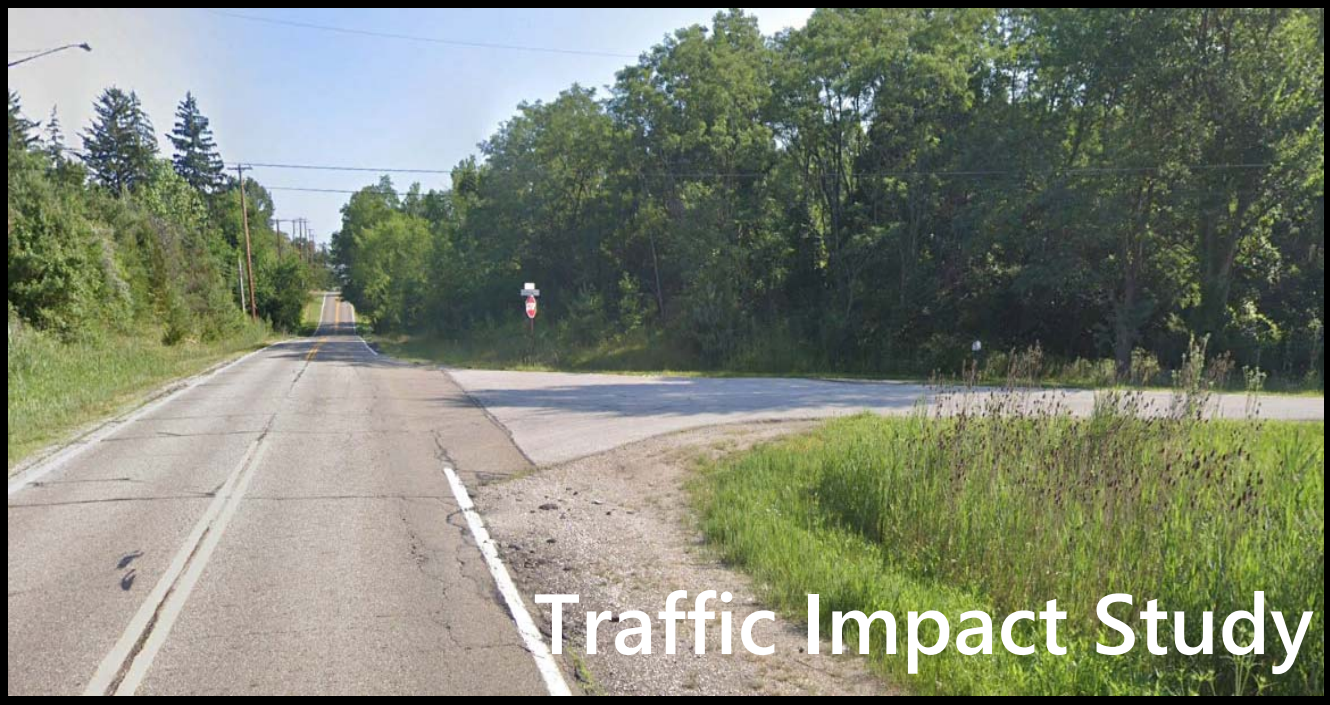
TMS Engineers, Inc



Traffic Impact Study

Proposed Elementary School

Twinsburg, Ohio

April 21, 2025

Prepared for:

Twinsburg City School District
11136 Ravenna Road
Twinsburg, Ohio 44087

TRAFFIC IMPACT STUDY

Proposed Elementary School

Twinsburg, Ohio

April 21, 2025

Prepared For:

Twinsburg City School District
11136 Ravenna Road
Twinsburg, Ohio 44087

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"This document was prepared consistent with local agency requirements and/or applicable guidelines contained in this report."

Table of Contents

Appendices

List of Figures

Appendix

List of Tables

List of Tables

List of Tables

Executive Summary

This Traffic Impact Study (TIS) has been prepared at the request of the Twinsburg City School District for a proposed elementary school in the City of Twinsburg, Summit County, Ohio. The proposed elementary school will be located in an area between Chamberlin Road to the west, Ravenna Road to the north and east, and Chamberlin Trail to the south. The location of the proposed elementary school can be seen in **Figure 1.1, Appendix A.**

The proposed elementary school is expected to serve students from pre-kindergarten through 6TH grade with total student population of 2,146 students.

The new elementary school will consolidate the following three schools:

- Wilcox Primary School (PK - 1st Grade)
- Samuel Bissell Elementary School (2nd & 3rd Grade)
- George G. Dodge Intermediate School (4th - 6th Grade)

The proposed elementary school has two (2) access locations. The first location is a full access driveway along the east side of Chamberlin Road and north of Chamberlin Trail. The driveway would permit all ingress and egress movement. The driveway would serve all entering and entering traffic for the school with the exception of the exiting bus traffic. The second location would be an exit only driveway to Chamberlin Trail. The exit only driveway would be for bus traffic only. **Figure 1.2, Appendix A** shows the site plan for the proposed school.

The new school is anticipated to have an opening day in 2027.

The AM hours of 7:00 to 8:00 and 8:15 to 9:15 were analyzed based on the peak hours of the roadway and the start times for each grade level. The 7:00 AM to 8:00 AM hour coincides with the start time for grades 4th through 6th. The 8:15 AM to 9:15 AM hour coincides with the start times for grades PK through 3rd.

The PM hours of 2:00 to 3:00 and 3:00 to 4:00 were analyzed based one the dismissal times for each grade level. The 2:00 PM to 3:00 PM hour coincides with the dismissal time for grades 4th through 6th. The 3:00 PM to 4:00 PM hour coincides with the dismissal times for grades PK through 3rd.

The proposed elementary school is expected to generate the following hourly traffic volumes during the peak period as shown in the table below:

ITE TRIP GENERATION			WEEKDAY TRIP ENDS			
ITE CODE	DESCRIPTION	SIZE (Sq. Ft.)	AM Peak Hour of Generator		PM Peak Hour of Generator	
520	**Elementary School**	**2,146**	**869**	**741**	**444**	**522**
	Grades 4- 6 (AM: 7:00-8:00 / PM: 2:00-3:00)		326	278	167	196
	Grades PK-3 (AM: 8:15-9:15 / PM: 3:00-4:00)		543	463	277	326
TOTAL NON-PASS-BY TRIPS			**1610**		**966**	

The ODOT **State Highway Access Management Manual** [7] requires that twenty year design hour traffic volumes be analyzed for a proposed development when the number of generated trips is greater than 500 in the peak hour. The proposed school is expected to generate a total of 1,610 driveway trips in the AM peak hours and a total of 966 driveway trips in the PM peak hours. Therefore, the year 2047 was analyzed for the twenty year design hour conditions from the opening year of the new elementary school.

Recommended Improvements to Serve Future Conditions without the School

The following improvements were recommended to accommodate the forecasted 2027 and 2047 No-Build conditions at the study area intersections:

Chamberlin Road & Ravenna Road

- Construct a 350 foot northbound right turn lane.
    - The north approach would consist a shared through/left turn lane and an exclusive right turn lane after construction.
- Upgrade the traffic signal to include the use of a northbound right turn overlap in the signal phasing. The overlap would permit the northbound right turn movement during the protected westbound left-turn phase.
    - The use of an overlap would require the existing 3-section traffic signal head on the right and facing northbound traffic be replaced with a 5-section traffic signal head. A design level review would be necessary to ensure the traffic signal mast arm can support the increased weight of a 5-section traffic signal head.

No improvements were recommended at the remaining study area intersections to accommodate the forecasted 2027 and 2047 No-Build conditions

Recommended Improvements to Mitigate the Traffic Associated with the School

No additional improvements were recommended to accommodate the forecasted 2027 and 2047 Build conditions at the study area intersections.

Development Access Recommendations

The following lane use and traffic control is recommended at the development access location along Chamberlin Road:

- Construct a single-lane roundabout.

-OR-

- Install traffic signal control.
  - Signal operation should included three signal phases. The first phase is all southbound movements with the left turn movement made during the green arrow indication (protected movement). The phase is all southbound and northbound movements where the left turn movement is made during a green ball indication when there is a gap in the opposing through traffic movements (permissive movement). The last phase is all westbound movements where the left turn movement is made during a green ball indication. The signal operation should include a westbound right-turn movement overlap that permits the westbound right turn movement during the protected southbound left-turn phase.
- Construct a 325 foot southbound left turn lane.
- Construct a 275 foot northbound right turn lane.
- Construct a 250 foot westbound left turn lane.

Conclusion

Based upon the results of the analysis in this study and the corresponding recommendations, it can be seen that the elementary school traffic can be accommodated without adversely impacting the area roadway network.

Chapter 1
Introduction

1.1 Purpose of Report

This Traffic Impact Study (TIS) has been prepared at the request of the Twinsburg City School District for a proposed elementary school in the City of Twinsburg, Summit County, Ohio. The proposed elementary school will be located in an area between Chamberlin Road to the west, Ravenna Road to the north and east, and Chamberlin Trail to the south. The location of the proposed elementary school can be seen in **Figure 1.1, Appendix A.**

The proposed elementary school is expected to serve students from pre-kindergarten through 6TH grade with total student population of 2,146 students.

The new elementary school will consolidate the following three schools:

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The new elementary school is proposed with two access locations. The first location is a full access driveway along the east side of Chamberlin Road and north of Chamberlin Trail. The driveway would permit all ingress and egress movements. The driveway would serve all entering and entering traffic for the school with the exception of the exiting bus traffic. The second location would be an exit only driveway to Chamberlin Trail. The exit only driveway would be for bus traffic only. **Figure 1.2, Appendix A** shows the site plan for the proposed school.

The new school is anticipated to have an opening day in 2027. The design year for the project will be based on the expected volume of new site generated traffic under the full build conditions during the expected peak hours.

1.2 Study Objectives

This study is structured for the following purposes;

- to adequately assess the traffic impacts associated with the proposed school, and identify the level of off-site access and traffic,
- to provide a comprehensive study which evaluates and documents the traffic impacts and off-site improvements, where warranted,
- and to provide a technically sound basis to identify mitigation requirements to off-site traffic impacts.

This study documents the methodologies, findings and conclusions of the analysis, including the basis for all assumptions, traffic parameters utilized and conclusions reached.

The development of future traffic volumes will be based on the forecasting guidelines and methodology found in the Ohio Department of Transportation's **Ohio Traffic Forecasting Manual, Volume 1 [4] & Volume 2 [5]**.

The traffic impacts will be determined by comparing the existing intersection levels-of-service, delay or density, volume to capacity ratio and queue storage ratio before the construction of the proposed school to the anticipated measures after the development is completed. Traffic analyses for the study area and access intersections will be calculated using the computerized version of the Transportation Research Board's **Highway Capacity Manual 7TH Edition [1], (HCS2025, Release 8.4)**. Data inputs for the HCS software program will be based on the guidance found in the Ohio Department of Transportation's **Analysis & Traffic Simulation Manual (OATS) [6]**.

The justification for any changes in the intersections will be determined by comparing data collected of the existing traffic conditions to the criteria established by the **Ohio Manual of Uniform Traffic Control Devices [2]** and professional engineering judgment from an on-site field review.

Intersection geometric design guidelines will be based in the information and procedures found in the Ohio Department of Transportation's **Location & Design Manual, Volume 1 [3]**.

1.3 Intersection Capacity & Levels-of-Service

Intersection capacity analyses will be performed at the development access intersection using the procedures outlined in the computerized version of the Transportation Research Board's **Highway Capacity Manual** [(1)].

The **HCM** [(1)] is the most widely used document in the transportation industry. It contains a set of methodologies and application procedures for evaluating the capacity and quality of service of various transportation facilities. The **HCM** [(1)] is built from more than 60 years or research work and represents a body of expert transportation consensus.

The capacity analysis procedures provide a calculated "average vehicle delay", which is based on traffic volumes, number of lanes, type of traffic control, channelization, grade, and percentage of large vehicles in the traffic stream at each intersection. The average delay calculated at an intersection is then assigned a "grade" or level of service (LOS) ranging from LOS A, the best, to LOS F, the worst based upon driver expectation. The intersection LOS "grades" as defined by the Transportation Research Board are as follows:

Table 1.1 Intersection Levels-of-Service

LOS	UNSIGNALIZED AVERAGE DELAY PER VEHICLE (seconds/vehicle)	SIGNALIZED AVERAGE DELAY PER VEHICLE (seconds/vehicle)
A	≤ 10.0	≤ 10.0
B	10.1 to 15.0	10.1 to 20.0
C	15.1 to 25.0	20.1 to 35.0
D	25.1 to 35.0	35.1 to 55.0
E	35.1 to 50.0	55.1 to 80.0
F	> 50	> 80

Intersection capacity analyses will be performed in order to estimate the maximum amount of traffic that can be accommodated by the intersection while maintaining recommended operational qualities. No-Build and Build peak hour traffic volumes will be analyzed to determine the level-of-service (LOS) at the study area intersections.

The selection of the design level-of-service is most frequently chosen from *Section 5.9* of the Ohio Department of Transportation's **OATS Manual** [6]. In most cases, a level-of-service E is considered the maximum delay threshold for approaches and movements after which improvements should be investigated to determine if the delay can be reduced to a level of E or better. Level-of-service D is the maximum delay threshold for intersections. The following table from *Section 5.9* details the operation goals for intersection analyses (All-Way Stop Control, Two-Way Stop Control, Signalized, & Roundabout).

Table 1.2 Intersection Operational Goals

RESULT	INSIDE AN MPO	OUTSIDE AN MPO
Intersection LOS	D or BETTER	C or BETTER
Approach LOS	E or BETTER	
Control LOS	E or BETTER	
v/c	All movements < 1.0 (<= 0.93 preferred)	
QSR	All movements <1.0 from HCS analysis, TransModeler may be needed to determine if queuing impacts upstream intersections.	

MPO = Metropolitan Planning Organization
v/c = Volume to Capacity Ratio
QSR = Queue Storage Ratio

The City of Twinsburg is located within the boundaries for the Akron Metropolitan Area Transportation Study (AMATS) metropolitan planning organization (MPO). The capacity analyses will determine if there are any locations, approaches or movements in which the delay, v/c, and/or QSR exceed the operational goals shown in *Table 1.2* for a location inside an MPO.

All intersections will be analyzed using the computerized version of the Transportation Research Board's **Highway Capacity Manual 7TH Edition [1], (HCS2025, Release 8.4).** The capacity analyses for signalized intersections will be based on the process detailed in *Section 6.2.2.1* of the ODOT **OATS Manual** [6]. The optimization of any traffic signal timings will be based on the delay minimization function with the objective of Balanced Delay.

It should be noted that any values for queue length, shown in the HCS analysis summary sheets that are displayed in red, indicate that the movement is expected to experience a "spillback" condition where the queue may exceed the existing length of the turn lane and extend into the adjacent through lane. These instances, if they occur, will be investigated for mitigation.

1.4 Intersection Turn Lanes

Turn Lane Warrants

The ODOT **Location and Design Manual, Volume 1** [3] and the **State Highway Access Management Manual** [7] describes the need for auxiliary turn lanes at unsignalized intersections. *Section 401.6.3* of the ODOT **Location and Design Manual** [4] states that:

"To determine the number and use of left (right) turn lanes, intersection capacity analysis procedures of the current edition of the Highway Capacity Manual should be used. For unsignalized intersections, left (right) turn lanes may also be needed if they meet warrants provided in Figures 401-5(6)a, b, c and d. The warrants apply only to the free-flow approach of the unsignalized intersection."

The Auxiliary Lane Graphs found in *Section 401-6* of the **Location and Design Manual, Volume 1** [4] are used for this determination. This applies to the free-flow approaches at unsignalized intersections.

Section 401-6 of the **Location and Design Manual, Volume 1** [4] specifies the current edition of the **Highway Capacity Manual** [1] should be used for signalized intersections.

It is the intent of this report to evaluate the need for exclusive deceleration and turn lanes at the school access location on Chamberlin Road.

Turn Lane Length

Existing turn lanes found to be deficient per the QSR results from the capacity analysis and any recommended turn lanes will be analyzed to determine the necessary storage length in accordance with the procedure found in the Ohio Department of Transportation's **Location and Design Manual, Volume 1** [3], *Section 401*. The ODOT criteria and procedures are furnished in **Appendix B**.

Guidance regarding maximum and minimum turn lane lengths can be found in *Section 401.6* of the ODOT **Location and Design Manual** [4].

Design Speed

The procedure for determining the necessary turn lane storage length found in the Ohio Department of Transportation's **Location and Design Manual, Volume 1** [3], *Section 401,* is in part based on the design speed of the roadway.

The AASHTO publication, **A Policy on Geometric Design of Highway Streets (Green Book)** [11]**,** defines design speed as a selected speed used to determine the various geometric design features of the roadway. The assumed design speed should be a logical one with respect to the topography, anticipated operating speed, the adjacent land use and the functional classification of highway.

The ODOT **Location and Design Manual, Volume 1** [3] provides guidance for determining the design speed of a roadway. *Section 104.2* of the ODOT **Location and Design Manual** [3] states that:

"The design speed should be at least the legal speed for facilities with a legal speed of 35 mph or less. For facilities with a legal speed of 40 or 45 mph the design speed shall either match the legal speed, or be 5 mph greater than the legal speed, depending on the context of the area. For facilities with a legal speed 50 mph or greater, the design speed shall be 5 mph greater than the legal speed."

1.5 References

The following list of references will be utilized for this report and the analysis contained within it:

1. *Highway Capacity Manual,* 7th Edition. Transportation Research Board of the National Academies, Washington, D.C.

2. *Ohio Manual of Uniform Traffic Control Devices for Streets and Highways,* 2012 Edition. Ohio Department of Transportation, Office of Traffic Engineering, Columbus, Ohio.

3. *Location and Design Manual,* Volume 1, Roadway Design. Ohio Department of Transportation, Office of Roadway Engineering, Columbus, Ohio.

4. *Ohio Traffic Forecasting Manual,* Volume 1, Traffic Forecasting Background. Ohio Department of Transportation, Office of Statewide Planning & Research, Columbus, Ohio.

5. *Ohio Traffic Forecasting Manual,* Volume 2, Traffic Forecasting Methodologies. Ohio Department of Transportation, Office of Statewide Planning & Research, Columbus, Ohio.

6. *ODOT Analysis and Traffic Simulation Manual (OATS),* Ohio Department of Transportation, Office of Roadway Engineering, Columbus, Ohio.

7. *State Highway Access Management Manual,* Ohio Department of Transportation, Office of Roadway Engineering, Columbus, Ohio.

8. *Trip Generation Manual,* 11th Edition, September 2021, Institute of Transportation Engineers, (ITE), Washington, D.C.

9. *Trip Generation Handbook,* 3rd Edition, September 2017, Institute of Transportation Engineers, (ITE), Washington, D.C.

10. *Traffic Engineering Manual,* October 23, 2002 Edition (Revised January 15, 2021), Ohio Department of Transportation, Office of Roadway Engineering, Columbus, Ohio.

11. *Highway Functional Classification Concepts, Criteria and Procedures*, 2013 Edition, Federal Highway Administration.

Chapter 2
Area Conditions

2.1 Transportation Network Study Area

The study area that will be analyzed for the new elementary school includes the following intersections:

1. **Chamberlin Road & Ravenna Road**
2. **Chamberlin Road & Chamberlin Trail**
3. **Chamberlin Road & East Aurora Road (State Route 82)**

These intersections will be enumerated and referred as listed above throughout this report and the analysis contained within it.

An aerial view of the of the study area can be seen in **Figure 2.1 Appendix A.**

The following section details the lane use and traffic control for the intersections under study for this report.

1. CHAMBERLIN ROAD/BELMEADOW DRIVE & RAVENNA ROAD

Ravenna Road has a northwest to southeast orientation in the study area. The roadway will be considered an east-west roadway for the purpose of this report and the analysis contained within.

Belmeadow Drive North Approach
- 1 Exclusive Left Turn Lane
- 1 Shared Through & Right Turn Lane

Chamberlin Road South Approach
- 1 Exclusive Left Turn Lane
- 1 Shared Through & Right Turn Lane

Ravenna Road West Approach
- 1 Exclusive Left Turn Lane
- 1 Through Lane
- 1 Exclusive Right Turn Lane

Ravenna Road East Approach
- 1 Exclusive Left Turn Lane
- 1 Shared Through & Right Turn Lane

The intersection is controlled by a traffic signal. The signal sequence can operate with three (3) "phases" which assign the right-of-way to specific movements and displays yellow and all-red clearances.

The first phase is the eastbound and westbound left turn movements with the left turn movement made during the green arrow indication (protected movement). The next phase is all eastbound and westbound movements where the left turn movement is made during a green ball indication when there is a gap in the opposing through traffic movements (permissive movement). The last phase is all northbound and southbound movements.

2. CHAMBERLIN ROAD & CHAMBERLIN TRAIL

Chamberlin Road North Approach
- 1 Shared Through & Right Turn Lane

Chamberlin Road South Approach
- 1 Shared Through & Right Turn Lane

Chamberlin Trail East Approach
- 1 Shared Left & Right Turn Lane

The intersection is controlled by a stop sign on the Chamberlin Trail east approach. The Chamberlin Road approaches operate under free-flow conditions with the southbound left turn movement yielding to the northbound movements.

3. CHAMBERLIN ROAD & EAST AURORA ROAD (SR 82)

Chamberlin Road North Approach
- 1 Shared Left/Through/Right Turn Lane

Chamberlin Road South Approach
- 1 Exclusive Left Turn Lane
- 1 Through Lane
- 1 Exclusive Right Turn Lane

East Aurora Road (SR 82) West Approach
- 1 Exclusive Left Turn Lane
- 1 Through Lane
- 1 Shared Through & Right Turn Lane

East Aurora Road (SR 82) East Approach
- 1 Exclusive Left Turn Lane
- 2 Though Lanes
- 1 Exclusive Right Turn Lane

The intersection is controlled by a traffic signal. The signal sequence can operate with seven (7) "phases" which assign the right-of-way to specific movements and displays yellow and all-red clearances.

The first two phases are the eastbound and westbound left turn movements with the left turn movement made during the green arrow indication (protected movement). The next two phases are all eastbound and westbound movements where the left turn movement is made during a green ball indication when there is a gap in the opposing through traffic movements (permissive movement). The next phase is the northbound left turn movement with the left turn movement made during the green arrow indication (protected movement). The last two phases are all northbound and southbound movements where the left turn movement is made during a green ball indication when there is a gap in the opposing through traffic movements (permissive movement). The signal operation includes a northbound right-turn movement overlap that permits the northbound right turn movement during the protected westbound left-turn phase.

Roadway & Intersection Characteristics

The following table details the primary characteristics of the study area roadways:

Table 2.1 Roadway Characteristics

INTERSECTION		APPROACH	LANE USE		SPEED LIMIT	TRAFFIC CONTROL
#	ROADWAYS		THROUGH LANES	TURN LANES		
1	Belmeadow Drive	North	2	Left	25	Traffic Signal
	Chamberlin Road	South	2	Left	35	
	Ravenna Road	East	2	Left	35	
	Ravenna Road	West	2	Left & Right	35	
2	Chamberlin Road	North	2	None	35	One-Way Stop Control
	Chamberlin Road	South	2	None	35	
	Chamberlin Trail	East	2	None	25	
3	Chamberlin Road	North	2	None	35	Traffic Signal
	Chamberlin Road	South	2	Left & Right	35	
	East Aurora Road	East	4	Left & Right	35	
	East Aurora Road	West	4	Left	35	

Figure 2.2, Appendix A shows the lane use and traffic control conditions based upon our field investigation in the study area. These will be considered the existing base conditions for this report.

2.2 Functional Classification

The Ohio Department of Transportation functionally classifies roadways to help define a roadway's characteristics as well as identify roadways that are eligible for federal funds. Functional classification is the grouping of roads, streets, and highways in a hierarchy based on the type of highway service they provide. Generally, streets and highways perform two types of service. They provide either traffic mobility or land access and can be ranked in terms of the proportion of service they provide.

The functional classification as determined by ODOT will be used in this report to apply growth and design hour factors to the study area roadways for use in forecasting the future traffic volumes in the study area. These factors are determined using data, guidelines, and methodology supplied by ODOT. The methods and the corresponding data are based on the roadways assigned functional classification. The ODOT methods for forecasting future traffic volumes are a recognized traffic engineering standard in the State of Ohio.

Roadways that are not listed as having a functional classification can be assigned into one of two categories. The first category is a local roadway and the second category is that of an access drive.

The roadway functional classifications are assigned either an urban or rural designation.

The ODOT the urban/rural designation and functional classification of the roadways in the study area can currently be found using the ODOT Transportation Information Mapping System (TIMS). TIMS is ODOT's web-mapping portal where information about Ohio's transportation system can be found. TIMS can currently be found at the following web address:

https://gis.dot.state.oh.us/tims/

The urban and rural designation for the study area roadways can be found under the Boundaries tab and the selection of the "Census Urban Areas" layer.

The roadway functional classification can be found under the Roadway Information tab and the selection of the "Functional Classification" layer.

The following table lists the study area roadways that have an assigned functional classification as determined by ODOT and local government entities.

Table 2.2 Functional Classification

INTERSECTION		AREA	FC#	CLASSIFICATION
#	ROADWAYS			
1	Ravenna Road	Urban	4	Minor Arterial
	Chamberlin Road		5	Major Collector
	Belmeadow Drive		7	Local Road
2	Chamberlin Road	Urban	5	Major Collector
	Chamberlin Trail		7	Local Road
3	East Aurora Road (SR 82)	Urban	4	Minor Arterial
	Chamberlin Road (North)		5	Major Collector
	Chamberlin Road (South)		7	Local Road

Figure 2.3, Appendix A illustrates the section of the functional classification map for the study area. The map was created using the ODOT Transportation Information Mapping System (TIMS) web-mapping portal.

2.3 Traffic

Weekday Peak Hours

Weekday nine hour turning movement counts were performed on Tuesday, April 1, 2025 at the following locations:

1. **Chamberlin Road & Ravenna Road**
2. **Chamberlin Road & Chamberlin Trail**
3. **Chamberlin Road & East Aurora Road (State Route 82)**

The 2025 weekday traffic count was conducted in fifteen (15) minute intervals between the hours of 7 AM - 10 AM, 11 AM - 2 PM, and 3 PM - 6 PM, then hourly totals were calculated. Average daily traffic was calculated for the roadways using expansion factors to account for daily and seasonal variations according to the recommendations and latest data from the Ohio Department of Transportation. Copies of the intersection turn movement counts are included in **Appendix C**.

The AM and PM intersection peak hours of roadway volumes are selected by reviewing data in 15-minute intervals. When there is more than one intersection within the study area, a consistent time period should be used for all intersections within the study area in order to develop an existing conditions traffic volume set, the system peak hour.

The following questions should be considered when choosing the peak hours for a study area with multiple intersections:

- What are the individual intersection peak hours?
- Are the individual peak hours the same time or close to each other?
- Would it result in significantly fewer vehicles to use a different peak hour for intersections that are not the same?
- What is the peak hour for intersections with the highest overall volume?
- What peak hour contributes the highest volume to the entire system?

Summaries tables which illustrate the entering traffic volumes during the AM and PM time periods are used to evaluate the previously discussed questions, to identify the peak hours for each intersection, and to determine the peak hour of the system.

The focus of this study is to determine the impact that the proposed elementary school will have on the surrounding roadway network. The analysis will consider both the roadway peak hour periods and the traffic volumes for the study area during the start and dismissal times for the schools. The daily schedules for each school in the district can be seen in **Appendix D**.

The start and end times for the existing Twinsburg schools are as follows:

Wilcox Primary School (PK - 1st Grade)

- 9:00 AM - 3:50 PM

Samuel Bissell Elementary School (2nd & 3rd Grade)

- 8:30 AM - 3:20 PM

George G. Dodge Intermediate School (4th - 6th Grade)

- 7:15 AM - 2:10 PM

The following tables detail a breakdown of the hourly volumes during the AM and PM hours that were determined to experience the highest traffic volumes at the study area intersections. The data shown in the tables will be considered in the determination of the AM and PM peak hours for the study area intersections.

Table 2.3 AM Peak Hour Traffic Volumes
(Total Entering Volume - Vehicles per Hour)

AM HOURLY PERIODS	Intersection #1	Intersection #2	Intersection #3	TOTAL
7:00-8:00	1242	**369**	1294	2905
7:15-8:15	**1250**	368	1352	**2970**
7:30-8:30	1219	351	**1370**	2940
7:45-8:45	1172	325	1366	2863
8:00-9:00	1062	299	1296	2657
8:15-9:15	974	276	1291	2541
8:30-9:30	894	238	1258	2390
8:45-9:45	821	223	1229	2273
9:00-10:00	756	195	1154	2105

The weekday AM peak hour of traffic for the study area was determined to be 7:15 AM to 8:15 AM from the collected traffic data detailed in *Table 2.3*.

Table 2.4 PM Peak Hour Traffic Volumes
(Total Entering Volume - Vehicles per Hour)

PM HOURLY PERIODS	Intersection #1	Intersection #2	Intersection #3	TOTAL
2:00-3:00	1102	359	1570	3031
2:15-3:15	1110	369	1543	3022
2:30-3:30	1162	387	1579	3128
2:45-3:45	1205	412	1620	3237
3:00-4:00	1227	418	1632	3277
3:15-4:15	1350	443	**1736**	3529
3:30-4:30	1408	441	1717	3566
3:45-4:45	1408	427	1637	3472
4:00-5:00	1436	438	1685	3559
4:15-5:15	1497	457	1657	3611
4:30-5:30	1512	472	1672	3656
4:45-5:45	1567	**479**	1668	**3714**
5:00-6:00	**1591**	464	1485	3540

The weekday PM peak hour of traffic for the study area was determined to be 4:45 PM to 4:45 PM from the collected traffic data detailed in *Table 2.4*. The PM peak hour was not found to coincide with the existing end times for any of the schools being consolidated at the new elementary school.

It will be assumed that the individual grades will retain their typical school day time periods with all grades from PK through 6th grade consolidated at one school.

The AM hours of 7:00 to 8:00 and 8:15 to 9:15 will be analyzed based on the peak hours of the roadway and the start times for each grade level. The 7:00 AM to 8:00 AM hour will coincide with the start time for grades 4th through 6th. The 8:15 AM to 9:15 AM hour will coincide with the start times for grades PK through 3rd.

The PM hours of 2:00 to 3:00 and 3:00 to 4:00 will be analyzed based the dismissal times for each grade level. The 2:00 PM to 3:00 PM hour will coincide with the dismissal time for grades 4th through 6th. The 3:00 PM to 4:00 PM hour will coincide with the dismissal times for grades PK through 3rd.

The following table visually details the start and end times for each school in the district and the AM and PM periods that will be analyzed in the report. The hourly analysis periods are outlined in green.

Table 2.5 School Schedules & Peak Periods

	TIME BEGINS	Wilcox (PK-1)	Bissell (2-3)	Dodge (4-6)
AM PEAK HOUR 700-800	7:00			
	7:15			7:15
	7:30			.
	7:45			
	8:00			
AM PEAK HOUR 815-915	8:15			
	8:30		8:30	
	8:45			
	9:00	9:00		
	9:00			
	-			
	1:45			
PM PEAK HOUR 200-300	2:00			2:10
	2:15			
	2:30			
	2:45			
PM PEAK HOUR 300-400	3:00			
	3:15		3:20	
	3:30			
	3:45	3:50		

The existing weekday 7:00 to 8:00 and 8:15 to 9:15 AM peak hour traffic volumes are shown in **Figure 2.4, Appendix A.**

The existing weekday 2:00 to 3:00 and 3:00 to 4:00 PM peak hour traffic volumes are shown in **Figure 2.5, Appendix A.**

Chapter 3
Projected Traffic Conditions

3.1 Site Traffic

Trip Generation

Calculating future total driveway trips requires an estimate of the traffic generated by the proposed development. The most widely accepted method of determining the amount of traffic that the proposed development will generate is to compare the proposed land use with existing facilities of the same use. The Institute of Transportation Engineers (ITE) has prepared a manual titled "**Trip Generation Manual**" [8], which is a compilation of similar traffic generation studies to aide in making such a comparison. The most recent update of this manual is the 11TH edition and was utilized for this study.

Grades PK through 6th grade are expected to have an enrollment of 2,146 students in the opening year of 2027. The Twinsburg City School District expects the enrollment to remain steady over the next 10 years. A copy of the projected enrollment numbers can be seen in **Appendix E**.

The following table details the corresponding ITE land use that will be used to forecast the site generated traffic volumes for the new PK-6 school:

Table 3.1 ITE Land Use Code

SITE PLAN DESCRIPTION	SIZE (# of Students)	ITE CODE	ITE DESCRIPTION
New PK-6 School	2,146	520	Elementary School

The Institute of Transportation Engineers (ITE) provides a web-based application (**ITETripGen**) that will be used to calculate the expected future driveway trips using the data from the **Trip Generation Manual** [8]. The **ITETripGen** web-based app can be accessed through a subscription at the following address:

https://itetripgen.org/

An independent variable is used in trip generation calculations, which consists of a physical, measurable and predictable characteristic that describes the study site. This has a direct relationship to the variation in the number of trips generated by the land use. For, elementary schools , the number or students or employees can be used. The number of students will be used when using the **ITETripGen** web-based app to calculate the number of driveway trips for the new PK-6 school.

Retail and service land use categories sometimes generate a different mixture of traffic than land uses such as residential homes and office facilities, which add all of the "new" traffic to the adjacent roadway system. Vehicle trips generated by a site can be separated into two major categories: non pass-by trips and pass-by trips. Non-pass-by trips can be further subdivided into primary trips and diverted trips. Pass-by and diverted trips may be part of a multiple-stop chain of trips.

A ***pass-by trip*** is made as an intermediate stop on the way from an origin to a primary trip destination. Pass-by trips are attracted from traffic passing the site on an adjacent street or roadway that offers direct access to the generator (i.e. motorists who are already on the road and stop to get coffee on their way to work from home).

A ***non-pass-by trip*** is simply any trip generated by a site that is not a pass-by trip. Non-pass-by trips are sometimes used when diverted trips are not calculated separately from primary trips in the analysis process.

A ***diverted trip*** is attracted from the traffic volume on roadways within the vicinity of the generator but without direct access to the site. A diverted trip requires a diversion from a roadway not adjacent to the site to another roadway to gain direct access to the site (i.e. motorists who are on the interstate and exit to get something to eat and then re-enter the interstate).

A ***primary trip*** is made for the specific purpose of visiting the generator. The stop at the generator is the primary reason for the trip.

The site generated traffic for the new PK-6 school will be will categorized as non-pass-by trips for the purpose of this report and all analysis contained within as the project does not include a retail or service type land use.

Trip Generation Summary

Trip generation calculations for the development were performed utilizing data contained in the **Trip Generation Manual** [8] and the methods outlined in the **Trip Generation Handbook** [9] including the application of pass-by rates.

The total site generated volumes were split evenly between grades in order to provide conservative estimates of the peak hour traffic volumes for the start and end times for each grade.

The following table details the expected generated weekday peak hour traffic volumes. Copies of the trip generation worksheets can be found in **Appendix F**.

Table 3.2 Trip Generation Summary

ITE TRIP GENERATION			WEEKDAY TRIP ENDS			
ITE CODE	DESCRIPTION	SIZE (Sq. Ft.)	AM Peak Hour of Generator		PM Peak Hour of Generator	
520	**Elementary School**	**2,146**	**869**	**741**	**444**	**522**
	Grades 4- 6 (AM: 7:00-8:00 / PM: 2:00-3:00)		326	278	167	196
	Grades PK-3 (AM: 8:15-9:15 / PM: 3:00-4:00)		543	463	277	326
TOTAL NON-PASS-BY TRIPS			**1610**		**966**	

The site generated trips from the *Table 3.2* will be split into two trip categories; vehicles and buses.

The allocation bus trips will be based on the following assumptions:

1. The bus volumes are based on the existing number of buses serving the existing elementary schools.
2. Each bus will represent 1 entering trip in the 15 minute period before the start/dismissal time and 1 exiting trip on the 15 minute period after the start/dismissal time.
3. Grades PK-1 will be served by 28 buses.
4. Grades 2-3 will be served by 15 buses.
5. Grades 4-6 will be served by 14 buses.
6. Bus trips are included in total trips detailed in *Table 3.2*.

Distribution of Non-Pass-by Generated Traffic

The directional distribution for the non-pass-by generated traffic is a function of the distribution of residential units within the City of Twinsburg and prevailing operating conditions on the existing roadways and at the existing schools in the study area.

The AM peak hour origin and the PM destination distribution patterns were based on the location of residences within the City of Twinsburg. **Figure 3.1, Appendix A** shows a district map for the Twinsburg City School District. The areas outlined in black were areas of the district that were assumed would be coming from the south during the AM peak hours and returning to the south in the PM peak hours.

The AM peak hour destination and PM origin distribution patterns were based upon the existing traffic volumes entering and exiting the study area peak hours shown in **Figure 2.5, Appendix A**.

The following tables detail the distribution of the site generated non-pass-by trips for the proposed elementary school under the opening and design year conditions.

Table 3.3 AM Peak Hour Origins

ORIGIN/ DESTINATION	ROUTE	% TOTAL	700-800 AM NEW TRIPS*	815-915 AM NEW TRIPS*
North	Belmeadow Drive	5.0%	15	25
East	Ravenna Road	50.0%	156	250
West	Ravenna Road	5.0%	16	25
Chamberlin Road (North of Site)		5.0%	16	25
Chamberlin Road (South of Site)		10.0%	31	50
East	East Aurora Road	15.0%	47	75
West	East Aurora Road	5.0%	16	25
South	Chamberlin Road	5.0%	15	25
	TOTALS	**100.0%**	**312**	**500**

*** Rounded**

Table 3.4 AM Peak Hour Destinations

ORIGIN/ DESTINATION	ROUTE	700-800 AM PEAK HOUR			815-915 AM PEAK HOUR		
		TO (EXIT)	% TOTAL	TRIPS*	TO (EXIT)	% TOTAL	TRIPS*
North	Belmeadow Drive	36	1.6%	4	38	1.9%	8
East	Ravenna Road	338	15.2%	40	373	18.5%	78
West	Ravenna Road	627	28.2%	74	407	20.2%	85
East	East Aurora Road	609	27.4%	72	575	28.6%	120
West	East Aurora Road	400	18.0%	48	422	20.9%	88
South	Chamberlin Road	215	9.6%	26	200	9.9%	41
	TOTALS	**2225**	**100.0%**	**264**	**2015**	**100.0%**	**420**

*** Rounded**

Table 3.5 PM Peak Hour Origins

ORIGIN/ DESTINATION	ROUTE	200-300 PM PEAK HOUR			300-400 PM PEAK HOUR		
		FROM (ENTER)	% TOTAL	TRIPS*	TO (EXIT)	% TOTAL	TRIPS*
North	Belmeadow Drive	86	3.7%	27	97	4.0%	41
East	Ravenna Road	407	17.7%	26	422	17.2%	44
West	Ravenna Road	387	16.8%	6	462	18.8%	9
East	East Aurora Road	675	29.3%	45	691	28.2%	66
West	East Aurora Road	492	21.3%	32	505	20.6%	48
South	Chamberlin Road	258	11.2%	17	275	11.2%	26
	TOTALS	**2305**	**100.0%**	**153**	**2452**	**100.0%**	**234**

*** Rounded**

Table 3.6 PM Peak Hour Destinations

ORIGIN/ DESTINATION	ROUTE	% TOTAL	200-300 PM NEW TRIPS*	300-400 PM NEW TRIPS*
North	Belmeadow Drive	5.0%	9	14
East	Ravenna Road	50.0%	91	142
West	Ravenna Road	5.0%	9	14
Chamberlin Road (North of Site)		5.0%	9	14
Chamberlin Road (South of Site)		10.0%	19	28
East	East Aurora Road	15.0%	27	43
West	East Aurora Road	5.0%	9	14
South	Chamberlin Road	5.0%	9	14
	TOTALS	**100.0%**	**182**	**283**

*** Rounded**

Directional Distribution of Site Generated Non-Pass-By Traffic

The trips were distributed to the site access driveways based on our engineering judgement of the following considerations:

- All traffic enters via the proposed north driveway along Chamberlin Road.
- All traffic exits via the proposed north driveway along Chamberlin Road with the exception of school buses. The school buses will exit via a proposed south driveway along Chamberlin Trail.

The directional distribution for the non-pass-by AM and PM peak hour generated traffic is shown graphically in **Figures 3.2 & 3.3, Appendix A** for the proposed new elementary school.

The bus trips will be distributed to and from the proposed elementary school based on our engineering judgement of the following considerations:

- The bus garage is located at the Chamberlin Middle School campus along Ravenna Road.
- AM bus trips will travel to the school from their pick-up routes and then return to the bus garage.
- PM bus trips will travel to the school from the bus garage and then exit to their drop-off routes.

Assignment of Non-Pass-By Site Generated Traffic

Based upon the distribution pattern shown in **Figure 3.1**, the non-pass-by AM peak site generated traffic was assigned to the study intersections. The assignment of the estimated site generated non-pass-by traffic for the AM peak hours under the opening and design year conditions is shown graphically in **Figure 3.4, Appendix A**.

Based upon the distribution pattern shown in **Figure 3.2**, the non-pass-by PM peak site generated traffic was assigned to the study intersections. The assignment of the estimated site generated non-pass-by traffic for the PM peak hours under the opening and design year conditions is shown graphically in **Figure 3.5, Appendix A**.

The assignment of the estimated site generated non-pass-by bus traffic for the AM peak hours under the opening and design year conditions is shown graphically in **Figure 3.6, Appendix A**.

The assignment of the estimated site generated non-pass-by bus traffic for the PM peak hours under the opening and design year conditions is shown graphically in **Figure 3.7, Appendix A**.

3.2 Non-Site Traffic

Background Traffic Growth

Design of new roadways or improvements to existing roadways should not usually be based on current traffic volumes alone, but should consider future traffic volumes expected to make use of the facilities. Roadways should be designed to accommodate the traffic volume that is likely to occur within the design life of the facility. In a practical sense, this design volume should be a value that can be estimated with reasonable accuracy. It is believed that the maximum design period is in the range of 15 to 24 years. Therefore, a period of twenty years is widely used as a basis for design for large projects. A period of ten years is currently specified by the Ohio Department of Transportation for smaller projects. Traffic cannot usually be forecasted accurately beyond this period on a specific facility because of probable changes in the general regional economy, population, and land development along the roadway.

The ODOT **State Highway Access Management Manual** [7] requires that ten year design hour traffic volumes be analyzed for a proposed development when the number of generated trips is below 500 in the peak hour and twenty year design hour traffic volumes when the number of generated trips is greater than 500 in the peak hour.

The proposed school is expected to generate a total of 1,610 driveway trips in the AM peak hours and a total of 966 driveway trips in the PM peak hours. Therefore, the year 2047 will be analyzed for the ten year design hour conditions from the opening year of the development.

The year 2027 (Opening Year) and 2047 (Design Year) will be analyzed for the proposed development. Therefore, it is necessary to estimate historical growth rates in order to establish the future traffic on the study area roadways due to non-site related conditions.

Roadways like Chamberlin Road, Ravenna Road and East Aurora Road (SR 82) carry a significant amount of through traffic due to it's functional characteristics. This through traffic component generally increases as regional growth occurs. Therefore, it is anticipated that existing traffic on these roadways will increase in future years.

Belmeadow Drive, Chamberlin Trail and Chamberlin Road south of SR 82 are classified as local roadways. The Ohio Department of Transportation, in their document **ODOT Highway Functional Classification System Concepts, Procedures and Instructions** [11], has identified the following characteristics for local roadways and access drives:

- Provide direct access to adjacent land
- Provide access to higher systems
- Carry no through traffic movement
- Constitute the mileage not classified as part of the Arterial and Collector systems

The "local" classified roadways will not have a growth rate applied to the existing traffic volumes as they are intended to provide access to the adjacent land and to higher system roadways. This will also apply to turn movements onto these roadways from Chamberlin Road, Ravenna Road and East Aurora Road (SR 82).

The ODOT Traffic Monitoring Management System (TMMS) was consulted to determine past historical trends on the study area roadways. The ODOT Traffic Monitoring Management System (TMMS) can be currently accessed at the following web address:

http://www.dot.state.oh.us/Divisions/Planning/TechServ/traffic/Pages/TMMS.aspx

The TMMS provided data at the following locations that was used to determine the study area growth rate:

1. State Route 82 (East of Chamberlin Road) - Location ID 28977

A linear regression equation was developed for this location based on the available historical data. The growth rate for the location was then calculated based on the procedure detailed in *Section 4.2* of the **Ohio Traffic Forecasting Manual, Volume 2** [5].

The location was determined to have increasing traffic volumes with positive historical growth rate of 0.1554%. A copy of the ODOT historical traffic data analysis and the growth rate calculations can be seen in **Appendix G**.

A positive growth rate of 0.1554% will be used in the forecast of future traffic conditions based on the historical traffic data and the functional classification of the study area roadways in order to provide a conservative forecast for the study area. The growth rate and factors for study area can be seen in the following table:

Table 3.7 - Growth Rate & Factors

GROWTH RATE (Annual Growth)	GROWTH FACTOR	
	2027	2047
0.1154%	1.003	1.034

Design Hour Traffic

The traffic patterns on any roadway typically show considerable variation in the traffic volumes experienced during the various hours of the day and in the hourly volumes experienced throughout the year. A key decision in the design process involves determining which of these hourly traffic volumes should be used as the basis for the design.

It would be wasteful to predicate a design on the maximum peak hour traffic that occurs during the year and the use of the average hourly traffic would result in an inadequate design. The hourly traffic volumes used in a design should not be exceeded very often or by very much. However, the hourly traffic volumes should not be so high that traffic would rarely be sufficient to make full use of the designed facility.

Normal design policy in the State of Ohio is based upon a review of curves that depict the variation in hourly traffic volumes during the year. The Ohio Department of Transportation recommends using the 30^{TH} highest hour as a design control for rural streets. There is typically very little difference between the volumes in this range. The Ohio Department of Transportation provides factors or a methodology to determine factors that are applied to counted daily traffic volumes to determine appropriate design hour traffic volumes.

Following guidelines set forth in the ODOT **State Highway Access Management Manual** [7], all analyses are required to examine the design hour volume for the adjacent roadway and peak hour traffic volume of the proposed development. The **Ohio Traffic Forecasting Manual** [4 & 5] will be used to determined peak hour factors for the study area roadways.

The design hour volumes are determined by multiplying the AM and PM peak hour volumes by the appropriate factors from the ODOT Peak Hour to Design Hour Factor Report based on the functional classification of the roadway, the day of the week and the month that the traffic data was collected. A copy of the ODOT's Peak Hour to Design Hour Factor Report can be seen in **Appendix H**.

The following table details the peak hour to design hour factors for the study area roadways.

Table 3.8 - Peak Hour to Design Hour Factors

INTERSECTION		APPROACH	MONTH	DAY	URBAN CLASSIFICATION	DHV FACTOR*
#	ROADWAYS					
1	Ravenna Road	East-West	April	Tuesday	Minor Arterial	1.14
	Chamberlin Road	South			Major Collector	1.14
	Belmeadow Drive	North			Local Roadway	1.14
2	Chamberlin Road	North-South	April	Tuesday	Major Collector	1.14
	Chamberlin Trail	East			Local Roadway	1.14
3	East Aurora Road	East-West	April	Tuesday	Minor Arterial	1.14
	Chamberlin Road	North			Major Collector	1.14
	Chamberlin Road	South			Local Roadway	1.14

*** Rounded**

The peak hour to design hour factors detailed in *Table 3.8* will be used in the forthcoming future traffic volume calculations in *Chapter 3, Section 3.3* of this report.

Peak Hour Factors

The intersection peak hour factor (PHF) is used to convert the hourly traffic volume into the flow rate that represents the busiest 15 minutes of the peak hour. The PHF is the sum of the traffic entering the intersection during the peak hour divided by four times the highest 15 minute volume during the peak hour. A PHF of 1 indicates that the traffic volume in each 15 minute volume is the same and therefore traffic flow is consistent throughout the hour. A lower PHF indicates a more variable traffic flow and that traffic volume has a spike during the peak 15 minute interval. PHF's under 0.80 occur in locations with highly peaked demand, such as at schools and factories during shift changes.

The **ODOT Analysis and Traffic Simulation Manual, (OATS)** [6] provides guidance to use the existing year PHF for all intersections from traffic counts collected for the project. The PHF is calculated for the intersection as a whole and not individual approaches or movements. A minimum of 0.80 for the PHF is required to be utilized unless justified by highly peaked demands such as for schools and factories noted above. If project specific counts are not available, a default value of 0.92 is to be utilized.

It is assumed for this report that the PHF for the No-Build analyses are the same as the calculated PHF from the collected existing year traffic counts. Peak hour factors less than 0.80 will be used due to the highly peaked demands of the school related traffic in the study area. The intersection PHF's are included in **Appendix C**.

The following table shows the No-Build PHF's calculated for the study area intersections during the AM and PM peak hours:

Table 3.9 - No-Build Intersection Peak Hour Factors

ROADWAY/INTERSECTION	AM PHF		PM PHF	
	7:00-8:00	8:15-9:15	2:00-3:00	3:00-4:00
(1) Chamberlin Road & Ravenna Road	0.90	0.86	0.93	0.91
(2) Chamberlin Road & Chamberlin Trail	0.93	0.83	0.88	0.86
(3) Chamberlin Road & E. Aurora Road	0.81	0.97	0.95	0.90

The peak hour factors in *Table 3.9* will be used in the forthcoming No-Build intersection capacity calculations in *Chapter 4* of this report.

Peak hour factors were calculated for the Build conditions by adding the entering traffic to the 15 minute interval preceding the school start and end times and adding the exiting traffic to the 15 minute interval after the school start and end times.

The following table shows the Build PHF's calculated for the study area intersections during the AM and PM peak hours:

Table 3.10 - Build Intersection Peak Hour Factors

ROADWAY/INTERSECTION	AM PHF		PM PHF	
	7:00-8:00	8:15-9:15	2:00-3:00	3:00-4:00
(1) Chamberlin Road & Ravenna Road	0.83	0.84	0.96	0.93
(2) Chamberlin Road & Chamberlin Trail	0.62	0.90	0.76	0.91
(3) Chamberlin Road & E. Aurora Road	0.82	0.94	0.93	0.88

The peak hour factors in *Table 3.10* will be used in the forthcoming Build intersection capacity calculations in *Chapter 4* of this report.

3.3 Future Traffic

No-Build Conditions

The previously discussed peak hour to design hour factors and growth factors for each movement were applied to the traffic volumes shown in **Figures 2.4 & 2.5, Appendix A** in order to estimate the future traffic considering non-project traffic conditions. This condition will be referred to as the "No-Build" condition as it will reference the calculated future study area volumes with out the development of a new elementary school at the site.

Printouts of our Excel spreadsheet detailing the use of the design hour factors, growth rates and the resulting expected 2027 and 2047 No-Build traffic volumes can be found in **Appendix I**.

The estimated 2027 No-Build traffic volumes for the study area are shown graphically in **Figures 3.8 & 3.9, Appendix A**. The estimated 2047 No-Build traffic volumes for the study area are shown graphically in **Figures 3.10 & 3.11, Appendix A**. The No-Build traffic volumes have been rounded to the nearest 10 to adhere to preferred ODOT practices.

These traffic volumes are the expected traffic if proposed school **is not** constructed, the "No-Build" condition.

The No-Build volumes on **Figures 3.8 - 3.11, Appendix A** will be used in the forthcoming No-Build intersection capacity calculations in *Chapter 4* of this report.

Build Conditions

The previously discussed site generated peak hour traffic volumes were added to the No-Build traffic volumes in order to estimate the future traffic considering project traffic conditions. This condition will be referred to as the "Build" condition as it will reference the calculated future study area volumes with the development of the new elementary school at the site.

The sum of the 2027 No-Build volumes, shown in **Figures 3.8 & 3.9, Appendix A**, were added to the site generated traffic (**Figures 3.4 - 3.7, Appendix A**) to equal the future Build peak hour volumes in order to estimate the future opening year traffic considering project traffic conditions. The estimated 2027 Build traffic volumes for the study area are shown graphically in **Figures 3.12 & 3.13, Appendix A** for the proposed elementary school.

The sum of the 2047 No-Build volumes, shown in **Figures 3.10 & 3.11, Appendix A**, were added to the site generated traffic (**Figures 3.4 - 3.7, Appendix A**) to equal the future Build peak hour volumes in order to estimate the future opening year traffic considering project traffic conditions. The estimated 2047 Build traffic volumes for the study area are shown graphically in **Figures 3.14 & 3.15, Appendix A** for the proposed elementary school.

These traffic volumes are the expected volumes if the proposed school **is** constructed, or the "Build" condition.

Chapter 4
Traffic Analysis

4.1 Capacity & LOS at Study Area Intersections

2027 Traffic Analysis - No-Build & Build Conditions

Traffic analyses were performed for the projected 2027 conditions under the No-Build and Build scenarios so:

1. any existing roadway/intersection deficiencies can be identified in the No-Build scenario which would not be attributable to the new elementary school, and;

2. a comparison can be made to determine the changes in the traffic operations which may be attributed to the new elementary.

The traffic volumes used in the 2027 No-Build analyses can be seen in **Figures 3.8 & 3.9, Appendix A**. Copies of the capacity worksheets for the 2027 No-Build analyses are included in **Appendix J.**

The traffic volumes used in the 2027 Build analyses can be seen in **Figures 3.12 & 3.13, Appendix A**. Copies of the capacity worksheets for the 2027 Build analyses are included in **Appendix K**.

1. Chamberlin Road & Ravenna Road

The peak hour traffic analysis results of the 2027 No-Build versus Build conditions for the signalized intersection of Chamberlin Road and Ravenna Road are shown in the following tables:

Table 4.1 - 2027 7:00-8:00 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	2027 No-Build Conditions 700-800 AM				Signal Control (80 Sec)	Intersection #1	2027 Build Conditions 700-800 AM				Signal Control (80 Sec)
Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	11.6	0.032	0.03	4	EBL	C	20.7	0.057	0.05	7
EBT	B	13.0	0.246	0.10	104	EBT	C	26.5	0.451	0.18	179
EBR	B	11.4	0.061	0.18	20	EBR	C	22.3	0.160	0.44	48
EB Approach	B	12.7	-	-	-	EB Approach	C	25.3	-	-	-
WBL	A	8.4	0.293	0.23	68	WBL	B	16.3	0.678	0.71	214
WBT	B	15.0	0.605	0.31	293	WBT	C	26.6	0.796	0.45	424
WB Approach	B	13.3	-	-	-	WB Approach	C	22.6	-	-	-
NBL	C	34.3	0.429	1.40	84	NBL	C	31.0	0.603	2.72	163
NBT	C	28.3	0.499	0.22	126	NBT	C	23.1	0.502	0.29	165
NB Approach	C	30.5	-	-	-	NB Approach	C	26.7	-	-	-
SBL	C	33.0	0.279	0.33	53	SBL	C	28.8	0.242	0.33	53
SBT	C	28.3	0.500	0.82	131	SBT	C	22.3	0.410	0.85	137
SB Approach	C	29.6	-	-	-	SB Approach	C	23.9	-	-	-
Intersection	**B**	**18.6**	-	-	-	**Intersection**	**C**	**24.0**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and Ravenna Road during the 7:00-8:00 AM peak hour will operate with level-of-service C or better under the forecasted 2027 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade from LOS B to LOS C with the addition of the site generated traffic. The westbound movements and approach were found to degrade one LOS from LOS A to LOS B and LOS B to LOS C. The northbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic. The overall intersection was found to degrade from LOS B to LOS C with the addition of the sited generated traffic.

The northbound left turn movement was found to have a QSR greater than 1.0 under the under the forecasted 2027 No-Build and Build scenarios.

Table 4.2 - 2027 8:15-9:15 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	2027 No-Build Conditions 815-915 AM				Signal Control (80 Sec)	Intersection #1	2027 Build Conditions 815-915 AM				Signal Control (80 Sec)
Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	A	8.2	0.040	0.05	7	EBL	B	15.9	0.053	0.08	12
EBT	B	11.6	0.304	0.13	131	EBT	C	23.5	0.481	0.21	210
EBR	A	9.4	0.043	0.12	14	EBR	B	18.8	0.129	0.38	42
EB Approach	B	11.1	-	-	-	EB Approach	C	22.2	-	-	-
WBL	A	7.1	0.214	0.14	43	WBL	B	16.9	0.728	0.74	221
WBT	B	10.2	0.365	0.17	156	WBT	B	15.7	0.451	0.22	210
WB Approach	A	9.3	-	-	-	WB Approach	B	16.4	-	-	-
NBL	C	34.7	0.365	1.13	68	NBL	C	31.2	0.561	2.49	149
NBT	C	32.2	0.655	0.24	141	NBT	C	31.1	0.786	0.44	254
NB Approach	C	33.0	-	-	-	NB Approach	C	31.1	-	-	-
SBL	D	36.2	0.205	0.18	29	SBL	D	35.8	0.214	0.18	30
SBT	C	30.3	0.421	0.55	88	SBT	C	23.9	0.336	0.62	100
SB Approach	C	31.6	-	-	-	SB Approach	C	26.2	-	-	-
Intersection	**B**	**17.1**	-	-	-	**Intersection**	**C**	**22.4**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and Ravenna Road during the 8:15-9:15 AM peak hour will operate with level-of-service D or better under the forecasted 2027 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade one LOS from LOS A to LOS B and LOS B to LOS C with the addition of the site generated traffic. The westbound approach and left turn movement were found to degrade from LOS A to LOS B. The northbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic. The overall intersection was found to degrade from LOS B to LOS C with the addition of the sited generated traffic.

The northbound left turn movement was found to have a QSR greater than 1.0 under the under the forecasted 2027 No-Build and Build scenarios.

Table 4.3 - 2027 2:00-3:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	2027 No-Build Conditions 200-300 PM				Signal Control (80 Sec)	Intersection #1	2027 Build Conditions 200-300 PM				Signal Control (80 Sec)
Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	A	8.4	0.109	0.13	20	EBL	B	11.1	0.121	0.16	24
EBT	B	13.3	0.370	0.17	168	EBT	B	17.1	0.413	0.19	193
EBR	B	10.6	0.082	0.24	27	EBR	B	13.9	0.131	0.41	45
EB Approach	B	12.3	-	-	-	EB Approach	B	15.8	-	-	-
WBL	A	8.2	0.238	0.16	47	WBL	B	11.2	0.336	0.25	74
WBT	B	12.7	0.381	0.18	170	WBT	B	16.3	0.421	0.21	194
WB Approach	B	11.4	-	-	-	WB Approach	B	14.5	-	-	-
NBL	C	30.3	0.155	0.56	33	NBL	C	25.9	0.144	0.61	37
NBT	C	32.2	0.756	0.33	190	NBT	C	29.8	0.822	0.44	253
NB Approach	C	31.9	-	-	-	NB Approach	C	29.2	-	-	-
SBL	D	36.6	0.141	0.11	18	SBL	D	36.4	0.138	0.11	18
SBT	C	27.9	0.267	0.39	63	SBT	C	23.6	0.206	0.37	59
SB Approach	C	29.6	-	-	-	SB Approach	C	26.0	-	-	-
Intersection	**B**	**17.2**	-	-	-	**Intersection**	**B**	**19.5**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and Ravenna Road during the 2:00-3:00 PM peak hour will operate with level-of-service D or better under the forecasted 2027 No-Build and Build scenarios.

The eastbound approach and movements were found to remain unchanged with the addition of the site generated traffic with the exception of the left turn movement. The eastbound and westbound left turn movements degraded from LOS A to LOS B. The westbound, northbound, and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic. The overall intersection was found to remain unchanged with the addition of the site generated traffic.

Table 4.4 - 2027 3:00-4:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	2027 No-Build Conditions 300-400 PM				Signal Control (80 Sec)	Intersection #1	2027 Build Conditions 300-400 PM				Signal Control (80 Sec)
Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	A	9.4	0.154	0.19	29	EBL	B	16.2	0.197	0.30	45
EBT	B	15.9	0.469	0.22	221	EBT	C	28.5	0.640	0.30	300
EBR	B	11.8	0.102	0.31	34	EBR	C	21.0	0.231	0.76	84
EB Approach	B	14.4	-	-	-	EB Approach	C	25.3	-	-	-
WBL	A	9.8	0.317	0.20	60	WBL	B	17.0	0.562	0.43	130
WBT	B	14.4	0.400	0.19	182	WBT	C	22.3	0.495	0.25	233
WB Approach	B	12.9	-	-	-	WB Approach	C	20.1	-	-	-
NBL	C	29.3	0.149	0.55	33	NBL	C	22.9	0.131	0.66	39
NBT	C	31.1	0.774	0.37	212	NBT	C	32.4	0.867	0.62	358
NB Approach	C	30.9	-	-	-	NB Approach	C	31.3	-	-	-
SBL	D	36.4	0.147	0.13	20	SBL	D	38.4	0.154	0.13	21
SBT	C	26.6	0.297	0.47	76	SBT	C	20.5	0.207	0.46	73
SB Approach	C	28.4	-	-	-	SB Approach	C	23.4	-	-	-
Intersection	**B**	**18.3**	-	-	-	**Intersection**	**C**	**25.2**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and Ravenna Road during the 3:00-4:00 PM peak hour will operate with level-of-service D or better under the forecasted 2027 No-Build and Build scenarios.

The eastbound and westbound approaches and movements were found to degrade one LOS from LOS A to LOS B and LOS B to LOS C with the addition of the site generated traffic. The northbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic. The overall intersection was found to degrade from LOS B to LOS C with the addition of the sited generated traffic.

The 2027 AM and PM peak hour comparison tables for the intersection of Chamberlin Road and Ravenna Road shown previously, indicate that the No-Build and Build levels-of-service, v/c ratios, and QSR results for all movements, approaches and the intersection are within the acceptable ranges as stated in the ODOT **OATS Manual** [6] and shown in *Table 1.2, Page 4* with the exception of the QSR for the northbound left turn movement in the AM peak hours.

A QSR greater than 1.0 indicates the storage length of the lane may not be adequate for the forecasted conditions. An analysis will be performed in a later section of this report to determine the queue length needed to mitigate the effect or any other improvement that could reduce the queue storage length for the northbound left turn movement.

2. Chamberlin Road & Chamberlin Trail

The peak hour traffic analysis results of the 2027 No-Build versus Build conditions for the unsignalized intersection of Chamberlin Road and Chamberlin Trail is shown in the following tables:

Table 4.5 - 2027 7:00-8:00 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Chamberlin Trail)

Intersection #2	2027 No-Build Conditions 700-800 AM			Stop Control (1-Way)	Intersection #2	2027 Build Conditions 700-800 AM			Stop Control (1-Way)
Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBT	B	11.0	0.03	3	WBT	C	18.8	0.17	19
WB Approach	B	11.0	-	-	WB Approach	C	18.8	-	-
SBL	A	7.6	0.00	0	SBL	A	8.2	0.00	0
SBT	A	0.0	-	-	SBT	A	0.0	-	-
SB Approach	A	0.0	-	-	SB Approach	A	0.0	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and Chamberlin Trail during the 7:00-8:00 AM peak hour will operate with level-of-service C or better under the forecasted 2027 No-Build and Build scenarios.

The westbound approach and movements were found to degrade from LOS B to LOS C with the addition of the site generated traffic. The southbound approach and movements were found to remain unchanged with the addition of the site generated traffic.

Table 4.6 - 2027 8:15-9:15 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Chamberlin Trail)

Intersection #2	2027 No-Build Conditions 815-915 AM			Stop Control (1-Way)	Intersection #2	2027 Build Conditions 815-915 AM			Stop Control (1-Way)
Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBT	B	10.9	0.02	3	WBT	B	14.4	0.13	21
WB Approach	B	10.9	-	-	WB Approach	B	14.4	-	-
SBL	A	7.6	0.00	0	SBL	A	8.0	0.00	0
SBT	A	0.0	-	-	SBT	A	0.0	-	-
SB Approach	A	0.0	-	-	SB Approach	A	0.0	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and Chamberlin Trail during the 8:15-9:15 AM peak hour will operate with level-of-service B or better under the forecasted 2027 No-Build and Build scenarios.

The westbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic.

Table 4.7 - 2027 2:00-3:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Chamberlin Trail)

Intersection #2	2027 No-Build Conditions 200-300 PM			Stop Control (1-Way)	Intersection #2	2027 Build Conditions 200-300 PM			Stop Control (1-Way)
Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBT	B	10.7	0.03	3	WBT	B	14.5	0.11	13
WB Approach	B	10.7	-	-	WB Approach	B	14.5	-	-
SBL	A	7.8	0.01	0	SBL	A	8.2	0.01	0
SBT	A	0.1	-	-	SBT	A	0.1	-	-
SB Approach	A	0.5	-	-	SB Approach	A	0.4	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and Chamberlin Trail during the 2:00-3:00 PM peak hour will operate with level-of-service B or better under the forecasted 2027 No-Build and Build scenarios.

The westbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic.

Table 4.8 - 2027 3:00-4:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Chamberlin Trail)

Intersection #2	2027 No-Build Conditions 300-400 PM			Stop Control (1-Way)	Intersection #2	2027 Build Conditions 300-400 PM			Stop Control (1-Way)
Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBT	B	11.4	0.04	3	WBT	C	16.1	0.18	23
WB Approach	B	11.4	-	-	WB Approach	C	16.1	-	-
SBL	A	7.9	0.01	0	SBL	A	8.3	0.01	0
SBT	A	0.1	-	-	SBT	A	0.1	-	-
SB Approach	A	0.4	-	-	SB Approach	A	0.4	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and Chamberlin Trail during the 3:00-4:00 PM peak hour will operate with level-of-service C or better under the forecasted 2027 No-Build and Build scenarios.

The westbound approach and movements were found to degrade from LOS B to LOS C with the addition of the site generated traffic. The southbound approach and movements were found to remain unchanged with the addition of the site generated traffic.

The 2027 AM and PM peak hour comparison tables for the intersection of Chamberlin Road and Chamberlin Trail shown previously, indicate that the No-Build and Build levels-of-service, v/c ratios, and QSR results for all movements, approaches and the intersection are within the acceptable ranges as stated in the ODOT **OATS Manual** [6] and shown in *Table 1.2, Page 4*.

No improvements were found to be necessary to accommodate the site generated traffic volumes under the forecasted 2027 conditions at the intersection of Chamberlin Road and Chamberlin Trail.

3. Chamberlin Road & East Aurora Road (SR 82)

The peak hour traffic analysis results of the 2027 No-Build versus Build conditions for the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) is shown in the following tables:

Table 4.9 - 2027 7:00-8:00 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & East Aurora Road)

Intersection #3	2027 No-Build Conditions 700-800 AM				Signal Control (80 Sec)	Intersection #3	2027 Build Conditions 700-800 AM				Signal Control (80 Sec)
Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	17.9	0.071	0.07	14	EBL	C	22.3	0.164	0.16	28
EBT	C	26.5	0.525	0.22	219	EBT	D	39.4	0.718	0.26	262
EBR	C	26.7	0.528	0.21	208	EBR	D	40.0	0.723	0.26	249
EB Approach	C	26.2	-	-	-	EB Approach	D	38.4	-	-	-
WBL	B	17.2	0.307	0.17	61	WBL	C	22.3	0.387	0.20	71
WBT	C	20.8	0.407	0.16	161	WBT	C	29.4	0.573	0.20	197
WBR	B	17.9	0.094	0.09	30	WBR	C	26.7	0.297	0.25	88
WB Approach	B	20.0	-	-	-	WB Approach	C	27.9	-	-	-
NBL	C	20.7	0.136	0.09	16	NBL	B	19.7	0.169	0.07	13
NBT	B	15.0	0.021	0.01	7	NBT	B	11.3	0.045	0.03	16
NBR	B	12.6	0.221	0.39	71	NBR	A	8.9	0.185	0.30	55
NB Approach	B	14.0	-	-	-	NB Approach	B	10.7	-	-	-
SBT	C	28.8	0.779	0.28	284	SBT	D	43.0	0.912	0.48	479
SB Approach	C	28.8	-	-	-	SB Approach	D	43.0	-	-	-
Intersection	**C**	**23.4**	-	-	-	**Intersection**	**C**	**33.6**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) during the 7:00-8:00 AM peak hour will operate with level-of-service D or better under the forecasted 2027 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade one LOS from LOS B to LOS C and LOS C to LOS D with the addition of the site generated traffic. The westbound approach and movements were found to degrade from LOS B to LOS C with the exception of the through movement which remain unchanged. The northbound approach and movements were not degraded with the addition of the site generated traffic. The southbound approach and movements were found to degrade from LOS C to LOS D. The overall intersection LOS remained unchanged with the addition of the sited generated traffic.

Table 4.10 - 2027 8:15-9:15 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & East Aurora Road)

Intersection #3	2027 No-Build Conditions 815-915 AM				Signal Control (80 Sec)	Intersection #3	2027 Build Conditions 815-915 AM				Signal Control (80 Sec)
Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	11.6	0.042	0.05	9	EBL	C	20.3	0.161	0.17	30
EBT	B	15.9	0.324	0.14	143	EBT	C	31.6	0.581	0.22	222
EBR	B	16.0	0.326	0.14	134	EBR	C	31.9	0.585	0.22	209
EB Approach	B	15.8	-	-	-	EB Approach	C	30.8	-	-	-
WBL	B	10.5	0.222	0.13	45	WBL	C	20.2	0.359	0.21	73
WBT	B	12.7	0.275	0.11	108	WBT	C	26.5	0.503	0.18	180
WBR	B	11.4	0.086	0.08	28	WBR	C	26.1	0.370	0.34	120
WB Approach	B	12.2	-	-	-	WB Approach	C	25.4	-	-	-
NBL	C	26.3	0.067	0.04	8	NBL	B	19.4	0.067	0.03	6
NBT	C	22.4	0.074	0.04	22	NBT	B	12.9	0.084	0.05	30
NBR	B	19.1	0.244	0.41	75	NBR	A	9.9	0.163	0.28	50
NB Approach	C	20.3	-	-	-	NB Approach	B	11.4	-	-	-
SBT	C	33.0	0.660	0.18	180	SBT	C	28.3	0.818	0.34	344
SB Approach	C	33.0	-	-	-	SB Approach	C	28.3	-	-	-
Intersection	**B**	**17.2**	-	-	-	**Intersection**	**C**	**26.4**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) during the 8:15-9:15 AM peak hour will operate with level-of-service C or better under the forecasted 2027 No-Build and Build scenarios.

The eastbound and westbound approaches and movements were found to degrade from LOS B to LOS C with the addition of the site generated traffic. The northbound approach and movements were not degraded with the addition of the site generated traffic. The southbound approach and movements remained unchanged with the addition of the sited generated traffic. The overall intersection LOS degraded from LOS B to LOS C with the addition of the sited generated traffic.

Table 4.11 - 2027 2:00-3:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & East Aurora Road)

Intersection #3	2027 No-Build Conditions 200-300 PM				Signal Control (80 Sec)	Intersection #3	2027 Build Conditions 200-300 PM				Signal Control (80 Sec)
Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	12.4	0.122	0.12	22	EBL	B	14.4	0.223	0.23	41
EBT	B	17.8	0.362	0.16	162	EBT	C	20.9	0.414	0.18	183
EBR	B	17.9	0.364	0.16	154	EBR	C	21.0	0.416	0.18	174
EB Approach	B	17.4	-	-	-	EB Approach	C	20.0	-	-	-
WBL	B	11.9	0.263	0.16	54	WBL	B	14.0	0.297	0.18	62
WBT	B	16.5	0.398	0.17	168	WBT	C	20.4	0.469	0.20	196
WBR	B	14.6	0.162	0.16	56	WBR	B	18.8	0.278	0.28	100
WB Approach	B	15.5	-	-	-	WB Approach	B	19.2	-	-	-
NBL	C	25.1	0.227	0.21	38	NBL	C	23.1	0.229	0.20	36
NBT	C	21.4	0.150	0.08	49	NBT	B	19.1	0.166	0.09	58
NBR	B	18.4	0.333	0.62	111	NBR	B	16.0	0.305	0.58	104
NB Approach	C	20.3	-	-	-	NB Approach	B	18.0	-	-	-
SBT	C	33.4	0.609	0.15	150	SBT	C	31.8	0.672	0.20	196
SB Approach	C	33.4	-	-	-	SB Approach	C	31.8	-	-	-
Intersection	**B**	**18.6**	-	-	-	**Intersection**	**C**	**20.7**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) during the 2:00-3:00 PM peak hour will operate with level-of-service C or better under the forecasted 2027 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade from LOS B to LOS C with the exception of the eastbound left turn movement. The eastbound left turn movement remained unchanged with the addition of the site generated traffic. The westbound approach and movements remained unchanged with the exception of the through movement. The westbound through movement was found to degrade from LOS B to LOS C. The northbound approach and movements were not degraded with the addition of the site generated traffic. The southbound approach and movements remained unchanged with the addition of the sited generated traffic. The overall intersection LOS degraded from LOS B to LOS C with the addition of the sited generated traffic.

Table 4.12 - 2027 3:00-4:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & East Aurora Road)

Intersection #3	2027 No-Build Conditions 300-400 PM				Signal Control (80 Sec)	Intersection #3	2027 Build Conditions 300-400 PM				Signal Control (80 Sec)
Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	13.6	0.172	0.16	29	EBL	B	17.7	0.365	0.37	66
EBT	B	19.5	0.405	0.18	183	EBT	C	25.7	0.512	0.22	216
EBR	B	19.6	0.406	0.18	176	EBR	C	25.7	0.513	0.21	209
EB Approach	B	18.9	-	-	-	EB Approach	C	24.3	-	-	-
WBL	B	12.9	0.205	0.11	40	WBL	B	17.3	0.266	0.14	49
WBT	B	19.4	0.482	0.21	207	WBT	C	26.8	0.633	0.25	247
WBR	B	17.0	0.224	0.23	79	WBR	C	25.9	0.471	0.49	171
WB Approach	B	18.3	-	-	-	WB Approach	C	25.7	-	-	-
NBL	C	23.8	0.236	0.21	38	NBL	C	20.8	0.239	0.19	35
NBT	C	20.1	0.187	0.10	65	NBT	B	16.4	0.203	0.12	77
NBR	B	17.3	0.336	0.01	1	NBR	B	13.5	0.289	0.55	99
NB Approach	B	19.2	-	-	-	NB Approach	B	15.6	-	-	-
SBT	C	32.4	0.648	0.18	177	SBT	C	29.7	0.731	0.24	239
SB Approach	C	32.4	-	-	-	SB Approach	C	29.7	-	-	-
Intersection	**C**	**20.1**	-	-	-	**Intersection**	**C**	**24.2**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) during the 3:00-4:00 PM peak hour will operate with level-of-service C or better under the forecasted 2027 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade from LOS B to LOS C with the exception of the eastbound left turn movement. The eastbound left turn movement remained unchanged with the addition of the site generated traffic. The westbound approach and movements were found to degrade from LOS B to LOS C with the exception of the left turn movement. The westbound left turn movement remained unchanged. The northbound and southbound approaches and movements were not degraded with the addition of the site generated traffic. The overall intersection LOS remained the same with the addition of the sited generated traffic.

The 2027 AM and PM peak hour comparison tables for the intersection of Chamberlin Road and East Aurora Road (SR 82) shown previously, indicate that the No-Build and Build levels-of-service, v/c ratios, and QSR results for all movements, approaches and the intersection are within the acceptable ranges as stated in the ODOT **OATS Manual** [6] and shown in *Table 1.2, Page 4*.

No improvements were found to be necessary to accommodate the site generated traffic volumes under the forecasted 2027 conditions at the intersection of Chamberlin Road and East Aurora Road (SR 82).

2047 Traffic Analysis - No-Build & Build Conditions

Traffic analyses were performed for the projected 2047 conditions under the No-Build and Build scenarios so:

1. any existing roadway/intersection deficiencies can be identified in the No-Build scenario which would not be attributable to the new elementary school, and;

2. a comparison can be made to determine the changes in the traffic operations which may be attributed to the new elementary school.

The traffic volumes used in the 2047 No-Build analyses can be seen in **Figures 3.10 & 3.11, Appendix A**. Copies of the capacity worksheets for the 2047 No-Build analyses are included in **Appendix L.**

The traffic volumes used in the 2047 Build analyses can be seen in **Figures 3.14 & 3.15, Appendix A**. Copies of the capacity worksheets for the 2047 Build analyses are included in **Appendix M.**

1. Chamberlin Road & Ravenna Road

The peak hour traffic analysis results of the 2047 No-Build versus Build conditions for the signalized intersection of Chamberlin Road and Ravenna Road are shown in the following tables:

Table 4.13 - 2047 7:00-8:00 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	2047 No-Build Conditions 700-800 AM				Signal Control (80 Sec)	Intersection #1	2047 Build Conditions 700-800 AM				Signal Control (80 Sec)
Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	11.7	0.032	0.03	4	EBL	C	20.8	0.059	0.05	7
EBT	B	13.0	0.246	0.10	104	EBT	C	26.5	0.451	0.18	179
EBR	B	11.4	0.061	0.18	20	EBR	C	22.3	0.160	0.44	48
EB Approach	B	12.7	-	-	-	EB Approach	C	25.3	-	-	-
WBL	A	8.4	0.293	0.23	68	WBL	B	16.3	0.678	0.71	214
WBT	B	15.2	0.616	0.32	299	WBT	C	27.4	0.810	0.47	437
WB Approach	B	13.5	-	-	-	WB Approach	C	23.1	-	-	-
NBL	C	34.3	0.429	1.40	84	NBL	C	31.0	0.603	2.72	163
NBT	C	28.3	0.499	0.22	126	NBT	C	23.1	0.502	0.29	165
NB Approach	C	30.5	-	-	-	NB Approach	C	26.7	-	-	-
SBL	C	33.0	0.279	0.33	53	SBL	C	28.8	0.242	0.33	53
SBT	C	28.3	0.500	0.82	131	SBT	C	22.3	0.410	0.85	137
SB Approach	C	29.6	-	-	-	SB Approach	C	23.9	-	-	-
Intersection	**B**	**18.6**	-	-	-	**Intersection**	**C**	**24.3**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and Ravenna Road during the 7:00-8:00 AM peak hour will operate with level-of-service C or better under the forecasted 2047 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade from LOS B to LOS C with the addition of the site generated traffic. The westbound movements and approach were found to degrade one LOS from LOS A to LOS B and LOS B to LOS C. The northbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic. The overall intersection was found to degrade from LOS B to LOS C with the addition of the sited generated traffic.

The northbound left turn movement was found to have a QSR greater than 1.0 under the under the forecasted 2047 No-Build and Build scenarios.

Table 4.14 - 2047 8:15-9:15 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	2047 No-Build Conditions 815-915 AM				Signal Control (80 Sec)	Intersection #1	2047 Build Conditions 815-915 AM				Signal Control (90 Sec)
Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	A	8.5	0.042	0.05	8	EBL	B	14.7	0.052	0.08	12
EBT	B	12.1	0.320	0.14	140	EBT	C	21.9	0.467	0.21	209
EBR	A	9.6	0.044	0.13	14	EBR	B	17.4	0.121	0.36	40
EB Approach	B	11.6	-	-	-	EB Approach	C	20.7	-	-	-
WBL	A	7.4	0.220	0.15	44	WBL	B	19.8	0.785	0.82	245
WBT	B	10.7	0.380	0.18	166	WBT	B	15.1	0.453	0.23	212
WB Approach	A	9.8	-	-	-	WB Approach	B	17.7	-	-	-
NBL	C	34.0	0.350	1.12	67	NBL	C	32.3	0.591	2.54	153
NBT	C	32.0	0.670	0.26	151	NBT	C	27.1	0.621	0.32	187
NB Approach	C	32.6	-	-	-	NB Approach	C	29.3	-	-	-
SBL	D	36.2	0.206	0.18	29	SBL	C	32.6	0.162	0.17	28
SBT	C	29.7	0.403	0.54	87	SBT	C	24.7	0.352	0.64	102
SB Approach	C	31.2	-	-	-	SB Approach	C	26.2	-	-	-
Intersection	**B**	**17.3**	-	-	-	**Intersection**	**C**	**21.8**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and Ravenna Road during the 8:15-9:15 AM peak hour will operate with level-of-service D or better under the forecasted 2047 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade one LOS from LOS A to LOS B and LOS B to LOS C with the addition of the site generated traffic. The westbound approach and left turn movement were found to degrade from LOS A to LOS B with the exception of the through movement. The westbound through movement remained unchanged. The northbound and southbound approaches and movements were not degraded with the addition of the site generated traffic. The overall intersection was found to degrade from LOS B to LOS C with the addition of the sited generated traffic.

The northbound left turn movement was found to have a QSR greater than 1.0 under the under the forecasted 2047 No-Build and Build scenarios.

Table 4.15 - 2047 2:00-3:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	2047 No-Build Conditions 200-300 PM				Signal Control (80 Sec)	Intersection #1	2047 Build Conditions 200-300 PM				Signal Control (80 Sec)
Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	A	8.5	0.111	0.13	20	EBL	B	11.3	0.123	0.16	24
EBT	B	13.5	0.382	0.18	176	EBT	B	17.5	0.429	0.20	200
EBR	B	10.6	0.082	0.24	27	EBR	B	14.1	0.132	0.41	45
EB Approach	B	12.5	-	-	-	EB Approach	B	16.1	-	-	-
WBL	A	8.3	0.258	0.17	51	WBL	B	11.3	0.359	0.26	79
WBT	B	12.9	0.393	0.19	176	WBT	B	16.5	0.434	0.21	200
WB Approach	B	11.5	-	-	-	WB Approach	B	14.6	-	-	-
NBL	C	30.6	0.194	0.70	42	NBL	C	26.1	0.172	0.74	45
NBT	C	32.1	0.755	0.33	190	NBT	C	29.8	0.821	0.44	253
NB Approach	C	31.8	-	-	-	NB Approach	C	29.2	-	-	-
SBL	D	36.6	0.141	0.11	18	SBL	D	36.3	0.138	0.11	18
SBT	C	27.9	0.267	0.39	63	SBT	C	23.6	0.206	0.37	59
SB Approach	C	29.6	-	-	-	SB Approach	C	26.0	-	-	-
Intersection	**B**	**17.3**	-	-	-	**Intersection**	**B**	**19.6**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and Ravenna Road during the 2:00-3:00 PM peak hour will operate with level-of-service D or better under the forecasted 2047 No-Build and Build scenarios.

The eastbound and westbound approaches and movements were found to remain unchanged with the addition of the site generated traffic with the exception of the left turn movements. The eastbound and westbound left turn movements were degraded from LOS A to LOS B. The northbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic. The overall intersection was found to remain unchanged with the addition of the site generated traffic.

Table 4.16 - 2047 3:00-4:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	2047 No-Build Conditions 300-400 PM				Signal Control (80 Sec)	Intersection #1	2047 Build Conditions 300-400 PM				Signal Control (80 Sec)
Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & Ravenna	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	A	9.7	0.159	0.20	30	EBL	B	16.7	0.212	0.29	44
EBT	B	16.8	0.501	0.24	237	EBT	C	32.8	0.739	0.33	326
EBR	B	12.1	0.103	0.32	35	EBR	C	21.8	0.253	0.76	83
EB Approach	B	15.2	-	-	-	EB Approach	C	28.5	-	-	-
WBL	B	10.3	0.353	0.22	66	WBL	B	17.9	0.632	0.45	134
WBT	B	15.0	0.418	0.21	193	WBT	C	23.6	0.544	0.25	239
WB Approach	B	13.4	-	-	-	WB Approach	C	21.2	-	-	-
NBL	C	28.8	0.145	0.55	33	NBL	C	21.1	0.131	0.62	37
NBT	C	30.9	0.782	0.38	219	NBT	C	32.6	0.870	0.61	356
NB Approach	C	30.6	-	-	-	NB Approach	C	31.3	-	-	-
SBL	D	36.4	0.147	0.13	20	SBL	D	36.1	0.149	0.12	20
SBT	C	26.2	0.287	0.47	75	SBT	B	18.8	0.202	0.42	67
SB Approach	C	28.0	-	-	-	SB Approach	C	21.7	-	-	-
Intersection	**B**	**18.6**	-	-	-	**Intersection**	**C**	**26.5**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and Ravenna Road during the 3:00-4:00 PM peak hour will operate with level-of-service D or better under the forecasted 2047 No-Build and Build scenarios.

The eastbound and westbound approaches and movements were found to degrade one LOS from LOS A to LOS B and LOS B to LOS C with the addition of the site generated traffic. The northbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic. The overall intersection was found to degrade from LOS B to LOS C with the addition of the sited generated traffic.

The 2047 AM and PM peak hour comparison tables for the intersection of Chamberlin Road and Ravenna Road shown previously, indicate that the No-Build and Build levels-of-service, v/c ratios, and QSR results for all movements, approaches and the intersection are within the acceptable ranges as stated in the ODOT **OATS Manual** [6] and shown in *Table 1.2, Page 4* with the exception of the QSR for the northbound left turn movement in the AM peak hours.

A QSR greater than 1.0 indicates the storage length of the lane may not be adequate for the forecasted conditions. An analysis will be performed in a later section of this report to determine the queue length needed to mitigate the effect or any other improvement that could reduce the queue storage length for the northbound left turn movement.

2. Chamberlin Road & Chamberlin Trail

The peak hour traffic analysis results of the 2047 No-Build versus Build conditions for the unsignalized intersection of Chamberlin Road and Chamberlin Trail is shown in the following tables:

Table 4.17 - 2047 7:00-8:00 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Chamberlin Trail)

Intersection #2	2047 No-Build Conditions 700-800 AM			Stop Control (1-Way)	Intersection #2	2047 Build Conditions 700-800 AM			Stop Control (1-Way)
Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBT	B	11.0	0.03	3	WBT	C	19.6	0.18	23
WB Approach	B	11.0	-	-	WB Approach	C	19.6	-	-
SBL	A	7.6	0.00	0	SBL	A	8.2	0.00	0
SBT	A	0.0	-	-	SBT	A	0.0	-	-
SB Approach	A	0.0	-	-	SB Approach	A	0.0	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and Chamberlin Trail during the 7:00-8:00 AM peak hour will operate with level-of-service C or better under the forecasted 2047 No-Build and Build scenarios.

The westbound approach and movements were found to degrade from LOS B to LOS C with the addition of the site generated traffic. The southbound approach and movements were found to remain unchanged with the addition of the site generated traffic.

Table 4.18 - 2047 8:15-9:15 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Chamberlin Trail)

Intersection #2	2047 No-Build Conditions 815-915 AM			Stop Control (1-Way)	Intersection #2	2047 Build Conditions 815-915 AM			Stop Control (1-Way)
Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBT	B	10.9	0.02	3	WBT	B	14.4	0.13	21
WB Approach	B	10.9	-	-	WB Approach	B	14.4	-	-
SBL	A	7.6	0.00	0	SBL	A	8.0	0.00	0
SBT	A	0.0	-	-	SBT	A	0.0	-	-
SB Approach	A	0.0	-	-	SB Approach	A	0.0	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and Chamberlin Trail during the 8:15-9:15 AM peak hour will operate with level-of-service B or better under the forecasted 2047 No-Build and Build scenarios.

The westbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic.

Table 4.19 - 2047 2:00-3:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Chamberlin Trail)

Intersection #2	2047 No-Build Conditions 200-300 PM			Stop Control (1-Way)	Intersection #2	2047 Build Conditions 200-300 PM			Stop Control (1-Way)
Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBT	B	10.9	0.04	3	WBT	B	14.8	0.11	13
WB Approach	B	10.9	-	-	WB Approach	B	14.8	-	-
SBL	A	7.8	0.01	0	SBL	A	8.2	0.01	0
SBT	A	0.1	-	-	SBT	A	0.1	-	-
SB Approach	A	0.5	-	-	SB Approach	A	0.4	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and Chamberlin Trail during the 2:00-3:00 PM peak hour will operate with level-of-service B or better under the forecasted 2047 No-Build and Build scenarios.

The westbound and southbound approaches and movements were found to remain unchanged with the addition of the site generated traffic.

Table 4.20 - 2047 3:00-4:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Chamberlin Trail)

Intersection #2	2047 No-Build Conditions 300-400 PM			Stop Control (1-Way)	Intersection #2	2047 Build Conditions 300-400 PM			Stop Control (1-Way)
Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & Chamberlin Tr.	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBT	B	11.6	0.04	3	WBT	C	16.4	0.18	27
WB Approach	B	11.6	-	-	WB Approach	C	16.4	-	-
SBL	A	7.9	0.01	0	SBL	A	8.3	0.01	0
SBT	A	0.1	-	-	SBT	A	0.1	-	-
SB Approach	A	0.4	-	-	SB Approach	A	0.3	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and Chamberlin Trail during the 3:00-4:00 PM peak hour will operate with level-of-service C or better under the forecasted 2047 No-Build and Build scenarios.

The westbound approach and movements were found to degrade from LOS B to LOS C with the addition of the site generated traffic. The southbound approach and movements were found to remain unchanged with the addition of the site generated traffic.

The 2047 AM and PM peak hour comparison tables for the intersection of Chamberlin Road and Chamberlin Trail shown previously, indicate that the No-Build and Build levels-of-service, v/c ratios, and QSR results for all movements, approaches and the intersection are within the acceptable ranges as stated in the ODOT **OATS Manual** [6] and shown in *Table 1.2, Page 4*.

No improvements were found to be necessary to accommodate the site generated traffic volumes under the forecasted 2047 conditions at the intersection of Chamberlin Road and Chamberlin Trail.

3. Chamberlin Road & East Aurora Road (SR 82)

The peak hour traffic analysis results of the 2047 No-Build versus Build conditions for the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) is shown in the following tables:

Table 4.21 - 2047 7:00-8:00 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & East Aurora Road)

Intersection #3	2047 No-Build Conditions 700-800 AM				Signal Control (80 Sec)	Intersection #3	2047 Build Conditions 700-800 AM				Signal Control (80 Sec)
Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	18.4	0.074	0.08	14	EBL	C	22.3	0.167	0.16	28
EBT	C	27.9	0.563	0.23	232	EBT	D	41.1	0.749	0.28	276
EBR	C	28.2	0.566	0.23	220	EBR	D	41.8	0.753	0.27	263
EB Approach	C	27.7	-	-	-	EB Approach	D	40.1	-	-	-
WBL	B	17.8	0.321	0.18	62	WBL	C	22.4	0.397	0.20	71
WBT	C	21.6	0.429	0.17	169	WBT	C	29.7	0.588	0.20	203
WBR	B	18.4	0.096	0.09	31	WBR	C	27.2	0.330	0.28	99
WB Approach	C	20.7	-	-	-	WB Approach	C	28.2	-	-	-
NBL	C	20.5	0.136	0.09	16	NBL	B	19.7	0.169	0.07	13
NBT	B	14.6	0.020	0.01	7	NBT	B	11.3	0.045	0.03	16
NBR	B	12.2	0.217	0.39	69	NBR	A	8.9	0.185	0.30	55
NB Approach	B	13.5	-	-	-	NB Approach	B	10.7	-	-	-
SBT	C	28.4	0.784	0.29	290	SBT	D	46.7	0.932	0.51	508
SB Approach	C	28.4	-	-	-	SB Approach	D	46.7	-	-	-
Intersection	**C**	**24.1**	-	-	-	**Intersection**	**D**	**35.3**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) during the 7:00-8:00 AM peak hour will operate with level-of-service D or better under the forecasted 2047 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade one LOS from LOS B to LOS C and LOS C to LOS D with the addition of the site generated traffic. The westbound approach LOS remained unchanged. The westbound left and right turn movements were found to degrade from LOS B to LOS C. The northbound approach and movements were not degraded with the addition of the site generated traffic. The southbound approach and movements were found to degrade from LOS C to LOS D. The overall intersection LOS was found to degrade from LOS C to LOS D with the addition of the sited generated traffic.

Table 4.22 - 2047 8:15-9:15 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & East Aurora Road)

Intersection #3	2047 No-Build Conditions 815-915 AM				Signal Control (80 Sec)	Intersection #3	2047 Build Conditions 815-915 AM				Signal Control (80 Sec)
Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	11.6	0.042	0.05	9	EBL	C	20.4	0.164	0.17	30
EBT	B	16.0	0.330	0.15	147	EBT	C	32.1	0.595	0.23	227
EBR	B	16.1	0.332	0.14	138	EBR	C	32.4	0.598	0.22	214
EB Approach	B	15.9	-	-	-	EB Approach	C	31.2	-	-	-
WBL	B	10.6	0.224	0.13	45	WBL	C	20.3	0.365	0.21	73
WBT	B	12.8	0.281	0.11	111	WBT	C	26.7	0.516	0.19	186
WBR	B	11.4	0.086	0.08	28	WBR	C	26.2	0.371	0.34	120
WB Approach	B	12.2	-	-	-	WB Approach	C	25.6	-	-	-
NBL	C	26.3	0.067	0.04	8	NBL	B	19.4	0.067	0.03	6
NBT	C	22.4	0.074	0.04	22	NBT	B	12.9	0.084	0.05	30
NBR	B	19.1	0.244	0.41	75	NBR	A	9.9	0.162	0.27	49
NB Approach	C	20.3	-	-	-	NB Approach	B	11.4	-	-	-
SBT	C	33.0	0.660	0.18	180	SBT	C	28.2	0.817	0.34	344
SB Approach	C	33.0	-	-	-	SB Approach	C	28.2	-	-	-
Intersection	**B**	**17.2**	-	-	-	**Intersection**	**C**	**26.6**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) during the 8:15-9:15 AM peak hour will operate with level-of-service C or better under the forecasted 2047 No-Build and Build scenarios.

The eastbound and westbound approaches and movements were found to degrade from LOS B to LOS C with the addition of the site generated traffic. The northbound approach and movements were not degraded with the addition of the site generated traffic. The southbound approach and movements remained unchanged with the addition of the sited generated traffic. The overall intersection LOS degraded from LOS B to LOS C with the addition of the sited generated traffic.

Table 4.23 - 2047 2:00-3:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & East Aurora Road)

Intersection #3	2047 No-Build Conditions 200-300 PM				Signal Control (80 Sec)	Intersection #3	2047 Build Conditions 200-300 PM				Signal Control (80 Sec)
Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	12.4	0.125	0.12	22	EBL	B	14.4	0.228	0.23	41
EBT	B	17.9	0.369	0.17	166	EBT	C	21.0	0.422	0.19	188
EBR	B	18.0	0.371	0.16	158	EBR	C	21.1	0.424	0.18	178
EB Approach	B	17.5	-	-	-	EB Approach	C	20.2	-	-	-
WBL	B	11.9	0.265	0.16	54	WBL	B	14.0	0.299	0.18	62
WBT	B	16.7	0.412	0.18	176	WBT	C	20.6	0.486	0.20	205
WBR	B	14.7	0.179	0.18	63	WBR	B	19.1	0.297	0.31	107
WB Approach	B	15.7	-	-	-	WB Approach	B	19.4	-	-	-
NBL	C	25.1	0.227	0.21	38	NBL	C	23.1	0.229	0.20	36
NBT	C	21.4	0.150	0.08	49	NBT	B	19.1	0.166	0.09	58
NBR	B	18.4	0.333	0.62	111	NBR	B	16.0	0.305	0.58	104
NB Approach	C	20.3	-	-	-	NB Approach	B	18.0	-	-	-
SBT	C	33.4	0.609	0.15	150	SBT	C	31.8	0.672	0.20	196
SB Approach	C	33.4	-	-	-	SB Approach	C	31.8	-	-	-
Intersection	**B**	**18.6**	-	-	-	**Intersection**	**C**	**20.8**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) during the 2:00-3:00 PM peak hour will operate with level-of-service C or better under the forecasted 2047 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade from LOS B to LOS C with the exception of the eastbound left turn movement. The eastbound left turn movement remained unchanged with the addition of the site generated traffic. The westbound approach and movements remained unchanged with the exception of the through movement. The westbound through movement was found to degrade from LOS B to LOS C. The northbound approach and movements were not degraded with the addition of the site generated traffic. The southbound approach and movements remained unchanged with the addition of the sited generated traffic. The overall intersection LOS degraded from LOS B to LOS C with the addition of the sited generated traffic.

Table 4.24 - 2047 3:00-4:00 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & East Aurora Road)

Intersection #3	2047 No-Build Conditions 300-400 PM				Signal Control (80 Sec)	Intersection #3	2047 Build Conditions 300-400 PM				Signal Control (90 Sec)
Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & SR 82	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
EBL	B	13.7	0.176	0.16	29	EBL	B	17.8	0.373	0.37	66
EBT	B	19.7	0.413	0.19	187	EBT	C	25.9	0.521	0.22	220
EBR	B	19.7	0.414	0.19	181	EBR	C	26.0	0.522	0.22	213
EB Approach	B	19.1	-	-	-	EB Approach	C	24.5	-	-	-
WBL	B	12.9	0.207	0.11	40	WBL	B	17.3	0.269	0.14	49
WBT	B	19.6	0.498	0.21	214	WBT	C	27.3	0.655	0.26	256
WBR	B	17.2	0.243	0.25	87	WBR	C	26.4	0.495	0.52	182
WB Approach	B	18.5	-	-	-	WB Approach	C	26.2	-	-	-
NBL	C	23.8	0.236	0.21	38	NBL	C	20.8	0.239	0.19	35
NBT	C	20.1	0.187	0.10	65	NBT	B	16.4	0.203	0.12	77
NBR	B	17.3	0.336	0.01	1	NBR	B	13.5	0.289	0.55	99
NB Approach	B	19.2	-	-	-	NB Approach	B	15.6	-	-	-
SBT	C	32.4	0.648	0.18	177	SBT	C	29.7	0.731	0.24	239
SB Approach	C	32.4	-	-	-	SB Approach	C	29.7	-	-	-
Intersection	**C**	**20.2**	-	-	-	**Intersection**	**C**	**24.4**	-	-	-

It was determined from the capacity analyses that the signalized intersection of Chamberlin Road and East Aurora Road (SR 82) during the 3:00-4:00 PM peak hour will operate with level-of-service C or better under the forecasted 2047 No-Build and Build scenarios.

The eastbound approach and movements were found to degrade from LOS B to LOS C with the exception of the eastbound left turn movement. The eastbound left turn movement remained unchanged with the addition of the site generated traffic. The westbound approach and movements were found to degrade from LOS B to LOS C with the exception of the left turn movement. The westbound left turn movement remained unchanged. The northbound approach and movements were not degraded with the addition of the site generated traffic. The southbound approach and movements were not degraded. The overall intersection LOS remained the same with the addition of the sited generated traffic.

The 2047 AM and PM peak hour comparison tables for the intersection of Chamberlin Road and East Aurora Road (SR 82) shown previously, indicate that the No-Build and Build levels-of-service, v/c ratios, and QSR results for all movements, approaches and the intersection are within the acceptable ranges as stated in the ODOT **OATS Manual** [6] and shown in *Table 1.2, Page 4*.

No improvements were found to be necessary to accommodate the site generated traffic volumes under the forecasted 2047 conditions at the intersection of Chamberlin Road and East Aurora Road (SR 82).

4.2 Auxiliary Turning Lane Warrant Analysis

It is the intent of this section of the report to evaluate the need for exclusive deceleration and turning lanes at the unsignalized site access location of Chamberlin Road and the north driveway. The turn lane warrants will be evaluated based on the following conditions:

Chamberlin Road

- Two-lane roadway
- Speed Limit = 35 miles per hour

The following table shows the results of the analysis of the need for an exclusive left and right turn lanes on Chamberlin Road at the proposed north driveway under the expected 2027 opening year Build conditions. Copies of the ODOT turn lane warrant graphs can be seen in **Appendix N**.

Table 4.25 2027 Turning Lane Warrants
(Chamberlin Road & North Driveway)

LOCATION	TURN LANE	2027 BUILD CONDITIONS			
		AM PEAK HOURS		PM PEAK HOURS	
		700 - 800	815 - 915	200 - 300	300 - 400
Chamberlin Road @ North Driveway	SB Left Turn Lane	**YES**	NO	**YES**	**YES**
	NB Right Turn Lane	NO	NO	**YES**	**YES**

The results of the turn lane analyses indicate that exclusive southbound left turn and northbound right turn lanes on Chamberlin Road at the north driveway ***ARE*** warranted under the expected 2027 opening year Build conditions.

The following table shows the results of the analysis of the need for an exclusive left and right turn lanes on Chamberlin Road at the proposed north driveway under the expected 2047 design year Build conditions. Copies of the ODOT turn lane warrant graphs can be seen in **Appendix N**.

Table 4.26 2047 Turning Lane Warrants
(Chamberlin Road & North Driveway)

LOCATION	TURN LANE	2047 BUILD CONDITIONS			
		AM PEAK HOURS		PM PEAK HOURS	
		700 - 800	815 - 915	200 - 300	300 - 400
Chamberlin Road @ North Driveway	SB Left Turn Lane	**YES**	**YES**	**YES**	**YES**
	NB Right Turn Lane	NO	NO	**YES**	**YES**

The results of the turn lane analyses indicate that exclusive southbound left turn and northbound right turn lanes on Chamberlin Road at the north driveway ***ARE*** warranted under the expected 2047 design year Build conditions.

It will be necessary to widen Chamberlin Road to accommodate the turn lanes.

4.3 Capacity & LOS at Development Access Intersection

Capacity analyses were performed for the proposed north driveway on Chamberlin Road using the procedures outlined in the computerized version of the Transportation Research Board's **Highway Capacity Manual 7TH Edition, 2025 (HCS version 8.4)**.

The driveway intersection analyses will be performed based on the driveway operating under stop sign control and include the warranted southbound left turn lane and northbound right turn lane on Chamberlin Road at the north driveway.

Build Condition - 2027 Capacity Analysis

Analyses were performed for the projected 2027 opening year conditions under the Build scenario for the north driveway to determine the future levels-of-service and delay at the site access intersection. The traffic volumes used in this analysis can be seen in **Figures 3.12 & 3.13, Appendix A**. The results of the 2027 Build analyses are shown in the following tables. Copies of the capacity worksheets are included in **Appendix O**.

Table 4.27 - 2027 AM Peak Hour Traffic Analysis Results
(Chamberlin Road & North Driveway)

Access #1	2027 Build Conditions 700-800 AM			Stop Control (1-Way)	Access #1	2027 Build Conditions 815-915 AM			Stop Control (1-Way)
Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBL	F	50.2	0.70	115	WBL	F	561.8	2.07	563
WBR	A	9.9	0.15	13	WBR	B	10.5	0.23	23
WB Approach	D	32.2	-	-	WB Approach	F	337.3	-	-
SBL	A	8.6	0.19	18	SBL	A	10.0	0.35	42
SB Approach	A	3.8	-	-	SB Approach	A	6.6	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and the north driveway during the AM peak hours will operate with level-of-service F or better under the forecasted 2027 Build scenarios.

The westbound left turn movement was found to operated with LOS F. The southbound approach and movements were found to operate with LOS A.

Table 4.28 - 2027 PM Peak Hour Traffic Analysis Results
(Chamberlin Road & North Driveway)

Access #1	2027 Build Conditions 200-300 PM			Stop Control (1-Way)	Access #1	2027 Build Conditions 300-400 PM			Stop Control (1-Way)
Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBL	C	15.3	0.17	15	WBL	D	25.7	0.39	45
WBR	B	10.5	0.17	15	WBR	B	12.0	0.28	30
WB Approach	B	12.2	-	-	WB Approach	C	16.8	-	-
SBL	A	8.3	0.07	5	SBL	A	9.1	0.14	14
SB Approach	A	2.3	-	-	SB Approach	A	3.2	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and the north driveway during the PM peak hours will operate with level-of-service D or better under the forecasted 2027 Build scenarios.

The westbound approach and movements were found to operated with LOS D or better. The southbound approach and movements were found to operate with LOS A.

The 2027 AM and PM peak hour results tables for the intersection of Chamberlin Road and the proposed north driveway shown previously, indicate that the Build levels-of-service, v/c ratios, and QSR results for all movements, approaches and the intersection are not within the acceptable ranges as stated in the ODOT **OATS Manual** [6] and shown in *Table 1.2, Page 4*.

Analyses will be performed in a later section of this report to determine what improvements will provide an acceptable level-of-service in the Build peak periods that will adhere to the acceptable ranges shown in *Table 1.2* and as stated in the **ODOT OATS Manual** [6].

Build Condition - 2047 Capacity Analysis

Analyses were performed for the projected 2047 design year conditions under the Build scenario for the north driveway to determine the future levels-of-service and delay at the site access intersection. The traffic volumes used in this analysis can be seen in **Figures 3.14 & 3.15, Appendix A**. The results of the 2047 Build analyses are shown in the following tables. Copies of the capacity worksheets are included in **Appendix P**.

Table 4.29 - 2047 AM Peak Hour Traffic Analysis Results
(Chamberlin Road & North Driveway)

Access #1	2047 Build Conditions 700-800 AM			Stop Control (1-Way)	Access #1	2047 Build Conditions 815-915 AM			Stop Control (1-Way)
Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBL	F	51.9	0.71	118	WBL	F	561.8	2.07	563
WBR	A	9.9	0.15	13	WBR	B	10.5	0.23	23
WB Approach	D	33.2	-	-	WB Approach	F	337.3	-	-
SBL	A	8.6	0.19	18	SBL	A	10.0	0.35	42
SB Approach	A	3.7	-	-	SB Approach	A	6.6	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and the north driveway during the AM peak hours will operate with level-of-service F or better under the forecasted 2047 Build scenarios.

The westbound left turn movement was found to operated with LOS F. The southbound approach and movements were found to operate with LOS A.

Table 4.30 - 2047 PM Peak Hour Traffic Analysis Results
(Chamberlin Road & North Driveway)

Access #1	2047 Build Conditions 200-300 PM			Stop Control (1-Way)	Access #1	2047 Build Conditions 300-400 PM			Stop Control (1-Way)
Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBL	C	15.7	0.17	15	WBL	D	26.7	0.40	48
WBR	B	10.6	0.17	15	WBR	B	12.1	0.29	30
WB Approach	B	12.4	-	-	WB Approach	C	17.2	-	-
SBL	A	8.3	0.07	5	SBL	A	9.1	0.14	14
SB Approach	A	2.2	-	-	SB Approach	A	3.2	-	-

It was determined from the capacity analyses that the unsignalized intersection of Chamberlin Road and the north driveway during the PM peak hours will operate with level-of-service D or better under the forecasted 2047 Build scenarios.

The westbound approach and movements were found to operated with LOS D or better. The southbound approach and movements were found to operate with LOS A.

The 2047 AM and PM peak hour results tables for the intersection of Chamberlin Road and the proposed north driveway shown previously, indicate that the Build levels-of-service, v/c ratios, and QSR results for all movements, approaches and the intersection are not within the acceptable ranges as stated in the ODOT **OATS Manual** [6] and shown in *Table 1.2, Page 4*.

Analyses will be performed in a later section of this report to determine what improvements will provide an acceptable level-of-service in the Build peak periods that will adhere to the acceptable ranges shown in *Table 1.2* and as stated in the **ODOT OATS Manual** [6].

4.4 Improvements for Capacity & LOS

Chamberlin Road & Ravenna Road

Traffic analyses for the 2027 and 2047 No-Build and Build conditions revealed issues at the intersection of Chamberlin Road and Ravenna Road where the northbound left turn lane QSR failed to meet the operational goals shown in *Table 1.2*. A QSR greater than 1.0 indicates the storage length of the lane may not be adequate for the forecasted conditions.

Certain improvements were analyzed in order to mitigate the QSR that failed to meet the operational goal. The analysis will be based on the 2047 Build conditions in order to serve the expected traffic volumes over the design life of the facility.

The following improvements were found to mitigate the conditions under the forecasted 2047 No-Build and Build conditions.

- Construct a northbound right turn lane.
    - The north approach would consist a shared through/left turn lane and an exclusive right turn lane after construction.
- Upgrade the traffic signal to include the use of a northbound right turn overlap in the signal phasing. The overlap would permit the northbound right turn movement during the protected westbound left-turn phase.
    - The use of an overlap would require the existing 3-section traffic signal head on the right and facing northbound traffic be replaced with a 5-section traffic signal head. A design level review would be necessary to ensure the traffic signal mast arm can support the increased weight of a 5-section traffic signal head.

The following tables show a comparison of the capacity analysis results with the recommended lane use and traffic signal improvements at the intersection on the expected 2047 conditions. Copies of the capacity worksheets for the intersections are included in **Appendix Q.**

Table 4.31 - 2047 700-800 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	No-Build - 700-800 AM Existing Conditions		Build - 700-800 AM Existing Conditions		Build - 700-800 AM Improvements	
Chamberlin & Ravenna	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
EB Approach	B	12.7	C	25.3	C	24.9
WB Approach	B	13.5	C	23.1	C	24.5
NB Approach	C	30.5	C	26.7	C	22.5
SB Approach	C	29.6	C	23.9	C	26.3
Intersection	**B**	**18.6**	**C**	**24.3**	**C**	**24.4**

Table 4.32 - 2047 815-915 AM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	No-Build - 815-915 AM Existing Conditions		Build - 815-915 AM Existing Conditions		Build - 815-915 AM Improvements	
Chamberlin & Ravenna	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
EB Approach	B	11.6	C	20.7	C	23.1
WB Approach	A	9.8	B	17.7	C	23.2
NB Approach	C	32.6	C	29.3	C	21.7
SB Approach	C	31.2	C	26.2	C	25.1
Intersection	**B**	**17.3**	**C**	**21.8**	**C**	**23.0**

Table 4.33 - 2047 200-300 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	No-Build - 200-300 PM Existing Conditions		Build - 200-300 PM Existing Conditions		Build - 200-300 PM Improvements	
Chamberlin & Ravenna	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
EB Approach	B	12.5	B	16.1	B	13.0
WB Approach	B	11.5	B	14.6	B	11.7
NB Approach	C	31.8	C	29.2	C	26.4
SB Approach	C	29.6	C	26.0	C	28.0
Intersection	**B**	**17.3**	**B**	**19.6**	**B**	**17.0**

Table 4.34 - 2047 300-400 PM Peak Hour Traffic Analysis Comparison (Chamberlin Road & Ravenna Road)

Intersection #1	No-Build - 300-400 PM Existing Conditions		Build - 300-400 PM Existing Conditions		Build - 300-400 PM Improvements	
Chamberlin & Ravenna	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
EB Approach	B	15.2	C	28.5	B	19.7
WB Approach	B	13.4	C	21.2	B	15.8
NB Approach	C	30.6	C	31.3	C	22.2
SB Approach	C	28.0	C	21.7	C	24.1
Intersection	**B**	**18.6**	**C**	**26.5**	**B**	**19.5**

Chamberlin Road & North Driveway

Traffic analyses for the 2047 Build conditions revealed issues at the intersection of Chamberlin Road and the proposed north driveway where the movement and approach levels-of-service failed to meet the operational goals shown in *Table 1.2*.

Certain improvements were analyzed in order to mitigate the levels-of-service that failed to meet operational goals. The analysis will be based on the 2047 Build conditions in order to serve the expected traffic volumes over the design life of the facility.

The following improvements were found to mitigate the conditions under the forecasted 2047 Build conditions.

- Construct a single lane roundabout **-OR-** Install traffic signal control.

The following tables shows the capacity analysis results of the roundabout improvement at the intersection on the expected 2047 Build conditions. Copies of the capacity worksheets for the intersections are included in **Appendix Q.**

Table 4.35 - 2047 Roundabout AM Peak Hour Traffic Analysis Results (Chamberlin Road & North Driveway)

Access #1	2047 Build Conditions 700-800 AM			Roundabout	Access #1	2047 Build Conditions 815-915 AM			Roundabout
Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBR	A	5.6	0.26	25	WBR	A	7.9	0.43	55
WB Approach	A	5.6	-	-	WB Approach	A	7.9	-	-
NBR	A	6.7	0.31	34	NBR	B	12.5	0.53	90
NB Approach	A	6.7	-	-	NB Approach	B	12.5	-	-
SBR	A	8.9	0.50	70	SBR	B	13.0	0.63	115
SB Approach	A	8.9	-	-	SB Approach	B	13.0	-	-
Intersection	**A**	**7.5**	**-**	**-**	**Intersection**	**B**	**11.3**	**-**	**-**

Table 4.36 - 2047 Roundabout PM Peak Hour Traffic Analysis Results (Chamberlin Road & North Driveway)

Access #1	2047 Build Conditions 200-300 PM			Roundabout	Access #1	2047 Build Conditions 300-400 PM			Roundabout
Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)	Chamberlin & North	LOS	Delay (sec/veh)	v/c	95th %tile Queue (ft)
WBR	A	5.3	0.19	18	WBR	A	7.4	0.33	38
WB Approach	A	5.3	-	-	WB Approach	A	7.4	-	-
NBR	A	5.9	0.31	34	NBR	A	8.8	0.47	71
NB Approach	A	5.9	-	-	NB Approach	A	8.8	-	-
SBR	A	5.3	0.26	25	SBR	A	6.3	0.34	38
SB Approach	A	5.3	-	-	SB Approach	A	6.3	-	-
Intersection	**A**	**5.6**	**-**	**-**	**Intersection**	**A**	**7.6**	**-**	**-**

Conditions at the intersection of Chamberlin Road and the proposed north driveway were determined to meet the operational goals shown in *Table 1.2* under the forecasted 2047 peak hour Build conditions with single lane roundabout control.

The following tables shows the capacity analysis results of the traffic signal control improvement at the intersection on the expected 2049 Build conditions. The previously discussed turn lanes will be included in the analysis. Copies of the capacity worksheets for the intersections are included in **Appendix Q.**

Table 4.37 - 2047 Traffic Signal AM Peak Hour Traffic Analysis Results (Chamberlin Road & North Driveway)

Access #1	2047 Build Conditions 700-800 AM				Signal Control (80 Sec)	Access #1	2047 Build Conditions 815-915 AM				Signal Control (80 Sec)
Chamberlin & North	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & North	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
WBL	D	35.3	0.718	0.45	136	WBL	C	33.6	0.832	0.73	220
WBR	C	27.3	0.384	0.31	93	WBR	C	20.1	0.351	0.00	1
WB Approach	C	31.7	-	-	-	WB Approach	C	28.1	-	-	-
NBT	A	8.9	0.183	0.07	70	NBT	B	15.3	0.276	0.12	119
NBR	A	8.7	0.147	0.16	47	NBR	B	16.1	0.330	0.42	126
NB Approach	A	8.8	-	-	-	NB Approach	B	15.7	-	-	-
SBL	A	5.2	0.284	0.18	54	SBL	A	8.6	0.531	0.46	138
SBT	A	4.1	0.237	0.06	60	SBT	A	5.3	0.170	0.05	52
SB Approach	A	4.6	-	-	-	SB Approach	A	7.5	-	-	-
Intersection	**B**	**12.6**	-	-	-	**Intersection**	**B**	**16.3**	-	-	-

Table 4.38 - 2047 Traffic Signal PM Peak Hour Traffic Analysis Results (Chamberlin Road & North Driveway)

Access #1	2047 Build Conditions 200-300 PM				Signal Control (80 Sec)	Access #1	2047 Build Conditions 300-400 PM				Signal Control (80 Sec)
Chamberlin & North	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)	Chamberlin & North	LOS	Delay (sec/veh)	v/c	QSR	95th %tile Queue (ft)
WBL	C	32.3	0.318	0.18	55	WBL	C	31.5	0.420	0.28	85
WBR	C	28.4	0.414	0.32	96	WBR	C	27.8	0.555	0.50	150
WB Approach	C	29.8	-	-	-	WB Approach	C	29.1	-	-	-
NBT	A	8.9	0.254	0.10	100	NBT	B	11.3	0.358	0.16	157
NBR	A	7.9	0.118	0.12	36	NBR	A	9.9	0.209	0.24	71
NB Approach	A	8.6	-	-	-	NB Approach	B	10.8	-	-	-
SBL	A	4.8	0.108	0.06	17	SBL	A	6.1	0.206	0.11	33
SBT	A	3.7	0.172	0.04	41	SBT	A	4.4	0.205	0.06	56
SB Approach	A	4.0	-	-	-	SB Approach	A	5.0	-	-	-
Intersection	**B**	**11.9**	-	-	-	**Intersection**	**B**	**13.6**	-	-	-

Conditions at the intersection of Chamberlin Road and the proposed north driveway were determined to meet the operational goals shown in *Table 1.2* under the forecasted 2047 peak hour Build conditions with traffic signal control.

Traffic Signal Control Warrants

The expected traffic conditions at the intersection of Chamberlin Road and the proposed north driveway will be analyzed and compared to the criteria established by the **OMUTCD** [(2)] and professional engineering judgement to determine if traffic signal control is a viable improvement and warranted at the intersection under the expected 2027 and 2047 Build conditions.

The **OMUTCD** [2] provides nine (9) sets of criteria, called warrants for the justification of traffic signal control. The warrants are;

- Warrant 1 - Eight Hour Vehicular Volume
- Warrant 2 - Four Hour Vehicular Volume
- Warrant 3 - Peak Hour Vehicular Volume
- Warrant 4 - Pedestrian Volume
- Warrant 5 - School Crossing
- Warrant 6 - Coordinated Signal System
- Warrant 7 - Crash Experience
- Warrant 8 - Roadway Network
- Warrant 9 - Intersection Near a Grade Crossing

The collected data and forecasted traffic volumes were analyzed and compared to the thresholds established by the criteria from the **OMUTCD** [2] for Warrants #1, #2, and #3. There are no sidewalks in the study area therefore the pedestrian volume (#4) and school crossing (#5) warrants will not be evaluated. The remaining warrants were not found applicable to the intersection conditions. The ODOT Signal Warrant Spreadsheet will be used to perform the analyses.

The **OMUTCD** [2] provides an "Option" that if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, or the speed limit exceeds 40 miles per hour the minimum thresholds may be reduced to 70% levels. The minimum thresholds will not be reduced as part of this signal warrant analysis

The previously discussed growth rates (*Section 3.2*) were applied to the collected nine hour traffic count data for the intersections in order to determine the forecasted 2027 and 2047 conditions. The design hour factors were not applied to hourly volumes to determine the future volumes for use in the traffic signal warrant analysis. The volume of site generated traffic at the intersections were determined using the peak hour percentages of the site generated traffic.

Copies of the ODOT traffic signal warrant analysis excel workbook including the forecast Build condition traffic volumes can be seen in **Appendix R**.

It was determined from the evaluation of the warrants established by the **OMUTCD** [2], that a traffic signal ***is*** expected to be justified as required by the **Ohio Revised Code** based upon the forecasted 2027 Build conditions at the intersection of Chamberlin Road and the proposed north driveway. Traffic signal control can be considered a viable improvement at the intersection.

4.5 Turn Lane Length Analysis

The northbound left turn lane on Chamberlin Road at Ravenna Road was found deficient in length under the 2027 and 2047 No-Build conditions. A northbound right turn lane with modifications to the traffic signal operation were recommended to mitigate the deficiency. Analyses were performed to determine the necessary turn lane storage length in order to accommodate the forecasted northbound right turn volumes from Chamberlin Road to Ravenna Road.

The turn lane calculations will be based on the following conditions:

- Signalized
- 35 MPH Design Speed
- Condition A

The following table details the results of the turn lane length analyses based upon the highest anticipated turn volumes at the intersection under the expected 2047 Build conditions.

Table 4.39 - Turn Lane Length Analysis
(Chamberlin Road & Ravenna Road)

Movement Direction	DHV	No. of Lanes	Cycles/ Hour	Average Veh/ Cycle/ Lane	Design Speed (mph)	Figure 401-10 Queue Length (ft)	Fig. 401-9 Condition A	Backup Length (ft)	Turn Lane Length (ft)
NB RT	381	1	45	8.47	35	350	350		350
NB LT/T	180	1	45	4.00	35	175		175	

Analyses were performed to determine the necessary turn lane storage length in order to accommodate the recommended turn lanes at the intersection of Chamberlin Road and the proposed north driveway during the 2027 and 2047 Build conditions under traffic signal control.

The turn lane calculations will be based on the following conditions:

- Signalized
- Chamberlin Road - 35 MPH Design Speed
- North Driveway - 25 MPH Design Speed
- Condition A

The following table details the results of the turn lane length analyses based upon the highest anticipated turn volumes at the intersection under the expected 2047 Build conditions.

Table 4.40 - Turn Lane Length Analysis
(Chamberlin Road & North Driveway)

Movement Direction	DHV	No. of Lanes	Cycles/ Hour	Average Veh/ Cycle/ Lane	Design Speed (mph)	Figure 401-10 Queue Length (ft)	Fig. 401-9 Condition A	Backup Length (ft)	Turn Lane Length (ft)
SB LT	358	1	45	7.96	35	325	325		325
SB T	280	1	45	6.22	35	275		275	
NB RT	185	1	45	4.11	35	200	200		275
NB T	303	1	45	6.73	35	275		275	
WB LT	249	1	45	5.53	25	250	250		250
WB RT	184	1	45	4.09	25	200		200	

4.6 Improvements to Accommodate Study Area Traffic

Recommended Improvements to Serve Future Conditions without the School

The following improvements were recommended to accommodate the forecasted 2027 and 2047 No-Build conditions at the study area intersections:

Chamberlin Road & Ravenna Road

- Construct a 350 foot northbound right turn lane.
    - The north approach would consist a shared through/left turn lane and an exclusive right turn lane after construction.
- Upgrade the traffic signal to include the use of a northbound right turn overlap in the signal phasing. The overlap would permit the northbound right turn movement during the protected westbound left-turn phase.
    - The use of an overlap would require the existing 3-section traffic signal head on the right and facing northbound traffic be replaced with a 5-section traffic signal head. A design level review would be necessary to ensure the traffic signal mast arm can support the increased weight of a 5-section traffic signal head.

No improvements were recommended at the remaining study area intersections to accommodate the forecasted 2027 and 2047 No-Build conditions

Recommended Improvements to Mitigate the Traffic Associated with the School

No additional improvements were recommended to accommodate the forecasted 2027 and 2047 Build conditions at the study area intersections.

Development Access Recommendations

The following lane use and traffic control is recommended at the development access location along Chamberlin Road:

- Construct a single-lane roundabout.

-OR-

- Install traffic signal control.
  - Signal operation should included three signal phases. The first phase is all southbound movements with the left turn movement made during the green arrow indication (protected movement). The phase is all southbound and northbound movements where the left turn movement is made during a green ball indication when there is a gap in the opposing through traffic movements (permissive movement). The last phase is all westbound movements where the left turn movement is made during a green ball indication. The signal operation should include a westbound right-turn movement overlap that permits the westbound right turn movement during the protected southbound left-turn phase.
- Construct a 325 foot southbound left turn lane.
- Construct a 275 foot northbound right turn lane.
- Construct a 250 foot westbound left turn lane.

The recommended lane use and traffic control for the study area to accommodate expected traffic volumes can be seen in **Figure 4.1, Appendix A**.

Chapter 5
Conclusions

Based on the results of the analyses, we offer the following conclusions and recommendations:

5.1 This Traffic Impact Study (TIS) has been prepared at the request of the Twinsburg City School District for a proposed elementary school in the City of Twinsburg, Summit County, Ohio. The proposed elementary school will be located in an area between Chamberlin Road to the west, Ravenna Road to the north and east, and Chamberlin Trail to the south.

5.2 The proposed elementary school is expected to serve students from pre-kindergarten through 6th grade with total student population of 2,146 students.

5.3 The new elementary school will consolidate the following three schools:

- Wilcox Primary School (PK - 1st Grade)
- Samuel Bissell Elementary School (2nd & 3rd Grade)
- George G. Dodge Intermediate School (4th - 6th Grade)

5.4 The new elementary school is proposed with two access locations. The first location is a full access driveway along the east side of Chamberlin Road and north of Chamberlin Trail. The driveway would permit all ingress and egress movements. The driveway would serve all entering and entering traffic for the school with the exception of the exiting bus traffic. The second location would be an exit only driveway to Chamberlin Trail. The exit only driveway would be for bus traffic only. **Figure 1.2, Appendix A** shows the site plan for the proposed school.

5.5 The new school is anticipated to have an opening day in 2027.

5.6 The AM hours of 7:00 to 8:00 and 8:15 to 9:15 were analyzed based on the peak hours of the roadway and the start times for each grade level. The 7:00 AM to 8:00 AM hour coincides with the start time for grades 4th through 6th. The 8:15 AM to 9:15 AM hour coincides with the start times for grades PK through 3rd.

5.7 The PM hours of 2:00 to 3:00 and 3:00 to 4:00 were analyzed based one the dismissal times for each grade level. The 2:00 PM to 3:00 PM hour coincides with the dismissal time for grades 4th through 6th. The 3:00 PM to 4:00 PM hour coincides with the dismissal times for grades PK through 3rd.

5.8 The proposed elementary school is expected to generate the following hourly traffic volumes during the peak period as shown in the table below:

ITE TRIP GENERATION			WEEKDAY TRIP ENDS			
ITE CODE	DESCRIPTION	SIZE (Sq. Ft.)	AM Peak Hour of Generator		PM Peak Hour of Generator	
520	**Elementary School**	**2,146**	**869**	**741**	**444**	**522**
	Grades 4- 6 (AM: 7:00-8:00 / PM: 2:00-3:00)		326	278	167	196
	Grades PK-3 (AM: 8:15-9:15 / PM: 3:00-4:00)		543	463	277	326
TOTAL NON-PASS-BY TRIPS			**1610**		**966**	

5.9 The ODOT **State Highway Access Management Manual** [7] requires that twenty year design hour traffic volumes be analyzed for a proposed development when the number of generated trips is greater than 500 in the peak hour. The proposed school is expected to generate a total of 1,610 driveway trips in the AM peak hours and a total of 966 driveway trips in the PM peak hours. Therefore, the year 2047 was analyzed for the twenty year design hour conditions from the opening year of the new elementary school.

5.10 The following improvements were recommended to accommodate the forecasted 2027 and 2047 No-Build conditions at the intersection of Chamberlin Road and Ravenna Road:

- Construct a 350 foot northbound right turn lane.
    - The north approach would consist a shared through/left turn lane and an exclusive right turn lane after construction.
- Upgrade the traffic signal to include the use of a northbound right turn overlap in the signal phasing. The overlap would permit the northbound right turn movement during the protected westbound left-turn phase.
    - The use of an overlap would require the existing 3-section traffic signal head on the right and facing northbound traffic be replaced with a 5-section traffic signal head. A design level review would be necessary to ensure the traffic signal mast arm can support the increased weight of a 5-section traffic signal head.

5.11 No improvements were recommended at the remaining study area intersections to accommodate the forecasted 2027 and 2047 No-Build conditions

5.12 No additional improvements were recommended to accommodate the forecasted 2027 and 2047 Build conditions at the study area intersections.

5.13 The following lane use and traffic control is recommended at the development access location along Chamberlin Road:

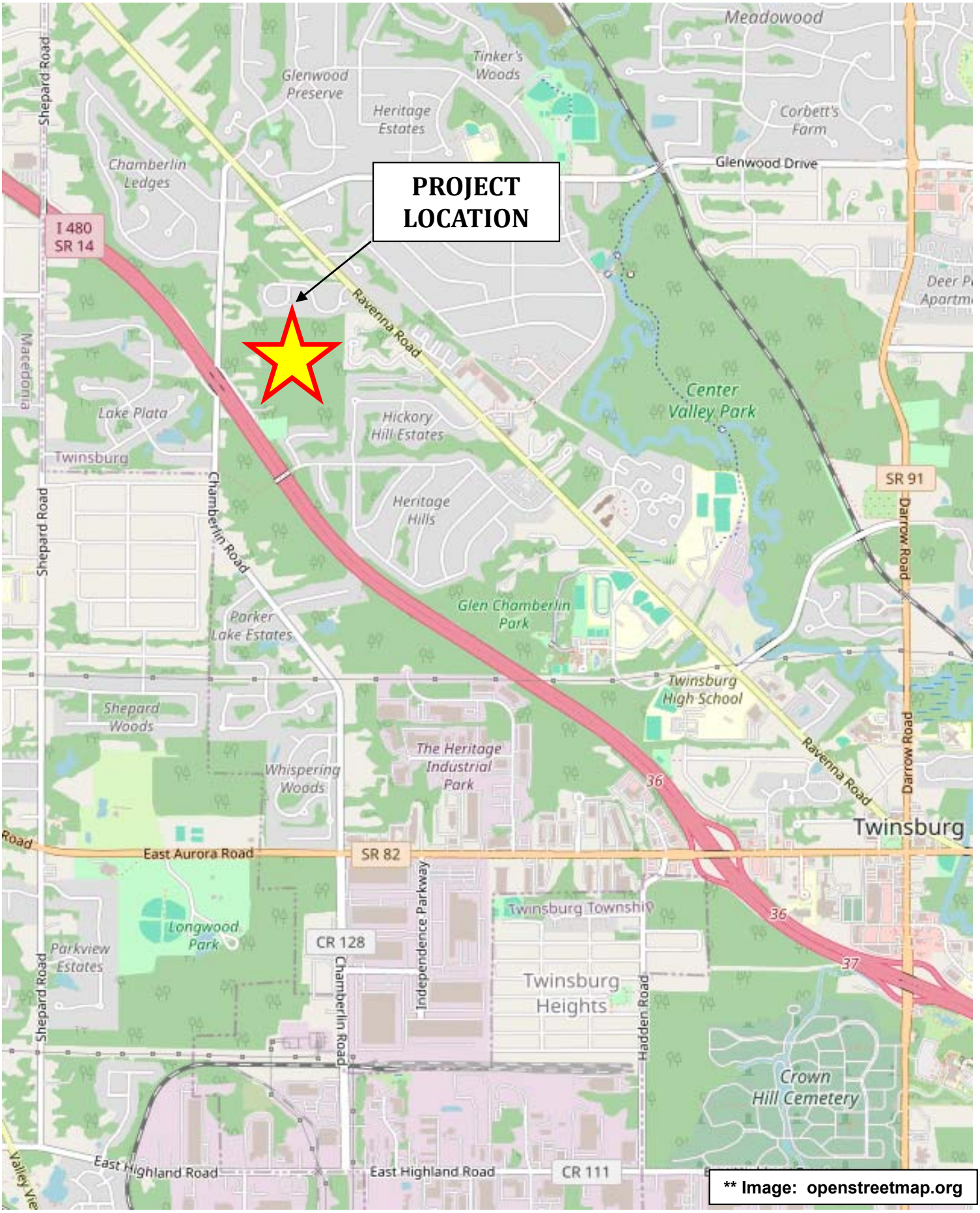
- Construct a single-lane roundabout.

-OR-

- Install traffic signal control.
  - Signal operation should included three signal phases. The first phase is all southbound movements with the left turn movement made during the green arrow indication (protected movement). The phase is all southbound and northbound movements where the left turn movement is made during a green ball indication when there is a gap in the opposing through traffic movements (permissive movement). The last phase is all westbound movements where the left turn movement is made during a green ball indication. The signal operation should include a westbound right-turn movement overlap that permits the westbound right turn movement during the protected southbound left-turn phase.
- Construct a 325 foot southbound left turn lane.
- Construct a 275 foot northbound right turn lane.
- Construct a 250 foot westbound left turn lane.

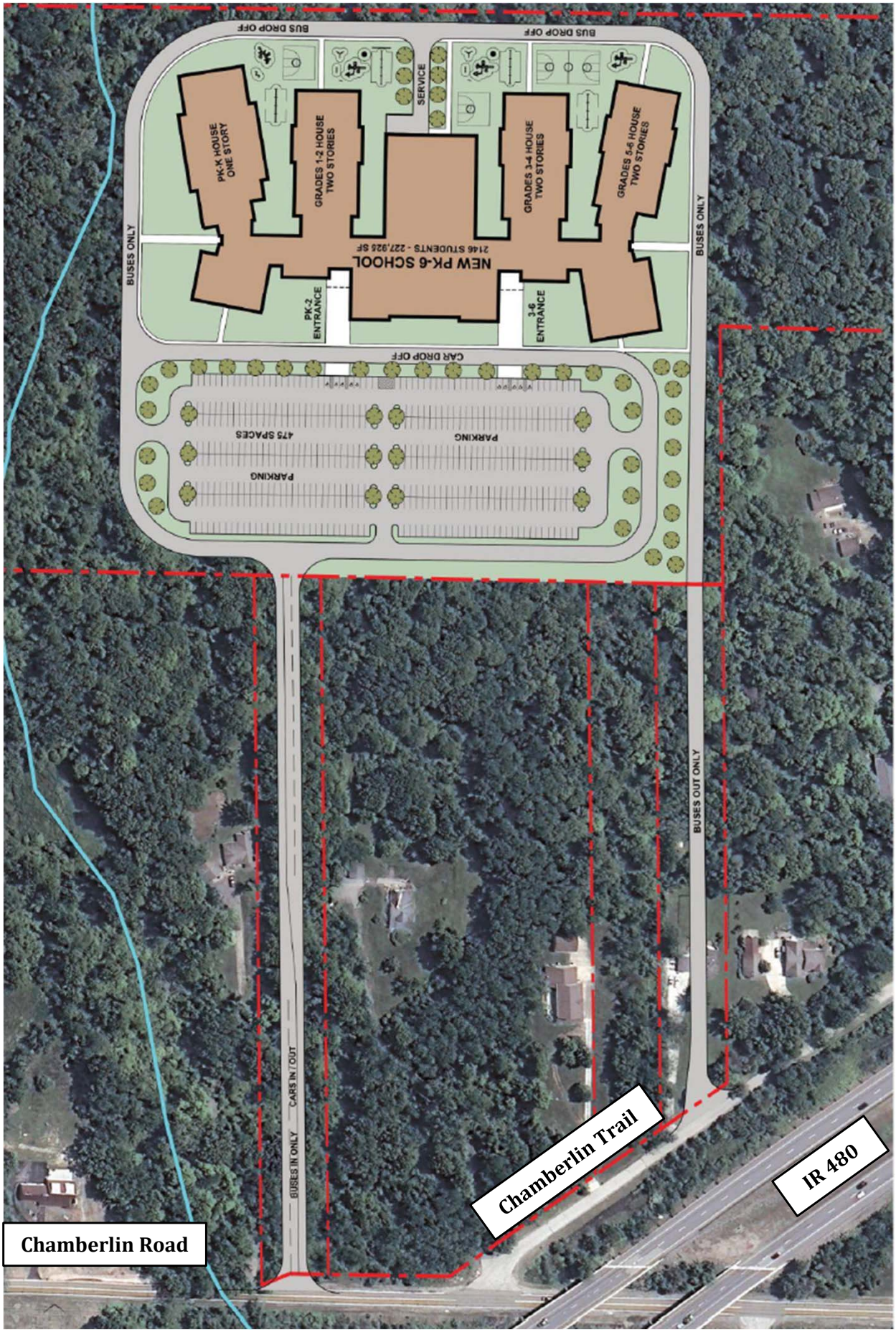
5.14 Based upon the results of the analysis in this study and the corresponding recommendations, it can be seen that the elementary school traffic can be accommodated without adversely impacting the area roadway network.

Appendix A
Figures

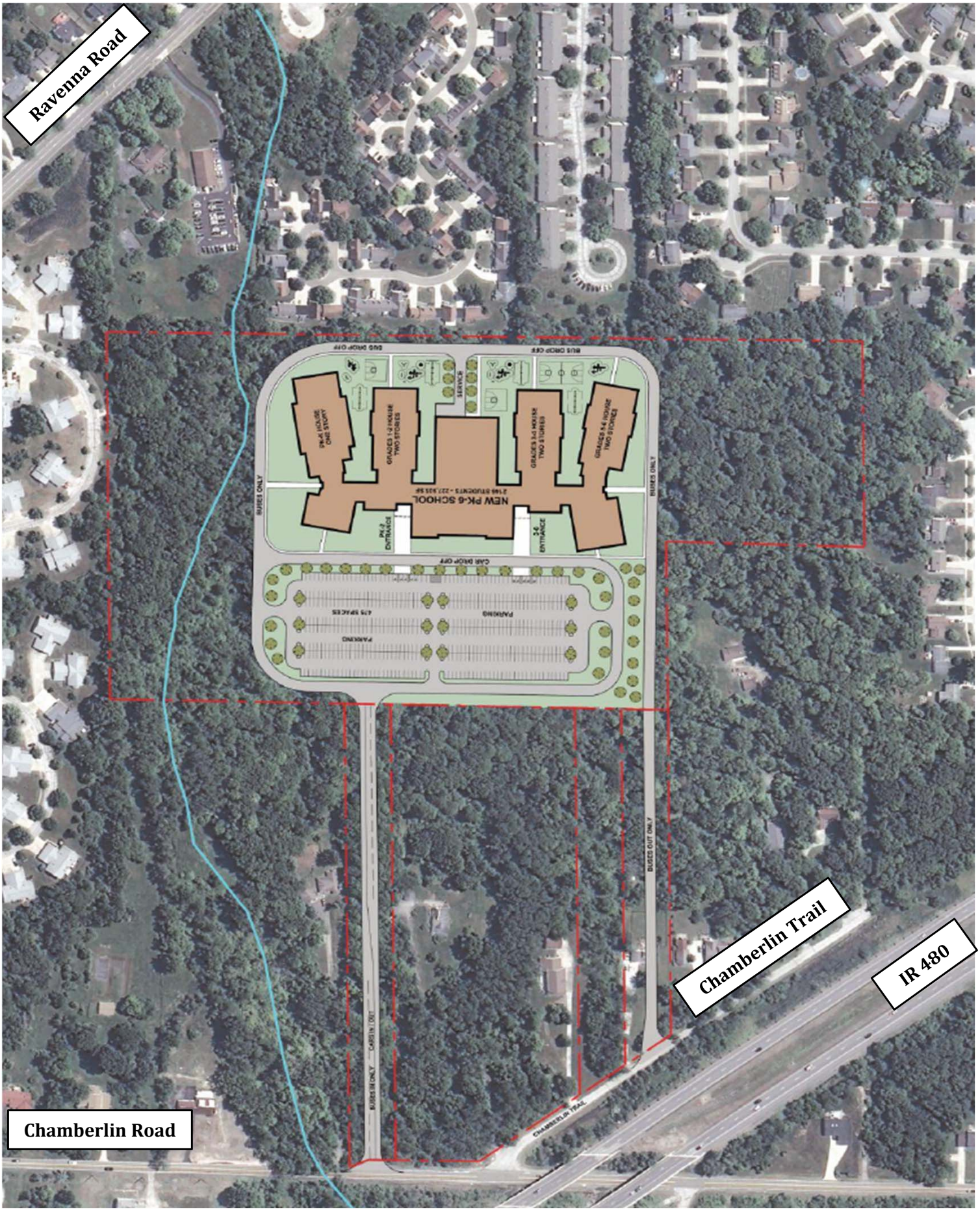


** Image: openstreetmap.org

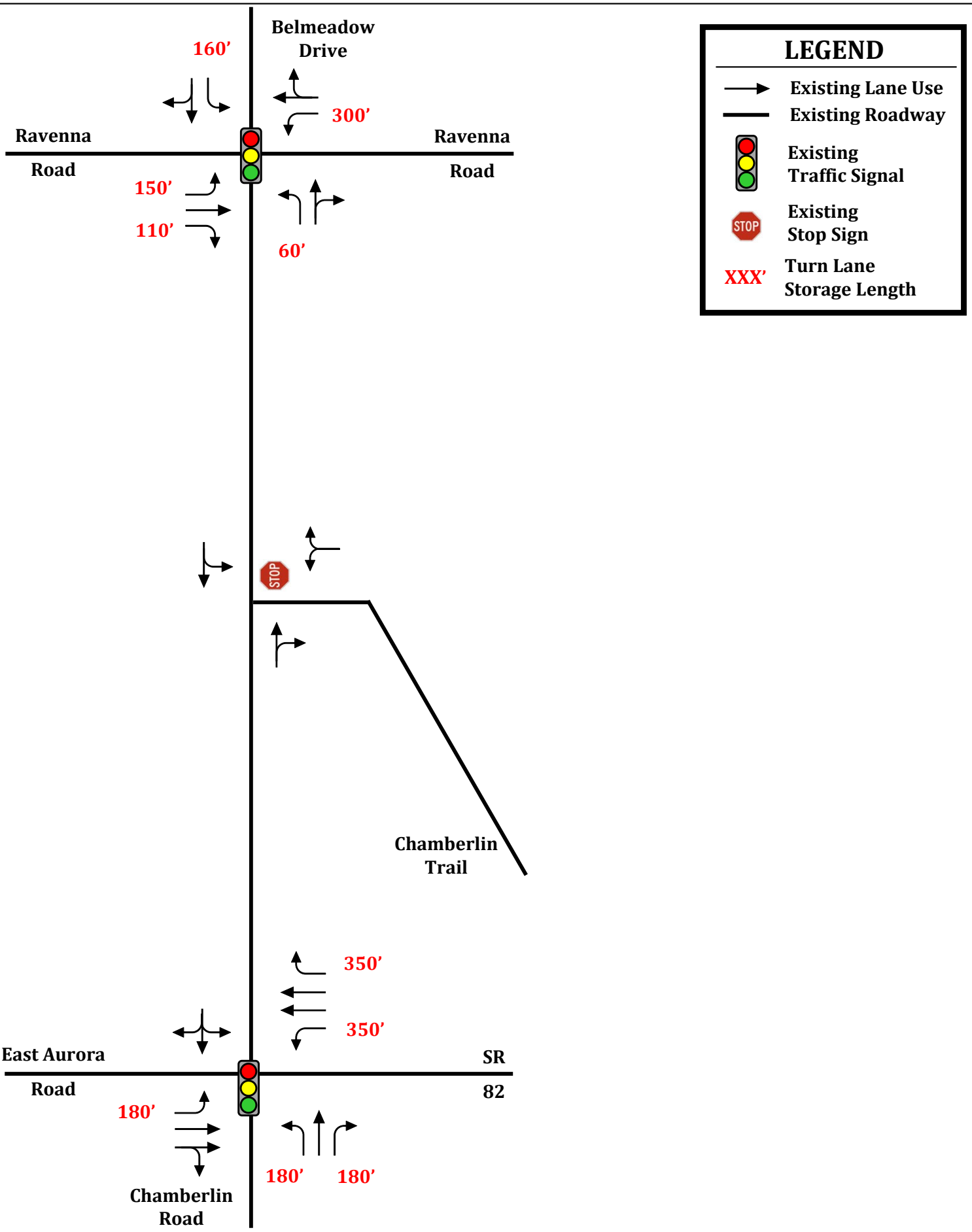
TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	**PK-6 Elementary School** **Twinsburg, Ohio** **Traffic Impact Study**	**Location Map**	**NORTH** NOT TO SCALE	**Figure: 1.1** **Appendix A**



TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	**PK-6 Elementary School** **Twinsburg, Ohio** **Traffic Impact Study**	**Site Plan**	**NORTH** NOT TO SCALE	**Figure: 1.2** **Appendix A**



TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	**PK-6 Elementary School** **Twinsburg, Ohio** **Traffic Impact Study**	**Aerial View**	**NORTH** NOT TO SCALE	**Figure: 2.1** **Appendix A**



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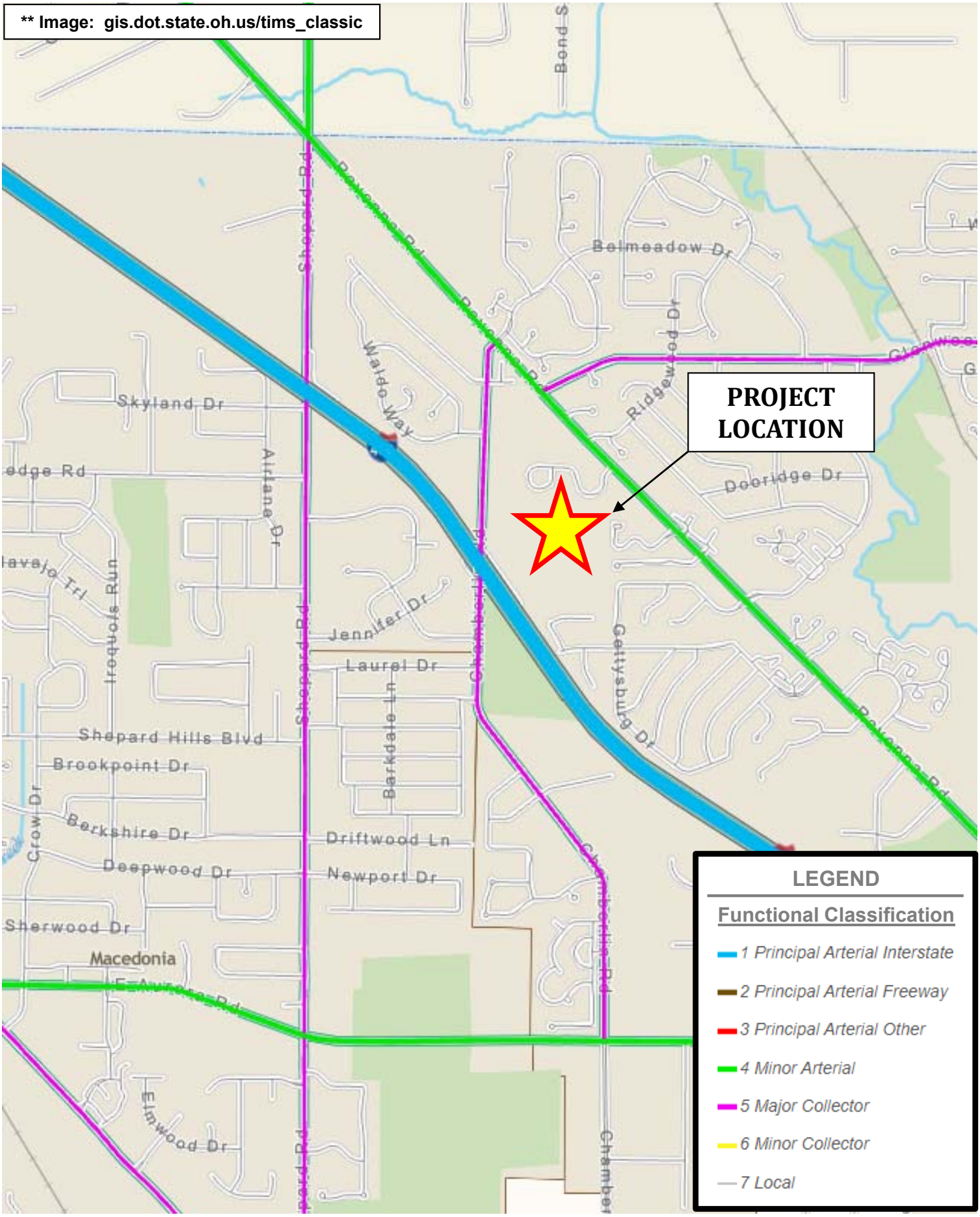

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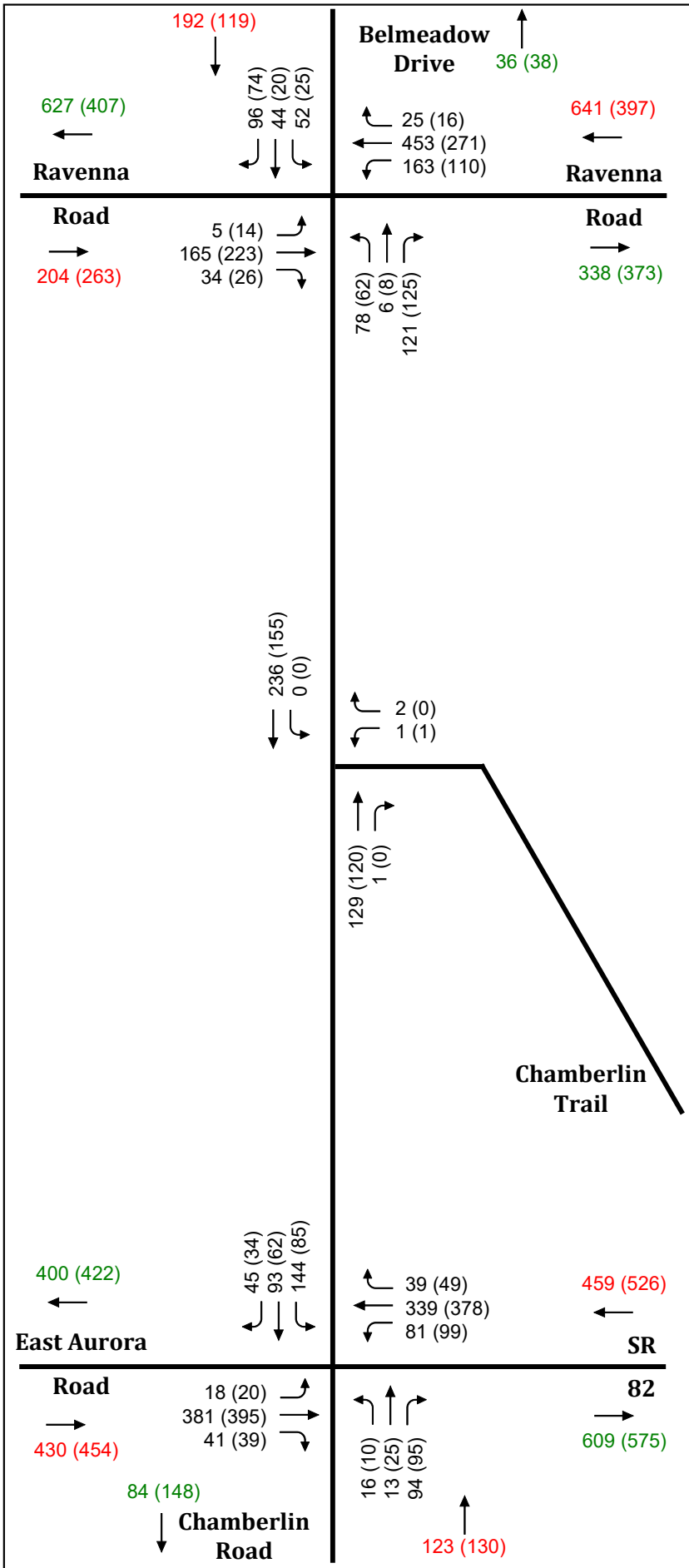
PK-6 Elementary School
Twinsburg, Ohio
Traffic Impact Study

Functional Classification
(ODOT TIMS)

NORTH
NOT TO SCALE

Figure: 2.3

Appendix A



LEGEND

XX	700-800 AM Peak Hour Traffic
(XX)	815-915 AM Peak Hour Traffic
———	Existing Roadway

RED = Entering Volumes For Trip Distributions

GREEN = Exiting Volumes For Trip Distributions

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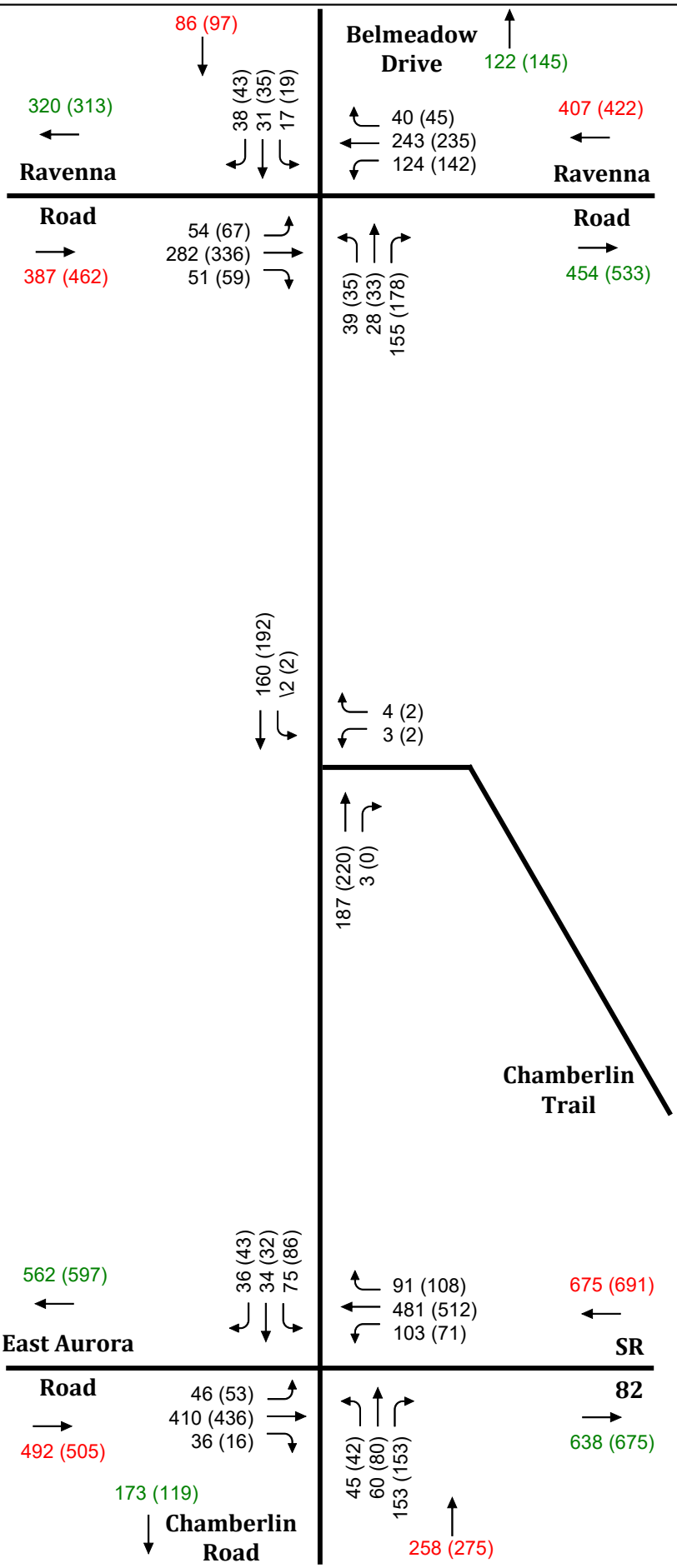
PK-6 Elementary School
Twinsburg, Ohio
Traffic Impact Study

2025 Existing
Weekday AM Peak Hour
Traffic Volumes

NORTH
NOT TO SCALE

Figure: 2.4

Appendix A



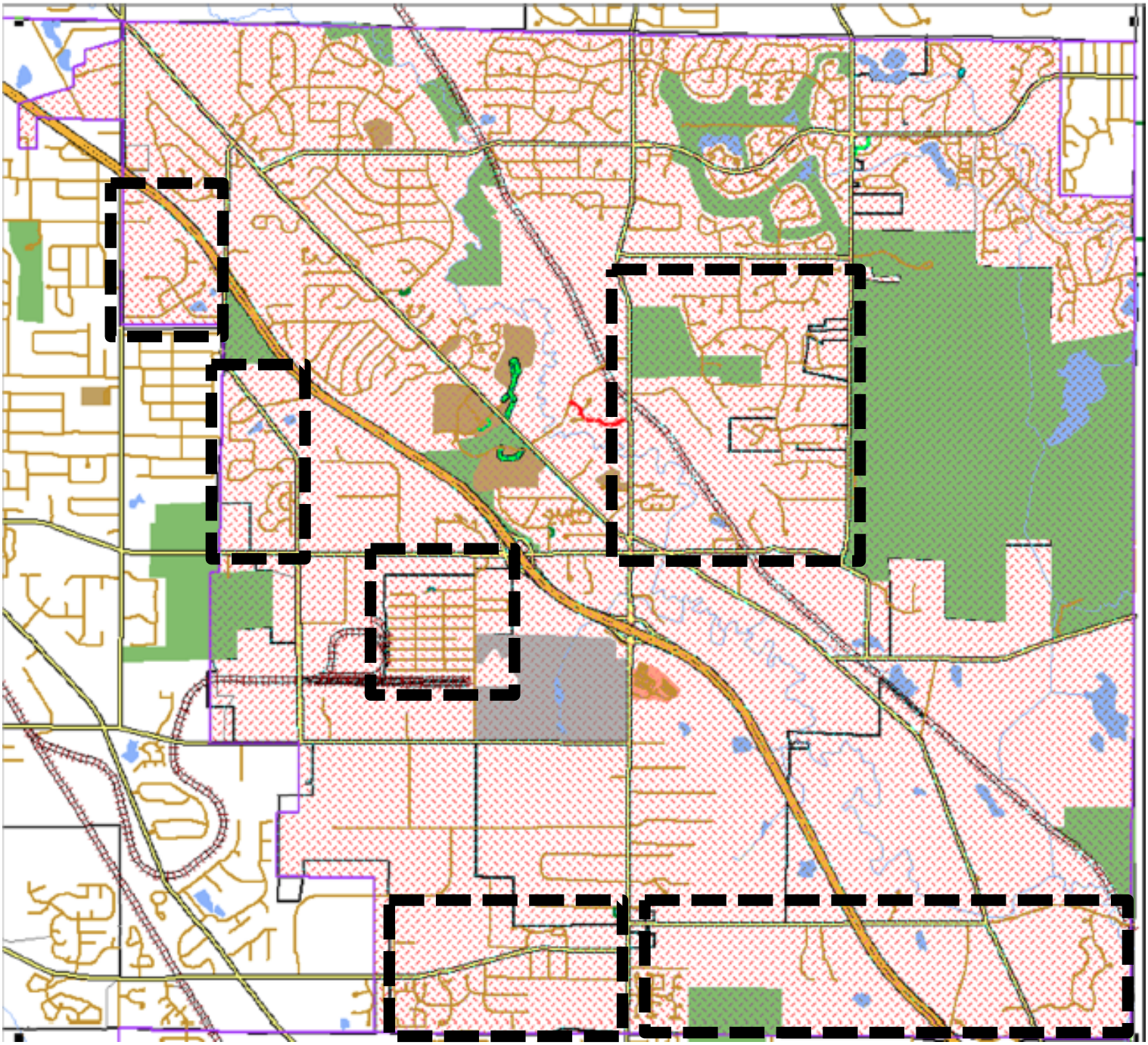
LEGEND

XX	200-300 PM Peak Hour Traffic
(XX)	300-400 PM Peak Hour Traffic
	Existing Roadway

RED = Entering Volumes For Trip Distributions

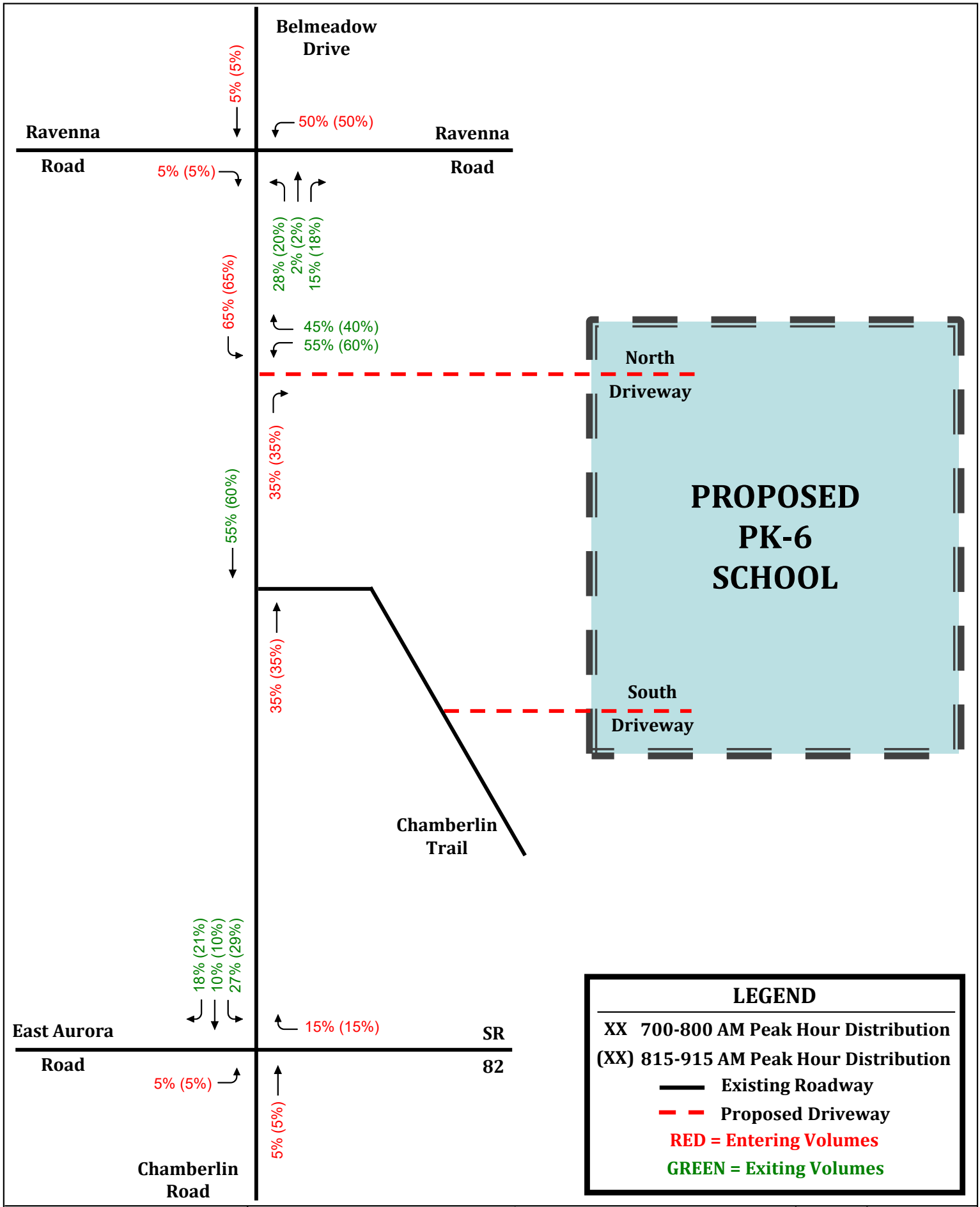
GREEN = Exiting Volumes For Trip Distributions

TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	PK-6 Elementary School Twinsburg, Ohio Traffic Impact Study	2025 Existing Weekday PM Peak Hour Traffic Volumes	NORTH NOT TO SCALE	Figure: 2.5 Appendix A

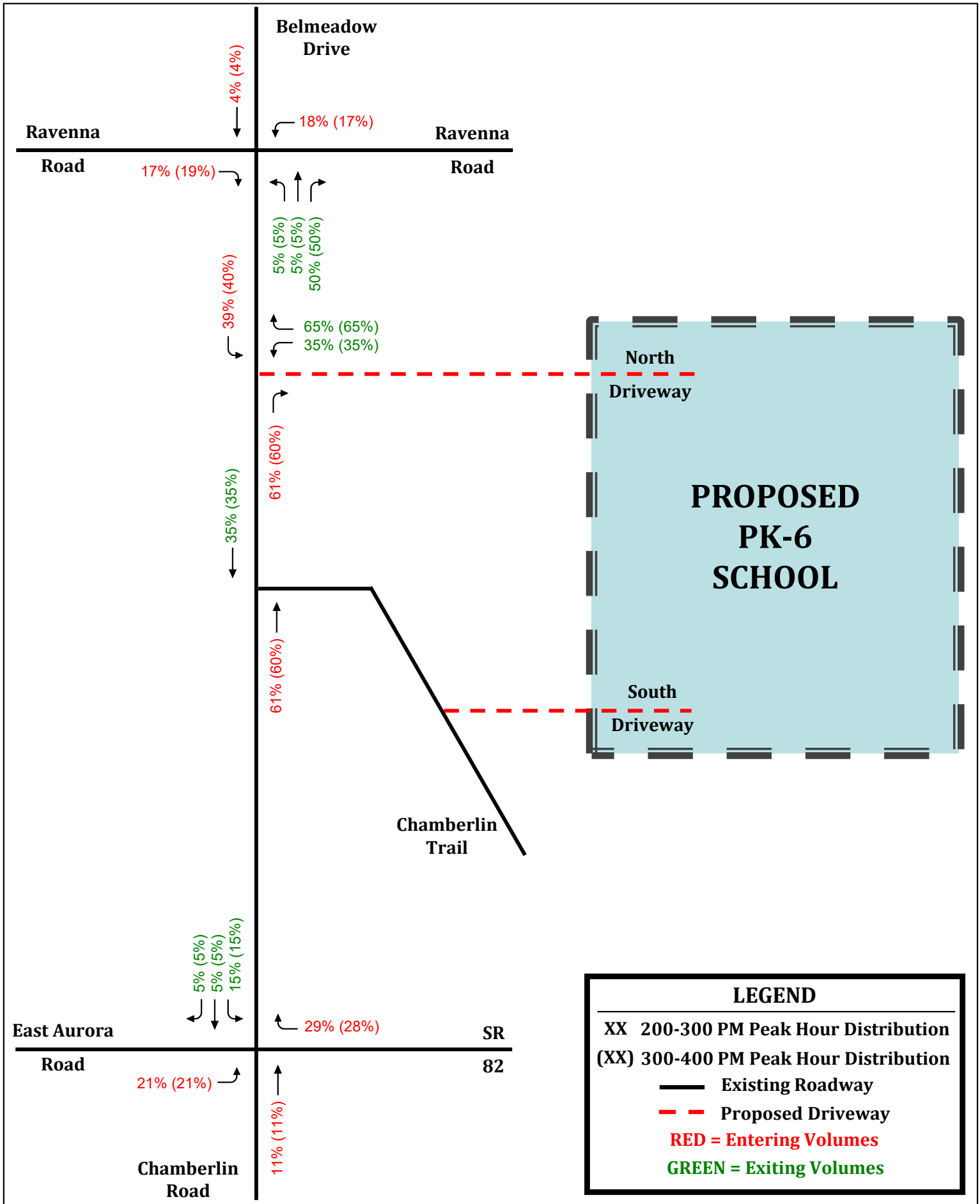


AM Peak Hour Origin via northbound Chamberlin Road.
PM Peak Hour Destination via southbound Chamberlin Road.

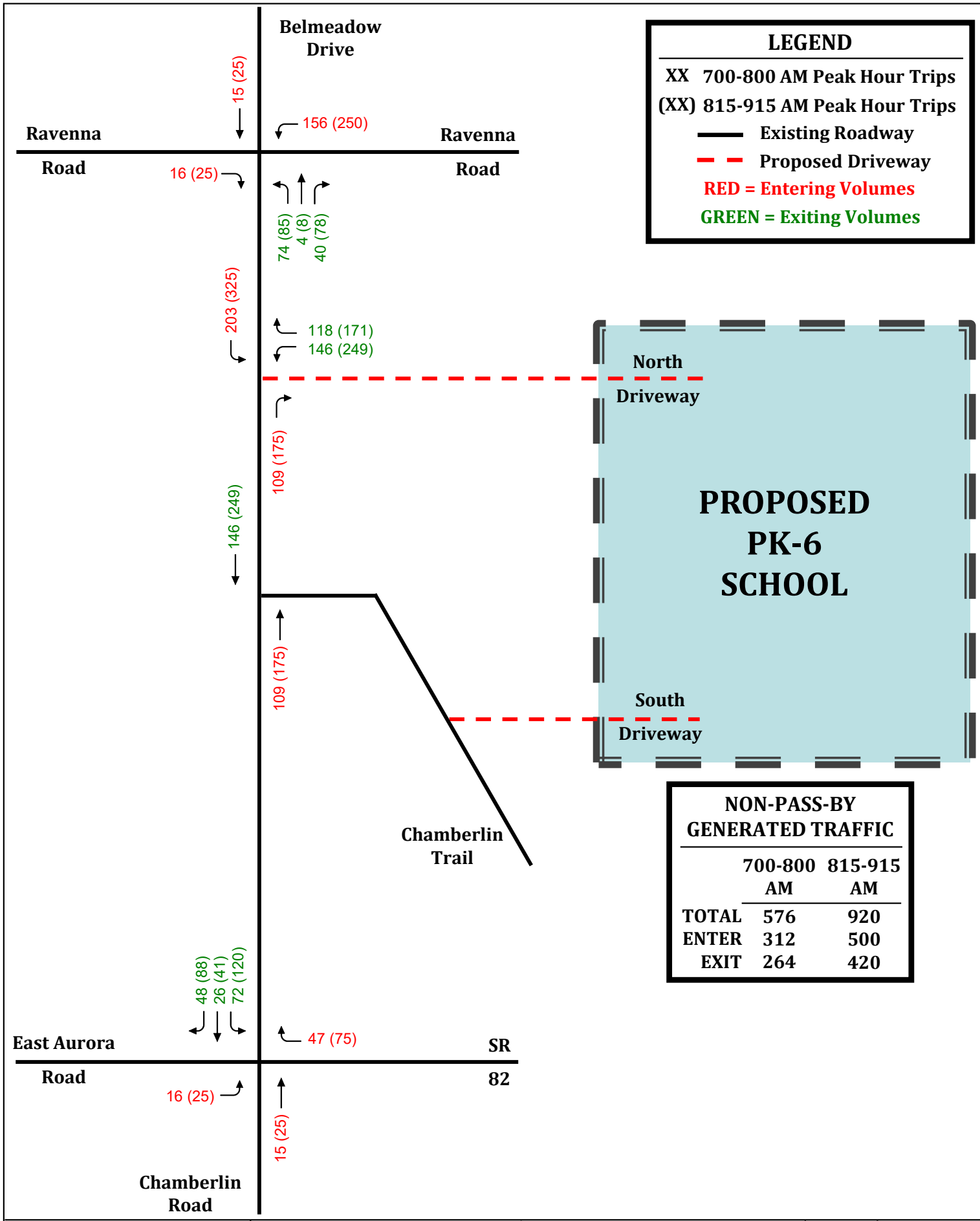
TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	**PK-6 Elementary School** **Twinsburg, Ohio** **Traffic Impact Study**	**Twinsburg City Schools** **District Map**	**NORTH** NOT TO SCALE	**Figure: 3.1** **Appendix A**



TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	PK-6 Elementary School Twinsburg, Ohio Traffic Impact Study	Weekday AM Peak Hour Directional Distribution	NORTH NOT TO SCALE	Figure: 3.2 Appendix A



TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	PK-6 Elementary School Twinsburg, Ohio Traffic Impact Study	Weekday PM Peak Hour Directional Distribution	NORTH NOT TO SCALE	Figure: 3.3 Appendix A



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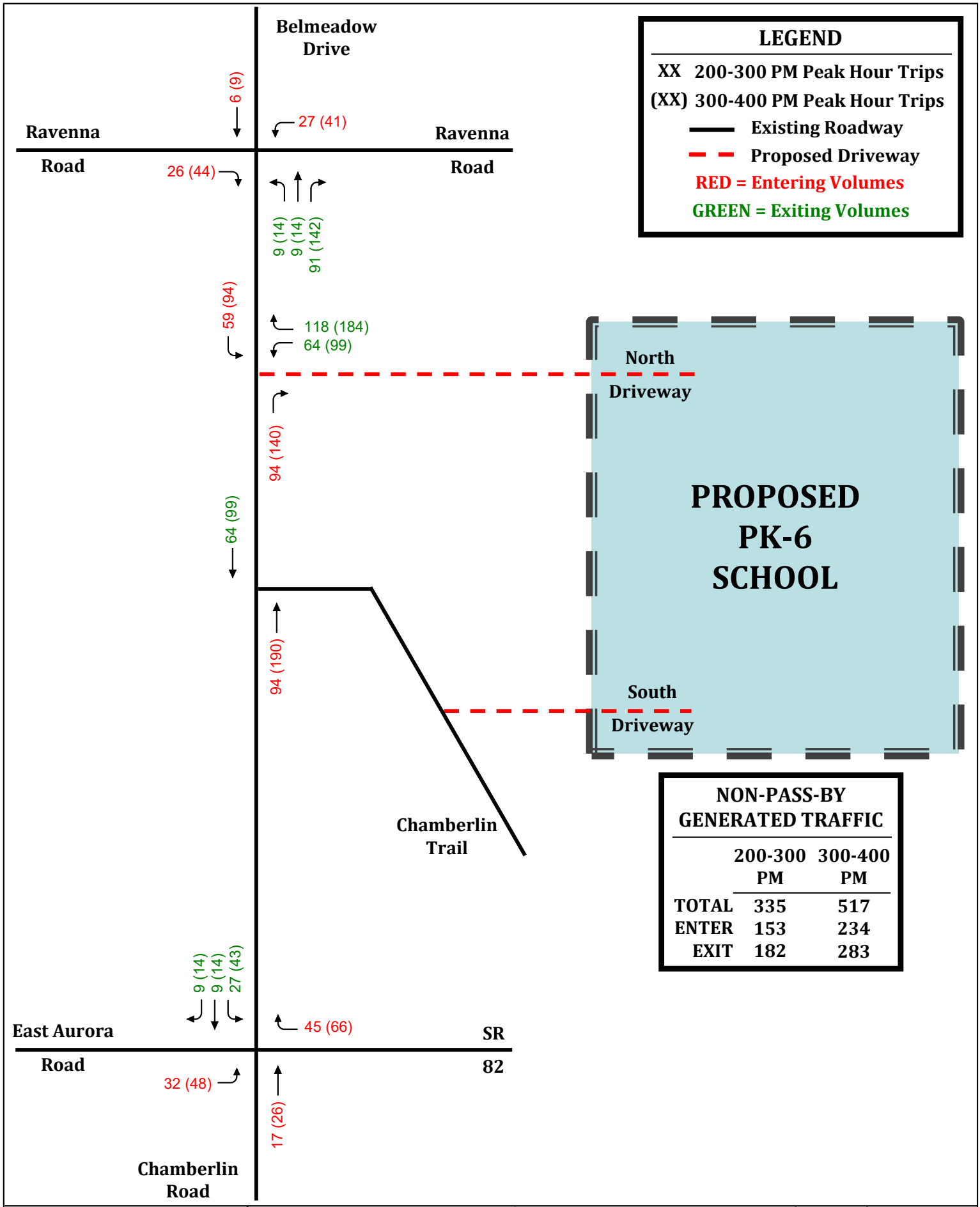
PK-6 Elementary School
Twinsburg, Ohio
Traffic Impact Study

Weekday AM Peak Hour
Site Generated Traffic

NORTH
NOT TO SCALE

Figure: 3.4

Appendix A



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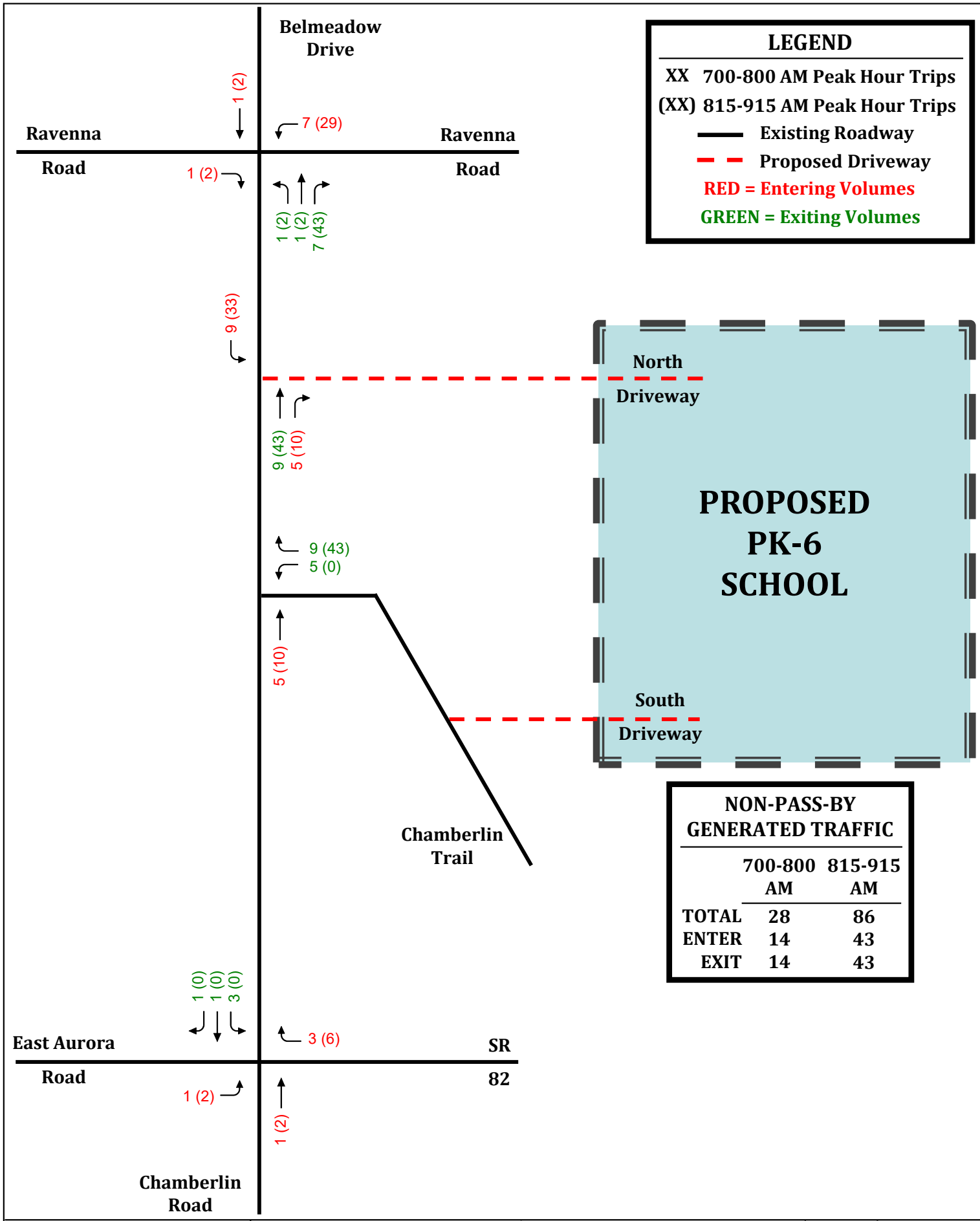
PK-6 Elementary School
Twinsburg, Ohio
Traffic Impact Study

Weekday PM Peak Hour
Site Generated Traffic

NORTH
NOT TO SCALE

Figure: 3.5

Appendix A



NON-PASS-BY GENERATED TRAFFIC

	700-800 AM	815-915 AM
TOTAL	28	86
ENTER	14	43
EXIT	14	43

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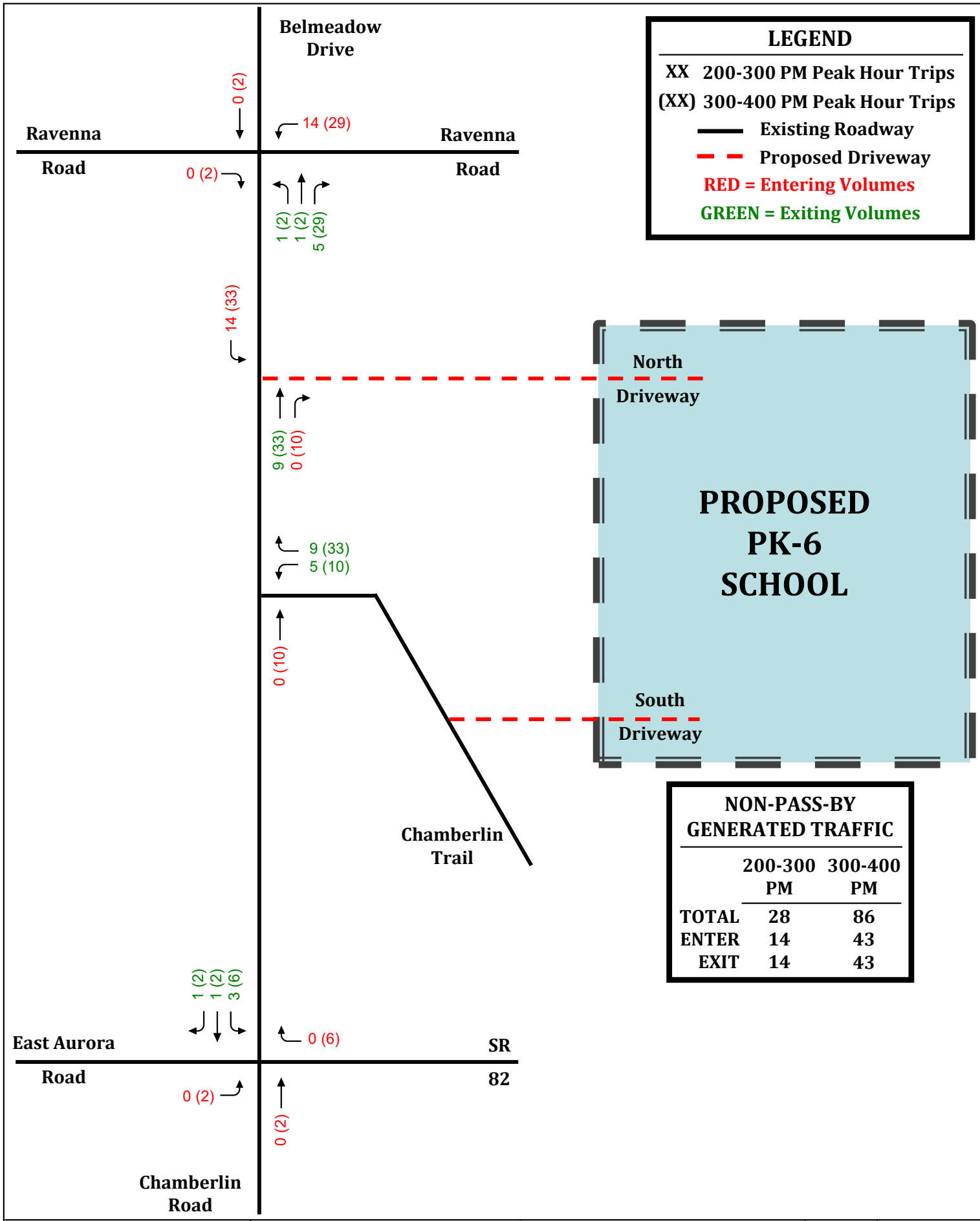
PK-6 Elementary School
Twinsburg, Ohio
Traffic Impact Study

Weekday AM Peak Hour
Site Generated
Bus Traffic

NORTH
NOT TO SCALE

Figure: 3.6

Appendix A



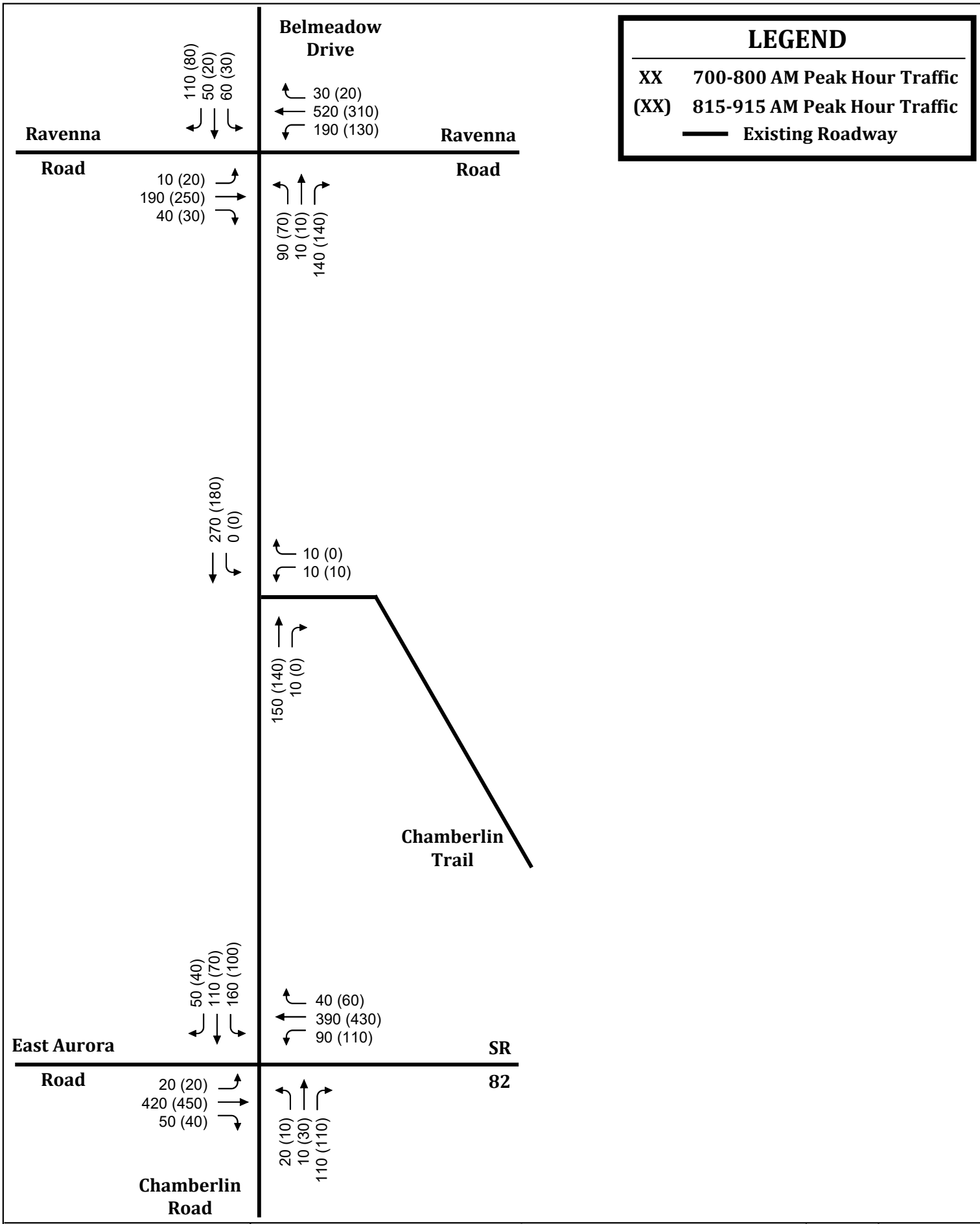
LEGEND

XX	200-300 PM Peak Hour Trips
(XX)	300-400 PM Peak Hour Trips
	Existing Roadway
	Proposed Driveway
	RED = Entering Volumes
	GREEN = Exiting Volumes

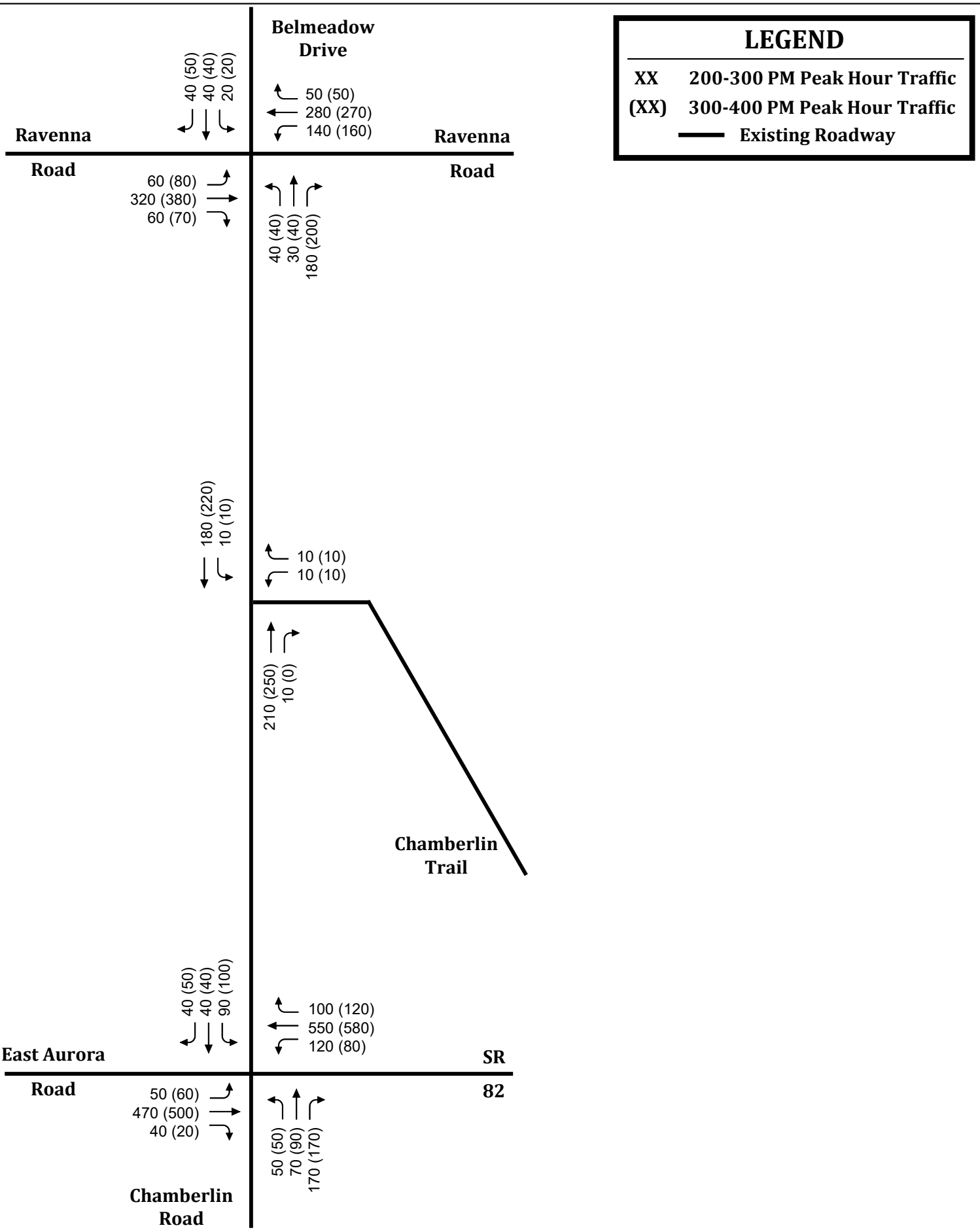
NON-PASS-BY GENERATED TRAFFIC

	200-300 PM	300-400 PM
TOTAL	28	86
ENTER	14	43
EXIT	14	43

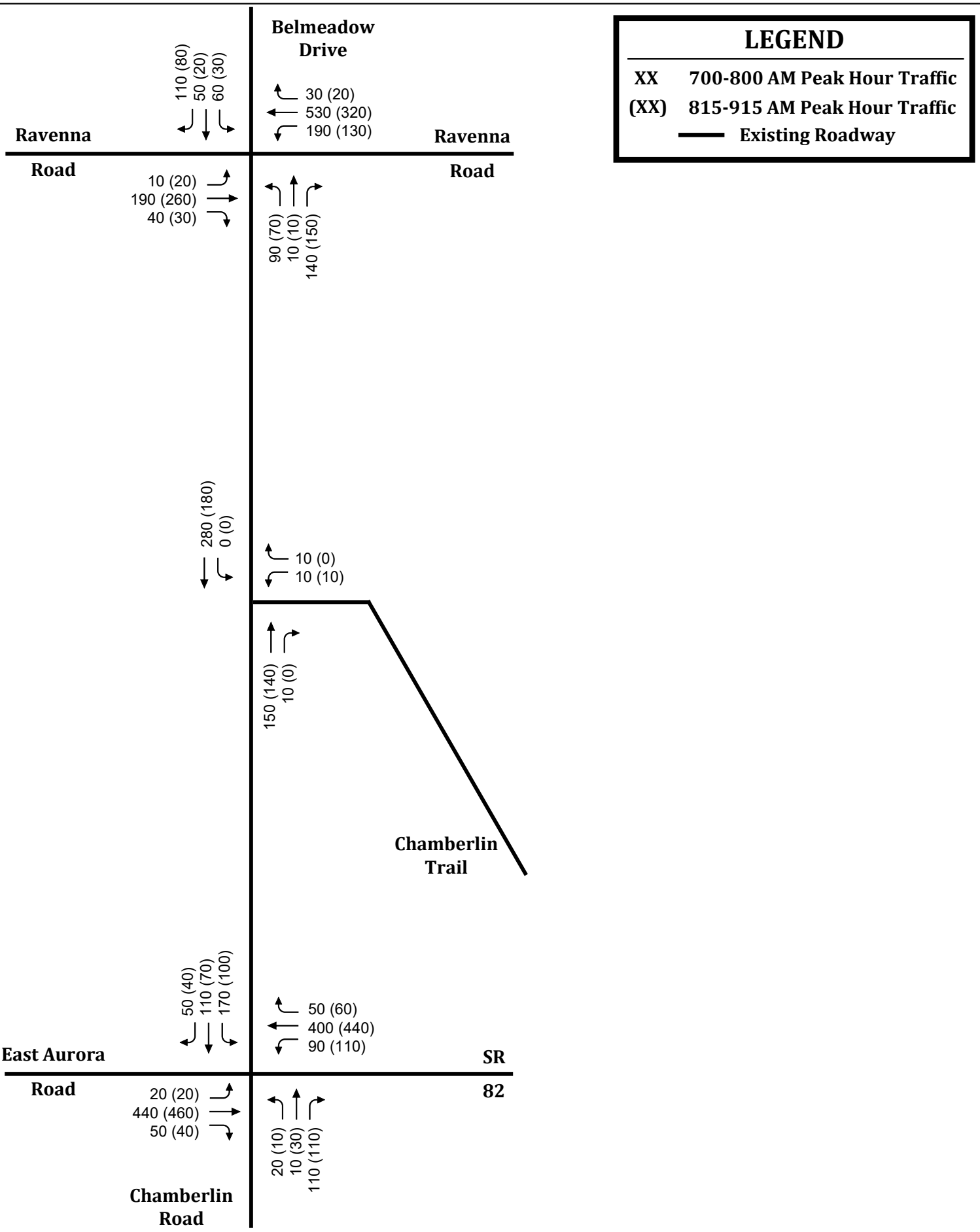
TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	PK-6 Elementary School Twinsburg, Ohio Traffic Impact Study	Weekday PM Peak Hour Site Generated Bus Traffic	NORTH NOT TO SCALE	Figure: 3.7 Appendix A



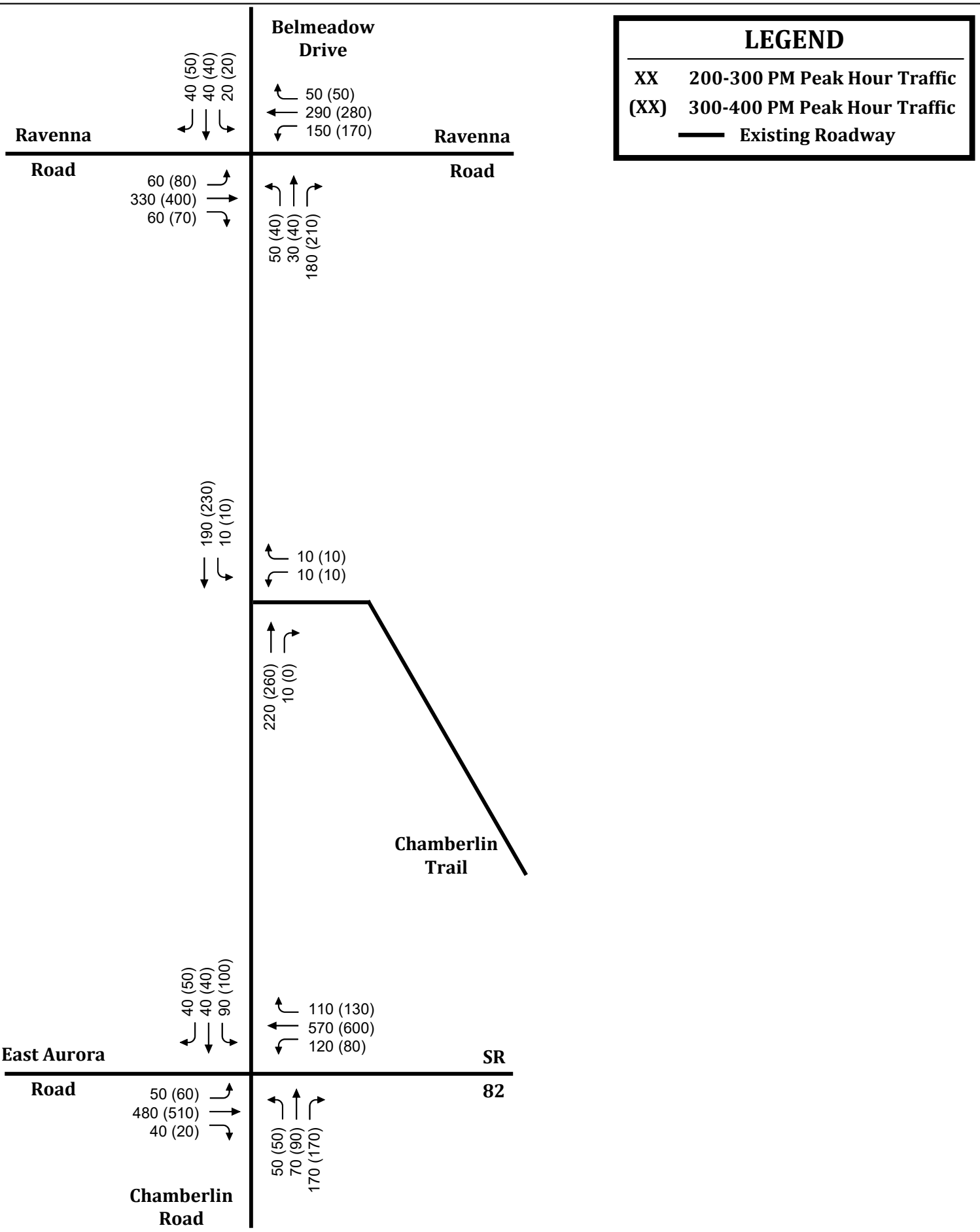
TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	PK-6 Elementary School Twinsburg, Ohio Traffic Impact Study	2027 No-Build Weekday AM Peak Hour Traffic Volumes	NORTH NOT TO SCALE	Figure: 3.8 Appendix A



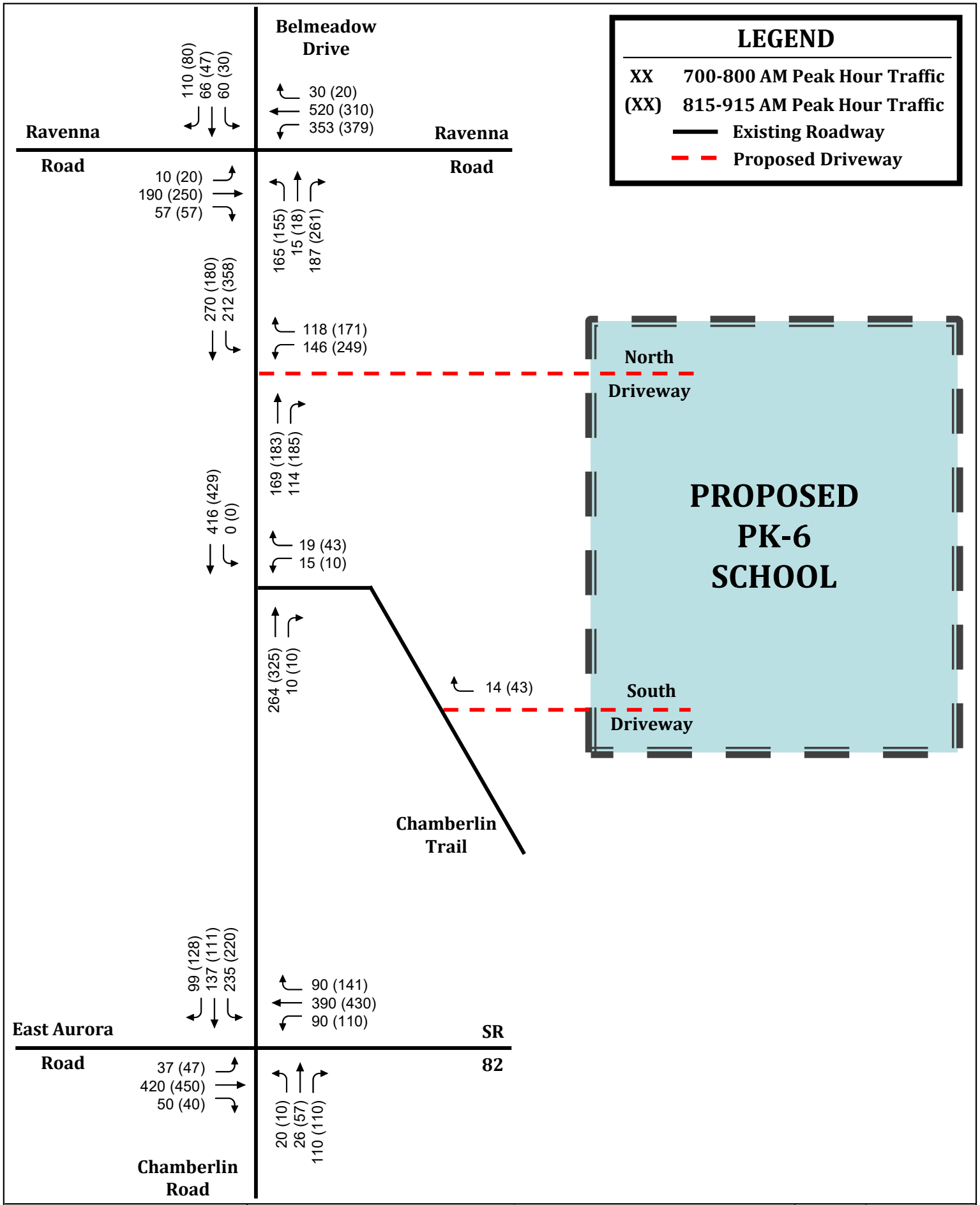
TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	**PK-6 Elementary School** **Twinsburg, Ohio** **Traffic Impact Study**	**2027 No-Build** **Weekday PM Peak Hour** **Traffic Volumes**	**NORTH** NOT TO SCALE	**Figure: 3.9** **Appendix A**



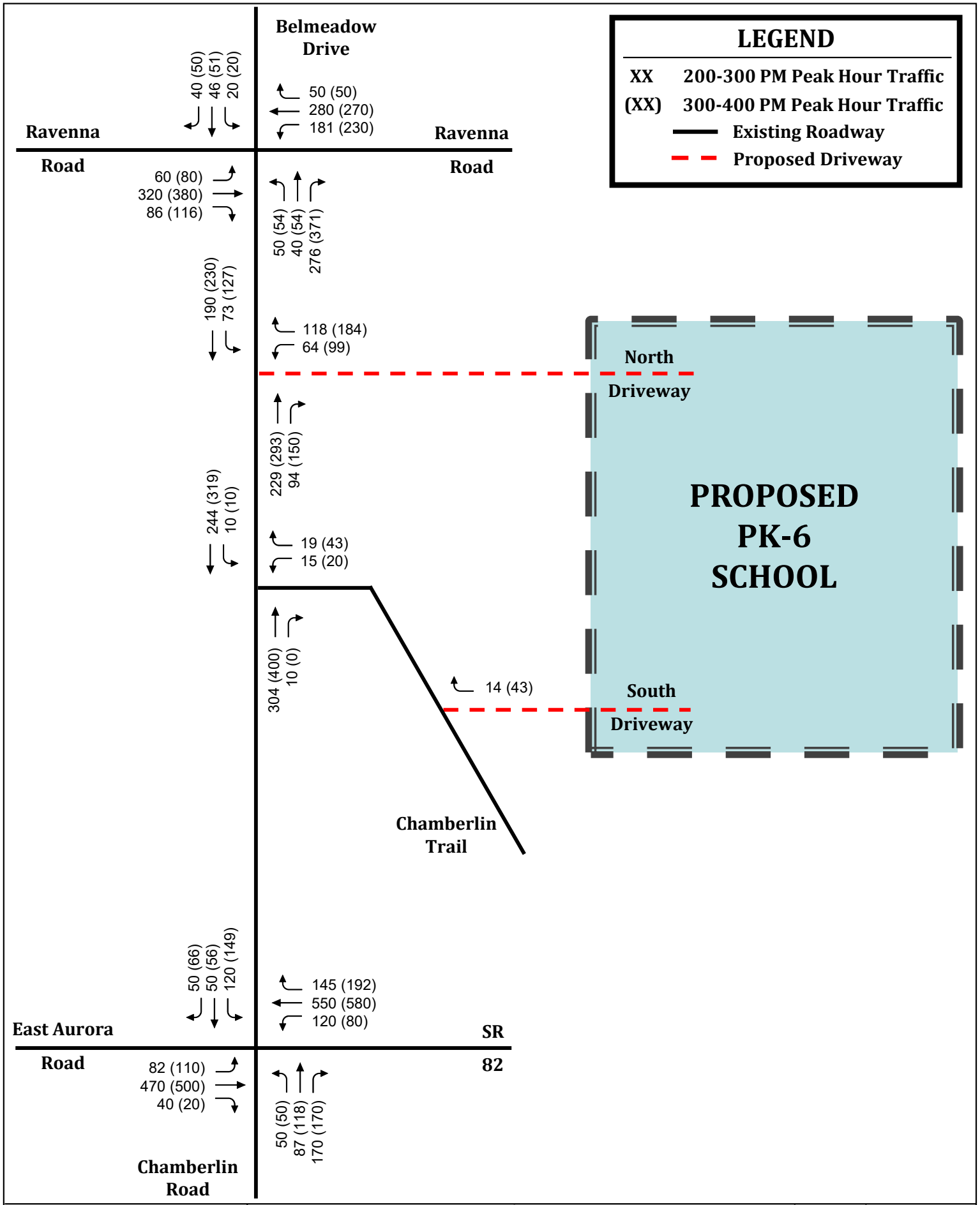
TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	**PK-6 Elementary School** **Twinsburg, Ohio** **Traffic Impact Study**	**2047 No-Build** **Weekday AM Peak Hour** **Traffic Volumes**	**NORTH** NOT TO SCALE	**Figure: 3.10** **Appendix A**



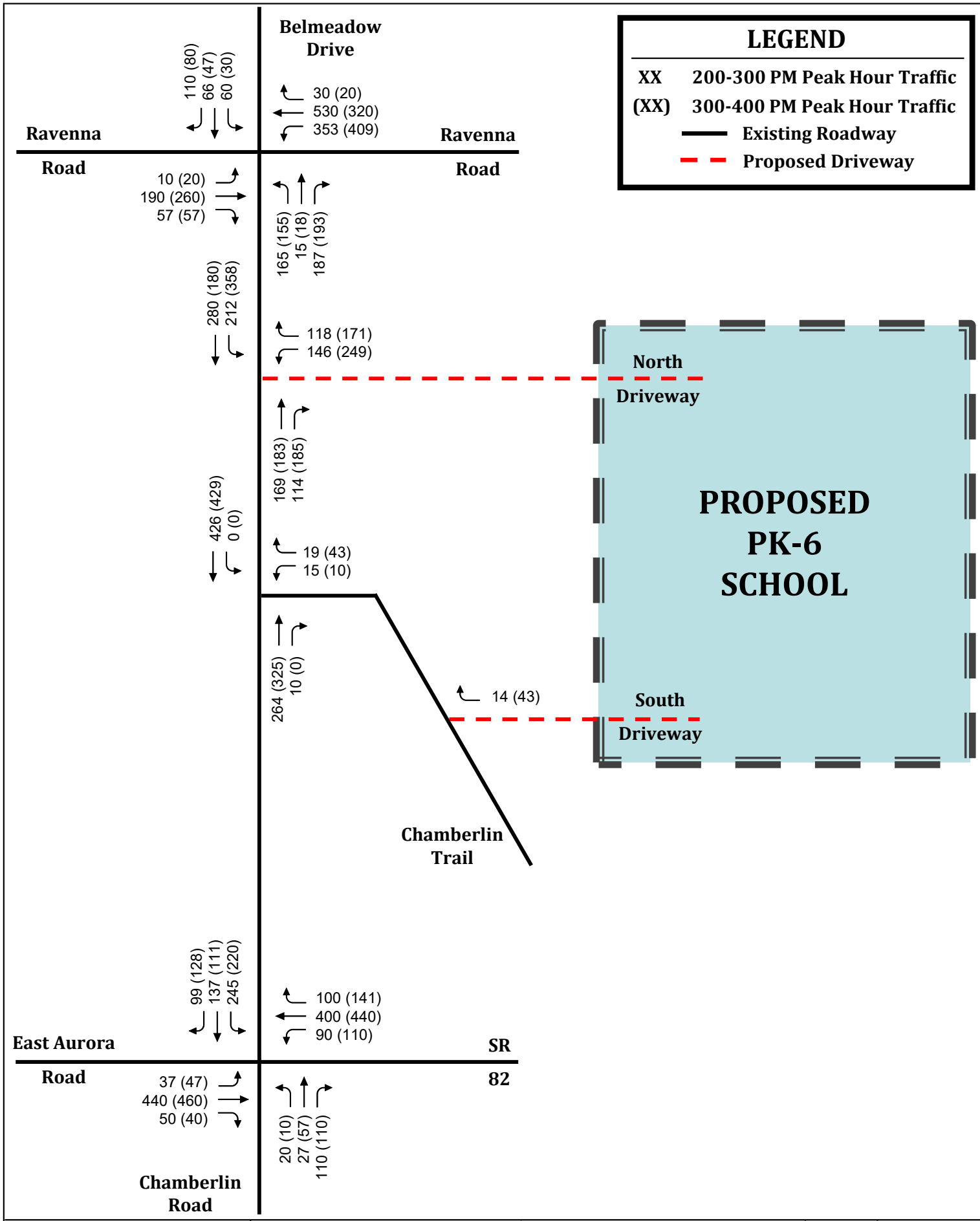
TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	PK-6 Elementary School Twinsburg, Ohio Traffic Impact Study	2047 No-Build Weekday PM Peak Hour Traffic Volumes	NORTH NOT TO SCALE	Figure: 3.11 Appendix A



TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	PK-6 Elementary School Twinsburg, Ohio Traffic Impact Study	2027 Build Weekday AM Peak Hour Traffic Volumes	NORTH NOT TO SCALE	Figure: 3.12 Appendix A



TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	PK-6 Elementary School Twinsburg, Ohio Traffic Impact Study	2027 Build Weekday PM Peak Hour Traffic Volumes	NORTH NOT TO SCALE	Figure: 3.13 Appendix A



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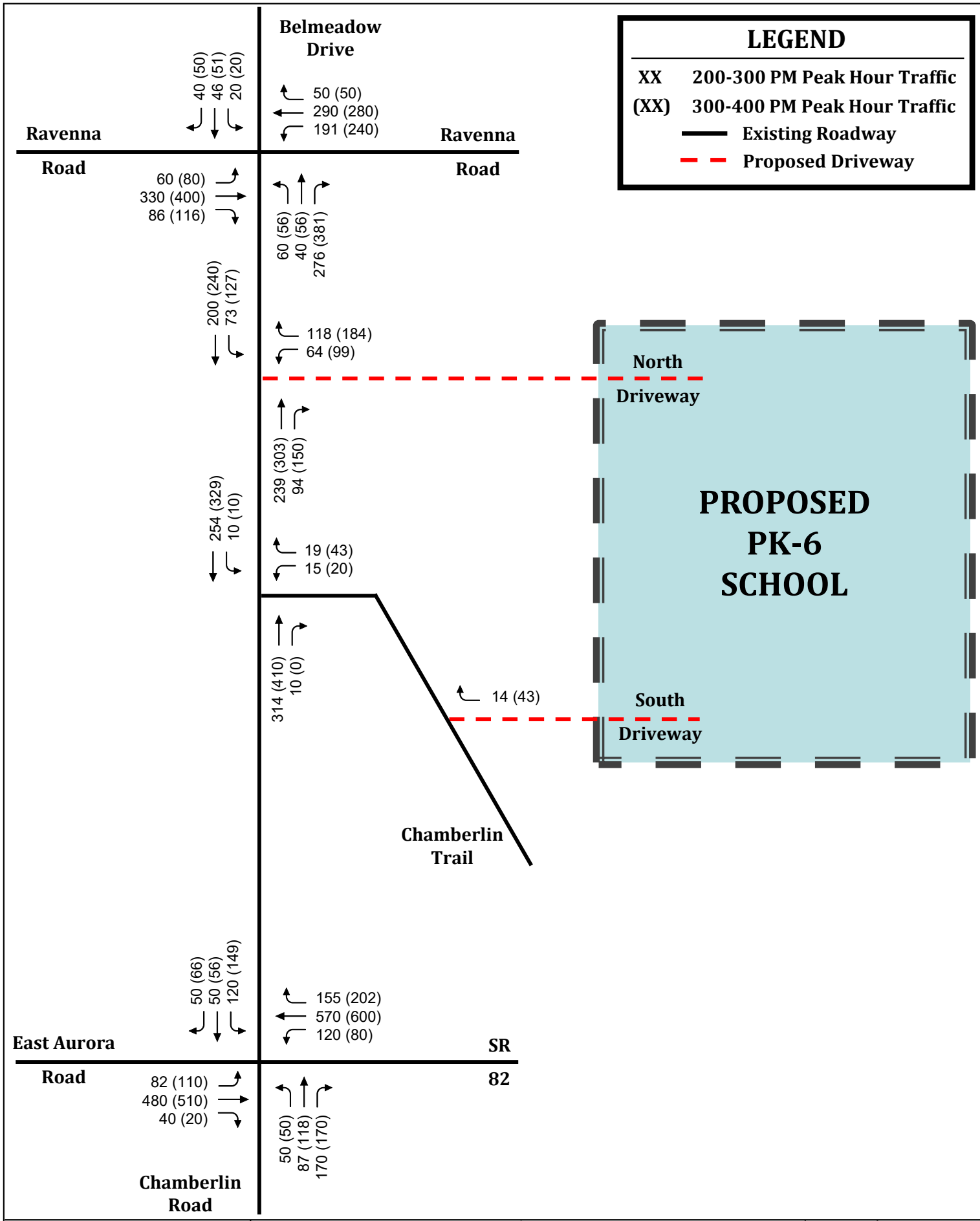

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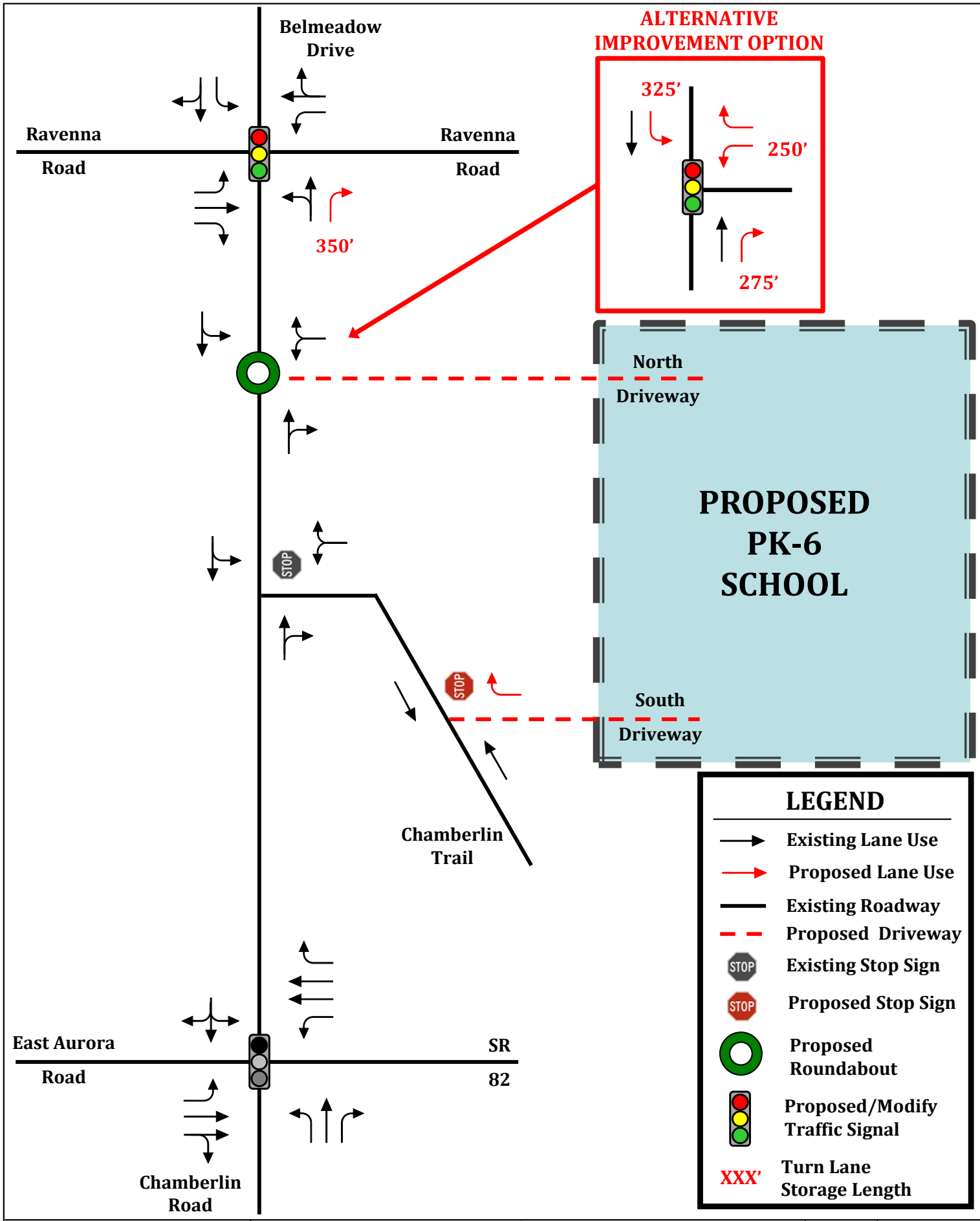


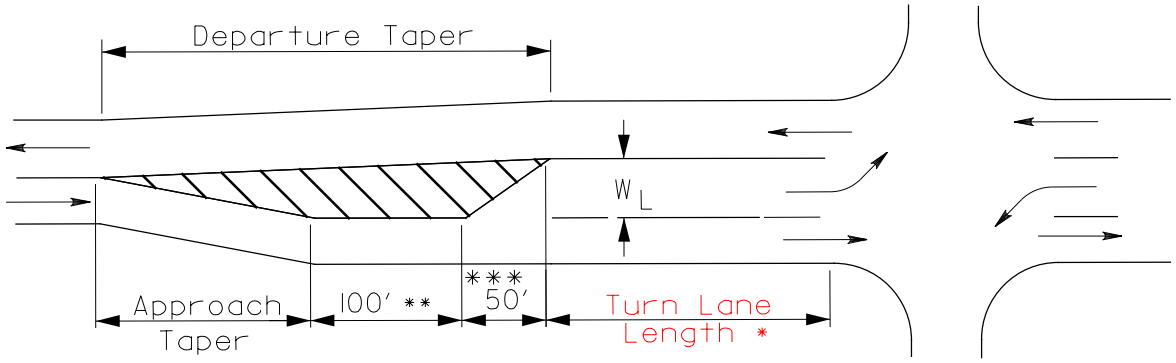
TMS Engineers, Inc. 2112 Case Parkway S., Unit 7, Twinsburg, Ohio 44087 www.TMSEngineers.com	PK-6 Elementary School Twinsburg, Ohio Traffic Impact Study	Recommended Lane Use & Traffic Control	NORTH NOT TO SCALE	Figure: 4.1 Appendix A

Appendix B
ODOT Turn Lane Design Criteria

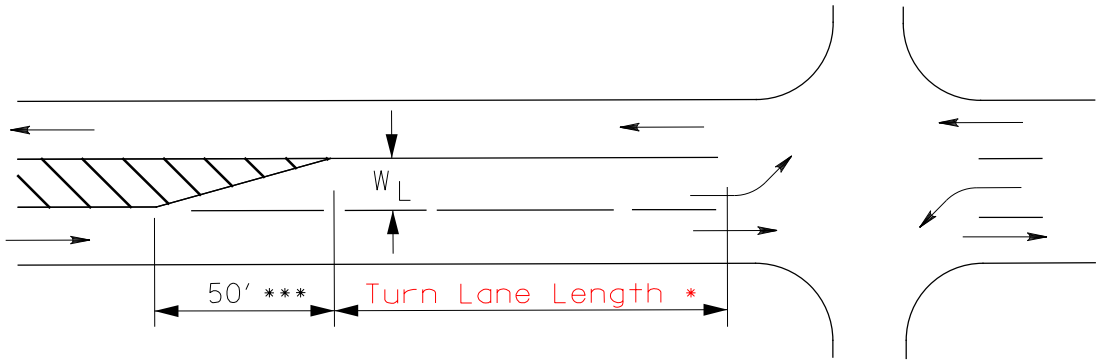
TURNING LANE DESIGN

401-7

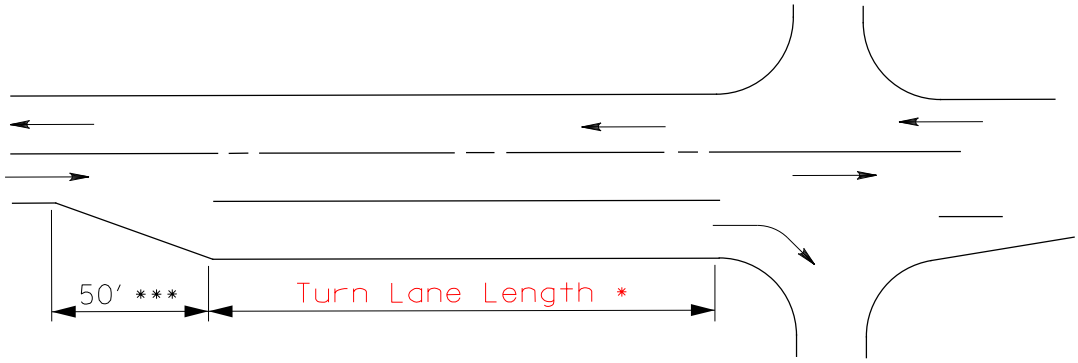
REFERENCE SECTIONS
401.6.1, 401.6.3



LEFT TURN LANE - NO MEDIAN OR MEDIAN WIDTH < W_L



LEFT TURN LANE - MEDIAN WIDTH >= W_L



RIGHT TURN LANE

* Turn Lane Length = Queue + Deceleration
See Figures 401-9 and 401-10 to compute turn lane length.

** May be reduced or eliminated in urban areas if intersection spacing or storage is constraining

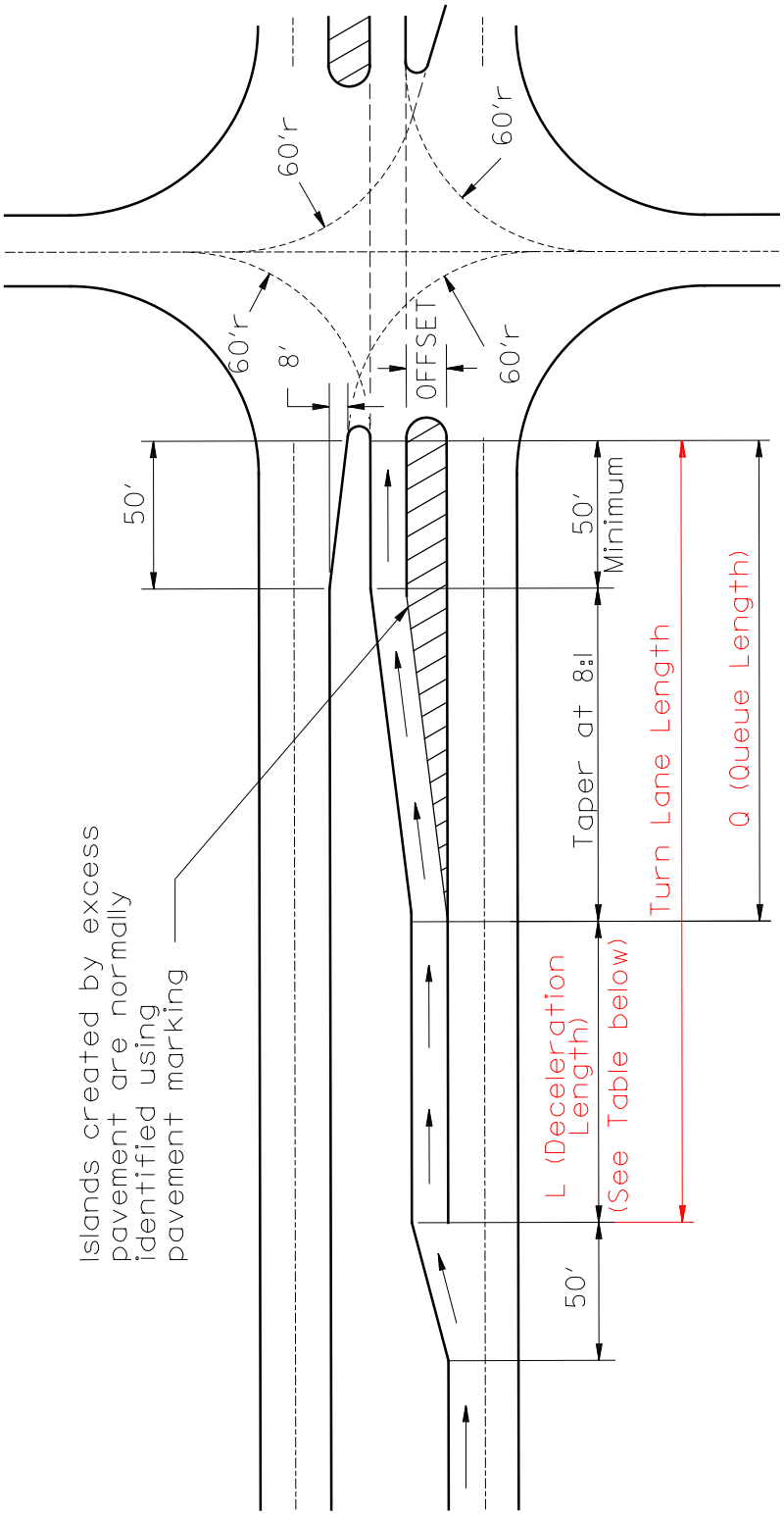
*** Diverging taper

W_L = Turn Lane Width

OFFSET LEFT TURN LANE

401-8

REFERENCE SECTIONS
401.6.1, 401.6.3



Compare the minimum queue length [(8 x offset) +50'] to the queue length from Figure 401-10 and use the greater of the two lengths

Design Speed	L
40 mph	75'
45 mph	125'
50 mph	175'
55 mph	250'
60 mph	300'
65 mph	375'

BASIS FOR COMPUTING LENGTH OF TURN LANES

401-9

REFERENCE SECTIONS
401.6.1 & 401.6.3

Type of Traffic Control	Design Speed		
	30-35	40-65	
	Turn Demand Volume		
	All	Low*	High
Signalized	A	B or C**	B or C**
Unsignalized Stopped Crossroad	A	A	A
Unsignalized Through Road	A	B	B or C**

* Low is considered 10% or less of approach traffic volume

** Whichever is greater

CONDITION A	QUEUE ONLY
Length = Queue Length (Figure 401-10)	

CONDITION B	HIGH SPEED DECELERATION ONLY
Design Speed	Length (feet)
40	75
45	125
50	175
55	250
60	300
65	375

CONDITION C	MODERATE SPEED DECELERATION AND QUEUE
Design Speed	Length (feet)
40	75 + Queue Length (Figure 401-10)
45	75 "
50	100 "
55	125 "
60	150 "
65	175 "

For explanation, see Turn Lane Design Example

QUEUE LENGTH AT INTERSECTIONS

401-10

REFERENCE SECTIONS
401.6.1 & 401.6.3

*Average # of Vehicles/Cycle	Queue Length (feet)
1	50
2	100
3	150
4	175
5	200
6	250
7	275
8	325
9	350
10	375
11	400
12	450
13	475
14	500
15	525
16	550
17	600
18	625
19	650
20	675
21	725
22	750
23	775
24	800
25	825
26	875
27	900
28	925
29	950
30	975

*Average # of Vehicles/Cycle	Queue Length (feet)
31	1025
32	1050
33	1075
34	1100
35	1125
36	1150
37	1175
38	1200
39	1225
40	1250
41	1300
42	1325
43	1350
44	1375
45	1400
46	1450
47	1475
48	1500
49	1525
50	1550
51	1600
52	1625
53	1650
54	1675
55	1700
56	1750
57	1775
58	1800
59	1825
60	1850

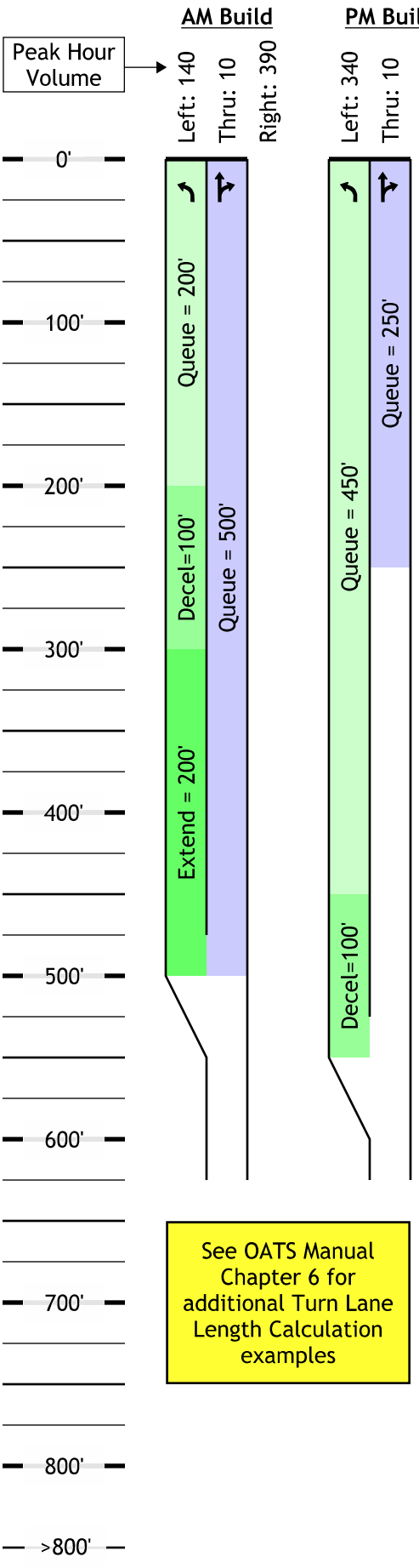
NOTE: ADDITIONAL TURN LANE STORAGE MAY BE REQUIRED WHEN THE AVERAGE VEHICLES PER CYCLE >= 10 AND THE HEAVY VEHICLES ARE >= 10%.

$$\text{* AVERAGE VEHICLES PER CYCLE} = \frac{\text{DHV (TURNING LANE)}}{\text{CYCLES/HOUR}}$$

IF CYCLES ARE UNKNOWN ASSUME:

UNSIGNALIZED OR
2 PHASE = 60 CYCLES/HOUR
3 PHASE = 40 CYCLES/HOUR
4 PHASE = 30 CYCLES/HOUR

Required Turn Lane Length Example Using Figures 401-9 and 401-10



See OATS Manual Chapter 6 for additional Turn Lane Length Calculation examples

Traffic Control: Signalized Design Speed: 50 mph

Cycle Length(s) = 120s (AM/PM)

Determine Required Turn Lane Length (Queue + Deceleration)

The required turn lane length is being calculated at a signalized intersection with a design speed of 50 mph; therefore, the storage will be based on Figure 401-9 Condition B or Condition C, whichever is greater.

Calculate Required Turn Lane Length for AM Peak Hour

1) Condition B = High speed deceleration only = 175 feet
2) Condition C = Queue Length (see calculations below) + Moderate Speed Deceleration = 200 feet + 100 feet = 300 feet.
3) Determine the left turn queue. Calculate the average number of vehicles per cycle for the turn lane. Round the answer up to the next whole number and determine the queue length per Figure 401-10. This length is shown in figure to the left in green. [(140 veh/hr)*(120 s/cyc)]/3600 s/hr = 4.7 veh/cyc > 5 veh/cyc > 200 feet.
4) Determine thru/adjacent lane queue. Calculate the average number of vehicles per cycle for the thru/adjacent lane. Round the answer up to the next whole number and determine the queue length per Figure 401-10. This length is shown in figure to the left in blue. [(400 veh/hr)*(120 s/cyc)]/3600 s/hr = 13.3 veh/cyc > 14 veh/cyc > 500 feet.
5) Compare the calculated lengths from Step 3 and Step 4. For this example the thru/adjacent lane queue (500 feet) is longer than the required left turn storage (300 feet); therefore, the left turn lane must be extended an additional 200 feet so left turning vehicles can enter the turn lane without being blocked by the thru/adjacent lane.
6) The required turn lane length of the left turn lane for the AM peak hour is **500 feet.**

Calculate Required Turn Lane Length for PM Peak Hour

1) Condition B = High speed deceleration only = 175 feet
2) Required turn lane storage for Condition C = Queue Length (see calculations below) + Moderate Speed Deceleration = 450 feet + 100 feet = 550 feet.
3) Determine the left turn queue. Calculate the average number of vehicles per cycle for the turn lane. Round the answer up to the next whole number and determine the queue length per Figure 401-10. This length is shown in figure to the left in green. [(340 veh/hr)*(120 s/cyc)]/3600 s/hr = 11.3 veh/cyc > 12 veh/cyc > 450 feet.
4) Determine thru/adjacent lane queue. Calculate the average number of vehicles per cycle for the thru/adjacent lane. Round the answer up to the next whole number and determine the queue length per Figure 401-10. This length is shown in figure to the left in blue. [(160 veh/hr)*(120 s/cyc)]/3600 s/hr = 5.3 veh/cyc > 6 veh/cyc > 250 feet.
5) Compare the calculated lengths from Step 3 and Step 4. For this example the thru/adjacent lane queue (250 feet) is shorter than the required left turn storage (550 feet); therefore, the left turn lane does not need to be extended so left turning vehicles can enter the turn lane without being blocked by the thru/adjacent lane.
6) The required turn lane length of the left turn lane for the PM peak hour is **550 feet.**

Determine Required Storage of Turn Lane

1) Per the AM and PM peak hour calculations the required turn lane length for the left turn lane is 500 feet and 550 feet, respectively.
2) The required turn lane length for the left turn lane is **550 feet**.
3) See PM Build figure to the left for the Final Design.

Appendix C
Traffic Count Data

VEHICULAR TRAFFIC COUNT SUMMARY

Municipality: Twinsburg **At Intersection of:** Chamberlin Road / Bellmeadow Dr **and** Ravenna Road

Date: 4/1/2025 **Day:** Tue. **Comments:** **Project:** 25-047

Chamberlin Rd s Ravenna Rd

Weather: Clear **Recorder(s):** DJS **Data entry by:** JJO **Date entered:** Apr. 2, 2025 040125

TIME BEGINS	Bellmeadow Drive FROM NORTH						Chamberlin Road / Bellmeadow Drive FROM SOUTH						TOTAL NORTH SOUTH	Ravenna Road FROM EAST						Ravenna Road FROM WEST						TOTAL EAST WEST	TOTAL ALL DIREC.	PEAK HOUR FACTOR			
	Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus			North	South	East	West
06:00																														
07:00	52	44	96	192	0	0	78	6	121	205	3	4	397	163	453	25	641	4	8	5	165	34	204	12	2	845	1242	0.857	0.754	0.885	0.823
08:00	28	28	85	141	0	0	67	8	129	204	2	3	345	110	313	11	434	10	5	15	243	25	283	9	5	717	1062	0.801	0.810	0.854	0.852
09:00	29	16	54	99	1	0	49	7	76	132	5	0	231	68	226	23	317	8	1	10	176	22	208	7	1	525	756	0.773	0.846	0.881	0.852
10:00																														
11:00	16	8	33	57	1	0	28	9	81	118	5	0	175	75	231	19	325	9	1	21	203	23	247	8	2	572	747	0.950	0.868	0.903	0.823
12:00	15	14	25	54	1	0	34	20	90	144	10	0	198	79	212	18	309	9	0	41	206	18	265	10	1	574	772	0.794	0.818	0.849	0.818
1:00	12	17	28	57	1	0	37	17	122	176	5	0	233	90	223	26	339	12	1	37	203	35	275	7	0	614	847	0.679	0.815	0.931	0.893
2:00	17	31	38	86	2	1	39	28	155	222	6	4	308	124	243	40	407	11	6	54	282	51	387	9	1	794	1102	1.024	1.028	1.028	1.099
3:00	19	35	43	97	10	2	35	33	178	246	5	5	343	142	235	45	422	7	6	67	336	59	462	6	1	884	1227	0.836	0.891	0.942	0.895
4:00	28	27	34	89	2	1	54	53	205	312	5	4	401	144	290	53	487	8	3	71	404	73	548	8	1	1035	1436	0.824	0.867	0.889	0.938
5:00	32	22	55	109	1	0	51	41	214	306	3	0	415	151	376	49	576	7	0	97	425	78	600	4	0	1176	1591	0.908	0.922	0.823	0.893
6:00																														
7:00																														
8:00																														
9:00																														
TOTALS	248	242	491	981	19	4	472	222	1371	2065	49	20	3046	1146	2802	309	4257	85	31	418	2643	418	3479	80	14	7736	10782				
ADT	471	460	933	1863	2.3%		877	413	2548	3838	3.3%		5702	2194	5365	592	8150	2.7%		800	5060	800	6661	2.7%		14811	20513				

N Leg Hourly Factor:	1.57	E Leg Hourly Factor:	1.58
S Leg Hourly Factor:	1.54	W leg Hourly Factor:	1.58
N Leg Monthly Factor:	1.21	E Leg Monthly Factor:	1.21
S Leg Monthly Factor:	1.21	W Leg Monthly Factor:	1.21

N Leg Combined Factor:	1.90	E Leg Combined Factor:	1.91
S Leg Combined Factor:	1.86	W Leg Combined Factor:	1.91

TMS ENGINEERS, INC.

2112 Case Parkway South #7

Twinsburg, Ohio 44087

(330) 686-6402 FAX: (330) 686-6417

Figure #:

Page #:

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

City: Twinsburg
Intersection: Chamberlin Dr & Ravenna Rd
Counter: DJS
Day of the Week: Tuesday

File Name : 1_Chamberlin & Ravenna 040125
Site Code : 00000000
Start Date : 4/1/2025
Page No : 1

Groups Printed- Cars - Trucks - Buses

	BELLMEADOW DRIVE From North					RAVENNA ROAD From East					CHAMBERLIN ROAD From South					RAVENNA ROAD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	19	13	10	0	42	10	87	44	0	141	25	2	21	0	48	6	37	2	0	45	276
07:15 AM	25	10	7	0	42	9	121	51	0	181	20	1	26	0	47	9	36	1	0	46	316
07:30 AM	31	10	11	0	52	4	112	33	0	149	28	1	13	0	42	10	51	1	0	62	305
07:45 AM	21	11	24	1	57	2	133	35	0	170	48	2	18	0	68	9	41	1	1	52	347
Total	96	44	52	1	193	25	453	163	0	641	121	6	78	0	205	34	165	5	1	205	1244
08:00 AM	24	13	7	0	44	5	97	25	0	127	24	5	19	0	48	7	56	2	0	65	284
08:15 AM	27	4	8	0	39	2	79	35	0	116	38	2	23	0	63	8	50	9	0	67	285
08:30 AM	22	6	10	0	38	2	81	21	0	104	33	0	15	0	48	4	62	2	0	68	258
08:45 AM	12	5	3	0	20	2	56	29	0	87	34	1	10	0	45	6	75	2	0	83	235
Total	85	28	28	0	141	11	313	110	0	434	129	8	67	0	204	25	243	15	0	283	1062
09:00 AM	13	5	4	0	22	10	55	25	0	90	20	5	14	0	39	8	36	1	1	46	197
09:15 AM	19	3	10	0	32	2	76	12	0	90	20	0	12	0	32	7	41	3	0	51	205
09:30 AM	14	4	9	0	27	6	39	17	0	62	20	2	13	0	35	4	53	4	0	61	185
09:45 AM	8	4	6	0	18	5	56	14	0	75	16	0	10	0	26	3	46	2	1	52	171
Total	54	16	29	0	99	23	226	68	0	317	76	7	49	0	132	22	176	10	2	210	758
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 1_Chamberlin & Ravenna 040125
Site Code : 00000000
Start Date : 4/1/2025
Page No : 2

Groups Printed- Cars - Trucks - Buses

	BELLMEADOW DRIVE From North					RAVENNA ROAD From East					CHAMBERLIN ROAD From South					RAVENNA ROAD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
11:00 AM	6	4	5	0	15	6	43	13	0	62	22	3	9	1	35	6	44	7	0	57	169
11:15 AM	8	0	4	0	12	4	60	19	0	83	14	0	11	0	25	6	39	2	0	47	167
11:30 AM	8	3	4	0	15	5	66	19	0	90	23	1	6	1	31	7	54	7	0	68	204
11:45 AM	11	1	3	1	16	4	62	24	0	90	22	5	2	0	29	4	66	5	0	75	210
Total	33	8	16	1	58	19	231	75	0	325	81	9	28	2	120	23	203	21	0	247	750
12:00 PM	8	3	2	0	13	4	53	16	0	73	30	4	10	0	44	5	54	14	0	73	203
12:15 PM	9	3	5	0	17	5	45	18	1	69	16	6	8	0	30	2	45	1	1	49	165
12:30 PM	5	6	2	0	13	6	52	19	0	77	20	5	13	0	38	5	46	12	0	63	191
12:45 PM	3	2	6	0	11	3	62	26	0	91	24	5	3	0	32	6	61	14	0	81	215
Total	25	14	15	0	54	18	212	79	1	310	90	20	34	0	144	18	206	41	1	266	774
01:00 PM	4	1	3	0	8	5	65	18	0	88	32	3	6	0	41	7	56	11	0	74	211
01:15 PM	4	5	2	0	11	8	63	20	0	91	21	3	10	0	34	8	37	8	0	53	189
01:30 PM	11	4	2	0	17	7	45	30	0	82	27	10	10	0	47	10	57	10	0	77	223
01:45 PM	9	7	5	0	21	6	50	22	0	78	42	1	11	0	54	10	53	8	0	71	224
Total	28	17	12	0	57	26	223	90	0	339	122	17	37	0	176	35	203	37	0	275	847
02:00 PM	9	3	2	0	14	12	59	28	0	99	34	7	10	0	51	12	67	9	0	88	252
02:15 PM	9	8	3	0	20	10	66	30	0	106	36	4	7	0	47	8	66	13	0	87	260
02:30 PM	12	10	4	0	26	11	54	36	0	101	37	12	11	0	60	14	74	18	0	106	293
02:45 PM	8	10	8	1	27	7	64	30	0	101	48	5	11	0	64	17	75	14	0	106	298
Total	38	31	17	1	87	40	243	124	0	407	155	28	39	0	222	51	282	54	0	387	1103
03:00 PM	13	4	1	0	18	15	46	34	0	95	36	8	12	0	56	16	68	7	0	91	260

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 1_Chamberlin & Ravenna 040125
Site Code : 00000000
Start Date : 4/1/2025

Groups Printed- Cars - Trucks - Buses

	BELLMEADOW DRIVE From North					RAVENNA ROAD From East					CHAMBERLIN ROAD From South					RAVENNA ROAD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:15 PM	13	10	3	1	27	11	65	36	0	112	52	5	3	0	60	7	90	17	0	114	313
03:30 PM	10	14	5	0	29	13	56	40	0	109	48	12	9	0	69	15	89	25	0	129	336
03:45 PM	7	7	10	0	24	6	68	32	0	106	42	8	11	0	61	21	89	18	1	129	320
Total	43	35	19	1	98	45	235	142	0	422	178	33	35	0	246	59	336	67	1	463	1229
04:00 PM	6	8	5	0	19	18	78	41	0	137	53	15	19	0	87	17	108	15	0	140	383
04:15 PM	10	8	6	0	24	10	76	41	0	127	46	14	13	0	73	13	114	19	0	146	370
04:30 PM	10	8	9	0	27	14	71	23	0	108	45	5	12	0	62	19	102	18	0	139	336
04:45 PM	8	3	8	0	19	11	65	39	0	115	61	19	10	0	90	24	80	19	0	123	347
Total	34	27	28	0	89	53	290	144	0	487	205	53	54	0	312	73	404	71	0	548	1436
05:00 PM	13	7	10	0	30	14	109	52	0	175	65	6	12	2	85	20	116	20	0	156	446
05:15 PM	15	6	8	0	29	9	102	30	0	141	47	15	11	0	73	18	95	29	0	142	385
05:30 PM	11	3	8	0	22	16	73	34	0	123	55	8	15	0	78	25	120	23	0	168	391
05:45 PM	16	6	6	0	28	10	92	35	0	137	47	12	13	0	72	15	94	25	0	134	371
Total	55	22	32	0	109	49	376	151	0	576	214	41	51	2	308	78	425	97	0	600	1593
Grand Total	491	242	248	4	985	309	2802	1146	1	4258	1371	222	472	4	2069	418	2643	418	5	3484	10796
Apprch %	49.8	24.6	25.2	0.4		7.3	65.8	26.9	0		66.3	10.7	22.8	0.2		12	75.9	12	0.1		
Total %	4.5	2.2	2.3	0	9.1	2.9	26	10.6	0	39.4	12.7	2.1	4.4	0	19.2	3.9	24.5	3.9	0	32.3	
Cars	483	231	244	4	962	293	2731	1117	1	4142	1339	213	444	4	2000	391	2579	415	4	3389	10493
% Cars	98.4	95.5	98.4	100	97.7	94.8	97.5	97.5	100	97.3	97.7	95.9	94.1	100	96.7	93.5	97.6	99.3	80	97.3	97.2
Trucks	8	8	3	0	19	8	55	22	0	85	15	6	28	0	49	17	61	2	1	81	234
% Trucks	1.6	3.3	1.2	0	1.9	2.6	2	1.9	0	2	1.1	2.7	5.9	0	2.4	4.1	2.3	0.5	20	2.3	2.2
Buses	0	3	1	0	4	8	16	7	0	31	17	3	0	0	20	10	3	1	0	14	69
% Buses	0	1.2	0.4	0	0.4	2.6	0.6	0.6	0	0.7	1.2	1.4	0	0	1	2.4	0.1	0.2	0	0.4	0.6

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 1_Chamberlin & Ravenna 040125
Site Code : 00000000
Start Date : 4/1/2025

	BELLMEADOW DRIVE From North					RAVENNA ROAD From East					CHAMBERLIN ROAD From South					RAVENNA ROAD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	19	**13**	10	0	42	**10**	87	44	0	141	25	**2**	21	0	48	6	37	**2**	0	45	276
07:15 AM	25	10	7	0	42	9	121	**51**	0	**181**	20	1	**26**	0	47	9	36	1	0	46	316
07:30 AM	**31**	10	11	0	52	4	112	33	0	149	28	1	13	0	42	**10**	**51**	1	0	**62**	305
07:45 AM	21	11	**24**	**1**	**57**	2	**133**	35	0	170	**48**	2	18	0	**68**	9	41	1	**1**	52	**347**
Total Volume	96	44	52	1	193	25	453	163	0	641	121	6	78	0	205	34	165	5	1	205	1244
% App. Total	49.7	22.8	26.9	0.5		3.9	70.7	25.4	0		59	2.9	38	0		16.6	80.5	2.4	0.5		
PHF	.774	.846	.542	.250	.846	.625	.852	.799	.000	.885	.630	.750	.750	.000	.754	.850	.809	.625	.250	.827	.896
Cars	96	44	52	1	193	22	448	159	0	629	117	5	76	0	198	31	154	5	1	191	1211
% Cars	100	100	100	100	100	88.0	98.9	97.5	0	98.1	96.7	83.3	97.4	0	96.6	91.2	93.3	100	100	93.2	97.3
Trucks	0	0	0	0	0	0	2	2	0	4	1	0	2	0	3	1	11	0	0	12	19
% Trucks	0	0	0	0	0	0	0.4	1.2	0	0.6	0.8	0	2.6	0	1.5	2.9	6.7	0	0	5.9	1.5
Buses	0	0	0	0	0	3	3	2	0	8	3	1	0	0	4	2	0	0	0	2	14
% Buses	0	0	0	0	0	12.0	0.7	1.2	0	1.2	2.5	16.7	0	0	2.0	5.9	0	0	0	1.0	1.1
Peak Hour Analysis From 08:15 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:15 AM																					
08:15 AM	**27**	4	8	0	**39**	2	79	**35**	0	**116**	**38**	2	**23**	0	**63**	**8**	50	**9**	0	67	**285**
08:30 AM	22	**6**	**10**	0	38	2	**81**	21	0	104	33	0	15	0	48	4	62	2	0	68	258
08:45 AM	12	5	3	0	20	2	56	29	0	87	34	1	10	0	45	6	**75**	2	0	**83**	235
09:00 AM	13	5	4	0	22	**10**	55	25	0	90	20	**5**	14	0	39	8	36	1	**1**	46	197
Total Volume	74	20	25	0	119	16	271	110	0	397	125	8	62	0	195	26	223	14	1	264	975
% App. Total	62.2	16.8	21	0		4	68.3	27.7	0		64.1	4.1	31.8	0		9.8	84.5	5.3	0.4		
PHF	.685	.833	.625	.000	.763	.400	.836	.786	.000	.856	.822	.400	.674	.000	.774	.813	.743	.389	.250	.795	.855
Cars	74	20	25	0	119	15	266	105	0	386	123	8	61	0	192	22	216	13	1	252	949
% Cars	100	100	100	0	100	93.8	98.2	95.5	0	97.2	98.4	100	98.4	0	98.5	84.6	96.9	92.9	100	95.5	97.3
Trucks	0	0	0	0	0	1	4	3	0	8	1	0	1	0	2	2	7	0	0	9	19
% Trucks	0	0	0	0	0	6.3	1.5	2.7	0	2.0	0.8	0	1.6	0	1.0	7.7	3.1	0	0	3.4	1.9
Buses	0	0	0	0	0	0	1	2	0	3	1	0	0	0	1	2	0	1	0	3	7
% Buses	0	0	0	0	0	0	0.4	1.8	0	0.8	0.8	0	0	0	0.5	7.7	0	7.1	0	1.1	0.7

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 1_Chamberlin & Ravenna 040125
Site Code : 00000000
Start Date : 4/1/2025

	BELLMEADOW DRIVE From North					RAVENNA ROAD From East					CHAMBERLIN ROAD From South					RAVENNA ROAD From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 02:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:00 PM																					
02:00 PM	9	3	2	0	14	**12**	59	28	0	99	34	7	10	0	51	12	67	9	0	88	252
02:15 PM	9	8	3	0	20	10	**66**	30	0	**106**	36	4	7	0	47	8	66	13	0	87	260
02:30 PM	**12**	**10**	4	0	26	11	54	**36**	0	101	37	**12**	**11**	0	60	14	74	**18**	0	**106**	293
02:45 PM	8	10	**8**	**1**	**27**	7	64	30	0	101	**48**	5	11	0	**64**	**17**	**75**	14	0	106	**298**
Total Volume	38	31	17	1	87	40	243	124	0	407	155	28	39	0	222	51	282	54	0	387	1103
% App. Total	43.7	35.6	19.5	1.1		9.8	59.7	30.5	0		69.8	12.6	17.6	0		13.2	72.9	14	0		
PHF	.792	.775	.531	.250	.806	.833	.920	.861	.000	.960	.807	.583	.886	.000	.867	.750	.940	.750	.000	.913	.925
Cars	37	29	17	1	84	36	234	120	0	390	149	26	37	0	212	49	274	54	0	377	1063
% Cars	97.4	93.5	100	100	96.6	90.0	96.3	96.8	0	95.8	96.1	92.9	94.9	0	95.5	96.1	97.2	100	0	97.4	96.4
Trucks	1	1	0	0	2	3	5	3	0	11	2	2	2	0	6	1	8	0	0	9	28
% Trucks	2.6	3.2	0	0	2.3	7.5	2.1	2.4	0	2.7	1.3	7.1	5.1	0	2.7	2.0	2.8	0	0	2.3	2.5
Buses	0	1	0	0	1	1	4	1	0	6	4	0	0	0	4	1	0	0	0	1	12
% Buses	0	3.2	0	0	1.1	2.5	1.6	0.8	0	1.5	2.6	0	0	0	1.8	2.0	0	0	0	0.3	1.1
Peak Hour Analysis From 03:00 PM to 03:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	**13**	4	1	0	18	**15**	46	34	0	95	36	8	**12**	0	56	16	68	7	0	91	260
03:15 PM	13	10	3	**1**	27	11	65	36	0	**112**	**52**	5	3	0	60	7	**90**	17	0	114	313
03:30 PM	10	**14**	5	0	**29**	13	56	**40**	0	109	48	**12**	9	0	**69**	15	89	**25**	0	**129**	**336**
03:45 PM	7	7	**10**	0	24	6	**68**	32	0	106	42	8	11	0	61	**21**	89	18	**1**	129	320
Total Volume	43	35	19	1	98	45	235	142	0	422	178	33	35	0	246	59	336	67	1	463	1229
% App. Total	43.9	35.7	19.4	1		10.7	55.7	33.6	0		72.4	13.4	14.2	0		12.7	72.6	14.5	0.2		
PHF	.827	.625	.475	.250	.845	.750	.864	.888	.000	.942	.856	.688	.729	.000	.891	.702	.933	.670	.250	.897	.914
Cars	38	29	18	1	86	42	228	139	0	409	171	32	33	0	236	57	331	67	1	456	1187
% Cars	88.4	82.9	94.7	100	87.8	93.3	97.0	97.9	0	96.9	96.1	97.0	94.3	0	95.9	96.6	98.5	100	100	98.5	96.6
Trucks	5	5	0	0	10	1	4	2	0	7	2	1	2	0	5	1	5	0	0	6	28
% Trucks	11.6	14.3	0	0	10.2	2.2	1.7	1.4	0	1.7	1.1	3.0	5.7	0	2.0	1.7	1.5	0	0	1.3	2.3
Buses	0	1	1	0	2	2	3	1	0	6	5	0	0	0	5	1	0	0	0	1	14
% Buses	0	2.9	5.3	0	2.0	4.4	1.3	0.7	0	1.4	2.8	0	0	0	2.0	1.7	0	0	0	0.2	1.1

VEHICULAR TRAFFIC COUNT SUMMARY

Municipality: Twinsburg **At Intersection of:** Chamberlin Road **and** Chamberlin Trail

Date: 4/1/2025 **Day:** Tue. **Comments:** **Project:** 25-047

Weather: Clear **Recorder(s):** EJJ **Data entry by:** JJO **Date entered:** Apr. 2, 2025

Chamberlin Rd & Chamberlin Tr 040125

TIME BEGINS	Chamberlin Road FROM NORTH						Chamberlin Road FROM SOUTH						TOTAL NORTH SOUTH	Chamberlin Trail FROM EAST						FROM WEST						TOTAL EAST WEST	TOTAL ALL DIREC.	PEAK HOUR FACTOR			
	Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus			North	South	East	West
06:00																														
07:00	0	236	0	236	3	2	0	129	1	130	3	4	366	1	0	2	3	1	0							3	369	0.787	0.691	0.375	0.000
08:00	0	168	0	168	4	3	0	130	0	130	1	1	298	1	0	0	1	0	0							1	299	0.875	0.929	0.250	0.000
09:00	0	103	0	103	3	0	0	89	2	91	6	0	194	0	0	1	1	0	0							1	195	0.805	0.910	0.250	0.000
10:00																														
11:00	2	104	0	106	3	0	0	110	0	110	6	0	216	0	0	1	1	0	0							1	217	0.828	0.786	0.250	0.000
12:00	1	93	0	94	5	1	0	110	2	112	7	0	206	1	0	3	4	1	0							4	210	0.839	0.848	0.500	0.000
1:00	1	119	0	120	4	0	0	145	5	150	5	0	270	2	0	2	4	1	0							4	274	0.857	0.872	0.500	0.000
2:00	2	160	0	162	3	2	0	187	3	190	3	3	352	3	0	4	7	0	0							7	359	1.125	1.105	0.875	
3:00	2	192	0	194	7	2	0	220	0	220	4	4	414	2	0	2	4	0	0							4	418	0.808	0.917	0.500	0.000
4:00	2	166	0	168	6	3	0	267	3	270	3	4	438	0	0	0	0	0	0							0	438	0.933	0.912	0.000	0.000
5:00	3	188	0	191	1	0	0	271	1	272	3	0	463	1	0	0	1	0	0							1	464	0.796	0.919	0.250	0.000
6:00																														
7:00																														
8:00																														
9:00																														
TOTALS	13	1529	0	1542	39	13	0	1658	17	1675	41	16	3217	11	0	15	26	3	0							26	3243				
ADT	24	2842	0	2866	3.4%		0	3082	32	3113	3.4%		5979	21	0	28	49	11.5%								49	6029				

N Leg Hourly Factor:	1.54	E Leg Hourly Factor:	1.57
S Leg Hourly Factor:	1.54	W leg Hourly Factor:	0.00
N Leg Monthly Factor:	1.21	E Leg Monthly Factor:	1.21
S Leg Monthly Factor:	1.21	W Leg Monthly Factor:	0.00

N Leg Combined Factor:	1.86	E Leg Combined Factor:	1.90
S Leg Combined Factor:	1.86	W Leg Combined Factor:	

TMS ENGINEERS, INC.

2112 Case Parkway South #7

Twinsburg, Ohio 44087

(330) 686-6402 FAX: (330) 686-6417

Figure #:

Page #:

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

City: Twinsburg
Intersection: Chamberlin Rd & Chamberlin Tr
Counter: EJJ
Day of the week: Tuesday

File Name : 2_Chamberlin & ChamberlinTrail 040125
Site Code : 00000000
Start Date : 4/1/2025
Page No : 1

Groups Printed- Cars - Trucks - Buses

	CHAMBERLIN ROAD From North					CHAMBERLIN TRAIL From East					CHAMBERLIN ROAD From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	53	0	0	53	0	0	0	0	0	0	28	0	1	29	0	0	0	0	0	82
07:15 AM	0	75	0	0	75	0	0	0	0	0	0	25	0	0	25	0	0	0	0	0	100
07:30 AM	0	59	0	0	59	1	0	0	0	1	0	30	0	0	30	0	0	0	0	0	90
07:45 AM	0	49	0	0	49	1	0	1	0	2	1	46	0	1	48	0	0	0	0	0	99
Total	0	236	0	0	236	2	0	1	0	3	1	129	0	2	132	0	0	0	0	0	371
08:00 AM	0	45	0	0	45	0	0	0	0	0	0	35	0	0	35	0	0	0	0	0	80
08:15 AM	0	48	0	0	48	0	0	1	0	1	0	34	0	0	34	0	0	0	0	0	83
08:30 AM	0	35	0	0	35	0	0	0	0	0	0	29	0	0	29	0	0	0	0	0	64
08:45 AM	0	40	0	0	40	0	0	0	0	0	0	32	0	0	32	0	0	0	0	0	72
Total	0	168	0	0	168	0	0	1	0	1	0	130	0	0	130	0	0	0	0	0	299
09:00 AM	0	32	0	0	32	0	0	0	0	0	0	25	0	0	25	0	0	0	0	0	57
09:15 AM	0	25	0	0	25	0	0	0	0	0	0	20	0	0	20	0	0	0	0	0	45
09:30 AM	0	25	0	0	25	0	0	0	0	0	1	23	0	0	24	0	0	0	0	0	49
09:45 AM	0	21	0	0	21	1	0	0	0	1	1	21	0	0	22	0	0	0	0	0	44
Total	0	103	0	0	103	1	0	0	0	1	2	89	0	0	91	0	0	0	0	0	195
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 2_Chamberlin & ChamberlinTrail 040125
Site Code : 00000000
Start Date : 4/1/2025
Page No : 2

Groups Printed- Cars - Trucks - Buses

	CHAMBERLIN ROAD From North					CHAMBERLIN TRAIL From East					CHAMBERLIN ROAD From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
11:00 AM	0	24	0	0	24	1	0	0	0	1	0	27	0	0	27	0	0	0	0	0	52
11:15 AM	0	22	1	0	23	0	0	0	0	0	0	20	0	0	20	0	0	0	0	0	43
11:30 AM	0	32	0	0	32	0	0	0	0	0	0	35	0	0	35	0	0	0	0	0	67
11:45 AM	0	26	1	0	27	0	0	0	0	0	0	28	0	0	28	0	0	0	0	0	55
Total	0	104	2	0	106	1	0	0	0	1	0	110	0	0	110	0	0	0	0	0	217
12:00 PM	0	24	1	0	25	0	0	0	0	0	0	29	0	0	29	0	0	0	0	0	54
12:15 PM	0	17	0	0	17	0	0	1	0	1	0	24	0	0	24	0	0	0	0	0	42
12:30 PM	0	24	0	0	24	2	0	0	0	2	2	31	0	0	33	0	0	0	0	0	59
12:45 PM	0	28	0	0	28	1	0	0	0	1	0	26	0	0	26	0	0	0	0	0	55
Total	0	93	1	0	94	3	0	1	0	4	2	110	0	0	112	0	0	0	0	0	210
01:00 PM	0	25	1	0	26	0	0	2	0	2	2	35	0	0	37	0	0	0	0	0	65
01:15 PM	0	27	0	0	27	2	0	0	0	2	2	32	0	0	34	0	0	0	0	0	63
01:30 PM	0	32	0	0	32	0	0	0	0	0	1	35	0	0	36	0	0	0	0	0	68
01:45 PM	0	35	0	0	35	0	0	0	0	0	0	43	0	0	43	0	0	0	0	0	78
Total	0	119	1	0	120	2	0	2	0	4	5	145	0	0	150	0	0	0	0	0	274
02:00 PM	0	35	1	0	36	0	0	2	0	2	1	41	0	0	42	0	0	0	0	0	80
02:15 PM	0	35	0	0	35	2	0	0	0	2	1	43	0	0	44	0	0	0	0	0	81
02:30 PM	0	46	0	0	46	0	0	1	0	1	1	48	0	0	49	0	0	0	0	0	96
02:45 PM	0	44	1	0	45	2	0	0	0	2	0	55	0	0	55	0	0	0	0	0	102
Total	0	160	2	0	162	4	0	3	0	7	3	187	0	0	190	0	0	0	0	0	359
03:00 PM	0	41	0	0	41	0	0	1	0	1	0	48	0	0	48	0	0	0	0	0	90

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 2_Chamberlin & ChamberlinTrail 040125
Site Code : 00000000
Start Date : 4/1/2025

Groups Printed- Cars - Trucks - Buses

	CHAMBERLIN ROAD From North					CHAMBERLIN TRAIL From East					CHAMBERLIN ROAD From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:15 PM	0	44	0	0	44	0	0	0	0	0	0	55	0	0	55	0	0	0	0	0	99
03:30 PM	0	60	0	0	60	0	0	1	0	1	0	60	0	0	60	0	0	0	0	0	121
03:45 PM	0	47	2	0	49	2	0	0	0	2	0	57	0	0	57	0	0	0	0	0	108
Total	0	192	2	0	194	2	0	2	0	4	0	220	0	0	220	0	0	0	0	0	418
04:00 PM	0	41	0	0	41	0	0	0	0	0	1	73	0	0	74	0	0	0	0	0	115
04:15 PM	0	42	1	0	43	0	0	0	0	0	0	54	0	0	54	0	0	0	0	0	97
04:30 PM	0	39	0	0	39	0	0	0	0	0	0	68	0	0	68	0	0	0	0	0	107
04:45 PM	0	44	1	0	45	0	0	0	0	0	2	72	0	0	74	0	0	0	0	0	119
Total	0	166	2	0	168	0	0	0	0	0	3	267	0	0	270	0	0	0	0	0	438
05:00 PM	0	59	1	0	60	0	0	0	0	0	1	73	0	0	74	0	0	0	0	0	134
05:15 PM	0	36	1	0	37	0	0	1	0	1	0	74	0	0	74	0	0	0	0	0	112
05:30 PM	0	47	1	0	48	0	0	0	0	0	0	66	0	0	66	0	0	0	0	0	114
05:45 PM	0	46	0	0	46	0	0	0	0	0	0	58	0	0	58	0	0	0	0	0	104
Total	0	188	3	0	191	0	0	1	0	1	1	271	0	0	272	0	0	0	0	0	464
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	1529	13	0	1542	15	0	11	0	26	17	1658	0	2	1677	0	0	0	0	0	3245
Apprch %	0	99.2	0.8	0		57.7	0	42.3	0		1	98.9	0	0.1		0	0	0	0		
Total %	0	47.1	0.4	0	47.5	0.5	0	0.3	0	0.8	0.5	51.1	0	0.1	51.7	0	0	0	0	0	
Cars	0	1477	13	0	1490	12	0	11	0	23	14	1604	0	1	1619	0	0	0	0	0	3132
% Cars	0	96.6	100	0	96.6	80	0	100	0	88.5	82.4	96.7	0	50	96.5	0	0	0	0	0	96.5
Trucks	0	39	0	0	39	3	0	0	0	3	3	38	0	1	42	0	0	0	0	0	84
% Trucks	0	2.6	0	0	2.5	20	0	0	0	11.5	17.6	2.3	0	50	2.5	0	0	0	0	0	2.6
Buses	0	13	0	0	13	0	0	0	0	0	0	16	0	0	16	0	0	0	0	0	29
% Buses	0	0.9	0	0	0.8	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0.9

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 2_Chamberlin & ChamberlinTrail 040125
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Start Date : 4/1/2025
Page No : 4

	CHAMBERLIN ROAD From North					CHAMBERLIN TRAIL From East					CHAMBERLIN ROAD From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	53	0	0	53	0	0	0	0	0	0	28	0	**1**	29	0	0	0	0	0	82
07:15 AM	0	**75**	0	0	**75**	0	0	0	0	0	0	25	0	0	25	0	0	0	0	0	**100**
07:30 AM	0	59	0	0	59	**1**	0	0	0	1	0	30	0	0	30	0	0	0	0	0	90
07:45 AM	0	49	0	0	49	1	0	**1**	0	**2**	**1**	**46**	0	1	**48**	0	0	0	0	0	99
Total Volume	0	236	0	0	236	2	0	1	0	3	1	129	0	2	132	0	0	0	0	0	371
% App. Total	0	100	0	0		66.7	0	33.3	0		0.8	97.7	0	1.5		0	0	0	0		
PHF	.000	.787	.000	.000	.787	.500	.000	.250	.000	.375	.250	.701	.000	.500	.688	.000	.000	.000	.000	.000	.928
Cars	0	231	0	0	231	1	0	1	0	2	0	123	0	1	124	0	0	0	0	0	357
% Cars	0	97.9	0	0	97.9	50.0	0	100	0	66.7	0	95.3	0	50.0	93.9	0	0	0	0	0	96.2
Trucks	0	3	0	0	3	1	0	0	0	1	1	2	0	1	4	0	0	0	0	0	8
% Trucks	0	1.3	0	0	1.3	50.0	0	0	0	33.3	100	1.6	0	50.0	3.0	0	0	0	0	0	2.2
Buses	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	6
% Buses	0	0.8	0	0	0.8	0	0	0	0	0	0	3.1	0	0	3.0	0	0	0	0	0	1.6
Peak Hour Analysis From 08:15 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:15 AM																					
08:15 AM	0	**48**	0	0	**48**	0	0	**1**	0	**1**	0	**34**	0	0	**34**	0	0	0	0	0	**83**
08:30 AM	0	35	0	0	35	0	0	0	0	0	0	29	0	0	29	0	0	0	0	0	64
08:45 AM	0	40	0	0	40	0	0	0	0	0	0	32	0	0	32	0	0	0	0	0	72
09:00 AM	0	32	0	0	32	0	0	0	0	0	0	25	0	0	25	0	0	0	0	0	57
Total Volume	0	155	0	0	155	0	0	1	0	1	0	120	0	0	120	0	0	0	0	0	276
% App. Total	0	100	0	0		0	0	100	0		0	100	0	0		0	0	0	0		
PHF	.000	.807	.000	.000	.807	.000	.000	.250	.000	.250	.000	.882	.000	.000	.882	.000	.000	.000	.000	.000	.831
Cars	0	149	0	0	149	0	0	1	0	1	0	118	0	0	118	0	0	0	0	0	268
% Cars	0	96.1	0	0	96.1	0	0	100	0	100	0	98.3	0	0	98.3	0	0	0	0	0	97.1
Trucks	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
% Trucks	0	1.9	0	0	1.9	0	0	0	0	0	0	1.7	0	0	1.7	0	0	0	0	0	1.8
Buses	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
% Buses	0	1.9	0	0	1.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 2_Chamberlin & ChamberlinTrail 040125
Site Code : 00000000
Start Date : 4/1/2025
Page No : 5

	CHAMBERLIN ROAD From North					CHAMBERLIN TRAIL From East					CHAMBERLIN ROAD From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 02:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:00 PM																					
02:00 PM	0	35	**1**	0	36	0	0	**2**	0	**2**	**1**	41	0	0	42	0	0	0	0	0	80
02:15 PM	0	35	0	0	35	**2**	0	0	0	2	1	43	0	0	44	0	0	0	0	0	81
02:30 PM	0	**46**	0	0	**46**	0	0	1	0	1	1	48	0	0	49	0	0	0	0	0	96
02:45 PM	0	44	1	0	45	2	0	0	0	2	0	**55**	0	0	**55**	0	0	0	0	0	**102**
Total Volume	0	160	2	0	162	4	0	3	0	7	3	187	0	0	190	0	0	0	0	0	359
% App. Total	0	98.8	1.2	0		57.1	0	42.9	0		1.6	98.4	0	0		0	0	0	0		
PHF	.000	.870	.500	.000	.880	.500	.000	.375	.000	.875	.750	.850	.000	.000	.864	.000	.000	.000	.000	.000	.880
Cars	0	155	2	0	157	4	0	3	0	7	3	181	0	0	184	0	0	0	0	0	348
% Cars	0	96.9	100	0	96.9	100	0	100	0	100	100	96.8	0	0	96.8	0	0	0	0	0	96.9
Trucks	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	6
% Trucks	0	1.9	0	0	1.9	0	0	0	0	0	0	1.6	0	0	1.6	0	0	0	0	0	1.7
Buses	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
% Buses	0	1.3	0	0	1.2	0	0	0	0	0	0	1.6	0	0	1.6	0	0	0	0	0	1.4
Peak Hour Analysis From 03:00 PM to 03:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	0	41	0	0	41	0	0	**1**	0	1	0	48	0	0	48	0	0	0	0	0	90
03:15 PM	0	44	0	0	44	0	0	0	0	0	0	55	0	0	55	0	0	0	0	0	99
03:30 PM	0	**60**	0	0	**60**	0	0	1	0	1	0	**60**	0	0	**60**	0	0	0	0	0	**121**
03:45 PM	0	47	**2**	0	49	**2**	0	0	0	**2**	0	57	0	0	57	0	0	0	0	0	108
Total Volume	0	192	2	0	194	2	0	2	0	4	0	220	0	0	220	0	0	0	0	0	418
% App. Total	0	99	1	0		50	0	50	0		0	100	0	0		0	0	0	0		
PHF	.000	.800	.250	.000	.808	.250	.000	.500	.000	.500	.000	.917	.000	.000	.917	.000	.000	.000	.000	.000	.864
Cars	0	183	2	0	185	2	0	2	0	4	0	212	0	0	212	0	0	0	0	0	401
% Cars	0	95.3	100	0	95.4	100	0	100	0	100	0	96.4	0	0	96.4	0	0	0	0	0	95.9
Trucks	0	7	0	0	7	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	11
% Trucks	0	3.6	0	0	3.6	0	0	0	0	0	0	1.8	0	0	1.8	0	0	0	0	0	2.6
Buses	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	6
% Buses	0	1.0	0	0	1.0	0	0	0	0	0	0	1.8	0	0	1.8	0	0	0	0	0	1.4

VEHICULAR TRAFFIC COUNT SUMMARY

Municipality: Twinsburg **At Intersection of:** Chamberlin Road **and** East Aurora Road (SR 82)

Date: 4/1/2025 **Day:** Tue. **Comments:** **Project:** 25-047

Chamberlin Rd s E.Aurora Rd 040125

Weather: Clear **Recorder(s):** KPB **Data entry by:** JJO **Date entered:** Apr. 2, 2025

TIME BEGINS	Chamberlin Rd. FROM NORTH						Chamberlin Rd. FROM SOUTH						TOTAL NORTH SOUTH	E. Aurora Rd. (SR 82) FROM EAST						E. Aurora Rd. (SR 82) FROM WEST						TOTAL EAST WEST	TOTAL ALL DIREC.	PEAK HOUR FACTOR			
	Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus			North	South	East	West
06:00																														
07:00	144	93	45	282	3	1	16	13	94	123	30	0	405	81	339	39	459	33	5	18	371	41	430	18	0	889	1294	0.839	0.769	0.802	0.721
08:00	95	73	34	202	3	1	16	26	95	137	25	0	339	76	352	51	479	39	0	16	420	42	478	29	1	957	1296	0.935	0.797	0.894	0.926
09:00	76	25	36	137	2	0	15	17	73	105	21	0	242	109	373	59	541	98	1	19	326	26	371	14	0	912	1154	0.797	0.847	0.867	0.867
10:00																														
11:00	71	19	43	133	5	1	45	22	76	143	44	0	276	77	389	62	528	63	2	35	312	25	372	28	0	900	1176	0.792	0.813	0.815	0.903
12:00	47	34	27	108	7	1	39	33	78	150	34	0	258	66	428	48	542	48	1	42	420	41	503	31	1	1045	1303	0.844	0.721	0.903	0.945
1:00	60	29	25	114	3	0	35	33	92	160	33	0	274	84	377	66	527	44	0	35	348	43	426	21	0	953	1227	0.838	0.816	0.928	0.895
2:00	75	34	36	145	4	1	45	60	153	258	30	0	403	103	481	91	675	49	3	46	410	36	492	18	0	1167	1570	1.066	1.290	1.068	0.969
3:00	86	32	43	161	4	2	42	80	153	275	34	0	436	71	512	108	691	49	5	53	436	16	505	11	3	1196	1632	0.875	0.790	0.924	0.949
4:00	79	28	40	147	7	1	63	92	142	297	25	0	444	105	506	121	732	38	3	59	437	13	509	17	1	1241	1685	0.782	0.863	0.924	0.929
5:00	71	29	38	138	3	0	30	69	115	214	25	0	352	63	473	137	673	26	1	60	384	16	460	7	0	1133	1485	0.784	0.754	0.858	0.898
6:00																														
7:00																														
8:00																														
9:00																														
TOTALS	804	396	367	1567	41	8	346	445	1071	1862	301	0	3429	835	4230	782	5847	487	21	383	3864	299	4546	194	6	10393	13822				
ADT	1494	736	682	2913	3.1%		657	845	2034	3537	16.2%		6449	1599	8099	1497	11194	8.7%		733	7398	572	8704	4.4%		19898	26347				

N Leg Hourly Factor:	1.54	E Leg Hourly Factor:	1.58
S Leg Hourly Factor:	1.57	W leg Hourly Factor:	1.58
N Leg Monthly Factor:	1.21	E Leg Monthly Factor:	1.21
S Leg Monthly Factor:	1.21	W Leg Monthly Factor:	1.21

N Leg Combined Factor:	1.86	E Leg Combined Factor:	1.91
S Leg Combined Factor:	1.90	W Leg Combined Factor:	1.91

TMS ENGINEERS, INC.

2112 Case Parkway South #7

Twinsburg, Ohio 44087

(330) 686-6402 FAX: (330) 686-6417

Figure #:

Page #:

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

City: Twinsburg
Intersection: Chamberlin Rd & E. Aurora Rd
Counter: KPB
Day of the Week: Tuesday

File Name : 3_Chamberlin & Aurora 040125
Site Code : 00000000
Start Date : 4/1/2025
Page No : 1

Groups Printed- Cars - Trucks - Busses

	CHAMBERLIN ROAD From North					EAST AURORA ROAD (SR 82) From East					CHAMBERLIN ROAD From South					EAST AURORA ROAD (SR 82) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	8	18	31	0	57	8	71	17	0	96	29	4	7	0	40	1	71	3	0	75	268
07:15 AM	15	30	39	0	84	13	74	19	0	106	24	2	3	0	29	9	86	1	0	96	315
07:30 AM	15	15	33	0	63	5	85	24	0	114	18	3	5	0	26	11	92	7	0	110	313
07:45 AM	7	30	41	0	78	13	109	21	0	143	23	4	1	0	28	20	122	7	0	149	398
Total	45	93	144	0	282	39	339	81	0	459	94	13	16	0	123	41	371	18	0	430	1294
08:00 AM	6	22	25	0	53	17	82	10	0	109	22	6	7	0	35	12	114	3	0	129	326
08:15 AM	7	18	25	0	50	9	88	19	0	116	31	8	4	0	43	13	109	2	0	124	333
08:30 AM	15	18	21	0	54	12	91	17	0	120	15	6	3	0	24	5	105	1	0	111	309
08:45 AM	6	15	24	0	45	13	91	30	1	135	27	6	2	0	35	12	92	10	0	114	329
Total	34	73	95	0	202	51	352	76	1	480	95	26	16	0	137	42	420	16	0	478	1297
09:00 AM	6	11	15	0	32	15	108	33	0	156	22	5	1	1	29	9	89	7	0	105	322
09:15 AM	10	3	24	0	37	11	82	32	0	125	23	5	3	1	32	5	98	4	0	107	301
09:30 AM	10	6	27	0	43	17	99	23	0	139	17	4	3	0	24	6	62	6	0	74	280
09:45 AM	10	5	10	0	25	16	84	21	0	121	11	3	8	0	22	6	77	2	0	85	253
Total	36	25	76	0	137	59	373	109	0	541	73	17	15	2	107	26	326	19	0	371	1156
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 3_Chamberlin & Aurora 040125
Site Code : 00000000
Start Date : 4/1/2025

Groups Printed- Cars - Trucks - Busses

	CHAMBERLIN ROAD From North					EAST AURORA ROAD (SR 82) From East					CHAMBERLIN ROAD From South					EAST AURORA ROAD (SR 82) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
11:00 AM	10	2	12	0	24	12	66	20	0	98	21	4	8	0	33	5	73	6	0	84	239
11:15 AM	12	5	20	0	37	15	110	12	0	137	16	4	6	0	26	7	82	7	0	96	296
11:30 AM	8	6	16	0	30	14	97	20	0	131	20	7	17	0	44	6	68	15	0	89	294
11:45 AM	13	6	23	0	42	21	116	25	0	162	19	7	14	0	40	7	89	7	0	103	347
Total	43	19	71	0	133	62	389	77	0	528	76	22	45	0	143	25	312	35	0	372	1176
12:00 PM	12	8	11	0	31	11	110	13	0	134	20	17	15	0	52	11	92	15	0	118	335
12:15 PM	3	5	6	0	14	13	122	15	0	150	22	4	5	0	31	9	104	10	0	123	318
12:30 PM	6	15	11	0	32	13	107	20	0	140	20	7	13	0	40	7	113	9	0	129	341
12:45 PM	6	6	19	0	31	11	89	18	0	118	16	5	6	0	27	14	111	8	0	133	309
Total	27	34	47	0	108	48	428	66	0	542	78	33	39	0	150	41	420	42	0	503	1303
01:00 PM	7	5	13	0	25	21	99	22	0	142	31	5	8	0	44	8	105	6	0	119	330
01:15 PM	8	2	13	0	23	8	98	22	0	128	19	8	7	0	34	15	78	4	0	97	282
01:30 PM	5	11	16	0	32	20	89	21	0	130	16	7	10	0	33	10	84	9	1	104	299
01:45 PM	5	11	18	0	34	17	91	19	0	127	26	13	10	0	49	10	81	16	0	107	317
Total	25	29	60	0	114	66	377	84	0	527	92	33	35	0	160	43	348	35	1	427	1228
02:00 PM	7	7	16	0	30	21	112	25	0	158	31	8	11	0	50	6	110	11	1	128	366
02:15 PM	10	6	17	0	33	19	120	29	0	168	44	14	8	0	66	15	100	8	0	123	390
02:30 PM	9	13	20	0	42	28	127	23	0	178	34	21	15	0	70	8	100	14	0	122	412
02:45 PM	10	8	22	0	40	23	122	26	0	171	44	17	11	2	74	7	100	13	0	120	405
Total	36	34	75	0	145	91	481	103	0	675	153	60	45	2	260	36	410	46	1	493	1573
03:00 PM	7	6	17	0	30	21	114	12	0	147	20	10	11	0	41	2	102	16	0	120	338

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 3_Chamberlin & Aurora 040125
Site Code : 00000000
Start Date : 4/1/2025
Page No : 3

Groups Printed- Cars - Trucks - Busses

	CHAMBERLIN ROAD From North					EAST AURORA ROAD (SR 82) From East					CHAMBERLIN ROAD From South					EAST AURORA ROAD (SR 82) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:15 PM	12	7	21	0	40	30	131	20	0	181	48	19	6	1	74	6	115	11	0	132	427
03:30 PM	10	14	22	0	46	31	138	18	0	187	38	32	17	0	87	6	111	16	0	133	453
03:45 PM	14	5	26	0	45	26	129	21	0	176	47	19	8	0	74	2	108	10	0	120	415
Total	43	32	86	0	161	108	512	71	0	691	153	80	42	1	276	16	436	53	0	505	1633
04:00 PM	14	7	18	0	39	31	132	24	0	187	37	27	22	0	86	6	112	12	0	130	442
04:15 PM	11	8	15	0	34	31	137	26	0	194	32	19	9	0	60	1	108	10	0	119	407
04:30 PM	8	7	12	0	27	23	93	37	0	153	30	21	19	0	70	3	105	15	0	123	373
04:45 PM	7	6	34	0	47	36	144	18	0	198	43	25	13	0	81	3	112	22	0	137	463
Total	40	28	79	0	147	121	506	105	0	732	142	92	63	0	297	13	437	59	0	509	1685
05:00 PM	5	8	15	0	28	33	130	33	0	196	31	28	12	0	71	2	101	16	1	120	415
05:15 PM	15	8	17	0	40	32	145	15	0	192	35	18	11	0	64	2	107	17	0	126	422
05:30 PM	10	5	11	0	26	42	114	9	0	165	32	14	4	0	50	12	97	19	0	128	369
05:45 PM	8	8	28	0	44	30	84	6	0	120	17	9	3	0	29	0	79	8	0	87	280
Total	38	29	71	0	138	137	473	63	0	673	115	69	30	0	214	16	384	60	1	461	1486
Grand Total	367	396	804	0	1567	782	4230	835	1	5848	1071	445	346	5	1867	299	3864	383	3	4549	13831
Apprch %	23.4	25.3	51.3	0		13.4	72.3	14.3	0		57.4	23.8	18.5	0.3		6.6	84.9	8.4	0.1		
Total %	2.7	2.9	5.8	0	11.3	5.7	30.6	6	0	42.3	7.7	3.2	2.5	0	13.5	2.2	27.9	2.8	0	32.9	
Cars	360	373	785	0	1518	754	3988	597	1	5340	828	430	303	1	1562	258	3708	380	3	4349	12769
% Cars	98.1	94.2	97.6	0	96.9	96.4	94.3	71.5	100	91.3	77.3	96.6	87.6	20	83.7	86.3	96	99.2	100	95.6	92.3
Trucks	7	23	11	0	41	17	232	238	0	487	243	15	43	4	305	41	150	3	0	194	1027
% Trucks	1.9	5.8	1.4	0	2.6	2.2	5.5	28.5	0	8.3	22.7	3.4	12.4	80	16.3	13.7	3.9	0.8	0	4.3	7.4
Busses	0	0	8	0	8	11	10	0	0	21	0	0	0	0	0	0	6	0	0	6	35
% Busses	0	0	1	0	0.5	1.4	0.2	0	0	0.4	0	0	0	0	0	0	0.2	0	0	0.1	0.3

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 3_Chamberlin & Aurora 040125
Site Code : 00000000
Start Date : 4/1/2025
Page No : 4

	CHAMBERLIN ROAD From North					EAST AURORA ROAD (SR 82) From East					CHAMBERLIN ROAD From South					EAST AURORA ROAD (SR 82) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	8	18	31	0	57	8	71	17	0	96	**29**	**4**	**7**	0	**40**	1	71	3	0	75	268
07:15 AM	**15**	**30**	39	0	**84**	**13**	74	19	0	106	24	2	3	0	29	9	86	1	0	96	315
07:30 AM	15	15	33	0	63	5	85	**24**	0	114	18	3	5	0	26	11	92	**7**	0	110	313
07:45 AM	7	30	**41**	0	78	13	**109**	21	0	**143**	23	4	1	0	28	**20**	**122**	7	0	**149**	**398**
Total Volume	45	93	144	0	282	39	339	81	0	459	94	13	16	0	123	41	371	18	0	430	1294
% App. Total	16	33	51.1	0		8.5	73.9	17.6	0		76.4	10.6	13	0		9.5	86.3	4.2	0		
PHF	.750	.775	.878	.000	.839	.750	.778	.844	.000	.802	.810	.813	.571	.000	.769	.513	.760	.643	.000	.721	.813
Cars	45	91	142	0	278	37	315	69	0	421	69	11	13	0	93	38	356	18	0	412	1204
% Cars	100	97.8	98.6	0	98.6	94.9	92.9	85.2	0	91.7	73.4	84.6	81.3	0	75.6	92.7	96.0	100	0	95.8	93.0
Trucks	0	2	1	0	3	1	20	12	0	33	25	2	3	0	30	3	15	0	0	18	84
% Trucks	0	2.2	0.7	0	1.1	2.6	5.9	14.8	0	7.2	26.6	15.4	18.8	0	24.4	7.3	4.0	0	0	4.2	6.5
Busses	0	0	1	0	1	1	4	0	0	5	0	0	0	0	0	0	0	0	0	0	6
% Busses	0	0	0.7	0	0.4	2.6	1.2	0	0	1.1	0	0	0	0	0	0	0	0	0	0	0.5
Peak Hour Analysis From 08:15 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:15 AM																					
08:15 AM	7	**18**	**25**	0	50	9	88	19	0	116	**31**	**8**	**4**	0	**43**	**13**	**109**	2	0	**124**	**333**
08:30 AM	**15**	18	21	0	**54**	12	91	17	0	120	15	6	3	0	24	5	105	1	0	111	309
08:45 AM	6	15	24	0	45	13	91	30	**1**	135	27	6	2	0	35	12	92	**10**	0	114	329
09:00 AM	6	11	15	0	32	**15**	**108**	**33**	0	**156**	22	5	1	**1**	29	9	89	7	0	105	322
Total Volume	34	62	85	0	181	49	378	99	1	527	95	25	10	1	131	39	395	20	0	454	1293
% App. Total	18.8	34.3	47	0		9.3	71.7	18.8	0.2		72.5	19.1	7.6	0.8		8.6	87	4.4	0		
PHF	.567	.861	.850	.000	.838	.817	.875	.750	.250	.845	.766	.781	.625	.250	.762	.750	.906	.500	.000	.915	.971
Cars	33	61	84	0	178	48	351	76	1	476	74	24	8	0	106	34	371	20	0	425	1185
% Cars	97.1	98.4	98.8	0	98.3	98.0	92.9	76.8	100	90.3	77.9	96.0	80.0	0	80.9	87.2	93.9	100	0	93.6	91.6
Trucks	1	1	0	0	2	1	27	23	0	51	21	1	2	1	25	5	24	0	0	29	107
% Trucks	2.9	1.6	0	0	1.1	2.0	7.1	23.2	0	9.7	22.1	4.0	20.0	100	19.1	12.8	6.1	0	0	6.4	8.3
Busses	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Busses	0	0	1.2	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1

TMS Engineers, Inc.

2112 Case Parkway South #7
Twinsburg, Ohio 44087
Transportation Manangement Services

File Name : 3_Chamberlin & Aurora 040125
Site Code : 00000000
Start Date : 4/1/2025
Page No : 5

	CHAMBERLIN ROAD From North					EAST AURORA ROAD (SR 82) From East					CHAMBERLIN ROAD From South					EAST AURORA ROAD (SR 82) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 02:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:00 PM																					
02:00 PM	7	7	16	0	30	21	112	25	0	158	31	8	11	0	50	6	**110**	11	**1**	**128**	366
02:15 PM	**10**	6	17	0	33	19	120	**29**	0	168	**44**	14	8	0	66	**15**	100	8	0	123	390
02:30 PM	9	**13**	20	0	**42**	**28**	**127**	23	0	**178**	34	**21**	**15**	0	70	8	100	**14**	0	122	**412**
02:45 PM	10	8	**22**	0	40	23	122	26	0	171	44	17	11	**2**	**74**	7	100	13	0	120	405
Total Volume	36	34	75	0	145	91	481	103	0	675	153	60	45	2	260	36	410	46	1	493	1573
% App. Total	24.8	23.4	51.7	0		13.5	71.3	15.3	0		58.8	23.1	17.3	0.8		7.3	83.2	9.3	0.2		
PHF	.900	.654	.852	.000	.863	.813	.947	.888	.000	.948	.869	.714	.750	.250	.878	.600	.932	.821	.250	.963	.954
Cars	35	32	73	0	140	88	454	81	0	623	128	59	41	1	229	30	399	45	1	475	1467
% Cars	97.2	94.1	97.3	0	96.6	96.7	94.4	78.6	0	92.3	83.7	98.3	91.1	50.0	88.1	83.3	97.3	97.8	100	96.3	93.3
Trucks	1	2	1	0	4	0	27	22	0	49	25	1	4	1	31	6	11	1	0	18	102
% Trucks	2.8	5.9	1.3	0	2.8	0	5.6	21.4	0	7.3	16.3	1.7	8.9	50.0	11.9	16.7	2.7	2.2	0	3.7	6.5
Busses	0	0	1	0	1	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	4
% Busses	0	0	1.3	0	0.7	3.3	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0.3
Peak Hour Analysis From 03:00 PM to 03:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	7	6	17	0	30	21	114	12	0	147	20	10	11	0	41	2	102	**16**	0	120	338
03:15 PM	12	7	21	0	40	30	131	20	0	181	**48**	19	6	**1**	74	**6**	**115**	11	0	132	427
03:30 PM	10	**14**	22	0	**46**	**31**	**138**	18	0	**187**	38	**32**	**17**	0	**87**	6	111	16	0	**133**	**453**
03:45 PM	**14**	5	**26**	0	45	26	129	**21**	0	176	47	19	8	0	74	2	108	10	0	120	415
Total Volume	43	32	86	0	161	108	512	71	0	691	153	80	42	1	276	16	436	53	0	505	1633
% App. Total	26.7	19.9	53.4	0		15.6	74.1	10.3	0		55.4	29	15.2	0.4		3.2	86.3	10.5	0		
PHF	.768	.571	.827	.000	.875	.871	.928	.845	.000	.924	.797	.625	.618	.250	.793	.667	.948	.828	.000	.949	.901
Cars	41	30	84	0	155	105	478	54	0	637	123	78	40	0	241	13	426	52	0	491	1524
% Cars	95.3	93.8	97.7	0	96.3	97.2	93.4	76.1	0	92.2	80.4	97.5	95.2	0	87.3	81.3	97.7	98.1	0	97.2	93.3
Trucks	2	2	0	0	4	0	32	17	0	49	30	2	2	1	35	3	7	1	0	11	99
% Trucks	4.7	6.3	0	0	2.5	0	6.3	23.9	0	7.1	19.6	2.5	4.8	100	12.7	18.8	1.6	1.9	0	2.2	6.1
Busses	0	0	2	0	2	3	2	0	0	5	0	0	0	0	0	0	3	0	0	3	10
% Busses	0	0	2.3	0	1.2	2.8	0.4	0	0	0.7	0	0	0	0	0	0	0.7	0	0	0.6	0.6

Appendix D
TCSD School Schedules

330.486.2004 ~ office
330.803.6130 ~ cell

“Darkness cannot drive out darkness, only light can do that. Hate cannot drive out hate, only love can do that.” ~ The Reverend Dr. Martin Luther King Jr.

---------- Forwarded message ---------
From: **TRACY ABBOTT** <tabbott@twinsburgcsd.org>
Date: Mon, Oct 21, 2024 at 8:37 AM
Subject: Fwd: Your scan (Scan to My Email)
To: Mark Desmond <mdesmond@twinsburgcsd.org>, MATTHEW STRICKLAND <mstrickland@twinsburgcsd.org>

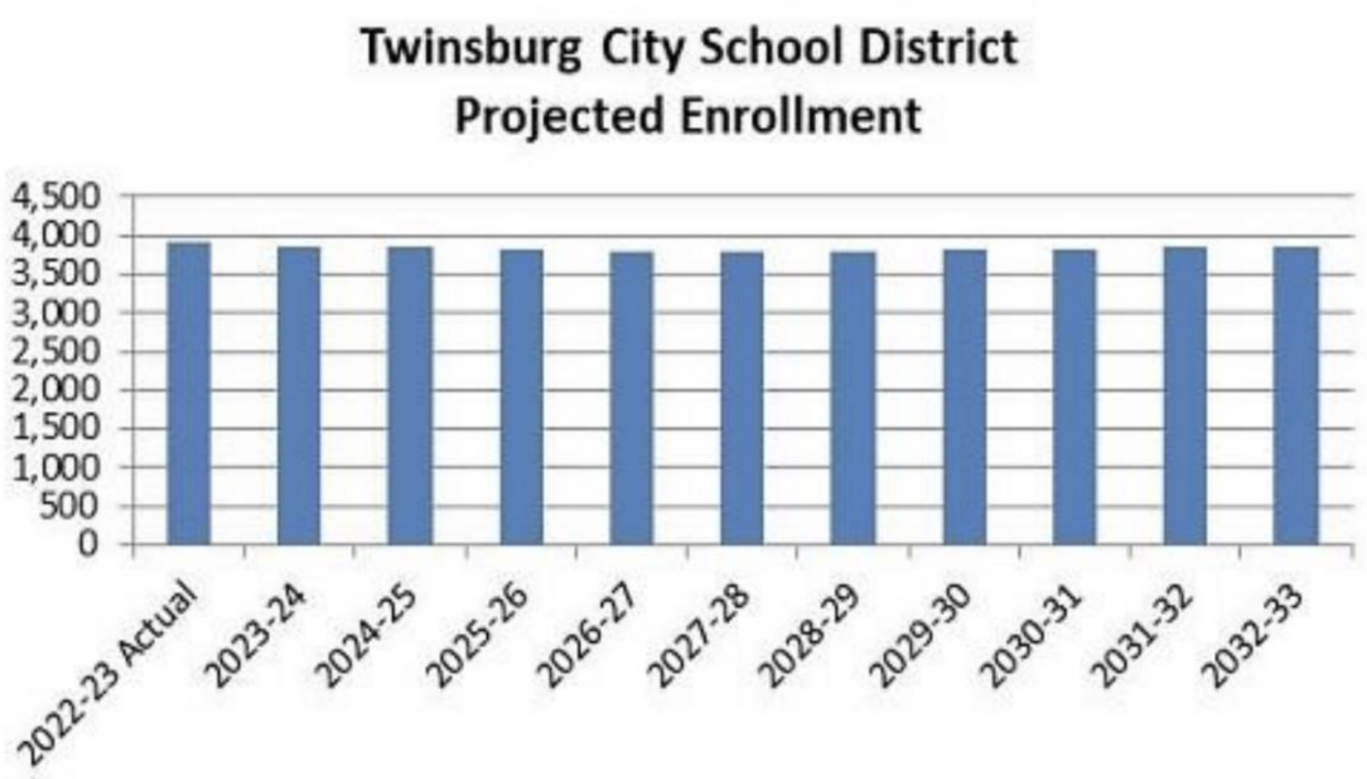
THS allows drop off as of 7:35
Dodge allows drop off at 6:50 with dismissal at 1:55.

	THS ***GR 9 - 12***	**RBC** ***GR 7 & 8***	**DODGE** ***GR 4 - 6***	**BISSELL** ***GR 2 & 3***	**WILCOX** ***KG & GR 1***	**WILCOX Preschool AM**	**WILCOX Preschool PM**
Teacher Start	7:40 AM	7:00 AM	6:45 AM	8:10 AM	8:40 AM	8:40 AM	N/A
AM Bus Routes	**7:00 AM-7:35 AM**	**6:15 AM-7:10 AM**	**6:05 AM-6:50 AM**	**7:35 AM-8:20 AM**	**8:05 AM-8:55 AM**	**8:05 AM-8:55 AM**	**12:30 PM-1:15 PM**
Start Time	8:05 AM	7:20 AM	7:15 AM	8:30 AM	9:00 AM	9:00 AM	1:20 PM
End Time	2:55 PM	2:15 PM	2:10 PM	3:20 PM	3:50 PM	11:30 AM	3:50 PM
PM Bus Routes	**3:05 PM-3:55 PM**	**2:30 PM-3:30PM**	**1:55 PM-2:40 PM**	**3:25 PM-4:20 PM**	**3:55 PM-4:45 PM**	**11:40 AM-12:20 PM**	**3:55 PM-4:45 PM**
Teacher End	3:10 PM	2:30 PM	2:15 PM	3:40 PM	4:10 PM	N/A	4:10 PM
Student Hrs/Day Emis	**6:20/6.33**	**6:25/6.42**	**6:25/6.42**	**6:20/6.33**	**6:20/6.33**	**2:30/2.5**	**2:30/2.5**

---------- Forwarded message ---------
From: **TRACY ABBOTT** <copier@twinsburgcsd.org>
Date: Mon, Oct 21, 2024 at 8:34 AM

Appendix E
TSCD Enrollment Data

Enrollment Projection



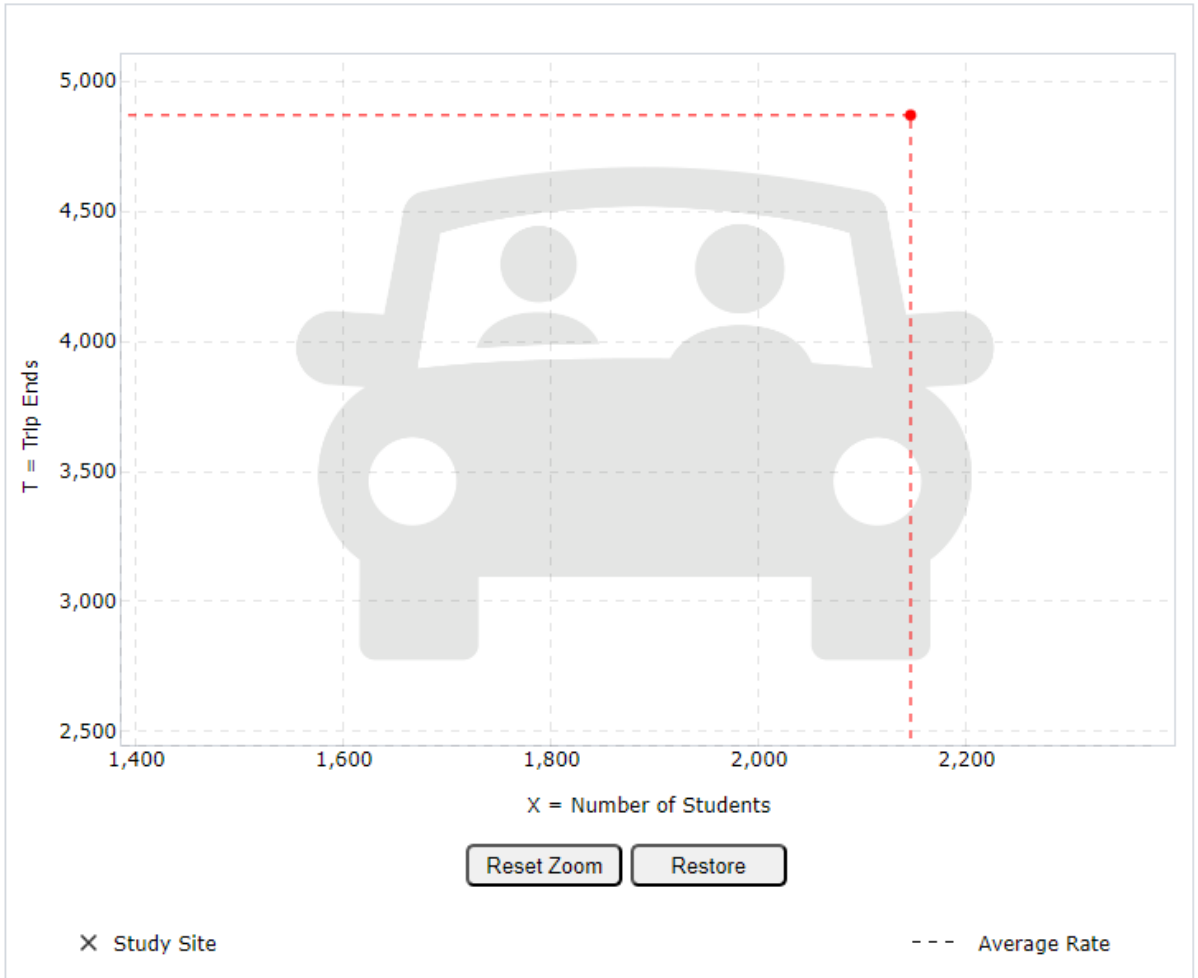
Appendix F
Trip Generation Data

ELEMENTARY SCHOOL – ITE CODE #520

WEEKDAY

Size: 2,146 Students

Data Plot and Equation



DATA STATISTICS

Land Use:
Elementary School (520) Click for Description and Data Plots

Independent Variable:
Students

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
16

Avg. Num. of Students:
651

Average Rate:
2.27

Range of Rates:
1.51 - 5.89

Standard Deviation:
0.93

Fitted Curve Equation:
Not Given

R^2:
****

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 4871 (Total), 2436 (Entry), 2435 (Exit)

Source: Institute of Transportation Engineers, Trip Generation Manual, 11TH Edition, 2021

Date: 9/25/2024

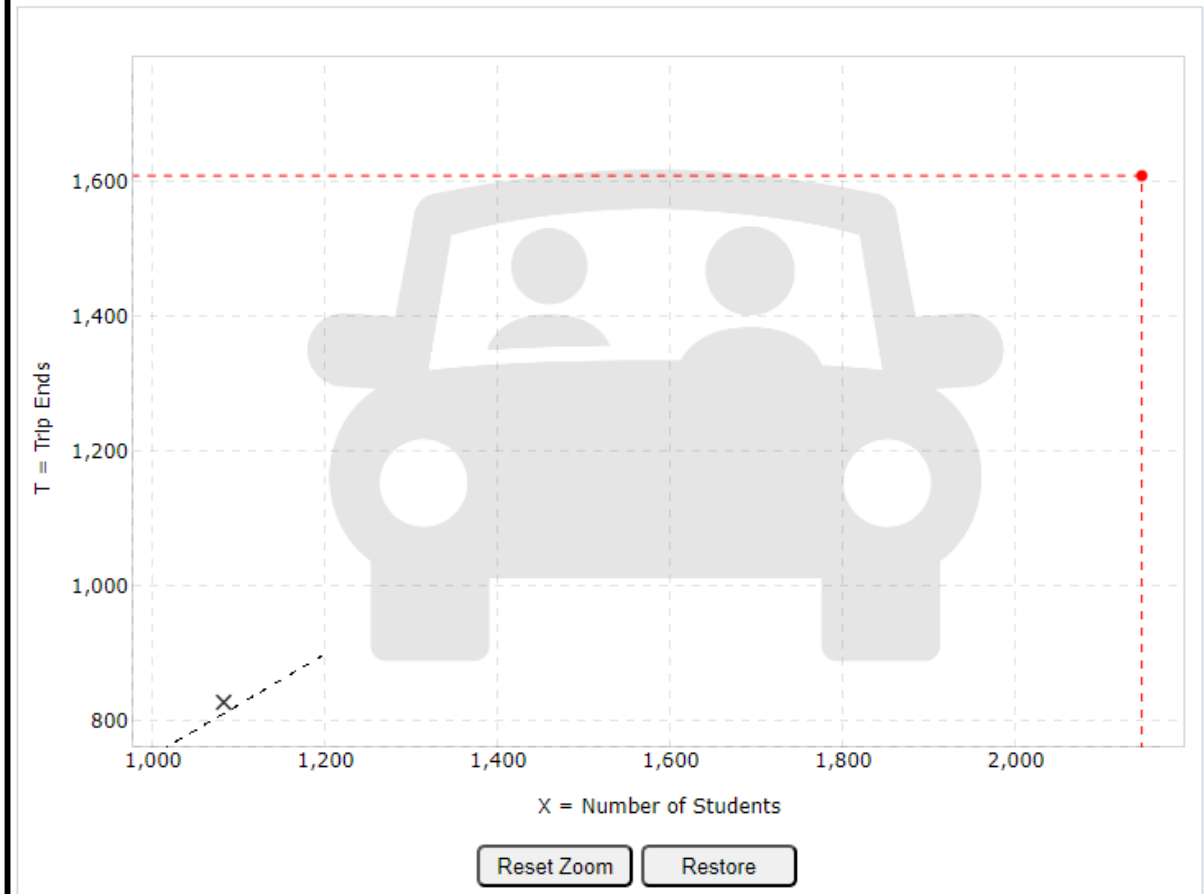
ELEMENTARY SCHOOL – ITE CODE #520

Size: 2,146 Students

WEEKDAY

AM Peak Hour of Generator

Data Plot and Equation



DATA STATISTICS

Land Use:
Elementary School (520) Click for Description and Data Plots

Independent Variable:
Students

Time Period:
Weekday
AM Peak Hour of Generator

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
46

Avg. Num. of Students:
616

Average Rate:
0.75

Range of Rates:
0.38 - 1.58

Standard Deviation:
0.27

Fitted Curve Equation:
Not Given

R^2:
****

Directional Distribution:
54% entering, 46% exiting

Calculated Trip Ends:
Average Rate: 1610 (Total), 869 (Entry), 741 (Exit)

Source: Institute of Transportation Engineers, Trip Generation Manual, 11TH Edition, 2021

Date: 9/25/2024

ELEMENTARY SCHOOL – ITE CODE #520

Size: 2,146 Students

WEEKDAY

PM Peak Hour of Generator

Data Plot and Equation

DATA STATISTICS

Land Use:
Elementary School (520) Click for Description and Data Plots

Independent Variable:
Students

Time Period:
Weekday
PM Peak Hour of Generator

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
54

Avg. Num. of Students:
608

Average Rate:
0.45

Range of Rates:
0.21 - 1.30

Standard Deviation:
0.19

Fitted Curve Equation:
Not Given

R^2:
****

Directional Distribution:
46% entering, 54% exiting

Calculated Trip Ends:
Average Rate: 966 (Total), 444 (Entry), 522 (Exit)

Source: Institute of Transportation Engineers, Trip Generation Manual, 11TH Edition, 2021

Date: 9/25/2024

Appendix G
ODOT Historical Data & Calculations

WORKSHEET FOR E-W GROWTH RATES

EAST AURORA ROAD (SR 82) ID: 28977 - COUNT DATA FROM ODOT WEBSITE
(East of Chamberlin Road - West of IR 480)

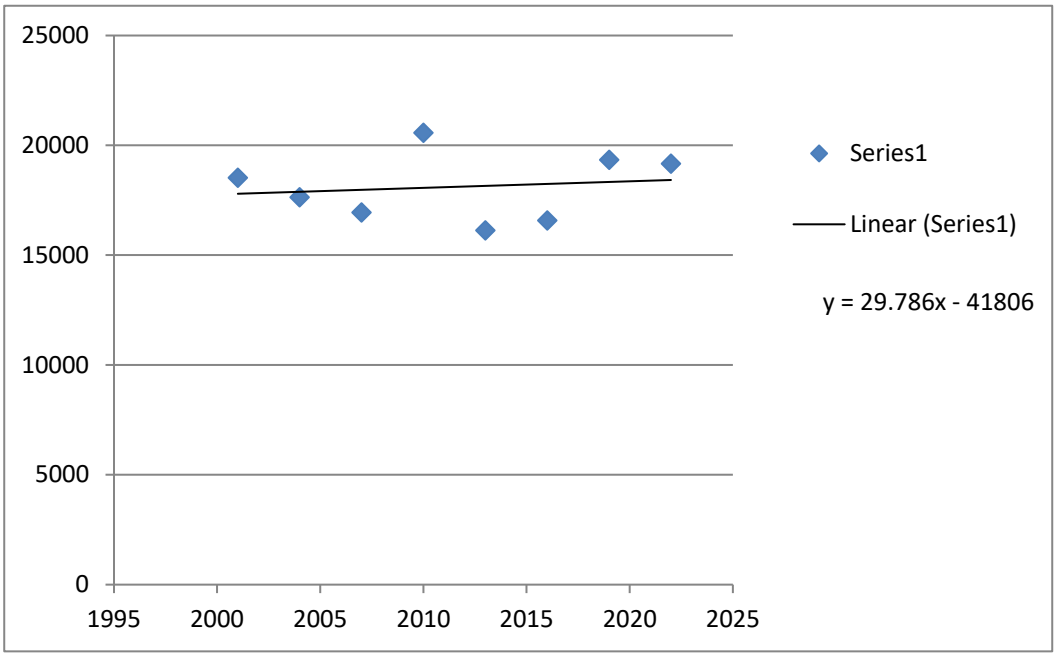
Year	*Volume*	*% Diff per Yr to Prev Yr Count*	*% Diff per Yr Since 2022*
2022	19164	-0.30%	
2019	19338	5.56%	-0.30%
2016	16574	0.93%	2.60%
2013	16126	-7.20%	2.09%
2010	20570	7.14%	-0.57%
2007	16940	-1.30%	0.88%
2004	17630	-1.60%	0.48%
2001	18520		0.17%

AVG/YEAR Since
2001
0.166%

AVG/YEAR Since
2013
2.09%

AVG/YEAR Since
2019
-0.30%

Coefficient (b) of Regression Equation:		**29.786**
Growth Rate =	b / Most Recent Count x 100%	
Growth Rate =	29.786 / 19164 X 100%	
Growth Rate =	**0.1554%**	



Appendix H
ODOT Peak Hour to Design Hour Charts

PEAK HOUR to DESIGN HOUR FACTORS

FUNCTIONAL CLASSIFICATION = 03, 04, 05u

(Urban Principal Arterial, Urban Minor Arterial, & Urban Minor Collector)

Day / Month	Monthly Average by Day-of-Week							
	WEEKDAY MON-THUR	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January	1.25	1.81	1.27	1.25	1.25	1.23	1.18	1.61
February	1.23	1.78	1.26	1.23	1.23	1.19	1.17	1.58
March	1.18	1.63	1.20	1.18	1.17	1.17	1.12	1.47
April	1.13	1.57	1.15	1.14	1.12	1.11	1.08	1.42
May	1.10	1.47	1.12	1.10	1.10	1.07	1.06	1.35
June	1.14	1.51	1.16	1.14	1.14	1.11	1.10	1.40
July	1.14	1.54	1.16	1.14	1.13	1.14	1.11	1.45
August	1.12	1.49	1.14	1.14	1.12	1.10	1.06	1.41
September	1.12	1.53	1.15	1.13	1.13	1.09	1.05	1.42
October	1.12	1.54	1.15	1.12	1.11	1.10	1.05	1.42
November	1.16	1.63	1.17	1.15	1.15	1.15	1.08	1.52
December	1.16	1.61	1.18	1.16	1.16	1.13	1.10	1.50

peak hour volume * factor = design hour volume

source: year 2018,2019,2021 Automatic Traffic Recorders (ATR) Data

ATR Stations:

2018: 15 Stations
2019: 21 Stations
2021: 22 Stations

Ohio Department of Transportation
Modeling & Forecasting Section
Nov 2022

NOTE: These are NOT seasonal adjustment factors!!!

Note: Insufficient data exists to produce factors for functional classes 06 and 07 Urban.

Appendix I
Background Traffic Volume Forecast Calculations

WORKSHEET FOR NO BUILD VEHICULAR TRAFFIC VOLUME CALCULATIONS

Chamberlin Rd & Ravenna Rd 040125

			Bellmeadow Drive FROM NORTH						Chamberlin Road / Bellmeadow Drive FROM SOUTH						TOTAL NORTH SOUTH	Ravenna Road FROM EAST						Ravenna Road FROM WEST						TOTAL EAST WEST	TOTAL ALL DIREC.
			Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		
AM PEAK (7:00 - 8:00)	2025	Raw	52	44	96	192			78	6	121	205			397	163	453	25	641			5	165	34	204			845	1242
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					
	2025	No Build	59	50	109	218			89	7	138	234			452	185	515	28	728			6	188	39	233			961	1413
	Growth	Factor	0.0000	0.0000	0.0000				0.0016	0.0000	0.0016					0.0016	0.0016	0.0000				0.0000	0.0016	0.0016					
	2027	Adj +Growth+DHV	59	50	109	218			89	7	138	234			452	186	517	28	731			6	188	39	233			964	1416
	Opening Year	Round	**60**	**50**	**110**	**220**			**90**	**10**	**140**	**240**			**460**	**190**	**520**	**30**	**740**			**10**	**190**	**40**	**240**			**980**	**1440**
	2047	Adj +Growth+DHV	59	50	109	218			92	7	142	241			459	192	533	28	753			6	194	40	240			993	1452
	Design Year	Round	**60**	**50**	**110**	**220**			**90**	**10**	**140**	**240**			**460**	**190**	**530**	**30**	**750**			**10**	**190**	**40**	**240**			**990**	**1450**
AM PEAK (8:15 - 9:15)	2025	Raw	25	20	74	119			62	8	125	195			314	110	271	16	397			14	223	26	263			660	974
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					
	2025	No Build	28	23	84	135			71	9	142	222			357	125	308	18	451			16	254	30	300			751	1108
	Growth	Factor	0.0000	0.0000	0.0000				0.0016	0.0000	0.0016					0.0016	0.0016	0.0000				0.0000	0.0016	0.0016					
	2027	Adj+Growth+DHV	28	23	84	135			71	9	143	223			358	125	309	18	452			16	254	30	300			752	1110
	Opening Year	Round	**30**	**20**	**80**	**130**			**70**	**10**	**140**	**220**			**350**	**130**	**310**	**20**	**460**			**20**	**250**	**30**	**300**			**760**	**1110**
	2047	Adj+Growth+DHV	28	23	84	135			73	9	147	229			364	129	319	18	466			16	262	31	309			775	1139
	Design Year	Round	**30**	**20**	**80**	**130**			**70**	**10**	**150**	**230**			**360**	**130**	**320**	**20**	**470**			**20**	**260**	**30**	**310**			**780**	**1140**

TMS Engineers, Inc.
2112 Case Parkway S.
Unit #7
Twinsburg, Ohio 44087

WORKSHEET FOR NO BUILD VEHICULAR TRAFFIC VOLUME CALCULATIONS

Chamberlin Rd & Ravenna Rd 040125

			Bellmeadow Drive FROM NORTH						Chamberlin Road / Bellmeadow Drive FROM SOUTH						TOTAL NORTH SOUTH	Ravenna Road FROM EAST						Ravenna Road FROM WEST						TOTAL EAST WEST	TOTAL ALL DIREC.
			Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		
PM PEAK (2:00 - 3:00)	2025	Raw	17	31	38	86			39	28	155	222			308	124	243	40	407			54	282	51	387			794	1102
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					
	2025	No Build	19	35	43	97			44	32	176	252			349	141	276	45	462			61	321	58	440			902	1251
	Growth	Factor	0.0000	0.0000	0.0000				0.0016	0.0000	0.0016					0.0016	0.0016	0.0000				0.0000	0.0016	0.0016					
	2027	Adj +Growth+DHV	19	35	43	97			44	32	177	253			350	141	277	45	463			61	322	58	441			904	1254
	Opening Year	Round	**20**	**40**	**40**	**100**			**40**	**30**	**180**	**250**			**350**	**140**	**280**	**50**	**470**			**60**	**320**	**60**	**440**			**910**	**1260**
	2047	Adj +Growth+DHV	19	35	43	97			46	32	182	260			357	146	286	45	477			61	332	60	453			930	1287
	Design Year	Round	**20**	**40**	**40**	**100**			**50**	**30**	**180**	**260**			**360**	**150**	**290**	**50**	**490**			**60**	**330**	**60**	**450**			**940**	**1300**
PM PEAK (3:00 - 4:00)	2025	Raw	19	35	43	97			35	33	178	246			343	142	235	45	422			67	336	59	462			884	1227
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					
	2025	No Build	22	40	49	111			40	38	202	280			391	161	267	51	479			76	382	67	525			1004	1395
	Growth	Factor	0.0000	0.0000	0.0000				0.0016	0.0000	0.0016					0.0016	0.0016	0.0000				0.0000	0.0016	0.0016					
	2027	Adj+Growth+DHV	22	40	49	111			40	38	203	281			392	162	268	51	481			76	383	67	526			1007	1399
	Opening Year	Round	**20**	**40**	**50**	**110**			**40**	**40**	**200**	**280**			**390**	**160**	**270**	**50**	**480**			**80**	**380**	**70**	**530**			**1010**	**1400**
	2047	Adj+Growth+DHV	22	40	49	111			41	38	209	288			399	167	276	51	494			76	395	69	540			1034	1433
	Design Year	Round	**20**	**40**	**50**	**110**			**40**	**40**	**210**	**290**			**400**	**170**	**280**	**50**	**500**			**80**	**400**	**70**	**550**			**1050**	**1450**

TMS Engineers, Inc.
2112 Case Parkway S.
Unit #7
Twinsburg, Ohio 44087

WORKSHEET FOR NO BUILD VEHICULAR TRAFFIC VOLUME CALCULATIONS

Chamberlin Rd & Chamberlin Tr 040125

			Chamberlin Road FROM NORTH						Chamberlin Road FROM SOUTH						TOTAL NORTH SOUTH	Chamberlin Trail FROM EAST						FROM WEST						TOTAL EAST WEST	TOTAL ALL DIREC.
			Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		
AM PEAK (7:00 - 8:00)	2025	Raw	0	236	0	236			0	129	1	130			366	1	0	2	3			0	0	0	0			3	369
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.0000	1.0000	1.0000					
	2025	No Build	0	268	0	268			0	147	1	148			416	1	0	2	3			0	0	0	0			3	419
	Growth	Factor	0.0000	0.0016	0.0000				0.0000	0.0016	0.0000					0.0000	0.0000	0.0000				0.0000	0.0000	0.0000					
	2027	Adj +Growth+DHV	0	269	0	269			0	147	1	148			417	1	0	2	3			0	0	0	0			3	420
	Opening Year	Round	**0**	**270**	**0**	**270**			**0**	**150**	**10**	**160**			**430**	**10**	**0**	**10**	**20**			**0**	**0**	**0**	**0**			**20**	**450**
	2047	Adj +Growth+DHV	0	278	0	278			0	152	1	153			431	1	0	2	3			0	0	0	0			3	434
	Design Year	Round	**0**	**280**	**0**	**280**			**0**	**150**	**10**	**160**			**440**	**10**	**0**	**10**	**20**			**0**	**0**	**0**	**0**			**20**	**460**
AM PEAK (8:15 - 9:15)	2025	Raw	0	155	0	155			0	120	0	120			275	1	0	0	1			0	0	0	0			1	276
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.0000	1.0000	1.0000					
	2025	No Build	0	176	0	176			0	136	0	136			312	1	0	0	1			0	0	0	0			1	313
	Growth	Factor	0.0000	0.0016	0.0000				0.0000	0.0016	0.0000					0.0000	0.0000	0.0000				0.0000	0.0000	0.0000					
	2027	Adj+Growth+DHV	0	177	0	177			0	137	0	137			314	1	0	0	1			0	0	0	0			1	315
	Opening Year	Round	**0**	**180**	**0**	**180**			**0**	**140**	**0**	**140**			**320**	**10**	**0**	**0**	**10**			**0**	**0**	**0**	**0**			**10**	**330**
	2047	Adj+Growth+DHV	0	182	0	182			0	141	0	141			323	1	0	0	1			0	0	0	0			1	324
	Design Year	Round	**0**	**180**	**0**	**180**			**0**	**140**	**0**	**140**			**320**	**10**	**0**	**0**	**10**			**0**	**0**	**0**	**0**			**10**	**330**

TMS Engineers, Inc.
2112 Case Parkway S.
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Chamberlin Rd & Chamberlin Tr 040125

			Chamberlin Road FROM NORTH						Chamberlin Road FROM SOUTH						TOTAL NORTH SOUTH	Chamberlin Trail FROM EAST						FROM WEST						TOTAL EAST WEST	TOTAL ALL DIREC.
			Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		
PM PEAK (2:00 - 3:00)	2025	Raw	0	160	2	162			0	187	3	190			352	3	0	4	7			0	0	0	0			7	359
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.0000	1.0000	1.0000					
	2025	No Build	0	182	2	184			0	213	3	216			400	3	0	5	8			0	0	0	0			8	408
	Growth	Factor	0.0000	0.0016	0.0000				0.0000	0.0016	0.0000					0.0000	0.0000	0.0000				0.0000	0.0000	0.0000					
	2027	Adj +Growth+DHV	0	183	2	185			0	213	3	216			401	3	0	5	8			0	0	0	0			8	409
	Opening Year	Round	**0**	**180**	**10**	**190**			**0**	**210**	**10**	**220**			**410**	**10**	**0**	**10**	**20**			**0**	**0**	**0**	**0**			**20**	**430**
	2047	Adj +Growth+DHV	0	188	2	190			0	220	3	223			413	3	0	5	8			0	0	0	0			8	421
	Design Year	Round	**0**	**190**	**10**	**200**			**0**	**220**	**10**	**230**			**430**	**10**	**0**	**10**	**20**			**0**	**0**	**0**	**0**			**20**	**450**
PM PEAK (3:00 - 4:00)	2025	Raw	2	192	0	194			0	220	0	220			414	2	0	2	4			0	0	0	0			4	418
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.0000	1.0000	1.0000					
	2025	No Build	2	218	0	220			0	250	0	250			470	2	0	2	4			0	0	0	0			4	474
	Growth	Factor	0.0000	0.0016	0.0000				0.0000	0.0016	0.0000					0.0000	0.0000	0.0000				0.0000	0.0000	0.0000					
	2027	Adj+Growth+DHV	2	219	0	221			0	251	0	251			472	2	0	2	4			0	0	0	0			4	476
	Opening Year	Round	**10**	**220**	**0**	**230**			**0**	**250**	**0**	**250**			**480**	**10**	**0**	**10**	**20**			**0**	**0**	**0**	**0**			**20**	**500**
	2047	Adj+Growth+DHV	2	226	0	228			0	259	0	259			487	2	0	2	4			0	0	0	0			4	491
	Design Year	Round	**10**	**230**	**0**	**240**			**0**	**260**	**0**	**260**			**500**	**10**	**0**	**10**	**20**			**0**	**0**	**0**	**0**			**20**	**520**

TMS Engineers, Inc.
2112 Case Parkway S.
Unit #7
Twinsburg, Ohio 44087

WORKSHEET FOR NO BUILD VEHICULAR TRAFFIC VOLUME CALCULATIONS

Chamberlin Rd & E.Aurora Rd 040125

			Chamberlin Rd. FROM NORTH						Chamberlin Rd. FROM SOUTH						TOTAL NORTH SOUTH	E. Aurora Rd. (SR 82) FROM EAST						E. Aurora Rd. (SR 82) FROM WEST						TOTAL EAST WEST	TOTAL ALL DIREC.
			Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		
AM PEAK (7:00 - 8:00)	2025	Raw	144	93	45	282			16	13	94	123			405	81	339	39	459			18	371	41	430			889	1294
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					
	2025	No Build	164	106	51	321			18	15	107	140			461	92	386	44	522			20	422	47	489			1011	1472
	Growth	Factor	0.0016	0.0000	0.0016				0.0000	0.0000	0.0000					0.0000	0.0016	0.0016				0.0016	0.0016	0.0000					
	2027	Adj +Growth+DHV	164	106	51	321			18	15	107	140			461	92	387	44	523			21	423	47	491			1014	1475
	Opening Year	Round	**160**	**110**	**50**	**320**			**20**	**10**	**110**	**140**			**460**	**90**	**390**	**40**	**520**			**20**	**420**	**50**	**490**			**1010**	**1470**
	2047	Adj +Growth+DHV	169	106	53	328			18	15	107	140			468	92	399	46	537			21	436	47	504			1041	1509
	Design Year	Round	**170**	**110**	**50**	**330**			**20**	**10**	**110**	**140**			**470**	**90**	**400**	**50**	**540**			**20**	**440**	**50**	**510**			**1050**	**1520**
AM PEAK (8:15 - 9:15)	2025	Raw	85	62	34	181			10	25	95	130			311	99	378	49	526			20	395	39	454			980	1291
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					
	2025	No Build	97	71	39	207			11	28	108	147			354	113	430	56	599			23	449	44	516			1115	1469
	Growth	Factor	0.0016	0.0000	0.0016				0.0000	0.0000	0.0000					0.0000	0.0016	0.0016				0.0016	0.0016	0.0000					
	2027	Adj+Growth+DHV	97	71	39	207			11	28	108	147			354	113	431	56	600			23	451	44	518			1118	1472
	Opening Year	Round	**100**	**70**	**40**	**210**			**10**	**30**	**110**	**150**			**360**	**110**	**430**	**60**	**600**			**20**	**450**	**40**	**510**			**1110**	**1470**
	2047	Adj+Growth+DHV	100	71	40	211			11	28	108	147			358	113	445	58	616			24	465	44	533			1149	1507
	Design Year	Round	**100**	**70**	**40**	**210**			**10**	**30**	**110**	**150**			**360**	**110**	**440**	**60**	**610**			**20**	**460**	**40**	**520**			**1130**	**1490**

TMS Engineers, Inc.
2112 Case Parkway S.
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WORKSHEET FOR NO BUILD VEHICULAR TRAFFIC VOLUME CALCULATIONS

Chamberlin Rd & E.Aurora Rd 040125

			Chamberlin Rd. FROM NORTH						Chamberlin Rd. FROM SOUTH						TOTAL NORTH SOUTH	E. Aurora Rd. (SR 82) FROM EAST						E. Aurora Rd. (SR 82) FROM WEST						TOTAL EAST WEST	TOTAL ALL DIREC.
			Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		Left	Thru	Right	Total	Trk	Bus	Left	Thru	Right	Total	Trk	Bus		
PM PEAK (2:00 - 3:00)	2025	Raw	75	34	36	145			45	60	153	258			403	103	481	91	675			46	410	36	492			1167	1570
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					
	2025	No Build	85	39	41	165			51	68	174	293			458	117	547	103	767			52	466	41	559			1326	1784
	Growth	Factor	0.0016	0.0000	0.0016				0.0000	0.0000	0.0000					0.0000	0.0016	0.0016				0.0016	0.0016	0.0000					
	2027	Adj +Growth+DHV	86	39	41	166			51	68	174	293			459	117	549	104	770			52	468	41	561			1331	1790
	Opening Year	Round	**90**	**40**	**40**	**170**			**50**	**70**	**170**	**290**			**460**	**120**	**550**	**100**	**770**			**50**	**470**	**40**	**560**			**1330**	**1790**
	2047	Adj +Growth+DHV	88	39	42	169			51	68	174	293			462	117	566	107	790			54	482	41	577			1367	1829
	Design Year	Round	**90**	**40**	**40**	**170**			**50**	**70**	**170**	**290**			**460**	**120**	**570**	**110**	**800**			**50**	**480**	**40**	**570**			**1370**	**1830**
PM PEAK (3:00 - 4:00)	2025	Raw	86	32	43	161			42	80	153	275			436	71	512	108	691			53	436	16	505			1196	1632
	DHV	Factor	1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					1.1373	1.1373	1.1373				1.1373	1.1373	1.1373					
	2025	No Build	98	36	49	183			48	91	174	313			496	81	582	123	786			60	496	18	574			1360	1856
	Growth	Factor	0.0016	0.0000	0.0016				0.0000	0.0000	0.0000					0.0000	0.0016	0.0016				0.0016	0.0016	0.0000					
	2027	Adj+Growth+DHV	98	36	49	183			48	91	174	313			496	81	584	123	788			60	497	18	575			1363	1859
	Opening Year	Round	**100**	**40**	**50**	**190**			**50**	**90**	**170**	**310**			**500**	**80**	**580**	**120**	**780**			**60**	**500**	**20**	**580**			**1360**	**1860**
	2047	Adj+Growth+DHV	101	36	51	188			48	91	174	313			501	81	602	127	810			62	513	18	593			1403	1904
	Design Year	Round	**100**	**40**	**50**	**190**			**50**	**90**	**170**	**310**			**500**	**80**	**600**	**130**	**810**			**60**	**510**	**20**	**590**			**1400**	**1900**

TMS Engineers, Inc.
2112 Case Parkway S.
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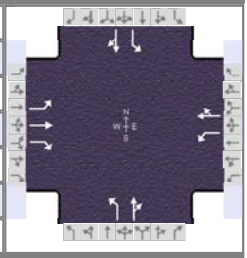
Appendix J
No-Build Capacity Analysis Worksheets - 2027

HCS Signalized Intersection Results Summary

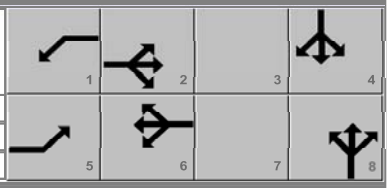
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.90
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM1 27NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	190	40	190	520	30	90	10	140	60	50	110

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	1.5	5.4	38.3	16.8	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	7.5	44.3	12.9	49.7		22.8		22.8
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.4		3.4
Queue Clearance Time (g_s), s	2.3		6.5			15.7		13.2
Green Extension Time (g_e), s	0.0	0.0	0.3	0.0		1.1		1.1
Phase Call Probability	0.22		0.99			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	11	211	44	211	611		100	167		67	178	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1711	1796	1522	1781	1852		1197	1589		1238	1691	
Queue Service Time (g_s), s	0.3	5.6	1.3	4.5	17.9		6.4	7.4		4.0	7.4	
Cycle Queue Clearance Time (g_c), s	0.3	5.6	1.3	4.5	17.9		13.7	7.4		11.2	7.4	
Green Ratio (*g/C*)	0.50	0.48	0.48	0.58	0.55		0.21	0.21		0.21	0.21	
Capacity (*c*), veh/h	351	859	728	720	1010		233	334		239	356	
Volume-to-Capacity Ratio (*X*)	0.032	0.246	0.061	0.293	0.605		0.429	0.499		0.279	0.500	
Back of Queue (*Q*), ft/ln (95 th percentile)	4	104	20	68	293		84	126		53	131	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.2	3.9	0.8	2.7	11.5		3.3	4.9		2.1	5.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.03	0.10	0.18	0.23	0.31		1.40	0.22		0.33	0.82	
Uniform Delay (d_1), s/veh	11.6	12.4	11.2	8.3	12.3		33.8	27.9		32.7	27.9	
Incremental Delay (d_2), s/veh	0.0	0.7	0.2	0.1	2.7		0.5	0.4		0.2	0.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	11.6	13.0	11.4	8.4	15.0		34.3	28.3		33.0	28.3	
Level of Service (LOS)	B	B	B	A	B		C	C		C	C	
Approach Delay, s/veh / LOS	12.7	B		13.3	B		30.5	C		29.6	C	
Intersection Delay, s/veh / LOS	18.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

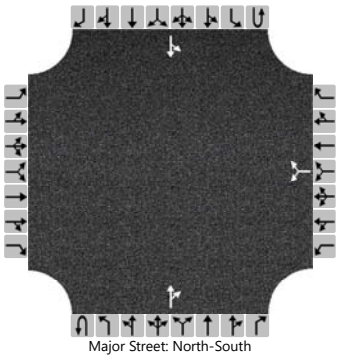
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	AM 700-800
Intersection Orientation	North-South
Project Description	No-Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		10			150	10		0	270	
Percent Heavy Vehicles (%)						33		33						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

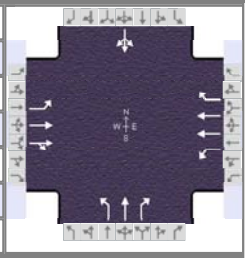
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.73		6.53						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.80		3.60						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							22							0		
Capacity, c (veh/h)							623							1405		
v/c Ratio							0.03							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
95% Queue Length, Q_{95} (ft)							3.2							0.0		
Control Delay (s/veh)							11.0							7.6	0.0	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						11.0								0.0		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

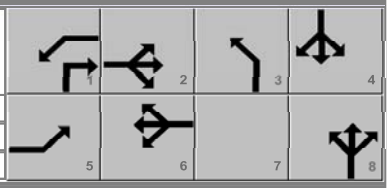
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.81
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_AM1 27NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	420	50	90	390	40	20	10	110	160	110	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	3.0	3.5	24.4	3.0	22.2	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



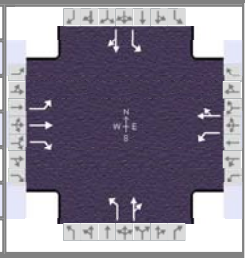
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	9.0	30.4	12.4	33.9	9.0	37.2		28.2
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	2.8		5.4		2.9	6.9		21.2
Green Extension Time (g_e), s	0.0	0.0	0.2	0.0	0.0	1.1		1.0
Phase Call Probability	0.42		0.92		0.42	1.00		1.00
Max Out Probability	0.00		0.00		0.02	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	25	295	285	111	481	49	25	12	136		395	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1753	1841	1772	1697	1696	1510	1471	1544	1309		1583	
Queue Service Time (g_s), s	0.8	10.6	10.7	3.4	8.6	1.8	0.9	0.4	4.9		18.7	
Cycle Queue Clearance Time (g_c), s	0.8	10.6	10.7	3.4	8.6	1.8	0.9	0.4	4.9		19.2	
Green Ratio (*g/C*)	0.34	0.31	0.31	0.39	0.35	0.35	0.34	0.39	0.47		0.28	
Capacity (*c*), veh/h	349	562	541	362	1182	526	181	602	615		507	
Volume-to-Capacity Ratio (*X*)	0.071	0.525	0.528	0.307	0.407	0.094	0.136	0.021	0.221		0.779	
Back of Queue (*Q*), ft/ln (95 th percentile)	14	219	208	61	161	30	16	7	71		284	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.5	8.5	8.3	2.3	6.0	1.1	0.5	0.2	2.4		11.3	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.07	0.22	0.21	0.17	0.16	0.09	0.09	0.01	0.39		0.28	
Uniform Delay (d_1), s/veh	17.9	23.0	23.0	17.0	19.8	17.6	20.6	15.0	12.6		27.8	
Incremental Delay (d_2), s/veh	0.0	3.5	3.7	0.2	1.0	0.4	0.1	0.0	0.1		1.0	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	17.9	26.5	26.7	17.2	20.8	17.9	20.7	15.0	12.6		28.8	
Level of Service (LOS)	B	C	C	B	C	B	C	B	B		C	
Approach Delay, s/veh / LOS	26.2	C		20.0	B		14.0	B		28.8	C	
Intersection Delay, s/veh / LOS	23.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

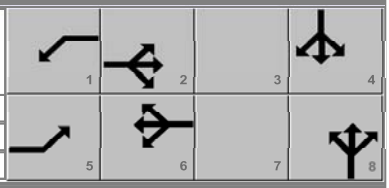
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.86
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM2 27NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	250	30	130	310	20	70	10	140	30	20	80

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	2.8	3.9	42.0	13.2	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	8.8	48.0	12.8	52.0		19.2		19.2
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	2.5		4.9			11.9		12.3
Green Extension Time (g_e), s	0.0	0.0	0.2	0.0		0.9		0.9
Phase Call Probability	0.40		0.97			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	23	291	35	151	384		81	174		35	116	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1739	1826	1547	1767	1836		1276	1601		1229	1661	
Queue Service Time (g_s), s	0.5	7.2	0.9	2.9	9.0		4.9	8.2		2.2	5.0	
Cycle Queue Clearance Time (g_c), s	0.5	7.2	0.9	2.9	9.0		9.9	8.2		10.3	5.0	
Green Ratio (*g/C*)	0.56	0.53	0.53	0.61	0.57		0.17	0.17		0.17	0.17	
Capacity (*c*), veh/h	576	957	811	707	1053		223	266		170	276	
Volume-to-Capacity Ratio (*X*)	0.040	0.304	0.043	0.214	0.365		0.365	0.655		0.205	0.421	
Back of Queue (*Q*), ft/ln (95 th percentile)	7	131	14	43	156		68	141		29	88	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	5.0	0.5	1.7	6.1		2.7	5.6		1.2	3.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.13	0.12	0.14	0.17		1.13	0.24		0.18	0.55	
Uniform Delay (d_1), s/veh	8.2	10.8	9.3	7.1	9.2		34.3	31.2		36.0	29.9	
Incremental Delay (d_2), s/veh	0.0	0.8	0.1	0.1	1.0		0.4	1.0		0.2	0.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	8.2	11.6	9.4	7.1	10.2		34.7	32.2		36.2	30.3	
Level of Service (LOS)	A	B	A	A	B		C	C		D	C	
Approach Delay, s/veh / LOS	11.1	B		9.3	A		33.0	C		31.6	C	
Intersection Delay, s/veh / LOS	17.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

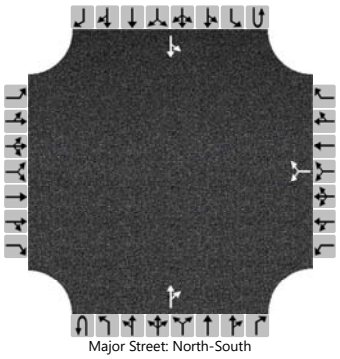
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	AM 815-915
Intersection Orientation	North-South
Project Description	No-Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		0			140	0		0	180	
Percent Heavy Vehicles (%)						0		0						4		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

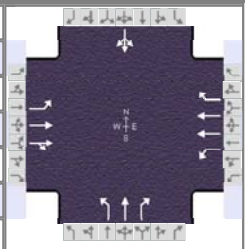
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.24		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							12							0		
Capacity, c (veh/h)							621							1397		
v/c Ratio							0.02							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
95% Queue Length, Q_{95} (ft)							2.5							0.0		
Control Delay (s/veh)							10.9							7.6	0.0	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						10.9								0.0		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

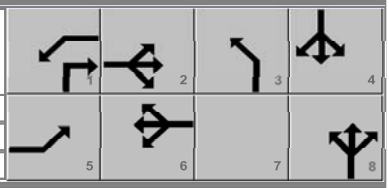
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.97
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_AM2 27NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	450	40	110	430	60	10	30	110	100	70	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	2.6	3.9	34.9	1.4	13.3	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



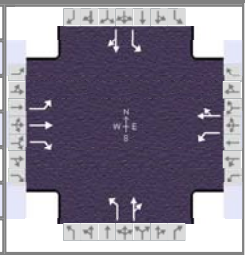
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	8.6	40.9	12.4	44.7	7.4	26.7		19.3
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	2.5		4.8		2.4	6.8		12.6
Green Extension Time (g_e), s	0.0	0.0	0.2	0.0	0.0	0.7		0.7
Phase Call Probability	0.37		0.92		0.20	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	21	255	250	113	443	62	10	31	113		216	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1725	1811	1759	1668	1668	1485	1541	1618	1372		1575	
Queue Service Time (g_s), s	0.5	7.4	7.5	2.8	6.3	1.8	0.4	1.2	4.8		9.5	
Cycle Queue Clearance Time (g_c), s	0.5	7.4	7.5	2.8	6.3	1.8	0.4	1.2	4.8		10.6	
Green Ratio (*g/C*)	0.47	0.44	0.44	0.52	0.48	0.48	0.21	0.26	0.34		0.17	
Capacity (*c*), veh/h	493	789	766	511	1614	718	155	419	465		328	
Volume-to-Capacity Ratio (*X*)	0.042	0.324	0.326	0.222	0.275	0.086	0.067	0.074	0.244		0.660	
Back of Queue (*Q*), ft/ln (95 th percentile)	9	143	134	45	108	28	8	22	75		180	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	5.5	5.4	1.7	4.0	1.1	0.3	0.8	2.6		7.1	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.14	0.14	0.13	0.11	0.08	0.04	0.04	0.41		0.18	
Uniform Delay (d_1), s/veh	11.6	14.8	14.8	10.5	12.3	11.1	26.2	22.4	19.0		32.2	
Incremental Delay (d_2), s/veh	0.0	1.1	1.1	0.1	0.4	0.2	0.1	0.0	0.1		0.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	11.6	15.9	16.0	10.5	12.7	11.4	26.3	22.4	19.1		33.0	
Level of Service (LOS)	B	B	B	B	B	B	C	C	B		C	
Approach Delay, s/veh / LOS	15.8	B		12.2	B		20.3	C		33.0	C	
Intersection Delay, s/veh / LOS	17.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

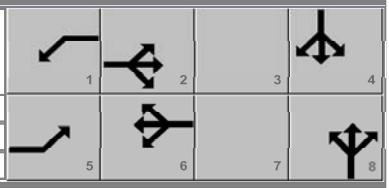
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.93
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM1 27NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	320	60	140	280	50	40	30	180	20	40	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.3	1.4	40.2	15.1	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	11.3	46.2	12.8	47.6		21.1		21.1
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	3.3		5.1			12.8		14.2
Green Extension Time (g_e), s	0.1	0.0	0.2	0.0		0.8		0.8
Phase Call Probability	0.76		0.96			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	65	344	65	151	355		43	226		22	86	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1856	1572	1753	1792		1280	1582		1146	1702	
Queue Service Time (g_s), s	1.3	9.1	1.7	3.1	9.5		2.4	10.8		1.4	3.5	
Cycle Queue Clearance Time (g_c), s	1.3	9.1	1.7	3.1	9.5		5.8	10.8		12.2	3.5	
Green Ratio (*g/C*)	0.57	0.50	0.50	0.59	0.52		0.19	0.19		0.19	0.19	
Capacity (*c*), veh/h	590	931	789	634	931		277	299		152	322	
Volume-to-Capacity Ratio (*X*)	0.109	0.370	0.082	0.238	0.381		0.155	0.756		0.141	0.267	
Back of Queue (*Q*), ft/ln (95 th percentile)	20	168	27	47	170		33	190		18	63	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.8	6.6	1.0	1.8	6.6		1.3	7.3		0.7	2.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.13	0.17	0.24	0.16	0.18		0.56	0.33		0.11	0.39	
Uniform Delay (d_1), s/veh	8.4	12.2	10.4	8.1	11.5		30.2	30.7		36.5	27.7	
Incremental Delay (d_2), s/veh	0.0	1.1	0.2	0.1	1.2		0.1	1.5		0.2	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	8.4	13.3	10.6	8.2	12.7		30.3	32.2		36.6	27.9	
Level of Service (LOS)	A	B	B	A	B		C	C		D	C	
Approach Delay, s/veh / LOS	12.3	B		11.4	B		31.9	C		29.6	C	
Intersection Delay, s/veh / LOS	17.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

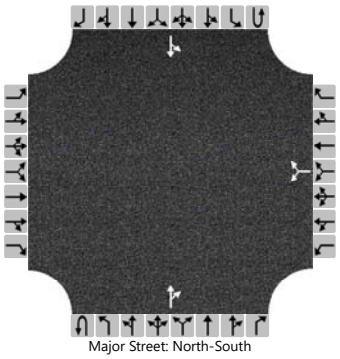
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	PM 200-300
Intersection Orientation	North-South
Project Description	No-Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.88
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		10			210	10		10	180	
Percent Heavy Vehicles (%)						0		0						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

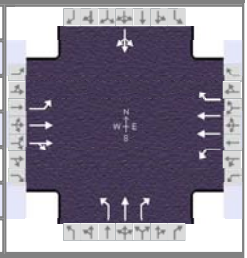
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							23							11		
Capacity, c (veh/h)							651							1310		
v/c Ratio							0.03							0.01		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
95% Queue Length, Q_{95} (ft)							2.5							0.0		
Control Delay (s/veh)							10.7							7.8	0.1	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						10.7								0.5		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

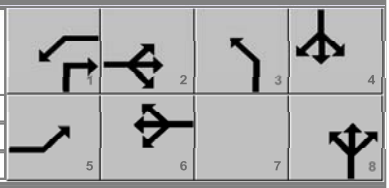
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.95
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_PM1 27NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	50	470	40	120	550	100	50	70	170	90	40	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.8	1.8	32.6	4.8	12.0	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



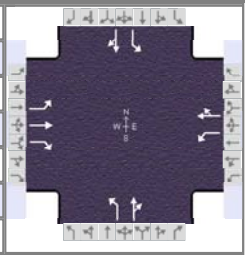
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	10.8	38.6	12.6	40.3	10.8	28.8		18.0
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	3.3		5.3		4.0	9.1		11.2
Green Extension Time (g_e), s	0.1	0.0	0.2	0.0	0.1	0.9		0.9
Phase Call Probability	0.69		0.94		0.69	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	53	271	265	126	579	105	53	74	179		179	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1753	1841	1790	1697	1696	1510	1640	1722	1459		1500	
Queue Service Time (g_s), s	1.3	8.2	8.3	3.3	9.4	3.4	2.0	2.6	7.1		8.1	
Cycle Queue Clearance Time (g_c), s	1.3	8.2	8.3	3.3	9.4	3.4	2.0	2.6	7.1		9.2	
Green Ratio (*g/C*)	0.47	0.41	0.41	0.49	0.43	0.43	0.24	0.29	0.37		0.15	
Capacity (*c*), veh/h	431	750	729	481	1456	648	232	492	537		294	
Volume-to-Capacity Ratio (*X*)	0.122	0.362	0.364	0.263	0.398	0.162	0.227	0.150	0.333		0.609	
Back of Queue (*Q*), ft/ln (95 th percentile)	22	162	154	54	168	56	38	49	111		150	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.9	6.3	6.2	2.0	6.3	2.1	1.4	1.8	4.0		5.9	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.12	0.16	0.16	0.16	0.17	0.16	0.21	0.08	0.62		0.15	
Uniform Delay (d_1), s/veh	12.3	16.5	16.5	11.8	15.7	14.0	25.0	21.3	18.2		32.7	
Incremental Delay (d_2), s/veh	0.0	1.4	1.4	0.1	0.8	0.5	0.2	0.1	0.1		0.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	12.4	17.8	17.9	11.9	16.5	14.6	25.1	21.4	18.4		33.4	
Level of Service (LOS)	B	B	B	B	B	B	C	C	B		C	
Approach Delay, s/veh / LOS	17.4	B		15.5	B		20.3	C		33.4	C	
Intersection Delay, s/veh / LOS	18.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

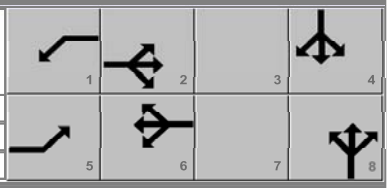
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.91
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM2 27NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	380	70	160	270	50	40	40	200	20	40	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	0.9	38.2	17.0	0.0	0.0	
Yellow	4.0	0.0	4.0	4.0	0.0	0.0	
Red	2.0	0.0	2.0	2.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	12.0	44.2	12.9	45.0		23.0		23.0
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	3.9		5.9			14.4		16.0
Green Extension Time (g_e), s	0.1	0.0	0.3	0.0		0.9		0.9
Phase Call Probability	0.86		0.98			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	88	418	77	176	352		44	264		22	99	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1767	1805		1276	1601		1027	1566	
Queue Service Time (g_s), s	1.9	12.0	2.1	3.9	9.9		2.4	12.4		1.6	4.2	
Cycle Queue Clearance Time (g_c), s	1.9	12.0	2.1	3.9	9.9		6.6	12.4		14.0	4.2	
Green Ratio (*g/C*)	0.55	0.48	0.48	0.56	0.49		0.21	0.21		0.21	0.21	
Capacity (*c*), veh/h	571	891	755	554	879		295	341		150	333	
Volume-to-Capacity Ratio (*X*)	0.154	0.469	0.102	0.317	0.400		0.149	0.774		0.147	0.297	
Back of Queue (*Q*), ft/ln (95 th percentile)	29	221	34	60	182		33	212		20	76	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	8.7	1.3	2.3	7.1		1.3	8.2		0.7	2.8	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.19	0.22	0.31	0.20	0.19		0.55	0.37		0.13	0.47	
Uniform Delay (d_1), s/veh	9.3	14.1	11.5	9.6	13.1		29.2	29.7		36.2	26.5	
Incremental Delay (d_2), s/veh	0.0	1.8	0.3	0.1	1.4		0.1	1.4		0.2	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	9.4	15.9	11.8	9.8	14.4		29.3	31.1		36.4	26.6	
Level of Service (LOS)	A	B	B	A	B		C	C		D	C	
Approach Delay, s/veh / LOS	14.4	B		12.9	B		30.9	C		28.4	C	
Intersection Delay, s/veh / LOS	18.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

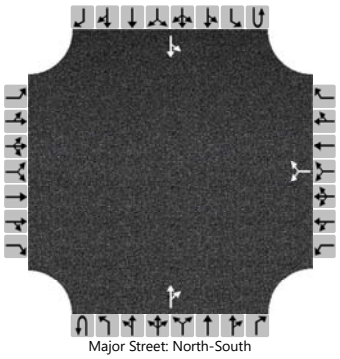
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	PM 300-400
Intersection Orientation	North-South
Project Description	No-Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		10			250	0		10	220	
Percent Heavy Vehicles (%)						0		0						5		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

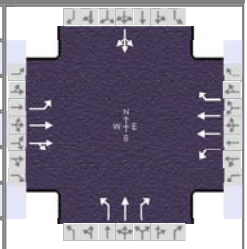
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.15		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.25		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							23							12		
Capacity, c (veh/h)							587							1254		
v/c Ratio							0.04							0.01		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
95% Queue Length, Q_{95} (ft)							2.5							0.0		
Control Delay (s/veh)							11.4							7.9	0.1	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						11.4								0.4		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

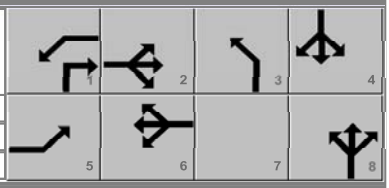
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.90
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_PM2 27NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	500	20	80	580	120	50	90	170	100	40	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.4	0.6	30.9	5.0	14.1	0.0						
Yellow	4.0	0.0	4.0	4.0	4.0	0.0						
Red	2.0	0.0	2.0	2.0	2.0	0.0						



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	11.4	36.9	12.0	37.5	11.0	31.0		20.1
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	3.7		4.4		4.1	9.3		13.1
Green Extension Time (g_e), s	0.1	0.0	0.1	0.0	0.1	1.0		1.0
Phase Call Probability	0.77		0.86		0.71	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.00

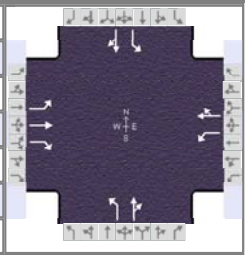
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	67	291	287	89	644	133	56	100	189		211	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1856	1830	1697	1696	1510	1626	1707	1447		1461	
Queue Service Time (g_s), s	1.7	9.1	9.1	2.4	11.4	4.7	2.1	3.4	7.3		10.0	
Cycle Queue Clearance Time (g_c), s	1.7	9.1	9.1	2.4	11.4	4.7	2.1	3.4	7.3		11.1	
Green Ratio (*g/C*)	0.45	0.39	0.39	0.46	0.39	0.39	0.26	0.31	0.39		0.18	
Capacity (*c*), veh/h	387	717	707	435	1338	595	235	534	562		326	
Volume-to-Capacity Ratio (*X*)	0.172	0.405	0.406	0.205	0.482	0.224	0.236	0.187	0.336		0.648	
Back of Queue (*Q*), ft/ln (95 th percentile)	29	183	176	40	207	79	38	65	1		177	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	7.1	7.1	1.5	7.8	3.0	1.4	2.3	0.0		6.9	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.18	0.18	0.11	0.21	0.23	0.21	0.10	0.01		0.18	
Uniform Delay (d_1), s/veh	13.5	17.8	17.9	12.8	18.1	16.1	23.6	20.1	17.2		31.6	
Incremental Delay (d_2), s/veh	0.1	1.7	1.7	0.1	1.2	0.9	0.2	0.1	0.1		0.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	13.6	19.5	19.6	12.9	19.4	17.0	23.8	20.1	17.3		32.4	
Level of Service (LOS)	B	B	B	B	B	B	C	C	B		C	
Approach Delay, s/veh / LOS	18.9	B		18.3	B		19.2	B		32.4	C	
Intersection Delay, s/veh / LOS	20.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

Appendix K
Build Capacity Analysis Worksheets - 2027

HCS Signalized Intersection Results Summary

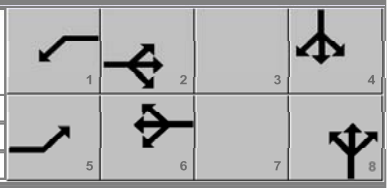
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.83
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM1 27.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	190	57	353	520	30	165	15	187	60	67	110

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	1.6	7.3	22.6	24.4	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	7.6	28.6	21.0	41.9		30.4		30.4
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.4		3.4
Queue Clearance Time (g_s), s	2.4		14.7			23.0		16.3
Green Extension Time (g_e), s	0.0	0.0	0.3	0.0		1.5		1.7
Phase Call Probability	0.23		1.00			1.00		1.00
Max Out Probability	0.00		1.00			0.03		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	12	229	69	425	663		199	243		72	213	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1711	1796	1522	1781	1852		1159	1591		1155	1709	
Queue Service Time (g_s), s	0.4	8.4	2.7	12.7	24.5		13.1	10.0		4.4	7.9	
Cycle Queue Clearance Time (g_c), s	0.4	8.4	2.7	12.7	24.5		21.0	10.0		14.3	7.9	
Green Ratio (*g/C*)	0.30	0.28	0.28	0.50	0.45		0.31	0.31		0.31	0.31	
Capacity (*c*), veh/h	211	508	430	628	833		330	485		298	521	
Volume-to-Capacity Ratio (*X*)	0.057	0.451	0.160	0.678	0.796		0.603	0.502		0.242	0.410	
Back of Queue (*Q*), ft/ln (95 th percentile)	7	179	48	214	424		163	165		53	137	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	6.8	1.8	8.4	16.7		6.4	6.5		2.1	5.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.18	0.44	0.71	0.45		2.72	0.29		0.33	0.85	
Uniform Delay (d_1), s/veh	20.7	23.6	21.5	14.5	18.9		30.4	22.8		28.7	22.1	
Incremental Delay (d_2), s/veh	0.0	2.9	0.8	1.8	7.8		0.7	0.3		0.2	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	20.7	26.5	22.3	16.3	26.6		31.0	23.1		28.8	22.3	
Level of Service (LOS)	C	C	C	B	C		C	C		C	C	
Approach Delay, s/veh / LOS	25.3	C		22.6	C		26.7	C		23.9	C	
Intersection Delay, s/veh / LOS	24.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

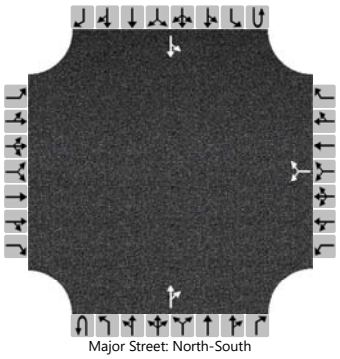
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	AM 700-800
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.62
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						15		19			265	10		0	416	
Percent Heavy Vehicles (%)						33		33						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

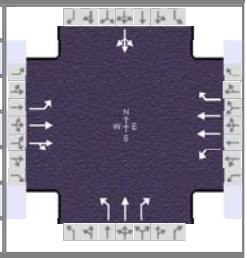
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.73		6.53						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.80		3.60						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							55							0		
Capacity, c (veh/h)							315							1117		
v/c Ratio							0.17							0.00		
95% Queue Length, Q_{95} (veh)							0.6							0.0		
95% Queue Length, Q_{95} (ft)							19.0							0.0		
Control Delay (s/veh)							18.8							8.2	0.0	
Level of Service (LOS)							C							A	A	
Approach Delay (s/veh)						18.8								0.0		
Approach LOS						C								A		

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.82
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_AM1 27.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	37	420	50	90	390	90	20	27	110	235	137	99

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.4	2.0	17.6	2.9	29.1	0.0	1	2	3	4	5	6	7	8
Yellow	4.0	0.0	4.0	4.0	4.0	0.0								
Red	2.0	0.0	2.0	2.0	2.0	0.0								

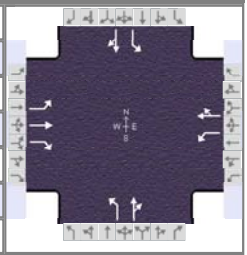
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	10.4	23.6	12.4	25.6	8.9	44.0		35.1
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	3.5		5.9		2.8	6.1		31.1
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	1.6		0.0
Phase Call Probability	0.63		0.91		0.42	1.00		1.00
Max Out Probability	0.55		1.00		0.11	0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	45	291	282	110	476	110	24	33	134		574	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1753	1841	1772	1697	1696	1510	1471	1544	1309		1548	
Queue Service Time (g_s), s	1.5	11.7	11.8	3.9	9.9	4.7	0.8	0.9	4.1		29.1	
Cycle Queue Clearance Time (g_c), s	1.5	11.7	11.8	3.9	9.9	4.7	0.8	0.9	4.1		29.1	
Green Ratio (*g/C*)	0.28	0.22	0.22	0.30	0.24	0.24	0.42	0.47	0.55		0.36	
Capacity (*c*), veh/h	274	405	390	284	830	369	144	733	726		630	
Volume-to-Capacity Ratio (*X*)	0.164	0.718	0.723	0.387	0.573	0.297	0.169	0.045	0.185		0.912	
Back of Queue (*Q*), ft/ln (95 th percentile)	28	262	249	71	197	88	13	16	55		479	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	10.1	10.0	2.7	7.4	3.3	0.4	0.5	1.8		19.0	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.26	0.26	0.20	0.20	0.25	0.07	0.03	0.30		0.48	
Uniform Delay (d_1), s/veh	22.2	28.9	28.9	22.0	26.5	24.6	19.5	11.3	8.8		25.8	
Incremental Delay (d_2), s/veh	0.1	10.5	11.1	0.3	2.9	2.0	0.2	0.0	0.0		17.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	22.3	39.4	40.0	22.3	29.4	26.7	19.7	11.3	8.9		43.0	
Level of Service (LOS)	C	D	D	C	C	C	B	B	A		D	
Approach Delay, s/veh / LOS	38.4	D		27.9	C		10.7	B		43.0	D	
Intersection Delay, s/veh / LOS	33.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

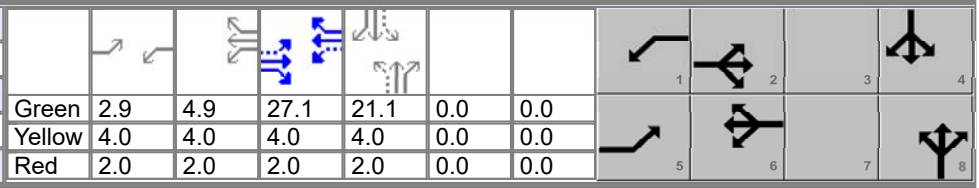
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.84
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM2 27.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	250	57	379	310	20	155	18	261	30	47	80

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	2.9	4.9	27.1	21.1	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	8.9	33.1	19.8	44.0		27.1		27.1
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.4		3.4
Queue Clearance Time (g_s), s	2.7		14.7			19.0		19.9
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		1.3		1.2
Phase Call Probability	0.41		1.00			1.00		1.00
Max Out Probability	0.00		1.00			0.10		0.14

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	24	298	68	451	393		185	332		36	151	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1739	1826	1547	1767	1836		1236	1601		1065	1707	
Queue Service Time (g_s), s	0.7	10.3	2.4	12.7	11.4		11.3	15.4		2.6	5.7	
Cycle Queue Clearance Time (g_c), s	0.7	10.3	2.4	12.7	11.4		17.0	15.4		17.9	5.7	
Green Ratio (*g/C*)	0.38	0.34	0.34	0.54	0.48		0.26	0.26		0.26	0.26	
Capacity (*c*), veh/h	448	619	525	620	872		329	423		167	451	
Volume-to-Capacity Ratio (*X*)	0.053	0.481	0.129	0.728	0.451		0.561	0.786		0.214	0.336	
Back of Queue (*Q*), ft/ln (95 th percentile)	12	210	42	221	210		149	254		30	100	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.5	8.1	1.6	8.6	8.2		5.9	10.0		1.2	4.0	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.08	0.21	0.38	0.74	0.22		2.49	0.44		0.18	0.62	
Uniform Delay (d_1), s/veh	15.9	20.9	18.3	13.2	14.0		30.6	27.3		35.6	23.8	
Incremental Delay (d_2), s/veh	0.0	2.7	0.5	3.7	1.7		0.6	3.8		0.2	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	15.9	23.5	18.8	16.9	15.7		31.2	31.1		35.8	23.9	
Level of Service (LOS)	B	C	B	B	B		C	C		D	C	
Approach Delay, s/veh / LOS	22.2	C		16.4	B		31.1	C		26.2	C	
Intersection Delay, s/veh / LOS	22.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

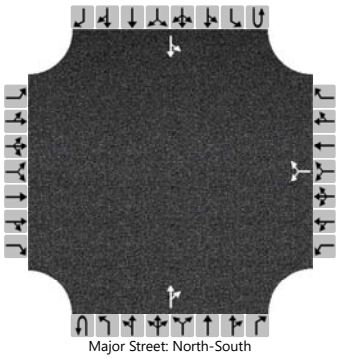
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	AM 815-915
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		43			325	0		0	429	
Percent Heavy Vehicles (%)						80		80						4		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

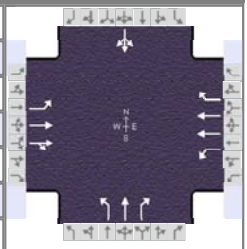
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						7.20		7.00						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						4.22		4.02						2.24		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							59							0		
Capacity, c (veh/h)							443							1187		
v/c Ratio							0.13							0.00		
95% Queue Length, Q_{95} (veh)							0.5							0.0		
95% Queue Length, Q_{95} (ft)							20.5							0.0		
Control Delay (s/veh)							14.4							8.0	0.0	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						14.4								0.0		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

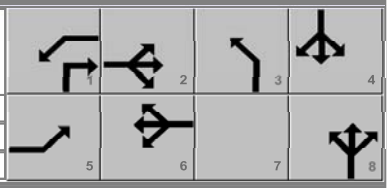
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.94
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_AM2 27.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	47	450	40	110	430	141	10	57	110	220	111	128

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.7	1.8	20.0	1.5	28.0	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



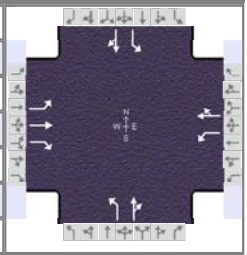
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	10.7	26.0	12.5	27.8	7.5	41.5		34.0
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	3.6		6.0		2.3	5.5		26.7
Green Extension Time (g_e), s	0.0	0.0	0.1	0.0	0.0	1.4		1.3
Phase Call Probability	0.67		0.93		0.21	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	50	264	258	117	457	150	11	61	117		488	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1725	1811	1759	1668	1668	1485	1541	1618	1372		1514	
Queue Service Time (g_s), s	1.6	10.2	10.3	4.0	9.2	6.5	0.3	1.7	3.5		24.3	
Cycle Queue Clearance Time (g_c), s	1.6	10.2	10.3	4.0	9.2	6.5	0.3	1.7	3.5		24.7	
Green Ratio (*g/C*)	0.31	0.25	0.25	0.33	0.27	0.27	0.39	0.44	0.52		0.35	
Capacity (*c*), veh/h	311	454	441	326	910	405	158	718	719		597	
Volume-to-Capacity Ratio (*X*)	0.161	0.581	0.585	0.359	0.503	0.370	0.067	0.084	0.163		0.818	
Back of Queue (*Q*), ft/ln (95 th percentile)	30	222	209	73	180	120	6	30	50		344	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	8.5	8.4	2.7	6.7	4.4	0.2	1.1	1.7		13.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.17	0.22	0.22	0.21	0.18	0.34	0.03	0.05	0.28		0.34	
Uniform Delay (d_1), s/veh	20.2	26.3	26.3	20.0	24.5	23.5	19.3	12.9	9.9		24.9	
Incremental Delay (d_2), s/veh	0.1	5.3	5.6	0.2	2.0	2.6	0.1	0.0	0.0		3.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	20.3	31.6	31.9	20.2	26.5	26.1	19.4	12.9	9.9		28.3	
Level of Service (LOS)	C	C	C	C	C	C	B	B	A		C	
Approach Delay, s/veh / LOS	30.8	C		25.4	C		11.4	B		28.3	C	
Intersection Delay, s/veh / LOS	26.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

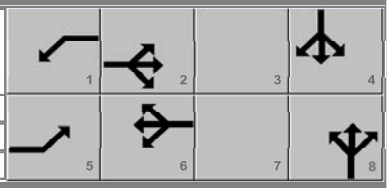
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.96
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM1 27.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	320	86	181	280	50	50	40	276	20	46	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.3	1.6	34.9	20.2	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	11.3	40.9	12.9	42.5		26.2		26.2
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	3.5		6.6			17.7		19.2
Green Extension Time (g_e), s	0.1	0.0	0.3	0.0		1.0		1.0
Phase Call Probability	0.75		0.98			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	63	333	90	189	344		52	329		21	90	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1856	1572	1753	1792		1276	1578		1043	1712	
Queue Service Time (g_s), s	1.5	9.9	2.7	4.6	10.3		2.7	15.7		1.5	3.3	
Cycle Queue Clearance Time (g_c), s	1.5	9.9	2.7	4.6	10.3		5.9	15.7		17.2	3.3	
Green Ratio (*g/C*)	0.50	0.44	0.44	0.52	0.46		0.25	0.25		0.25	0.25	
Capacity (*c*), veh/h	515	807	684	561	816		362	400		151	434	
Volume-to-Capacity Ratio (*X*)	0.121	0.413	0.131	0.336	0.421		0.144	0.822		0.138	0.206	
Back of Queue (*Q*), ft/ln (95 th percentile)	24	193	45	74	194		37	253		18	59	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.9	7.5	1.7	2.9	7.5		1.4	9.7		0.7	2.3	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.19	0.41	0.25	0.21		0.61	0.44		0.11	0.37	
Uniform Delay (d_1), s/veh	11.1	15.6	13.5	11.0	14.7		25.8	28.1		36.2	23.5	
Incremental Delay (d_2), s/veh	0.0	1.6	0.4	0.1	1.6		0.1	1.6		0.2	0.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	11.1	17.1	13.9	11.2	16.3		25.9	29.8		36.4	23.6	
Level of Service (LOS)	B	B	B	B	B		C	C		D	C	
Approach Delay, s/veh / LOS	15.8	B		14.5	B		29.2	C		26.0	C	
Intersection Delay, s/veh / LOS	19.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

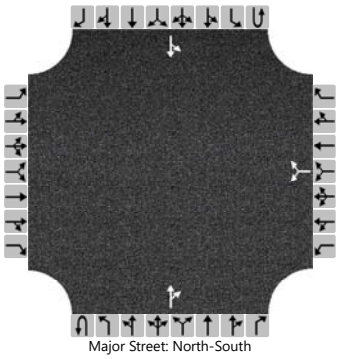
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	PM 200-300
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.76
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						15		19			304	10		10	244	
Percent Heavy Vehicles (%)						41		41						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage						Undivided										

Critical and Follow-up Headways

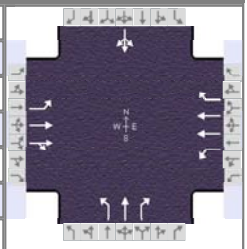
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.81		6.61						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.87		3.67						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							45							13		
Capacity, c (veh/h)							425							1140		
v/c Ratio							0.11							0.01		
95% Queue Length, Q_{95} (veh)							0.4							0.0		
95% Queue Length, Q_{95} (ft)							13.3							0.0		
Control Delay (s/veh)							14.5							8.2	0.1	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						14.5								0.4		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

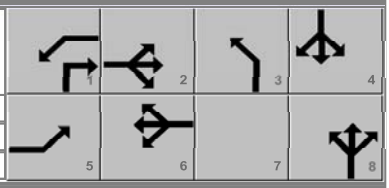
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.93
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_PM1 27.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	82	470	40	120	550	145	50	87	170	120	50	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	0.6	29.1	4.9	15.4	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



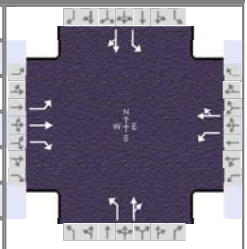
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	12.0	35.1	12.6	35.7	10.9	32.3		21.4
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	4.4		5.6		4.0	8.8		14.3
Green Extension Time (g_e), s	0.1	0.0	0.2	0.0	0.1	1.1		1.0
Phase Call Probability	0.86		0.94		0.70	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	88	277	271	129	591	156	54	94	183		237	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1753	1841	1790	1697	1696	1510	1640	1722	1459		1470	
Queue Service Time (g_s), s	2.4	9.0	9.1	3.6	10.6	5.8	2.0	3.1	6.8		11.4	
Cycle Queue Clearance Time (g_c), s	2.4	9.0	9.1	3.6	10.6	5.8	2.0	3.1	6.8		12.3	
Green Ratio (*g/C*)	0.44	0.36	0.36	0.45	0.37	0.37	0.28	0.33	0.41		0.19	
Capacity (*c*), veh/h	395	671	652	435	1261	561	235	565	599		352	
Volume-to-Capacity Ratio (*X*)	0.223	0.414	0.416	0.297	0.469	0.278	0.229	0.166	0.305		0.672	
Back of Queue (*Q*), ft/ln (95 th percentile)	41	183	174	62	196	100	36	58	104		196	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.6	7.1	7.0	2.3	7.4	3.7	1.3	2.1	3.8		7.6	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.23	0.18	0.18	0.18	0.20	0.28	0.20	0.09	0.58		0.20	
Uniform Delay (d_1), s/veh	14.2	19.0	19.0	13.9	19.1	17.6	22.9	19.1	15.9		31.0	
Incremental Delay (d_2), s/veh	0.1	1.9	2.0	0.1	1.3	1.2	0.2	0.1	0.1		0.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	14.4	20.9	21.0	14.0	20.4	18.8	23.1	19.1	16.0		31.8	
Level of Service (LOS)	B	C	C	B	C	B	C	B	B		C	
Approach Delay, s/veh / LOS	20.0	C		19.2	B		18.0	B		31.8	C	
Intersection Delay, s/veh / LOS	20.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

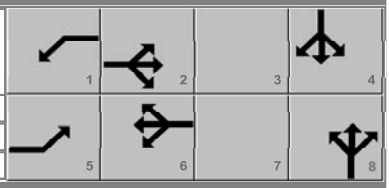
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.93
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM2 27.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	380	116	230	270	50	54	54	371	20	51	50

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.1	3.7	29.0	28.2	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	12.1	35.0	15.8	38.8		34.2		34.2
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.4		3.4
Queue Clearance Time (g_s), s	4.5		9.5			24.9		26.8
Green Extension Time (g_e), s	0.1	0.0	0.3	0.0		1.4		1.4
Phase Call Probability	0.87		1.00			1.00		1.00
Max Out Probability	0.00		0.00			0.01		0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	86	409	125	247	344		58	457		22	109	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1767	1805		1264	1591		860	1581	
Queue Service Time (g_s), s	2.5	15.7	4.8	7.5	12.3		2.9	22.9		2.0	4.2	
Cycle Queue Clearance Time (g_c), s	2.5	15.7	4.8	7.5	12.3		7.0	22.9		24.8	4.2	
Green Ratio (*g/C*)	0.41	0.34	0.34	0.46	0.39		0.33	0.33		0.33	0.33	
Capacity (*c*), veh/h	436	638	541	440	695		443	527		139	524	
Volume-to-Capacity Ratio (*X*)	0.197	0.640	0.231	0.562	0.495		0.131	0.867		0.154	0.207	
Back of Queue (*Q*), ft/ln (95 th percentile)	45	300	84	130	233		39	358		21	73	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.8	11.8	3.3	5.1	9.1		1.5	13.9		0.8	2.7	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.30	0.30	0.76	0.43	0.25		0.66	0.62		0.13	0.46	
Uniform Delay (d_1), s/veh	16.1	23.6	20.0	16.5	19.8		22.9	26.7		38.2	20.4	
Incremental Delay (d_2), s/veh	0.1	4.9	1.0	0.4	2.5		0.0	5.8		0.2	0.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	16.2	28.5	21.0	17.0	22.3		22.9	32.4		38.4	20.5	
Level of Service (LOS)	B	C	C	B	C		C	C		D	C	
Approach Delay, s/veh / LOS	25.3	C		20.1	C		31.3	C		23.4	C	
Intersection Delay, s/veh / LOS	25.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

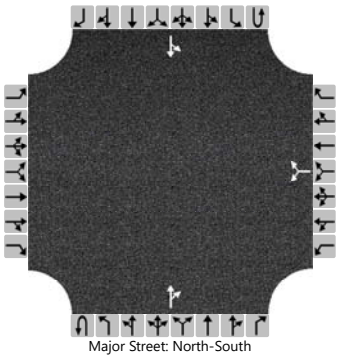
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	PM 300-400
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						20		43			400	0		10	319	
Percent Heavy Vehicles (%)						68		68						5		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

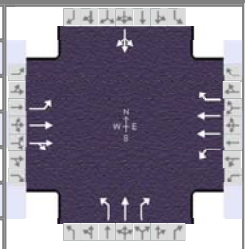
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						7.08		6.88						4.15		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						4.11		3.91						2.25		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							69							11		
Capacity, c (veh/h)							393							1105		
v/c Ratio							0.18							0.01		
95% Queue Length, Q_{95} (veh)							0.6							0.0		
95% Queue Length, Q_{95} (ft)							23.2							0.0		
Control Delay (s/veh)							16.1							8.3	0.1	
Level of Service (LOS)							C							A	A	
Approach Delay (s/veh)						16.1								0.4		
Approach LOS						C								A		

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.88
Urban Street	Chamberlin Road	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_PM2 27.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	110	500	20	80	580	192	50	118	170	149	56	66

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.1	0.5	24.5	5.0	19.9	0.0	1	2	3	4		
Yellow	4.0	0.0	4.0	4.0	4.0	0.0	5	6	7	8		
Red	2.0	0.0	2.0	2.0	2.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	12.6	31.0	12.1	30.5	11.0	36.9		25.9
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.3		3.3
Queue Clearance Time (g_s), s	5.7		4.8		3.9	8.6		18.7
Green Extension Time (g_e), s	0.2	0.0	0.1	0.0	0.0	1.3		1.2
Phase Call Probability	0.94		0.87		0.72	1.00		1.00
Max Out Probability	0.00		0.00		0.01	0.00		0.01

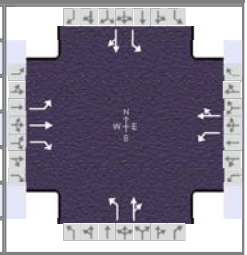
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	125	297	294	91	659	218	57	134	193		308	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1856	1830	1697	1696	1510	1626	1707	1447		1415	
Queue Service Time (g_s), s	3.7	10.5	10.5	2.8	13.4	9.4	1.9	4.2	6.6		15.9	
Cycle Queue Clearance Time (g_c), s	3.7	10.5	10.5	2.8	13.4	9.4	1.9	4.2	6.6		16.7	
Green Ratio (*g/C*)	0.39	0.31	0.31	0.38	0.31	0.31	0.34	0.39	0.46		0.25	
Capacity (*c*), veh/h	342	581	573	342	1041	463	237	659	668		421	
Volume-to-Capacity Ratio (*X*)	0.365	0.512	0.513	0.266	0.633	0.471	0.239	0.203	0.289		0.731	
Back of Queue (*Q*), ft/ln (95 th percentile)	66	216	209	49	247	171	35	77	99		239	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.6	8.4	8.4	1.9	9.3	6.4	1.3	2.8	3.6		9.3	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.37	0.22	0.21	0.14	0.25	0.49	0.19	0.12	0.55		0.24	
Uniform Delay (d_1), s/veh	17.4	22.5	22.5	17.1	23.9	22.5	20.6	16.4	13.4		28.8	
Incremental Delay (d_2), s/veh	0.2	3.2	3.3	0.2	2.9	3.4	0.2	0.1	0.1		0.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	17.7	25.7	25.7	17.3	26.8	25.9	20.8	16.4	13.5		29.7	
Level of Service (LOS)	B	C	C	B	C	C	C	B	B		C	
Approach Delay, s/veh / LOS	24.3	C		25.7	C		15.6	B		29.7	C	
Intersection Delay, s/veh / LOS	24.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

Appendix L
No-Build Capacity Analysis Worksheets - 2047

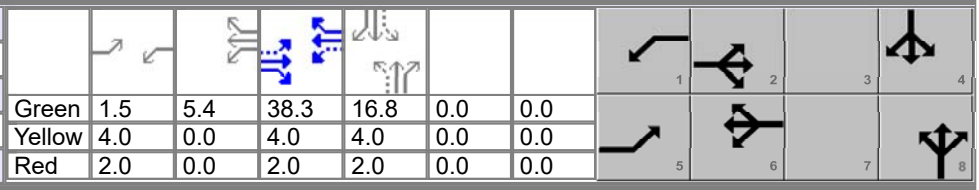
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.90
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM1 47NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	190	40	190	530	30	90	10	140	60	50	110

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	1.5	5.4	38.3	16.8	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	7.5	44.3	12.9	49.7		22.8		22.8
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.4		3.4
Queue Clearance Time (g_s), s	2.3		6.5			15.7		13.2
Green Extension Time (g_e), s	0.0	0.0	0.3	0.0		1.1		1.1
Phase Call Probability	0.22		0.99			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	11	211	44	211	622		100	167		67	178	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1711	1796	1522	1781	1852		1197	1589		1238	1691	
Queue Service Time (g_s), s	0.3	5.6	1.3	4.5	18.4		6.4	7.4		4.0	7.4	
Cycle Queue Clearance Time (g_c), s	0.3	5.6	1.3	4.5	18.4		13.7	7.4		11.2	7.4	
Green Ratio (*g/C*)	0.50	0.48	0.48	0.58	0.55		0.21	0.21		0.21	0.21	
Capacity (*c*), veh/h	344	859	728	720	1011		233	334		239	356	
Volume-to-Capacity Ratio (*X*)	0.032	0.246	0.061	0.293	0.616		0.429	0.499		0.279	0.500	
Back of Queue (*Q*), ft/ln (95 th percentile)	4	104	20	68	299		84	126		53	131	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.2	3.9	0.8	2.7	11.8		3.3	4.9		2.1	5.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.03	0.10	0.18	0.23	0.32		1.40	0.22		0.33	0.82	
Uniform Delay (d_1), s/veh	11.7	12.4	11.2	8.3	12.4		33.8	27.9		32.7	27.9	
Incremental Delay (d_2), s/veh	0.0	0.7	0.2	0.1	2.8		0.5	0.4		0.2	0.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	11.7	13.0	11.4	8.4	15.2		34.3	28.3		33.0	28.3	
Level of Service (LOS)	B	B	B	A	B		C	C		C	C	
Approach Delay, s/veh / LOS	12.7	B		13.5	B		30.5	C		29.6	C	
Intersection Delay, s/veh / LOS	18.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

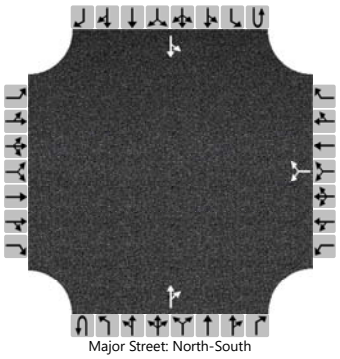
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	AM 700-800
Intersection Orientation	North-South
Project Description	No-Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		10			150	10		0	280	
Percent Heavy Vehicles (%)						33		33						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

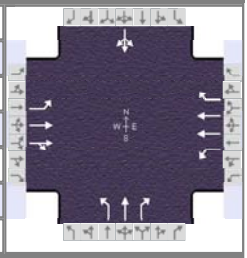
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.73		6.53						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.80		3.60						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							22							0		
Capacity, c (veh/h)							617							1405		
v/c Ratio							0.03							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
95% Queue Length, Q_{95} (ft)							3.2							0.0		
Control Delay (s/veh)							11.0							7.6	0.0	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						11.0								0.0		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

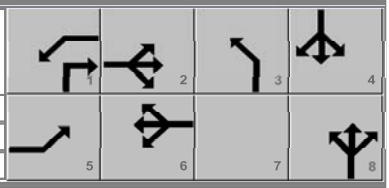
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.81
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_AM1 47NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	440	50	90	400	40	20	10	110	170	110	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	3.0	3.5	23.7	3.0	22.9	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



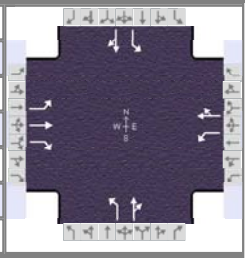
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	9.0	29.7	12.4	33.2	9.0	37.9		28.9
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	2.8		5.5		2.9	6.8		21.9
Green Extension Time (g_e), s	0.0	0.0	0.1	0.0	0.0	1.1		1.0
Phase Call Probability	0.42		0.92		0.42	1.00		1.00
Max Out Probability	0.00		0.00		0.14	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	25	307	298	111	494	49	25	12	136		407	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1753	1841	1774	1697	1696	1510	1471	1544	1309		1576	
Queue Service Time (g_s), s	0.8	11.3	11.3	3.5	9.0	1.8	0.9	0.4	4.8		19.5	
Cycle Queue Clearance Time (g_c), s	0.8	11.3	11.3	3.5	9.0	1.8	0.9	0.4	4.8		19.9	
Green Ratio (*g/C*)	0.33	0.30	0.30	0.38	0.34	0.34	0.35	0.40	0.48		0.29	
Capacity (*c*), veh/h	334	546	526	346	1152	513	182	615	626		520	
Volume-to-Capacity Ratio (*X*)	0.074	0.563	0.566	0.321	0.429	0.096	0.136	0.020	0.217		0.784	
Back of Queue (*Q*), ft/ln (95 th percentile)	14	232	220	62	169	31	16	7	69		290	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.5	9.0	8.8	2.3	6.4	1.2	0.5	0.2	2.3		11.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.08	0.23	0.23	0.18	0.17	0.09	0.09	0.01	0.39		0.29	
Uniform Delay (d_1), s/veh	18.4	23.8	23.8	17.6	20.4	18.0	20.3	14.6	12.1		27.4	
Incremental Delay (d_2), s/veh	0.0	4.2	4.4	0.2	1.2	0.4	0.1	0.0	0.1		1.0	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	18.4	27.9	28.2	17.8	21.6	18.4	20.5	14.6	12.2		28.4	
Level of Service (LOS)	B	C	C	B	C	B	C	B	B		C	
Approach Delay, s/veh / LOS	27.7	C		20.7	C		13.5	B		28.4	C	
Intersection Delay, s/veh / LOS	24.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

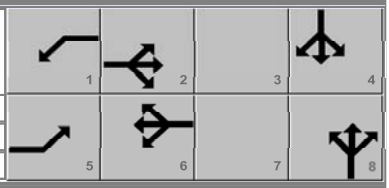
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.86
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM2 47NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	260	30	130	320	20	70	10	150	30	20	80

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	2.8	3.9	41.4	13.8	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	8.8	47.4	12.8	51.4		19.8		19.8
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	2.5		5.0			11.8		12.8
Green Extension Time (g_e), s	0.0	0.0	0.2	0.0		0.9		0.9
Phase Call Probability	0.40		0.97			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	23	302	35	151	395		81	186		35	116	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1739	1826	1547	1767	1836		1276	1600		1217	1661	
Queue Service Time (g_s), s	0.5	7.7	0.9	3.0	9.5		4.8	8.7		2.2	5.0	
Cycle Queue Clearance Time (g_c), s	0.5	7.7	0.9	3.0	9.5		9.8	8.7		10.8	5.0	
Green Ratio (*g/C*)	0.55	0.52	0.52	0.60	0.57		0.17	0.17		0.17	0.17	
Capacity (*c*), veh/h	558	944	800	688	1039		233	278		170	288	
Volume-to-Capacity Ratio (*X*)	0.042	0.320	0.044	0.220	0.380		0.350	0.670		0.206	0.403	
Back of Queue (*Q*), ft/ln (95 th percentile)	8	140	14	44	166		67	151		29	87	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	5.4	0.5	1.7	6.5		2.6	5.9		1.2	3.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.14	0.13	0.15	0.18		1.12	0.26		0.18	0.54	
Uniform Delay (d_1), s/veh	8.5	11.2	9.5	7.4	9.6		33.7	30.9		36.0	29.4	
Incremental Delay (d_2), s/veh	0.0	0.9	0.1	0.1	1.1		0.3	1.0		0.2	0.3	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	8.5	12.1	9.6	7.4	10.7		34.0	32.0		36.2	29.7	
Level of Service (LOS)	A	B	A	A	B		C	C		D	C	
Approach Delay, s/veh / LOS	11.6	B		9.8	A		32.6	C		31.2	C	
Intersection Delay, s/veh / LOS	17.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

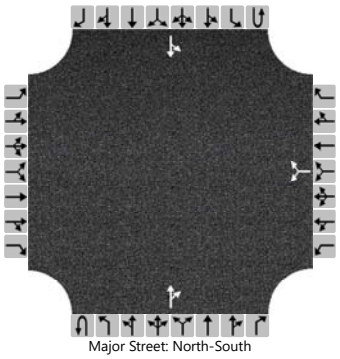
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	AM 815-915
Intersection Orientation	North-South
Project Description	No-Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		0			140	0		0	180	
Percent Heavy Vehicles (%)						0		0						4		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

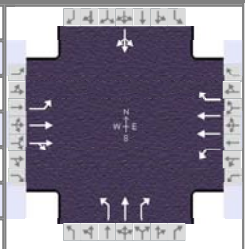
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.24		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							12							0		
Capacity, c (veh/h)							621							1397		
v/c Ratio							0.02							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
95% Queue Length, Q_{95} (ft)							2.5							0.0		
Control Delay (s/veh)							10.9							7.6	0.0	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						10.9								0.0		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

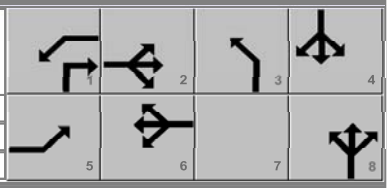
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.97
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_AM2 47NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	460	40	110	440	60	10	30	110	100	70	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	2.6	3.9	34.8	1.4	13.3	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



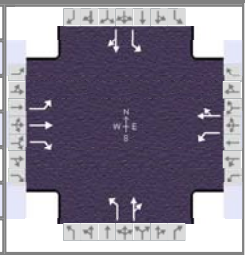
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	8.6	40.8	12.4	44.7	7.4	26.7		19.3
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	2.5		4.8		2.4	6.8		12.6
Green Extension Time (g_e), s	0.0	0.0	0.2	0.0	0.0	0.7		0.7
Phase Call Probability	0.37		0.92		0.20	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	21	261	255	113	454	62	10	31	113		216	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1725	1811	1760	1668	1668	1485	1541	1618	1372		1575	
Queue Service Time (g_s), s	0.5	7.6	7.6	2.8	6.5	1.8	0.4	1.2	4.8		9.5	
Cycle Queue Clearance Time (g_c), s	0.5	7.6	7.6	2.8	6.5	1.8	0.4	1.2	4.8		10.6	
Green Ratio (*g/C*)	0.47	0.44	0.44	0.52	0.48	0.48	0.21	0.26	0.34		0.17	
Capacity (*c*), veh/h	488	789	767	506	1614	718	155	419	466		328	
Volume-to-Capacity Ratio (*X*)	0.042	0.330	0.332	0.224	0.281	0.086	0.067	0.074	0.244		0.660	
Back of Queue (*Q*), ft/ln (95 th percentile)	9	147	138	45	111	28	8	22	75		180	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	5.6	5.5	1.7	4.1	1.1	0.3	0.8	2.6		7.1	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.15	0.14	0.13	0.11	0.08	0.04	0.04	0.41		0.18	
Uniform Delay (d_1), s/veh	11.6	14.9	14.9	10.5	12.3	11.1	26.2	22.4	19.0		32.2	
Incremental Delay (d_2), s/veh	0.0	1.1	1.2	0.1	0.4	0.2	0.1	0.0	0.1		0.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	11.6	16.0	16.1	10.6	12.8	11.4	26.3	22.4	19.1		33.0	
Level of Service (LOS)	B	B	B	B	B	B	C	C	B		C	
Approach Delay, s/veh / LOS	15.9	B		12.2	B		20.3	C		33.0	C	
Intersection Delay, s/veh / LOS	17.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

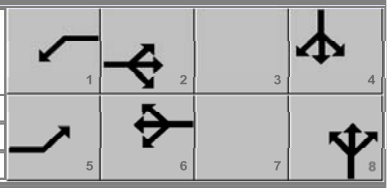
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.93
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM1 47NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	330	60	150	290	50	50	30	180	20	40	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.3	1.5	40.1	15.1	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	11.3	46.1	12.8	47.6		21.1		21.1
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	3.3		5.4			12.8		14.2
Green Extension Time (g_e), s	0.1	0.0	0.3	0.0		0.8		0.8
Phase Call Probability	0.76		0.97			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	65	355	65	161	366		54	226		22	86	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1856	1572	1753	1793		1280	1582		1146	1702	
Queue Service Time (g_s), s	1.3	9.4	1.7	3.4	9.9		3.0	10.8		1.4	3.5	
Cycle Queue Clearance Time (g_c), s	1.3	9.4	1.7	3.4	9.9		6.4	10.8		12.2	3.5	
Green Ratio (*g/C*)	0.57	0.50	0.50	0.59	0.52		0.19	0.19		0.19	0.19	
Capacity (*c*), veh/h	581	929	787	625	931		277	299		152	322	
Volume-to-Capacity Ratio (*X*)	0.111	0.382	0.082	0.258	0.393		0.194	0.755		0.141	0.267	
Back of Queue (*Q*), ft/ln (95 th percentile)	20	176	27	51	176		42	190		18	63	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.8	6.9	1.0	2.0	6.8		1.6	7.3		0.7	2.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.13	0.18	0.24	0.17	0.19		0.70	0.33		0.11	0.39	
Uniform Delay (d_1), s/veh	8.5	12.3	10.4	8.2	11.6		30.4	30.7		36.4	27.7	
Incremental Delay (d_2), s/veh	0.0	1.2	0.2	0.1	1.2		0.1	1.5		0.2	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	8.5	13.5	10.6	8.3	12.9		30.6	32.1		36.6	27.9	
Level of Service (LOS)	A	B	B	A	B		C	C		D	C	
Approach Delay, s/veh / LOS	12.5	B		11.5	B		31.8	C		29.6	C	
Intersection Delay, s/veh / LOS	17.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

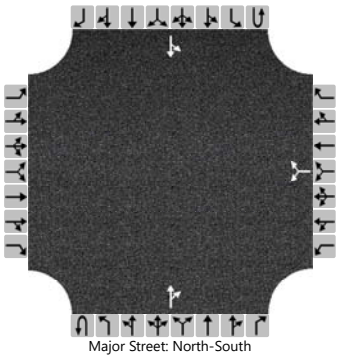
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	PM 200-300
Intersection Orientation	North-South
Project Description	No-Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.88
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		10			220	10		10	190	
Percent Heavy Vehicles (%)						0		0						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

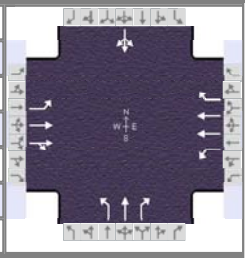
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							23							11		
Capacity, c (veh/h)							636							1297		
v/c Ratio							0.04							0.01		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
95% Queue Length, Q_{95} (ft)							2.5							0.0		
Control Delay (s/veh)							10.9							7.8	0.1	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)					10.9								0.5			
Approach LOS					B								A			

HCS Signalized Intersection Results Summary

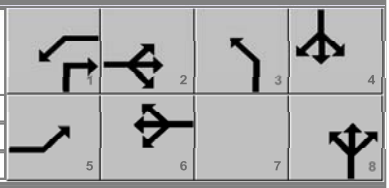
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.95
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_PM1 47NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	50	480	40	120	570	110	50	70	170	90	40	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.8	1.8	32.6	4.8	12.0	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



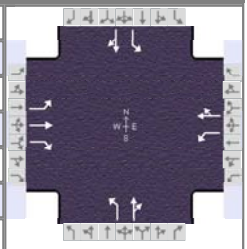
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	10.8	38.6	12.6	40.3	10.8	28.8		18.0
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	3.3		5.3		4.0	9.1		11.2
Green Extension Time (g_e), s	0.1	0.0	0.2	0.0	0.1	0.9		0.9
Phase Call Probability	0.69		0.94		0.69	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	53	277	271	126	600	116	53	74	179		179	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1753	1841	1791	1697	1696	1510	1640	1722	1459		1500	
Queue Service Time (g_s), s	1.3	8.4	8.4	3.3	9.8	3.8	2.0	2.6	7.1		8.1	
Cycle Queue Clearance Time (g_c), s	1.3	8.4	8.4	3.3	9.8	3.8	2.0	2.6	7.1		9.2	
Green Ratio (*g/C*)	0.47	0.41	0.41	0.49	0.43	0.43	0.24	0.29	0.37		0.15	
Capacity (*c*), veh/h	422	750	729	476	1456	648	232	492	537		294	
Volume-to-Capacity Ratio (*X*)	0.125	0.369	0.371	0.265	0.412	0.179	0.227	0.150	0.333		0.609	
Back of Queue (*Q*), ft/ln (95 th percentile)	22	166	158	54	176	63	38	49	111		150	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.9	6.4	6.3	2.0	6.6	2.4	1.4	1.8	4.0		5.9	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.12	0.17	0.16	0.16	0.18	0.18	0.21	0.08	0.62		0.15	
Uniform Delay (d_1), s/veh	12.4	16.5	16.6	11.8	15.8	14.1	25.0	21.3	18.2		32.7	
Incremental Delay (d_2), s/veh	0.0	1.4	1.4	0.1	0.9	0.6	0.2	0.1	0.1		0.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	12.4	17.9	18.0	11.9	16.7	14.7	25.1	21.4	18.4		33.4	
Level of Service (LOS)	B	B	B	B	B	B	C	C	B		C	
Approach Delay, s/veh / LOS	17.5	B		15.7	B		20.3	C		33.4	C	
Intersection Delay, s/veh / LOS	18.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

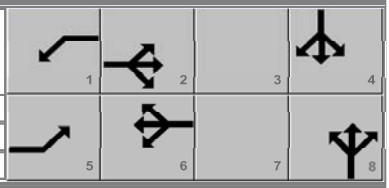
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.91
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM2 47NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	400	70	170	280	50	40	40	210	20	40	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	0.9	37.6	17.5	0.0	0.0	
Yellow	4.0	0.0	4.0	4.0	0.0	0.0	
Red	2.0	0.0	2.0	2.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	12.0	43.6	12.9	44.5		23.5		23.5
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	3.9		6.2			14.9		16.5
Green Extension Time (g_e), s	0.1	0.0	0.3	0.0		0.9		0.9
Phase Call Probability	0.86		0.98			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	88	440	77	187	363		44	275		22	99	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1767	1806		1276	1599		1017	1566	
Queue Service Time (g_s), s	1.9	13.0	2.2	4.2	10.4		2.4	12.9		1.7	4.2	
Cycle Queue Clearance Time (g_c), s	1.9	13.0	2.2	4.2	10.4		6.5	12.9		14.5	4.2	
Green Ratio (*g/C*)	0.54	0.47	0.47	0.56	0.48		0.22	0.22		0.22	0.22	
Capacity (*c*), veh/h	554	877	744	530	867		304	351		150	344	
Volume-to-Capacity Ratio (*X*)	0.159	0.501	0.103	0.353	0.418		0.145	0.782		0.147	0.287	
Back of Queue (*Q*), ft/ln (95 th percentile)	30	237	35	66	193		33	219		20	75	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.2	9.3	1.4	2.6	7.5		1.3	8.5		0.7	2.7	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.20	0.24	0.32	0.22	0.21		0.55	0.38		0.13	0.47	
Uniform Delay (d_1), s/veh	9.7	14.7	11.8	10.2	13.5		28.7	29.4		36.2	26.0	
Incremental Delay (d_2), s/veh	0.0	2.0	0.3	0.1	1.5		0.1	1.5		0.2	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	9.7	16.8	12.1	10.3	15.0		28.8	30.9		36.4	26.2	
Level of Service (LOS)	A	B	B	B	B		C	C		D	C	
Approach Delay, s/veh / LOS	15.2	B		13.4	B		30.6	C		28.0	C	
Intersection Delay, s/veh / LOS	18.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

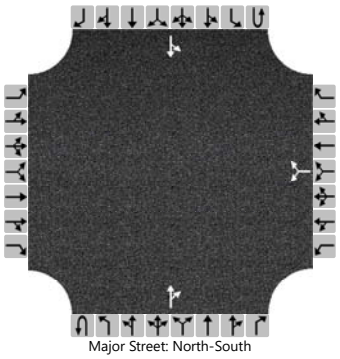
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	PM 300-400
Intersection Orientation	North-South
Project Description	No-Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		10			260	0		10	230	
Percent Heavy Vehicles (%)						0		0						5		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

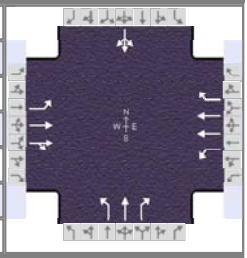
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.15		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.25		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							23							12		
Capacity, c (veh/h)							573							1242		
v/c Ratio							0.04							0.01		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
95% Queue Length, Q_{95} (ft)							2.5							0.0		
Control Delay (s/veh)							11.6							7.9	0.1	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						11.6								0.4		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

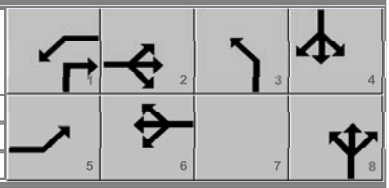
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.90
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_PM2 47NB.xus		
Project Description	No-Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	510	20	80	600	130	50	90	170	100	40	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.4	0.6	30.9	5.0	14.1	0.0	
Yellow	4.0	0.0	4.0	4.0	4.0	0.0	
Red	2.0	0.0	2.0	2.0	2.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	11.4	36.9	12.0	37.5	11.0	31.0		20.1
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	3.7		4.4		4.1	9.3		13.1
Green Extension Time (g_e), s	0.1	0.0	0.1	0.0	0.1	1.0		1.0
Phase Call Probability	0.77		0.86		0.71	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.00

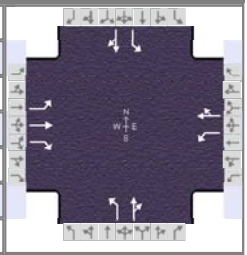
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	67	296	293	89	667	144	56	100	189		211	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1856	1831	1697	1696	1510	1626	1707	1447		1461	
Queue Service Time (g_s), s	1.7	9.3	9.3	2.4	11.9	5.1	2.1	3.4	7.3		10.0	
Cycle Queue Clearance Time (g_c), s	1.7	9.3	9.3	2.4	11.9	5.1	2.1	3.4	7.3		11.1	
Green Ratio (*g/C*)	0.45	0.39	0.39	0.46	0.39	0.39	0.26	0.31	0.39		0.18	
Capacity (*c*), veh/h	378	717	708	430	1338	595	235	534	562		326	
Volume-to-Capacity Ratio (*X*)	0.176	0.413	0.414	0.207	0.498	0.243	0.236	0.187	0.336		0.648	
Back of Queue (*Q*), ft/ln (95 th percentile)	29	187	181	40	214	87	38	65	1		177	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	7.3	7.2	1.5	8.0	3.3	1.4	2.3	0.0		6.9	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.19	0.19	0.11	0.21	0.25	0.21	0.10	0.01		0.18	
Uniform Delay (d_1), s/veh	13.6	17.9	17.9	12.8	18.3	16.2	23.6	20.1	17.2		31.6	
Incremental Delay (d_2), s/veh	0.1	1.8	1.8	0.1	1.3	1.0	0.2	0.1	0.1		0.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	13.7	19.7	19.7	12.9	19.6	17.2	23.8	20.1	17.3		32.4	
Level of Service (LOS)	B	B	B	B	B	B	C	C	B		C	
Approach Delay, s/veh / LOS	19.1	B		18.5	B		19.2	B		32.4	C	
Intersection Delay, s/veh / LOS	20.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

Appendix M
Build Capacity Analysis Worksheets - 2047

HCS Signalized Intersection Results Summary

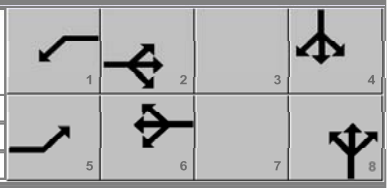
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.83
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM1 47.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	190	57	353	530	30	165	15	187	60	67	110

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	1.6	7.3	22.6	24.4	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	7.6	28.6	21.0	41.9		30.4		30.4
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.4		3.4
Queue Clearance Time (g_s), s	2.4		14.7			23.0		16.3
Green Extension Time (g_e), s	0.0	0.0	0.3	0.0		1.5		1.7
Phase Call Probability	0.23		1.00			1.00		1.00
Max Out Probability	0.00		1.00			0.03		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	12	229	69	425	675		199	243		72	213	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1711	1796	1522	1781	1852		1159	1591		1155	1709	
Queue Service Time (g_s), s	0.4	8.4	2.7	12.7	25.2		13.1	10.0		4.4	7.9	
Cycle Queue Clearance Time (g_c), s	0.4	8.4	2.7	12.7	25.2		21.0	10.0		14.3	7.9	
Green Ratio (*g/C*)	0.30	0.28	0.28	0.50	0.45		0.31	0.31		0.31	0.31	
Capacity (*c*), veh/h	204	508	430	628	833		330	485		298	521	
Volume-to-Capacity Ratio (*X*)	0.059	0.451	0.160	0.678	0.810		0.603	0.502		0.242	0.410	
Back of Queue (*Q*), ft/ln (95 th percentile)	7	179	48	214	437		163	165		53	137	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	6.8	1.8	8.4	17.2		6.4	6.5		2.1	5.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.18	0.44	0.71	0.47		2.72	0.29		0.33	0.85	
Uniform Delay (d_1), s/veh	20.8	23.6	21.5	14.5	19.1		30.4	22.8		28.7	22.1	
Incremental Delay (d_2), s/veh	0.0	2.9	0.8	1.8	8.4		0.7	0.3		0.2	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	20.8	26.5	22.3	16.3	27.4		31.0	23.1		28.8	22.3	
Level of Service (LOS)	C	C	C	B	C		C	C		C	C	
Approach Delay, s/veh / LOS	25.3	C		23.1	C		26.7	C		23.9	C	
Intersection Delay, s/veh / LOS	24.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

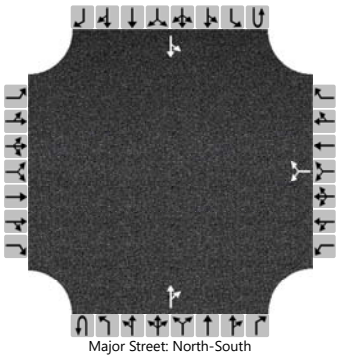
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	AM 700-800
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.62
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						15		19			265	10		0	426	
Percent Heavy Vehicles (%)						41		41						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage						Undivided										

Critical and Follow-up Headways

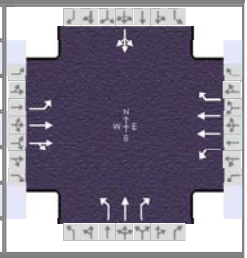
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.81		6.61						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.87		3.67						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							55							0		
Capacity, c (veh/h)							301							1117		
v/c Ratio							0.18							0.00		
95% Queue Length, Q_{95} (veh)							0.7							0.0		
95% Queue Length, Q_{95} (ft)							23.2							0.0		
Control Delay (s/veh)							19.6							8.2	0.0	
Level of Service (LOS)							C							A	A	
Approach Delay (s/veh)						19.6								0.0		
Approach LOS						C								A		

HCS Signalized Intersection Results Summary

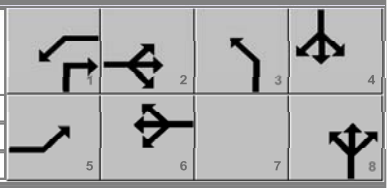
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.82
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_AM1 47.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	37	440	50	90	400	100	20	27	110	245	137	99

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.4	2.0	17.6	2.9	29.1	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



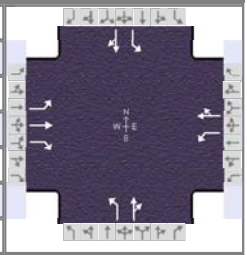
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	10.4	23.6	12.4	25.6	8.9	44.0		35.1
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	3.5		5.9		2.8	6.1		31.1
Green Extension Time (g_e), s	0.0	0.0	0.1	0.0	0.0	1.6		0.0
Phase Call Probability	0.63		0.91		0.42	1.00		1.00
Max Out Probability	0.10		0.00		0.11	0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	45	303	294	110	488	122	24	33	134		587	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1753	1841	1774	1697	1696	1510	1471	1544	1309		1545	
Queue Service Time (g_s), s	1.5	12.3	12.4	3.9	10.2	5.3	0.8	0.9	4.1		29.1	
Cycle Queue Clearance Time (g_c), s	1.5	12.3	12.4	3.9	10.2	5.3	0.8	0.9	4.1		29.1	
Green Ratio (*g/C*)	0.28	0.22	0.22	0.30	0.24	0.24	0.42	0.47	0.55		0.36	
Capacity (*c*), veh/h	270	405	391	277	830	369	144	733	726		629	
Volume-to-Capacity Ratio (*X*)	0.167	0.749	0.753	0.397	0.588	0.330	0.169	0.045	0.185		0.932	
Back of Queue (*Q*), ft/ln (95 th percentile)	28	276	263	71	203	99	13	16	55		508	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	10.7	10.5	2.7	7.6	3.7	0.4	0.5	1.8		20.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.28	0.27	0.20	0.20	0.28	0.07	0.03	0.30		0.51	
Uniform Delay (d_1), s/veh	22.2	29.1	29.2	22.1	26.7	24.8	19.5	11.3	8.8		26.1	
Incremental Delay (d_2), s/veh	0.1	12.0	12.6	0.3	3.0	2.4	0.2	0.0	0.0		20.6	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	22.3	41.1	41.8	22.4	29.7	27.2	19.7	11.3	8.9		46.7	
Level of Service (LOS)	C	D	D	C	C	C	B	B	A		D	
Approach Delay, s/veh / LOS	40.1	D		28.2	C		10.7	B		46.7	D	
Intersection Delay, s/veh / LOS	35.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

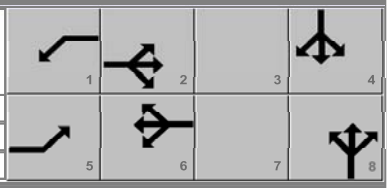
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.84
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM2 47.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	260	57	409	320	20	155	18	193	30	47	80

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	2.9	3.9	29.0	20.2	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	8.9	35.0	18.8	45.0		26.2		26.2
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.4		3.4
Queue Clearance Time (g_s), s	2.7		14.8			19.3		15.3
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.9		1.1
Phase Call Probability	0.41		1.00			1.00		1.00
Max Out Probability	0.00		1.00			0.34		0.05

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	24	310	68	487	405		185	251		36	151	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1739	1826	1547	1767	1836		1236	1606		1146	1707	
Queue Service Time (g_s), s	0.7	10.4	2.3	12.8	11.6		11.5	11.1		2.3	5.8	
Cycle Queue Clearance Time (g_c), s	0.7	10.4	2.3	12.8	11.6		17.3	11.1		13.3	5.8	
Green Ratio (*g/C*)	0.40	0.36	0.36	0.55	0.49		0.25	0.25		0.25	0.25	
Capacity (*c*), veh/h	455	663	562	620	894		312	405		220	430	
Volume-to-Capacity Ratio (*X*)	0.052	0.467	0.121	0.785	0.453		0.591	0.621		0.162	0.352	
Back of Queue (*Q*), ft/ln (95 th percentile)	12	209	40	245	212		153	187		28	102	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.4	8.1	1.5	9.6	8.3		6.0	7.4		1.1	4.1	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.08	0.21	0.36	0.82	0.23		2.54	0.32		0.17	0.64	
Uniform Delay (d_1), s/veh	14.7	19.5	17.0	13.8	13.5		31.6	26.5		32.4	24.6	
Incremental Delay (d_2), s/veh	0.0	2.4	0.4	6.0	1.7		0.7	0.6		0.1	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	14.7	21.9	17.4	19.8	15.1		32.3	27.1		32.6	24.7	
Level of Service (LOS)	B	C	B	B	B		C	C		C	C	
Approach Delay, s/veh / LOS	20.7	C		17.7	B		29.3	C		26.2	C	
Intersection Delay, s/veh / LOS	21.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

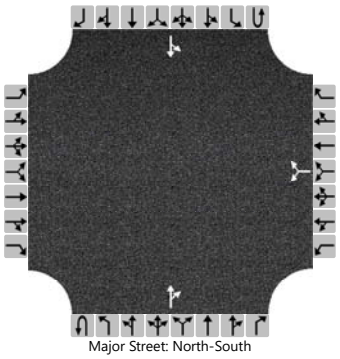
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	AM 815-915
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		43			325	0		0	429	
Percent Heavy Vehicles (%)						81		81						4		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

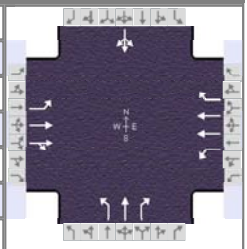
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						7.21		7.01						4.14		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						4.23		4.03						2.24		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							59							0		
Capacity, c (veh/h)							442							1187		
v/c Ratio							0.13							0.00		
95% Queue Length, Q_{95} (veh)							0.5							0.0		
95% Queue Length, Q_{95} (ft)							20.6							0.0		
Control Delay (s/veh)							14.4							8.0	0.0	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						14.4								0.0		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

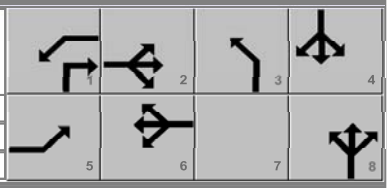
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.94
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_AM2 47.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	47	460	40	110	440	141	10	57	110	220	111	128

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.7	1.8	20.0	1.5	28.0	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



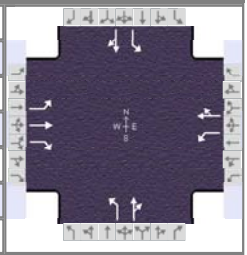
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	10.7	26.0	12.5	27.8	7.5	41.5		34.0
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	3.7		6.0		2.3	5.5		26.7
Green Extension Time (g_e), s	0.0	0.0	0.1	0.0	0.0	1.4		1.3
Phase Call Probability	0.67		0.93		0.21	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	50	269	263	117	468	150	11	61	117		488	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1725	1811	1760	1668	1668	1485	1541	1618	1372		1514	
Queue Service Time (g_s), s	1.7	10.5	10.5	4.0	9.5	6.5	0.3	1.7	3.5		24.2	
Cycle Queue Clearance Time (g_c), s	1.7	10.5	10.5	4.0	9.5	6.5	0.3	1.7	3.5		24.7	
Green Ratio (*g/C*)	0.31	0.25	0.25	0.33	0.27	0.27	0.39	0.44	0.52		0.35	
Capacity (*c*), veh/h	305	452	440	321	908	404	159	719	720		598	
Volume-to-Capacity Ratio (*X*)	0.164	0.595	0.598	0.365	0.516	0.371	0.067	0.084	0.162		0.817	
Back of Queue (*Q*), ft/ln (95 th percentile)	30	227	214	73	186	120	6	30	49		344	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	8.7	8.5	2.7	6.9	4.4	0.2	1.1	1.7		13.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.17	0.23	0.22	0.21	0.19	0.34	0.03	0.05	0.27		0.34	
Uniform Delay (d_1), s/veh	20.3	26.4	26.5	20.1	24.7	23.6	19.3	12.8	9.9		24.8	
Incremental Delay (d_2), s/veh	0.1	5.7	5.9	0.3	2.1	2.6	0.1	0.0	0.0		3.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	20.4	32.1	32.4	20.3	26.7	26.2	19.4	12.9	9.9		28.2	
Level of Service (LOS)	C	C	C	C	C	C	B	B	A		C	
Approach Delay, s/veh / LOS	31.2	C		25.6	C		11.4	B		28.2	C	
Intersection Delay, s/veh / LOS	26.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

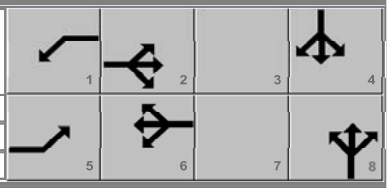
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.96
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM1 47.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	330	86	191	290	50	60	40	276	20	46	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.3	1.9	34.6	20.3	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	11.3	40.6	13.1	42.5		26.3		26.3
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	3.5		6.9			17.7		19.2
Green Extension Time (g_e), s	0.1	0.0	0.3	0.0		1.0		1.0
Phase Call Probability	0.75		0.99			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	63	344	90	199	354		63	329		21	90	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1856	1572	1753	1793		1276	1578		1043	1712	
Queue Service Time (g_s), s	1.5	10.3	2.7	4.9	10.7		3.2	15.7		1.5	3.3	
Cycle Queue Clearance Time (g_c), s	1.5	10.3	2.7	4.9	10.7		6.5	15.7		17.2	3.3	
Green Ratio (*g/C*)	0.50	0.43	0.43	0.52	0.46		0.25	0.25		0.25	0.25	
Capacity (*c*), veh/h	507	801	679	554	817		363	401		151	435	
Volume-to-Capacity Ratio (*X*)	0.123	0.429	0.132	0.359	0.434		0.172	0.821		0.138	0.206	
Back of Queue (*Q*), ft/ln (95 th percentile)	24	200	45	79	200		45	253		18	59	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.9	7.8	1.8	3.1	7.8		1.7	9.7		0.7	2.3	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.20	0.41	0.26	0.21		0.74	0.44		0.11	0.37	
Uniform Delay (d_1), s/veh	11.3	15.8	13.7	11.2	14.8		26.0	28.1		36.2	23.5	
Incremental Delay (d_2), s/veh	0.0	1.7	0.4	0.1	1.7		0.1	1.6		0.2	0.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	11.3	17.5	14.1	11.3	16.5		26.1	29.8		36.3	23.6	
Level of Service (LOS)	B	B	B	B	B		C	C		D	C	
Approach Delay, s/veh / LOS	16.1	B		14.6	B		29.2	C		26.0	C	
Intersection Delay, s/veh / LOS	19.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

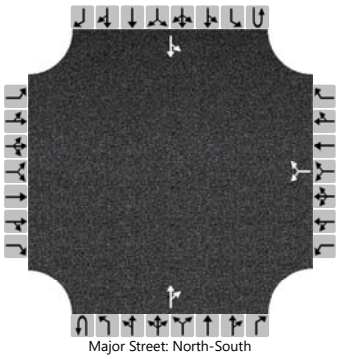
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	PM 200-300
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.76
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						15		19			314	10		10	254	
Percent Heavy Vehicles (%)						41		41						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

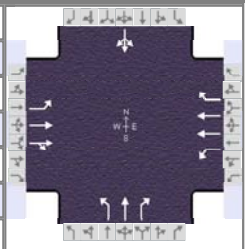
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.81		6.61						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.87		3.67						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							45							13		
Capacity, c (veh/h)							412							1128		
v/c Ratio							0.11							0.01		
95% Queue Length, Q_{95} (veh)							0.4							0.0		
95% Queue Length, Q_{95} (ft)							13.3							0.0		
Control Delay (s/veh)							14.8							8.2	0.1	
Level of Service (LOS)							B							A	A	
Approach Delay (s/veh)						14.8								0.4		
Approach LOS						B								A		

HCS Signalized Intersection Results Summary

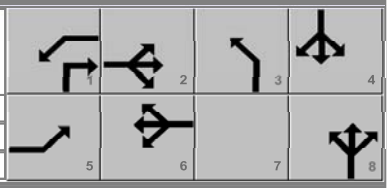
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.93
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_PM1 47.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	82	480	40	120	570	155	50	87	170	120	50	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	0.6	29.1	4.9	15.4	0.0
Yellow	4.0	0.0	4.0	4.0	4.0	0.0
Red	2.0	0.0	2.0	2.0	2.0	0.0



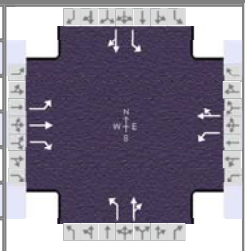
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	12.0	35.1	12.6	35.7	10.9	32.3		21.4
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2		3.2
Queue Clearance Time (g_s), s	4.4		5.6		4.0	8.8		14.3
Green Extension Time (g_e), s	0.1	0.0	0.2	0.0	0.1	1.1		1.0
Phase Call Probability	0.86		0.94		0.70	1.00		1.00
Max Out Probability	0.00		0.00		0.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	88	283	276	129	613	167	54	94	183		237	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1753	1841	1791	1697	1696	1510	1640	1722	1459		1470	
Queue Service Time (g_s), s	2.4	9.2	9.3	3.6	11.1	6.2	2.0	3.1	6.8		11.4	
Cycle Queue Clearance Time (g_c), s	2.4	9.2	9.3	3.6	11.1	6.2	2.0	3.1	6.8		12.3	
Green Ratio (*g/C*)	0.44	0.36	0.36	0.45	0.37	0.37	0.28	0.33	0.41		0.19	
Capacity (*c*), veh/h	387	671	652	431	1261	561	235	565	599		352	
Volume-to-Capacity Ratio (*X*)	0.228	0.422	0.424	0.299	0.486	0.297	0.229	0.166	0.305		0.672	
Back of Queue (*Q*), ft/ln (95 th percentile)	41	188	178	62	205	107	36	58	104		196	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.6	7.3	7.1	2.3	7.7	4.0	1.3	2.1	3.8		7.6	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.23	0.19	0.18	0.18	0.20	0.31	0.20	0.09	0.58		0.20	
Uniform Delay (d_1), s/veh	14.3	19.1	19.1	13.9	19.3	17.8	22.9	19.1	15.9		31.0	
Incremental Delay (d_2), s/veh	0.1	1.9	2.0	0.1	1.3	1.3	0.2	0.1	0.1		0.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	14.4	21.0	21.1	14.0	20.6	19.1	23.1	19.1	16.0		31.8	
Level of Service (LOS)	B	C	C	B	C	B	C	B	B		C	
Approach Delay, s/veh / LOS	20.2	C		19.4	B		18.0	B		31.8	C	
Intersection Delay, s/veh / LOS	20.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

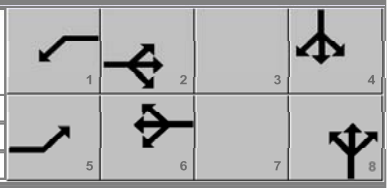
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.93
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM2 47.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	400	116	240	280	50	56	56	381	20	51	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	4.0	24.9	27.2	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	12.0	30.9	15.9	34.9		33.2		33.2
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.4		3.4
Queue Clearance Time (g_s), s	4.5		9.7			24.1		26.0
Green Extension Time (g_e), s	0.1	0.0	0.2	0.0		1.3		1.2
Phase Call Probability	0.85		1.00			1.00		1.00
Max Out Probability	0.00		0.17			0.04		0.09

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	86	430	125	258	355		60	470		22	109	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1767	1806		1264	1591		850	1581	
Queue Service Time (g_s), s	2.5	16.5	4.7	7.7	12.5		2.8	22.1		1.9	3.9	
Cycle Queue Clearance Time (g_c), s	2.5	16.5	4.7	7.7	12.5		6.7	22.1		24.0	3.9	
Green Ratio (*g/C*)	0.39	0.31	0.31	0.44	0.36		0.34	0.34		0.34	0.34	
Capacity (*c*), veh/h	406	582	493	409	652		459	540		145	537	
Volume-to-Capacity Ratio (*X*)	0.212	0.739	0.253	0.632	0.544		0.131	0.870		0.149	0.202	
Back of Queue (*Q*), ft/ln (95 th percentile)	44	326	83	134	239		37	356		20	67	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.7	12.8	3.3	5.2	9.3		1.4	13.8		0.7	2.4	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.29	0.33	0.76	0.45	0.25		0.62	0.61		0.12	0.42	
Uniform Delay (d_1), s/veh	16.6	24.6	20.6	17.3	20.3		21.1	24.8		35.9	18.7	
Incremental Delay (d_2), s/veh	0.1	8.2	1.2	0.6	3.2		0.0	7.9		0.2	0.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	16.7	32.8	21.8	17.9	23.6		21.1	32.6		36.1	18.8	
Level of Service (LOS)	B	C	C	B	C		C	C		D	B	
Approach Delay, s/veh / LOS	28.5	C		21.2	C		31.3	C		21.7	C	
Intersection Delay, s/veh / LOS	26.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Two-Way Stop-Control Report

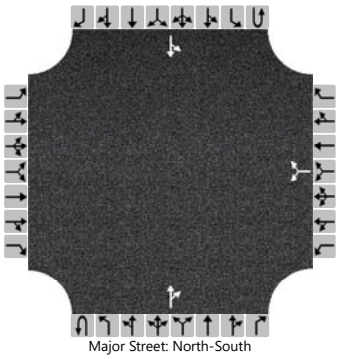
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	PM 300-400
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & Chamberlin Tr.
Jurisdiction	Twinsburg, OH
East/West Street	Chamberlin Trail
North/South Street	Chamberlin Road
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						20		43			410	0		10	329	
Percent Heavy Vehicles (%)						68		68						5		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

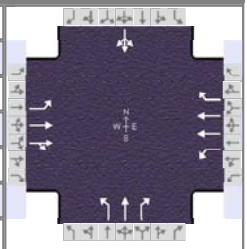
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						7.08		6.88						4.15		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						4.11		3.91						2.25		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							69							11		
Capacity, c (veh/h)							383							1094		
v/c Ratio							0.18							0.01		
95% Queue Length, Q_{95} (veh)							0.7							0.0		
95% Queue Length, Q_{95} (ft)							27.0							0.0		
Control Delay (s/veh)							16.4							8.3	0.1	
Level of Service (LOS)							C							A	A	
Approach Delay (s/veh)						16.4								0.3		
Approach LOS						C								A		

HCS Signalized Intersection Results Summary

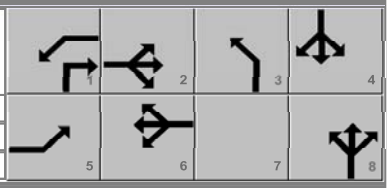
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	4/18/2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.88
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ E. Aurora Road (SR 82)	File Name	3_PM2 47.xus		
Project Description	Build Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	110	510	20	80	600	202	50	118	170	149	56	66

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.1	0.5	24.5	5.0	19.9	0.0	
Yellow	4.0	0.0	4.0	4.0	4.0	0.0	
Red	2.0	0.0	2.0	2.0	2.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8		4
Case Number	1.1	4.0	1.1	3.0	1.0	3.0		8.3
Phase Duration, s	12.6	31.0	12.1	30.5	11.0	36.9		25.9
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0	6.0	6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.3		3.3
Queue Clearance Time (g_s), s	5.7		4.8		3.9	8.6		18.7
Green Extension Time (g_e), s	0.2	0.0	0.1	0.0	0.0	1.3		1.2
Phase Call Probability	0.94		0.87		0.72	1.00		1.00
Max Out Probability	0.00		0.00		0.01	0.00		0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	125	303	299	91	682	230	57	134	193		308	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1856	1831	1697	1696	1510	1626	1707	1447		1415	
Queue Service Time (g_s), s	3.7	10.7	10.7	2.8	14.0	9.9	1.9	4.2	6.6		15.9	
Cycle Queue Clearance Time (g_c), s	3.7	10.7	10.7	2.8	14.0	9.9	1.9	4.2	6.6		16.7	
Green Ratio (*g/C*)	0.39	0.31	0.31	0.38	0.31	0.31	0.34	0.39	0.46		0.25	
Capacity (*c*), veh/h	335	581	573	338	1041	463	237	659	668		421	
Volume-to-Capacity Ratio (*X*)	0.373	0.521	0.522	0.269	0.655	0.495	0.239	0.203	0.289		0.731	
Back of Queue (*Q*), ft/ln (95 th percentile)	66	220	213	49	256	182	35	77	99		239	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.6	8.6	8.5	1.9	9.6	6.9	1.3	2.8	3.6		9.3	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.37	0.22	0.22	0.14	0.26	0.52	0.19	0.12	0.55		0.24	
Uniform Delay (d_1), s/veh	17.5	22.6	22.6	17.2	24.1	22.7	20.6	16.4	13.4		28.8	
Incremental Delay (d_2), s/veh	0.3	3.3	3.4	0.2	3.2	3.8	0.2	0.1	0.1		0.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Control Delay (*d*), s/veh	17.8	25.9	26.0	17.3	27.3	26.4	20.8	16.4	13.5		29.7	
Level of Service (LOS)	B	C	C	B	C	C	C	B	B		C	
Approach Delay, s/veh / LOS	24.5	C		26.2	C		15.6	B		29.7	C	
Intersection Delay, s/veh / LOS	24.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

Appendix N
ODOT Turn Lane Warrant Graphs

AUXILLIARY TURN LANE WARRANTS

PROJECT INFORMATION

1. Client	TWINSBURG CITY SCHOOL DISTRICT
2. Job Number	25-047
3. Jurisdiction	TWINSBURG, OHIO
4. Name of roadway where turn lanes are to be analyzed	CHAMBERLIN ROAD @ NORTH DRIVEWAY
5. Roadway speed limit	35
6. Number of Lanes	2
7. Analysis Condition (Year / Build)	2027 (Grades 4-6)
8. Direction of Roadway	NB/SB
9. Direction of Side Street Approach	WB
10. Is the Roadway Divided or Undivided	Undivided

11. Enter Volume Data for Intersection

NORTHBOUND

- Right Turn		Right	Thru	Advancing
	AM	115	169	284
	PM	94	229	323

		SOUTHBOUND	NORTHBOUND					
- Left Turn		Left	Thru	Thru	Right	Advancing	Opposing	LT%
	AM	213	270	169	115	483	284	44.1%
	PM	73	190	229	94	263	323	27.8%

Notes:

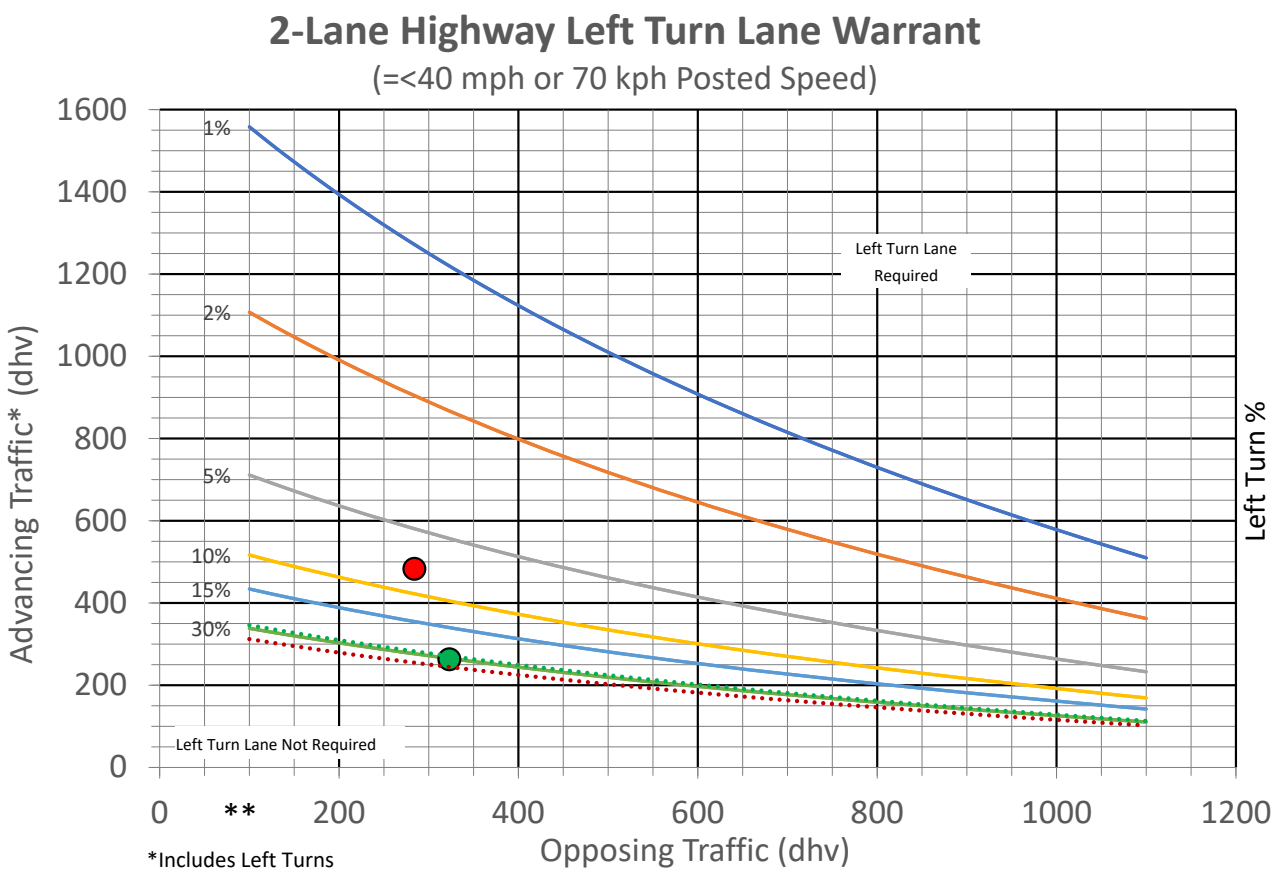
1. Analyst to fill in all blue areas.
2. Green areas are calculated for the analyst

CHAMBERLIN ROAD @ NORTH DRIVEWAY

2027 (Grades 4-6) **WARRANT IS MET**

Left turn lane is warranted in the AM when the red dot is located on or above the dotted red line.

Left turn lane is warranted in the PM when the green dot is located on or above the dotted green line.



*Includes Left Turns

**There is no minimum number of turns

TIME	SOUTHBOUND		NORTHBOUND		ADVANCING	OPPOSING	LT%	WARRANT?
	LEFT	THRU	THRU	RIGHT				
AM	213	270	169	115	483	284	44.1%	YES
PM	73	190	229	94	263	323	27.8%	NO

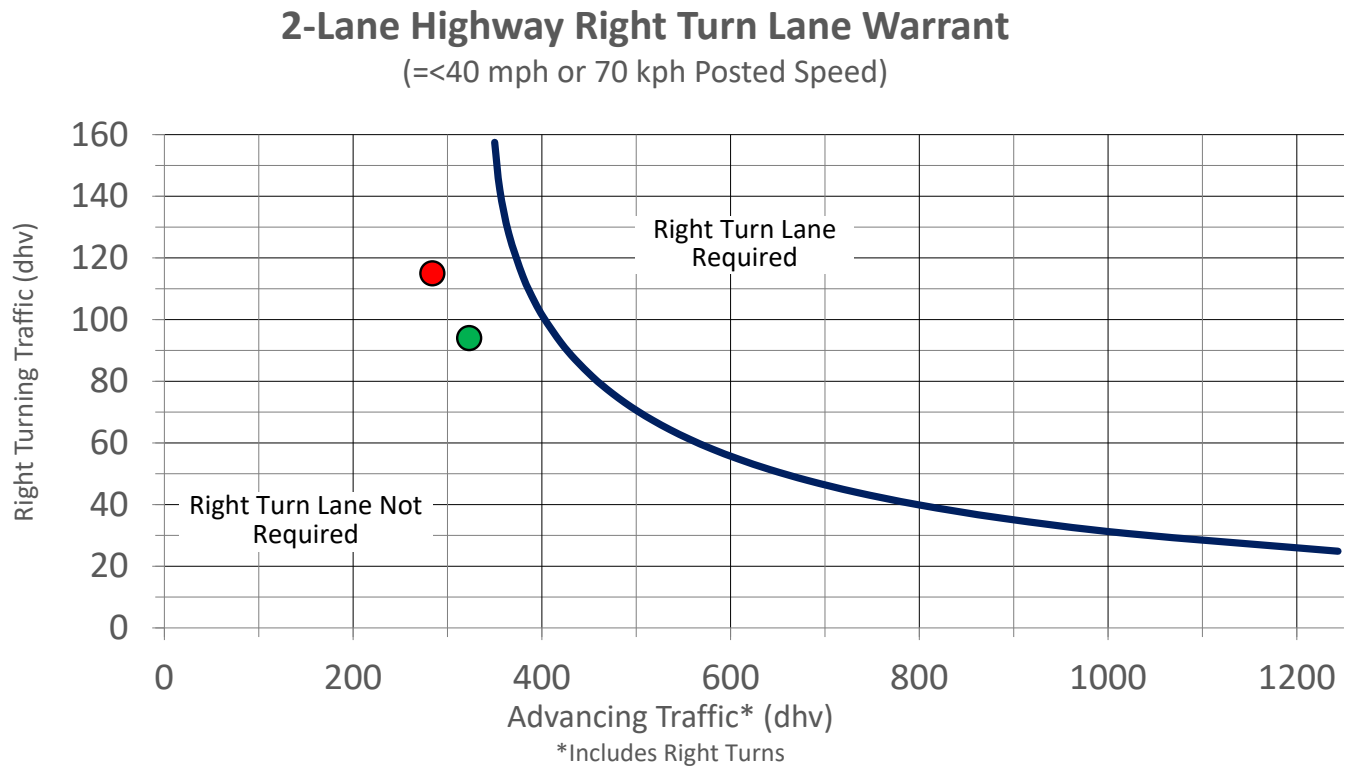
2-LANE LEFT TURN LANE WARRANT (LOW SPEED)

401-5aM

REFERENCE SECTION 401.6.1

CHAMBERLIN ROAD @ NORTH DRIVEWAY

2027 (Grades 4-6) **WARRANT IS NOT MET**



TIME	NORTHBOUND			WARRANT?
	THRU	RIGHT	ADVANCING	
AM	169	115	284	NO
PM	229	94	323	NO

2-LANE RIGHT TURN LANE WARRANT (LOW SPEED)

401-6aM

REFERENCE SECTION 401.6.3

AUXILLIARY TURN LANE WARRANTS

PROJECT INFORMATION

1. Client	TWINSBURG CITY SCHOOL DISTRICT
2. Job Number	25-047
3. Jurisdiction	TWINSBURG, OHIO
4. Name of roadway where turn lanes are to be analyzed	CHAMBERLIN ROAD @ NORTH DRIVEWAY
5. Roadway speed limit	35
6. Number of Lanes	2
7. Analysis Condition (Year / Build)	2027 (Grades PK-3)
8. Direction of Roadway	NB/SB
9. Direction of Side Street Approach	WB
10. Is the Roadway Divided or Undivided	Undivided

11. Enter Volume Data for Intersection

NORTHBOUND

- Right Turn	Right	Thru	Advancing
AM	185	183	368
PM	150	293	443

	SOUTHBOUND	NORTHBOUND					
- Left Turn	Left	Thru	Thru	Right	Advancing	Opposing	LT%
AM	358	180	183	185	538	368	66.5%
PM	127	230	293	150	357	443	35.6%

Notes:

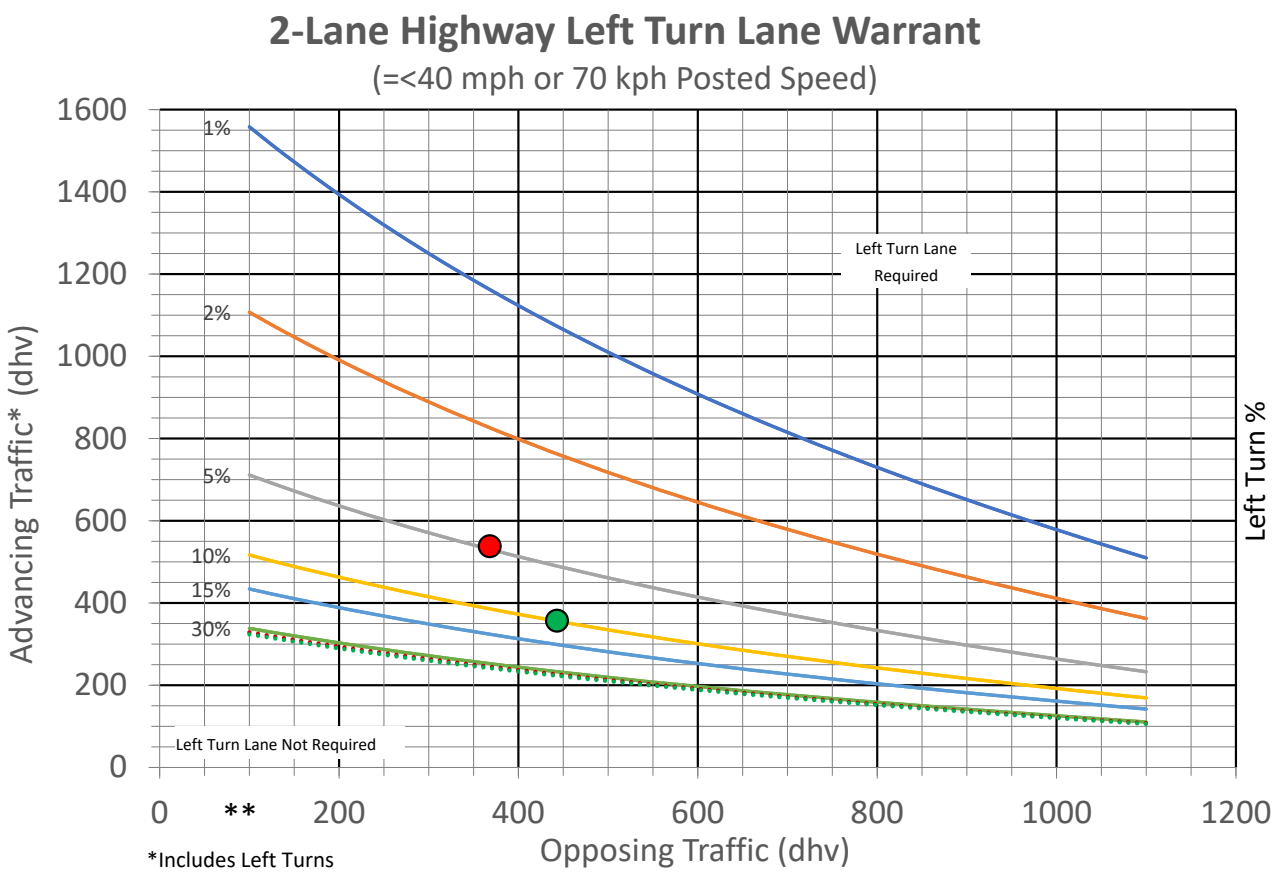
1. Analyst to fill in all blue areas.
2. Green areas are calculated for the analyst

CHAMBERLIN ROAD @ NORTH DRIVEWAY

2027 (Grades PK-3) **WARRANT IS MET**

Left turn lane is warranted in the AM when the red dot is located on or above the dotted red line.

Left turn lane is warranted in the PM when the green dot is located on or above the dotted green line.



*Includes Left Turns

**There is no minimum number of turns

TIME	SOUTHBOUND		NORTHBOUND		ADVANCING	OPPOSING	LT%	WARRANT?
	LEFT	THRU	THRU	RIGHT				
AM	358	180	183	185	538	368	66.5%	YES
PM	127	230	293	150	357	443	35.6%	YES

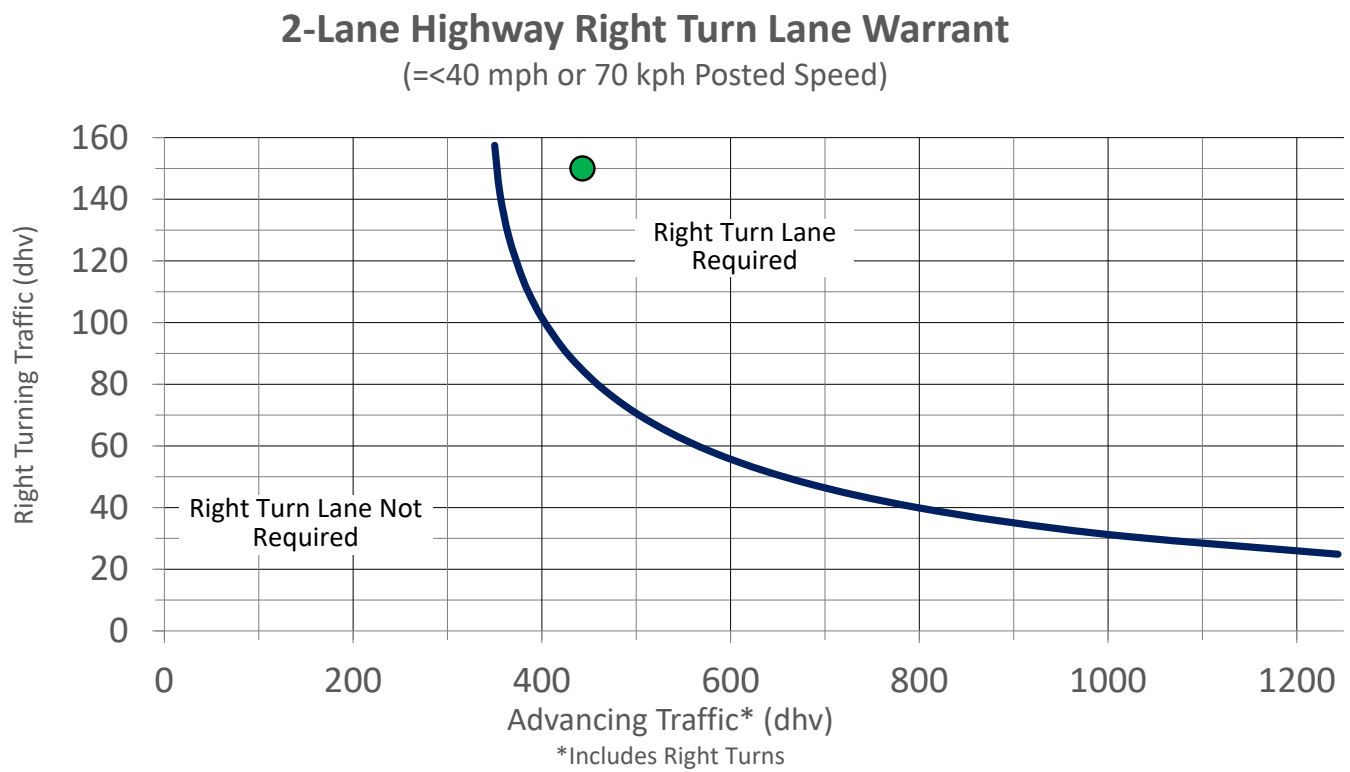
2-LANE LEFT TURN LANE WARRANT (LOW SPEED)

401-5aM

REFERENCE SECTION 401.6.1

CHAMBERLIN ROAD @ NORTH DRIVEWAY

2027 (Grades PK-3) **WARRANT IS MET**



TIME	NORTHBOUND			WARRANT?
	THRU	RIGHT	ADVANCING	
AM	183	185	368	YES
PM	293	150	443	YES

2-LANE RIGHT TURN LANE WARRANT (LOW SPEED)

401-6aM

REFERENCE SECTION 401.6.3

AUXILLIARY TURN LANE WARRANTS

PROJECT INFORMATION

1. Client	TWINSBURG CITY SCHOOL DISTRICT
2. Job Number	25-047
3. Jurisdiction	TWINSBURG, OHIO
4. Name of roadway where turn lanes are to be analyzed	CHAMBERLIN ROAD @ NORTH DRIVEWAY
5. Roadway speed limit	35
6. Number of Lanes	2
7. Analysis Condition (Year / Build)	2047 (Grades 4-6)
8. Direction of Roadway	NB/SB
9. Direction of Side Street Approach	WB
10. Is the Roadway Divided or Undivided	Undivided

11. Enter Volume Data for Intersection

- Right Turn		NORTHBOUND		
		Right	Thru	Advancing
	AM	115	169	284
	PM	94	239	333

- Left Turn		SOUTHBOUND	NORTHBOUND					
		Left	Thru	Thru	Right	Advancing	Opposing	LT%
	AM	213	280	169	115	493	284	43.2%
	PM	73	200	239	94	273	333	26.7%

Notes:

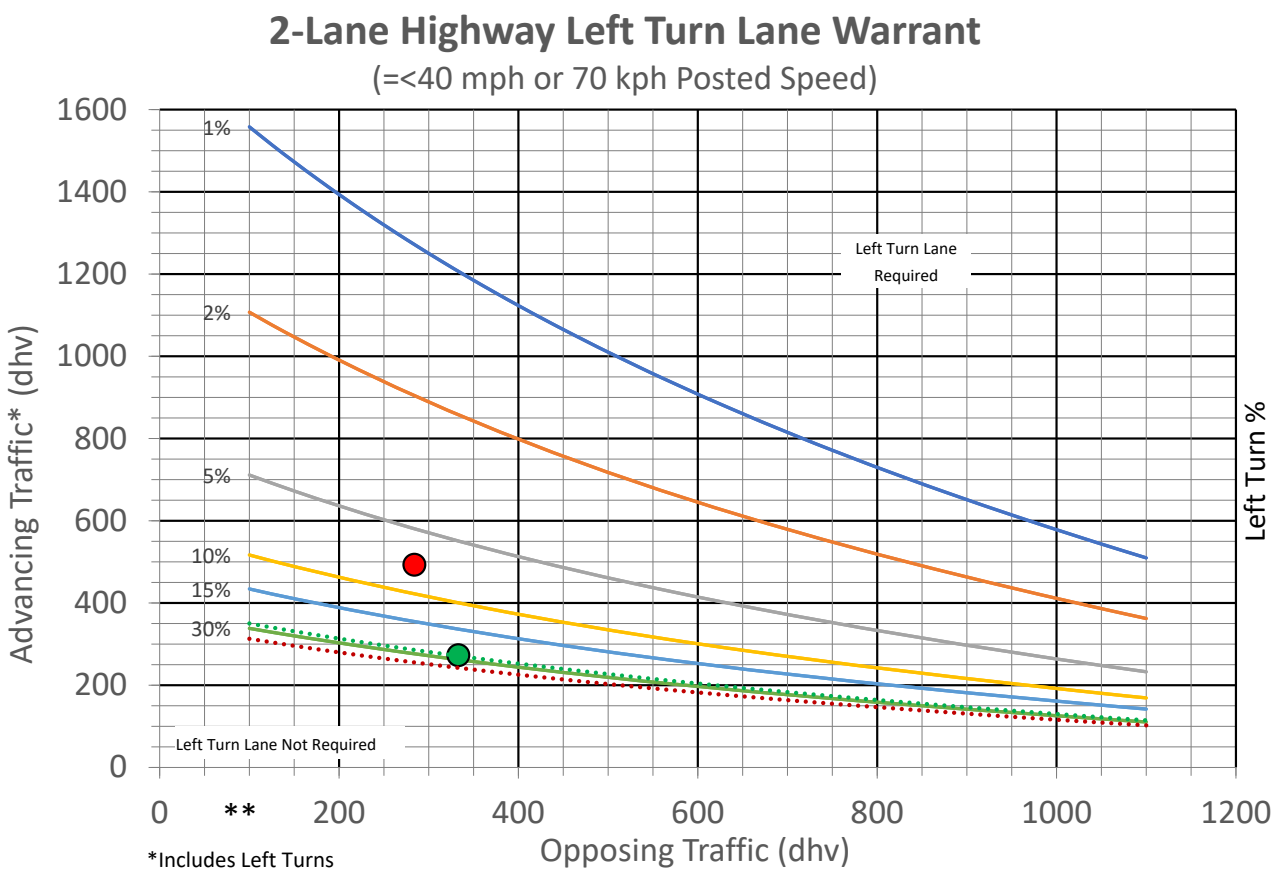
1. Analyst to fill in all blue areas.
2. Green areas are calculated for the analyst

CHAMBERLIN ROAD @ NORTH DRIVEWAY

2047 (Grades 4-6) **WARRANT IS MET**

Left turn lane is warranted in the AM when the red dot is located on or above the dotted red line.

Left turn lane is warranted in the PM when the green dot is located on or above the dotted green line.



*Includes Left Turns

**There is no minimum number of turns

TIME	SOUTHBOUND		NORTHBOUND		ADVANCING	OPPOSING	LT%	WARRANT?
	LEFT	THRU	THRU	RIGHT				
AM	213	280	169	115	493	284	43.2%	YES
PM	73	200	239	94	273	333	26.7%	YES

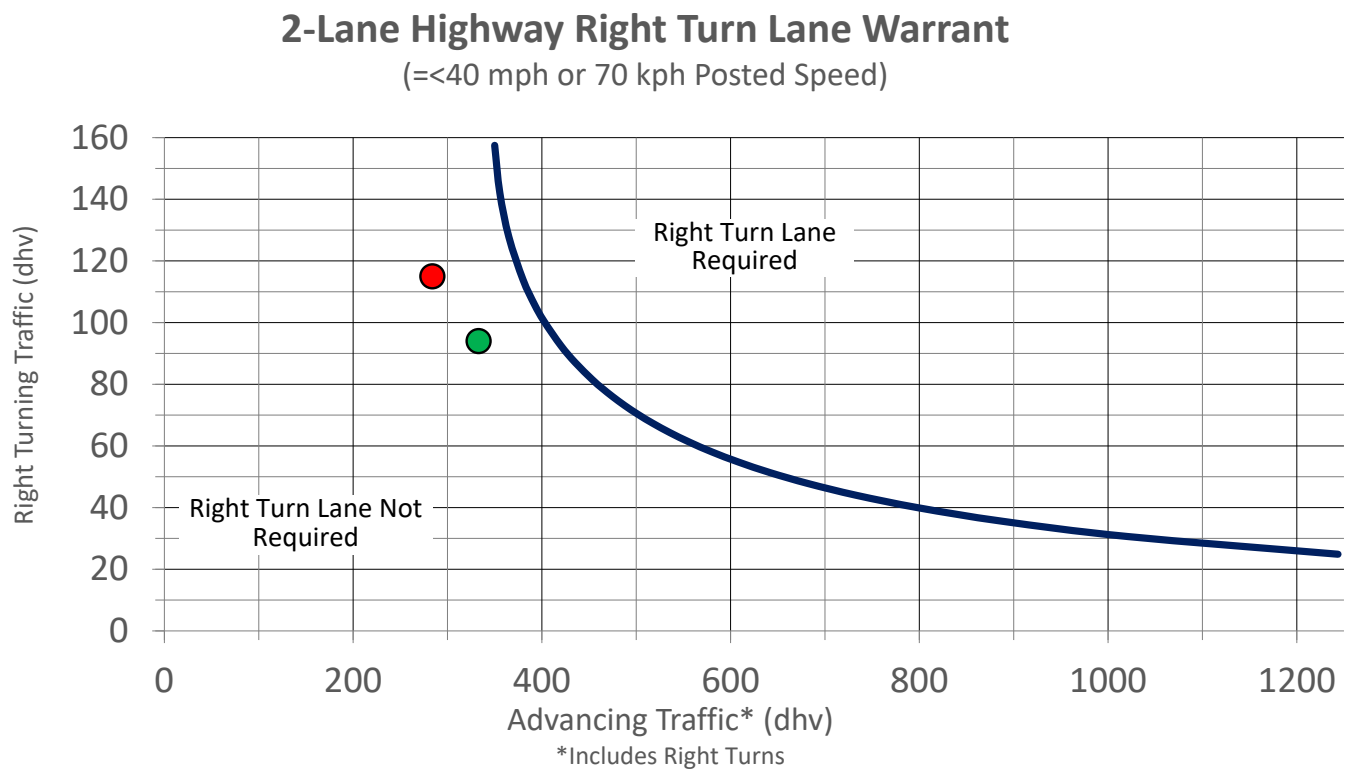
2-LANE LEFT TURN LANE WARRANT (LOW SPEED)

401-5aM

REFERENCE SECTION 401.6.1

CHAMBERLIN ROAD @ NORTH DRIVEWAY

2047 (Grades 4-6) **WARRANT IS NOT MET**



TIME	NORTHBOUND			WARRANT?
	THRU	RIGHT	ADVANCING	
AM	169	115	284	NO
PM	239	94	333	NO

2-LANE RIGHT TURN LANE WARRANT (LOW SPEED)

401-6aM

REFERENCE SECTION 401.6.3

AUXILLIARY TURN LANE WARRANTS

PROJECT INFORMATION

1. Client	TWINSBURG CITY SCHOOL DISTRICT
2. Job Number	25-047
3. Jurisdiction	TWINSBURG, OHIO
4. Name of roadway where turn lanes are to be analyzed	CHAMBERLIN ROAD @ NORTH DRIVEWAY
5. Roadway speed limit	35
6. Number of Lanes	2
7. Analysis Condition (Year / Build)	2047 (Grades PK-3)
8. Direction of Roadway	NB/SB
9. Direction of Side Street Approach	WB
10. Is the Roadway Divided or Undivided	Undivided

11. Enter Volume Data for Intersection

NORTHBOUND

- Right Turn	Right	Thru	Advancing
AM	185	183	368
PM	150	303	453

	SOUTHBOUND	NORTHBOUND				
- Left Turn	Left	Thru	Thru	Right	Advancing	Opposing	LT%
AM	358	180	183	185	538	368	66.5%
PM	127	240	303	150	367	453	34.6%

Notes:

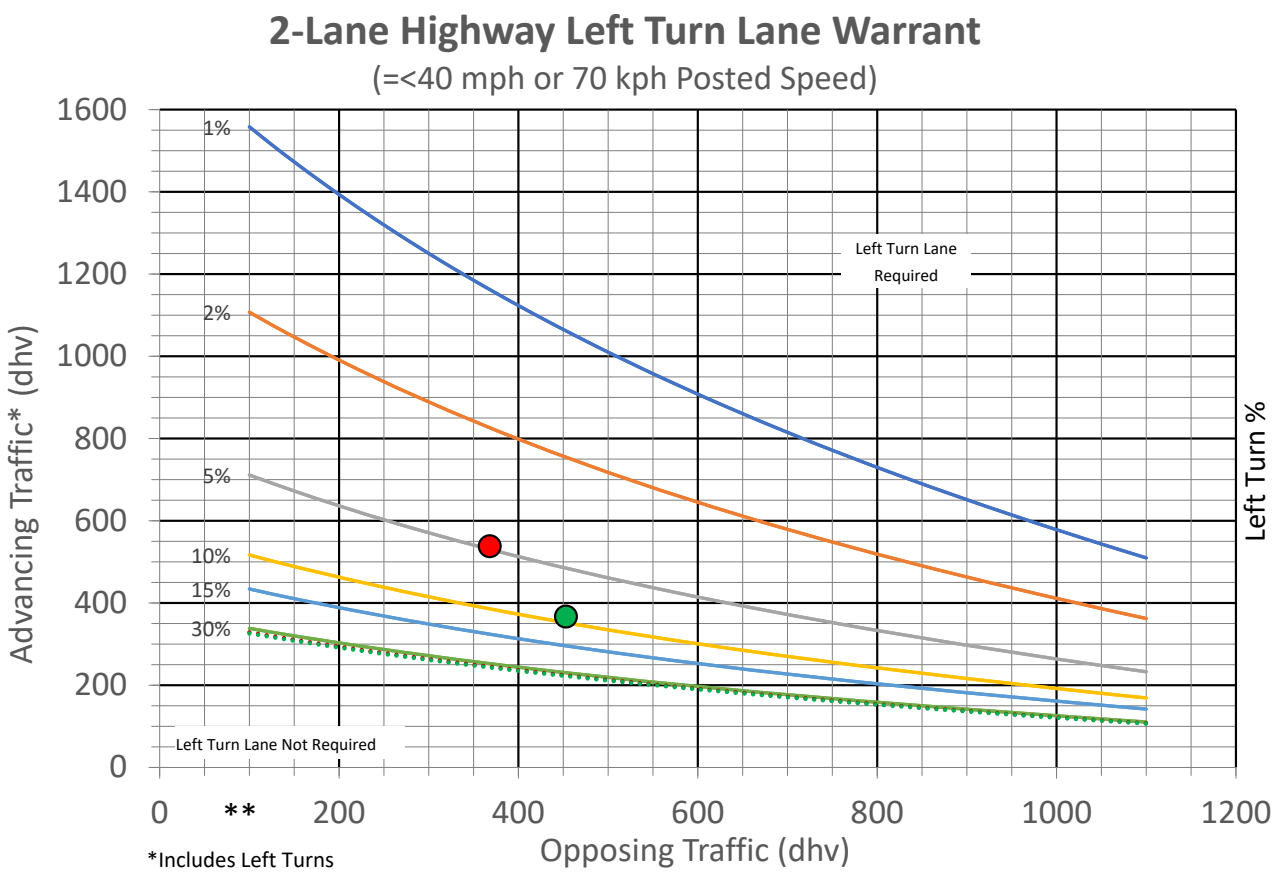
1. Analyst to fill in all blue areas.
2. Green areas are calculated for the analyst

CHAMBERLIN ROAD @ NORTH DRIVEWAY

2047 (Grades PK-3) **WARRANT IS MET**

Left turn lane is warranted in the AM when the red dot is located on or above the dotted red line.

Left turn lane is warranted in the PM when the green dot is located on or above the dotted green line.



*Includes Left Turns

**There is no minimum number of turns

TIME	SOUTHBOUND		NORTHBOUND		ADVANCING	OPPOSING	LT%	WARRANT?
	LEFT	THRU	THRU	RIGHT				
AM	358	180	183	185	538	368	66.5%	YES
PM	127	240	303	150	367	453	34.6%	YES

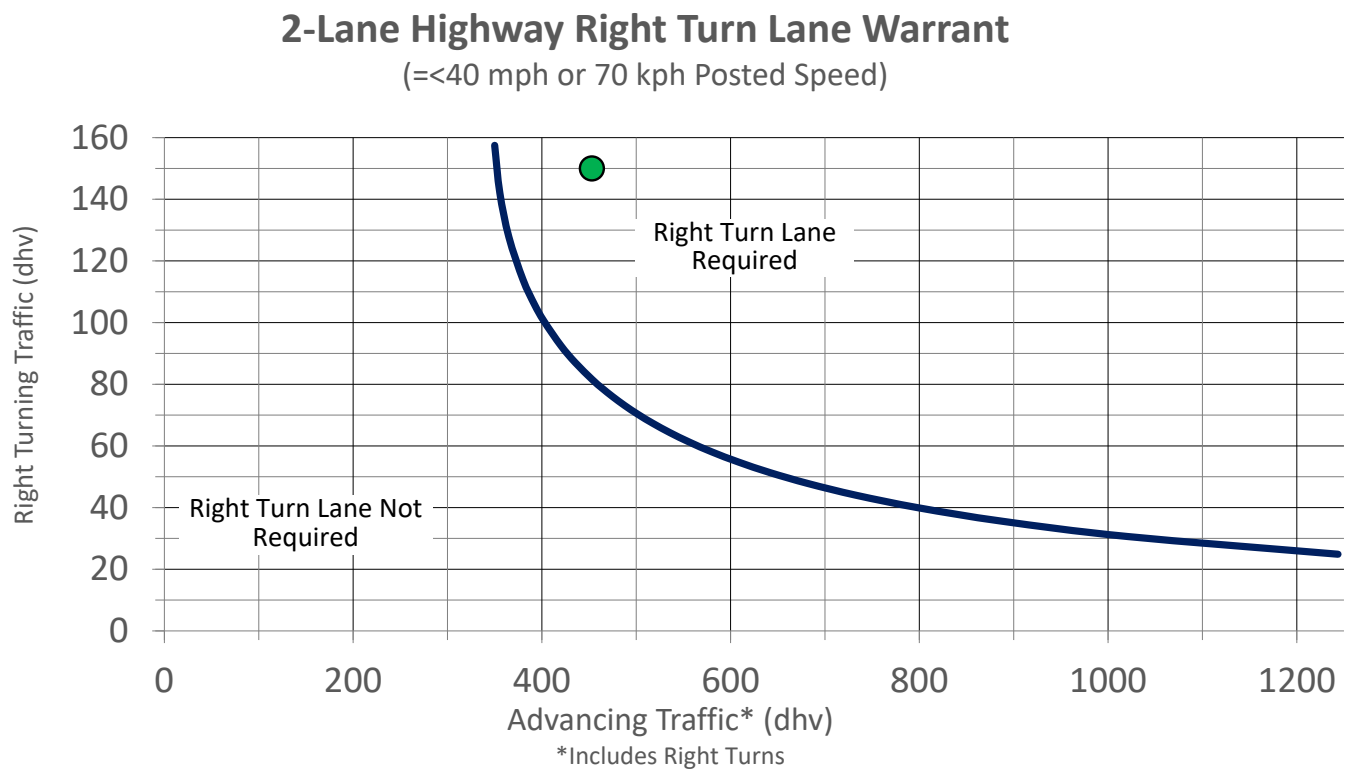
2-LANE LEFT TURN LANE WARRANT (LOW SPEED)

401-5aM

REFERENCE SECTION 401.6.1

CHAMBERLIN ROAD @ NORTH DRIVEWAY

2047 (Grades PK-3) **WARRANT IS MET**



TIME	NORTHBOUND			WARRANT?
	THRU	RIGHT	ADVANCING	
AM	183	185	368	YES
PM	303	150	453	YES

2-LANE RIGHT TURN LANE WARRANT (LOW SPEED)

401-6aM

REFERENCE SECTION 401.6.3

Appendix O
Access Capacity Analysis Worksheets - 2027

HCS Two-Way Stop-Control Report

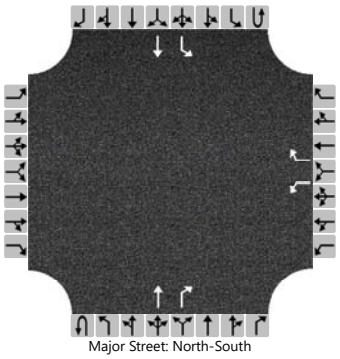
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	AM 700-800
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & North
Jurisdiction	Twinsburg, OH
East/West Street	North Driveway
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	1	1	0
Configuration						L		R			T	R		L	T	
Volume (veh/h)						146		118			169	115		213	270	
Percent Heavy Vehicles (%)						0		0						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized						No				No						
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						162		131						237		
Capacity, c (veh/h)						232		859						1239		
v/c Ratio						0.70		0.15						0.19		
95% Queue Length, Q_{95} (veh)						4.6		0.5						0.7		
95% Queue Length, Q_{95} (ft)						115.0		12.5						17.9		
Control Delay (s/veh)						50.2		9.9						8.6		
Level of Service (LOS)						F		A						A		
Approach Delay (s/veh)						32.2								3.8		
Approach LOS						D								A		

HCS Two-Way Stop-Control Report

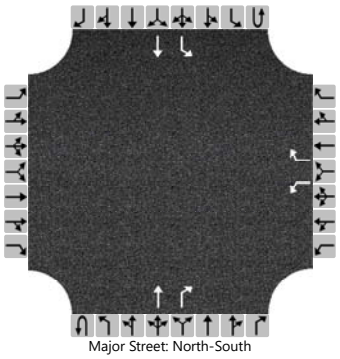
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	AM 815-915
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & North
Jurisdiction	Twinsburg, OH
East/West Street	North Driveway
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	1	1	0
Configuration						L		R			T	R		L	T	
Volume (veh/h)						249		171			183	185		358	180	
Percent Heavy Vehicles (%)						0		0						7		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized						No					No					
Median Type | Storage						Undivided										

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.17		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.26		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						277		190						398		
Capacity, c (veh/h)						134		842						1123		
v/c Ratio						2.07		0.23						0.35		
95% Queue Length, Q_{95} (veh)						22.5		0.9						1.6		
95% Queue Length, Q_{95} (ft)						562.5		22.5						42.2		
Control Delay (s/veh)						561.8		10.5						10.0		
Level of Service (LOS)						F		B						A		
Approach Delay (s/veh)						337.3								6.6		
Approach LOS						F								A		

HCS Two-Way Stop-Control Report

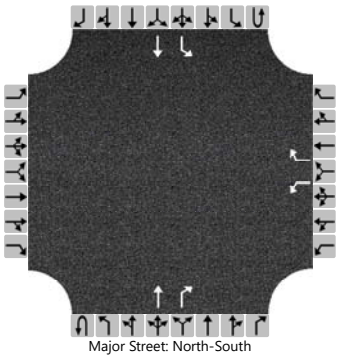
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	PM 200-300
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & North
Jurisdiction	Twinsburg, OH
East/West Street	North Driveway
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	1	1	0
Configuration						L		R			T	R		L	T	
Volume (veh/h)						64		118			229	94		73	190	
Percent Heavy Vehicles (%)						0		0						7		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized						No				No						
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.17		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.26		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						71		131						81		
Capacity, c (veh/h)						419		789						1173		
v/c Ratio						0.17		0.17						0.07		
95% Queue Length, Q_{95} (veh)						0.6		0.6						0.2		
95% Queue Length, Q_{95} (ft)						15.0		15.0						5.3		
Control Delay (s/veh)						15.3		10.5						8.3		
Level of Service (LOS)						C		B						A		
Approach Delay (s/veh)						12.2								2.3		
Approach LOS						B								A		

HCS Two-Way Stop-Control Report

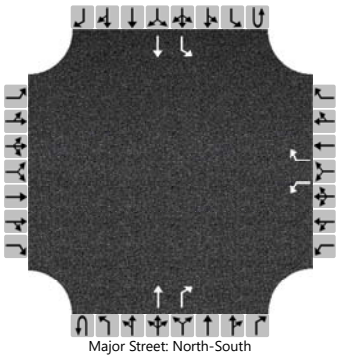
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2027
Time Analyzed	PM 300-400
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & North
Jurisdiction	Twinsburg, OH
East/West Street	North Driveway
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	1	1	0
Configuration						L		R			T	R		L	T	
Volume (veh/h)						99		184			293	150		127	230	
Percent Heavy Vehicles (%)						0		0						12		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized						No				No						
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.22		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.31		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						110		204						141		
Capacity, c (veh/h)						282		720						1021		
v/c Ratio						0.39		0.28						0.14		
95% Queue Length, Q_{95} (veh)						1.8		1.2						0.5		
95% Queue Length, Q_{95} (ft)						45.0		30.0						13.7		
Control Delay (s/veh)						25.7		12.0						9.1		
Level of Service (LOS)						D		B						A		
Approach Delay (s/veh)						16.8								3.2		
Approach LOS						C								A		

Appendix P
Access Capacity Analysis Worksheets - 2047

HCS Two-Way Stop-Control Report

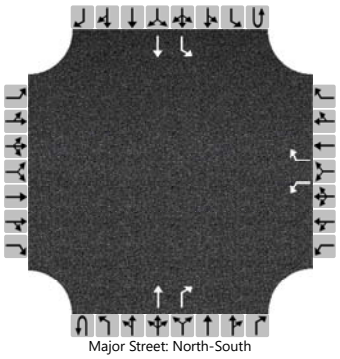
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	AM 700-800
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & North
Jurisdiction	Twinsburg, OH
East/West Street	North Driveway
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	1	1	0
Configuration						L		R			T	R		L	T	
Volume (veh/h)						146		118			169	115		213	280	
Percent Heavy Vehicles (%)						0		0						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized						No				No						
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						162		131						237		
Capacity, c (veh/h)						228		859						1239		
v/c Ratio						0.71		0.15						0.19		
95% Queue Length, Q_{95} (veh)						4.7		0.5						0.7		
95% Queue Length, Q_{95} (ft)						117.5		12.5						17.9		
Control Delay (s/veh)						51.9		9.9						8.6		
Level of Service (LOS)						F		A						A		
Approach Delay (s/veh)						33.2								3.7		
Approach LOS						D								A		

HCS Two-Way Stop-Control Report

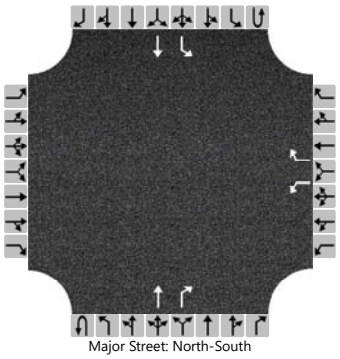
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	AM 815-915
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & North
Jurisdiction	Twinsburg, OH
East/West Street	North Driveway
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	1	1	0
Configuration						L		R			T	R		L	T	
Volume (veh/h)						249		171			183	185		358	180	
Percent Heavy Vehicles (%)						0		0						7		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized						No				No						
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.17		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.26		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						277		190						398		
Capacity, c (veh/h)						134		842						1123		
v/c Ratio						2.07		0.23						0.35		
95% Queue Length, Q_{95} (veh)						22.5		0.9						1.6		
95% Queue Length, Q_{95} (ft)						562.5		22.5						42.2		
Control Delay (s/veh)						561.8		10.5						10.0		
Level of Service (LOS)						F		B						A		
Approach Delay (s/veh)						337.3								6.6		
Approach LOS						F								A		

HCS Two-Way Stop-Control Report

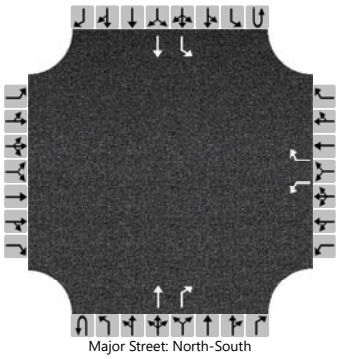
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	PM 200-300
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & North
Jurisdiction	Twinsburg, OH
East/West Street	North Driveway
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	1	1	0
Configuration						L		R			T	R		L	T	
Volume (veh/h)						64		118			239	94		73	200	
Percent Heavy Vehicles (%)						0		0						7		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized						No					No					
Median Type | Storage						Undivided										

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.17		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.26		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						71		131						81		
Capacity, c (veh/h)						406		778						1161		
v/c Ratio						0.17		0.17						0.07		
95% Queue Length, Q_{95} (veh)						0.6		0.6						0.2		
95% Queue Length, Q_{95} (ft)						15.0		15.0						5.3		
Control Delay (s/veh)						15.7		10.6						8.3		
Level of Service (LOS)						C		B						A		
Approach Delay (s/veh)						12.4								2.2		
Approach LOS						B								A		

HCS Two-Way Stop-Control Report

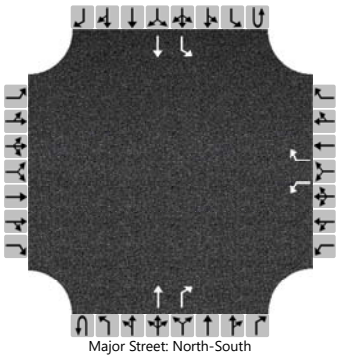
General Information

Analyst	ABC
Agency/Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	PM 300-400
Intersection Orientation	North-South
Project Description	Build Conditions

Site Information

Intersection	Chamberlin & North
Jurisdiction	Twinsburg, OH
East/West Street	North Driveway
North/South Street	Chamberlin Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	1	1	0
Configuration						L		R			T	R		L	T	
Volume (veh/h)						99		184			303	150		127	240	
Percent Heavy Vehicles (%)						0		0						12		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized						No				No						
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.22		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.31		

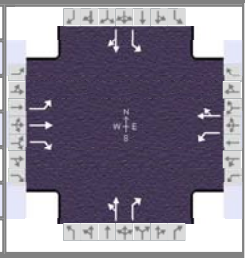
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						110		204						141		
Capacity, c (veh/h)						273		710						1012		
v/c Ratio						0.40		0.29						0.14		
95% Queue Length, Q_{95} (veh)						1.9		1.2						0.5		
95% Queue Length, Q_{95} (ft)						47.5		30.0						13.7		
Control Delay (s/veh)						26.7		12.1						9.1		
Level of Service (LOS)						D		B						A		
Approach Delay (s/veh)						17.2								3.2		
Approach LOS						C								A		

Appendix Q
Capacity Analysis Worksheets - 2047 Improvements

HCS Signalized Intersection Results Summary

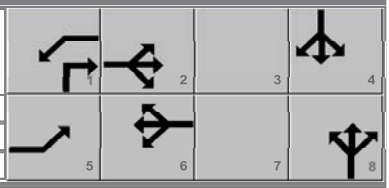
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.83
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM1 47 RTL-OL.xus		
Project Description	Build - NB RTL w/ Overlap				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	190	57	353	530	30	165	15	187	60	67	110

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	1.6	6.4	23.0	25.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



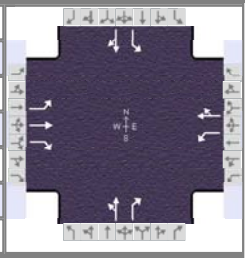
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		7.0		6.0
Phase Duration, s	7.6	29.0	20.0	41.4		31.0		31.0
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	2.4		14.9			23.8		27.0
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.3		0.0
Phase Call Probability	0.23		1.00			1.00		1.00
Max Out Probability	0.03		1.00			1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	12	229	69	425	675			217	225	72	213	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1711	1796	1522	1781	1852			821	1572	1417	1709	
Queue Service Time (g_s), s	0.4	8.3	2.7	12.9	25.6			13.9	6.9	3.2	7.8	
Cycle Queue Clearance Time (g_c), s	0.4	8.3	2.7	12.9	25.6			21.8	6.9	25.0	7.8	
Green Ratio (*g/C*)	0.31	0.29	0.29	0.49	0.44			0.31	0.49	0.31	0.31	
Capacity (*c*), veh/h	197	516	438	613	819			343	767	147	534	
Volume-to-Capacity Ratio (*X*)	0.061	0.443	0.157	0.694	0.824			0.633	0.294	0.492	0.399	
Back of Queue (*Q*), ft/ln (95 th percentile)	7	178	48	223	448			187	101	64	135	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	6.7	1.8	8.8	17.6			7.3	3.9	2.6	5.4	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.18	0.44	0.74	0.48			0.32	0.29	0.40	0.84	
Uniform Delay (d_1), s/veh	20.8	23.3	21.3	14.9	19.6			30.2	12.3	38.7	21.6	
Incremental Delay (d_2), s/veh	0.0	2.7	0.8	2.9	9.2			2.9	0.1	0.9	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	20.8	26.0	22.0	17.7	28.8			33.0	12.3	39.7	21.8	
Level of Service (LOS)	C	C	C	B	C			C	B	D	C	
Approach Delay, s/veh / LOS	24.9	C		24.5	C		22.5	C		26.3	C	
Intersection Delay, s/veh / LOS	24.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

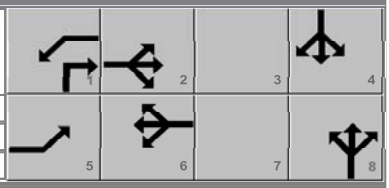
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.84
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_AM2 47 RTL_OL.xus		
Project Description	Build - NB RTL w/ Overlap				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	260	57	409	320	20	155	18	193	30	47	80

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	2.9	4.0	26.7	22.4	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



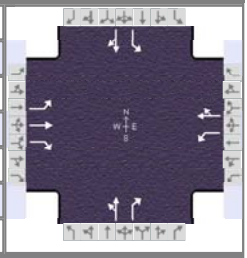
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		7.0		6.0
Phase Duration, s	8.9	32.7	18.9	42.8		28.4		28.4
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	2.7		14.6			19.1		21.0
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		1.1		0.9
Phase Call Probability	0.41		1.00			1.00		1.00
Max Out Probability	0.00		1.00			0.07		0.18

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	24	310	68	487	405			206	230	36	151	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1739	1826	1547	1767	1836			990	1585	1412	1707	
Queue Service Time (g_s), s	0.7	10.9	2.4	12.6	12.3			11.9	7.6	1.9	5.6	
Cycle Queue Clearance Time (g_c), s	0.7	10.9	2.4	12.6	12.3			17.1	7.6	19.0	5.6	
Green Ratio (*g/C*)	0.37	0.33	0.33	0.52	0.46			0.28	0.44	0.28	0.28	
Capacity (*c*), veh/h	410	608	515	571	835			367	701	190	486	
Volume-to-Capacity Ratio (*X*)	0.058	0.509	0.132	0.853	0.485			0.561	0.328	0.188	0.311	
Back of Queue (*Q*), ft/ln (95 th percentile)	12	221	42	287	227			162	1	29	96	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.5	8.5	1.6	11.2	8.9			6.4	0.0	1.2	3.9	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.08	0.22	0.39	0.96	0.24			0.28	0.00	0.18	0.60	
Uniform Delay (d_1), s/veh	16.3	21.4	18.6	16.8	15.3			29.0	14.6	35.4	22.5	
Incremental Delay (d_2), s/veh	0.0	3.0	0.5	11.2	2.0			0.5	0.1	0.2	0.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	16.3	24.5	19.2	28.1	17.3			29.5	14.7	35.6	22.6	
Level of Service (LOS)	B	C	B	C	B			C	B	D	C	
Approach Delay, s/veh / LOS	23.1	C		23.2	C		21.7	C		25.1	C	
Intersection Delay, s/veh / LOS	23.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

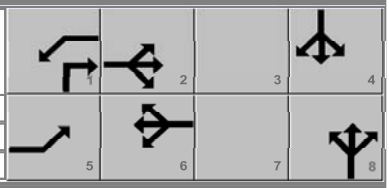
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.96
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM1 47 RTL_OL.xus		
Project Description	Build - NB RTL w/ Overlap				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	330	86	191	290	50	60	40	276	20	46	40

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.3	1.7	39.0	16.0	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



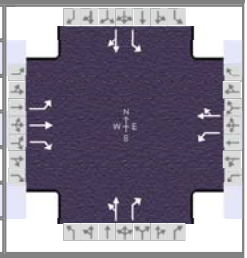
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		7.0		6.0
Phase Duration, s	11.3	45.0	12.9	46.7		22.0		22.0
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	3.3		6.4			15.0		10.0
Green Extension Time (g_e), s	0.1	0.0	0.3	0.0		1.0		1.1
Phase Call Probability	0.75		0.99			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	63	344	90	199	354			104	288	21	90	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1767	1856	1572	1753	1793			1283	1547	1354	1712	
Queue Service Time (g_s), s	1.3	9.3	2.5	4.4	9.7			3.4	13.0	1.1	3.5	
Cycle Queue Clearance Time (g_c), s	1.3	9.3	2.5	4.4	9.7			6.9	13.0	8.0	3.5	
Green Ratio (*g/C*)	0.55	0.49	0.49	0.57	0.51			0.20	0.29	0.20	0.20	
Capacity (*c*), veh/h	576	906	767	621	912			329	444	245	343	
Volume-to-Capacity Ratio (*X*)	0.109	0.380	0.117	0.321	0.388			0.316	0.647	0.085	0.261	
Back of Queue (*Q*), ft/ln (95 th percentile)	20	175	39	67	175			80	210	16	64	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.8	6.8	1.5	2.6	6.8			3.1	8.1	0.6	2.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.14	0.17	0.36	0.22	0.19			0.14	0.60	0.10	0.40	
Uniform Delay (d_1), s/veh	8.9	12.9	11.1	8.8	12.0			28.6	25.0	31.9	27.0	
Incremental Delay (d_2), s/veh	0.0	1.2	0.3	0.1	1.2			0.2	0.6	0.1	0.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	9.0	14.1	11.4	9.0	13.3			28.8	25.6	31.9	27.1	
Level of Service (LOS)	A	B	B	A	B			C	C	C	C	
Approach Delay, s/veh / LOS	13.0	B		11.7	B		26.4	C		28.0	C	
Intersection Delay, s/veh / LOS	17.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

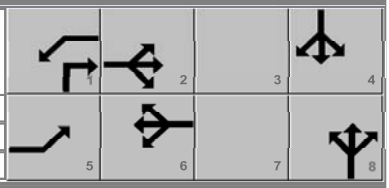
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.93
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ Ravenna Road	File Name	1_PM2 47 RTL_OL.xus		
Project Description	Build - NB RTL w/ Overlap				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	400	116	240	280	50	56	56	381	20	51	50

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	3.1	31.8	21.1	0.0	0.0
Yellow	4.0	0.0	4.0	4.0	0.0	0.0
Red	2.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		7.0		6.0
Phase Duration, s	12.0	37.8	15.0	40.9		27.1		27.1
Change Period, ($Y+R_c$), s	6.0	6.0	6.0	6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.3		3.3
Queue Clearance Time (g_s), s	4.1		8.7			19.7		10.3
Green Extension Time (g_e), s	0.1	0.0	0.4	0.0		1.4		1.5
Phase Call Probability	0.85		1.00			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

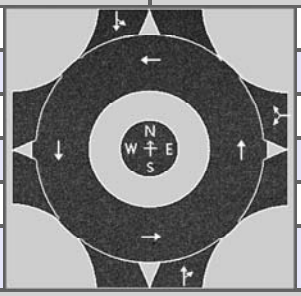
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	86	430	125	258	355			120	410	22	109	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1585	1767	1806			1365	1560	1236	1581	
Queue Service Time (g_s), s	2.1	14.4	4.1	6.7	11.0			2.9	17.7	1.2	4.3	
Cycle Queue Clearance Time (g_c), s	2.1	14.4	4.1	6.7	11.0			7.2	17.7	8.3	4.3	
Green Ratio (*g/C*)	0.47	0.40	0.40	0.51	0.44			0.26	0.38	0.26	0.26	
Capacity (*c*), veh/h	504	744	631	497	788			428	588	306	417	
Volume-to-Capacity Ratio (*X*)	0.171	0.578	0.198	0.519	0.450			0.281	0.697	0.070	0.260	
Back of Queue (*Q*), ft/ln (95 th percentile)	36	268	69	109	206			84	260	17	77	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.4	10.6	2.7	4.3	8.1			3.3	10.1	0.6	2.8	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.24	0.27	0.63	0.36	0.22			0.15	0.74	0.10	0.48	
Uniform Delay (d_1), s/veh	12.4	18.8	15.7	13.0	15.8			24.3	21.1	27.7	23.3	
Incremental Delay (d_2), s/veh	0.1	3.3	0.7	0.3	1.9			0.1	0.6	0.0	0.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	12.4	22.1	16.4	13.3	17.7			24.4	21.6	27.8	23.4	
Level of Service (LOS)	B	C	B	B	B			C	C	C	C	
Approach Delay, s/veh / LOS	19.7	B		15.8	B		22.2	C		24.1	C	
Intersection Delay, s/veh / LOS	19.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Roundabouts Report

General Information

Analyst	ABC
Agency or Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	AM 700-800
Project Description	Build - Roundabout



Site Information

Intersection	Chamberlin & North
E/W Street Name	North Driveway
N/S Street Name	Chamberlin Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	Twinsburg, OH

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LR				TR				LT	
Volume (V), veh/h					0	146		118	0		169	115	0	213	280	
Percent Heavy Vehicles, %					0	0		0	0		5	5	0	6	6	
Flow Rate (v_{PCE}), pc/h					0	162		131	0		197	134	0	251	330	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s					4.9763			4.9763			4.9763	
Follow-Up Headway, s					2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					293			331			581	
Entry Volume, veh/h					293			315			548	
Circulating Flow (v_c), pc/h	743			197			251			162		
Exiting Flow (v_{ex}), pc/h	385			0			328			492		
Capacity (c_{pce}), pc/h					1129			1068			1170	
Capacity (c), veh/h					1129			1017			1104	
v/c Ratio (x)					0.26			0.31			0.50	

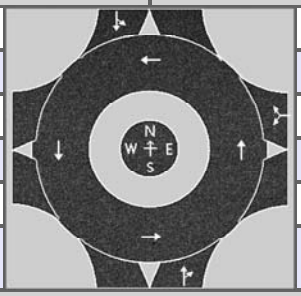
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					5.6			6.7			8.9	
Lane LOS					A			A			A	
95% Queue Length, Q_{95} (veh)					1.0			1.3			2.8	
95% Queue Length, Q_{95} (ft)					25.0			33.8			70.0	
Approach Delay, s/veh | LOS				5.6	A		6.7	A		8.9	A	
Intersection Delay, s/veh | LOS	7.5						A					

HCS Roundabouts Report

General Information

Analyst	ABC
Agency or Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	AM 815-915
Project Description	Build - Roundabout



Site Information

Intersection	Chamberlin & North
E/W Street Name	North Driveway
N/S Street Name	Chamberlin Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	Twinsburg, OH

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LR				TR				LT	
Volume (V), veh/h					0	249		171	0		183	185	0	358	180	
Percent Heavy Vehicles, %					0	0		0	0		15	15	0	9	9	
Flow Rate (v_{PCE}), pc/h					0	277		190	0		234	236	0	434	218	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s					4.9763			4.9763			4.9763	
Follow-Up Headway, s					2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					467			470			652	
Entry Volume, veh/h					467			409			598	
Circulating Flow (v_c), pc/h	929			234			434			277		
Exiting Flow (v_{ex}), pc/h	670			0			424			495		
Capacity (c_{pce}), pc/h					1087			886			1040	
Capacity (c), veh/h					1087			771			954	
v/c Ratio (x)					0.43			0.53			0.63	

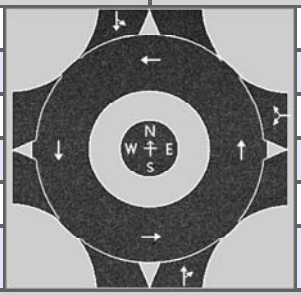
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					7.9			12.5			13.0	
Lane LOS					A			B			B	
95% Queue Length, Q_{95} (veh)					2.2			3.2			4.6	
95% Queue Length, Q_{95} (ft)					55.0			89.6			115.0	
Approach Delay, s/veh | LOS				7.9	A		12.5	B		13.0	B	
Intersection Delay, s/veh | LOS	11.3						B					

HCS Roundabouts Report

General Information

Analyst	ABC
Agency or Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	PM 200-300
Project Description	Build - Roundabout



Site Information

Intersection	Chamberlin & North
E/W Street Name	North Driveway
N/S Street Name	Chamberlin Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	Twinsburg, OH

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LR				TR				LT	
Volume (V), veh/h					0	64		118	0		239	94	0	73	200	
Percent Heavy Vehicles, %					0	0		0	0		6	6	0	8	8	
Flow Rate (v_{PCE}), pc/h					0	71		131	0		281	111	0	88	240	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s					4.9763			4.9763			4.9763	
Follow-Up Headway, s					2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					202			392			328	
Entry Volume, veh/h					202			370			304	
Circulating Flow (v_c), pc/h	399			281			88			71		
Exiting Flow (v_{ex}), pc/h	199			0			412			311		
Capacity (c_{pce}), pc/h					1036			1262			1284	
Capacity (c), veh/h					1036			1190			1189	
v/c Ratio (x)					0.19			0.31			0.26	

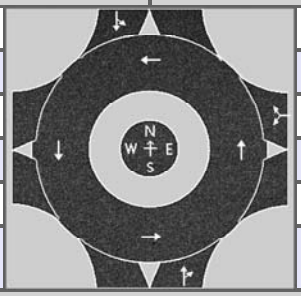
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					5.3			5.9			5.3	
Lane LOS					A			A			A	
95% Queue Length, Q_{95} (veh)					0.7			1.3			1.0	
95% Queue Length, Q_{95} (ft)					17.5			34.1			25.0	
Approach Delay, s/veh | LOS				5.3		A	5.9		A	5.3		A
Intersection Delay, s/veh | LOS	5.6						A					

HCS Roundabouts Report

General Information

Analyst	ABC
Agency or Co.	TMS Engineers, Inc.
Date Performed	4/18/2025
Analysis Year	2047
Time Analyzed	PM 300-400
Project Description	Build - Roundabout



Site Information

Intersection	Chamberlin & North
E/W Street Name	North Driveway
N/S Street Name	Chamberlin Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	Twinsburg, OH

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LR				TR				LT	
Volume (V), veh/h					0	99		184	0		303	150	0	127	240	
Percent Heavy Vehicles, %					0	0		0	0		12	12	0	4	4	
Flow Rate (v_{PCE}), pc/h					0	110		204	0		377	187	0	147	277	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s					4.9763			4.9763			4.9763	
Follow-Up Headway, s					2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

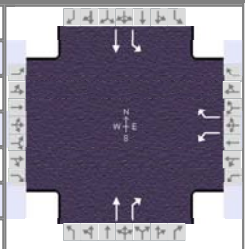
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					314			564			424	
Entry Volume, veh/h					314			504			408	
Circulating Flow (v_c), pc/h	534			377			147			110		
Exiting Flow (v_{ex}), pc/h	334			0			581			387		
Capacity (c_{pce}), pc/h					939			1188			1234	
Capacity (c), veh/h					939			1061			1186	
v/c Ratio (x)					0.33			0.47			0.34	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					7.4			8.8			6.3	
Lane LOS					A			A			A	
95% Queue Length, Q_{95} (veh)					1.5			2.6			1.5	
95% Queue Length, Q_{95} (ft)					37.5			71.2			37.5	
Approach Delay, s/veh | LOS				7.4		A	8.8		A	6.3		A
Intersection Delay, s/veh | LOS	7.6						A					

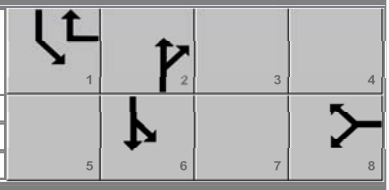
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 700-800	PHF	0.90
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ North Driveway	File Name	AM1_47 Signal.xus		
Project Description	Build - Traffic Signal				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				146		118		169	115	213	280	

Signal Information												
Cycle, s	80.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	7.0	45.1	10.0	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0		
				Red	2.0	2.0	2.0	0.0	0.0	0.0		



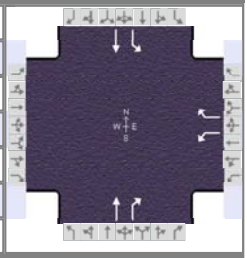
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				16.0		51.1	13.0	64.0
Change Period, (*Y+R c*), s				6.0		6.0	6.0	6.0
Max Allow Headway (*MAH*), s				3.2		0.0	3.1	0.0
Queue Clearance Time (*g s*), s				8.9			6.1	
Green Extension Time (*g e*), s				0.6		0.0	0.4	0.0
Phase Call Probability				1.00			0.99	
Max Out Probability				0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				162		131		188	128	237	311	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1826	1547	1725	1811	
Queue Service Time (*g s*), s				6.9		5.6		4.0	3.1	4.1	4.6	
Cycle Queue Clearance Time (*g c*), s				6.9		5.6		4.0	3.1	4.1	4.6	
Green Ratio (*g/C*)				0.12		0.21		0.56	0.56	0.68	0.73	
Capacity (*c*), veh/h				226		341		1028	871	834	1313	
Volume-to-Capacity Ratio (*X*)				0.718		0.384		0.183	0.147	0.284	0.237	
Back of Queue (*Q*), ft/ln (95 th percentile)				136		93		70	47	54	60	
Back of Queue (*Q*), veh/ln (95 th percentile)				5.4		3.7		2.7	1.8	2.0	2.3	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.45		0.31		0.07	0.16	0.18	0.06	
Uniform Delay (*d 1*), s/veh				33.7		27.0		8.5	8.3	5.2	3.6	
Incremental Delay (*d 2*), s/veh				1.6		0.3		0.4	0.4	0.1	0.4	
Initial Queue Delay (*d 3*), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				35.3		27.3		8.9	8.7	5.2	4.1	
Level of Service (LOS)				D		C		A	A	A	A	
Approach Delay, s/veh / LOS	0.0			31.7		C	8.8		A	4.6		A
Intersection Delay, s/veh / LOS	12.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

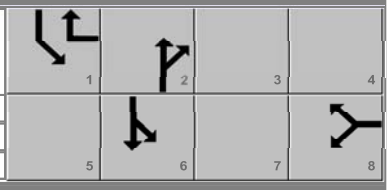
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	AM 815-915	PHF	0.90
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ North Driveway	File Name	AM2_47 Signal.xus		
Project Description	Build - Traffic Signal				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				249		171		183	185	358	180	

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	12.2	35.1	14.7	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



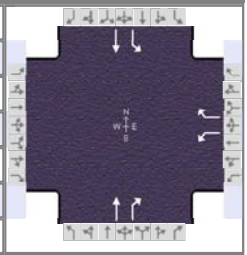
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				20.7		41.1	18.2	59.3
Change Period, ($Y+R_c$), s				6.0		6.0	6.0	6.0
Max Allow Headway (*MAH*), s				3.2		0.0	3.1	0.0
Queue Clearance Time (g_s), s				13.8			11.5	
Green Extension Time (g_e), s				0.9		0.0	0.7	0.0
Phase Call Probability				1.00			1.00	
Max Out Probability				0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				277		190		203	206	398	200	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1678	1422	1682	1767	
Queue Service Time (g_s), s				11.8		7.1		6.2	7.6	9.5	3.4	
Cycle Queue Clearance Time (g_c), s				11.8		7.1		6.2	7.6	9.5	3.4	
Green Ratio (*g/C*)				0.18		0.34		0.44	0.44	0.62	0.67	
Capacity (*c*), veh/h				332		541		736	624	749	1177	
Volume-to-Capacity Ratio (*X*)				0.832		0.351		0.276	0.330	0.531	0.170	
Back of Queue (*Q*), ft/ln (95 th percentile)				220		1		119	126	138	52	
Back of Queue (*Q*), veh/ln (95 th percentile)				8.8		0.0		4.2	4.5	5.1	1.9	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.73		0.00		0.12	0.42	0.46	0.05	
Uniform Delay (d_1), s/veh				31.5		20.0		14.3	14.7	8.4	5.0	
Incremental Delay (d_2), s/veh				2.1		0.1		0.9	1.4	0.2	0.3	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				33.6		20.1		15.3	16.1	8.6	5.3	
Level of Service (LOS)				C		C		B	B	A	A	
Approach Delay, s/veh / LOS	0.0			28.1		C	15.7		B	7.5		A
Intersection Delay, s/veh / LOS	16.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

HCS Signalized Intersection Results Summary

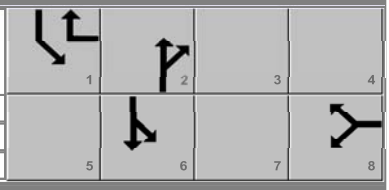
General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 200-300	PHF	0.90
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ North Driveway	File Name	PM1_47 Signal.xus		
Project Description	Build - Traffic Signal				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				64		118		239	94	73	200	

Signal Information										
Cycle, s	80.0	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	No	Simult. Gap E/W	On							
Force Mode	Fixed	Simult. Gap N/S	On							

Green	5.8	46.3	9.9	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



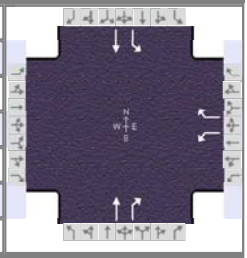
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				15.9		52.3	11.8	64.1
Change Period, ($Y+R_c$), s				6.0		6.0	6.0	6.0
Max Allow Headway (*MAH*), s				3.3		0.0	3.1	0.0
Queue Clearance Time (g_s), s				7.7			3.3	
Green Extension Time (g_e), s				0.4		0.0	0.1	0.0
Phase Call Probability				0.99			0.84	
Max Out Probability				0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				71		131		266	104	81	222	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1811	1535	1697	1781	
Queue Service Time (g_s), s				2.9		5.7		5.8	2.5	1.3	3.1	
Cycle Queue Clearance Time (g_c), s				2.9		5.7		5.8	2.5	1.3	3.1	
Green Ratio (*g/C*)				0.12		0.20		0.58	0.58	0.68	0.73	
Capacity (*c*), veh/h				224		317		1047	888	750	1294	
Volume-to-Capacity Ratio (*X*)				0.318		0.414		0.254	0.118	0.108	0.172	
Back of Queue (*Q*), ft/ln (95 th percentile)				55		96		100	36	17	41	
Back of Queue (*Q*), veh/ln (95 th percentile)				2.2		3.8		3.8	1.4	0.6	1.5	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.18		0.32		0.10	0.12	0.06	0.04	
Uniform Delay (d_1), s/veh				32.0		28.1		8.3	7.6	4.8	3.4	
Incremental Delay (d_2), s/veh				0.3		0.3		0.6	0.3	0.0	0.3	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				32.3		28.4		8.9	7.9	4.8	3.7	
Level of Service (LOS)				C		C		A	A	A	A	
Approach Delay, s/veh / LOS	0.0			29.8		C	8.6		A	4.0		A
Intersection Delay, s/veh / LOS	11.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

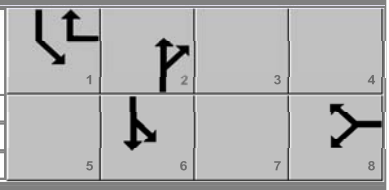
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	TMS Engineers, Inc.			Duration, h	0.250
Analyst	ABC	Analysis Date	Apr 18, 2025	Area Type	Other
Jurisdiction	Twinsburg, OH	Time Period	PM 300-400	PHF	0.90
Urban Street	Chamberlin Road	Analysis Year	2047	Analysis Period	1> 7:00
Intersection	@ North Driveway	File Name	PM2_47 Signal.xus		
Project Description	Build - Traffic Signal				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				99		184		303	150	127	240	

Signal Information												
Cycle, s	80.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
				Green	6.7	43.7	11.6	0.0	0.0	0.0		
				Yellow	4.0	4.0	4.0	0.0	0.0	0.0		
				Red	2.0	2.0	2.0	0.0	0.0	0.0		



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				17.6		49.7	12.7	62.4
Change Period, ($Y+R_c$), s				6.0		6.0	6.0	6.0
Max Allow Headway (*MAH*), s				3.3		0.0	3.1	0.0
Queue Clearance Time (g_s), s				11.0			4.4	
Green Extension Time (g_e), s				0.6		0.0	0.2	0.0
Phase Call Probability				1.00			0.96	
Max Out Probability				0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				110		204		337	167	141	267	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1722	1459	1753	1841	
Queue Service Time (g_s), s				4.4		9.0		8.8	4.7	2.4	4.0	
Cycle Queue Clearance Time (g_c), s				4.4		9.0		8.8	4.7	2.4	4.0	
Green Ratio (*g/C*)				0.14		0.23		0.55	0.55	0.66	0.71	
Capacity (*c*), veh/h				262		368		941	797	685	1298	
Volume-to-Capacity Ratio (*X*)				0.420		0.555		0.358	0.209	0.206	0.205	
Back of Queue (*Q*), ft/ln (95 th percentile)				85		150		157	71	33	56	
Back of Queue (*Q*), veh/ln (95 th percentile)				3.4		6.0		5.7	2.6	1.3	2.2	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.28		0.50		0.16	0.24	0.11	0.06	
Uniform Delay (d_1), s/veh				31.1		27.3		10.2	9.3	6.0	4.1	
Incremental Delay (d_2), s/veh				0.4		0.5		1.1	0.6	0.1	0.4	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				31.5		27.8		11.3	9.9	6.1	4.4	
Level of Service (LOS)				C		C		B	A	A	A	
Approach Delay, s/veh / LOS	0.0			29.1		C	10.8		B	5.0		A
Intersection Delay, s/veh / LOS	13.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

Appendix R
Traffic Signal Warrant Analysis

STUDY AND ANALYSIS INFORMATION

Municipality:	Twinsburg, OH	**Traffic Volumes Obtained By:**	TMS Engineering, Inc.
County:	Summit	**Analysis Date:**	4/18/2025
ODOT Engineering District:	4	**Agency/ Company Name Performing Warrant Analysis:**	TMS Engineering, Inc.
Google map link:	Map		

Analysis Information

Data Collection Date:	4/1/2025
Day of the Week:	Tuesday
Is the intersection in a built-up area of an isolated community of <10,000 population?	No
Existing Traffic Signal at intersection:	No
Total Number of Approaches at Intersection:	3

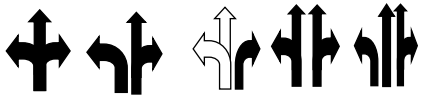
Major Street Information

Major Street Name and Route Number:	Chamberlin Road
Major Street Approach Direction:	N-Bound S-Bound
Number of Thru Lanes on Each Major Street Approach:	1 **LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street*:	35 **MPH**

*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number:	North Driveway
Minor Street Approach Configuration:	E-Bound 2 W-Bound



Number of Thru Lanes on Each Minor Street Approach:	1 **LANE(S)**
Apply Right Turn Lane Reduction*:	No

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	100% Warrant Satisfied?	Notes and Comments: *Known error: if Speed Limit < 45mph, it may not state that it passes at 70%.	
Warrant 1, Eight-Hour Vehicular Volume	Yes	**No**		
Warrant 2, Four-Hour Vehicular Volume	Yes	**No**		
Warrant 3, Peak Hour	Yes	**Yes**	Signals installed under Warrant 3 should be traffic actuated.	**Peak Hour** 8:15 AM 9:15 AM
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD.	**Peak Hour** 8:15 AM 9:15 AM
Warrant 5, School Crossing	No		N/A	
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)	
Warrant 7, Crash Experience	No		If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.	
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)	
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9	
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.	

For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:

1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: Install New Traffic Signal

Notes: 2027 Build Conditions

Start Time	Southbound Approach						Westbound Approach						Northbound Approach						Eastbound Approach					
	Southbound						Westbound						Nouthbound						Eastbound					
	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total
12:00 AM						0						0						0						0
12:15 AM						0						0						0						0
12:30 AM						0						0						0						0
12:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 AM						0						0						0						0
1:15 AM						0						0						0						0
1:30 AM						0						0						0						0
1:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 AM						0						0						0						0
2:15 AM						0						0						0						0
2:30 AM						0						0						0						0
2:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM						0						0						0						0
3:15 AM						0						0						0						0
3:30 AM						0						0						0						0
3:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 AM						0						0						0						0
4:15 AM						0						0						0						0
4:30 AM						0						0						0						0
4:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 AM						0						0						0						0
5:15 AM						0						0						0						0
5:30 AM						0						0						0						0
5:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 AM						0						0						0						0
6:15 AM						0						0						0						0
6:30 AM						0						0						0						0
6:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	54	213		0	267	0	0	0		0	0	115	29	0		0	144	0	0	0		0	0
7:15 AM	0	76	0		0	76	118	0	146		0	264	0	35	0		0	35	0	0	0		0	0
7:30 AM	0	60	0		0	60	0	0	0		0	0	0	32	0		0	32	0	0	0		0	0
7:45 AM	0	50	0		0	50	0	0	0		0	0	0	48	0		0	48	0	0	0		0	0
Hourly Total	0	240	213	0	0	453	118	0	146	0	0	264	115	144	0	0	0	259	0	0	0	0	0	0
8:00 AM	0	46	0		0	46	0	0	0		0	0	0	36	0		0	36	0	0	0		0	0
8:15 AM	0	49	179		0	228	0	0	0		0	0	92	35	0		0	127	0	0	0		0	0
8:30 AM	0	36	0		0	36	86	0	125		0	211	0	30	0		0	30	0	0	0		0	0
8:45 AM	0	41	179		0	220	0	0	0		0	0	93	33	0		0	126	0	0	0		0	0
Hourly Total	0	172	358	0	0	530	86	0	125	0	0	211	185	134	0	0	0	319	0	0	0	0	0	0
9:00 AM	0	33	0		0	33	85	0	124		0	209	0	68	0		0	68	0	0	0		0	0
9:15 AM	0	26	0		0	26	0	0	0		0	0	0	21	0		0	21	0	0	0		0	0
9:30 AM	0	26	0		0	26	0	0	0		0	0	0	24	0		0	24	0	0	0		0	0
9:45 AM	0	22	0		0	22	0	0	0		0	0	0	23	0		0	23	0	0	0		0	0
Hourly Total	0	107	0	0	0	107	85	0	124	0	0	209	0	136	0	0	0	136	0	0	0	0	0	0
10:00 AM						0						0						0						0
10:15 AM						0						0						0						0
10:30 AM						0						0						0						0
10:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	25	0		0	25	0	0	0		0	0	0	29	0		0	29	0	0	0		0	0
11:15 AM	0	24	0		0	24	0	0	0		0	0	0	21	0		0	21	0	0	0		0	0
11:30 AM	0	33	0		0	33	0	0	0		0	0	0	36	0		0	36	0	0	0		0	0
11:45 AM	0	28	0		0	28	0	0	0		0	0	0	29	0		0	29	0	0	0		0	0
Hourly Total	0	110	0	0	0	110	0	0	0	0	0	0	0	115	0	0	0	115	0	0	0	0	0	0
12:00 PM	0	26	0		0	26	0	0	0		0	0	0	30	0		0	30	0	0	0		0	0
12:15 PM	0	18	0		0	18	0	0	0		0	0	0	25	0		0	25	0	0	0		0	0
12:30 PM	0	25	0		0	25	0	0	0		0	0	0	34	0		0	34	0	0	0		0	0
12:45 PM	0	29	0		0	29	0	0	0		0	0	0	28	0		0	28	0	0	0		0	0
Hourly Total	0	98	0	0	0	98	0	0	0	0	0	0	0	117	0	0	0	117	0	0	0	0	0	0
1:00 PM	0	27	0		0	27					0	0	0	36	0		0	36						0
1:15 PM	0	28	0		0	28					0	0	0	35	0		0	35						0
1:30 PM	0	33	0		0	33					0	0	0	36	0		0	36						0
1:45 PM	0	36	0		0	36					0	0	0	44	0		0	44						0
Hourly Total	0	124	0	0	0	124	0	0	0	0	0	0	0	151	0	0	0	151	0	0	0	0	0	0
2:00 PM	0	37	73		0	110	0	0	0		0	0	94	42	0		0	136	0	0	0		0	0
2:15 PM	0	36	0		0	36	118	0	64		0	182	0	55	0		0	55	0	0	0		0	0
2:30 PM	0	47	0		0	47	0	0	0		0	0	0	49	0		0	49	0	0	0		0	0
2:45 PM	0	46	0		0	46	0	0	0		0	0	0	58	0		0	58	0	0	0		0	0
Hourly Total	0	166	73	0	0	239	118	0	64	0	0	182	94	204	0	0	0	298	0	0	0	0	0	0
3:00 PM	0	42	64		0	106	0	0	0		0	0	75	49	0		0	124	0	0	0		0	0
3:15 PM	0	45	0		0	45	92	0	50		0	142	0	56	0		0	56	0	0	0		0	0
3:30 PM	0	61	63		0	124	0	0	0		0	0	75	61	0		0	136	0	0	0		0	0
3:45 PM	0	50	0		0	50	92	0	49		0	141	0	93	0		0	93	0	0	0		0	0
Hourly Total	0	198	127	0	0	325	184	0	99	0	0	283	150	259	0	0	0	409	0	0	0	0	0	0
4:00 PM	0	42	0		0	42	0	0	0		0	0	0	74	0		0	74	0	0	0		0	0
4:15 PM	0	44	0		0	44	0	0	0		0	0	0	55	0		0	55	0	0	0		0	0
4:30 PM	0	40	0		0	40	0	0	0		0	0	0	69	0		0	69	0	0	0		0	0
4:45 PM	0	46	0		0	46	0	0	0		0	0	0	73	0		0	73	0	0	0		0	0
Hourly Total	0	172	0	0	0	172	0	0	0	0	0	0	0	271	0	0	0	271	0	0	0	0	0	0
5:00 PM	0	61	0		0	61	0	0	0		0	0	0	74	0		0	74	0	0	0		0	0
5:15 PM	0	38	0		0	38	0	0	0		0	0	0	75	0		0	75	0	0	0		0	0
5:30 PM	0	49	0		0	49	0	0	0		0	0	0	67	0		0	67	0	0	0		0	0
5:45 PM	0	47	0		0	47	0	0	0		0	0	0	59	0		0	59	0	0	0		0	0
Hourly Total	0	195	0	0	0	195	0	0	0	0	0	0	0	275	0	0	0	275	0	0	0	0	0	0

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? No

**Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)*

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
											Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	100%		70%		100%		70%		80%		80%		56%		56%	
			Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1	X		500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1			600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
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5:15 AM	0	0																
5:30 AM	0	0																
5:45 AM	0	0																
6:00 AM	0	0																
6:15 AM	411	0			1						1				1			
6:30 AM	522	264	1	1													1	1
6:45 AM	614	264							1	1			1	1				
7:00 AM	712	264																
7:15 AM	383	264			1	1									1	1		
7:30 AM	627	0	1								1						1	
7:45 AM	601	211							1	1			1	1				
8:00 AM	849	211					1	1										
8:15 AM	868	420			1	1									1	1		
8:30 AM	560	420	1	1							1	1					1	1
8:45 AM	544	209							1	1								
9:00 AM	243	209																
9:15 AM	142	0																
9:30 AM	95	0																
9:45 AM	45	0																
10:00 AM	0	0																
10:15 AM	54	0																
10:30 AM	99	0																
10:45 AM	168	0																
11:00 AM	225	0																
11:15 AM	227	0																
11:30 AM	225	0																
11:45 AM	215	0																
12:00 PM	215	0																
12:15 PM	222	0																
12:30 PM	242	0																
12:45 PM	252	0																
1:00 PM	275	0																
1:15 PM	458	0			1						1				1		1	
1:30 PM	486	182																
1:45 PM	513	182	1	1														
2:00 PM	537	182							1	1								
2:15 PM	521	182			1	1					1	1			1	1	1	1
2:30 PM	531	142																
2:45 PM	695	142	1										1	1				
3:00 PM	734	283							1	1								
3:15 PM	620	283			1	1					1	1			1	1	1	1
3:30 PM	618	141																
3:45 PM	467	141																

4:00 PM	443	0																
4:15 PM	462	0			1						1				1		1	
4:30 PM	476	0																
4:45 PM	483	0																
5:00 PM	470	0																
5:15 PM	335	0													1			
5:30 PM	222	0																
5:45 PM	106	0																
6:00 PM	0	0																
6:15 PM	0	0																
6:30 PM	0	0																
6:45 PM	0	0																
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10:45 PM	0	0																
11:00 PM	0	0																
11:15 PM	0	0																
11:30 PM	0	0																
11:45 PM	0	0																
HOURS MET			**5**	**3**	**7**	**4**	**1**	**1**	**5**	**5**	**7**	**3**	**3**	**3**	**8**	**4**	**7**	**4**
WARRANT SATISFIED?			**NO**		**N/A**		**NO**		**N/A**		**NO**				**NO**			

Warrant Met: **No**

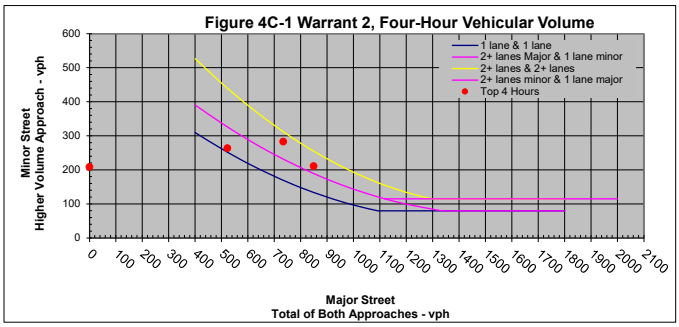
Notes:

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach		Total Number of Unique Hours Met on Figure 4C-1	3
Major street:	1 Lane	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	6
Minor Street:	1 Lane		

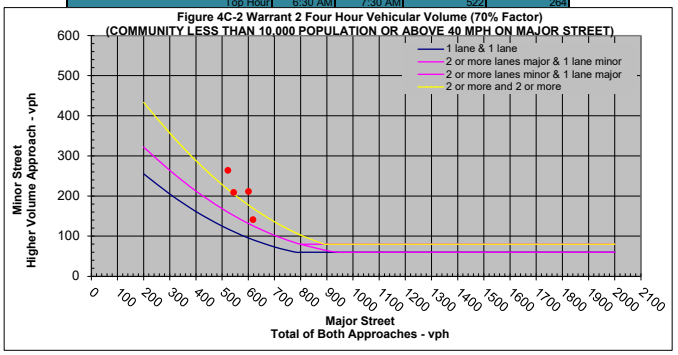
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? No

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Required Minimum Minor Street For 4C-1	Required Minimum Minor Street For 4C-2	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Major - Chamberlin Road		Minor - North Driveway							
	N-Bound	S-Bound	W-Bound	E-Bound						
12:00 AM	0	0	0	0	0	550	377	0		
12:15 AM	0	0	0	0	0	550	377	0		
12:30 AM	0	0	0	0	0	550	377	0		
12:45 AM	0	0	0	0	0	550	377	0		
1:00 AM	0	0	0	0	0	550	377	0		
1:15 AM	0	0	0	0	0	550	377	0		
1:30 AM	0	0	0	0	0	550	377	0		
1:45 AM	0	0	0	0	0	550	377	0		
2:00 AM	0	0	0	0	0	550	377	0		
2:15 AM	0	0	0	0	0	550	377	0		
2:30 AM	0	0	0	0	0	550	377	0		
2:45 AM	0	0	0	0	0	550	377	0		
3:00 AM	0	0	0	0	0	550	377	0		
3:15 AM	0	0	0	0	0	550	377	0		
3:30 AM	0	0	0	0	0	550	377	0		
3:45 AM	0	0	0	0	0	550	377	0		
4:00 AM	0	0	0	0	0	550	377	0		
4:15 AM	0	0	0	0	0	550	377	0		
4:30 AM	0	0	0	0	0	550	377	0		
4:45 AM	0	0	0	0	0	550	377	0		
5:00 AM	0	0	0	0	0	550	377	0		
5:15 AM	0	0	0	0	0	550	377	0		
5:30 AM	0	0	0	0	0	550	377	0		
5:45 AM	0	0	0	0	0	550	377	0		
6:00 AM	0	0	0	0	0	550	377	0		
6:15 AM	144	267	0	0	411	304	157	0		
6:30 AM	179	343	264	0	522	252	118	264	Met	Met
6:45 AM	211	403	264	0	614	213	92	264		
7:00 AM	259	453	264	0	712	177	71	264		
7:15 AM	151	232	264	0	383	318	168	264		
7:30 AM	243	384	0	0	627	208	89	0		
7:45 AM	241	360	211	0	601	219	95	211		Met
8:00 AM	319	530	211	0	849	134	60	211	Met	
8:15 AM	351	517	420	0	868	128	60	420		
8:30 AM	245	315	420	0	560	236	107	420		
8:45 AM	239	305	209	0	544	243	111	209		Met
9:00 AM	136	107	209	0	243	395	233	209		
9:15 AM	68	74	0	0	142	456	288	0		
9:30 AM	47	48	0	0	95	486	316	0		
9:45 AM	23	22	0	0	45	519	347	0		
10:00 AM	0	0	0	0	0	550	377	0		
10:15 AM	29	25	0	0	54	513	342	0		
10:30 AM	50	49	0	0	99	483	313	0		
10:45 AM	86	82	0	0	168	440	273	0		
11:00 AM	115	110	0	0	225	405	242	0		
11:15 AM	116	111	0	0	227	404	241	0		
11:30 AM	120	105	0	0	225	405	242	0		
11:45 AM	118	97	0	0	215	411	247	0		
12:00 PM	117	98	0	0	215	411	247	0		
12:15 PM	123	99	0	0	222	407	244	0		
12:30 PM	133	109	0	0	242	395	233	0		
12:45 PM	135	117	0	0	252	390	228	0		
1:00 PM	151	124	0	0	275	376	217	0		
1:15 PM	251	207	0	0	458	281	140	0		
1:30 PM	271	215	182	0	486	268	130	182		Met
1:45 PM	284	229	182	0	513	256	121	182		
2:00 PM	298	239	182	0	537	246	113	182		
2:15 PM	286	235	182	0	521	253	118	182		
2:30 PM	287	244	142	0	531	248	115	142		Met
2:45 PM	374	321	142	0	695	183	74	142		
3:00 PM	409	325	283	0	734	169	67	283	Met	
3:15 PM	359	261	283	0	620	211	91	283		
3:30 PM	358	260	141	0	618	212	91	141		Met
3:45 PM	291	176	141	0	467	277	136	141		
4:00 PM	271	172	0	0	443	289	145	0		
4:15 PM	271	191	0	0	462	280	138	0		
4:30 PM	291	185	0	0	476	273	133	0		
4:45 PM	289	194	0	0	483	270	131	0		
5:00 PM	275	195	0	0	470	276	135	0		
5:15 PM	201	134	0	0	335	343	189	0		
5:30 PM	126	96	0	0	222	407	244	0		
5:45 PM	59	47	0	0	106	479	309	0		
6:00 PM	0	0	0	0	0	550	377	0		
6:15 PM	0	0	0	0	0	550	377	0		
6:30 PM	0	0	0	0	0	550	377	0		
6:45 PM	0	0	0	0	0	550	377	0		
7:00 PM	0	0	0	0	0	550	377	0		
7:15 PM	0	0	0	0	0	550	377	0		
7:30 PM	0	0	0	0	0	550	377	0		
7:45 PM	0	0	0	0	0	550	377	0		
8:00 PM	0	0	0	0	0	550	377	0		
8:15 PM	0	0	0	0	0	550	377	0		
8:30 PM	0	0	0	0	0	550	377	0		
8:45 PM	0	0	0	0	0	550	377	0		
9:00 PM	0	0	0	0	0	550	377	0		
9:15 PM	0	0	0	0	0	550	377	0		
9:30 PM	0	0	0	0	0	550	377	0		
9:45 PM	0	0	0	0	0	550	377	0		
10:00 PM	0	0	0	0	0	550	377	0		
10:15 PM	0	0	0	0	0	550	377	0		
10:30 PM	0	0	0	0	0	550	377	0		
10:45 PM	0	0	0	0	0	550	377	0		
11:00 PM	0	0	0	0	0	550	377	0		
11:15 PM	0	0	0	0	0	550	377	0		
11:30 PM	0	0	0	0	0	550	377	0		
11:45 PM	0	0	0	0	0	550	377	0		



Top Hours for Figure 4C-1	Start Time	End Time	Major Street	Minor Street
Top Hour	3:00 PM	4:00 PM	734	283
2nd Highest Hour	8:00 AM	9:00 AM	849	211
3rd Highest Hour	6:30 AM	7:30 AM	522	264
4th Highest Hour	12:00 AM	1:00 AM	0	209

Top Hours for Figure 4C-2	Start Time	End Time	Major Street	Minor Street
Top Hour	6:30 AM	7:30 AM	522	264



Are the requirements for Warrant 2 met?: No

OMUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	8:15 AM
Major Street:	1 Lane	Peak Hour End Time	9:15 AM
Minor Street:	1 Lane		

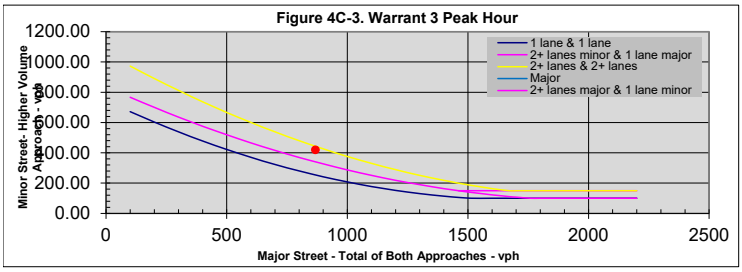
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?	No
Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?	Yes

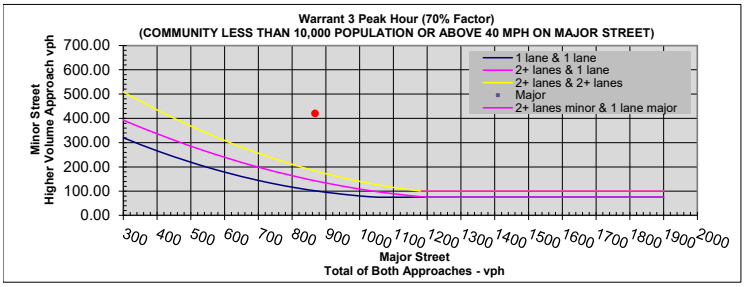
Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*

Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	Yes
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	Yes
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	Yes

*If applicable, attach all supporting calculations and documentation.

Are the requirements for Warrant 3 met?: Yes





Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Sum of Major Street and Highest Minor Street	Sum of Major Street and Combined Minor Street
	Hour Vehicular Volume			
12:00 AM	0	0	0	0
12:15 AM	0	0	0	0
12:30 AM	0	0	0	0
12:45 AM	0	0	0	0
1:00 AM	0	0	0	0
1:15 AM	0	0	0	0
1:30 AM	0	0	0	0
1:45 AM	0	0	0	0
2:00 AM	0	0	0	0
2:15 AM	0	0	0	0
2:30 AM	0	0	0	0
2:45 AM	0	0	0	0
3:00 AM	0	0	0	0
3:15 AM	0	0	0	0
3:30 AM	0	0	0	0
3:45 AM	0	0	0	0
4:00 AM	0	0	0	0
4:15 AM	0	0	0	0
4:30 AM	0	0	0	0
4:45 AM	0	0	0	0
5:00 AM	0	0	0	0
5:15 AM	0	0	0	0
5:30 AM	0	0	0	0
5:45 AM	0	0	0	0
6:00 AM	0	0	0	0
6:15 AM	411	0	411	411
6:30 AM	522	264	786	786
6:45 AM	614	264	878	878
7:00 AM	712	264	976	976
7:15 AM	383	264	647	647
7:30 AM	627	0	627	627
7:45 AM	601	211	812	812
8:00 AM	849	211	1060	1060
8:15 AM	868	420	1288	1288
8:30 AM	560	420	980	980
8:45 AM	544	209	753	753
9:00 AM	243	209	452	452
9:15 AM	142	0	142	142
9:30 AM	95	0	95	95
9:45 AM	45	0	45	45
10:00 AM	0	0	0	0
10:15 AM	54	0	54	54
10:30 AM	99	0	99	99
10:45 AM	168	0	168	168
11:00 AM	225	0	225	225
11:15 AM	227	0	227	227
11:30 AM	225	0	225	225
11:45 AM	215	0	215	215
12:00 PM	215	0	215	215
12:15 PM	222	0	222	222
12:30 PM	242	0	242	242
12:45 PM	252	0	252	252
1:00 PM	275	0	275	275
1:15 PM	458	0	458	458
1:30 PM	486	182	668	668
1:45 PM	513	182	695	695
2:00 PM	537	182	719	719
2:15 PM	521	182	703	703
2:30 PM	531	142	673	673
2:45 PM	695	142	837	837
3:00 PM	734	283	1017	1017
3:15 PM	620	283	903	903
3:30 PM	618	141	759	759
3:45 PM	467	141	608	608
4:00 PM	443	0	443	443
4:15 PM	462	0	462	462
4:30 PM	476	0	476	476
4:45 PM	483	0	483	483
5:00 PM	470	0	470	470
5:15 PM	335	0	335	335
5:30 PM	222	0	222	222
5:45 PM	106	0	106	106
6:00 PM	0	0	0	0
6:15 PM	0	0	0	0
6:30 PM	0	0	0	0
6:45 PM	0	0	0	0
7:00 PM	0	0	0	0
7:15 PM	0	0	0	0
7:30 PM	0	0	0	0
7:45 PM	0	0	0	0
8:00 PM	0	0	0	0
8:15 PM	0	0	0	0
8:30 PM	0	0	0	0
8:45 PM	0	0	0	0
9:00 PM	0	0	0	0
9:15 PM	0	0	0	0
9:30 PM	0	0	0	0
9:45 PM	0	0	0	0
10:00 PM	0	0	0	0
10:15 PM	0	0	0	0
10:30 PM	0	0	0	0
10:45 PM	0	0	0	0
11:00 PM	0	0	0	0
11:15 PM	0	0	0	0
11:30 PM	0	0	0	0
11:45 PM	0	0	0	0

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
868	420	254	101