

DRAFT **MEMORANDUM**

TO: Daniel McGarry, Ed. D.
Acting Superintendent of Schools, Upper Darby School District

FROM: Paul F. Wood, PE
Pennoni Associates Inc.

DATE: September 6, 2019

SUBJECT: **Aronimink Elementary School TIS Findings**

Introduction

The Upper Darby School District is proposing to construct a 36,000 square-foot multi-story classroom/gymnasium addition to the existing Aronimink Elementary School located at 4611 Bond Avenue, Drexel Hill, PA. In addition, 11,000 square feet of existing administrative offices are proposed to be replaced with additional classrooms. The current student enrollment for the Aronimink Elementary School is 253 students. At the completion of the project in 2024, the School District plans to have a maximum capacity of up to 700 elementary school students.

A Transportation Impact Study (TIS) has been prepared in accordance with Section 503 of Delaware County's Subdivision and Land Development Ordinances (SALDO) and PennDOT's Publication 282, Appendix A "*Policies and Procedures for Transportation Impact Studies*". Upper Darby Township does not provide guidance on the preparation of Transportation Impact Studies in a separate municipal SALDO. These TIS guidelines outline the requirements for the preparation of traffic studies for proposed developments to document the impacts to the surrounding roadway network and determine what, if any, improvements are necessary to offset the traffic attributed to the development or redevelopment of a site.

Pennoni has over 50 years of experience in the Transportation and Traffic Engineering field and the Pennoni Traffic Group has 20 professional engineers registered in Pennsylvania. Their team has prepared and reviewed hundreds of Transportation Impact Studies for clients across the mid-Atlantic region. The resumes of the TIS author and person responsible for quality control have been attached.

This memo summarizes the existing conditions, future conditions without the proposed expansion, and future conditions with the proposed expansion. By comparing the future no-build scenarios to the build scenarios, impacts that the proposed development has on the surrounding intersections can be assessed. The full TIS has been prepared by a licensed professional traffic engineer for submission to both PennDOT and Upper Darby Township for review and approval.

The study intersections include:

1. Marvine Ave & Burmont Rd (SR 2007)
2. Marvine Ave & Roberts Ave / Site Driveway #1
3. Roberts Ave & Bond Ave
4. Bond Ave & Anderson Ave / School Driveway #2
5. Bond Ave & Alexander Ave
6. Bond Ave & Burmont Rd (SR 2007)

A map of the study intersections is provided in **Figure 1**.

TRAFFIC IMPACT STUDY SUMMARY

Existing traffic data was collected at all study intersections on Thursday, April 25, 2019 from 7 AM to 9:30 AM and 2:30 PM to 6 PM in order to capture conditions while school is in session. This data was used to create a computer model of the roadway network based on methodologies contained in the latest edition of the “*Highway Capacity Manual*” (HCM) by the Transportation Research Board using Synchro Version 10.3 software. This computer model was used to determine the Level of Service (LOS) of the study intersections under various traffic conditions. Level of Service (LOS) is a term used to describe vehicle operator satisfaction with the driving experience. Research has determined that operator satisfaction is based primarily on travel speed and intersection delay. By utilizing models to simulate the flow of traffic at intersections, the average delay experienced by vehicles can be estimated. These models consider such factors as traffic volumes, roadway geometry, traffic control, and driver behavior.

Levels of Service designations are based on a comparison of the average delays calculated by the models with perceived acceptable delays. For the Automobile Mode, the Federal Highway Administration’s (FHWA) Highway Capacity Manual (HCM) assigns a Level of Service (LOS) designation between “A” and “F” to intersection operations. LOS “A” designates very good operating conditions, while LOS “F” denotes delays of over 80 seconds for signalized intersections and delays of over 50 seconds for unsignalized intersections and roundabouts. Typically, a LOS “D” or better is considered acceptable in urban areas.

The analysis investigated the following conditions during the AM and PM peak hours:

- 2019 Existing Traffic Conditions
- Opening year without the proposed development (2024 No-Build)
- Horizon year without the proposed development (2029 No-Build)
- Opening Year with the proposed development (2024 Build)
- Horizon Year with the proposed development (2029 Build)

Existing Conditions:

Currently on-site parking is provided via two separate parking lots. One provides 33 faculty parking spaces for Aronimink Elementary and is accessed via the northern driveway at the intersection of Marvine Ave & Roberts Ave. The second lot provides 26 parking spaces for the District Administration Office employees and is accessed via the southern driveway at the intersection of Bond Ave & Anderson Ave. An existing Site plan is provided in **Figure 2**.

Access to the site driveway at the intersection of Marvine Ave & Roberts Ave is restricted to bus traffic only for a half hour during both the AM and PM peak hour.

The project site is bounded by Burmont Road (SR 2007) to the east, Bond Avenue to the south, Roberts Avenue to the west, and Marvine Avenue to the north.

Aronimink Elementary School enrollment for the 2018-19 school year was 253 students.

Vehicle trip generation estimates were calculated based upon the number of students for the existing site in accordance with “*Trip Generation*”, Tenth Edition, 2017, an Institute of Transportation Engineers (ITE) Informational Report. The existing site generates 478 trips during the average weekday, 170 trips during the AM peak hour, and 86 trips during the PM peak hour.

All intersections currently operate at an overall LOS A and all intersection approaches operate at a LOS C or better. Capacity analysis results are summarized for the study intersections in **Table 1**.

Future Conditions Without Development:

The anticipated background growth of the surrounding area according to PennDOT’s table of “Growth Factors for August 2019 to July 2020” is 0.0% for non-interstate highways in Delaware County. Therefore, the future conditions without the proposed development are the same as the existing conditions.

All intersections will continue to operate at an overall LOS A and all intersection approaches operate at a LOS C or better during the opening year (2024) and horizon year (2029) without the proposed expansion. Capacity analysis results are summarized for the study intersections in **Table 1**.

Future Conditions with Development:

In the proposed condition, the existing site driveways at Anderson Avenue and Marvine Avenue will be utilized by parents and faculty and traffic will flow one-way northbound. These accesses will serve a total of 61 parking spaces on-site in addition to the parent drop-off / pick-up location. The proposed site plan is attached as **Figure 3**.

According to the trip generation estimates, the proposed development is to generate 846 new trips during the average weekday, 299 new trips during the AM peak hour, and 152 new trips during the PM peak hour. The trip generation for the Aronimink Elementary School was calculated from the manual on Trip Generation, Tenth Edition, 2017, an Institute of Transportation Engineers (ITE) Informational Report as required by Section 503 of Delaware County's SALDO.

In order to separate bus and passenger vehicle traffic and minimize pedestrian conflicts; two (2) one-way minimum-use driveways are proposed along Burmont Avenue (SR 2007) for a proposed bus loop. An enter only driveway is proposed, which will create a fourth leg to the intersection of Burmont Road (SR 2007) and Alexander Avenue. An exit only driveway is proposed, which will create a fourth leg to the intersection of Burmont Road (SR 2007) and Blythe Avenue. These driveways will be designed in accordance with PennDOT Highway Occupancy Permit guidelines.

Two (2) one-way minimum-use driveways are proposed along Bond Avenue for the proposed parking lot to be constructed between the existing Aronimink Elementary School and the church on the northwest corner of the intersection of Burmont Road (SR 2007) and Bond Avenue. An enter only driveway is proposed near the church's western property line and an exit only driveway is proposed to the west of the enter-only driveway. These accesses will serve a total of 69 parking spaces on-site in addition to the parent drop-off / pick-up location.

Vehicle trip generation estimates were calculated based upon the maximum number of students for the proposed site in accordance with the manual on Trip Generation, Tenth Edition, 2017, an Institute of Transportation Engineers (ITE) Informational Report. The proposed site is expected to generate 1,324 trips during the average weekday, 469 trips during the AM peak hour, and 238 trips during the PM peak hour. This results in a total of 299 new trips during the AM peak hour, and 152 new trips during the PM peak hour.

Traffic Analysis with Proposed Development:

Due to the proposed on-site improvements, which include a separate bus loop and on-site parent pick-up / drop-off, traffic patterns to and from the school will be modified on the surrounding roadway network. Therefore, the existing site traffic was removed from the roadway network and all site trips associated with the build condition were added back onto the surrounding roadways to and from the proposed site entrance and exit.

Capacity analyses were conducted to determine the Level of Service (LOS) for all study area intersections. The study area intersections were analyzed for the 2019 existing, 2024 No-Build, 2024 Build, 2029 No-Build, and 2029 Build conditions. Capacity analyses were completed based on methodologies contained in the latest edition of the HCM using Synchro software. Capacity analysis results are summarized for the study intersections in **Table 1**.

No turn lanes are provided at any of the study intersections. Therefore, queue lengths were compared to the distance between adjacent intersections. No queues are anticipated which would impact the operation of existing intersections or driveways. The queue analysis results are summarized for the study intersections in **Table 2**.

The proposed expansion and renovation of the Aronimink Elementary School contributes new traffic to the study area; however, the analysis did not indicate any LOS or Queue deficiencies attributed to the addition of

traffic to and from the site which required mitigation. No LOS increases greater than 10 seconds of total intersection delay were observed between the No-build and Build conditions. Additionally, no intersection levels of service dropped to a level of service below C. Therefore, no intersection improvements are required by either PennDOT or Delaware County SALDO guidelines.

Traffic Signal Warrants were performed at the intersection of Burmont Road and Bond Avenue under 2029 traffic volumes with the proposed expansion and renovation of the Aronimink Elementary School. PennDOT will not approve the installation of a traffic signal unless one of the signal warrants provided in Chapter 4 of the Federal Highway Administration's "Manual on Uniform Traffic Control Devices" are met. The anticipated AM and PM peak hour traffic volumes with the proposed development traffic do not meet the requirements for the 4-hour or 8-hour warrant criteria. In other words, the peak hour traffic volumes at the intersection will not exceed the traffic volume thresholds, which would need to be exceeded for 4 or 8 hours of a day, in order to warrant the installation of a traffic signal. An analysis of the available crash history also does not indicate that a crash trend correctable by signalization exists. Signal warrant output from the evaluation of the peak hour traffic volumes with the proposed expansion and renovation are attached.

Sight Distances:

Sight distance was measured for the proposed Bus Loop Driveways proposed along Burmont Road. The measurements were compared to the requirements as stated in PennDOT Title 67, Chapter 441, *Access to and Occupancy of Highways by Driveways and Local Roads*. The corner sight distances are summarized in the table below. There are no sight distance deficiencies at the existing site driveways.

Level of Service	Direction	Available Sight Distance	Speed Limit	AASHTO Intersection Sight Distance	PennDOT Required Sight Distance ³
Proposed Bus Loop Exit	Left	425'	30 MPH	335' ¹	191'
	Right	350'	30 MPH	335' ¹	201'
Proposed Bus Loop Entrance	Left In	>350'	30 MPH	245' ²	201'
	Follow-up	>350'	30 MPH	n/a	201'

¹ AASHTO intersection sight distance for Left Turn from Stop at 30 MPH (Table 9-7).

² AASHTO intersection sight distance for left turn from Major Roadway at 30 MPH (Table 9-17).

³ Formula Sight distance from PennDOT Form M-950S.

Sight distances are reported for the posted speed limit, however a school zone speed limit of 15 miles per hour will be in effect during the times that busses will be entering the bus loop in the morning and exiting from the proposed bus loop in the afternoon.

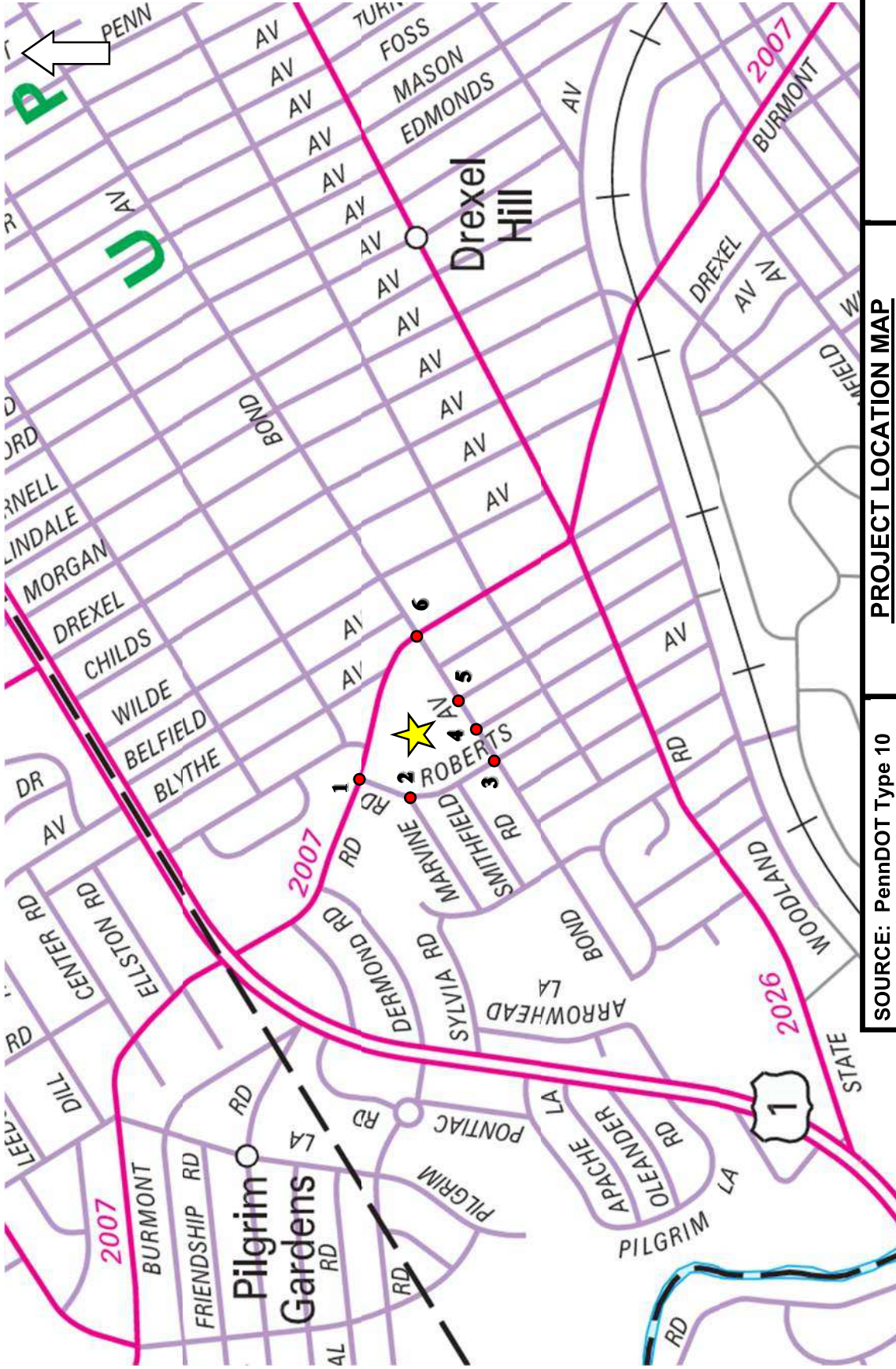
Recommendations

The *Greening of Student Pick-Ups at School Dismissal*, a 2010 TexITE Technical Paper recommends 6% of the total enrollment of students as a recommended on-site stacking length for the parent drop-off/pick-up zone for an elementary school. Based on the maximum student enrollment of 700, it is recommended to provide 840 feet of on-site stacking length for the parent drop-off/pick-up zone.

At the intersection of Marvine Avenue and Roberts Avenue / Northern School Driveway, Install one-way and do not enter signs at the proposed Site Driveway to restrict traffic to one-way outbound, and install a stop sign to emphasize the all-way stop condition at the intersection.

At the intersection of Bond Avenue and Anderson Avenue / Southern School Driveway, install one-way and do not enter signs at the Site Driveway to restrict traffic to one-way inbound. Additionally, the proposed enter-only driveway will be one-way northbound and Anderson Avenue is currently one-way southbound, which eliminates conflicting traffic movements onto Bond Avenue. Consider the removal of the stop signs along Bond Avenue.

Design the proposed bus loop accesses along Burmont Road in accordance with PennDOT Highway Occupancy Permit guidelines and provide signage to restrict traffic to one-way.



PROJECT LOCATION MAP

Figure 1

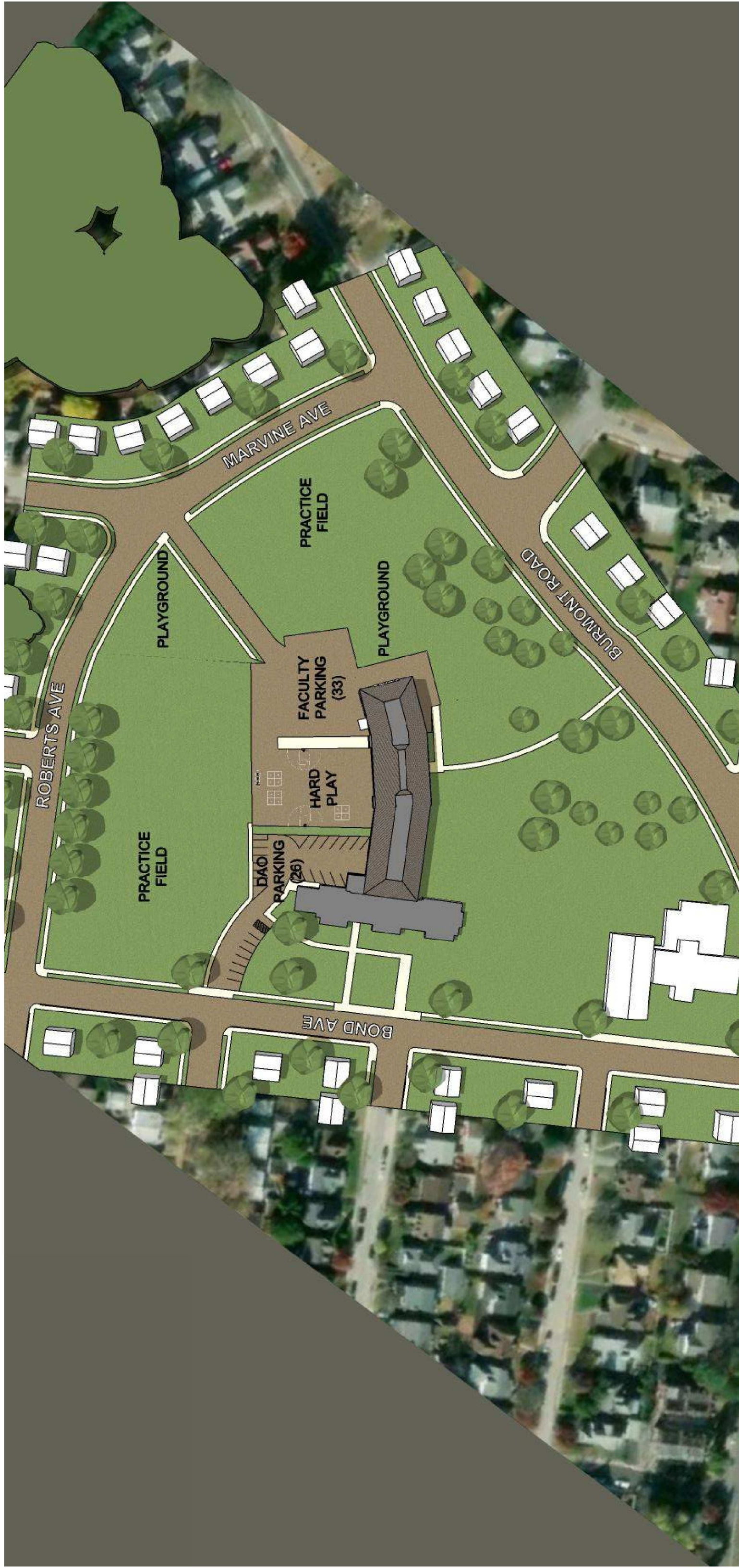
Aronimink Elementary School TIS
 Upper Darby Township
 DELEWARE COUNTY, PA

SOURCE: PennDOT Type 10

JOB NO.: UDSDX19001
 SCALE: NOT TO SCALE

DRAWN BY : AMR
 REVIEWED BY : PFW

- Study Intersection
- ★ Site Location



Aronimink Elementary School

Existing Site Plan



FIGURE 2

SITE INFORMATION:

ADDRESS: 4611 BOND AVENUE
DREXEL HILL, PA 19026

CLIENT: UPPER DARBY SCHOOL DISTRICT
4611 BOND AVENUE
DREXEL HILL, PA 19026

ENGINEER: PENNONI
JASON SHERIDAN, PE
1900 MARKET STREET, SUITE 300
PHILADELPHIA, PA 19103

ZONING REQUIREMENTS - R-1 RESIDENTIAL DISTRICT

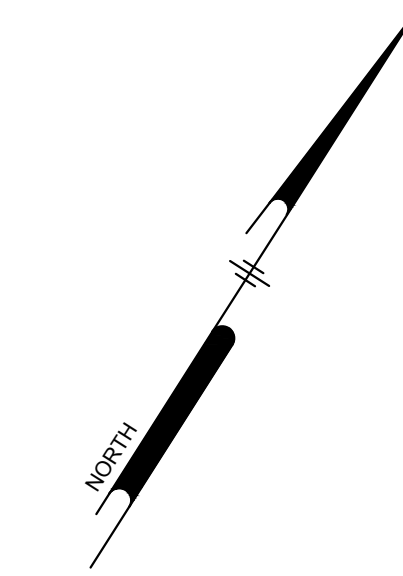
UPPER DARBY TOWNSHIP ZONING CODE - CHAPTER 404				
PROPOSED DEVELOPMENT AREA: 398,894 SF (9.16 ACRES)				
SECTION	USE REGULATIONS	REQUIRED/ALLOWABLE	EXISTING	PROPOSED
301		PUBLIC SCHOOL, COLLEGE, OR UNIVERSITY	PUBLIC SCHOOL	NO CHANGE
401	MINIMUM LOT SIZE	6,500 SF	398,894 SF	NO CHANGE
	MINIMUM STREET FRONTAGE	35 FT	646 FT	NO CHANGE
	MINIMUM LOT WIDTH AT BUILDING LINE	65 FT	630.19 FT	630.19 FT
	MINIMUM FRONT YARD	25 FT	100.7 FT	NO CHANGE
	MINIMUM SIDE YARD	25 FT AGGREGATE, 10 FT MIN	189.0 FT	134.1'
	MINIMUM REAR YARD	20 FT	289.1 FT	134.1 FT
	MAXIMUM BUILDING HEIGHT	35 FT	35 FT	35 FT
	MAXIMUM BUILDING COVERAGE	30%	6.2%	10.4%

PARKING REQUIREMENTS

USE	REQUIRED ALLOWABLE	EXISTING	PROPOSED
SCHOOL	3 SPACES / 1 CLASSROOM (34 CLASSROOMS x 3 SPACES = 102 REQUIRED)	66 SPACES	119 SPACES

LOADING REQUIREMENTS

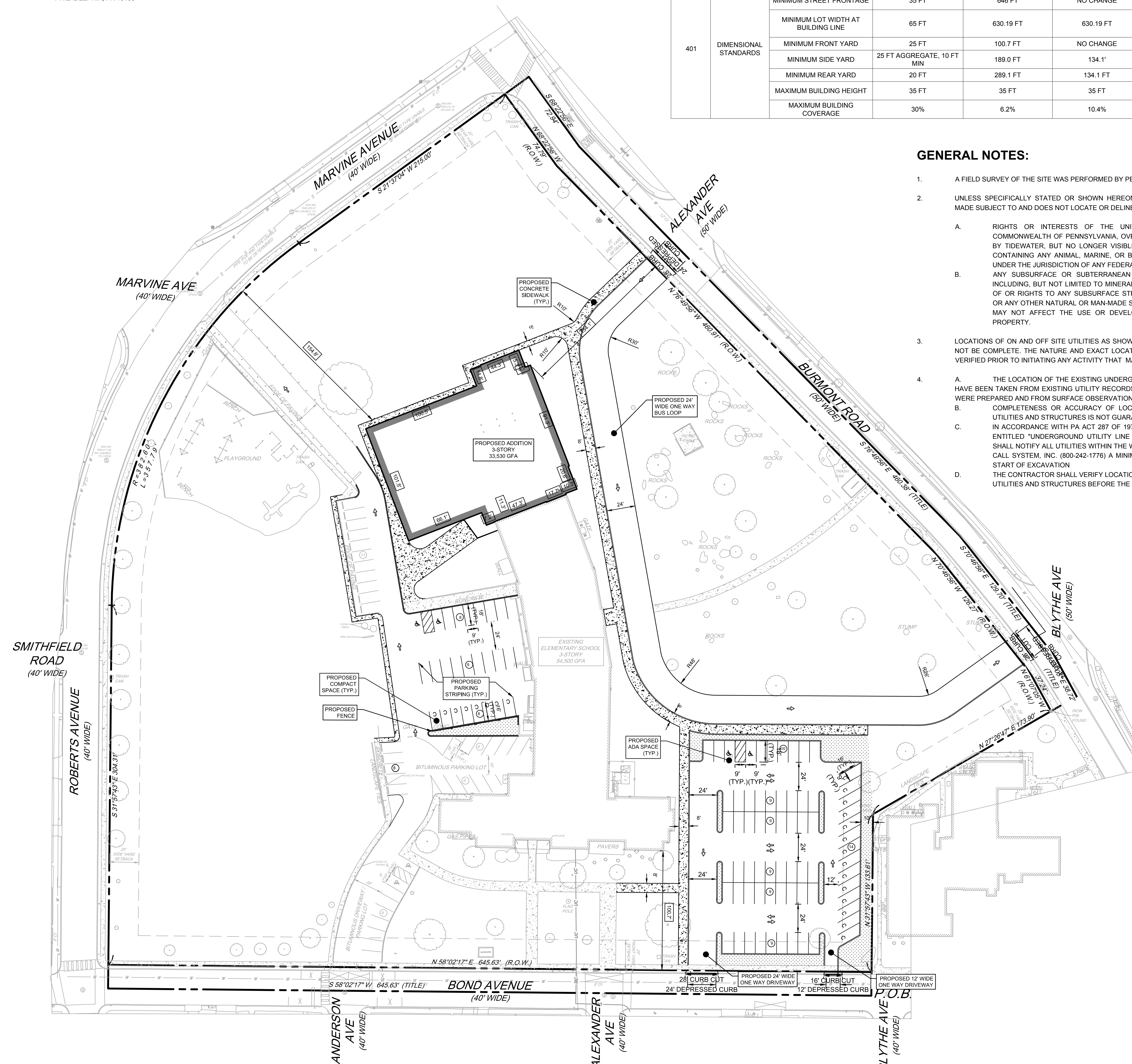
USE	REQUIRED ALLOWABLE	PROPOSED
SCHOOL	MINIMUM 1 SPACE (14' WIDE X 50' LONG)	1 SPACE



GENERAL NOTES:

- A FIELD SURVEY OF THE SITE WAS PERFORMED BY PENNONI ASSOCIATES ON APRIL 29, 2019.
- UNLESS SPECIFICALLY STATED OR SHOWN HEREON TO THE CONTRARY, THIS SURVEY IS MADE SUBJECT TO AND DOES NOT LOCATE OR DELINEATE:
 - RIGHTS OR INTERESTS OF THE UNITED STATES OF AMERICA OR THE COMMONWEALTH OF PENNSYLVANIA, OVER LANDS NOW OR FORMERLY FLOWED BY TIDEWATER, BUT NO LONGER VISIBLE OR PHYSICALLY EVIDENT, OR LANDS CONTAINING ANY ANIMAL, MARINE, OR BOTANICAL SPECIES REGULATED BY OR UNDER THE JURISDICTION OF ANY FEDERAL, STATE, OR LOCAL AGENCY.
 - ANY SUBSURFACE OR SUBTERRANEAN CONDITION, EASEMENTS OR RIGHTS, INCLUDING, BUT NOT LIMITED TO MINERAL OR MINING RIGHTS, OR THE LOCATION OF OR RIGHTS TO ANY SUBSURFACE STRUCTURES, CONTAINERS OR FACILITIES OR ANY OTHER NATURAL OR MAN-MADE SUBSURFACE CONDITION WHICH MAY OR MAY NOT AFFECT THE USE OR DEVELOPMENT POTENTIAL OF THE SUBJECT PROPERTY.
- LOCATIONS OF ON AND OFF SITE UTILITIES AS SHOWN ARE APPROXIMATE AND MAY OR MAY NOT BE COMPLETE. THE NATURE AND EXACT LOCATION OF EXISTING UTILITIES SHOULD BE VERIFIED PRIOR TO INITIATING ANY ACTIVITY THAT MAY AFFECT THEIR USE OR LOCATION.
- THE LOCATION OF THE EXISTING UNDERGROUND UTILITIES SHOWN ON THIS PLAN HAVE BEEN TAKEN FROM EXISTING UTILITY RECORDS AVAILABLE AT THE TIME THESE PLANS WERE PREPARED AND FROM SURFACE OBSERVATION OF THE SITE.
 - COMPLETENESS OR ACCURACY OF LOCATION AND DEPTH OF UNDERGROUND UTILITIES AND STRUCTURES IS NOT GUARANTEED.
 - IN ACCORDANCE WITH PA ACT 287 OF 1974 AS AMENDED BY PA ACT 121 OF 2008 ENTITLED "UNDERGROUND UTILITY LINE PROTECTION LAW". THE CONTRACTOR SHALL NOTIFY ALL UTILITIES WITHIN THE WORK AREA VIA THE PENNSYLVANIA ONE CALL SYSTEM, INC. (800-242-1776) A MINIMUM OF 3 WORKING DAYS BEFORE THE START OF EXCAVATION.
 - THE CONTRACTOR SHALL VERIFY LOCATIONS AND DEPTHS OF ALL UNDERGROUND UTILITIES AND STRUCTURES BEFORE THE START OF WORK.

- THIS SITE IS CURRENTLY ZONED IN THE R-1 RESIDENTIAL DISTRICT.
- REFERENCE IS MADE TO PENNSYLVANIA ONE CALL SYSTEM, ASSIGNED SERIAL NUMBER 20191162180 IN ACCORDANCE WITH PA ACT 287 OF 1974 AS AMENDED BY PA ACT 121 OF 2008 ENTITLED "UNDERGROUND UTILITY LINE PROTECTION LAW" (800-242-1776)
- THIS PLAN WAS PREPARED IN ACCORDANCE WITH INSTRUCTIONS OF THE CLIENT.
- VERTICAL DATUM IS BASED ON NAVD 1988.
- HORIZONTAL COORDINATE DATUM IS IN PENNSYLVANIA STATE PLANE COORDINATE SYSTEM SOUTH ZONE, NORTH AMERICAN DATUM 1983 BASED ON GPS OBSERVATION.
- BENCHMARK: NJIT - LEICA SMARTNET VIA GPS OBSERVATION
- PROPERTY BOUNDARY INFORMATION OBTAINED FROM DEED PLOTS PERFORMED BY PENNONI ASSOCIATES ON MAY 13, 2019.
- THE SITE IS SERVED BY PUBLIC SEWER (DELCORA).
- THE SITE IS SERVED BY PUBLIC WATER (AQUA PA).
- A PENNDOT HOP PERMIT IS REQUIRED FOR THE SITE IMPROVEMENTS WITHIN THE ROW.
- THE PROPOSED USES ARE PUBLIC SCHOOL AND ACTIVE RECREATION. THE SPRINGFIELD TOWNSHIP AND CLIFTON HEIGHTS BOROUGH JOINT COMPREHENSIVE PLAN DATED JANUARY 2007 INDICATES A LAND USE OF OPEN SPACE.



EXISTING

- SANITARY SEWER MANHOLE
- SANITARY SEWER
- STORM SEWER MANHOLE
- STORM SEWER
- STORM SEWER INLET
- OVERHEAD COMMUNICATION LINE
- UNDERGROUND POWER LINE
- LIGHT POLE
- UTILITY POLE
- POWER MANHOLE
- ELECTRICAL EQUIPMENT
- WATER PIPE
- WATER VALVE
- MONITORING WELL
- HYDRANT
- GAS VALVE
- TELECOMM MANHOLE
- UNIDENTIFIED MANHOLE
- SIGN
- BOLLARD
- GUARD RAIL
- GUARD RAIL
- WALL
- JUNCTION BOX
- HVAC STRUCTURE
- FLAG POLE
- PROPERTY LINE
- RIGHT OF WAY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING BUILDING OUTLINE
- EXISTING TREES
- EXISTING CURB
- EXISTING SIDEWALK
- ADJACENT PROPERTY LINE
- SETBACK LINE
- SOILS BOUNDARY
- EXISTING GRADES 20%-25%
- EXISTING GRADES 25% OR GREATER

PROPOSED

- CURB LINE
- PROPERTY LINE
- RETAINING WALL
- SIDEWALK
- BUILDING OUTLINE
- DEPRESSED CURB
- SIGN
- PROPOSED MONUMENT
- PROPOSED IRON PIN
- BUILDING OVERHANG
- PROPOSED WALL
- PROPOSED LANDSCAPE AREA
- PROPOSED BIORETENTION/RAIN GARDEN
- PROPOSED CONTOUR
- 240 PROPOSED INDEX CONTOUR
- 244.82 PROPOSED SPOT ELEVATION
- PROPOSED DRAINAGE MANHOLE
- PROPOSED INLET

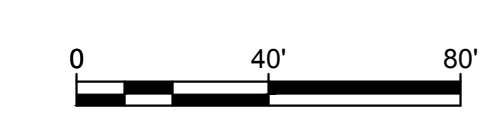
BOROUGH SIGNATURES
APPROVED BY THE BOROUGH COUNCIL OF THE BOROUGH OF CLIFTON HEIGHTS
THIS _____ DAY OF _____ 20____

ATTEST SECRETARY

OWNER/DEVELOPER'S CERTIFICATION
COMMONWEALTH OF PENNSYLVANIA COUNTY OF DELAWARE
ON THE _____ DAY OF _____ A.D. 20____ BEFORE ME,
THE SUBSCRIBER, A NOTARY PUBLIC OF THE COMMONWEALTH OF PENNSYLVANIA,
RESIDING IN _____ PERSONALLY APPEARED
_____, (NAME OF OFFICER OF THE CORPORATION), WHO
ACKNOWLEDGED (HIMSELF/HERSELF) TO BE THE (PRESIDENT OR SECRETARY), BEING
AUTHORIZED TO DO SO, (HE/SHE) EXECUTED THE FOREGOING PLAN BY SIGNING THAT
SAID CORPORATION IS THE OWNER OF THE DESIGNATED LAND, THAT ALL NECESSARY
APPROVAL OF THE PLAN HAS BEEN OBTAINED AND IS ENDORSED THEREON AND THAT
SAID CORPORATION DESIRES THAT THE FOREGOING PLAN MAY BE DULY RECORDED.

NOTARY PUBLIC _____ MY COMMISSION EXPIRES _____

ENGINEER CERTIFICATION:
I, _____ ON THIS DATE _____
HEREBY CERTIFY THAT THIS SITE PLAN MEETS THE DELAWARE COUNTY
SUBDIVISION AND LAND DEVELOPMENT ORDINANCE.



ISSUED FOR: PRELIMINARY LAND DEVELOPMENT SUBMISSION

ARONIMINK ELEMENTARY SCHOOL
RENOVATIONS AND ADDITION
FOR THE
UPPER DARBY SCHOOL DISTRICT
TOWNSHIP OF DREXEL HILL DELAWARE COUNTY, PA

REVISIONS	DATE	DESCRIPTION

SITE PLAN	
JOB NO.	UDSDX19001
DATE	08.20.2019
DWN. BY	HB
SHEET NO.	1 OF 1

PDE #xxxx

KCSA Architects
Eight East Broad Street
Harrisburg, PA
F 215-368-5866
kcsa-architects.com

kcb Architects

CONSULTANTS

Pennonni

PENNONI ASSOCIATES INC.
1900 Market Street, Suite 300
Philadelphia, PA 19103
T 215-222-3300 F 215-222-3588

FIGURE 3
NOT FOR CONSTRUCTION

I:\Projects\2019\201908\20190801 - Aronimink Elementary School\ARONIMINK_SCHETS\20190801.dwg PLOTTED: 2020/08/15 09:51 AM BY: Holly Binko PLOTFILE: Pennoni\NSL.B PROJECT STATUS: —



Aronimink Elementary School TIS

Table 1

Level of Service Summary (HCM Results)

Time Period:	Weekday AM Peak Hour		Done By: AMR		Chkd By: PFW			
Intersection	Approach	Direction / Movement	2019 Existing		2024 / 2029 No-Build		2024 / 2029 Build	
			Delay	LOS	Delay	LOS	Delay	LOS
1) Burmont Road (SR 2007) and Marvine Avenue	Burmout Road (SR 2007)	EB Through	0.0	A	0.0	A	0.0	A
		EB Right Turn						
		Approach						
	Burmout Road (SR 2007)	WB Left Turn	0.0	A	0.0	A	0.1	A
		WB Through						
		Approach						
	Marvine Avenue	NB Left Turn	15.8	C	15.8	C	19.4	C
		NB Right Turn						
		Approach						
	Intersection			2.5	A	2.5	A	5.0
2) Marvine Avenue and Roberts Avenue / Driveway 1	Marvine Avenue	EB Left Turn	7.7	A	7.7	A	7.3	A
		EB Through						
		EB Right Turn						
		Approach						
	Driveway 1	WB Left Turn	7.0	A	7.0	A	8.4	A
		WB Through						
		WB Right Turn						
		Approach						
	Roberts Avenue	NB Left Turn	7.5	A	7.5	A	8.0	A
		NB Through						
		NB Right Turn						
		Approach						
	Marvine Avenue	SB Left Turn	7.9	A	7.9	A	8.0	A
		SB Through						
		SB Right Turn						
Approach								
Intersection			7.6	A	7.6	A	8.2	A
3) Bond Avenue and Roberts Avenue	Bond Avenue	EB Left Turn	7.6	A	7.6	A	7.9	A
		EB Through						
		EB Right Turn						
		Approach						
	Bond Avenue	WB Left Turn	7.1	A	7.1	A	7.3	A
		WB Through						
		WB Right Turn						
		Approach						
	Roberts Avenue	NB Left Turn	7.4	A	7.4	A	7.3	A
		NB Through						
		NB Right Turn						
		Approach						
	Roberts Avenue	SB Left Turn	7.3	A	7.3	A	7.9	A
		SB Through						
		SB Right Turn						
Approach								
Intersection			7.4	A	7.4	A	7.7	A



Aronimink Elementary School TIS

Table 1

Level of Service Summary (HCM Results)

Time Period:	Weekday AM Peak Hour		Done By: AMR		Chkd By: PFW			
Intersection	Approach	Direction / Movement	2019 Existing		2024 / 2029 No-Build		2024 / 2029 Build	
			Delay	LOS	Delay	LOS	Delay	LOS
4) Bond Avenue and Anderson Avenue / Driveway 2	Bond Avenue	EB Left Turn	7.2	A	7.2	A	5.0	A
		EB Through						
		EB Right Turn						
		Approach	7.2	A	7.2	A	5.0	A
	Bond Avenue	WB Left Turn	7.1	A	7.1	A	5.0	A
		WB Through						
		WB Right Turn						
		Approach	7.1	A	7.1	A	5.0	A
	Driveway 2	SB Left Turn	6.8	A	6.8	A	0.0	A
		SB Through						
		SB Right Turn						
		Approach	6.8	A	6.8	A	0.0	A
	Intersection			7.1	A	7.1	A	5.0
5) Bond Avenue and Alexander Avenue	Bond Avenue	EB Through	7.2	A	7.2	A	7.1	A
		EB Right Turn						
		Approach						
	Bond Avenue	WB Left Turn	7.3	A	7.3	A	8.1	A
		WB Through						
		Approach						
	Alexander Avenue	NB Left Turn	6.8	A	6.8	A	7.1	A
		NB Right Turn						
		Approach						
	Intersection			7.1	A	7.1	A	7.9
6) Burmont Road (SR 2007) and Bond Avenue	Bond Avenue	EB Left Turn	14.8	B	14.8	B	24.6	C
		EB Through						
		EB Right Turn						
		Approach	14.8	B	14.8	B	24.6	C
	Bond Avenue	WB Left Turn	11.8	B	11.8	B	17.1	C
		WB Through						
		WB Right Turn						
		Approach	11.8	B	11.8	B	17.1	C
	Burmont Road (SR 2007)	NB Left Turn	0.4	A	3.4	A	1.9	A
		NB Through						
		NB Right Turn						
		Approach	0.4	A	0.4	A	1.9	A
	Burmont Road (SR 2007)	SB Left Turn	0.3	A	0.3	A	0.4	A
		SB Through						
SB Right Turn								
Approach		0.3	A	0.3	A	0.4	A	
Intersection			3.2	A	3.2	A	4.9	A



Aronimink Elementary School TIS

Table 1

Level of Service Summary (HCM Results)

Time Period:	Weekday PM Peak Hour		Done By: AMR		Chkd By: PFW			
Intersection	Approach	Direction / Movement	2019 Existing		2024 / 2029 No-Build		2024 / 2029 Build	
			Delay	LOS	Delay	LOS	Delay	LOS
1) Burmont Road (SR 2007) and Marvine Avenue	Burmont Road (SR 2007)	EB Through	0.0	A	0.0	A	0.0	A
		EB Right Turn						
		Approach						
	Burmont Road (SR 2007)	WB Left Turn	0.7	A	0.7	A	0.1	A
		WB Through						
		Approach						
	Marvine Avenue	NB Left Turn	17.4	C	17.4	C	16.1	C
		NB Right Turn						
		Approach						
Intersection			2.1	A	2.1	A	2.3	A
2) Marvine Avenue and Roberts Avenue / Driveway 1	Marvine Avenue	EB Left Turn	7.2	A	7.2	A	7.1	A
		EB Through						
		EB Right Turn						
		Approach						
	Driveway 1	WB Left Turn	7.1	A	7.1	A	7.6	A
		WB Through						
		WB Right Turn						
		Approach						
	Roberts Avenue	NB Left Turn	7.3	A	7.3	A	7.7	F
		NB Through						
		NB Right Turn						
		Approach						
	Marvine Avenue	SB Left Turn	7.4	A	7.4	A	7.6	A
		SB Through						
		SB Right Turn						
Approach								
Intersection			7.3	A	7.3	A	7.6	A
3) Bond Avenue and Roberts Avenue	Bond Avenue	EB Left Turn	7.4	A	7.4	A	7.6	A
		EB Through						
		EB Right Turn						
		Approach						
	Bond Avenue	WB Left Turn	7.1	A	7.1	A	7.2	A
		WB Through						
		WB Right Turn						
		Approach						
	Roberts Avenue	NB Left Turn	7.1	A	7.1	A	7.0	A
		NB Through						
		NB Right Turn						
		Approach						
	Roberts Avenue	SB Left Turn	7.4	A	7.4	A	7.7	A
		SB Through						
		SB Right Turn						
Approach								
Intersection			7.3	A	7.3	A	7.5	A



Aronimink Elementary School TIS

Table 1

Level of Service Summary (HCM Results)

Time Period:	Weekday PM Peak Hour		Done By: AMR		Chkd By: PFW			
Intersection	Approach	Direction / Movement	2019 Existing		2024 / 2029 No-Build		2024 / 2029 Build	
			Delay	LOS	Delay	LOS	Delay	LOS
			4) Bond Avenue and Anderson Avenue / Driveway 2	Bond Avenue	EB Left Turn	7.2	A	7.2
EB Through								
EB Right Turn								
Approach	7.2	A			7.2	A	5.0	A
Bond Avenue	WB Left Turn	7.2		A	7.2	A	5.0	A
	WB Through							
	WB Right Turn							
	Approach	7.2		A	7.2	A	5.0	A
Driveway 2	SB Left Turn	7.0		A	7.0	A	0.0	A
	SB Through							
	SB Right Turn							
	Approach	7.0		A	7.0	A	0.0	A
Intersection				7.2	A	7.2	A	5.0
5) Bond Avenue and Alexander Avenue	Bond Avenue	EB Through	7.2	A	7.2	A	7.2	A
		EB Right Turn						
		Approach						
	Bond Avenue	WB Left Turn	7.2	A	7.2	A	7.5	A
		WB Through						
		Approach						
	Alexander Avenue	NB Left Turn	6.6	A	6.6	A	6.7	A
		NB Right Turn						
		Approach						
	Intersection			7.0	A	7.0	A	7.3
6) Burmont Road (SR 2007) and Bond Avenue	Bond Avenue	EB Left Turn	14.4	B	14.4	B	17.2	C
		EB Through						
		EB Right Turn						
		Approach	14.4	B	14.4	B	17.2	C
	Bond Avenue	WB Left Turn	12.1	B	12.1	B	14.0	B
		WB Through						
		WB Right Turn						
		Approach	12.1	B	12.1	B	14.0	B
	Burmont Road (SR 2007)	NB Left Turn	0.2	A	0.2	A	1.1	A
		NB Through						
		NB Right Turn						
		Approach	0.2	A	0.2	A	1.1	A
	Burmont Road (SR 2007)	SB Left Turn	0.3	A	0.3	A	0.4	A
		SB Through						
SB Right Turn								
Approach		0.3	A	0.3	A	0.4	A	
Intersection			2.4	A	2.4	A	2.9	A



Aronimink Elementary School TIS

Table 2

AM Peak Hour 95th Percentile Queue Results

Time Period:	Weekday AM Peak Hour		Done By: AMR						
			Chkd By: PFW						
Intersection	Approach	Direction / Movement	Storage Length ¹	2019 Existing		2024 / 2029 No-Build		2024 / 2029 Build	
			Existing/Proposed (Feet)	HCM (Vehicles)	HCM (Feet)	HCM (Vehicles)	HCM (Feet)	HCM (Vehicles)	HCM (Feet)
1) Burmont Road (SR 2007) and Marvine Avenue	Burmont Road (SR 2007)	EB Through	750	0	0	0	0	0	0
		EB Right Turn							
	Burmont Road (SR 2007)	WB Left Turn	225	0.1	2.5	0.1	2.5	0	0
		WB Through							
	Marvine Avenue	NB Left Turn	350	1	25	1	25	2.7	67.5
NB Right Turn									
2) Marvine Avenue and Roberts Avenue / Driveway 1	Marvine Avenue	EB Left Turn	775	0.1	2.5	0.1	2.5	0.2	5
		EB Through							
		EB Right Turn							
	Driveway 1	WB Left Turn	175	0.1	2.5	0.1	2.5	1.2	30
		WB Through							
		WB Right Turn							
	Roberts Avenue	NB Left Turn	275	0.4	10	0.4	10	0.3	7.5
		NB Through							
		NB Right Turn							
	Marvine Avenue	SB Left Turn	350	0.4	10	0.4	10	0.3	7.5
SB Through									
SB Right Turn									
3) Bond Avenue and Roberts Avenue	Bond Avenue	EB Left Turn	200	0.2	5	0.2	5	0.3	7.5
		EB Through							
		EB Right Turn							
	Bond Avenue	WB Left Turn	175	0.2	5	0.2	5	0.1	2.5
		WB Through							
		WB Right Turn							
	Roberts Avenue	NB Left Turn	450	0.2	5	0.2	5	0.3	7.5
		NB Through							
		NB Right Turn							
	Roberts Avenue	SB Left Turn	250	0.2	5	0.2	5	0.5	12.5
SB Through									
SB Right Turn									



Aronimink Elementary School TIS

Table 2

AM Peak Hour 95th Percentile Queue Results

Time Period:	Weekday AM Peak Hour		Done By: AMR Chkd By: PFW						
			Intersection	Approach	Direction / Movement	Storage Length ¹	2019 Existing		2024 / 2029 No-Build
Existing/Proposed (Feet)	HCM (Vehicles)	HCM (Feet)				HCM (Vehicles)	HCM (Feet)	HCM (Vehicles)	HCM (Feet)
4) Bond Avenue and Anderson Avenue / Driveway 2	Bond Avenue	EB Left Turn	175	0.2	5	0.2	5	0	0
		EB Through							
		EB Right Turn							
	Bond Avenue	WB Left Turn	175	0.2	5	0.2	5	0	0
		WB Through							
		WB Right Turn							
	Driveway 2	SB Left Turn	125	0	0	0	0	0	0
		SB Through							
		SB Right Turn							
5) Bond Avenue and Alexander Avenue	Bond Avenue	EB Through	175	0.1	2.5	0.1	2.5	0	0
		EB Right Turn							
	Bond Avenue	WB Left Turn	200	0.2	5	0.2	5	0.8	20
		WB Through							
	Alexander Avenue	NB Left Turn	450	0.1	2.5	0.1	2.5	0.1	2.5
		NB Right Turn							
6) Burmont Road (SR 2007) and Bond Avenue	Bond Avenue	EB Left Turn	200	0.5	12.5	0.5	12.5	0.7	17.5
		EB Through							
		EB Right Turn							
	Bond Avenue	WB Left Turn	125	0.5	12.5	0.5	12.5	1.3	32.5
		WB Through							
		WB Right Turn							
	Burmout Road (SR 2007)	NB Left Turn	450	0	0	0	0	0.2	5
		NB Through							
		NB Right Turn							
	Burmout Road (SR 2007)	SB Left Turn	275	0	0	0	0	0	0
		SB Through							
		SB Right Turn							

¹For through movements, the distance is measured to the nearest intersection or major driveway.



Aronimink Elementary School TIS

Table 2

AM Peak Hour 95th Percentile Queue Results

Time Period:	Weekday PM Peak Hour		Done By: AMR						
			Chkd By: PFW						
Intersection	Approach	Direction / Movement	Storage Length ¹	2019 Existing		2024 / 2029 No-Build		2024 / 2029 Build	
			Existing/Proposed (Feet)	HCM (Vehicles)	HCM (Feet)	HCM (Vehicles)	HCM (Feet)	HCM (Vehicles)	HCM (Feet)
1) Burmont Road (SR 2007) and Marvine Avenue	Burmont Road (SR 2007)	EB Through	750	0	0	0	0	0	0
		EB Right Turn							
	Burmont Road (SR 2007)	WB Left Turn	225	0.1	2.5	0.1	2.5	0	0
		WB Through							
	Marvine Avenue	NB Left Turn	350	0.9	22.5	0.9	22.5	1.2	30
		NB Right Turn							
2) Marvine Avenue and Roberts Avenue / Driveway 1	Marvine Avenue	EB Left Turn	775	0.1	2.5	0.1	2.5	0.1	2.5
		EB Through							
		EB Right Turn							
	Driveway 1	WB Left Turn	175	0.1	2.5	0.1	2.5	0.6	15
		WB Through							
		WB Right Turn							
	Roberts Avenue	NB Left Turn	275	0.2	5	0.2	5	0.2	5
		NB Through							
		NB Right Turn							
	Marvine Avenue	SB Left Turn	350	0.3	7.5	0.3	7.5	0.3	7.5
SB Through									
SB Right Turn									
3) Bond Avenue and Roberts Avenue	Bond Avenue	EB Left Turn	200	0.1	2.5	0.2	5	0.2	5
		EB Through							
		EB Right Turn							
	Bond Avenue	WB Left Turn	175	0.1	2.5	0.1	2.5	0.1	2.5
		WB Through							
		WB Right Turn							
	Roberts Avenue	NB Left Turn	450	0.1	2.5	0.1	2.5	0.2	5
		NB Through							
		NB Right Turn							
	Roberts Avenue	SB Left Turn	250	0.3	7.5	0.3	7.5	0.4	10
SB Through									
SB Right Turn									



Aronimink Elementary School TIS

Table 2

AM Peak Hour 95th Percentile Queue Results

Time Period:	Weekday PM Peak Hour		Done By: AMR						
			Chkd By: PFW						
Intersection	Approach	Direction / Movement	Storage Length ¹	2019 Existing		2024 / 2029 No-Build		2024 / 2029 Build	
			Existing/Proposed (Feet)	HCM (Vehicles)	HCM (Feet)	HCM (Vehicles)	HCM (Feet)	HCM (Vehicles)	HCM (Feet)
4) Bond Avenue and Anderson Avenue / Driveway 2	Bond Avenue	EB Left Turn	175	0.1	2.5	0.1	2.5	0	0
		EB Through							
		EB Right Turn							
	Bond Avenue	WB Left Turn	175	0.2	5	0.2	5	0	0
		WB Through							
		WB Right Turn							
	Driveway 2	SB Left Turn	125	0.1	2.5	0.1	2.5	0	0
		SB Through							
		SB Right Turn							
5) Bond Avenue and Alexander Avenue	Bond Avenue	EB Through	175	0.2	5	0.2	5	0.1	2.5
		EB Right Turn							
	Bond Avenue	WB Left Turn	200	0.1	2.5	0.1	2.5	0.4	10
		WB Through							
	Alexander Avenue	NB Left Turn	450	0.1	2.5	0.1	2.5	0.1	2.5
		NB Right Turn							
6) Burmont Road (SR 2007) and Bond Avenue	Bond Avenue	EB Left Turn	200	0.4	10	0.4	10	0.4	10
		EB Through							
		EB Right Turn							
	Bond Avenue	WB Left Turn	125	0.4	10	0.4	10	0.6	15
		WB Through							
		WB Right Turn							
	Burmout Road (SR 2007)	NB Left Turn	450	0	0	0	0	0.1	2.5
		NB Through							
		NB Right Turn							
	Burmout Road (SR 2007)	SB Left Turn	275	0	0	0	0	0	0
		SB Through							
		SB Right Turn							

¹ For through movements, the distance is measured to the nearest intersection or major driveway.

STUDY AND ANALYSIS INFORMATION

Municipality:	Upper Darby Township	Analysis Date:	9/3/2019
County:	Delaware County	Conducted By:	PFW
PennDOT Engineering District:	6	Agency/Company Name:	Pennonni

Analysis Information

Data Collection Date:	4/25/2019
Day of the Week:	Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population?

Major Street Information

Major Street Name and Route Number:	Burmont Road (SR 2007)		
Major Street Approach #1 Direction:	N-Bound		
Major Street Approach #2 Direction:	S-Bound		

Number of Lanes for Moving Traffic on Each Major Street Approach:	1	LANE(S)
Speed Limit or 85th Percentile Speed on the Major Street:	30	MPH

Minor Street Information

Minor Street Name and Route Number:	Bond Avenue		
Minor Street Approach #1 Direction:	E-Bound		
Minor Street Approach #2 Direction:	W-Bound		

Number of Lanes for Moving Traffic on Each Minor Street Approach: LANE(S)

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Met?
Warrant 1, Eight-Hour Vehicular Volume	Yes	No
Warrant 2, Four-Hour Vehicular Volume	Yes	No
Warrant 3, Peak Hour	Yes	No
Warrant 4, Pedestrian Volume	Yes	No
Warrant 5, School Crossing	Yes	No
Warrant 6, Coordinated Signal System	No	N/A
Warrant 7, Crash Experience	Yes	No
Warrant 8, Roadway Network	No	N/A
Warrant 9, Intersection Near a Grade Crossing	No	N/A
Warrant PA-1, ADT Volume Warrant	Yes	No
Warrant PA-2, Midblock and Trail Crossings	No	N/A

MUTCD 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
--	----

Combination of Conditions A and B Necessary?*: Yes

**Only applicable for Warrant 1 if after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems. See Section 4C.02 of the 2009 MUTCD for application.*

Condition A - Minimum Vehicular Volume									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or More	1	600	480	420	336	150	120	105	84
2 or More	2 or More	600	480	420	336	200	160	140	112
1	2 or More	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or More	1	900	720	630	504	75	60	53	42
2 or More	2 or More	900	720	630	504	100	80	70	56
1	2 or More	750	600	525	420	100	80	70	56

Condition A Evaluation

Number of Unique Hours Met: N/A Condition A Satisfied? N/A

Condition B Evaluation

Number of Unique Hours Met: N/A Condition B Satisfied? N/A

Combination of Condition A and Condition B Evaluation

Number of Unique Hours Met for Condition A: 0

Number of Unique Hours Met for Condition B: 2

Combination of Condition A and Condition B Satisfied? No

MUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

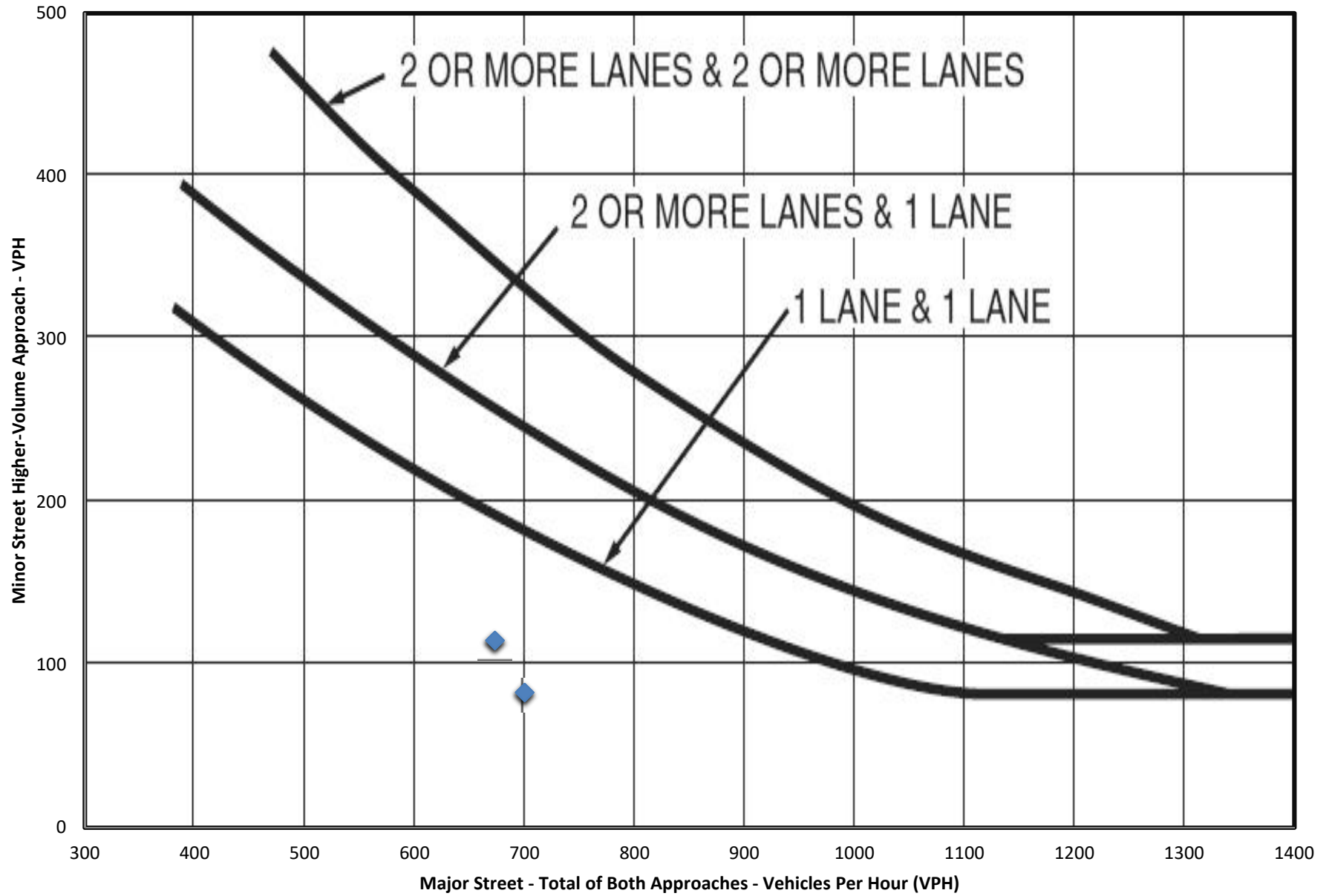
Total Number of Unique Hours Met On Figure 4C-1
0

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No
---	----

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
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	
1:45 AM	0	0	
2:00 AM	0	0	
2:15 AM	0	0	
2:30 AM	0	0	
2:45 AM	0	0	
3:00 AM	0	0	
3:15 AM	0	0	
3:30 AM	0	0	
3:45 AM	0	0	
4:00 AM	0	0	
4:15 AM	0	0	
4:30 AM	0	0	
4:45 AM	0	0	
5:00 AM	0	0	
5:15 AM	0	0	
5:30 AM	0	0	
5:45 AM	0	0	
6:00 AM	0	0	
6:15 AM	0	0	
6:30 AM	0	0	
6:45 AM	0	0	
7:00 AM	0	0	
7:15 AM	673	115	
7:30 AM	673	115	
7:45 AM	673	115	
8:00 AM	673	115	
8:15 AM	0	0	
8:30 AM	0	0	
8:45 AM	0	0	
9:00 AM	0	0	
9:15 AM	0	0	
9:30 AM	0	0	
9:45 AM	0	0	
10:00 AM	0	0	
10:15 AM	0	0	
10:30 AM	0	0	
10:45 AM	0	0	
11:00 AM	0	0	
11:15 AM	0	0	
11:30 AM	0	0	
11:45 AM	0	0	

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
12:00 PM	0	0	
12:15 PM	0	0	
12:30 PM	0	0	
12:45 PM	0	0	
1:00 PM	0	0	
1:15 PM	0	0	
1:30 PM	0	0	
1:45 PM	0	0	
2:00 PM	0	0	
2:15 PM	0	0	
2:30 PM	0	0	
2:45 PM	0	0	
3:00 PM	700	83	
3:15 PM	700	83	
3:30 PM	700	83	
3:45 PM	700	83	
4:00 PM	0	0	
4:15 PM	0	0	
4:30 PM	0	0	
4:45 PM	0	0	
5:00 PM	0	0	
5:15 PM	0	0	
5:30 PM	0	0	
5:45 PM	0	0	
6:00 PM	0	0	
6:15 PM	0	0	
6:30 PM	0	0	
6:45 PM	0	0	
7:00 PM	0	0	
7:15 PM	0	0	
7:30 PM	0	0	
7:45 PM	0	0	
8:00 PM	0	0	
8:15 PM	0	0	
8:30 PM	0	0	
8:45 PM	0	0	
9:00 PM	0	0	
9:15 PM	0	0	
9:30 PM	0	0	
9:45 PM	0	0	
10:00 PM	0	0	
10:15 PM	0	0	
10:30 PM	0	0	
10:45 PM	0	0	
11:00 PM	0	0	

MUTCD Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



Abhishek Joshi, PE, PTOE

Project Engineer

EDUCATION

MS, Civil Engineering; University of Kansas (2007)

BS, Civil Engineering; Gujarat University (2005)

PROFESSIONAL REGISTRATIONS

Professional Engineer: PA (#082548, exp. 9-30-19)

Professional Engineer: OH (#76923, exp. 12-31-19)

CERTIFICATIONS

Professional Traffic Operations Engineer (#4141, exp. 12-1-19)

TRAININGS

PTV VISSIM Public Transit & Dynamic Traffic Assignment (2017, no exp.)

Traffic Signal Design, PennDOT Training, (2017, no exp.)

Synchro Software (2016 & 2008, no exp.)

Project Management, Pennoni (2015, no exp.)

MicroStation Software (2014, no exp.)

Tru-Traffic 10.0 Software (2013, no exp.)

VISSIM Software (2010, no exp.)

Paramics Software (2009 & 2010, no exp.)

PROFESSIONAL AFFILIATIONS

Institute of Transportation Engineers

HONORS/AWARDS

NA

EXPERIENCE SUMMARY

As a Project Engineer in the Transportation Division, Mr. Joshi's responsibilities include traffic modeling, traffic signal design, preparation of bid packages and traffic impact studies.

Mr. Joshi offers over ten years of experience as a Traffic Engineer and his responsibilities include traffic data collection, capacity analysis, traffic impact study preparation, traffic control and roundabout analysis, crash analysis, and traffic microsimulation. He is proficient in various traffic engineering software packages including VISSIM, SYNCHRO, SimTraffic, Paramics, Traffix, Highway Capacity Software, Petra, SIDRA, Arcady, Rodel, and MicroStation.

REPRESENTATIVE PROJECTS

Pennsylvania Turnpike Commission/Urban Engineers – Scranton Beltway, Luzerne and Lackawanna Counties, PA (2/19 - Present)

Project Engineer – This project involves creating a beltway system around Scranton by installing two new direct connections between I-476 (Penna Turnpike) and I-81. Responsibilities and tasks include creating VISSIM models for various scenarios, capacity analysis for the interchanges and ramps, and preparation of Point of Access Study for the proposed interchange between I-81 and I-476. (URBAN1801A)

University of Pennsylvania – Penn Parking, Traffic & Circulation Study, Philadelphia, PA, (6/18 - Present)

Assistant Project Manager – Penn Medicine is embarking on new capital initiatives for Phase 3.0 of the *Penn Connects* plan to evaluate the traffic impact of what has transpired including vehicular counts and modeling and look for new recommendations to alleviate current congestion while promoting a more balanced multi-modal approach to campus circulation. The study included data collection and analysis for 50 intersections in and around the University City area of Philadelphia. Short and long-term recommendations were provided for improved regional access, signal system and circulation enhancements, intersection capacity improvements, travel demand management, wayfinding recommendations, travelers information, transit recommendations, bike and pedestrian specific improvements. (UPFPA18019)

York County Planning Commission – Signal Retiming, York County, PA, (6/18 - Present)

Project Engineer – Responsible for performing capacity analysis & queueing analysis, vehicle change and clearance calculations, Time-of-Day (TOP) plans, phasing analysis, turn lane and storage length analysis, signal optimization and recommendations for various signals in York County, PA. YCPCO18003

PennDOT – District 6-0 - Transportation System Management & Operations, Philadelphia and Montgomery Counties, PA (5/18 - Present)

Project Engineer – Assist in the preparation of the Concept of Operations report and Systems Engineering report for the I-76 parallel corridors Transportation System Management & Operations (TSMO). The scope of this project was to assist PennDOT in developing and progressing TSMO projects with a focus on Active Arterial Traffic Management. The goal is to implement integrated corridor management practices on the I-76 parallel corridors to help relieve congestion on I-76 mainline during non-recurring congestion, incidents, and special events. (MBJV17002)

Abhishek Joshi, PE, PTOE

Project Engineer

Springfield Township – MTF Country Club Signal Design, Springfield Township, PA, (5/18 - Present)

Project Engineer – Responsible for traffic signal design services for the Country Club’s access driveway to Sproul Road in Springfield Township. The signal design included capacity analysis, traffic signal warrant, turn lane warrant, signal phasing warrant and preparation of signal plans. With the signal design, the project was able to incorporate new pedestrian facilities to and from nearby bus shelters. (SPFLD00339)

City of Winter Haven – 6th Street Traffic Signal Timing Study and Implementation, Winter Haven, FL, (6/18 - Present)

Traffic Engineer - Responsible for signal timing improvements where the City has identified congestion during peak hours at the traffic signals they own and maintain along the 6th Street corridor intersections. In order to reduce the congestion and improve safety Pennoni is preparing a traffic signal timing study and implementing the signal optimization changes to their traffic signals along 6th Street South at Avenues A, C, and K South. The scope of services include: data collection, before/after travel time documentations using Tru-Traffic, Macro-simulation and Micro-simulation modeling using Synchro (Ver 10.0), and a traffic signal timing report. Project completion expected in December 2018. (ZZZ1600845)

Jeffrey Rotwitt – Sun Center Studios, Aston, PA (10/17 - Present)

Project Engineer – The scope of this project was to prepare a Transportation Impact Study (TIS) for the proposed development at the existing Sun Center Studio site in Aston, PA for PennDOT HOP submission. The proposed development is to consists of 93,000 square-feet of an indoor studio attraction that includes interactive exhibits, rides and entertainment with 32,791 square feet for special event dinners and banquets; 175-room hotel; and 74,950 square feet of an outdoor retail, dining and entertainment (RDE) area with seasonal events. The challenges for this project were to estimate trips generated by the proposed development and internal captures for the site. (JROT17001)

Marple Township – Broomall Fire Company, Marple, PA (7/17 - Present)

Project Engineer – Designed traffic signal and roadway improvements at the intersection of West Chester Pike & Malin Road as part of the relocation of the fire station for the Broomall Fire Company. The roadway improvements include the addition of a separate southbound left-turn with the shared left-through-right lane to improve the queue on Malin Road during the PM peak hour. Signal improvements include phase change to a split phase signal with an emergency signal on Malin Road for the new fire station. The scope of the project was to provide signal upgrades and roadway improvements to the intersection of West Chester Pike & Malin Road to improve queueing conditions on Malin Road and allow easy and quick access for the emergency vehicles to West Chester Pike. The challenge was improving the quarter-mile existing queue on Malin Road during the PM peak hour while maintaining similar delay for the West Chester Pike approaches. An additional left-turn lane and minor road split phasing significantly improved the queue on Malin Road while maintaining the existing Level of Service on West Chester Pike. (MRPL0616)

(SEPTA) – Wissahickon Transportation Center, Philadelphia, PA (12/16 - Present)

Lead Traffic Engineer – SEPTA is proposing to construct a new Wissahickon Transportation Center facility immediately northwest of the existing center. Mr. Joshi’s responsibilities include traffic data collection effort, estimation of generated trips from the new center based on the routes and headway information provided by SEPTA, development and calibration of existing conditions model in Synchro software, analyses of various alternatives and preparation of a Transportation Impact Assessment summarizing the findings and recommendations. (ZZZ1614621)

PennDOT – I-95 Central Access Philadelphia Project (CAP), Philadelphia, PA (10/16 –Present)

Project Engineer – The I-95 CAP project replaces the existing cap over I-95 between Chestnut and Walnut Streets and is a new 11-acre Penn’s Landing CAP that will bridge over I-95 and Columbus Blvd from Chestnut to Walnut Streets, and from Front Street to the Delaware River. It will also extend the existing South Street Pedestrian Bridge and complete the on-road section of the Delaware River Trail from Washington Avenue to Spring Garden Street. Assisted with the preparation of the preliminary Transportation Management Plan (TMP), set up traffic model and performed overnight detour analysis for a section of I-95. The scope of this project is to prepare preliminary design documents, plans, and TMP for a proposed park covering a section of I-95 and Columbus Boulevard between Chestnut and Walnut Street. (PNDT1613)

Abhishek Joshi, PE, PTOE

Project Engineer

Brandywine Realty Trust - Byberry North Business Center, Philadelphia, PA (6/16 - Present)

Project Engineer – Prepared a Transportation Impact Study (TIS) for the proposed warehouse facility at the intersection of Roosevelt Boulevard and Southampton Road in northeast Philadelphia. The TIS included capacity analysis, queue analysis, and trip generation and distribution calculations and figures. A unique aspect of the project was analysis of Continuous Flow Intersection and an Offset-Left Turn design for the intersection of Roosevelt Boulevard and Southampton Road. (ZZZ1704060)

PennDOT – Edgehill Road Reconstruction, Abington Township, PA (2015 – Present)

Project Engineer – The project involves environmental studies, preliminary engineering, final design and services during construction for the widening and reconstruction of Edge Hill Road and Tyson Corner in Montgomery County. Responsible for the preparation of signal design and associated plans and report. (ABIN0501F)

PennDOT District 6-0 – Highway Occupancy Permit (HOP) Reviews, Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties, PA (2014 – Present)

Project Engineer – Reviewer of Highway Occupancy Permit (HOP) applications submitted to PennDOT District 6-0. Responsibilities include the review of scoping meeting applications and Transportation Impact Studies (TIS) for conformance with PennDOT guidelines.

First Philadelphia Preparatory Charter School – Internal Circulation Analysis, Philadelphia, PA (11/17 - 1/18)

Project Engineer – The scope of this project was to collect traffic counts and queuing data and provide alternatives to improve the internal circulation for the school to prevent spillbacks onto Tacony Street. The challenges for this project were to separate the circulation for the different grades and different arrival times within the internal parking lot. Recommendations included new circulation patterns for the different grades, use of traffic control devices and staff to guide vehicles, and make use of the close-by off-site parking lot. (FPPCS17001)

Children’s Hospital of Philadelphia – CHOP Schuylkill Avenue Post-Construction TIS, Philadelphia, PA (6/17 - 2/18)

Project Engineer – Prepared two post-construction Transportation Impact Studies (TIS) for the CHOP Roberts Center for Pediatric Research. The scope of this project was to conduct a post-construction traffic impact study to analyze the proposed development impacts on South Street and propose additional improvements as necessary. Signal retiming was proposed along South Street between Convention Road and 26th Street. Signal timing directives were prepared for each signalized intersection and new timings were implemented through coordination with City of Philadelphia Street Department. A second post-construction traffic study was prepared after the implementation of new timings to verify projected conditions. Proposed signal timings and offsets were prepared using Synchro and Tru-Traffic software.

University of Pennsylvania Health System – Perelman Center of Advanced Medicine Valet/Drop-off Alternatives Analysis, Philadelphia, PA (3/16 – 11/16)

Lead Traffic Engineer – The Perelman valet parking and patient drop-off driveway often experiences traffic volumes that results in queues along Civic Center Boulevard. Mr. Joshi’s responsibilities include traffic counts and dwell time data collection, development and calibration of existing conditions traffic model in VISSIM software, analyses of various alternatives and preparation of a memorandum summarizing the findings.

City of Winter Haven – 1st Street Retiming, Winter Haven, FL (3/16 – 6/16)

Staff Engineer – Responsible for traffic data collection, travel time runs using Tru-Traffic software, clearance calculations using FDOT and nationally recognized guidelines, signal retiming and offsets optimization using Synchro and Tru-Traffic software. City of Winter Haven has noticed increased congestion along 1st Street between Cypress Garden Boulevard and Central Avenue likely attributed to recent nearby commercial redevelopment, LEGOLAND Florida and other changing traffic patterns. Approximately 26,000 vehicles travel through this corridor on a typical weekday. The 1st Street retiming benefit-cost analysis yielded a total net of \$1,775,792 in annual travel time, fuel and crash related benefits to the public; compared to the project cost of \$29,950, resulting in the project benefit-cost ratio of 59:1.

Abhishek Joshi, PE, PTOE

Project Engineer

Delaware River Joint Toll Bridge Commission – Pre-Construction Traffic Study for the Scudder Falls Bridge Replacement Project, Various Locations, PA (2015 – 2016)

Lead Traffic Engineer – The Commission owns and operates 20 bridges crossing the Delaware River in southeast Pennsylvania. I-95/Scudder Falls Bridge, which is currently not a tolled facility, is important commuter connection between Bucks County, PA and Mercer County, NJ. The Commission is proposing to replace the bridge and implement tolling when completed. An interagency agreement was made between the Commission, PennDOT and NJDOT to perform a pre-construction and a post-construction traffic study. The pre-construction traffic study will serve as a baseline for purposes of determining the traffic diversion impacts from tolling of the Scudder Falls bridge. The Commission, as described in the interagency agreement, will take reasonable measures to mitigate for traffic impacts on PennDOT and NJDOT state roads in the event the post-construction traffic study identifies traffic issues. Mr. Joshi's responsibilities include preparation of a site-specific health and safety plan, organization of data collection effort for 100+ study locations, field review checklist, capacity analyses for study intersections, roadways (2-lane, Multi-lane, Freeway, Urban Street), and interchanges (merge, diverge, weave).

Crozer-Chester Medical Center – Point of Access Study, City of Chester, Delaware County, PA (2014)

Staff Engineer – Responsible for preparation of a Point of Access Study in accordance with PennDOT Publication 10X, Appendix Q – Points of Access. The objective of this project was to identify and evaluate a range of design alternatives for improved access onto Interstate 95, a limited access highway. The Point of Access study was prepared in the area of Interstate 95 Exit 5 (Kerlin Street) and Exit 6 (Providence Road/Edgemont Avenue) located in the City of Chester, Delaware County, Pennsylvania. (ZZZ1402294)

Penn State University-Abington Campus – Traffic Impact Assessment, Abington, PA (2014)

Staff Engineer – Responsible for preparation of a Traffic Impact Assessment (TIA) for a proposed residence hall near the campus of Pennsylvania State University in the Township of Abington, Montgomery County, Pennsylvania. The study site will be redeveloped with 100-unit residence hall that will house 390 students.

Delaware River Joint Toll Bridge Commission – Annual Report on Toll Bridge Volume & Revenue Projections, Various Counties, PA & NJ (2014)

Staff Engineer - Responsible for preparation of the 2015 Annual Traffic Engineering Report for the twenty bridges under their jurisdiction connecting New Jersey with Pennsylvania. The purpose of the Annual Report is to develop traffic and revenue projections for the ensuing year. The report includes recommendations for revisions of tolls as necessary or advisable to comply with the Commission's Current Bond Indenture. The study includes a review of historical traffic volumes on all twenty bridges (including thirteen (13) toll-supported bridges), coordination with County offices, NJDOT and PennDOT, and detailed calculations for the debt service coverage ration based on existing and projected revenues and expenditures.

Nelson Group – Master Plan for William Penn Charter School, Philadelphia, PA (2014)

Staff Engineer – Responsible for the transportation elements of a master plan redevelopment. Includes a review of site access and circulation of pedestrian/bike/cars/buses, design of drop-off locations, and parking assessments.

PennDOT District 5-0 - Pocono Mountain Ind. Park Auth., I-80 Exits 298 & 299, SR 611 & SR 715, Monroe County, PA (2014)

Staff Engineer - Responsible for conducting traffic modeling and alternatives analysis efforts for improvements at the I-80 Exit 298 and 299 interchanges in Pocono Township, Monroe County, PA. The design alternatives included newly signalized intersections, roundabouts, additional turning lanes at intersections, and additional lanes to increase capacity on the corridors. The alternatives were modeled utilizing Synchro/SimTraffic 8 software to determine intersection levels of service, volume to capacity ratios, and queuing. The roundabouts were modeled utilizing SIDRA Intersection 5.1 software. The results of the analysis were summarized in an Alternative Analysis Traffic Report for submission to PennDOT and FHWA for review and comments.

PROJECTS PRIOR TO PENNONI

City of Philadelphia Streets Department - Citywide Retiming Initiative, Philadelphia, PA (2013 - 2014)

Traffic Engineer - The project was part of a citywide, ARLE and CMAQ-funded retiming initiative to improve corridor travel times and reduce congestion and delay. The project includes manual turning movement counts, ATRs, collection of travel time data,



Abhishek Joshi, PE, PTOE

Project Engineer

existing conditions inventory, Synchro/SimTraffic modeling, preparation of work orders, and an after study to be included in a final report. Mr. Joshi's responsibilities included: data collection (turning movement counts and intersection inventory), clearance calculations, development of Synchro models, and compilation of final reports.

- Project included signal retiming along the following eight corridors across the City of Philadelphia:
- Frankford Avenue – 5.9 miles, 43 signals,
- Bartram Avenue – 1.7 miles, 8 signals
- Hunting Park Avenue West – 1.9 miles, 15 signals
- Hunting Park Avenue East – 2.6 miles, 18 signals
- Lindbergh Boulevard – 2.4 miles, 14 signals
- 5th Street – 2.0 miles, 17 signals
- Spruce Street – 2.4 miles, 24 signals
- Grant Avenue/Welsh Street – 5.1 miles, 18 signals

Keating Consulting LLC - Wynn Philadelphia Casino & Resort Traffic Impact Study, Philadelphia, PA (2013)

Traffic Engineer - Project included data collection and traffic analysis of eight intersections near a property for a proposed 307-suite hotel and parking garage, as well as surface parking, night club, four lounges, three dining venues, and a casino. Mr. Joshi's responsibilities included: organizing the traffic data collection effort, developing a detailed Synchro/SimTraffic model for multiple peak hours, and completing a Traffic Impact Assessment report, which includes capacity analysis, queue analysis, and trip generation and distribution calculations and figures. A unique aspect of the project was the ongoing I-95 Girard Avenue Interchange Reconstruction Project construction, which changed the surrounding intersections and significantly affected the trip distribution calculations.

Erie County General Authority - Erie Inland Port Study and Planning, Erie County, PA (2013)

The Erie County General Authority (ECGA), through its affiliates, has developed the Erie Inland Port Initiative, a global competitive model for the region. The central element of this effort is the development of a rail-served industrial park in western Erie County for handling the movement of goods and bulk materials throughout the region. The overall goal of the Erie Inland Port Study is to link economic development objectives with transportation investments. Due to the proposed development of the Erie Rail Terminal it is anticipated that there will be an increase in length of time that access across the Walbridge Road rail road tracks is impacted, as well as number of trucks on surrounding roadways. Mr. Joshi analyzed the impacts of the proposed development on the surrounding roadway using traffic simulation software Synchro. The simulation model evaluated the impacts of a 10,000-foot CSX train going through Walbridge crossing; followed immediately by a second 10,000-foot NS train going through Walbridge crossing. Simulation models indicated extensive queuing due to increase in the length of closure along Walbridge road. Mr. Joshi performed various mitigation alternatives which include closure and relocation of Walbridge Street railroad crossing, providing "escape" lanes on Walbridge Road for vehicles to return on main road and divert to another crossing.

Museum Towers - Traffic Impact Study, Museum Towers, Philadelphia, PA (2013)

Project included development of a traffic impact study for the construction of additional apartments to the existing complex and construction of a parking garage at an existing parking lot. Project included a need for turning movement counts at the existing driveways and surrounding intersections, an evaluation of existing driveway data, and analysis of multiple scenarios involving different driveway configurations. Mr. Joshi's responsibilities included: organization of the data collection effort, compilation of field-collected data, development of a calibrated Synchro model to represent existing conditions, interpretation of client-provided driveway information, development of future conditions models with various alternatives, and compilation of a final report summarizing the findings of the analysis.

SR 4044, Sec MG1, Plank Road, Montgomery County, PA (2013 – 2014)

Project included the design of two new traffic signals, redesign of one existing traffic signal, and analysis of several detour scenarios to be put in place while intersection improvements are being performed. Components of the project include a safety review along the corridor, existing and projected levels of service analysis, traffic projections, traffic signal design, traffic signing and pavement markings, trip



Abhishek Joshi, PE, PTOE

Project Engineer

distribution for detours, and detour warrant analysis. Mr. Joshi's responsibilities included: data collection (pedestrian counts and intersection inventory), signing and pavement marking plans, detour analysis, signal timings for the redesign and detour scenarios.

NJDOT - Traffic Signal Optimization Project, Statewide, NJ (2013 – 2014)

This project is a part of a NJDOT open-end contract includes manual turning movement counts, collection of travel time data, existing conditions inventory, Synchro/SimTraffic modeling, TruTraffic bandwidth analysis, and related documentation. Revised signal directives are prepared for multiple time frames for each corridor and after implementation an after study is performed. To date the following corridors have been evaluated: Rt. 42, Rt. 45, Rt. 30, and Rt. 72. Mr. Joshi's responsibilities included: development of Synchro models for corridors and performing travel time runs. Project included signal retiming based on hourly, daily and seasonal variations along the following nine corridors across New Jersey:

- Rt. 42, Monroe and Washington Townships, 6 miles, 12 signals
- Rt. 45, Gloucester County, 7 miles, 19 signals
- Rt. 30, Galloway Township and Absecon City, 4 miles, 12 signals
- Rt. 72, Stafford Township and Ship Bottom, 9 miles, 14 signals
- Rt. 9 Atlantic County, 11 miles, 30 signals
- Rt. 47, Cumberland County, 9 miles, 20 signals
- Rt. 206, Hillsborough Township, 5 miles, 13 signals
- Rt. 70, Camden and Burlington Counties, 12 miles, 25 signals
- Rt. 47/9, Middle Township, 2 miles and 7 signals

Traffic Impact Studies, Various Jurisdiction (2007 - 2013)

Traffic Engineer - Responsible for numerous traffic impact studies for various private developers in the state of Indiana. Responsibilities include assisting in organizing data collection effort, trip generation, traffic distribution and assignment calculations and figures, developing a detailed macro/meso/micro scoping traffic simulation model using industry recognized computer program for multiple peak hours, and compiling traffic impact study report.

Town of Fishers - Traffic Impact Fee Analysis, Fishers, IN (2007 - 2013)

Traffic Engineer - Project included determining the amount of traffic impact fees that can be assessed against the future impacts of developments that will be constructed within the town limits. Traffic impact fee analysis was carried out using microscopic traffic modeling software Quadstone Paramics. The study area included 6 miles x 8-mile town area to be studied comprising of 100 study intersections, all major and minor roadways including Interstate 69 and State Road 37.

City of Noblesville - Pleasant Street Bridge Analysis, Noblesville, IN

Project included determining the traffic impacts associated with the construction of Pleasant Street Bridge over the White River in Noblesville, IN. Paramics microscopic traffic modeling software was used to create a comprehensive traffic model of the study area. The existing network was modeled and calibrated, each phase of the project was added to the network and the model was run to redistribute traffic volumes based on revised paths and routes created by the additional roadway segments. Capacity Analysis was carried out for the AM and PM peak hour traffic at the study intersections and roadway segments to evaluate the impacts of proposed bridge construction in study area.

Michigan City - 10th Street Railroad Crossing Analysis, Michigan City, IN

Wanted to open a new railroad crossing along the Amtrak railroad. To open a new crossing, an existing crossing must be closed. To satisfy this requirement, Amtrak has proposed that the 10th Street crossing would be closed. To justify the change, a traffic analysis was carried out to determine the effects on the existing roadway system that would be caused by the proposed closing. Paramics microscopic traffic modeling software was used to construct a traffic model that uses existing traffic volumes, traffic patterns, and intersection data to model current conditions within the study area. The model was then run with the modified network to predict traffic diversion and reassignment based on capacity constraints within the roadway network and assign trips based on factors such as travel time, ease of route, delay and other performance measures.

Abhishek Joshi, PE, PTOE

Project Engineer

Allisonville Road Corridor, Traffic Signal Progression Analysis, Fishers, IN

Traffic Engineer Responsible for the Allisonville Road Traffic Signal Progression Analysis project between 82nd Street and 126th Street in Indianapolis/Fishers, Indiana. The corridor includes 15 traffic signals along 5 miles of Allisonville Road through the City of Indianapolis and the Town of Fishers, IN. Responsibilities include coordination of data collection efforts, development of detailed calibrated SimTraffic models for the multiple peak hours and development of optimized signal timings that will facilitate better progression.

96th and Allisonville Road, Alternative Intersection Analysis, Fishers, IN

Project included alternative intersection analysis for the existing signalized intersection of 96th Street and Allisonville Road in Fishers, Indiana. Alternative Intersection Analysis was carried out by analyzing this intersection as a Continuous Flow Intersection, Roundabout Interchange, Single Point Interchange and Compact Diamond Interchange. A capacity analysis was carried out using Synchro software for each of the intersection alternatives using existing and estimated year 2029 traffic volumes.

I-69 Interchange Justification Study, Ft. Wayne, IN

Project included Interchange Justification study for the proposed new interchange along I-69 at Union Chapel Road in Ft. Wayne, Indiana. Responsibilities include assisting in organizing data collection effort, trip generation for the proposed new development within the study area, traffic assignment and distribution, developing a traffic model in Synchro for multiple peak hours, and compiling an Interchange Justification Study report.

52nd Street and German Church Road, Traffic Signal Warrant Analysis, Indianapolis, IN

Project included traffic signal warrant analysis at the intersection of 52nd Street and German Church Road in Indianapolis, IN. Responsibilities include assisting in data collection (average daily traffic, intersection turning movement counts, crash data, speed limit inventory, and existing intersection geometrics), comparing collected data with the warrant criteria provided in Indiana Manual on Uniform Traffic Control Device for Streets and Highways and compilation of warrant analysis report.

Dow AgroSciences Campus - Pedestrian/Vehicular Circulation Master Plan, Indianapolis, IN

Project included to address the internal transportation issues and to plan for increased pedestrian movements resulting from the construction of a new building within the existing Dow AgroSciences campus in Indianapolis, IN. Responsibilities included assisting in pedestrian and vehicular data collection, identifying future pedestrian/vehicular conflict point based on the forecasted travel paths, presenting alternatives to ensure safe pedestrian access to/from various buildings and creating efficient vehicular operations around the campus. Various alternatives such as Raised Crosswalk, Roadside Flashers, In Pavement Flashers, Traffic Signal, At-Grade Walkway, Pedestrian Skyway, and Shuttle Buses, were compared for this project.

City of Muncie - Pedestrian Right-of-Way Assessment, Muncie, IN

Project included a review and inventory of various pedestrian facilities within the public right-of-way in the study area throughout the City of Muncie, IN. Approximately 148,000 linear feet of public right-of-way was surveyed within the study area. The inventoried facilities included, but were not limited to; curb ramps (presence and design), sidewalk condition, lateral clearance, presence of pedestrian push buttons at signalized intersection and slopes and grades along the path of travel. The purpose of this inventory was to document all substandard pedestrian facilities within the public right-of-way that limit accessibility and/or do not meet the ADA requirements.

Town of Fishers - FHWA Roadway Reclassification Project, Fishers, IN

Project included a FHWA roadway reclassification request application on behalf of the Town of Fishers. The roadway reclassification change request was based on the increase in traffic volumes resulting from changing land uses and new developments in the Town. Responsibilities included assisting in data collection, preparation and submittals of the reclassification application for the Town.

CMAQ Analysis, 96th Street and Lantern Road, Fishers, IN

Project included a CMAQ analysis for the intersection of 96th Street and Lantern Road in Fishers, IN. The benefit of converting this intersection to a roundabout was determine using "measures of effectiveness" including intersection delay, carbon monoxide (CO)

Abhishek Joshi, PE, PTOE

Project Engineer

emissions, nitrogen oxide (NOx) emissions and volatile organic compounds (VOC) at the intersection. Responsibilities included data collection, and capacity analysis for the study intersection using Sidra and Synchro software.

Vissim Simulation, Keystone Crossing and 126th Street, Carmel IN

Project included traffic microsimulation for a “peanut style” roundabout interchange at the intersection of Keystone Crossing and 126th Street in Carmel, Indiana. The microscopic traffic modeling was carried out using software Vissim.

PUBLICATIONS AND PRESENTATIONS

“Beyond Traffic Signal Timings: Maximizing Critical Intersection Capacity through Phasing & Lane Configuration”, Penn State Transportation Engineering and Safety Conference, December 2017

“Innovative Intersection Solutions”, 97th Purdue Road School, March 2011

“Traffic Impact Fee Analysis using Paramics”, Paramics Insight Issue 7, Summer, 2010

Paul Wood, PE

Senior Engineer

EDUCATION

BS, Civil and Environmental Engineering, The Pennsylvania State University (2002)

PROFESSIONAL REGISTRATIONS

Professional Engineer: PA
(PE075260, exp. 9-30-21)

CERTIFICATIONS/TRAINING

InSync Workshop, Rhythm Engineering (2016, no exp.)

Project Management Bootcamp, PSMJ Resources, Inc. (2008, no exp.)

Traffic Signal Workshop, NWUCPS, (2005, no exp.)

Permit Required Confined Space Entry, Eichelbergers, (2005, no exp.)

Hazard Communications, Eichelbergers, (2005, no exp.)

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers

Harrisburg Young Professionals

EXPERIENCE SUMMARY

Mr. Wood serves as a Senior Engineer in our Transportation Division with over 17 years of experience. He assists with highway design in areas such as roadway geometry and intersection design, including preliminary and final design of intersections, signing, pavement markings, pedestrian, and drainage facilities. Other duties include preparing and reviewing highway occupancy permit plans, traffic impact studies, signing and pavement marking plans, temporary traffic control plans, and various transportation related studies and reports.

REPRESENTATIVE PROJECTS

The Pennsylvania State University – James Building Traffic Impact Study, State College, PA (1/19 – Present)

Senior Engineer – Oversaw the scoping, data collection, analysis and preparation of a traffic impact study to determine the potential effects of replacing the existing James Building with a new Center of Innovation, Making, and Learning. (PNUPA19001)

Borough of Mechanicsburg – Signalization Upgrades, Mechanicsburg, PA (12/18 – Present)

Senior Engineer – Updated traffic signal permit plans for all signals within the borough's closed loop system based upon the timings recommended within the approved study. (MECHB18002)

Millersville University – Shenks Lane Intersection, Millersville, PA (11/18 – Present)

Senior Engineer – Oversaw the analysis of multiple intersections around the campus of Millersville University to determine the adequacy of the existing traffic control and to determine the potential effects of implementing modifications to the existing intersection geometry in order to implement pedestrian improvements. (MILLU18001)

PROJECTS PRIOR TO PENNONI

South Union Street Streetscape, Middletown Borough, Dauphin County, PA

Transportation Engineer - Prepared roadway construction, traffic signal, traffic control, and project manual for the reconstruction of sidewalk, curb, traffic signals, and accessible curb ramps in downtown Middletown. Oversaw construction management and tracked progress payments utilizing multiple funding sources, and through several significant change orders requested by the client.

Park Boulevard Realignment, Derry Township, Dauphin County, PA

Transportation Engineer - Prepared multi-phase maintenance and protection of traffic plan, signing and pavement marking plans, and QA/QC'd traffic signal design for the realignment of Park Boulevard. Also, assisted with determining the impacts to traffic patterns and traffic control needed at adjacent intersections due to the restriction of a narrow railroad underpass to 1-way.

Northampton County Area Community College, Pocono Township, Monroe County, PA

Transportation Engineer - Designed and coordinated the Highway Occupancy Permitting of the signalized high-volume driveway on SR 715 for a proposed expansion of the Monroe County branch campus. The project included state route widening for multiple turn lanes, drainage modifications, signalization, in addition to utility and adjacent driveway permits.

Paul Wood, PE

Senior Engineer

Trindle Road (SR 0641) and Central Boulevard, Hampden Twp., Cumberland County, PA

Transportation Engineer - Proposed multiple methods to cut costs, which were instrumental in being awarded Design-Build Contract. Oversaw the Intersection Design Study which shaped the design of the Trindle Road corridor, in addition to signal, signing and pavement marking, and traffic control plans.

Central Logistics Park (SR 0645), Bethel Township, Berks County, PA

Transportation Engineer - Project entailed permitting the addition of a center left turn lane between the I-78 interchange and site access for a 2.7 million square-foot warehouse development. For the proposed widening to be constructed concurrently with a PennDOT reconstruction project coordination between the Developer, PennDOT, and their contractor was essential. Also, obtained a Highway Occupancy Permit for the extension of sanitary sewer to the site.

Craighead Bridge (Zion Road over Conodoguinet Creek), Bethel Twp., Cumberland Co., PA

Transportation Engineer - Project entailed replacement of a structurally deficient bridge adjacent to Old York Road (SR 0174). For the proposed bridge to be constructed, traffic control required a detour of Zion Road and restriction of Old York Road (SR 0174) to a signalized one lane closure. Responsibilities also included preparing signing and pavement marking plans for the project.

York Hospital Helipad Relocation, York, York County, PA

Transportation Engineer - Project entailed an emergency room renovation, access reconfiguration, and helipad relocation. Along with the client, contractor, structural, and site engineers I developed a detailed construction sequencing and traffic control plan which enabled the emergency room, ambulance access, and existing or proposed helipad to operate continuously during construction. Construction sequencing maintained vital utility services to the hospital and inter-discipline coordination ensured the constructability of the new helipad, retaining walls, and drainage while minimizing impacts to staff and visitor access and parking.

Halifax Sheetz, Halifax Township, Dauphin County, PA

Transportation Engineer - Obtained highway occupancy permit for a proposed Sheetz at the intersection of River Road (SR 0147) and Peters Mountain Road (SR 0225). Design included two driveways and asymmetric widening for a two-way center left turn lane. Prior to design of improvements assisted with preparation of Transportation Impact Study. (Similar projects: Bushkill Turkey Hill, Clarks Ferry Sheetz, Schuylkill Haven Sheetz, Milesburg Snappy's)

City of Easton - Larry Holmes Drive, Northampton County, PA

Transportation Engineer - Responsible for the preparation of final construction plans for traffic signals, signing and pavement markings, and temporary traffic control associated with streetscape and signal improvements to the South Third Street, Washington Avenue, and Larry Holmes Drive corridors.

Gettysburg Hospital Parking and On-Site Circulation Study, Gettysburg Borough, Adams County, PA

Transportation Engineer - Assisted in performing a parking and on-site circulation study for Gettysburg Hospital. Changes anticipated in services and facilities prompted the Hospital to ensure its future parking needs would be met and that traffic flows would be properly managed. Duties included collecting data from hospital administration and the staff of an adjacent medical office building and conducting a parking survey to document parking usage data, and identify options to address its existing and future parking needs.

State Route 0743 over Norfolk Southern Railroad, Derry Township, Dauphin County, PA

Traffic Engineer - Responsible for preliminary design and alternatives analysis for the intersection of Chocolate Avenue (State Route 0422) and Cocoa Avenue (State Route 0743). Also, prepared intersection design report, final design of traffic signal, and traffic signal permit and construction plans. Project entailed relocation of a portion of Cocoa Avenue to eliminate an offset intersection. A continuous Green T intersection was implemented to maintain access to surrounding properties while minimizing delay to traffic on Chocolate Avenue.

Paul Wood, PE

Senior Engineer

West Hill Business Center, Weisenberg Township, Lehigh County, PA

Transportation Engineer - Responsible for highway occupancy permit and traffic signal drawings, and exhibits for the acquisition of Right-of-Way necessary for the construction of roadway improvements. Project entailed the compilation of background data, review of nearby development's traffic impact study and recommended improvements; modeling of the roadway network to analyze existing and future conditions. Generated traffic impact study and recommended roadway improvements required to mitigate effects of the development and generated Highway Occupancy Permit Plans for PennDOT approval based upon these recommendations.

Linglestown Road (State Route 39, Section 13 Final Design), West Hanover Township, Dauphin County, PA

Traffic Engineering Technician - Responsible for traffic signal layouts for use on final PennDOT signal permit and construction plans; checked all plans, coordination sheets, and tabulations. Also, assisted with Traffic Control Plans and Temporary Traffic Signal design. Project entailed a redistribution of traffic patterns due to proposed driveway consolidations intended to reduce congestion and increase safety for vehicles entering and exiting businesses along Linglestown Road. Generated signal warrant reports, traffic signal construction, and permit plans for the proposed intersection improvements and the I-81 entrance/exit ramps.

Carlisle Crossing for McCoy Development LLC. South Middleton Township, Cumberland County, PA

Transportation Engineering Technician - Responsible for traffic signal warrants and turn lane analyses at existing and proposed intersections and interchange ramps. Also, designed traffic signal layouts, timings, phases, and signs for proposed signals. Project entailed design of traffic patterns, driveway alignments, drainage, and roadside grading tie into the site plan in order to accommodate new traffic movements. The project also required the preparation of Highway Occupancy Permit Plans to incorporate all of the proposed roadway and traffic signal improvements.

State Route 0611 Corridor Improvements, Stroud Township, Monroe County, PA

Traffic Engineering Technician - Responsible for synchro modeling and detailed findings and alternatives report. Project entailed redistribution of existing driveway traffic volumes and optimized traffic signal timings and phases as part of corridor improvements study in order to recommended roadway network improvements which would relieve congestion and improve safety.

Silver Spring Square, Silver Spring Township, Cumberland County, PA

Traffic Engineering Technician - Responsible for preparing Traffic Impact Study and intersection design reports for traffic signals. Also, prepared permit and construction plans for traffic signals along Carlisle Pike. Project entailed generation of synchro modeling and analysis of the Carlisle Pike, State Route 0114, and surrounding roadways to determine the impacts of the Silver Spring Square development. Designed intersection improvements required to mitigate additional development traffic. Assisted in the geometric design of additional lanes along the Carlisle Pike and at the site driveways for Highway Occupancy Plan. Revised original traffic impact study per client and township comments; generated traffic signal warrant reports for all proposed traffic signals. Created movements, sequence and timing charts, signal notes, designed street signs, and wiring diagrams for traffic signal plans.

Jack Frost/Big Boulder, Kidder Township, Luzerne County, PA

Traffic Engineering Technician - Responsible for completion of traffic impact study for the development of recreational housing. Project entailed performance of trip generation, distribution, and assignments for comparison of pre-development and post-development intersection capacity analyses, in addition to, turn lane and traffic signal warrants.

Stray Winds Property, Susquehanna Township, Dauphin County, PA

Traffic Engineering Technician - Responsible for traffic impact study, identifying existing and anticipated geometric deficiencies on the surrounding roadway network. Utilized traffic simulation software to analyze existing and anticipated traffic patterns and make recommendations for site access. Project entailed traffic data collection and conducting roadway alignment surveys; performing detailed trip generation and distribution analysis for 400-unit subdivision.

Paul Wood, PE

Senior Engineer

Bushkill Turkey Hill Minit Market, South Middletown Township, Monroe County, PA

Traffic Engineer - Responsible for overseeing all necessary computations and design for the Traffic Impact Study and Highway Occupancy Permit. Project entailed design and plan preparation required to obtain Highway Occupancy Permit Approval for a Medium volume driveway and right-in/right-out driveway for the development and future development.

BRIDGE DESIGN AND INSPECTION

Kinzua Bridge Inspection and Recovery, Mt. Jewett, McKean County, PA

Bridge Engineering Technician - Project entailed initial inspection of this bridge, the fourth largest viaduct in the world. Each column of the towers, which stand as high as 300 feet off the ground, was visually and physically inspected. Detailed notes of any section loss or deformations were made for use in the structural modeling and analysis of the structure. Recommendations were made for repairs, which were designed by HRG, and recorded during the construction preview inspection. Assisted in the emergency inspection of the Kinzua Viaduct after high winds caused the collapse of 11 of the 20 towers. Comparisons between the original inspection notes and current conditions were made to determine the extent of the damage to the remaining towers.

Pennsylvania Department of Conservation and Natural Resources (DCNR) Bridge Inspections, Various Locations, PA

Bridge Engineering Technician - Responsible for organization, inspection, and writing of reports. Project entailed inspection of several different types and sizes of bridges, located throughout the state, were included as part of this 2002 contract.

Buckhill Falls Bridge, Barrett Township, Monroe County, PA

Bridge Engineering Technician - Responsible for inspections. Project entailed inspection of a privately-owned, two-span stone arch bridge. Maintenance and capacity were of primary concern as the bridge services the main route into the community of Buckhill Falls.

Ferguson Township Bridges, Ferguson Township, Clearfield County, PA

Bridge Engineering Technician - Responsible for design. Project entailed replacements for two single-span bridges carrying Township Roads 431 and 426 over Gazzam Run. Type, size, and location studies were performed to aid in the hydraulic analysis and will be submitted for final design approval.

State Route 45 & Industrial Park Road, Mifflinburg, Union County, PA

Bridge Engineering Technician - Responsible for design. Project entailed lengthening of an existing box culvert to allow for the widening of State Route 45, west of the town of Mifflinburg. Prior to design, a field inspection was performed to document existing site conditions.

PUBLICATIONS AND PRESENTATIONS

NA

