



**HEINRICH & KLEIN
ASSOCIATES, INC.**

TRAFFIC ENGINEERING & PLANNING
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MEMORANDUM

TO: Joseph Scandone
The Malvern School

FROM: Andreas Heinrich, P.E., P.T.O.E.

DATE: April 10, 2018

RE: Traffic Study
The Malvern School Child Day Care Center
Westtown Township, Chester County, PA

In accordance with your request, please accept the results of this Traffic Study for The Malvern School Child Day Care Center proposed to be developed on the northeast corner of the intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road in Westtown Township, Chester County, Pennsylvania. The site was formerly occupied by the former Westtown Township municipal building, which has long since been demolished. It is proposed to construct a new building comprised of 11,000 square feet of floor space to accommodate a child day care center (maximum enrollment 170 children). Access to the site will be provided via a driveway that will intersect Pleasant Grove Road at a point approximately feet 260 east of Wilmington Pike (U.S. Route 202).

The purpose of this Traffic Study is to assess the potential traffic impact of the proposed child day care center on the immediately adjacent roadways, and to comment on site assess from the viewpoint of both traffic efficiency and safety. As such, this study includes:

- visits to the site to observe traffic conditions and to note existing physical characteristics of the adjacent roadways;
- completion of a Turning Movement Traffic Count at the intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road on a weekday from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM;
- estimation of the anticipated traffic generation characteristics and potential travel patterns of new traffic generated by The Malvern School Child Day Care Center;

- completion of a volume/capacity analysis of existing peak hour traffic and of future peak hour traffic after development of the proposed child day care center; and,
- review of the Conditional Use Plan relative to the provision of safe and efficient access to the proposed child day care center.

Existing Transportation Setting

The Malvern School Child Day Care Center is proposed to be developed on the northeast corner of the intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road in Westtown Township, Chester County, Pennsylvania. Access to the site will be provided via a driveway that will intersect Pleasant Grove Road at a point approximately feet 260 east of Wilmington Pike (U.S. Route 202).

Wilmington Pike (S.R. 0202) is generally a two-way, multi-lane arterial State highway. Wilmington Pike (U.S. Route 202) provides two travel lanes in both directions with a raised concrete median separating the two directions of travel. Separate left turn lanes are provided in the median at the intersection with Pleasant Grove Road. Paved shoulders are provided along both sides of the highway. The posted speed limit along Wilmington Pike (U.S. Route 202) is 45 miles per hour.

Pleasant Grove Road is generally a two-way, two-lane local road. Pleasant Grove Road is generally about 20 to 22 feet wide east of Wilmington Pike (U.S. Route 202). Pleasant Grove Road is widened on approach to Wilmington Pike (U.S. Route 202), but the westbound approach is signed and striped to allow right turns only to northbound Wilmington Pike (U.S. Route 202). The eastbound approach is similarly restricted to right turns only to southbound Wilmington Pike (U.S. Route 202), but all turns are made via a channelized ramp. Traffic on westbound Pleasant Grove Road is Stop-sign controlled at the intersection Wilmington Pike (U.S. Route 202) while traffic on eastbound Pleasant Grove Road is Yield-sign controlled at the intersection Wilmington Pike (U.S. Route 202). The posted speed limit along Pleasant Grove Road is 35 miles per hour.

Existing highway travel demand and traffic patterns in the vicinity of the site were determined through completion of a Turning Movement Traffic Count at the intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road. The traffic count was completed from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM on Thursday, April 5, 2018. A copy of the traffic count summary sheet is attached.

The four highest consecutive 15 minute periods during the weekday morning and weekday afternoon peak periods constitute the peak hours for traffic traveling through the intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road. The morning peak hour occurs from 7:00 AM to 8:00 AM while the afternoon peak hour occurs from 5:00 PM to 6:00PM. Existing peak hour traffic volumes are summarized in Figure 1.

Traffic Generation Characteristics

As described previously, the site was formerly occupied by the former Westtown Township municipal building, which has long since been demolished. It is proposed to construct a new building comprised of 11,000 square feet of floor space to accommodate a child day care center (maximum enrollment 170 children). The Malvern School Child Day Care Center will obviously generate some new traffic -- as might any new development of the property.

Based on the size of the proposed development, an estimate of new traffic demand can be calculated for the proposed development. The anticipated traffic generation of the proposed development is estimated from trip generation data compiled by the Institute of Transportation Engineers and documented in the publication entitled Trip Generation Manual⁽¹⁾. Table 1 presents the calculated vehicular trip generation rates for the proposed development. Application of these rates to the size of the proposed development produces the daily and peak hourly traffic volumes presented in the bottom of Table 1.

It should be noted that not all traffic generated by and attracted to child day care centers is new traffic. A significant proportion of traffic generated by and attracted to child day care centers is diverted as pass-by trips from the existing stream of traffic on the adjacent highways. Most child day care centers are situated in commercial areas, near employment centers, or along heavily traveled roads. This is to facilitate the home-to-work trip during the morning peak hour and the reverse work-to-home trip during the afternoon peak hour. Origin-destination surveys reveal that 44% of the traffic generated by child day care centers is part of the home-to-work or work-to-home trip and is already on the adjacent or near-by roadways with the child day care center representing an intermediate stop on the way to another destination. These diverted trips and "pass-by" trips can represent up to 95% of the total traffic generated by child day care centers. Therefore, less than 25% and as little as 5% to 10% of the traffic generated by child day care centers represents "new" traffic added to the adjacent roadways. Based on a study published by the Mid-Atlantic Section of the Institute of Transportation Engineers⁽²⁾, it is anticipated that 44% of the traffic generated by the proposed child day care center will be pass-by traffic; while an additional 32% of the traffic generated by the proposed child day care center will be diverted link traffic.

As shown in Table 1, after deducting 44% of the trip generation as pass-by traffic, it is anticipated that the proposed child day care center will generate a total of about 366 new trips per day (total inbound and outbound). During the weekday morning peak hour it is anticipated that the proposed child day care center will generate about 68 new trips per hour while during the afternoon peak hour it is anticipated that the proposed child day care center will generate about 65 new trips per hour.

(1) Trip Generation Manual 10th Edition, Institute of Transportation Engineers, Washington DC, 2017.

(2) "Trip Generation of Day Care Centers", Preston W. Hitchens, Jr., Newsletter Mid-Atlantic Section Institute of Transportation Engineers, October 1990.

TABLE 1
TRAFFIC GENERATION CHARACTERISTICS
THE MALVERN SCHOOL
WESTTOWN TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA

TRIP RATES⁽¹⁾

<u>Description</u>	<u>Daily</u>	<u>Morning Peak Hour</u>		<u>Afternoon Peak Hour</u>	
		<u>In</u>	<u>Out</u>	<u>In</u>	<u>Out</u>
Child Day Care Center (170 children) ⁽²⁾	3.84	0.38	0.33	0.32	0.37

TRAFFIC VOLUMES⁽¹⁾

<u>Description</u>	<u>Daily</u>	<u>Morning Peak Hour</u>		<u>Afternoon Peak Hour</u>	
		<u>In</u>	<u>Out</u>	<u>In</u>	<u>Out</u>
Child Day Care Center (170 children)	652	64	56	55	62
Pass-by Trips	286	26	26	26	26
Total New Trips	366	38	30	29	36

(1) *Trip Generation Manual, 10th Edition, Institute of Transportation Engineers, Washington, D.C., 2017 (ITE Land Use Code 565).*

(2) *Trips per child enrolled.*

It is noted that the site had been approved for development of an office building comprised of up to 30,000 square feet of floor space. It had been estimated that the previously approved office building may have generated 530 trips per day (total inbound and outbound) with peak hour traffic generation of 72 trips per hour during the morning peak hour and 69 trips per hour during the afternoon peak hour. Not taking into account pass-by traffic and the directional distribution of new traffic generation, comparison of the trip generation for the two alternative development scenarios reveals that the two development scenarios would have generated a very similar total volume of new traffic added to the surrounding roadways.

It is anticipated that traffic generated by The Malvern School Child Day Care Center will approach and depart the site according to existing traffic patterns along Wilmington Pike (U.S. Route 202) and along Pleasant Grove Road. For the purpose of this Traffic Study it is assumed that about 40% of the traffic generated by the proposed development will be oriented to/from the north on Wilmington Pike (U.S. Route 202), about 40% of the traffic generated by the proposed development will be oriented to/from the south on Wilmington Pike (U.S. Route 202), and about 20% of the traffic generated by the proposed development will be oriented to/from the east on Pleasant Grove Road. Since left turns are prohibited from the westbound approach of Pleasant Grove Road at Wilmington Pike (U.S. Route 202), it is assumed exiting traffic oriented to the south on Wilmington Pike (U.S. Route 202) will travel east to Skiles Boulevard or Concord Road to complete their trip. Figure 2 presents the potential assignment of new and pass-by trips generated by and attracted to the proposed new child day care center.

Volume/Capacity Analysis

While traffic volumes provide a measure of activity on the area road system, it is also important to calculate the ability of the road system to adequately accommodate the traffic demand. This involves a comparison of peak hour traffic demand with available roadway or intersection capacity. Intersections are usually the critical points in any road network. At intersections, conflicts occur between through, crossing and turning traffic. It is at intersections where congestion is most likely to occur.

A volume/capacity analysis was completed for the unsignalized intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road based upon the peak hour traffic volumes illustrated in Figure 1. The volume/capacity analysis was completed in accordance with the standard procedures contained in the "HCM2010 Highway Capacity Manual"⁽³⁾. By definition, vehicle capacity represents "the maximum number of vehicles that can pass a given point during a specified period under prevailing roadway, traffic and control conditions". The level of functioning of an intersection or a uniform section of lane or roadway can be expressed in terms of levels of service. A level of service is a qualitative

(3) "HCM 2010 Highway Capacity Manual", Transportation Research Board, National Research Council, Washington, D.C., 2010.

measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. Such measures include speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

In calculating the capacity of an unsignalized intersection, it is assumed that the through movements on the major street and the right turns from the major street are unimpeded and have the right-of-way over all minor street traffic and left turns from the major street. All other movements in the intersection cross, merge with, or are affected by other flows. For each movement, all conflicting flows are summed and a "critical gap" is determined. The control delay of a critical movement includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

Since operation at capacity is usually unsatisfactory to most drivers, a descriptive mechanism has been developed which relates capacity with the expected traffic delay. This is known as Level of Service (LOS). Level of service for a two-way stop-controlled intersection is determined by the computed or measured control delay and is defined for each minor movement. Table 2 provides the correlation between levels of service and the average total delay at unsignalized intersections.

The resultant levels of service calculated from the volume/capacity analysis of existing traffic conditions, as shown in Figure 3, indicate that all critical movements at the unsignalized intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road currently operate at an acceptable LOS D or better during both the morning and the afternoon peak hours. A copy of the volume/capacity analysis worksheets for existing traffic conditions is attached.

Existing traffic traveling through the intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road was then increased by 1.30% (based on the most recent Pennsylvania Department of Transportation Bureau of Planning and Research Growth Factors for the period August 2017 to July 2018) to reflect some traffic growth over the next year or so.

New traffic generated by and attracted to the proposed child day care center, as previously shown in Figure 2, was then added to future peak hour traffic volumes without development. Future peak hour traffic volume after development of The Malvern School Child Day Care Center, are presented in Figure 4 for the weekday morning and weekday afternoon peak hours.

The resultant levels of service calculated from the volume/capacity analysis of future traffic conditions after development of The Malvern School Child Day Care Center, as shown in Figure 5, reveals that all critical movements at the unsignalized intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road will continue to operate at an acceptable LOS D or better during both the morning and the afternoon peak hours. A copy of the volume/capacity analysis worksheets for future traffic conditions after development is attached.

TABLE 2

LEVEL OF SERVICE

UNSIGNALIZED INTERSECTIONS

At unsignalized intersections the criteria used to evaluate the quality of flow is the measure of the adequacy of the number of acceptable gaps in the through traffic stream for drivers facing a STOP or YIELD condition. Variables affecting the gaps are the distribution or arrival of vehicles in the through traffic stream, percentage of trucks, grades, and the amount of time it requires to enter the traffic stream from a stop position (critical gap size). The control delay of a critical movement includes the initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

As a result, the following criteria has been established:

<u>Level of Service</u>	<u>Control Delay Range (sec./veh/)</u>
A	less than 10
B	10 to 15
C	15 to 25
D	25 to 35
E	35 to 50
F	more than 50 and/or volume-to- capacity ratio greater than 1.0

Site Access

As described previously, access to the site will be provided via a driveway that will intersect Pleasant Grove Road at a point approximately feet 260 east of Wilmington Pike (U.S. Route 202).

Based on the posted speed limit of 35 miles per hour along Pleasant Grove Road, it is desirable to provide safe sight distance of 440 feet to the left and 350 feet to the right of the both of the proposed access driveways, as measured from a position 10 feet back of the pavement edge along Pleasant Grove Road. In addition, it is desirable to provide safe sight distance of 300 feet to the east along Pleasant Grove Road for a vehicle attempting to turn left into the proposed access driveway. Observations reveal that adequate sight distance in excess of 500 feet is available to the left along Pleasant Grove Road; and, adequate sight distance into the intersection with Wilmington Pike (U.S. Route 202) is available to the right along Pleasant Grove Road.

Review of auxiliary turn lane warrants reveals that widening of Pleasant Grove Road for a separate left turn lane and/or right turn deceleration lane at the site access driveway will not be warranted.

As shown in Figure 5, the results of a volume/capacity analysis for site access reveals that all critical movements at the site access driveway will operate at an acceptable LOS A during both the morning and afternoon peak hours.

Conclusions

The foregoing Traffic Study for The Malvern School Child Day Care Center proposed to be developed on the northeast corner of the intersection of Wilmington Pike (U.S. Route 202) and Pleasant Grove Road in Westtown Township, Chester County, Pennsylvania, clearly demonstrates that new traffic generated by the proposed child day care center will not have a significant traffic impact on the adjacent roadways, and can be accommodated in a safe and efficient manner after development.

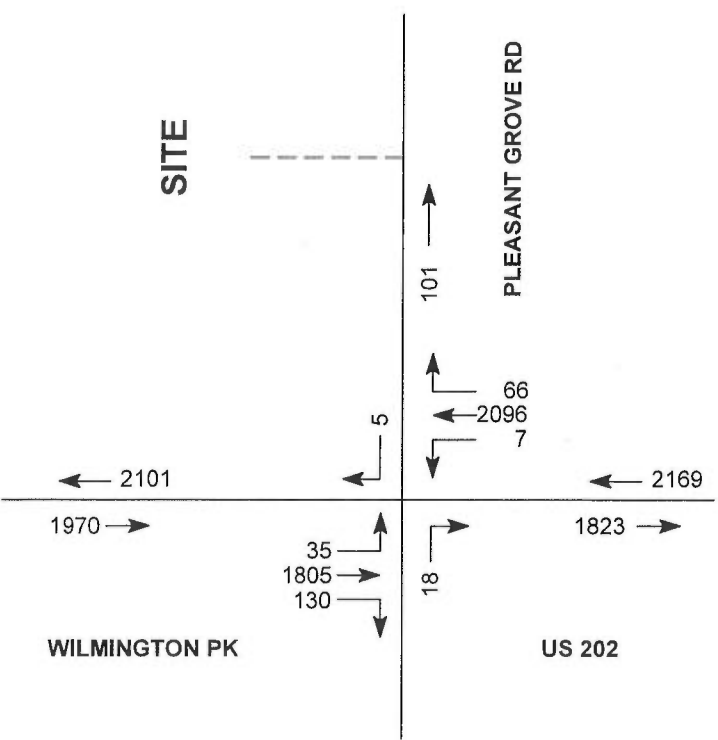
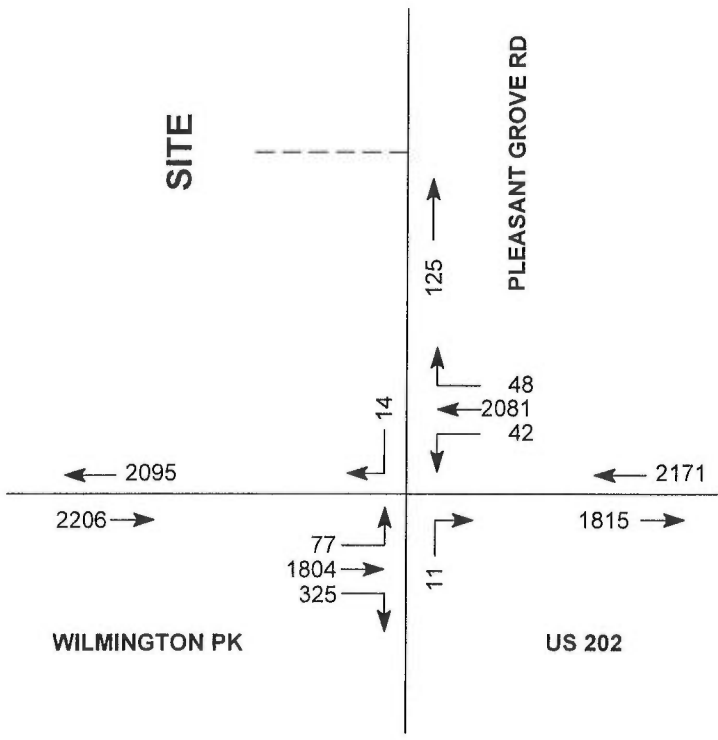


Andreas Heinrich, P.E., P.T.O.E.
Principal

AH:rh

cc: Louis J. Colagreco, Jr., Esq.
Andrew Eberwein, P.E.





**FIGURE 1
EXISTING PEAK HOUR TRAFFIC
(APRIL, 2018)**

**THE MALVERN SCHOOL
WESTTOWN TOWNSHIP, PA**

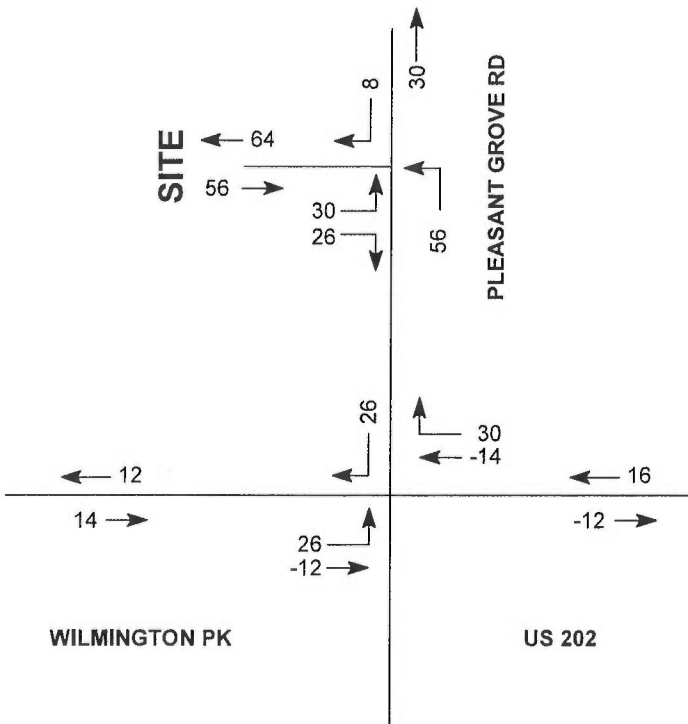
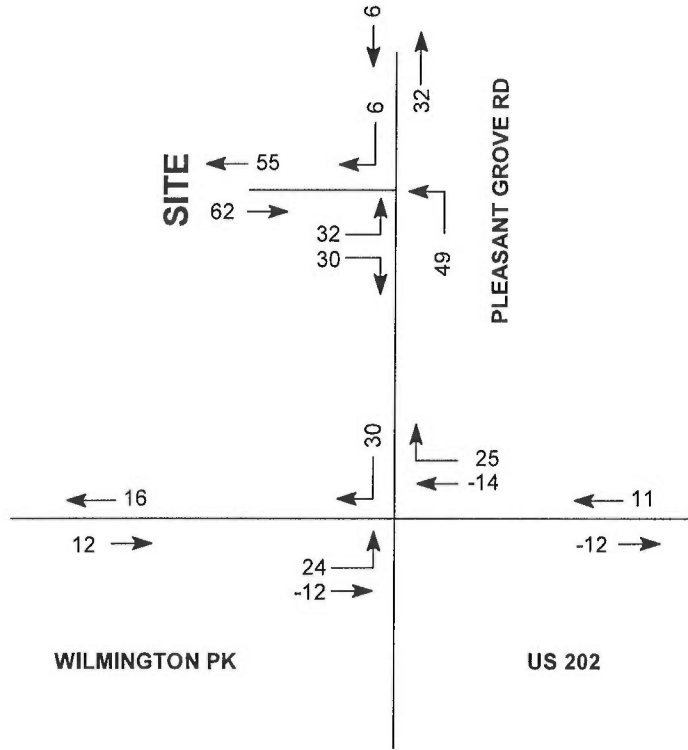
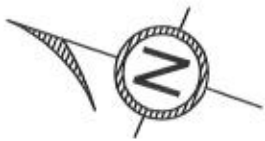


FIGURE 2
DEVELOPMENT GENERATED TRAFFIC

THE MALVERN SCHOOL
WESTTOWN TOWNSHIP, PA



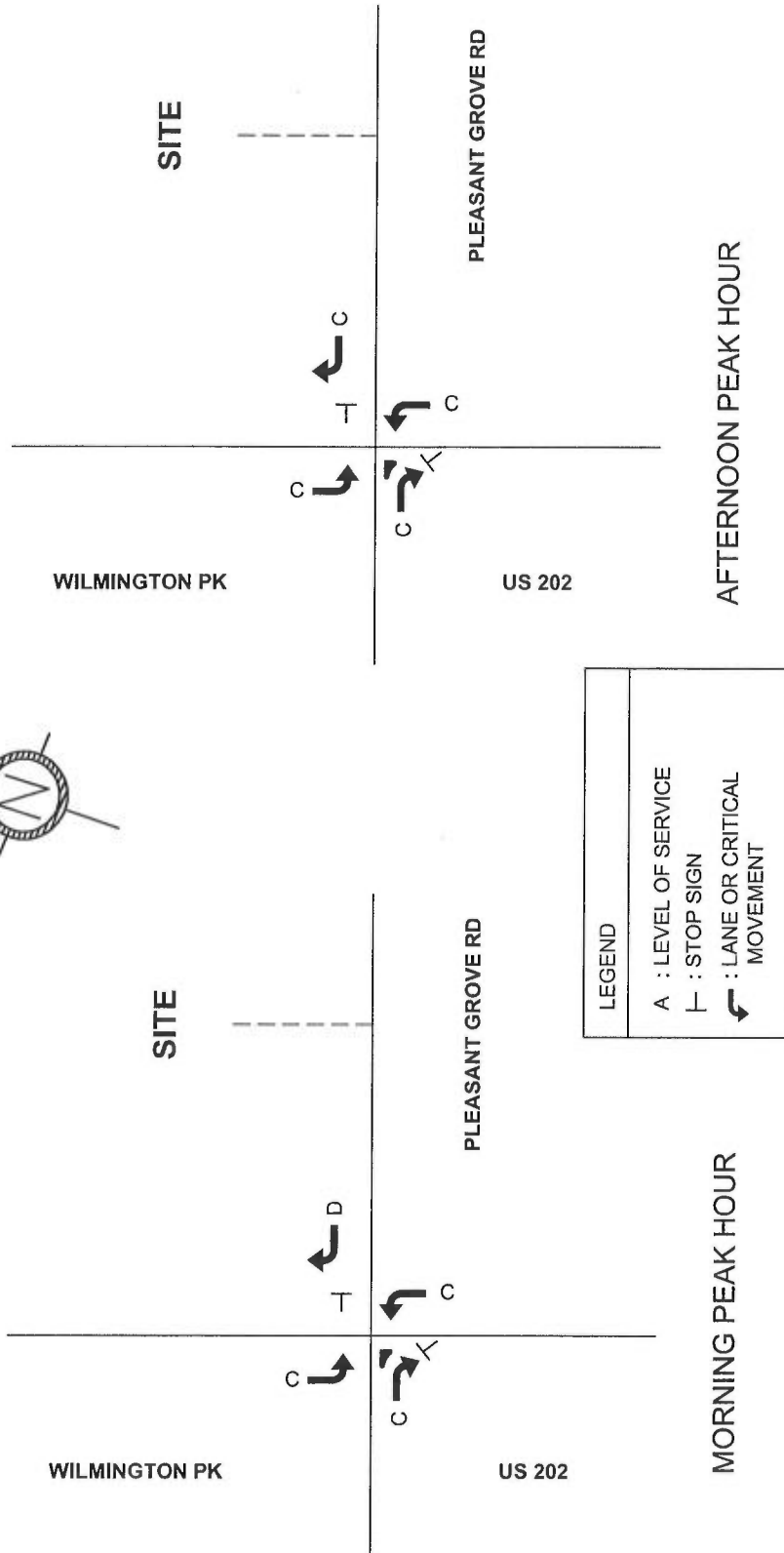


FIGURE 3
EXISTING LEVELS OF SERVICE
(APRIL, 2018)

THE MALVERN SCHOOL
WESTTOWN TOWNSHIP, PA



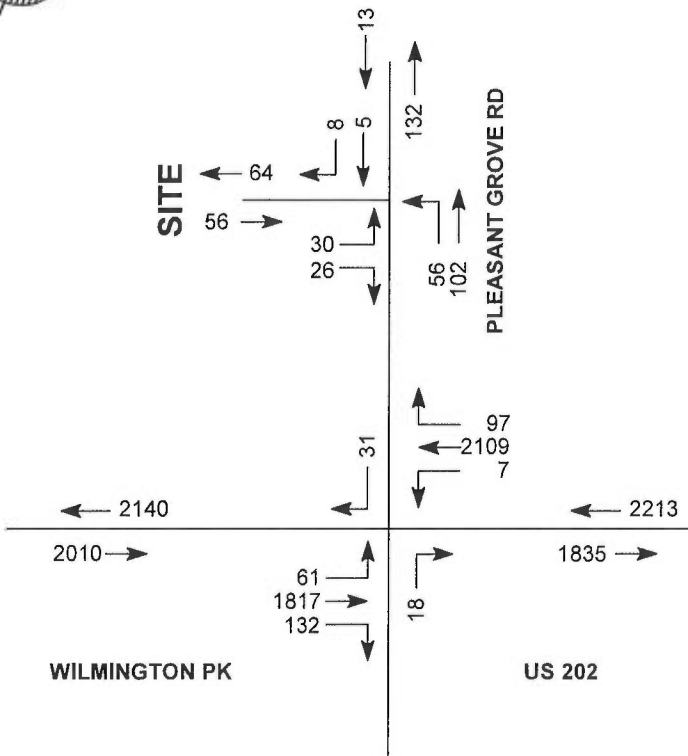
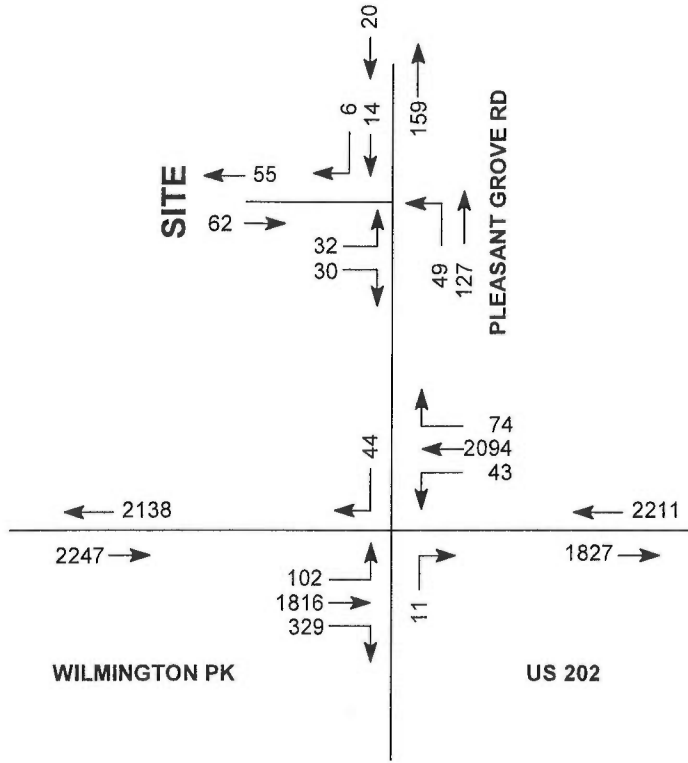


FIGURE 4
FUTURE PEAK HOUR TRAFFIC
AFTER DEVELOPMENT

THE MALVERN SCHOOL
WESTTOWN TOWNSHIP, PA



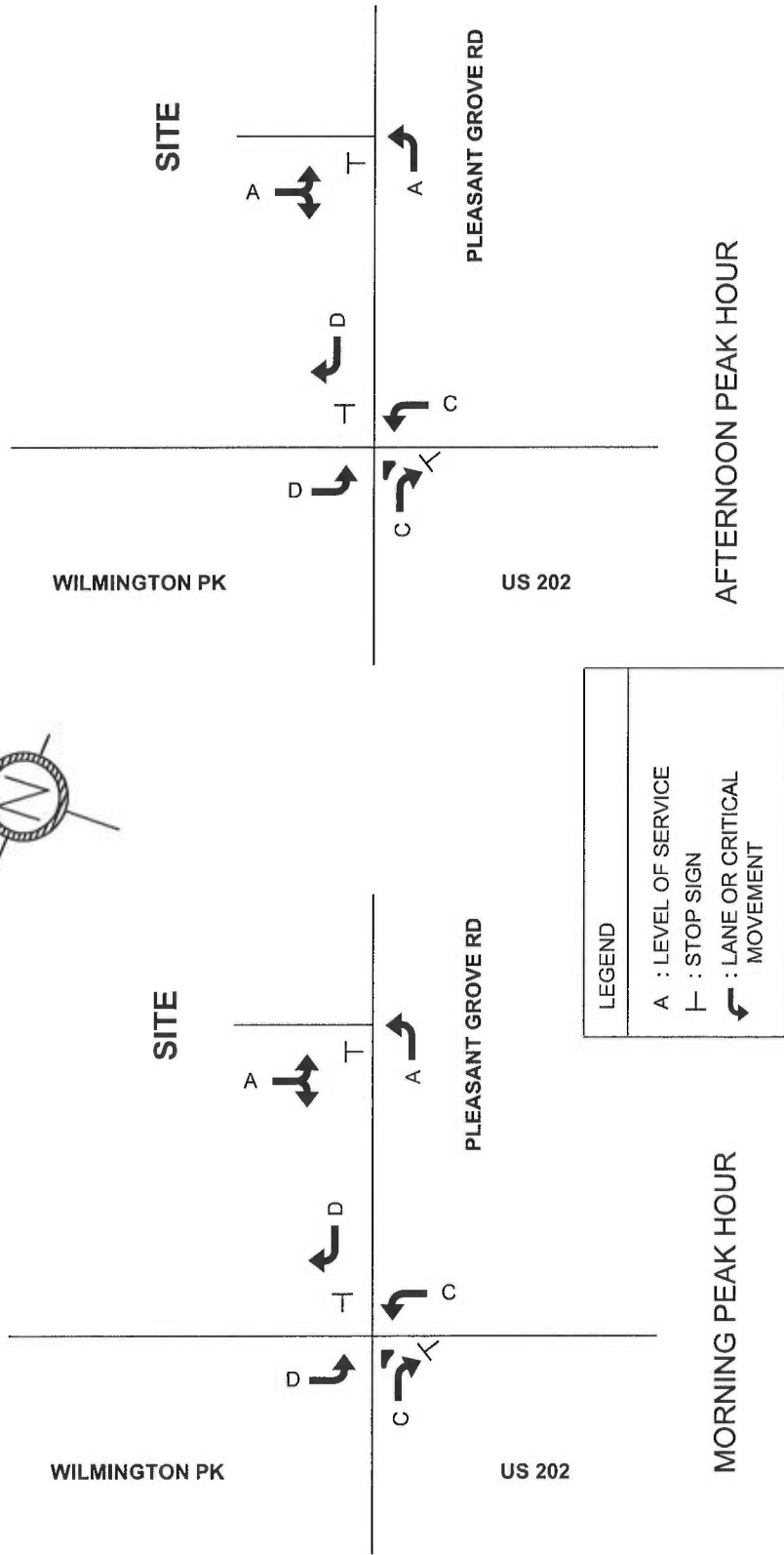


FIGURE 5
FUTURE LEVELS OF SERVICE
AFTER DEVELOPMENT

THE MALVERN SCHOOL
WESTTOWN TOWNSHIP, PA



WILMINGTON PIKE (ROUTE 202)

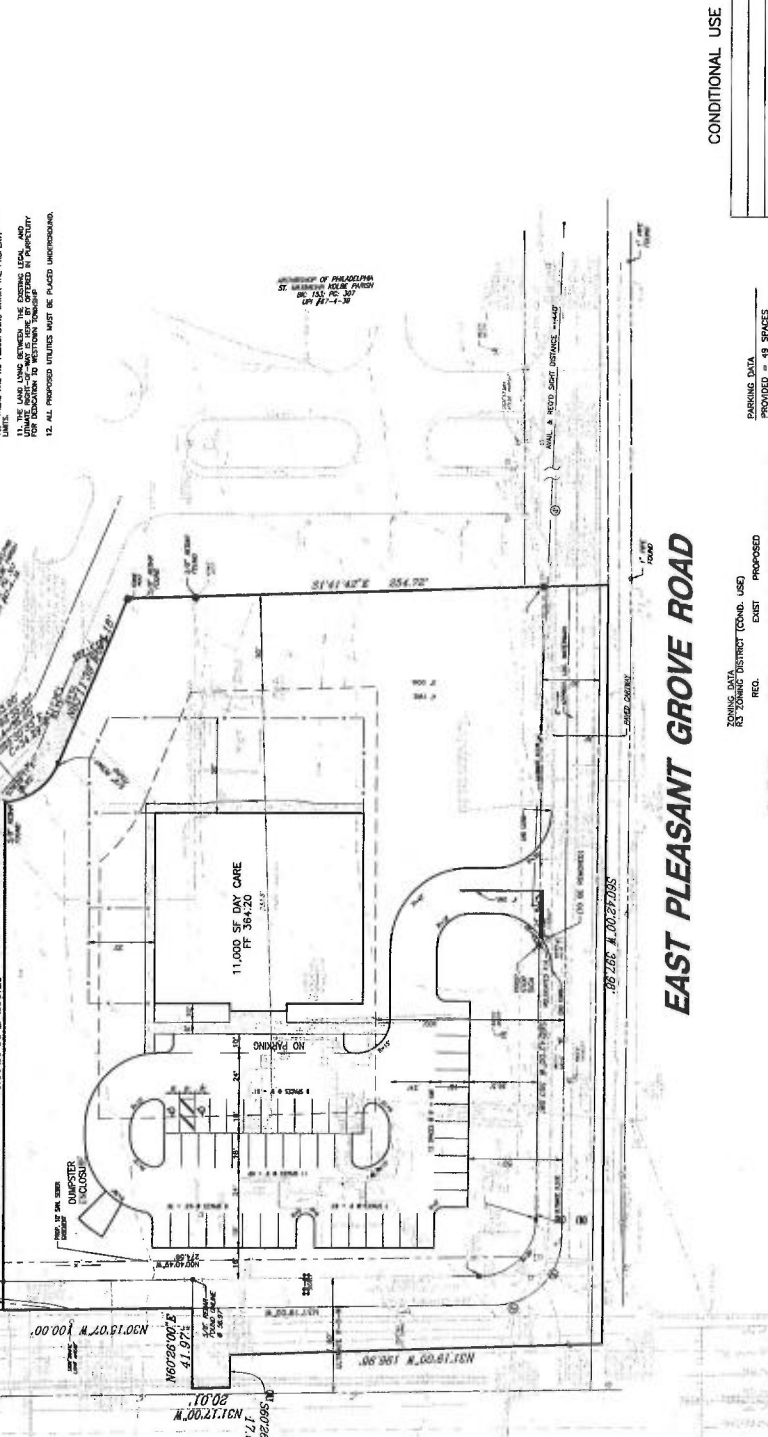
EAST PLEASANT GROVE ROAD

GENERAL NOTES

1. BOUNDARY AND TOPOGRAPHIC SURVEY INFORMATION PROVIDED BY PROPERTY OWNER FROM DATED 1/17/2008.
2. ALL UTILITIES ARE SHOWN AS LOCATED BY THE OWNER.
3. THE PROPOSED PROJECT CONSISTS OF 11,000 SF OF GRAZING ESTABLISHMENT.
4. THE PROPOSED PROJECT CONSISTS OF 11,000 SF OF GRAZING ESTABLISHMENT.
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9. THE PROPOSED PROJECT CONSISTS OF 11,000 SF OF GRAZING ESTABLISHMENT.
10. THE PROPOSED PROJECT CONSISTS OF 11,000 SF OF GRAZING ESTABLISHMENT.
11. THE LAND LINES BETWEEN THE EXISTING LEGAL AND PROPOSED UTILITIES MUST BE PLACED UNDERGROUND.
12. ALL PROPOSED UTILITIES MUST BE PLACED UNDERGROUND.

LOCATION MAP

DATE: 11-20-2018



MIN. LOT AREA	REQ.	EXIST.	PROPOSED
2 AC.	2.44 AC.	2.27 AC. (NET OF P.O.W.)	3.43 AC. (MEASURED FROM E.L. P.O.W.)
MAX. IMP. COVERAGE	100%	23%	34.81% (MEASURED FROM E.L. P.O.W.)
FRONT YARD SETBACK	100'	60'	100'
MIN. SIDE YARD	50'	50'	50'
MIN. REAR YARD	50'	50'	50'
MAX. FLOOR AREA RATIO	3	.0896	11
MAX. BLDG HEIGHT	38' (3 STORES) C-38'	77'	65.09'
MIN. VEGETATED COVER	40%	77%	65.09%

GRAPHIC SCALE
 0 50 100 150 FEET

CONDITIONAL USE PLAN

LAND DEVELOPMENT
THE MALVERN SCHOOL
 CHESTER COUNTY, PA

Edward B. Walsh & Associates, Inc.
 152 Drexelton Forge Rd.
 Chester, PA 19381
 Phone: 610-603-0260
 Fax: 610-603-0680

ASSESSMENT MAP 67-4, PARCEL 38 (UPI NO. 67-4-38)

1:150 SCALE

DATE: 11-20-2018

PROJECT: 182522

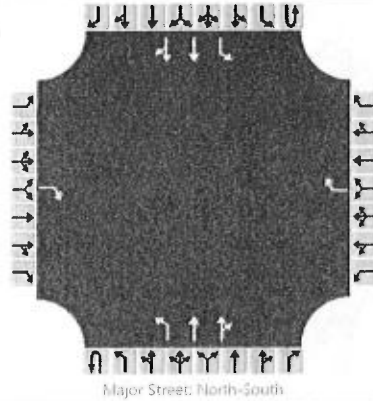
182522

182522

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	AUH	Intersection	US 202 & Pleasant Grove				
Agency/Co.	H&K	Jurisdiction	Westtown Township, PA				
Date Performed	4/6/2018	East/West Street	Pleasant Grove Road				
Analysis Year	2018	North/South Street	US Route 202				
Time Analyzed	AM Peak - Existing	Peak Hour Factor	0.94				
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25				
Project Description	The Malvern School						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	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	1		0	0	1	0	1	2	0	0	1	2	0
Configuration				R				R		L	T	TR		L	T	TR
Volume, V (veh/h)				18				5		7	2096	66		35	1805	130
Percent Heavy Vehicles (%)				6				0		14				0		
Proportion Time Blocked																
Percent Grade (%)		2				2										
Right Turn Channelized		Yes				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)				7.2				7.2		3.9					3.9	
Critical Headway (sec)				7.52				7.40		4.18					3.90	
Base Follow-Up Headway (sec)				2.9				2.9		2.4					2.4	
Follow-Up Headway (sec)				2.96				2.90		2.54					2.40	

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				19				5		7					37	
Capacity, c (veh/h)				210				179		246					243	
v/c Ratio				0.09				0.03		0.03					0.15	
95% Queue Length, Q ₉₅ (veh)				0.3				0.1		0.1					0.5	
Control Delay (s/veh)				23.8				25.7		20.1					22.5	
Level of Service, LOS				C				D		C					C	
Approach Delay (s/veh)		23.8				25.7				0.1				0.4		
Approach LOS		C				D				C				C		

HCS7 Two-Way Stop-Control Report

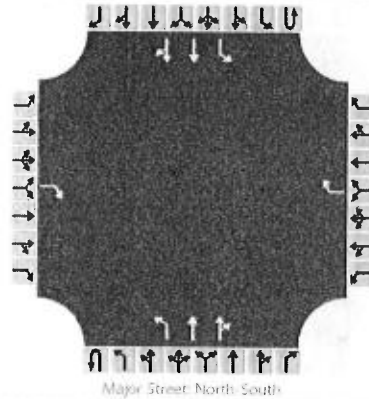
General Information

Analyst	AUH
Agency/Co.	H&K
Date Performed	4/6/2018
Analysis Year	2018
Time Analyzed	PM Peak - Existing
Intersection Orientation	North-South
Project Description	The Malvern School

Site Information

Intersection	US 202 & Pleasant Grove
Jurisdiction	Westtown Township, PA
East/West Street	Pleasant Grove Road
North/South Street	US Route 202
Peak Hour Factor	0.97
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	1	0	1	2	0	0	1	2	0
Configuration				R				R		L	T	TR		L	T	TR
Volume, V (veh/h)				11				14		42	2081	48		77	1804	325
Percent Heavy Vehicles (%)				0				0		0				0		
Proportion Time Blocked																
Percent Grade (%)		2				2										
Right Turn Channelized		Yes				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)				7.2				7.2		3.9						3.9
Critical Headway (sec)				7.52				7.40		4.18						3.90
Base Follow-Up Headway (sec)				2.9				2.9		2.4						2.4
Follow-Up Headway (sec)				2.96				2.90		2.54						2.40

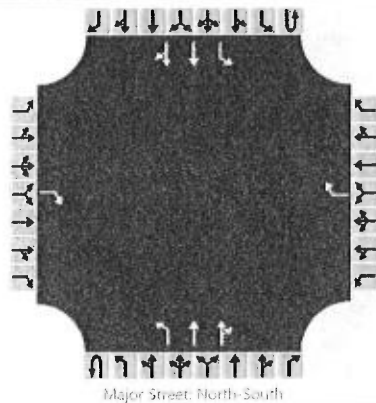
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				11				14		43						79
Capacity, c (veh/h)				196				196		265						265
v/c Ratio				0.06				0.07		0.16						0.30
95% Queue Length, Q ₉₅ (veh)				0.2				0.2		0.6						1.2
Control Delay (s/veh)				24.5				24.8		21.2						24.3
Level of Service, LOS				C				C		C						C
Approach Delay (s/veh)		24.5				24.8				0.4				0.8		
Approach LOS		C				C										

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	AUH			Intersection	US 202 & Pleasant Grove		
Agency/Co.	H&K			Jurisdiction	Westtown Township, PA		
Date Performed	4/6/2018			East/West Street	Pleasant Grove Road		
Analysis Year	2020			North/South Street	US Route 202		
Time Analyzed	PM Peak - After Devel.			Peak Hour Factor	0.97		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	The Malvern School						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	1		0	0	1	0	1	2	0	0	1	2	0	
Configuration				R				R		L	T	TR		L	T	TR	
Volume, V (veh/h)				11				44		43	2094	74		102	1816	329	
Percent Heavy Vehicles (%)				0				0		0				0			
Proportion Time Blocked																	
Percent Grade (%)		2				2											
Right Turn Channelized		Yes				No				No					No		
Median Type/Storage	Undivided																

Critical and Follow-up Headways

Base Critical Headway (sec)				7.2				7.2		3.9						3.9
Critical Headway (sec)				7.52				7.40		4.18						3.90
Base Follow-Up Headway (sec)				2.9				2.9		2.4						2.4
Follow-Up Headway (sec)				2.96				2.90		2.54						2.40

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				11				45		44						105
Capacity, c (veh/h)				193				189		261						256
v/c Ratio				0.06				0.24		0.17						0.41
95% Queue Length, Q ₉₅ (veh)				0.2				0.9		0.6						1.9
Control Delay (s/veh)				24.8				29.9		21.6						28.5
Level of Service, LOS				C				D		C						D
Approach Delay (s/veh)	24.8				29.9				0.4				1.3			
Approach LOS	C				D											

HCS7 Two-Way Stop-Control Report

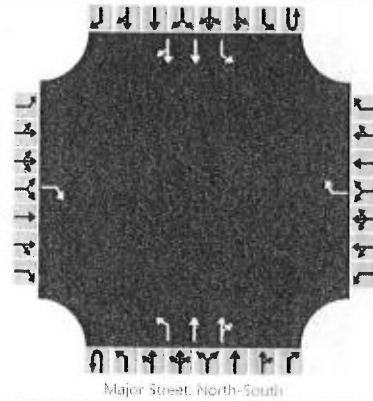
General Information

Analyst	AUH
Agency/Co.	H&K
Date Performed	4/6/2018
Analysis Year	2020
Time Analyzed	AM Peak - After Devel.
Intersection Orientation	North-South
Project Description	The Malvern School

Site Information

Intersection	US 202 & Pleasant Grove
Jurisdiction	Westtown Township, PA
East/West Street	Pleasant Grove Road
North/South Street	US Route 202
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	1	0	1	2	0	0	1	2	0
Configuration				R				R		L	T	TR		L	T	TR
Volume, V (veh/h)				18				31	7	2109	97			61	1817	132
Percent Heavy Vehicles (%)				6				0	14					0		
Proportion Time Blocked																
Percent Grade (%)		2				2										
Right Turn Channelized		Yes				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

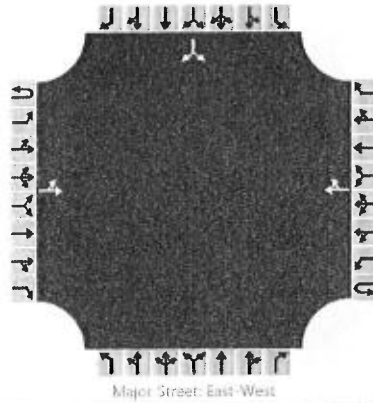
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				19				33		7					65	
Capacity, c (veh/h)				207				172		243					234	
v/c Ratio				0.09				0.19		0.03					0.28	
95% Queue Length, Q ₉₅ (veh)				0.3				0.7		0.1					1.1	
Control Delay (s/veh)				24.1				30.8		20.3					26.2	
Level of Service, LOS				C				D		C					D	
Approach Delay (s/veh)		24.1				30.8				0.1				0.8		
Approach LOS		C				D										

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	AUH			Intersection	Pleasant Grove Rd & Site		
Agency/Co.	H&K			Jurisdiction	Westtown Township, PA		
Date Performed	4/6/2018			East/West Street	Pleasant Grove Road		
Analysis Year	2020			North/South Street	Site Access		
Time Analyzed	AM Peak - After Devel.			Peak Hour Factor	0.72		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	The Malvern School						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Priority																	
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0	
Configuration		LT						TR							LR		
Volume, V (veh/h)		56	102				5	8						30		26	
Percent Heavy Vehicles (%)		0												0		0	
Proportion Time Blocked																	
Percent Grade (%)																-3	
Right Turn Channelized		No				No				No				No			
Median Type/Storage	Undivided																

Critical and Follow-up Headways

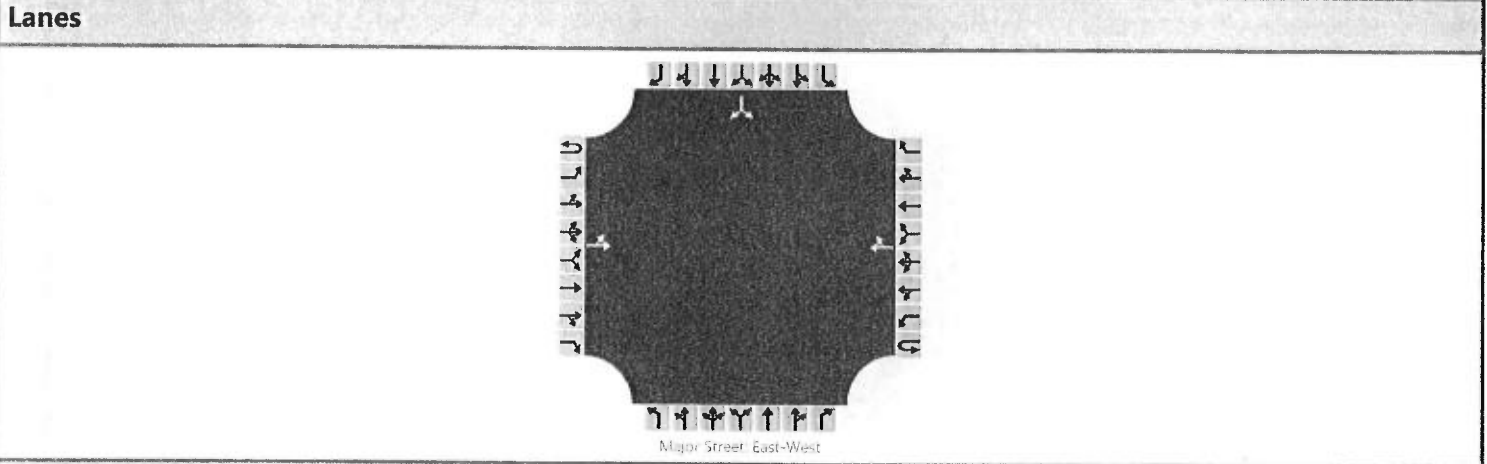
Base Critical Headway (sec)	4.3													7.1		6.2
Critical Headway (sec)	4.30													5.80		5.90
Base Follow-Up Headway (sec)	3.0													3.0		3.1
Follow-Up Headway (sec)	3.00													3.00		3.10

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)	78															78
Capacity, c (veh/h)	1183															910
v/c Ratio	0.07															0.09
95% Queue Length, Q ₉₅ (veh)	0.2															0.3
Control Delay (s/veh)	8.3															9.3
Level of Service, LOS	A															A
Approach Delay (s/veh)	3.3												9.3			
Approach LOS													A			

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	AUH	Intersection	Pleasant Grove Rd & Site				
Agency/Co.	H&K	Jurisdiction	Westtown Township, PA				
Date Performed	4/6/2018	East/West Street	Pleasant Grove Road				
Analysis Year	2020	North/South Street	Site Access				
Time Analyzed	PM Peak - After Devel.	Peak Hour Factor	0.76				
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25				
Project Description	The Malvern School						



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Priority																	
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0	
Configuration		LT						TR							LR		
Volume, V (veh/h)		49	127				14	6						32		30	
Percent Heavy Vehicles (%)		0												0		0	
Proportion Time Blocked																	
Percent Grade (%)																-3	
Right Turn Channelized		No				No				No				No			
Median Type/Storage		Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.3												7.1		6.2
Critical Headway (sec)		4.30												5.80		5.90
Base Follow-Up Headway (sec)		3.0												3.0		3.1
Follow-Up Headway (sec)		3.00												3.00		3.10

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		64														82	
Capacity, c (veh/h)		1176														913	
v/c Ratio		0.05														0.09	
95% Queue Length, Q ₉₅ (veh)		0.2														0.3	
Control Delay (s/veh)		8.2														9.3	
Level of Service, LOS		A														A	
Approach Delay (s/veh)		2.7												9.3			
Approach LOS														A			