



Traffic Study

Cowles Elementary

Windsor Heights, IA

Submitted by:
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Certification

Traffic Study

for

Cowles Elementary

City of Windsor Heights, IA
BMI Project No. – A13.115169

January 8, 2018



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under that laws of the State of Iowa.



1/8/2017

Rob J. Haaland

Date

License Number 19529

MY LICENSE RENEWAL DATE IS DECEMBER 31, 2018

Pages or sheets covered by this seal:

Pages 1 to 6, Appendix A to E

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I. Executive Summary

The City of Windsor Heights and the Des Moines Public Schools collaborated to work with Bolton and Menk, Inc. to study the traffic pattern in the area adjacent to the entrance to the Cowles school parking lot. Cowles Elementary in the City of Windsor Heights has noted a potential traffic flow issue of delayed traffic during the school drop off and pick up times. The study reviewed the existing conditions, a proposed alternative, and crash data in accordance with the Iowa Department of Transportation Guidelines for Traffic Impact Analysis. The City and School are interested in analyzing the traffic operations and safety to determine the appropriate roadway configuration.

The following summarizes the main outcomes of this study:

A. Safety

There have been 17 crashes on the study corridor between January 1, 2012 and December 31, 2016. The crash rates and severity of crashes are below the statewide average and do not indicate any significant safety concerns. The crashes are outside of the school peaks, so changes to school traffic flow will not positively affect the crash rate.

B. Proposed Roadway Improvements

The traffic study indicates traffic capacity is sufficient for either scenario with intersections operating at a high level of service. The traffic flow should be left as is with changes to parking. Parking should be removed along College Avenue and the bus stopping location should be relocated as to not restrict traffic approaching the school on College Avenue from 63rd Street.

C. Pedestrian / Bicyclist / Transit accommodations

The pedestrian facilities do not match up with the allowed parking locations. The parking on Del Matro Avenue should be switched to the south side and the parking on 64th Street should be switched to the east side to provide direct access to the sidewalk from the parking. This will also provide a barrier for the pedestrians on the sidewalk.

II. Introduction

Cowles Elementary in the City of Windsor Heights has noted a potential traffic flow issue of delayed traffic during the school drop off and pick up times. The City of Windsor Heights and the Des Moines Public Schools collaborated to work with Bolton and Menk, Inc. to study the traffic pattern in the area adjacent to the entrance to the school parking lot. The study reviewed the existing conditions, a proposed alternative, and crash data in accordance with the Iowa Department of Transportation Guidelines for Traffic Impact Analysis. Future analysis was not reviewed since the future traffic conditions changes are expected to be negligible. The study intersections include:

- 63rd Street at Sunset Terrace
- 63rd Street at College Avenue
- 64th Street at Sunset Terrace
- 64th Street at Del Matro Avenue
- 64th Street at College Avenue

The City and the School are interested in analyzing the traffic operations and safety to determine the appropriate roadway configurations. The roadways of 63rd Street, College Avenue, 64th Street, Del Matro Avenue, and Sunset Terrace are currently two-way streets with one lane in each direction. The proposed alternative is to revise College Avenue and 64th Street north of Del Matro Avenue to one way west/south bound and revise the signing to remove parking on 64th Street during school drop off and pick up hours.

The purpose of this traffic impact study is to identify transportation issues existing or created as a result of changes to the roadway system and recommend solutions to the potential issues to provide a safer and efficient transportation facility for vehicular, pedestrian and bicycle traffic.

III. Existing Conditions Review

The Cowles Elementary study area focuses on the entrance to the parking lot at 64th Street and College Avenue and the roads that would be immediately impacted by traffic changes. Based on discussions with the City and School, the majority of traffic accesses the site from 63rd Street both south and northbound via College Avenue. Once the parents have dropped off or picked up their children, they are directed south out of the driveway on 64th Street and then can head west on Del Matro Avenue or south on 64th Street to Sunset Terrace. Parents also drop off and pick up their children along 64th Street and Del Matro Avenue. The school principal noted school start time of 8:30 am and school dismissal time of 3:30 pm.

See **Appendix A** for aerial of existing conditions.

The streets in the study area are all two-lane with one lane in each direction.

- 63rd Street (HWY 28) is 26 feet wide back of curb to back of curb. It has a speed limit of 30 MPH in the study area. Parking is not allowed along the road.
- College Avenue is a block long from 63rd Street to 64th Street and is 24 feet wide back of curb to back of curb and widens to 40 feet wide back of curb to back of curb from the intersection with 64th Street to 50 ft east of this intersection. It has a speed limit of 25 MPH. Only bus parking is allowed along the road from 7:00 AM to 5:00 PM.
- 64th Street is 25 feet wide back of curb to back of curb. It has a speed limit of 25 MPH. Parking is allowed along the west side of the road.
- Del Matro Avenue is 25 feet wide back of curb to back of curb. It has a speed limit of 25 MPH. Parking is allowed along the north side of the road.
- Sunset Terrace is 25 feet wide back of curb to back of curb. It has a speed limit of 25 MPH. Parking is allowed along the north side of the road.

63rd Street is HWY 28 and has a functional classification of principal arterial. The other streets within the study area are classified as local roads.

AM and PM Peak Hour Turning Movement Counts were performed by Bolton & Menk, Inc. on November 14, 2017 for the intersections of 63rd Street at College Avenue, 64th Street at College Avenue, and 64th Street at Del Matro Avenue and on November 16, 2017 for the intersections of 63rd Street at Sunset Terrace and 64th Street at Sunset Terrace for the study. Because the intersection of College Avenue and 64th Street is also the entrance to the school parking lot, it was used to determine the school peak. There were vehicular traffic peak hours of 7:45-8:45 AM and 3:00-4:00 PM with pedestrian peaks during the same times. See **Appendix B** for Peak hour count turning movement information.

The traffic currently approaches the intersection at the school primarily from the east with 86% in the AM and 76% in the PM. 8% in the AM and 15% in the PM approach from the south and 6% in the AM and 9% in the PM approach from the west.

IV. Safety Review

The crash history review of the study intersections was completed using the crash data available through the Iowa DOT Crash Mapping Analysis Tool for January 1, 2012 through December 31, 2016. There were 17 reported crashes at the study intersections during that time. Of those, there was one major injury crash, one minor injury crash, three possible/unknown injury crashes, and 12 property damage only crashes. A summary follows.

- There were 8 crashes at the intersection of 63rd Street and College Avenue. Two were possible/unknown injury crashes, and 6 were property damage only crashes. Of the crashes, seven were rear end with six northbound and one southbound, and 1 was head on. None of the crashes happened during the school traffic peaks. The crash rate at the intersection was calculated as 0.29 crashes per MEV (Million Entering Vehicles) which is below the statewide average of 0.90 crashes per MEV for an intersection of a primary roadway with a city street.
- There were 9 crashes at the intersection of 63rd Street and Sunset Terrace/Clark Street. There was one major injury crash, one minor injury crash, one possible/unknown injury crash, and six property damage only crashes. The major injury crash was a broadside crash with southbound hitting eastbound. The minor injury crash was a rear end of northbound traffic. The possible injury crash did not have enough data to determine crash type. Of the property damage only crashes, four were rear end and two were broadside. Northbound rear end crashes were 45%. None of the crashes happened during the school traffic peaks. The crash rate was calculated as 0.30 crashes per MEV (Million Entering Vehicles) which is below the statewide average of 0.90 crashes per MEV for a primary roadway with a city street.
- There were no crashes during the 5 year period at the intersections of 64th Street at Sunset Terrace, 64th Street at Del Matro Avenue, and 64th Street at College Avenue.

While the crash rates are below the statewide averages for the type of intersections, the crash trend of northbound rear end crashes at the intersections on 63rd Street could be reviewed for potential options. Since this roadway is also a state highway, it is the jurisdiction of the Iowa DOT and should be coordinated with them.

V. All Way Stop Warrant

An All Way Stop review was requested to the City by a parent for the intersection of 64th Street at Sunset Terrace. Warrants for All-Way Stop Control are used to determine if the control type is appropriate for an intersection.

All Way Stop Control Warrant Analysis

This intersection is currently side street stop controlled. All way stop control can be useful at an intersection if primary traffic flow is at conflicting directions or as a safety measure at intersections if safety concerns exist because of high traffic volumes in multiple directions or if there is insufficient sight distance available to see conflicting traffic on an approach to an intersection. Section 2B.07 of the MUTCD states that the need for an all way stop control shall be considered if one of the following conditions is met:

- Condition A: Where traffic control signals are justified, an all-way stop can be installed as an interim measure.
- Condition B: Five or more crashes are reported in a 12-month period.
- Condition C: Minimum volumes:

- The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and
- The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but
- If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.
- D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

Based on 2017 traffic volumes, all way stop control warrants are not met. The results of the all way warrant analysis are documented in **Appendix C**.

VI. Project Scenario Review

The project scenarios for this analysis include the existing conditions and one proposed alternative for lane configuration.

The Alternative 1 lane configuration discussed was to revise College Avenue to 2-lane one way westbound, 64th Street north of Del Matro Avenue to 2-lane one way south bound, and revise the signing to remove parking on 64th Street during school drop off and pick up hours. Alternative 1 Turning Movement information can be found in **Appendix D**.

VII. Traffic Modeling

The traffic operations analysis for the intersections consider the following measures to determine the adequacy of the intersection design to meet acceptable operations: intersection delay/Level of Service (LOS) and volume-to-capacity ratios (V/C). An explanation of each of these measures is provided below:

A. LEVEL OF SERVICE AND DELAY

The operational analysis results are described as a Level of Service (LOS) ranging from A to F. These letters serve to describe a range of operating conditions for different types of facilities. Levels of Service are calculated based on the 2010 Highway Capacity Manual, which defines the level of service, based on control delay. Control delay is the delay experienced by vehicles slowing down as they are approaching the intersection, the wait time at the intersection, and the time for the vehicle to speed up through the intersection and enter into the traffic stream. The average intersection control delay is a volume weighted average of delay experienced by all motorists entering the intersection on all intersection approaches. The control delay is modeled within the analysis software, Trafficware Synchro. Level of Service D is commonly taken as an acceptable design year LOS. The level of service and its associated intersection delays for signalized and unsignalized intersections are presented below. The delay threshold for unsignalized intersections is lower for each LOS compared to signalized intersections, which accounts for the fact that people expect a higher level of service when at a stop-controlled intersection.

Table 2: Level of Service Criteria

	Signalized Intersection	Unsignalized Intersection
LOS	Control Delay per Vehicle (sec.)	Control Delay per Vehicle (sec.)
A	≤ 10	≤ 10
B	>10 and ≤ 20	>10 and ≤ 15
C	>20 and ≤ 35	>15 and ≤ 25
D	>35 and ≤ 55	>25 and ≤ 35
E	>55 and ≤ 80	>35 and ≤ 50
F	>80	>50

Note: If $V/C > 1.0$, then LOS will be equal to F, independently of the delay.

Two Scenarios were analyzed to determine the effects of the school generated traffic on the transportation system. The scenarios analyzed were:

1. Existing conditions – The existing conditions were analyzed to determine if there were preexisting issues.
2. Alternate 1 – The Alternate 1 option changes were analyzed to determine if the changes would create an improved traffic flow.

The Level of service and queueing tabulations for the scenarios described can be found in **Appendix E**.

The results of the analysis show that the existing conditions provide low delays, high level of service and acceptable queueing.

The Alternate 1 option provided similar low delays/level of service and acceptable queueing for the system. The main improvement the changes create is of queueing for eastbound traffic on College Avenue at 63rd Street, but this is currently not an issue.

VIII. Multimodal Review

63rd Street is currently utilized by Des Moines Area Regional Transit and planned to remain part of the transit system in the DART Forward 2035 planning document.

There currently are not bike accommodations within the study area. There are no planned improvements for bike facilities.

Pedestrian facilities are currently provided along the east side of 63rd Street, the west side of 63rd St north of College Avenue, the North side of College Avenue, the west side of 64th from Del Matro Avenue to College Avenue, the east side of 64th Street south of Del Matro Avenue, and the south side of Del Matro Avenue.

IX. Conclusions & Recommendations

The purpose of this traffic impact study is to analyze existing conditions and identify any issues; analyze alternative and identify benefits to the transportation system surrounding the school and recommend solutions to mitigate the potential issues to provide a safer transportation facility for vehicular, pedestrian and bicycle traffic.

A. Safety

There have been 17 crashes on the study corridor between January 1, 2012 and December 31, 2016. The crash rates and severity of crashes are below the statewide average and do not indicate any significant safety concerns. The crashes are outside of the school peaks, so changes to school traffic flow will not positively affect the crash rate.

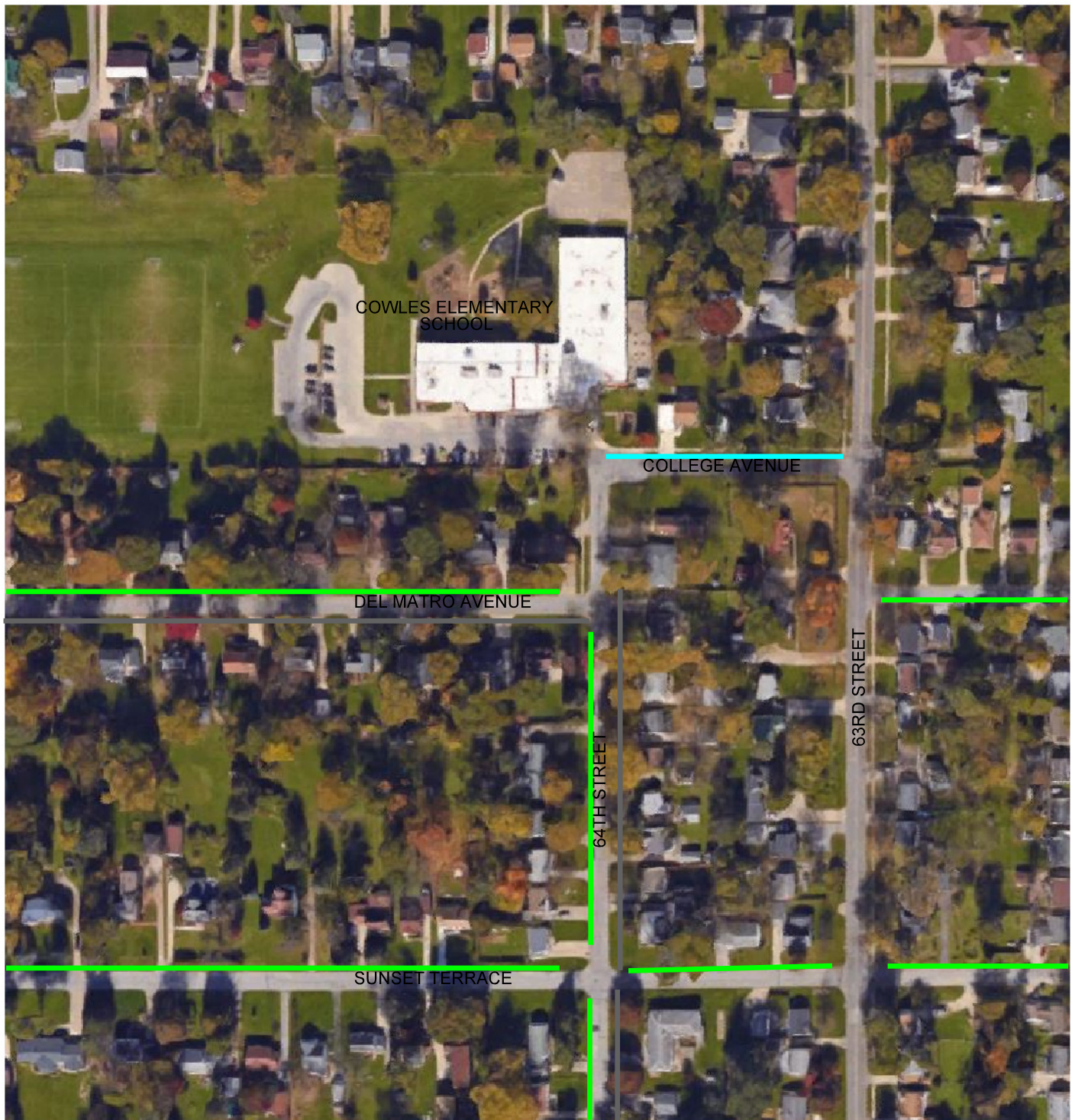
B. Proposed Roadway Improvements

The traffic study indicates traffic capacity is sufficient for either scenario with intersections operating at a high level of service. The traffic flow should be left as is with changes to parking. Parking should be removed along College Avenue and the bus stopping location should be relocated as to not restrict traffic approaching the school on College Avenue from 63rd Street.

C. Pedestrian / Bicyclist / Transit accommodations

The pedestrian facilities do not match up with the allowed parking locations. The parking on Del Matro Avenue should be switched to the south side and the parking on 64th Street should be switched to the east side to provide direct access to the sidewalk from the parking. This will also provide a barrier for the pedestrians on the sidewalk.

Appendix A: Existing Conditions



- EXISTING PARKING
- BUS PARKING 7:00 AM TO 5:00 PM
- NEWLY CONSTRUCTED SIDEWALK

EXISTING CONDITIONS
COWLES ELEMENTARY SCHOOL TRAFFIC STUDY
WINDSOR HEIGHTS, IOWA

NOT TO SCALE



Appendix B: Peak Hour Count Information



Appendix C: All Way Stop Warrant

ALL WAY STOP WARRANT

LOCATION: Windsor Heights

COUNTY: Polk

REF. POINT:

DATE: 1/5/2018

OPERATOR: RJH

0.70 FACTOR USED?

No

Speed	Approach Description	Lanes
25	Major App1: Sunset Terrace WB	1
25	Major App3: Sunset Terrace EB	1
25	Minor App2: 64th Street NB	1
25	Minor App4: 64th Street SB	1

HOUR	300				200		WARRANT MET
	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	
0:00 - 1:00							
1:00 - 2:00							
2:00 - 3:00							
3:00 - 4:00							
4:00 - 5:00							
5:00 - 6:00							
6:00 - 7:00	3	12	1	9	15	10	/
7:00 - 8:00	11	12	8	28	23	36	/
8:00 - 9:00	13	11	11	127	24	138	/
9:00 - 10:00	5	6	8	11	11	19	/
10:00 - 11:00	12	9	8	9	21	17	/
11:00 - 12:00	6	8	6	23	14	29	/
12:00 - 13:00	10	7	3	15	17	18	/
13:00 - 14:00	10	7	4	12	17	16	/
14:00 - 15:00	16	7	5	12	23	17	/
15:00 - 16:00	20	12	11	69	32	80	/
16:00 - 17:00	25	9	8	20	34	28	/
17:00 - 18:00	22	9	11	24	31	35	/
18:00 - 19:00	22	12	4	11	34	15	/
19:00 - 20:00							
20:00 - 21:00							
21:00 - 22:00							
22:00 - 23:00							
23:00 - 24:00							

Met (Hr) Required (Hr)

Allway Stop Warrant:

0

8

Not satisfied

REMARKS:

Appendix D: Alternative 1 Turning Movements



Appendix E: LOS and Queueing Tables

Table 1: Scenario Traffic Operations Analysis - Windsor Heights Cowles Elementary

Intersection ID	Intersection	Peak Hour	Intersection Delay		Movement Delay (sec/veh)																Maximum Delay-LOS (2.)		Limiting Movement (3.)	Max Approach Queue										
					NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT					EBR		WBL		WBT		WBR		Direction	Average Queue (ft)	Max Queue (ft)
1	64th St & School Entrance/College Ave Stop Controlled	Existing AM School Peak	3	A	3	A	0	A	3	A	-	-	-	-	5	A	5	A	1	A	1	A	-	5	A	EBT	EBT/R	50	125					
		Existing PM School Peak	2	A	2	A	-	-	1	A	-	-	-	-	5	A	4	A	0	A	0	A	-	5	A	EBT	EBT/R	50	75					
		Alternate 1 AM School Peak	3	A	-	-	-	-	-	-	-	-	-	-	-	-	5	A	1	A	1	A	-	5	A	EBR	EBT/R	50	125					
		Alternate 1 PM School Peak	2	A	-	-	-	-	-	-	-	-	-	-	-	4	A	1	A	0	A	-	4	A	EBR	EBT/R	50	100						
2	64th St & Del Matro Stop Controlled	Existing AM School Peak	1	A	4	A	1	A	-	-	1	A	0	A	6	A	-	4	A	-	-	-	6	A	EBL	EBL/R	25	50						
		Existing PM School Peak	1	A	3	A	1	A	-	-	1	A	0	A	5	A	-	4	A	-	-	-	5	A	EBL	SBT/R	25	50						
		Alternate 1 AM School Peak	1	A	5	A	0	A	-	-	1	A	0	A	-	-	4	A	-	-	-	-	5	A	NBL	SBT/R	25	75						
		Alternate 1 PM School Peak	1	A	3	A	1	A	-	-	1	A	0	A	-	-	3	A	-	-	-	-	3	A	EBR	SBT/R	25	50						
3	64th St & Sunset Terrace Stop Controlled	Existing AM School Peak	4	A	-	-	6	A	-	-	5	A	5	A	3	A	1	A	0	A	0	A	-	1	A	1	A	6	A	NBT	SBL/T/R	50	75	
		Existing PM School Peak	3	A	-	-	5	A	3	A	4	A	4	A	3	A	2	A	0	A	-	-	1	A	1	A	5	A	NBT	SBL/T/R	50	75		
		Alternate 1 AM School Peak	4	A	-	-	6	A	-	-	5	A	5	A	4	A	1	A	0	A	0	A	-	0	A	1	A	6	A	NBT	SBL/T/R	50	100	
		Alternate 1 PM School Peak	4	A	-	-	5	A	4	A	5	A	3	A	4	A	1	A	0	A	-	-	2	A	1	A	0	A	5	A	NBT	SBL/T/R	50	75
4	63rd St & Sunset Terrace Stop Controlled	Existing AM School Peak	2	A	7	A	1	A	0	A	3	A	1	A	1	A	27	D	11	B	15	C	25	D	12	B	6	A	27	D	EBL	EBL/T/R	50	175
		Existing PM School Peak	1	A	5	A	1	A	1	A	10	B	1	A	0	A	25	D	6	A	7	A	13	B	17	C	9	A	25	D	EBL	NBL/T/R	25	150
		Alternate 1 AM School Peak	3	A	6	A	1	A	0	A	5	A	1	A	1	A	31	D	16	C	19	C	19	C	11	B	6	A	31	D	EBL	EBL/T/R	75	200
		Alternate 1 PM School Peak	2	A	5	A	1	A	1	A	6	A	1	A	1	A	25	D	11	B	14	B	29	D	14	B	6	A	29	D	WBL	NBL/T/R	25	150
5	63rd St & College Ave Stop Controlled	Existing AM School Peak	5	A	20	C	8	A	-	-	-	2	A	2	A	25	D	-	-	11	B	-	-	-	-	-	25	D	EBL	NBL/T	100	450		
		Existing PM School Peak	2	A	6	A	2	A	-	-	-	1	A	0	A	22	C	2	A	9	A	-	-	-	-	22	C	EBL	NBL/T	50	175			
		Alternate 1 AM School Peak	5	A	23	C	8	A	-	-	-	2	A	1	A	-	-	-	-	-	-	-	-	-	-	23	C	NBL	NBL/T	100	500			
		Alternate 1 PM School Peak	1	A	6	A	2	A	-	-	-	1	A	1	A	-	-	-	-	-	-	-	-	-	-	6	A	NBL	NBL/T	50	200			

1. Delay in seconds per vehicle
2. Maximum delay and LOS on any approach and/or movement
3. Limiting Movement is the highest delay movement.

Table 2: Peak Hour Queues By Movement - Scenario Geometry

Intersection ID	Intersection	Peak Hour	Queue Lengths																			
			EBL/R		EBL/T/R		EBT/R		WBL/T		WBL/T/R		NBL/R		NBL/T		NBL/T/R		SBL/T/R		SBT/R	
			Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
1	64th St & School Entrance/College Ave <i>Stop Controlled</i>	Existing AM School Peak	-	-	-	-	50	125	-	-	-	-	25	50	-	-	-	-	-	-	-	-
		Existing PM School Peak	-	-	-	-	50	75	0	25	-	-	25	50	-	-	-	-	-	-	-	-
		Alternate 1 AM School Peak	-	-	-	-	50	125	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Alternate 1 PM School Peak	-	-	-	-	50	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	64th St & Del Matro <i>Stop Controlled</i>	Existing AM School Peak	25	50	-	-	-	-	-	-	-	-	-	-	25	50	-	-	-	-	25	50
		Existing PM School Peak	25	50	-	-	-	-	-	-	-	-	-	-	25	50	-	-	-	-	25	50
		Alternate 1 AM School Peak	25	50	-	-	-	-	-	-	-	-	-	-	25	50	-	-	-	-	25	75
		Alternate 1 PM School Peak	25	50	-	-	-	-	-	-	-	-	-	-	25	50	-	-	-	-	25	50
3	64th St & Sunset Terrace <i>Stop Controlled</i>	Existing AM School Peak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	50	50	75	-	-
		Existing PM School Peak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	50	50	75	-	-
		Alternate 1 AM School Peak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	50	50	100	-	-
		Alternate 1 PM School Peak	-	-	0	25	-	-	-	-	-	-	-	-	-	-	25	50	50	75	-	-
4	63rd St & Sunset Terrace <i>Stop Controlled</i>	Existing AM School Peak	-	-	50	175	-	-	-	-	25	50	-	-	-	-	25	125	25	50	-	-
		Existing PM School Peak	-	-	25	75	-	-	-	-	25	50	-	-	-	-	25	150	25	125	-	-
		Alternate 1 AM School Peak	-	-	75	200	-	-	-	-	25	50	-	-	-	-	25	100	25	75	-	-
		Alternate 1 PM School Peak	-	-	50	150	-	-	-	-	25	50	-	-	-	-	25	150	25	75	-	-
5	63rd St & College Ave <i>Stop Controlled</i>	Existing AM School Peak	25	75	-	-	-	-	-	-	-	-	-	-	100	450	-	-	-	-	25	25
		Existing PM School Peak	50	75	-	-	-	-	-	-	-	-	-	-	50	175	-	-	-	-	-	-
		Alternate 1 AM School Peak	-	-	-	-	-	-	-	-	-	-	-	-	100	500	-	-	-	-	25	25
		Alternate 1 PM School Peak	-	-	-	-	-	-	-	-	-	-	-	-	50	200	-	-	-	-	25	50