

SCHOOL TRAFFIC MANAGEMENT PLAN

Ellsworth Hill Elementary School

City of Hudson, Summit County, Ohio



Prepared For:

Hudson City Schools
2400 Hudson Aurora Road
Hudson, OH 44236

Prepared By:

GPD Group
520 South Main Street
Suite 2531
Akron, OH 44311

December 2018

School Traffic Management Plan Ellsworth Hill Elementary School

City of Hudson, Summit County, Ohio

Prepared For:

Hudson City Schools
2400 Hudson Aurora Road
Hudson, OH 44236

December 2018

Engineer's Seal



Prepared By:

A handwritten signature in blue ink, appearing to read "Ryan M. Gillespie".

Ryan M. Gillespie, P.E., PTOE
Registration No. 74312
Certification No. 3183

Prepared
Under The Responsible
Charge of:

A handwritten signature in blue ink, appearing to read "Michael A. Hobbs".

Michael A. Hobbs, P.E., PTOE
Registration No. 68713
Certification No. 1346

December 17, 2018

Date



GPD GROUP®
Glaus, Pyle, Schomer, Burns & DeHaven, Inc.

520 South Main Street, Suite 2531, Akron, Ohio 44311
330-572-2100 Fax 330-572-2101

TABLE OF CONTENTS

I.	Purpose:	1
II.	Project Setting:	1
	Study Area.....	1
	Area Roadway System	1
	Existing Traffic Volumes	1
III.	Proposed Action:	2
IV.	Projected Traffic Volumes:.....	3
	Existing School Traffic	3
	School Trip Generation	3
	Site Trip Distribution & Assignment.....	4
V.	Traffic Analysis:	4
	HCS Intersection Capacity Analysis	4
	Traffic Signal Warrant Analysis	7
VI.	Summary and Recommendations:.....	8

LIST OF TABLES

Table 1:	School Building Enrollment Summary
Table 2:	Existing School Traffic Summary
Table 3:	Trip Generation Summary
Table 4:	HCS Intersection Capacity Analysis Summary
Table 5:	Traffic Signal Warrant Analysis Summary

LIST OF FIGURES

Figure 1:	Project Location
Figure 2:	Aerial Photograph
Figure 3:	Existing 'No-Build' Peak Hour Traffic Volumes
Figure 4:	Preliminary Site Plan
Figure 5:	Existing Background Peak Hour Traffic Volumes
Figure 6:	Future 'Build' Peak Hour Traffic Volumes

LIST OF APPENDICES

Appendix A:	Turning Movement Counts
Appendix B:	School Traffic Volumes
Appendix C:	HCS Intersection Capacity Analysis
Appendix D:	Traffic Signal Warrant Analysis



I. Purpose:

This School Traffic Management Plan is being prepared at the request of the Hudson City School District in association with the proposed expansion and reconfiguration of Ellsworth Hill Elementary School in the City of Hudson, Ohio. The purpose of this particular study is to analyze the vehicular operating conditions in the vicinity of the existing school; both during and after its proposed expansion to determine what, if any, impact the proposed project will have on the surrounding roadway network.

II. Project Setting:

Study Area

The subject property serves as the site of the existing Ellsworth Hill Elementary School which currently serves Pre-Kindergarten and 2nd Grade students. The site has frontage along Stow Road to the east and Middleton Road to the north. The land uses within the surrounding area primarily consist of single-family residential neighborhoods. See **Figure 1** for a project location map and **Figure 2** for an aerial photograph of the project area.

Area Roadway System

Stow Road currently exists as a two (2) lane asphalt roadway within the study area. The current posted speed limit on Stow Road is 35 miles per hour (mph). According to information obtained from the Ohio Department of Transportation's (ODOT) Transportation Information Mapping System (TIMS) website, Stow Road is classified as an urban major collector south of Middleton Road and as an urban local roadway north of Middleton Road. Middleton Road also exists as a two (2) lane asphalt roadway within the study area. The current posted speed limit on Middleton Road is 35 mph. According to information obtained from ODOT's TIMS website, Middleton Road is classified as an urban major collector. It should also be noted that Stow Road and Middleton Road exist as a school zone along the Ellsworth Hill Elementary School site frontage and observe a reduced speed limit of 20 mph during restricted hours.

The Stow Road / Middleton Road intersection is currently unsignalized with the Middleton Road approaches operating under stop control. A flashing beacon that hangs over the middle of the intersection was installed in 2012 with strain poles located on the northeast and southwest corners of the intersection. The intersection consists of four (4) approaches with the following lane configurations: EB Middleton Road – one (1) lane (left-thru-right), WB Middleton Road – one (1) lane (left-thru-right), NB Stow Road – one (1) lane (left-thru-right) and SB Stow Road – one (1) lane (left-thru-right). This intersection was recently evaluated as part of the Stow Road / Middleton Road Intersection Study prepared by GPD Group in October of 2018.

Existing Traffic Volumes

As part of a previously prepared Intersection Study, Cummins Consulting Services performed a turning movement traffic count at the Stow Road / Middleton Road intersection on Tuesday, February 6th, 2018 from 6:00 AM to 7:00 PM. For purposes of this study,



Cummins Consulting Services returned to the study area on Tuesday, April 10th, 2018 and performed additional turning movement counts at the Ellsworth Hill School driveways located along both Stow Road and Middleton Road from 7:00 AM to 9:30 AM and from 2:00 PM to 4:30 PM.

While the AM peak hour for the Stow Road / Middleton Road intersection was previously found to occur from 7:15 AM to 8:15 AM, the AM peak hour for Ellsworth Hill school traffic was found to occur afterwards from 8:15 AM to 9:15 AM. Similarly, the PM peak hour for the intersection was from 5:00 PM to 6:00 PM, whereas the PM peak hour for Ellsworth Hill occurred prior to that from 3:15 PM to 4:15 PM. See **Appendix A** for the turning movement count data. The existing 'No-Build' traffic volumes during the school peak hours can be seen in **Figure 3**.

III. Proposed Action:

The proposed project will expand the existing Ellsworth Hill Elementary School in order to accommodate additional students who currently attend school at the central campus. As part of the District project, Pre-Kindergarten students at Ellsworth Hill Elementary School will be relocated to McDowell Elementary School while 1st grade students from Evemere Elementary School will be relocated up to Ellsworth Hill. **Table 1** details the projected enrollment changes for Ellsworth Hill Elementary School.

Table 1: School Building Enrollment Summary								
School Facility	Existing Enrollment				Proposed Enrollment			
	Grade Levels	AM Student Enrollment	Grade Levels	PM Student Enrollment	Grade Levels	AM Student Enrollment	Grade Levels	PM Student Enrollment
Ellsworth Hill ES	Pre-K / 2 nd	360	Pre-K / 2 nd	364	1 st / 2 nd	661	1 st / 2 nd	661

As shown in **Table 1**, Ellsworth Hill will experience an increase in student enrollment following the replacement of the Pre-Kindergarten students with 1st grade students. The Pre-Kindergarten program currently has 41 students in the morning program and 45 students in the afternoon program, whereas 1st grade consists of 342 students that will attend all day. This increase in student enrollment will be expected to increase school traffic during the arrival and dismissal periods.

The school will continue to access Stow Road and Middleton Road through the existing driveways, both which already provide dedicated left turn lanes into the school property. Through the use of an existing on-site gate, the northern drive on Middleton Road will continue to serve bus traffic while the eastern drive on Stow Road will serve staff and parent drop-off and pick-up. As part of the project, the internal parking lot will be modified in order to provide more internal queue length for parent drop-off and pick-up. The preliminary site plan is shown in **Figure 4**.



IV. Projected Traffic Volumes:

Existing School Traffic

In order to assess the amount of traffic currently generated by the existing facility, the traffic entering and exiting the school driveways was isolated from the non-school traffic in the study area. Based on the total volumes entering and exiting the site, it was found that the AM peak hour of the generator occurred from 8:15 AM to 9:15 AM while the PM peak hour of the generator was from 3:15 PM to 4:15 PM. **Table 2** summarizes the entering and exiting traffic volumes for each school driveway at Ellsworth Hill Elementary School during the schools peak hours.

Table 2: Existing School Traffic Summary						
Intersection	AM Peak (8:15 AM - 9:15 AM)			PM Peak (3:15 PM - 4:15 PM)		
	Entering	Exiting	Total	Entering	Exiting	Total
Stow Road / Ellsworth Hill School Drive	113	79	192	46	77	123
Middleton Road / Ellsworth Hill School Drive	15	16	31	14	15	29
Existing School Trip Generation	128	95	223	60	92	152
Existing Entering/Existing Distribution	57%	43%	100%	39%	61%	100%

As shown in **Table 2**, Ellsworth Hill Elementary School is currently generating 223 trips during the school's AM peak hour (128 entering and 95 exiting) and 152 trips during the school's PM peak hour (60 entering and 92 exiting). Utilizing the individual driveway counts, the associated direction of arrivals and departures, and the traffic counts and flow patterns along Stow Road and Middleton Road, the assignment and travel path of all existing school trips throughout the study area was determined. **Appendix B** contains figures that show the existing school trips during the school's peak hours at each intersection within the study area. In order to isolate the background non-school related traffic in the study area, all elementary school traffic (shown in **Appendix B**) was removed from the existing 'No-Build' peak hour traffic volumes (shown in **Figure 3**). See **Figures 5** for the existing peak hour background traffic volumes.

School Trip Generation

Using the existing student enrollment numbers and the associated peak hour trips from the driveway counts, it was calculated that the existing school generates 0.62 trips per student during the school's AM peak hour and 0.42 trips per student during the school's PM peak hour. **Table 3** on the following page details the expected trip generation of Ellsworth Hill Elementary School following the proposed expansion.



Table 3: Trip Generation Summary						
Scenario	AM Peak (8:15 AM - 9:15 AM)			PM Peak (3:15 PM - 4:15 PM)		
	Entering	Exiting	Total	Entering	Exiting	Total
Existing School (360/364 students)	128	95	223	60	92	152
Proposed School (661 students)	235	174	409	109	167	276
Net Trip Increase	+ 107	+ 79	+ 186	+ 49	+ 75	+ 124

As shown in **Table 3**, the expanded Ellsworth Hill Elementary School would be expected to generate 409 trips during the school's AM peak hour (235 entering and 174 exiting) and 276 trips during the school's PM peak hour (109 entering and 167 exiting). This will be an increase of 186 trips in the morning and 124 trips in the afternoon compared to the amount of traffic currently being generated by the existing school. While the study will utilize these numbers in the subsequent analysis, it is important to note that this approach likely overestimates the actual number of future trips that will be generated as the addition of 1st grade students won't result in a corresponding increase in the number of buses currently serving the school and it increases the potential for shared rides for families or neighbors who can now drop-off or pick-up both 1st and 2nd graders in the same trip.

Site Trip Distribution & Assignment

The anticipated school traffic discussed in the Trip Generation section was distributed and assigned to the roadway network based on existing travel volumes/patterns to and from the existing Ellsworth Hill Elementary School. Based on the existing traffic count data as well as the location of the school within the District, it is expected that essentially all school traffic will originate from Stow Road to the south or Middleton Road to the west. As with the current on-site traffic separation, buses will be expected to continue to utilize the driveway on Middleton Road while staff and parents will use the driveway on Stow Road. The distribution and assignment figures that detail the projected future travel patterns and location of school traffic can be found in **Appendix B**. These projected school trips were then added to the existing background volumes in order to estimate the future 'Build' volumes that would be expected following the school expansion project. **Figure 6** displays the future 'Build' peak hour traffic volumes.

V. Traffic Analysis:

HCS Intersection Capacity Analysis

Intersection Capacity analyses were performed for the existing 'No-Build' and future 'Build' conditions in order to determine the operating conditions that would be expected to be experienced at each study intersection. The quality of the operating conditions experienced by an intersection is measured in terms of Level-of-Service (LOS). Levels-of-Service can range from LOS A to LOS F. Level-of-Service ratings of A, B, and C are considered to be in the acceptable range. Per City of Hudson standards, Levels-of-Service D, E and F are considered below average with significant levels of delay experienced by vehicles. The Level-of-Service thresholds vary for signalized and unsignalized intersections. The



thresholds related to average control delay for both signalized and unsignalized intersections are as follows:

Level-of-Service	Delay Threshold – Signalized (Sec)	Delay Threshold – Unsignalized (Sec)
A	< 10	< 10
B	> 10 - 20	> 10 – 15
C	> 20 - 35	> 15 – 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

The capacity analysis is performed utilizing the computer program HCS7 developed by McTrans Corporation and is based on the Highway Capacity Manual (HCM), 6th Edition and the 2009 Manual of Uniform Traffic Control Devices (MUTCD). Based on criteria established by ODOT, the Highway Capacity Software (HCS) is used to determine the required number of lanes and the lane assignments at intersections (i.e. the needed capacity).

It should be acknowledged that this capacity analysis is based on the traffic volumes experienced during the peak 1-hour timeframe for both the morning and afternoon periods but school facilities naturally experience a traffic surge that occurs within a more confined timeframe of 15 to 30 minutes. In order to account for this, the actual Peak Hour Factors (PHF) were used instead of the standard 0.92. The PHF is a measure of fluctuations in traffic demand during the peak hour and ranges from zero (0) to one (1). A PHF of 1 means that every 15-minute interval during the peak hour is the same therefore, the traffic flow is constant over the peak hour. As the PHF decreases, it shows that traffic is more variable over the peak hour and that the peak hour traffic volume has a surge during a peak 15-minute interval. The PHF's utilized in the capacity analysis were based on the existing traffic count data in order to more accurately represent the actual school traffic surge that occurs in this area relative to each individual intersection.

Table 4 on the following page summarizes the HCS Intersection Capacity Analysis and details the Levels-of-Service and delay experienced under the existing 'No-Build' and future 'Build' conditions for each intersection within the study area. See **Appendix C** for the HCS analysis printouts.



Table 4: HCS Intersection Capacity Analysis Summary								
Intersection / Movement	Existing 'No-Build' Conditions				Future 'Build' Conditions			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
Stow Road / Middleton Road								
Eastbound Left-Thru-Right	B	13.1	B	12.7	B	13.6	B	13.1
Eastbound Approach	B	13.1	B	12.7	B	13.6	B	13.1
Westbound Left-Thru-Right	C	18.1	C	18.7	C	20.3	C	21.0
Westbound Approach	C	18.1	C	18.7	C	20.3	C	21.0
Northbound Left	A	7.7	A	8.1	A	7.7	A	8.2
Northbound Approach	A	1.7	A	3.7	A	2.2	A	4.2
Southbound Left	A	8.0	A	7.6	A	8.0	A	7.6
Southbound Approach	A	0.1	A	0.0	A	0.1	A	0.0
Middleton Road / School Drive								
Westbound Left	A	8.6	A	8.6	A	8.8	A	8.7
Westbound Approach	A	0.7	A	0.4	A	1.1	A	0.6
Northbound Left-Right	B	11.9	B	11.2	B	13.0	B	11.8
Northbound Approach	B	11.9	B	11.2	B	13.0	B	11.8
Stow Road / School Drive								
Eastbound Left-Thru-Right	B	14.6	B	14.0	C	23.2	C	17.6
Eastbound Approach	B	14.6	B	14.0	C	23.2	C	17.6
Westbound Left-Thru-Right	C	15.0	C	16.5	C	19.9	C	19.9
Westbound Approach	C	15.0	C	16.5	C	19.9	C	19.9
Northbound Left	A	8.2	A	8.2	A	8.6	A	8.4
Northbound Approach	A	1.7	A	0.7	A	2.7	A	1.3
Southbound Left	A	8.2	A	7.9	A	8.2	A	7.9
Southbound Approach	A	0.0	A	0.0	A	0.0	A	0.0

As shown in **Table 4**, all study intersections will continue to operate at an acceptable Levels-of-Service C or better during the school peak hours under the existing 'No-Build' and future 'Build' conditions. The analysis above indicates that each intersection has sufficient capacity to accommodate both the current and future traffic demand following completion of the expansion project. No Level-of-Service degradation to unacceptable Levels-of-Service is expected and as such, no off-site roadway improvements will be needed for the additional traffic generated by Ellsworth Hill Elementary School.



Traffic Signal Warrant Analysis

Utilizing the existing 'No-Build' and future 'Build' traffic volumes, as specified in *Section 402-2* of the ODOT Traffic Engineering Manual (TEM), traffic signal warrant analyses were performed for the Stow Road / Middleton Road intersection. A traffic signal is considered warranted for construction if at least one (1) of a possible nine (9) 2009 Manual of Uniform Traffic Control Devices (MUTCD) warrant requirements are satisfied. For this analysis, only Warrant #3 was analyzed based on peak hour volumes. Warrant #3 is described below:

Warrant #3 Peak Hour Vehicular Volume

The Peak Hour Vehicular Volume warrant is intended for application when traffic conditions are such that for one hour of the day, minor street traffic suffers undue delay in entering or crossing the major street. The Peak Hour Vehicular Volume warrant is satisfied when the minimum required volumes on the major and highest volume minor approach are met for any one-hour period (any four consecutive 15-minute periods) on an average day.

In order to determine whether this intersection meets the warrant requirements to justify signalization, the peak hour traffic volumes were compared to the volume thresholds for Warrant #3 (Peak Hour Volume). The results of the traffic signal warrant analyses are shown in **Table 5**. See **Appendix D** for the traffic signal warrant analysis.

Table 5: Traffic Signal Warrant Analysis Summary	
Intersection	Warrant #3
Existing 'No-Build' Conditions	
Stow Road / Middleton Road	Not Satisfied
Future 'Build' Conditions	
Stow Road / Middleton Road	Not Satisfied

As shown in **Table 5**, the traffic signal warrant analysis determined that the Stow Road / Middleton Road intersection will not meet the volume thresholds of Warrant #3 (Peak Hour Volume) to justify the need for a traffic signal, nor does it come anywhere close to doing so during the school's arrival and dismissal periods. These findings are consistent with those of the Stow Road / Middleton Road Intersection Study which also determined that a traffic signal was not warranted, even during the intersection's peak hours which experience far higher traffic volumes than it does during the school's peak hours.



VI. Summary and Recommendations:

This School Traffic Management Plan is being prepared at the request of the Hudson City School District in association with the proposed expansion and reconfiguration of Ellsworth Hill Elementary School in the City of Hudson, Ohio. The purpose of this particular study is to analyze the vehicular operating conditions in the vicinity of the existing school; both during and after its proposed expansion to determine what, if any, impact the proposed project will have on the surrounding roadway network.

In Summary,

1. From the count data, the AM peak hour for Ellsworth Hill school traffic was found to occur from 8:15 AM to 9:15 AM while the PM peak hour for Ellsworth Hill occurred from 3:15 PM to 4:15 PM.
2. The proposed project will expand the existing Ellsworth Hill Elementary School in order to accommodate additional students who currently attend school at the central campus. As part of the District project, Pre-Kindergarten students at Ellsworth Hill Elementary School (41 students in morning program and 45 students in afternoon program) will be relocated to McDowell Elementary School while 1st grade (341 students) currently at Evemere Elementary School will be relocated up to Ellsworth Hill.
3. The school will continue to access Stow Road and Middleton Road through the existing driveways, both which already provide dedicated left turn lanes into the school property. Through the use of an existing on-site gate, the northern drive on Middleton Road will continue to serve bus traffic while the eastern drive on Stow Road will serve staff and parent drop-off and pick-up. As part of the project, the internal parking lot will be modified in order to provide more internal queue length for parent drop-off and pick-up.
4. Ellsworth Hill Elementary School is currently generating 223 trips during the school's AM peak hour (128 entering and 95 exiting) and 152 trips during the school's PM peak hour (60 entering and 92 exiting). This correlates to a trip generation rate of 0.62 trips per student during the school's AM peak hour and 0.42 trips per student during the school's PM peak hour.
5. Based on the school's trip generation rate, the expanded Ellsworth Hill Elementary School would be expected to generate 409 trips during the school's AM peak hour (235 entering and 174 exiting) and 276 trips during the school's PM peak hour (109 entering and 167 exiting). These numbers are believed to overestimate the actual number of future trips as bus trips will likely not increase and there will be greater potential for shared parent drop-off and pick-up trips.
6. The capacity analysis found that all study intersections will continue to operate at an acceptable Levels-of-Service C or better during the school peak hours under the existing 'No-Build' and future 'Build' conditions. This confirms that each intersection has sufficient capacity to accommodate both the current and future traffic demand following completion of the expansion project.



7. The traffic signal warrant analysis determined that the Stow Road / Middleton Road intersection will not meet the volume thresholds of Warrant #3 (Peak Hour Volume) to justify the need for a traffic signal, nor does it come anywhere close to doing so during the school's arrival and dismissal periods. These findings are consistent with those of the Stow Road / Middleton Road Intersection Study which also determined that a traffic signal was not warranted, even during the intersection's peak hours which experience far higher traffic volumes than it does during the school's peak hours

Based on the analysis contained in this study, the proposed Ellsworth Hill Elementary School expansion project is not anticipated to have an adverse impact on the surrounding roadway network and will provide adequate accessibility to and from the site under the projected traffic conditions. Based on the information and analyses in this study, GPD Group recommends the following:

1. The Ellsworth Hill Elementary School expansion project should be constructed as depicted on the current site plan which maintains the use of the existing school driveways while modifying the existing parking lot to provide more internal queue length for parent drop-off and pick-up.
2. No Level-of-Service degradation to unacceptable Levels-of-Service is expected and as such, no off-site roadway improvements will be needed for the additional traffic generated by the proposed Ellsworth Hill Elementary School project.



FIGURES

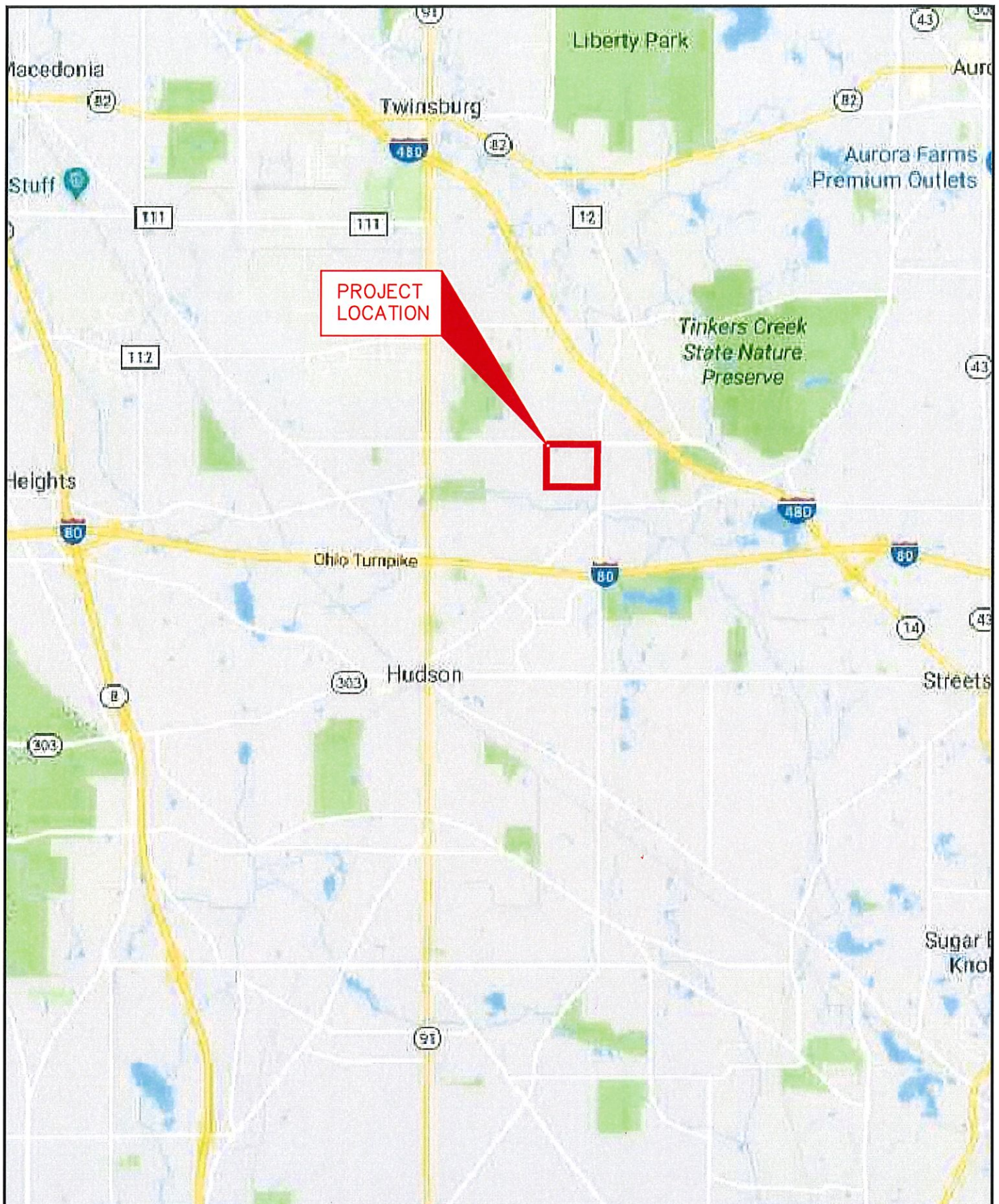


FIGURE 1

PROJECT LOCATION MAP

DECEMBER 2018



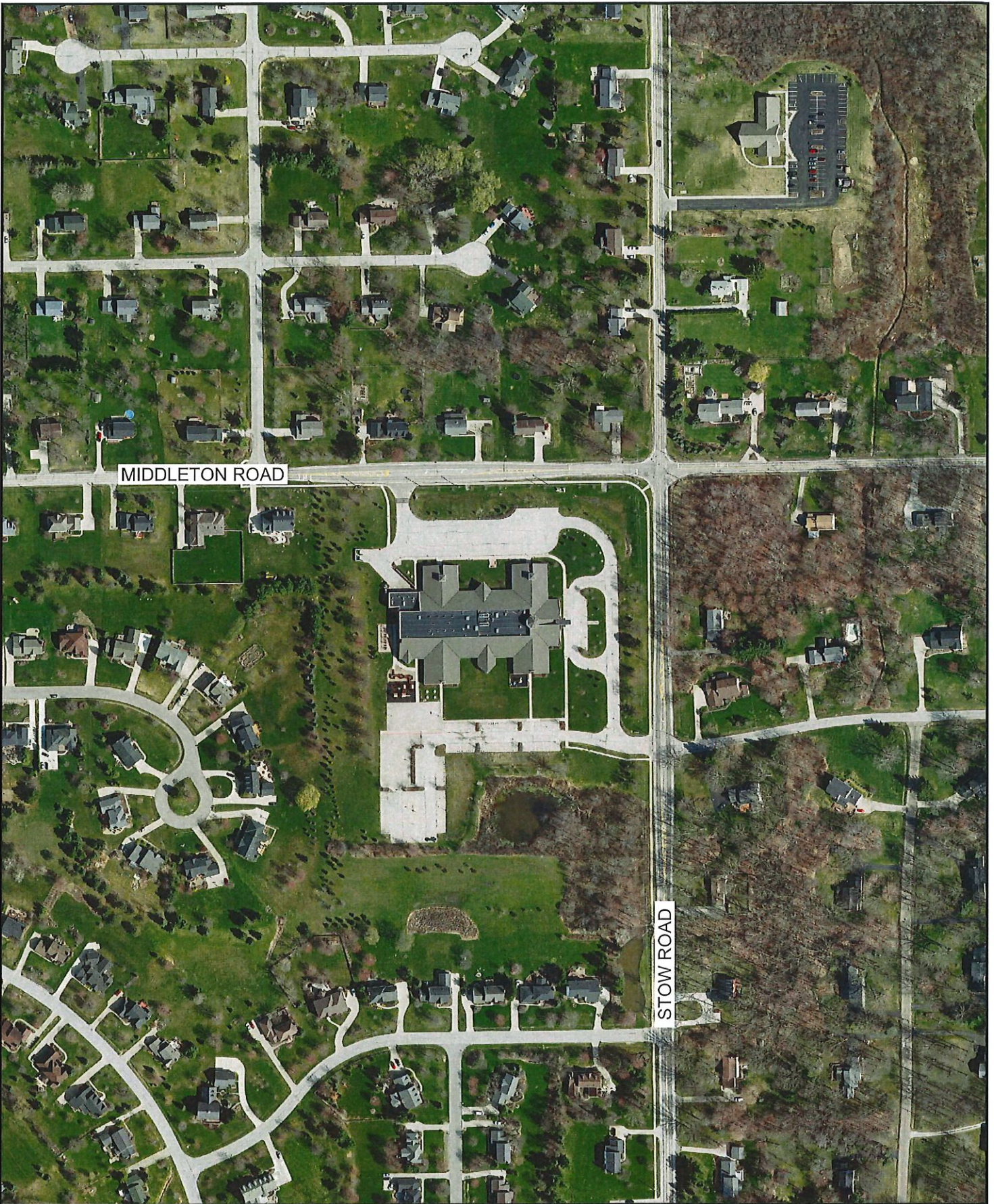
N.T.S.



GPD GROUP®

Glaus, Pyle, Schomer, Burns & DeHaven, Inc.
Copyright © Glaus, Pyle, Schomer, Burns & DeHaven, Inc. 2015

CAD FILE: C:\2018\2018008\03 - ELLSWORTH HILL ES\TRAFFIC\FIGURES\FIGURE 2_AERIAL PHOTOGRAPH.DWG
DATE: 12/17/2018 TIME: 8:36:35 AM



N.T.S.

FIGURE 2

AERIAL PHOTOGRAPH

DECEMBER 2018



GPD GROUP®

Glaus, Pyle, Schomer, Burns & DeHaven, Inc.
Copyright: Glaus, Pyle, Schomer, Burns & DeHaven, Inc. 2015

TECHNICIAN: DOOMBROSKY