, part-time STOP signs are not recommended as a viable solution at this time. Additionally, due to the roadway class, the surrounding environment,

and traffic volumes, driver compliance is expected to be weak if part-time STOP signs were implemented. Therefore, part-time STOP signs are not recommended as a solution to improve pedestrian safety at the intersection.

iii. Crossing Guards

Lastly, MUTCD Chapter 7 was also reviewed. This chapter provides recommendations for when to introduce adult crossing guards. Per the MUTCD, adult crossing guards should be introduced if inadequate gaps exist for school children to cross. During the times of manual traffic count collection, the pedestrians crossing the north side of the intersection appeared to have adequate gaps in traffic to safely cross the street. No instances were observed where children were crossing at dangerous times due to an excessive wait time for safe gaps between vehicles.

iv. Pavement Markings

Chapter 7C Markings of the MUTCD provides guidance for when to mark intersections for pedestrian safety enhancements. The chapter states that crosswalks should be marked at intersections on a school route where there is significant conflict between motorists. Crosswalk markings legally establish the crosswalk and help alert motorists of an assigned pedestrian crossing location not controlled by a signal or STOP or YIELD signs. In addition to solid white markings, the "SCHOOL" word marking may also be used to extend across the width of the approach lanes. These pavement markings are feasible options for the study intersection and examples are shown below in Figure 3. Upon coordination with the Iowa DOT, the City of Windsor Heights, and the City of Des Moines, pavement markings may be recommended as a solution to improve pedestrian safety at the intersection.

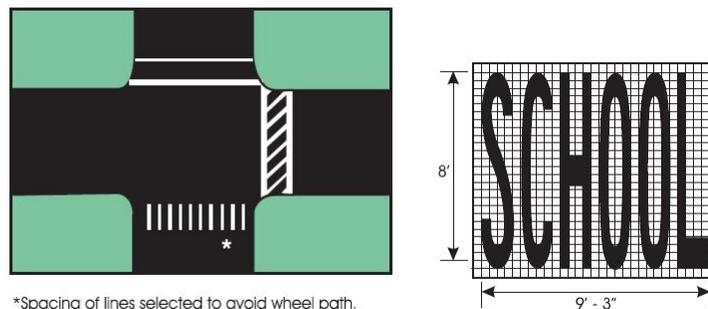


Figure 3: Typical Crosswalks and School Marking Dimensions for One Lane Approach

b. Iowa DOT Traffic and Safety Manual – School Crossing Study

Guidance for addressing school crossing improvements is provided by the Iowa DOT Traffic and Safety Manual, Chapter 7, Section F-1. Primarily, the City is responsible for developing a school route plan prior to considering additional forms of school crossing safety improvements. Then, other analyses can be performed to determine the justification of special protection. These analyses include an MUTCD signal warrant analysis, a gap study, and the consideration of other traffic control devices.

Other traffic control considerations include introducing adult crossing guards, roll out STOP signs, and traffic control signals. As previously discussed, traffic control signals and adult crossing guards are not warranted at the intersection. The low volume on the minor street

and the minor pedestrian volume do not justify the installation of a traffic signal per the MUTCD warrants. Additionally, the existing conditions provide adequate gaps for pedestrians to safely cross the street; therefore the MUTCD does not recommend the introduction of crossing guards at the intersection. However, Iowa Code Section 321.249 permits the City to provide temporary roll out stop signs in established school zones upon approval by the Iowa DOT. Roll out STOP signs are temporary, portable stop-signs that are permitted by MUTCD in areas with temporary traffic control issues. These STOP signs can effectively protect pedestrians from vehicles during the school peak hours and then be removed during the school day to allow vehicles to travel freely. However, due to the multiple jurisdictions controlling the roadway, the existing roadway class, and surrounding environment, the part-time STOP signs are not a viable solution for the intersection at this time.

c. *Iowa Statewide Urban Design and Specifications (SUDAS)*

Chapter 13, Section B-1 “Traffic Control Signal Needs Studies” outlines the SUDAS guidelines for considering pedestrian crossing improvements. Consistent with MUTCD guidelines, SUDAS also references Minnesota DOT’s guidance for warranting flashing beacons at intersections (Mn/DOT Traffic Signal Design Manual Section 9-4.02).

The flashing beacons warning drivers of the upcoming 63rd Street and College Avenue intersection would be required to be mounted on a pedestal above many warning and regulatory signs, such as a School Advanced Warning Sign. However, any flashing beacon must be justified under one or more of the four warrants. Below summarizes whether or not the intersection conditions meet the minimum criteria for each warrant:

1. Limited Visibility
Warrant not met due to sight distance being greater than the minimum sight distance of 250 feet required for a 35 MPH design speed.
2. Crash Rate
Warrant not met since no right-angle or left-turn type crashes were reported at the intersection. To meet this warrant, at least four these crash types have to have occurred in one year at the intersection.
3. School Crossing
Warrant not met since the intersection did not experience more than 500 vehicles per hour crossing the crosswalk *and* insufficient gaps for pedestrians during the school day peak hours.
4. Rural Trunk Highway Junctions
Warrant not applicable since the study intersection is in an urban setting.

Per SUDAS, none of the criteria for recommending a flashing beacon at the intersection are met with existing conditions.

d. *Des Moines Manual for School Crossing Control*

The City of Des Moines’ Manual for School Crossing Control outlines five school crossing control warrants. These warrants consider the addition of painted crosswalks, school speed

limit flashing signals, STOP signs, traffic signals, and adult crossing guards. Below summarizes whether or not the intersection conditions meet the minimum criteria for each warrant:

1. Painted Crosswalk

A minimum of 25 students per peak period warrant the addition of a painted crosswalk for a school crossing. Existing pedestrian volume are less than 25 per peak period and therefore do not warrant a painted crosswalk.

2. School Speed Limit Flashing Signals

Where the speed limit on the street is greater than 25 MPH within established school districts and school zones, School Speed Limit Flashing Signals are warranted on collector or arterial streets. 63rd Street is a collector with a speed limit of 30 MPH. Assuming the school is within a school zone, 25 MPH School Speed Limit Flashing Signals could be installed based on a recommendation by the Traffic Safety Committee and approval from the Des Moines City Council. However, due to the various jurisdictions that own and maintain the intersection, additional coordination by the City of Windsor Heights would be necessary.

3. Stop Signs

A stop sign can only be installed if a painted crosswalk exists at the intersection. Since the intersection does not have existing pavement markings for a crosswalk, stop signs are not warranted at this time.

4. Traffic Signals

Per MUTCD, traffic signal warrants are not met at the study intersection and therefore no additional pedestrian control features apply.

5. Adult Crossing Guards

The conditions state that a minimum of five lanes of traffic must approach the intersection and with a minimum volume factor of 1,400. Since the intersection has three approach lanes, the study intersection does not currently meet the conditions outlined by the manual to assign adult crossing guards.

IV. SUMMARY

The low volume of observed pedestrians during the school day peak hours prevented most warrants that justify pedestrian crossing improvements at the intersection of 63rd Street and College Avenue from being met. These improvements include the installation of a traffic signal, adult crossing guards, part-time STOP Signs, and flashing beacon signs. It should also be noted that the vehicle volume on 63rd Street was high enough to meet the minimum vehicular volume level on the major road; whereas the College Avenue volume did not meet the threshold for the minor road. To consider any significant improvements, including a traffic signal, over 20 pedestrians would have had to cross the crosswalk during one peak hour.

According to the Des Moines Manual for School Crossing Control, criteria is met at the intersection to install School Speed Limit Flashing Signals. These flashing signals may improve the safety of the intersection by alerting drivers of the crossing. Therefore, School Speed Limit Flashing Signals and

pavement markings are considered viable improvement options. Coordination between the City of Windsor Heights, the City of Des Moines, and the Iowa DOT is required prior to installation of any improvement alternatives. Table 2 below summarizes the discussed improvement options and if the warrants or criteria are met and recommended based on the analysis.

Table 2: Pedestrian Crossing Improvement Options Comparisons

Improvement Alternative	Warrants/Criteria Met and Recommended
Traffic Signal (MUTCD)	No
Portable/Part-Time STOP Sign (MUTCD/Iowa DOT)	No
Crossing Guards (MUTCD)	No
Pavement Markings (MUTCD)	Yes
Flashing Beacons (SUDAS)	No
School Speed Limit Flashing Signals (Des Moines)	Yes
Permanent STOP signs (Des Moines)	No

V. SCHOOL SURVEY CONSIDERATION

After reviewing the pedestrian volume observed at the intersection, it became imperative to understand the reason for the low pedestrian volume. It is possible that school-aged pedestrians are not utilizing the crossing due to anticipated safety concerns. On the other hand, there simply may not be many students who walk to and from the school, particularly because the nearby Montessori school draws a significant amount of students from outside the neighborhood boundaries and from a large geographic area. If students are discouraged to use the crosswalk due to the high vehicular volume and lack of safety, then it is likely other safety measures could be considered and valued. To gain a better understanding, a brief survey to the school families, sponsored by the City, could gain additional insight into the existing conditions and travel behaviors related to school traffic.

Appendix

MUTCD Signal Warrant Analysis

Iowa DOT Crash Report Summary

MUTCD Signal Warrant Analysis

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:

Intersection: 63rd Street & College Avenue

County: Polk

City: Windsor Heights

Major Street: 63rd Street

Minor Street: College Avenue

Critical Approach Speed: 30 mph

Critical Approach Speed: 25 mph

Lanes: 1 lane

Lanes: 1 lane

% Right Turns Included

From North (SB) 100%

From East (WB) 100%

From South (NB) 100%

From West (EB) 100%

In built-up area of isolated community of < 10,000 population? No

Total number of approaches at intersection? 3

If it is a "T" intersection, inflate minor threshold to 150%? No

Manually set volume level? No

Analysis based on **EXISTING** volume data.

Date	Day of the Week	Time (HH:MM)			
		From	AM / PM	To	AM / PM
26-May-16	Thursday	7:00	AM	4:00	PM

Warrant Evaluation Summary	Warrant Met:
Warrant 1: Eight - Hour Vehicular Volume	No
Condition A: Minimum Vehicular Volume	No
Condition B: Interruption of Continuous Traffic	No
Condition C: Combination: 80% of A and B	No
Warrant 2: Four-Hour Volume	No
Warrant 3: Peak Hour Volume	No
Warrant 4: Pedestrian Volume	No
Criterion A: Four-Hour	No
Criterion B: Peak-Hour	No
Warrant 5: School Crossing	No
Warrant 6: Coordinated Signal System	N/A
Warrant 7: Crash Experience	No
Warrant 8: Roadway Network	N/A
Warrant 9: Intersection Near a Grade Crossing	N/A

Warrant Analysis Conducted By:

Name: Erin Katopodis

Agency: MSA Professional Services

Date: 6/3/2016

Warrant 1: Eight - Hour Vehicular Volume

100%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To:

Condition A : Min. Veh. Volume		
Volume Level	100%	80%
Major Rd. Req	500	400
Minor Rd. Req	150	120
Number of Hours	0	0

Satisfied? No

Condition B: Interruption of Continuous Traffic		
Volume Level	100%	80%
Major Rd. Req	750	600
Minor Rd. Req	75	60
Number of Hours	0	0

Satisfied? No

Condition C: Combination of A & B at 80%		
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Satisfied? No

Time Period	From	To	Manually Set To:		Total
			Major Road: Both App. (VPH)	Minor Road: High App. (VPH)	
6:00 AM Enter Start Time (Military Time) (HH:MM)					
1	6:00	7:00	0	0	0
2	7:00	8:00	1103	25	1128
3	8:00	9:00	1080	14	1094
4	9:00	10:00	0	0	0
5	10:00	11:00	0	0	0
6	11:00	12:00	0	0	0
7	12:00	13:00	0	0	0
8	13:00	14:00	0	0	0
9	14:00	15:00	1010	14	1024
10	15:00	16:00	1005	24	1029
11	16:00	17:00	0	0	0
12	17:00	18:00	0	0	0
13	18:00	19:00	0	0	0
14	19:00	20:00	0	0	0
15	20:00	21:00	0	0	0
16	21:00	22:00	0	0	0

Warrant 2: Four-Hour Volume

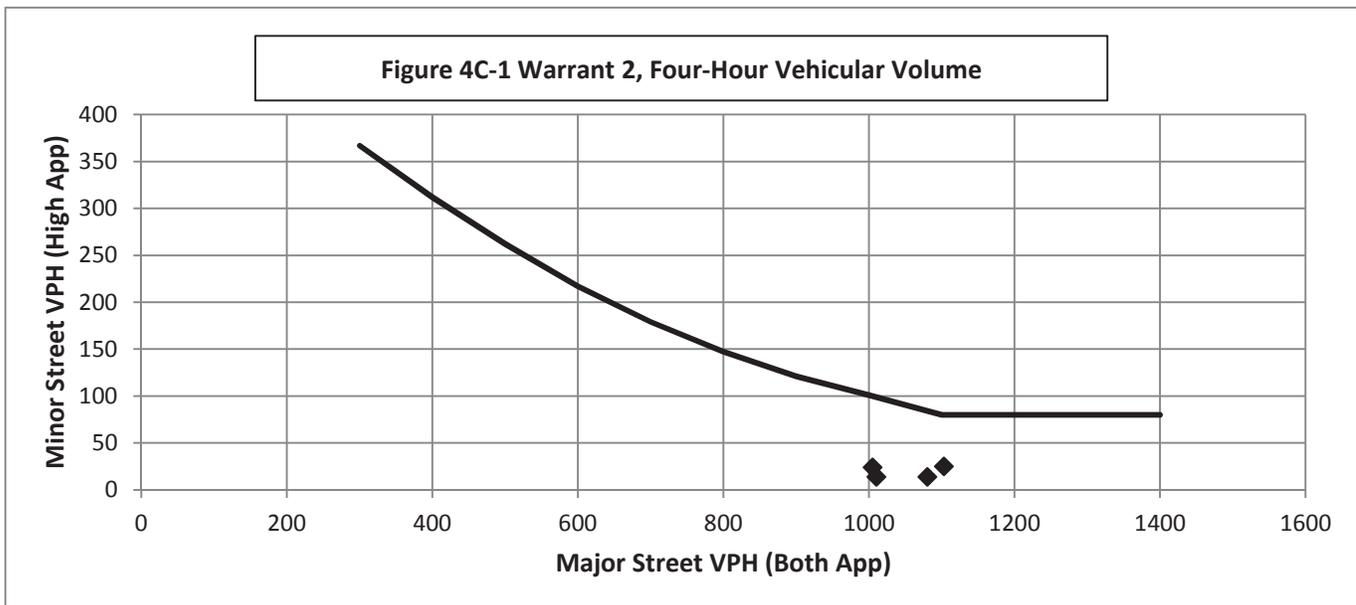
100%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To:

Hour Start	7:00	8:00	15:00	14:00
Major Road Vol.	1103	1080	1005	1010
Minor Road Vol.	25	14	24	14



Warrant 3: Peak Hour Volume

100%

Warrant Evaluated? Yes

Warrant Satisfied? No

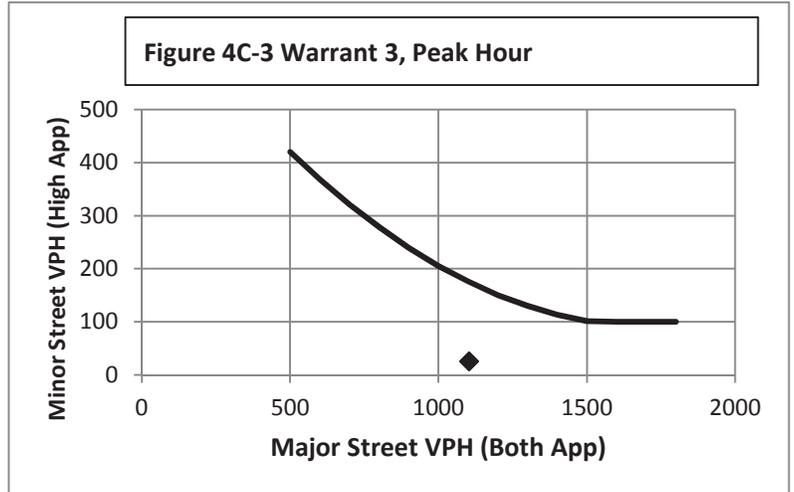
Manually Set To:

Condition justifying use of warrant:

Criteria		Met?
Delay on Minor Approach	4	No
Volume on Minor Approach	100	
Total Entering Volume (veh/h)	650	

Manually Set Peak Hour?

Peak Hour	Major Road Vol. (Both App.)	Minor Road Vol. (High App.)
7:00	1103	25



Warrant 4: Pedestrian Volume

100%

Warrant Evaluated? Yes

Warrant Satisfied? No

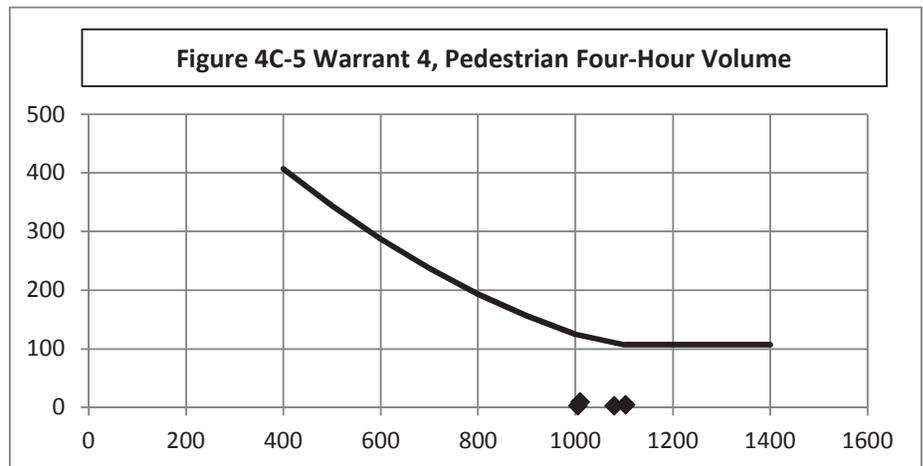
Manually Set To:

Criterion A: Four Hour

Hour (Start)	Pedestrian Volume	Major Road Vol.
7:00	5	1103
8:00	3	1080
14:00	10	1010
15:00	3	1005

Manually Set Major Rd Vol? **No**
Avg. walk speed less than 3.5 ft/s? **No**

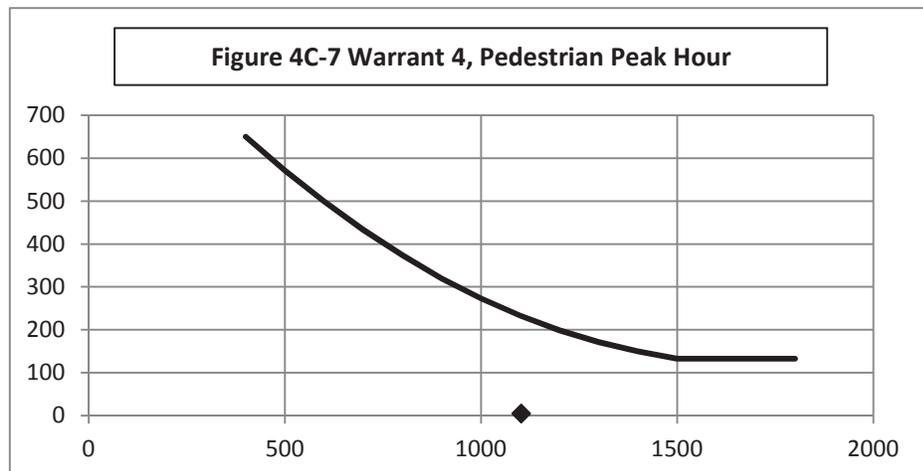
Criterion A Satisfied? **No**



Criterion B: Peak Hour

Peak Hour	Pedestrian Vol.	Major Road Vol.
7:00	5	1103

Criterion B Satisfied? **No**



Warrant 5: School Crossing

100%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To:

Criteria		Fulfilled?
1	There are a MINIMUM of 20 school children during the highest crossing hour.	No
2	There are fewer adequate gaps in the major road traffic stream during the period when the school children are using the crossing than the number of minutes in the same period.	No
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.	Yes

Warrant 6: Coordinated Signal System

100%

Warrant Evaluated? No

Warrant Satisfied? N/A

Manually Set To:

Criteria		Fulfilled?
1	Signal spacing > 1000 ft	
2	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.	
3	On a two-way road, adjacent signals do not provide the necessary degree of platooning and the proposed and the adjacent signals will collectively provide a progressive operation.	

Warrant 7: Crash Experience

100%

Warrant Evaluated? Yes

Warrant Satisfied? No

Manually Set To:

Criteria		Met?	Fulfilled?
1	Adequate trial of other remedial measures has failed to reduce crash frequency. Measures Tried:		No
2	Five or more reported crashes, of types susceptible to correction by signal, have occurred within a 12 month period.	# of crashes per 12 months 3	No
3	Warrant 1, Condition A (80%)	No	No
	Warrant 1, Condition B (80%)	No	
	Warrant 4, Criterion A (80%)	No	
	Warrant 4, Criterion B (80%)	No	

Warrant 8: Roadway Network

100%

Warrant Evaluated? No

Warrant Satisfied? N/A

Manually Set To:

Criteria		Met?	Fulfilled?
1	Total entering volume of at least 1,000 veh/h during typical weekday peak hour	1128	Yes
	Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.		No
2	Total entering vol. of at least 1,000 veh/h for each of any 5 hrs of non-normal business day (Sat. or Sun.)		
	Hour		
	Volume		

Characteristics of Major Routes - Select yes if all intersecting routes have characteristic	Fulfilled?
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 9: Intersection Near a Grade Crossing

100%

Warrant Evaluated? No

Warrant Satisfied? N/A

Manually Set To:

Adjustment Factors			Manually Set Peak Hour?				
Rail Traffic per Day	% High Occupancy Buses on Minor Road	% Tractor-Trailer Trucks on Minor Road	D	Peak Hour	Major Road Vol.	Minor Road Vol.	Adjusted Minor Vol.
1	0	0% to 2.5%	660	7:00	1103	25	8.375

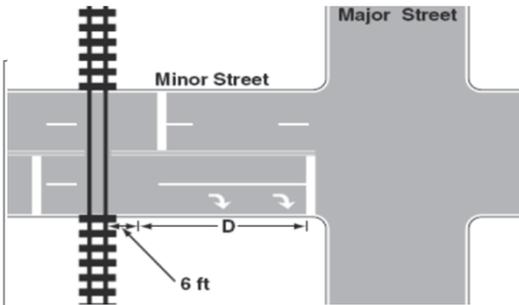
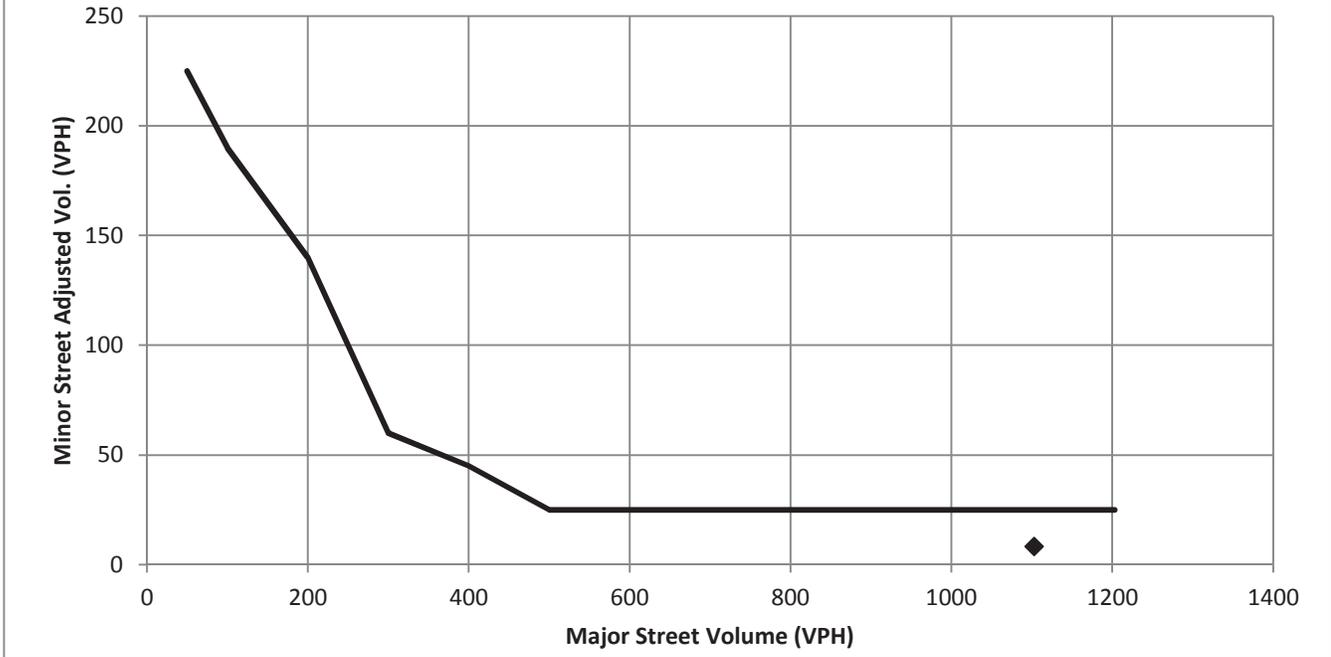


Figure 4C-9 Warrant9, Intersection Near a grade Crossing (One Approach Lane at the Track Crossing)



Conclusions/Comments:

**2013 - 2016 Reportable Crash History
 Intersection of 63rd St. & College Ave 75' Radius
 Windsor Heights, IA**

Year	County	Crashes						Injuries					
		Fatal	Major	Minor	Poss/Unk	PDO	Fatalities	Major	Minor	Possible	Unknown		
2013	Local	0	0	0	0	0	0	0	0	0	0	0	0
2014	Local	3	0	0	0	0	3	0	0	0	0	0	0
2015	Local	1	0	0	0	0	1	0	0	0	0	0	0
2016	Local	1	0	0	0	1	0	1	0	0	0	1	0
Totals:		5	0	0	0	1	4	1	0	0	0	1	0

**meeting the following criteria:
 (This feature currently not operational.)**

Feature Count Report (Thursday, June 23, 2016 10:10:15 AM Central Daylight Time)
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 by:
 Jon Frederiksen
 Engineering Intern

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