

TRANSPORTATION IMPACT STUDY FOR 151-237 Gettysburg Pike

**Owner:
Linlo Properties XVI LLC; Eberly, etal.**

**Applicant/Developer:
LINLO Properties XVI, LLC
150 Corporate Center Drive, Suite 100
Camp Hill, PA 17011
Rep Lowell Gates**

**Highview Commercial
280 Highway 35 South, Suite 150
Red Bank, NJ 07701
REP: David Gunia**

**Site Location:
151-237 Gettysburg Pike
Upper Allen Township,
Cumberland County, Pennsylvania**

**July 10, 2020
Revised: January 25, 2022**

Prepared by:



ALPHA CONSULTING ENGINEERS, INC.

PLANNING ♦ ENGINEERING ♦ SURVEYING

115 Limekiln Road, P.O. Box G
New Cumberland, PA 17070
(717) 770-2500 Fax (717) 770-2400
www.alphacei.com

FORWARD

This report provides a traffic impact analysis for proposed commercial facilities in Upper Allen Township. The report is organized into 4 sections.

- I. Executive Summary - A brief 4-page summary of the study, results, and recommendations. Also included within the executive summary is a tabular summary of estimated intersection capacity level-of-service and delay.
- II. Traffic Impact Study – A stand-alone text document describing in more detail elements of analysis.
- III. Appendix A – Supporting documents including; Existing Volume/LOS Figures, Trip Distribution Percentage and Volumes Figures, Opening Year Conditions Figures, Horizon Year Conditions Figures, Site Photos, Existing Data, Traffic Count Data Sheets, Growth Rates and Volume Worksheets, and Trip Generation Data Sheets, Turn Lane Analysis, and Correspondence.
- IV. Appendix B - Crash Analysis

REVISION NOTES

January 25, 2022 – Revised per PennDOT comments dated December 23, 2021 to include:

- Revise internal capture to remove 2 internally captured vehicles during the AM peak hour, 4 internally captured vehicles during the PM peak hour, and 3 internally captured vehicles during the Saturday mid-day peak hour. This revision was carried through the volume worksheets, figures, and related analysis. There were no changes to the results of the study from this revision.
- Revise the trip generation to add 1 vehicle trip to the estimated 786 PM peak hour trips, and add 2 vehicle trips to the estimated 987 Saturday mid-day peak hour trips. This revision was carried through the volume worksheets, figures, and related analysis. There were no changes to the results of the study from this revision. While not included in any computational analysis 11 vehicle trips were added to the estimated 9,515 weekday trips, 13 vehicle trips were added to the estimated 11,390 Saturday trips, and 1 vehicle trip was added to the estimated 912 PM peak hour of the generator trips.
- Revise the AM peak hour factor for the intersection of SR 0114 and Gettysburg Pike to a peak hour factor of 0.84.
- Revise the signal times to reflect corridor cycle lengths for each development time, build, no-build scenario.

The future year analysis has been revised to reflect an opening year of 2022 as an opening year of 2021 is no longer realistic.

November 19, 2021 – Revised per PennDOT comments dated October 6, 2021.

September 7, 2021 – Revised per PennDOT comments dated July 16, 2021. Revision from updated land uses on the south lot per updated land development plan dated June 28, 2021.

June 15, 2021 – Revised land uses on the south lot to include residential, retail, restaurant, and medical office land uses. Revisions resulting from the updated land uses include:

- Revised pass-by rate and distribution calculations.
- The addition of internal capture trips based on NCHRP Report 684.
- Resulting capacity calculations and figures

Revised per PennDOT comments received December 18, 2020.

October 13, 2020 – Revised per approved scoping application.

September 23, 2020 – Revised per Township comments received July 20, 2020 and PennDOT comments regarding trip generation, distribution and assignment received August 20, 2020.

- Per discussion with PennDOT, the trip generation for the south lot has been revised to be the more conservative methodology of the following:
 - Shopping center using the regression equation.
 - Fast-food restaurant with drive-through window + shopping center using the average rate.
- Per discussion with the Township Engineer, additional analysis is included for the future 2021 and 2026, AM and PM peak hours using the April 2020 system plan:

- Current year analysis is based on the previous system plan and Gettysburg Pike signal permits dated August 2018.
- Current signal plans for the US Route 15 Ramps are dated April 2013.

July 10, 2020 – The initial study to be submitted to Upper Allen Township for review as part of the subdivision and land development application for facilities located on the north lot.



Mark E Allen

TABLE OF CONTENTS

Executive Summary	1-4
Traffic Study	
Introduction	
Scope and Location.....	5-6
Fig 1 - Study Area	7
Fig 1a - Aerial	8
Fig 1b – Existing Features Plan.....	9
Fig 2 - Site Plan.....	10a-b
Land Use Context	11
Existing Roadway Network.....	11-13
Existing Traffic Volumes and Analysis.....	13
Seasonal Adjustments and Growth Factors.....	13
No-Build Future Traffic Volumes (opening and horizon years).....	13-14
Project Description	14
Site Access.....	14
Trip Generation.....	14-19
Trip Distribution / Assignment.....	20
Build Future Traffic Volumes (opening and design years).....	20
Capacity Analysis.....	20-23
Turn Lane and Turn Restriction Warrant Analysis.....	24
Queue Analysis.....	24-33
Sight Distance Analysis.....	34-35
Recommended Improvements.	36-37
 Appendix A Part 1	
• Table 1 LOS Summary Table	
• Figures	
• Site Photos	
• Existing Data	
 Appendix A Part 2	
• Traffic Counts	
• Trip Generation Worksheets	
• Growth Rates and Volume Worksheets	
• Capacity Analysis Worksheets	
• Queue Length Worksheets	
• Turn Lane Analysis Worksheets	
• Adjacent Development	
 Appendix A Part 3	
• Correspondence	

Executive Summary

EXECUTIVE SUMMARY

ALPHA Consulting Engineers Inc. has prepared a traffic impact study for LINLO Properties XVI, LLC to estimate traffic impacts related to proposed facilities. As part of the study, this executive summary is provided as a brief, concise, project overview.

LINLO Properties XVI, LLC is proposing to construct commercial and residential facilities at 151 to 237 Gettysburg Pike, Upper Allen Township, Cumberland County. The development site consists of two parcels of land, labeled herein as the north lot and the south lot separated by South Market Street (SR 0114). The development areas are bounded by residential housing and commercial uses on both the north and south, by Gettysburg Pike on the West, and Route 15 on the East.

Proposed facilities are anticipated to include a restaurant (approx. 3,000 square feet), a convenience market/gas station (approx. 5,000 square feet) with fueling pumps (approx. 16 fueling positions), associated driveways and parking, and stormwater facilities on the north lot. Facilities proposed on the south lot will include restaurants (approximately 4,600 square feet), retail/service/commercial space (approximately 38,800 square feet), apartment units (approximately 54), associated driveways and parking, and stormwater facilities.

Four site driveways are proposed to provide access to the development. Vehicular access to the north lot shall be via one full movement driveway along Gettysburg Pike and one right-in only access along South Market Street. The right-in only access will require a break in limited access. Per PennDOT, any break in the limited access right-of-way along SR 0114 will require coordination and approval from the District Excess Land Committee. Central Office approval will also be required. Vehicular access to the south lot shall be via one full movement driveway and one right-in right-out driveway along Gettysburg Pike.

Access is not allowed onto the adjoining sections of US Route 15 and eastbound South Market Street as they are limited access highways. Site driveways are classified as medium-volume driveways.

The development is expected to generate approximately 9,500 vehicle trips on an average weekday while school is in session. The trip generation estimate includes approximately 810 vehicle trips during the morning, or AM peak hour of the adjacent street, approximately 787 vehicle trips during the evening, or PM peak hour of the adjacent street, and approximately 989 vehicle trips during the Saturday mid-day peak hour. The peak hour of the adjacent street is analyzed herein as the timeframe when the greatest traffic impact is anticipated. Based on published data, it is estimated that an average of 50 percent of the development trips will be pass by trips (vehicles currently on the adjacent roadway). Total pass by volume represents less than 15 percent of the existing volumes measured along the adjacent streets. The mixed uses within the south lot are estimated to internally capture approximately 14 vehicle trips during the morning or AM peak hour, approximately 132 vehicle trips during the PM peak hour, and approximately 107 vehicle trips during the Saturday peak hour.

Traffic analysis was conducted for traffic conditions occurring during the current 2020 year along with future scenarios under the 2022 opening year and 2027 horizon year at the following intersections:

- S Market Street SR 114 – Gettysburg Pike, existing signalized intersection,

- S Market Street SR 114 – US 15 Southbound Ramp, existing signalized intersection,
- S Market Street SR 114 – US 15 Northbound Ramp, existing signalized intersection,
- Site Driveway 1 – Gettysburg Pike (Build scenarios only),
- Site Driveway 2 – South Market Street SR 114 (Build scenarios only),
- Site Driveway 3 – Gettysburg Pike (Build scenarios only),
- Site Driveway 4 – Gettysburg Pike (Build scenarios only).

The existing signalized intersections along South Market Street operate as part of a coordinated traffic signal system. This system has been updated, by others, as part of intersection improvements recently constructed which include an exclusive eastbound right turn lane at the intersection with Gettysburg Pike. Analysis within this report includes separate scenarios to evaluate the improvements by the adjacent development.

Analysis indicates that the proposed site driveway intersections and all the existing signalized intersections within the study area will operate at acceptable levels as described under Township criteria for all build scenarios. Acceptable levels for urban areas are considered a level of service (LOS) 'D' or better for the intersection. A discussion pertaining to levels of service is included within the report.

The intersections with site driveways 1, 2, 3, and 4 are estimated to operate at LOS 'A' under the 2022 and 2027 design years for all peak hours.

During the AM peak hour, the intersection of South Market Street and Gettysburg Pike currently operates at an acceptable LOS 'B' and is estimated to operate at LOS 'C' under the 2022 design year and at LOS 'D' under the 2027 design year without the development. With the addition of the development generated traffic, the intersection is estimated to continue to operate at a LOS 'D' or better. Intersection delay is estimated to only increase by approximately 8 seconds as a result of the LOS drop. During the PM peak hour, the intersection of South Market Street and Gettysburg Pike currently operates at an acceptable LOS 'B' and is estimated to operate at LOS 'C' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to continue to operate at LOS 'C'. During the Saturday mid-day peak hour, the intersection of South Market Street and Gettysburg Pike currently operates at an acceptable LOS 'B' and is estimated to continue to operate at LOS 'B' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to operate at a LOS 'C'. Intersection delay is estimated to only increase by approximately 10 seconds as a result of the LOS drop.

During the AM peak hour, the intersection of South Market Street and US 15 Southbound Ramp currently operates at an acceptable LOS 'B' and is estimated to continue to operate at LOS 'B' or better under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to continue to operate at a LOS 'B' or better. During the PM peak hour, the intersection of South Market Street and US 15 Southbound Ramp currently operates at an acceptable LOS 'B' and is estimated to operate at LOS 'C' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to continue to operate at a LOS 'C' or better. During the Saturday mid-day peak hour, the intersection of South Market Street and US 15 Southbound Ramp currently operates at an acceptable LOS 'A' and is estimated to continue to operate at LOS 'A' under the 2022 and 2027 design years without the development. With the addition of the development

generated traffic, the intersection is estimated to operate at a LOS 'B'. Intersection delay is estimated to only increase by approximately 3 seconds as a result of the LOS drop.

During both the AM and PM peak hours, the intersection of South Market Street and US 15 Northbound Ramp currently operates at an acceptable LOS 'B' and is estimated to continue to operate at LOS 'B' under 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to operate at a LOS 'C' or better. Intersection delay is estimated to only increase by approximately 9 seconds as a result of the LOS drop. During the Saturday mid-day peak hour, the intersection of South Market Street and US 15 Northbound Ramp currently operates at an acceptable LOS 'A' and is estimated to continue to operate at LOS 'A' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to operate at a LOS 'B'. Intersection delay is estimated to only increase by approximately 3 seconds as a result of the LOS drop.

Sight distance analysis indicates that for all site driveways, the desirable (safe sight distance) will be met under the design scenarios.

Crash data analyzed for the adjacent corridor indicated that there are no known safety concerns per PennDOT's criteria.

Queue length analysis indicates that the left turn movements required to exit the north lot and return to US 15 extend beyond the available storage lengths for the following movements: the southbound left turn movement at the intersection of South Market Street and Gettysburg Pike, the eastbound through movement at the intersection of South Market Street and US 15 Southbound Ramp, and the eastbound left turn movement at the intersection of South Market Street and US 15 Northbound Ramp. Upper Allen Township has noted as part of the land development plan approval that 'There is an insufficient stacking lane area on South Market Street for the Route 15 northbound ramp'. Additional vehicle storage area is required for these movements.

Recommended Improvements:

Both a roundabout and upgraded signalized intersection improvements were evaluated to mitigate the South Market Street, Gettysburg Pike intersection. Based on discussions and correspondence with PennDOT, an upgraded signalized intersection is recommended to be constructed at this intersection as follows: Construct an exclusive northbound right turn lane 200 feet in length with a turn bay taper of 75 feet in length. Provide 2 lane use control signs (R3-8B, L-S-R) 48"x30" for the northbound approach. Modify the traffic signals to provide right turn overlap phase for the northbound approach. Extend the southbound left turn lane by 110 feet. Relocate the existing lane use control signs for southbound approach consistent with PennDOT's requirements. Extend the westbound right turn lane to the turn bay taper for site driveway 2. Relocate the existing lane use control signs for westbound approach consistent with PennDOT's requirements. Per PennDOT, convert the exclusive eastbound right turn lane (recently constructed by others) to a combined through-right turn lane and provide 2 lane use control signs (R3-8B, L-S-SR) 48"x30". Additional right-of-way will be required for the traffic signal improvements.

To mitigate the storage length deficiency at the South Market Street, US 15 intersection, eastbound capacity improvements are recommended as follows: Construct dual eastbound through lanes along South Market Street from the intersection with Gettysburg Pike to the

intersection with the US 15 northbound ramp. At the intersection with the northbound ramp, the leftmost through lane transitions to an exclusive left turn lane. Reconstruct the eastbound approach to the US 15 southbound ramp to maintain the eastbound right turn (sweep) lane. At the eastbound approach to the US 15 southbound ramp provide 2 lane use control signs (R3-8B, S-S-R) 48"x30". Provide appropriate signing and pavement markings as determined during the design phase. Relocate the existing lane use control signs for eastbound approach to the northbound ramp consistent with PennDOT's requirements. Provide coordinated signal retiming for the entire signal system (I-0010) with the lane extensions.

Site driveway 1 shall be designed / constructed with an exclusive exiting right turn lane 12 feet in width and an exclusive exiting left turn lane 11 feet in width. Both lanes are to be 125 feet in length as shown on the Land Development Plan. Provide 2 stop signs (R1-1) 30"x30" for the exiting movements. Construct a southbound entering left turn lane 75 feet in length with a turn bay taper of 75 feet in length. Additional right-of-way will be required for this improvement. Provide 2 lane use control signs (R3-8A, L-S) 30"x30".

Site driveway 2 shall be designed / constructed to prohibit left turning entering movements by use of a raised center median along South Market Street and a swept entrance 200 feet in length that will accommodate entering right turns by delivery vehicles. Include a turn bay taper along South Market Street 75 feet in length. Provide 2 do not enter signs (R5-1) 30"x30" for the exiting approach. Per discussions with PennDOT this configuration is based upon PennDOT's preference of options provided.

Site driveway 3 shall be designed / constructed with an exclusive exiting right turn lane 12 feet in width and an exclusive exiting left turn lane 12 feet in width. Both lanes are to be 50 feet in length as shown on the Land Development Plan. Provide 2 stop signs (R1-1) 30"x30" for the exiting movements. Construct a southbound entering left turn lane, 150 feet in length, with a turn bay taper of 75 feet in length. Provide 2 lane use control signs (R3-8A, L-S) 30"x30" for the entering left turn movement. Provide median island signing keep right and object marker signs (R4-7) 24"x30" (OM1-3) 18"x18".

Site driveway 4 shall be designed / constructed with a raised 'porkchop' concrete island to restrict turning movements to right-in right-out. Lanes shall be 12 feet in width as shown on the Land Development Plan. Provide a stop sign (R1-1) 30"x30", and a no left turn sign (R3-2) 24"x24" for the exiting movement. Provide 2 do not enter signs (R5-1) 30"x30" and a no left turn sign (R3-2) 24"x24" for the entrance visible to the southbound approach. Provide median island signing keep right and object marker signs (R4-7) 24"x30" (OM1-3) 18"x18".

The recommended improvements are preliminarily estimated to cost approximately 1,700,000 dollars and shall be constructed prior to the opening of the development. The recommended improvements are anticipated to begin construction at the same time as the site work construction, approximately fall of 2022. The Highway Occupancy Permittee shall fund and have the improvements constructed. The Pennsylvania Department of Transportation requires the statement that *'all improvements will be constructed to accommodate non-motorized access/circulation and be ADA-compliant unless otherwise approved by the Department.'* In summary, the proposed development and improvements will have minimal traffic impact on the study intersections which will continue to operate at existing levels of service, capacity, and safety.

LEVELS OF SERVICE [DELAY] SUMMARY

Intersection	Move ment	AM PEAK HOUR STREET										
		2020 Base line	2021 Opening Year					2026 Horizon Year				
			Base		Projected			Base		Projected		
			No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike SIGNALIZED	ILOS	B [18]	C [33]	C [31]	D [42]	D [40]	C [28]	C [34]	D [38]	D [44]	D [43]	C [29]
S Market Street - Southbound Ramp US 15 SIGNALIZED	ILOS	B [17]	A [9]	B [16]	B [11]	B [18]	A [8]	A [9]	B [18]	B [11]	B [15]	B [14]
S Market Street - Northbound Ramp US 15 SIGNALIZED	ILOS	B [14]	B [16]	B [17]	B [20]	B [19]	B [19]	B [15]	B [16]	C [22]	C [25]	C [26]
Gettysburg Pike - Site Driveway 1 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [9]	A [9]	A [9]	NA	NA	A [9]	A [9]	A [9]
S Market Street SR 0114 - Site Driveway 2 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [1]	A [1]		NA	NA	A [1]	A [1]	
Gettysburg Pike - Site Driveway 3 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [2]	A [2]	A [2]	NA	NA	A [2]	A [2]	A [2]
Gettysburg Pike - Site Driveway 4 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [1]	A [1]	A [1]	NA	NA	A [1]	A [1]	A [1]

Base = No-Build (without proposed development) scenario for design year conditions

Projected = Build (with proposed development) scenario for design year conditions

ILOS = Overall Intersection Level of Service

■ = Mitigation not required for LOS.

LEVELS OF SERVICE [DELAY] SUMMARY

Intersection	Move ment	PM PEAK HOUR STREET										
		2020 Base line	2021 Opening Year					2026 Horizon Year				
			Base		Projected			Base		Projected		
			No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike SIGNALIZED	ILOS	B [20]	C [24]	C [23]	C [32]	C [31]	C [20]	C [26]	C [25]	C [34]	C [32]	C [21]
S Market Street - Southbound Ramp US 15 SIGNALIZED	ILOS	B [20]	B [18]	C [21]	C [21]	C [24]	B [18]	C [20]	C [23]	C [23]	C [24]	B [17]
S Market Street - Northbound Ramp US 15 SIGNALIZED	ILOS	B [15]	B [14]	B [17]	B [18]	C [23]	C [22]	B [16]	B [20]	C [25]	C [27]	C [26]
Gettysburg Pike - Site Driveway 1 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [9]	A [9]	A [9]	NA	NA	A [9]	A [9]	A [9]
S Market Street SR 0114 - Site Driveway 2 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [1]	A [1]		NA	NA	A [1]	A [1]	
Gettysburg Pike - Site Driveway 3 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [2]	A [2]	A [2]	NA	NA	A [2]	A [2]	A [2]
Gettysburg Pike - Site Driveway 4 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [1]	A [1]	A [1]	NA	NA	A [1]	A [1]	A [1]

Base = No-Build (without proposed development) scenario for design year conditions

Projected = Build (with proposed development) scenario for design year conditions

ILOS = Overall Intersection Level of Service

■ = Mitigation not required for LOS.

LEVELS OF SERVICE [DELAY] SUMMARY

Intersection	Move ment	SAT PEAK HOUR STREET										
		2020 Base line	2021 Opening Year					2026 Horizon Year				
			Base		Projected			Base		Projected		
			No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike SIGNALIZED	ILOS	B [15]	B [17]	B [17]	C [28]	C [27]	C [20]	B [17]	B [17]	C [27]	C [26]	C [20]
S Market Street - Southbound Ramp US 15 SIGNALIZED	ILOS	A [10]	A [10]	A [10]	A [10]	B [10]	B [13]	A [10]	A [10]	B [10]	B [10]	B [13]
S Market Street - Northbound Ramp US 15 SIGNALIZED	ILOS	A [8]	A [8]	A [8]	B [11]	B [11]	B [14]	A [8]	A [8]	B [11]	B [11]	B [14]
Gettysburg Pike - Site Driveway 1 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [7]	A [7]	A [7]	NA	N/A	A [7]	A [7]	A [7]
S Market Street SR 0114 - Site Driveway 2 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [1]	A [1]		NA	N/A	A [1]	A [1]	
Gettysburg Pike - Site Driveway 3 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [3]	A [3]	A [3]	NA	N/A	A [3]	A [3]	A [3]
Gettysburg Pike - Site Driveway 4 UN-SIGNALIZED TWSC	ILOS	N/A	N/A	N/A	A [1]	A [1]	A [1]	NA	N/A	A [1]	A [1]	A [1]

Base = No-Build (without proposed development) scenario for design year conditions

Projected = Build (with proposed development) scenario for design year conditions

ILOS = Overall Intersection Level of Service

■ = Mitigation not required for LOS.

Traffic Impact Study

INTRODUCTION

This report provides a traffic impact analysis for proposed commercial and residential facilities located in Upper Allen Township, Cumberland County, Pennsylvania. The analysis presented follows standard traffic engineering practice as defined for travel impacts associated with proposed land use developments, and follows the guidelines presented in the Institute of Transportation Engineers (ITE) publication 'Transportation Impact Analyses for Site Development'. General formatting is based on Pennsylvania Department of Transportation's (PennDOT) publication 'Policies and Procedures for Transportation Impact Studies' dated January 28, 2009 and last revised July 2017 as included as Appendix A of PennDOT Publication 282.

Requirement: Transportation Impact Studies (TIS), also referred to as traffic impact studies or reports, are required for land developments by the Township when certain quantitative criteria or thresholds, as defined under §220-11.F [SALDO], are met. The proposed land development meets the quantitative criteria under this section of the Township's ordinance. A TIS is therefore required by the Township. Transportation Impact Studies may be required by PennDOT as part of any application for Highway Occupancy Permits (HOP). An HOP, as administered by PennDOT under Section 420 of the Act of June 1, 1945 (P.L. 1242, No. 428), known as the "State Highway Law" is required for access to and occupancy of state highways. Site access is proposed via two full movement site driveways connecting to Gettysburg Pike, an additional right-in-right-out driveway also connected to Gettysburg Pike, and one right in only site driveway on South Market Street (State Road 0114). A HOP is therefore required for access to the State Road. PennDOT's "Guidelines for preparation of a Traffic Impact Study" indicates that a TIS is required when one of the following conditions is met: *(1) the access is expected to have an ADT of 3,000 or more; (2) during any one hour time period, the development is expected to generate either 100 or more new vehicle trips entering the development or 100 or more new vehicle trips exiting the development; or (3) in the opinion of the Department, the development is expected to have a significant impact on highway safety or traffic flow even though it does not meet (1) or (2) above.* According to these criteria, the proposed development meets PennDOT volume warrants for preparation of TIS, as the development is expected to have an ADT of 3,000 or more and is estimated to generate more than 100 inbound or outbound new peak hour trips.

Scope: Per discussion with PennDOT and Township representatives, the scope of this report includes an analysis of the following area intersections as shown on **Figure 1**:

- S Market Street SR 114 – Gettysburg Pike,
- S Market Street SR 114 – US 15 Southbound Ramp,
- S Market Street SR 114 – US 15 Northbound Ramp,
- Site Driveway 1 – Gettysburg Pike (Build scenarios only),
- Site Driveway 2 – South Market Street SR 114 (Build scenarios only),
- Site Driveway 3 – Gettysburg Pike (Build scenarios only),
- Site Driveway 4 – Gettysburg Pike (Build scenarios only).

Elements of the report were agreed to be the following: Data collection shall be performed during mid-week morning (6:00 to 9:00 AM), evening (3:00 to 7:00 PM) hours while public school is in session, and on Saturdays during the mid-day peak hour; Turn

movement data shall be collected at the adjacent intersections noted above; No turn movement data is collected at the site driveways as the site driveways do not exist or have minimal traffic; Trip generation shall be based on data available within the manual, *Trip Generation*, Tenth Edition, 2017, an Institute of Transportation Engineers (ITE) Informational Report; Distribution and assignment of trips are to be based on existing data collected at the adjoining intersections (i.e. directional percentage); Growth rates shall 0.74% based on published data from PennDOT; queue analysis shall be included for the study intersections and any other study intersection that will require mitigation;

Location: Two tracts of land separated by South Market Street are associated with the proposed development and this study. The north tract, or north lot as referred to herein, is a 3-acre tract of land located at the eastern quadrant of the intersection of South Market Street SR 0114 with Gettysburg Pike. This lot was previously used as two commercial / office establishments. This tract of land is now vacant.

The south tract, or south lot as referred to herein, is a 6-acre tract of land located at the southern quadrant of the intersection of South Market Street SR 0114 with Gettysburg Pike. This lot is the combination of 4 single family detached residences and agricultural / pasture lands.

The current developed conditions are shown on **Figures 1a and 1b**. The analysis herein only applies to the facility as shown on **Figure 2**.



- ① PROPOSED STUDY INTERSECTIONS:
1 SOUTH MARKET STREET (SR 0114) - GETTYSBURG PIKE 2 SOUTH MARKET STREET (SR 0114) - SOUTHBOUND RAMP US 15 3 SOUTH MARKET STREET (SR 0114) - NORTHBOUND RAMP US 15
➡ SITE DRIVEWAYS

SITE

DESIGN : MEA
DRAWN : MEA
CHECKED : X.X.
DATE : 07-10-2020
REV: 08-31-2021

ALPHA
ALPHA CONSULTING ENGINEERS, INC.
PLANNING • ENGINEERING • SURVEYING
115 LIMEKILN RD., P.O. BOX "G"
NEW CUMBERLAND, PA 17070
PHONE: 717.770 - 2500
FAX: 717.770 - 2400
WWW.ALPHACON.COM

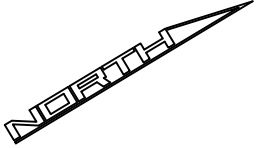
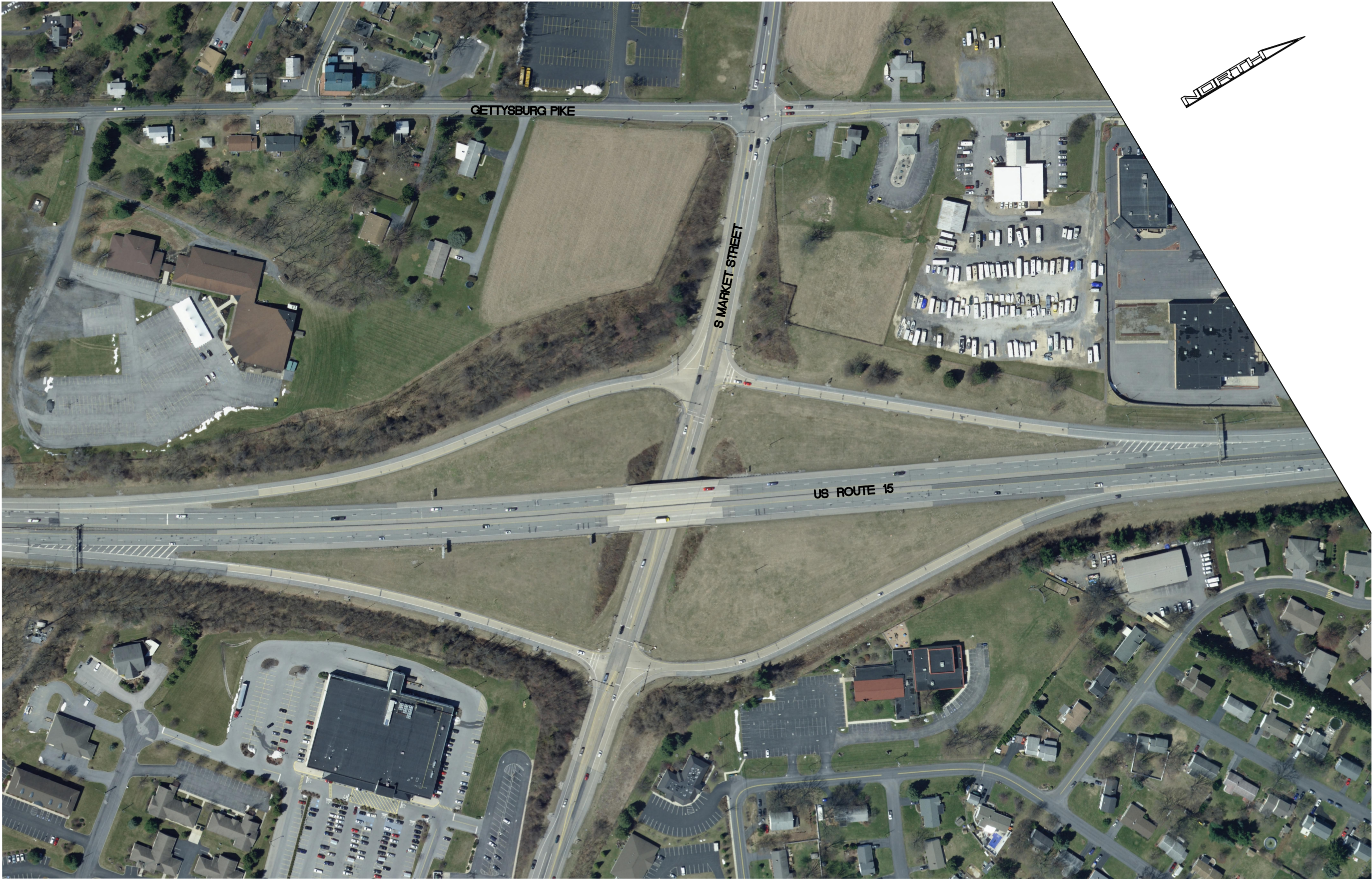
TRANSPORTATION IMPACT STUDY

STUDY AREA - FIGURE 1

151 - 225 GETTYSBURG PIKE

UPPER ALLEN TOWNSHIP, CUMBERLAND COUNTY, PENNSYLVANIA

PROJECT NO.
319590
SURVEY BOOK :
Z:\Surveyor\Year\Project\Text
SCALE : 1" = 200'
DWG : 151-225-IMP-01.dwg
FILE : 151-225-IMP-01.dwg
SHEET 7



SITE

DESIGN : MEA
DRAWN : MEA
CHECKED : X.X.
DATE : 07-10-2020

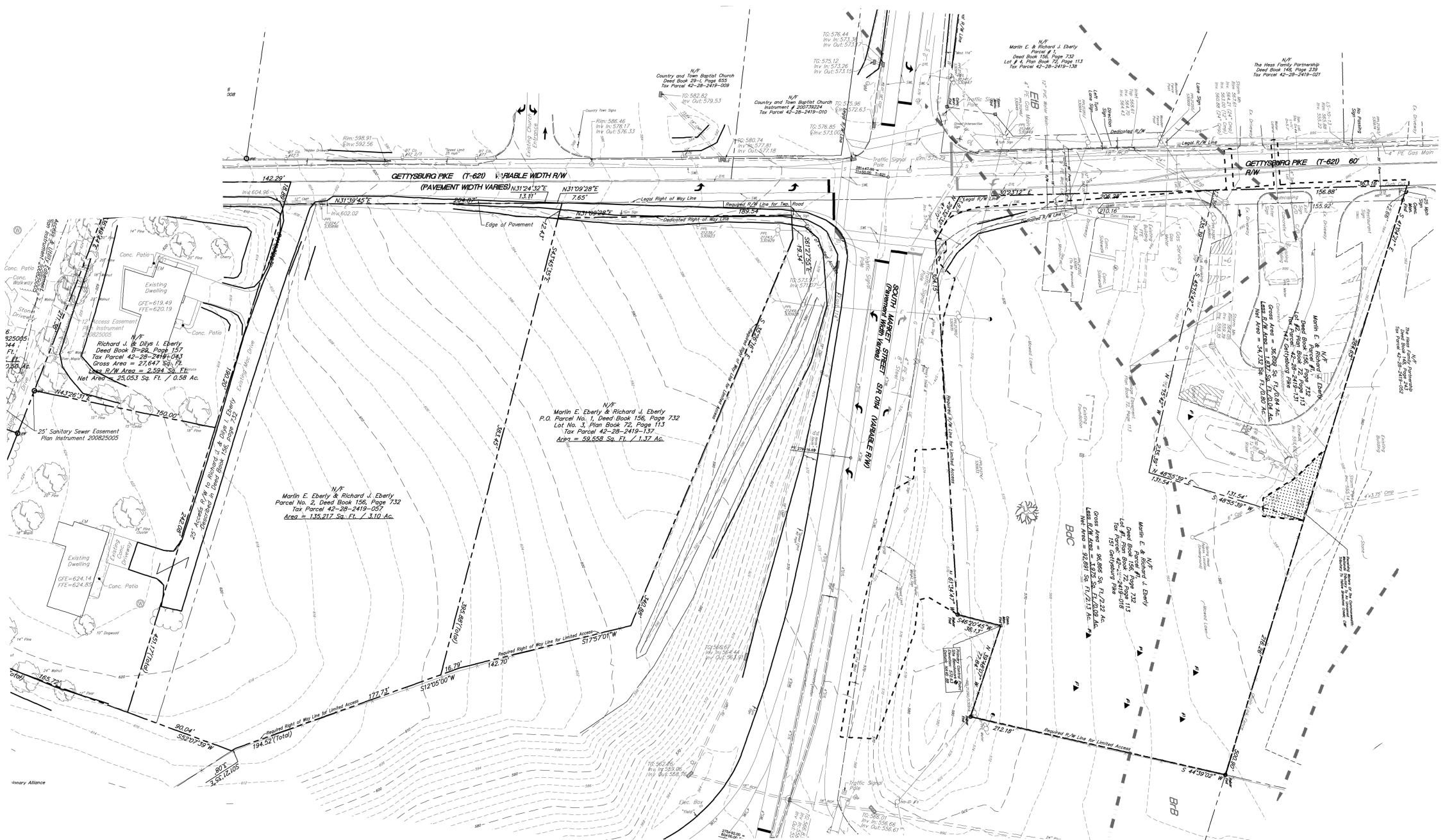
ALPHA
ALPHA CONSULTING ENGINEERS, INC.
PLANNING • ENGINEERING • SURVEYING
116 LIMEKILN RD., P.O. BOX "G"
NEW CUMBERLAND, PA 17070
PHONE: (717) 770 - 2500
FAX: (717) 770 - 2400
WWW.ALPHACON.COM

TRANSPORTATION IMPACT STUDY
AERIAL - FIGURE 1a

151 - 225 GETTYSBURG PIKE

UPPER ALLEN TOWNSHIP, CUMBERLAND COUNTY, PENNSYLVANIA

PROJECT NO.
319590
SURVEY BOOK :
Z:\Surveyor\Year\ProjectList
SCALE : 1" = 100'
DWG : 151-225.dwg
FILE : Dwg\Plans\151-225.dwg
SHEET **8**



ALPHA
ALPHA CONSULTING ENGINEERS, INC.
PLANNING • ENGINEERING • SURVEYING
115 LIMCKILN RD., P.O. BOX "G"
NEW CUMBERLAND, PA 17070
PHONE: (717) 770 - 2500
FAX: (717) 770 - 2400
WWW.ALPHACEI.COM

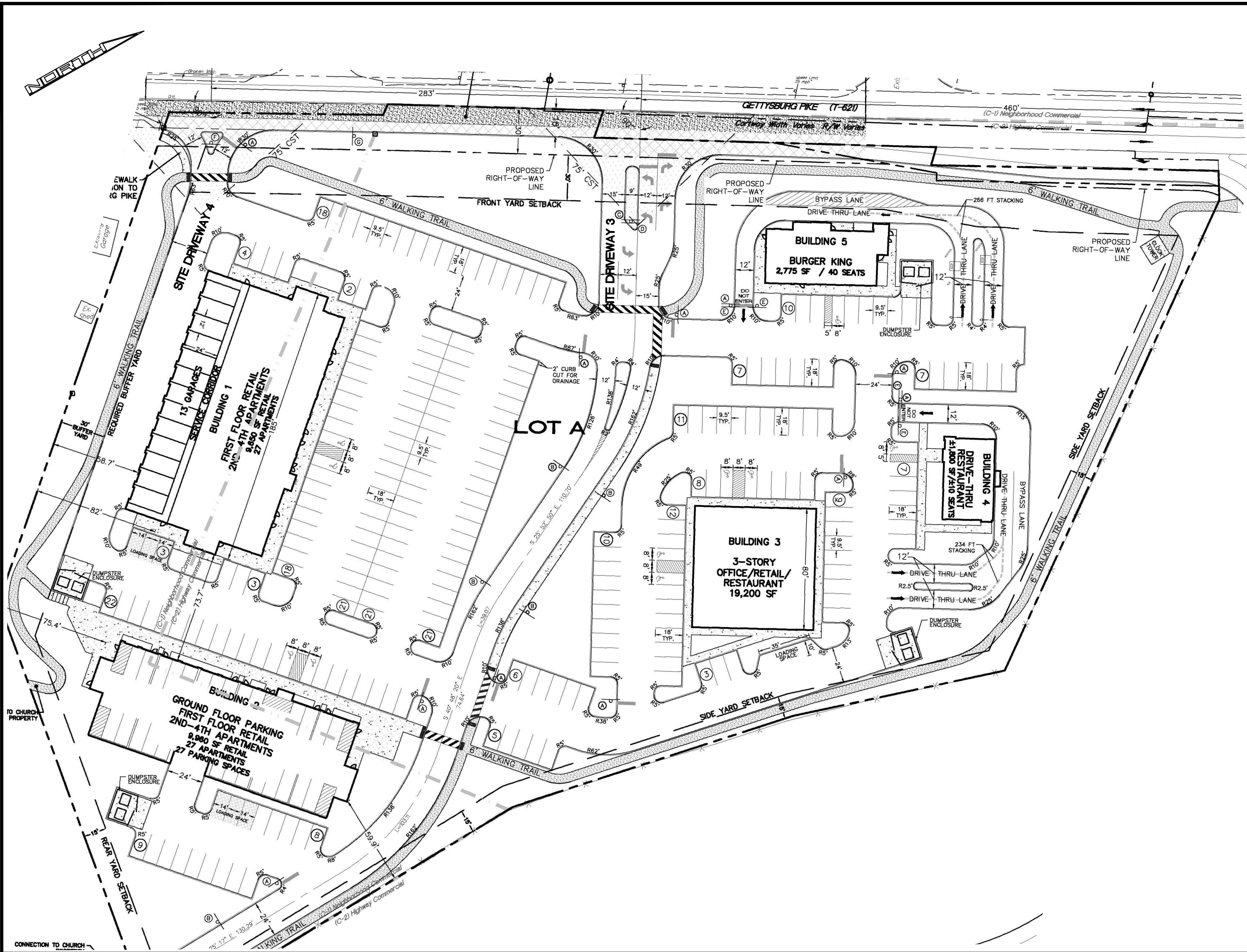
PROJECT NO.
319590

SURVEY BOOK :
Z:\Surveyor\Year\Project.txt

SCALE: 1" = 100'

DWG FILE : Y:\6\317508.dgn (317508\DWG\Plans\HOP\TIS\00 TIS Loc.dwg)

SHEET 9

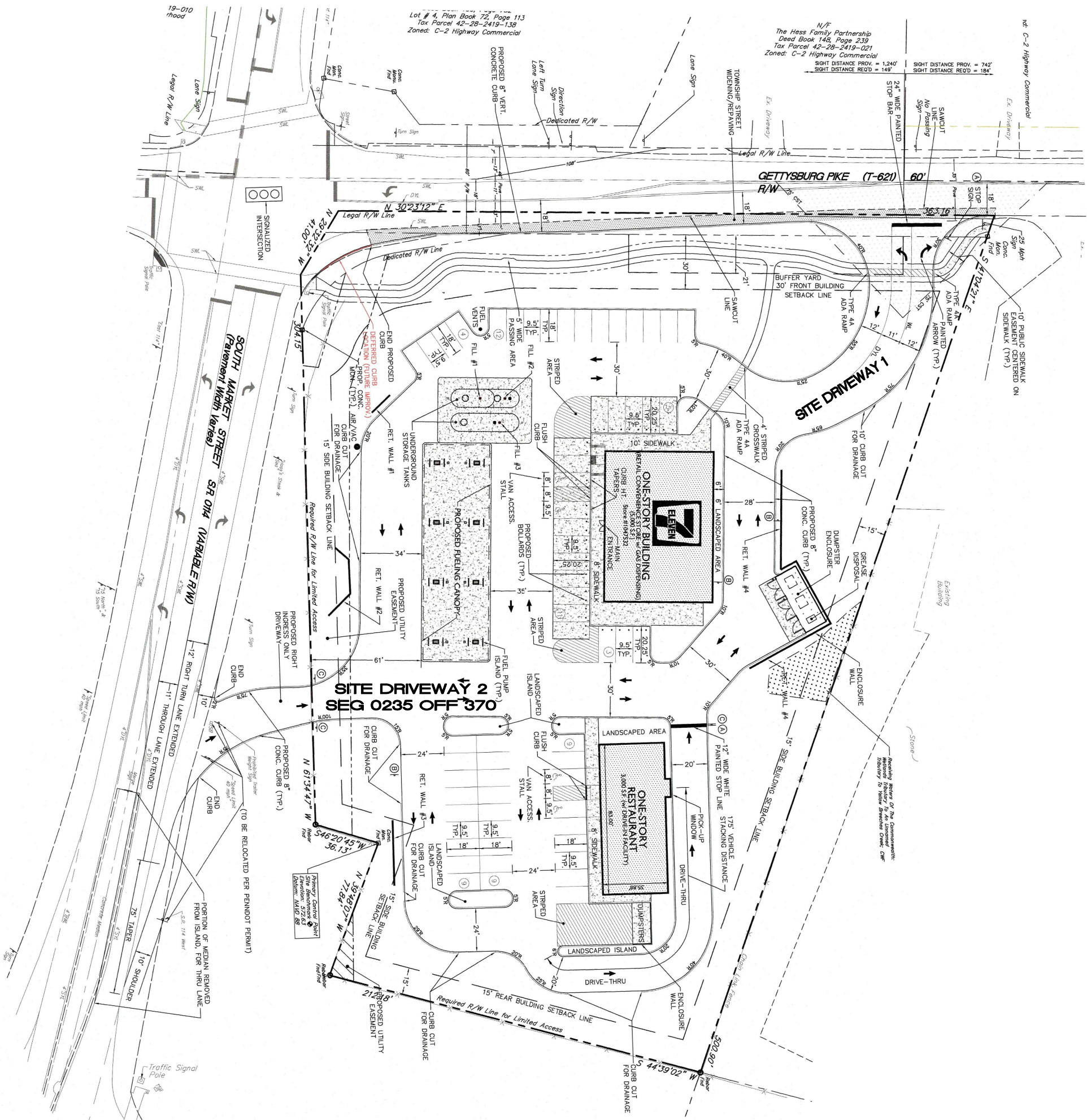
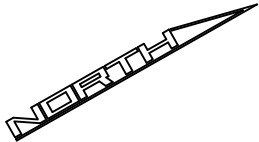


DESIGN :	MEA
DRAWN :	MEA
CHECKED :	X.X.
DATE :	07-10-2020
REV :	08-31-2021

ALPHA CONSULTING ENGINEERS, INC.
PLANNING • ENGINEERING • SURVEYING
115 LIMEKILN RD., P.O. BOX "G"
NEW CUMBERLAND, PA 17070
PHONE: (717) 770 - 2500
FAX: (717) 770 - 2400
WWW.ALPHACON.COM

TRANSPORTATION IMPACT STUDY
SITE PLAN - FIGURE 2
151 - 237 GETTYSBURG PIKE
UPPER ALLEN TOWNSHIP, CUMBERLAND COUNTY, PENNSYLVANIA

PROJECT NO.	319590
SURVEY BOOK :	Z:\Surveyor\Year\Project\List
SCALE :	1" = 60'
SHEET	10A



DESIGN : MEA
DRAWN : MEA
CHECKED : X.X.
DATE : 07-10-2020
REV : 08-31-2021

ALPHA
ALPHA CONSULTING ENGINEERS, INC.
PLANNING • ENGINEERING • SURVEYING
115 LIMEKILN RD., P.O. BOX "G"
NEW CUMBERLAND, PA 17070
PHONE: 717/770 - 2500
FAX: (717) 770 - 2400
WWW.ALPHACON.COM

TRANSPORTATION IMPACT STUDY
SITE PLAN - FIGURE 2

151 - 237 GETTYSBURG PIKE

UPPER ALLEN TOWNSHIP, CUMBERLAND COUNTY, PENNSYLVANIA

PROJECT NO.
319590
SURVEY BOOK :
Z:\Surveyor\Year\Project\List
SCALE : 1" = 60'

SHEET 10B

LAND USE CONTEXT

Guidance for the development of non-limited access roads as context sensitive is provided in PennDOT Publication 13M. To achieve the objectives within the publication, land use context is determined to provide appropriate roadway design. Land use context for the proposed development and the immediate surrounding area is predominately 'Suburban Corridor' for the adjacent Gettysburg Pike and S Market Street SR 0114 corridors. The area is bounded by residential housing and commercial use on the north, south and west, Gettysburg Pike on the West and US Route 15 on the East. This context coincides with Upper Allen Township's current zoning of the site being 'Commercial Limited'. The land use context may be referred to throughout this report in the comparison and selection of appropriate design criteria.

EXISTING ROADWAY NETWORK

The existing roadway network affected by the proposed development, as agreed upon during the scoping meeting with Upper Allen Township and PennDOT, consists of the Gettysburg Pike corridor immediately adjacent to the site and the previously noted study intersections. The Gettysburg Pike corridor falls within PennDOT's designated urbanized area boundary. Existing lane configurations and intersection controls are illustrated in **Figure 3**. Photographs of the intersection and approaches are provided in the appendix / tabbed section of the study.

- Corridors

Gettysburg Pike

Gettysburg Pike is classified as an 'Urban Collector', and falls under Traffic Pattern Group 5 (TPG-5) as designated by PennDOT. Upper Allen Township has classified Gettysburg Pike as a 'Community Arterial' north of the intersection with South Market Street, and as a "Community Collector" for sections of the roadway located south of the intersection with South Market Street. Traffic flows in a north/south direction for the section of the roadway adjacent to the site with an Annual Average Daily Traffic approaching 5,000 vehicles. The speed limit is posted at 25 mph for sections of the road located south of the intersection with South Market Street, and 35 mph for sections of the road located north of the intersection with South Market Street. The noted speed limit is slightly lower than the range recommended for the land use context. The alignment approaching the site from both the north and south is straight having grades that vary from approximately 6 to 1%, providing reasonable sight distances for turning movements. The wearing surface is bituminous and is in good shape. Lane widths average 11 to 13 feet over the length of the roadway. Shoulders vary in width from 0 to 6 feet. Uses along the Gettysburg Pike corridor consist of primarily commercial and services with some agricultural and residential uses.

South Market Street SR 0114

South Market Street is classified as a 'Community Arterial', and falls under Traffic Pattern Group 5 (TPG-5) as designated by PennDOT. Upper Allen Township has classified South Market Street as a 'Arterial'. Traffic flows in an east/west direction for the section of the roadway adjacent to the site with an Annual Average Daily Traffic approaching 9,000 vehicles. The speed limit is posted at 40 mph for sections of the road located adjacent to the site. The noted speed limit is within the range recommended for the land

use context. The alignment approaching the site from both the east and west is straight having grades that vary from approximately 6 to 1%, providing reasonable sight distances for turning movements. The wearing surface is bituminous and is in good shape. Lane widths average 11 to 14 feet over the length of the roadway. Shoulders vary in width from 0 to 10 feet. Uses along the South Market Street corridor consist of primarily commercial and services with some agricultural and residential uses.

- Intersections

South Market Street (SR 0114) – Gettysburg Pike, signalized intersection:

This is a signalized 4-leg intersection. **Figure 3a** provides in-depth detail of approaches, lanes, lane widths, medians, grades, speed limits, signage, and traffic signal systems for this signalized intersection. Intersection capacity currently operates at a LOS 'C' or better for all peak hours. **Figure 3a** also includes the signal permit and system plans for improvements currently under construction at this intersection.

South Market Street (SR 0114) – Southbound Ramp US 15, signalized intersection:

This is a signalized 4-leg intersection. **Figure 3a** provides in-depth detail of approaches, lanes, lane widths, medians, grades, speed limits, signage, and traffic signal systems for this signalized intersection. Intersection capacity currently operates at a LOS 'C' or better for all peak hours.

South Market Street (SR 0114) – Northbound Ramp US 15, signalized intersection:

This is a signalized 4-leg intersection. **Figure 3a** provides in-depth detail of approaches, lanes, lane widths, medians, grades, speed limits, signage, and traffic signal systems for this signalized intersection. Intersection capacity currently operates at a LOS 'B' or better for all peak hours.

- Multimodal Transportation

Capital Area Transit (CAT) does not currently operate any transit routes along Gettysburg Pike in front of the proposed development site. The nearest transit route is (bus route 120) the Winding Hill Express. This route connects the Winding Hills Road Park-n-ride to the Capitol Complex in Harrisburg. This route also has direct connection to the Harrisburg Transit Center which houses the Amtrak Station, Capitol Trailways and Greyhound Bus terminals. Connecting routes provide access to Harrisburg International Airport. For bicyclists, bike racks are provided on CAT's busses and bike racks are provided at some of the Park-n-rides. Nearest Park-n-ride site is located at the intersection of East Winding Hill Road and Orchard Boulevard (1 mile from site). Connecting routes, Park-n-ride sites, and time tables for route 120 are included within the 'Existing Conditions' tabbed section of the appendix.

Rabbitransit operates a route between Gettysburg and Harrisburg along the adjacent US 15 corridor. The only direct connection is located at the Harrisburg Transit Center.

Williams Grove Road (SR 2011), located approximately one (1) mile to the west, is designated as PA Bike Route J. Bike traffic along the bike route will not be impacted by the development as minimal traffic generated by the development is estimated to be directed toward Williams Grove Road and the shoulder width along Williams Grove Road is being maintained at the existing width. Pedestrian access facilities within the site will

be provided and built per the approved land development plans. Pedestrian facilities are currently provided at each signalized intersection.

EXISTING TRAFFIC VOLUMES AND ANALYSIS

Manual traffic counts were conducted on February 20, 2020 during the weekday (6:00 to 9:00 AM) morning and (3:00 to 7:00 PM) evening periods as well as on February 22, 2020 during the Saturday Peak periods to obtain peak hour data. Data was collected using ‘Jamar Technologies, Inc’ model TDC-12 hand held recorders. There was no pedestrian activity along the study corridors during the data collection periods. Peak hours and volumes for the individual intersections are illustrated in **Table 2**. Turn movement vehicle volume data is included in the appendix. Existing condition traffic volumes for the weekday AM, and weekday PM peak hours are illustrated and included in the appendix as part of **Figure 3**. **Table 1** as included within the executive summary details the average LOS and control delay for each intersection. Each LOS is illustrated and included in the appendix as part of **Figure 3**.

TABLE 2
Peak Hour and Volume

Intersection	Peak Hour			
	AM (Volume)	PM (Volume)	Saturday (Volume)	
S Market Street (SR114)- Gettysburg Pike	7:00 – 8:00 (1628)	4:15 – 5:15 (1718)	11:30 – 12:30 (1363)	
S Market Street (SR114)- Southbound Ramp US 15	7:15 – 8:15 (1486)	4:00 – 5:00 (1790)	11:15 – 12:15 (1292)	
S Market Street (SR114)- Northbound Ramp US 15	7:15 – 8:15 (1597)	4:00 – 5:00 (1718)	11:15 – 12:15 (1425)	

SEASONAL ADJUSTMENT AND GROWTH FACTORS

PennDOT publishes forward-looking growth projections for a one-year period in a one-page document entitled “Growth Factors for August 2019 to July 2020”. For purposes of this analysis, the published value is 0.74% for urban non-interstate highways in Cumberland County. While the land use context is ‘Suburban’, the urban value is chosen as the study area intersections fall within PennDOT’s urban boundary. This factor was applied to arrive at the 2022 base volumes for the opening year and 2027 base volumes for the design horizon year. Traffic volume worksheets are included in a separate tabbed section of the appendix detailing future volumes anticipated per movement, per intersection.

NO-BUILD FUTURE TRAFFIC VOLUMES

Baseline year is 2020 to coincide with the previously noted data collection. Opening year is assumed to be 2022 based on the anticipated development schedule. Opening year - base condition (no-build) traffic volumes for the weekday AM, weekday PM, and Saturday

peak hours are illustrated and included in the appendix as part of **Figures 5a and 5b**. Opening year - base condition (no-build) LOS for the weekday AM and PM peak hours and Saturday peak hours are illustrated and included in the appendix as part of **Figures 5e and 5f**. **Table 1** details the LOS for each intersection within the study area.

PennDOT's policy is to set the design horizon year at 5 years beyond the opening year, or 2027. Design horizon year - base condition (no-build) traffic volumes for the weekday AM and PM peak hours and Saturday peak hours are illustrated and included in the appendix as part of **Figures 6a and 6b**. Design horizon year- base condition (no-build) LOS for the weekday AM and PM peak hours and Saturday peak hours are illustrated and included in the appendix as part of **Figures 6e and 6f**. **Table 1** details the LOS for each intersection within the study area.

PROJECT DESCRIPTION

LINLO Properties XVI, LLC and Highview Commercial are proposing to construct new commercial and residential facilities located at 151 to 237 along Gettysburg Pike in Upper Allen Township. Proposed facilities are anticipated to include a restaurant (approx. 3,000 square feet), a convenience market/gas station (approx. 5,000 square feet) with fueling pumps (approx. 16 fueling positions), associated driveways and parking, and stormwater facilities on the north lot. Facilities proposed on the south lot will include restaurants (approximately 4,600 square feet), retail/service/commercial space (approximately 38,800 square feet), apartment units (approximately 54), associated driveways and parking, and stormwater facilities. The conceptual sketch plans are attached as **Figure 2**. The proposed development is consistent with the zoning. Construction is anticipated to start in 2022 and be completed in the same year to achieve a use in 2022.

PROPOSED SITE ACCESS

Vehicular access to the north lot is proposed via 1 full movement driveway along Gettysburg Pike and one right in only access along South Market Street. The proposed right in only access will require a break in limited access. Per PennDOT, the proposed break in limited access right-of-way along SR 0114 will require coordination and approval from the District Excess Land Committee. Central Office approval will also be required. Vehicular access to the south lot is proposed via 1 full movement driveway along Gettysburg Pike and one right in right out driveway also along Gettysburg Pike. Access is not allowed onto the adjoining sections of US Route 15 and South Market Street (SR 0114) as they are limited access highways. Site driveways are classified as medium-volume driveways. Proposed access is shown on **Figure 2**.

TRIP GENERATION

The trip generation equations for the proposed development are obtained from the manual, *Trip Generation*, Tenth Edition, 2017, an Institute of Transportation Engineers (ITE) Informational Report. For this analysis, Land Use Code 221 (Multi-Family Housing Mid-Rise), Land Use Code 820 (Shopping Center), Land Use Code 934 (Fast-Food Restaurant with Drive-Through Window), and Land Use Code 960 (Super Convenience Market/Gas Station) were used to calculate the average number of vehicular trips the development is estimated to generate during the weekday, weekday AM peak, weekday PM peak, weekday generator peak periods, Saturday, and Saturday peak periods. Peak hour trips calculated are representative of volume that occurs only during the peak hour of

the generator and or adjacent street traffic. **Table 3a** shows the equations and directional percentages for the analyzed time periods. **Table 3b** lists the estimated trips generated by the proposed development at full build out. Per PennDOT, the most conservative value calculated for Land Use 960 and the average rate for Land Use 820 shall be used to determine estimated generated trips. Pass-by trips, primary trips, and trips internally captured are broken down in **Table 3c**. Trip generation data sheets are included in a separate tabbed section of the appendix.

The proposed development is expected to generate approximately 9,500 vehicle trips on an average weekday while school is in session. The trip generation estimate includes approximately 810 vehicle trips during the morning or AM peak hour of the adjacent street and approximately 787 vehicle trips during the PM peak hour of the adjacent street and approximately 989 vehicle trips during the SAT peak hour.

TABLE 3a
ITE TRIP GENERATION EQUATIONS

Land Use Description	ITE #	Time Period	Equations	Independent Variable (X)	Entering %	Exiting %
Multi-Family Housing (Mid-Rise)	221	Weekday	AR: $T = 5.44(X)$ $T = 5.45(X) - 1.75$	(54) Dwelling Units	50%	50%
		AM Peak Hour of Adj Street	AR: $T = 0.36(X)$ $\ln(T) = 0.98 \ln(X) - 0.98$		26%	74%
		PM Peak Hour of Adj Street	AR: $T = 0.44(X)$ $\ln(T) = 0.96 \ln(X) - 0.63$		61%	39%
		AM Peak Hour of Generator	AR: $T = 0.32(X)$ $\ln(T) = 0.83 \ln(X) - 0.27$		27%	73%
		PM Peak Hour of Generator	AR: $T = 0.41(X)$ $\ln(T) = 0.83 \ln(X) - 0.05$		60%	40%
		Saturday	AR: $T = 4.91(X)$ $T = 3.04(X) + 417.11$		50%	50%
		Saturday Peak	AR: $T = 0.44(X)$ $T = 0.42(X) + 6.73$		49%	51%

T = number of site-generated vehicular trips Available M= Measured Trip Rate

AR = Trip Generation Rate, No equation provided.

SNA = Split Not

TABLE 3a (continued)
ITE TRIP GENERATION EQUATIONS

Land Use Description	ITE #	Time Period	Equations	Independent Variable (X)	Entering %	Exiting %
Shopping Center	820	Weekday	AR: $T = 37.75(X)$ $\ln(T) = 0.68 \ln(X) + 5.57$	(38.8) (For Average Rate Scenario)	50%	50%
		AM Peak Hour of Adj Street	AR: $T = 0.94(X)$ $T = 0.50(X) + 151.78$		62%	38%
		PM Peak Hour of Adj Street	AR: $T = 3.81(X)$ $\ln(T) = 0.74 \ln(X) + 2.89$		48%	52%
		AM Peak Hour of Generator	AR: $T = 3.00(X)$ $T = 2.76(X) + 77.28$	(43.4) (For Regression Equation Scenario)	54%	46%
		PM Peak Hour of Generator	AR: $T = 4.21(X)$ $\ln(T) = 0.72 \ln(X) + 3.02$	1,000 SF	50%	50%
		Saturday	AR: $T = 46.12(X)$ $\ln(T) = 0.62 \ln(X) + 6.24$		50%	50%
		Saturday Peak Hour	AR: $T = 4.50(X)$ $\ln(T) = 0.79 \ln(X) + 2.79$		52%	48%

16

Land Use Description	ITE #	Time Period	Equations	Independent Variable (X)	Entering %	Exiting %
Fast-Food Restaurant with Drive-Through Window	934	Weekday	AR: $T = 470.95(X)$	(3) For Single Facility on North Lot	50%	50%
		AM Peak Hour of Adj Street	AR: $T = 40.19(X)$		51%	49%
		PM Peak Hour of Adj Street	AR: $T = 32.67(X)$		52%	48%
		AM Peak Hour of Generator	AR: $T = 50.97(X)$	(1.8) (2.8) For Separate Facilities on South Lot	52%	48%
		PM Peak Hour of Generator	AR: $T = 51.36(X)$	1,000 SF	51%	49%
		Saturday	AR: $T = 616.12(X)$		50%	50%
		Saturday Peak	AR: $T = 54.86(X)$		51%	49%

T = number of site-generated vehicular trips Available M= Measured Trip Rate

AR = Trip Generation Rate, No equation provided.

SNA = Split Not

TABLE 3a (continued)
ITE TRIP GENERATION EQUATIONS

Land Use Description	ITE #	Time Period	Equations	Independent Variable (X)	Entering %	Exiting %
Super Convenience Market/Gas Station	960	Weekday	$T = 837.58(X)$	(5.0) 1,000 SF	50%	50%
		AM Peak Hour of Adj Street	AR: $T = 83.14(X)$ $T = 137.38(X) - 264.53$		50%	50%
		PM Peak Hour of Adj Street	$T = 69.28(X)$		50%	50%
		AM Peak Hour of Generator	AR: $T = 70.01(X)$ $T = 99.90(X) - 130.36$		50%	50%
		PM Peak Hour of Generator	AR: $T = 67.53(X)$ $T = 77.96(X) - 46.12$		50%	50%
		Saturday	$T = 700.00(X)$		50%	50%
		Saturday Peak	AR: $T = 63.80(X)$ $T = 104.71(X) - 204.23$		50%	50%

Land Use Description	ITE #	Time Period	Equations	Independent Variable (X)	Entering %	Exiting %
Super Convenience Market/Gas Station	960	Weekday	$T = 230.52(X)$	(16) Fueling Positions	50%	50%
		AM Peak Hour of Adj Street	$T = 28.08(X)$		50%	50%
		PM Peak Hour of Adj Street	$T = 22.96(X)$		50%	50%
		AM Peak Hour of Generator	$T = 21.30(X)$		50%	50%
		PM Peak Hour of Generator	$T = 20.25(X)$		50%	50%
		Saturday	$T = 291.67(X)$		50%	50%
		Saturday Peak	$T = 23.26(X)$		50%	50%

T = number of site-generated vehicular trips Available
M= Measured Trip Rate

AR = Trip Generation Rate, No equation provided.

SNA = Split Not

TABLE 3c
PROPOSED DEVELOPMENT – BUILD OUT – PASS-BY AND PRIMARY TRIPS

		Trips											
		Total				Enter				Exit			
Land Use		Uses without Pass-by Rate	Shopping Center	Fast-Food Restaurant	Super Convenience Market	Uses without Pass-by Rate	Shopping Center	Fast-Food Restaurant	Super Convenience Market	Uses without Pass-by Rate	Shopping Center	Fast-Food Restaurant	Super Convenience Market
ITE#			820	934	960		820	934	960		820	934	960
Period	Type												
Weekday AM Adj.	Total	19	36	306	449	5	22	155	224	14	14	151	225
		810				406				404			
	Capture	3	4	7		0	2	5		3	2	2	
	Capture Total	14				7				7			
	External	16	32	299	449	5	20	150	224	11	12	149	225
	Pass-by Rate		0	0.49	0.76		0	0.49	0.76		0	0.49	0.76
	Pass-by		0	147	341		0	74	170		0	73	171
	Pass-by Total		488				244				244		
	Primary	16	32	152	108	5	20	76	54	11	12	76	54
	Primary Total	308				155				153			
Weekday PM Adj.	Total	24	148	248	367	14	71	129	183	10	77	119	184
		787				397				390			
	Capture	14	62	56		8	34	24		6	28	32	
	Capture Total	132				66				66			
	External	10	86	192	367	6	37	105	183	4	49	87	184
	Pass-by Rate		0.34	0.50	0.76		0.34	0.50	0.76		0.34	0.50	0.76
	Pass-by		29	96	279		12	53	139		17	43	140
	Pass-by Total		404				204				200		
	Primary	10	57	96	88	6	25	52	44	4	32	44	44
	Primary Total	251				127				124			
Saturday Peak	Total	24	175	418	372	12	91	212	186	12	84	206	186
		989				501				488			
	Capture	8	47	52		3	26	23		5	24	29	
	Capture Total	107				52				55			
	External	16	128	366	372	9	65	189	186	7	63	177	186
	Pass-by Rate		0.26	0	0.66		0.26	0	0.66		0.26	0	0.66
	Pass-by		33	0	246		17	0	123		16	0	123
	Pass-by Total		279				140				139		
	Primary	16	95	366	126	9	48	189	63	7	47	177	63
	Primary Total	603				309				294			

TRIP DISTRIBUTION

The distribution and assignment of site-generated trips was based upon an analysis of the following: (1) existing traffic patterns and distributions within the study area; (2) the available routes for travel; and (3) the proposed site driveway location and configuration.

Available routes for travel are broken down into three areas and roadways. For vehicles entering from the south and south west from Carlisle and I-81, PA Route 74 is the most direct route. For vehicles entering from the south (Maryland, Virginia, and the DC metropolitan area), Gettysburg Pike from US 15 North is the most direct route. For vehicles entering from the east (I-83, I-76), west (I-76), and the north (I-81) Grantham Road via US 15 South is the most direct route. The measured distribution is indicative of the proximity of US 15. Travel patterns and distributions of site-specific traffic are illustrated in the appendix as part of **Figure 4**.

BUILD FUTURE TRAFFIC VOLUMES (OPENING YEAR)

The site-generated trips for the proposed development were added to the 2022 opening year - base condition (no-build) to calculate 2022 opening year - projected (full build out) conditions. Projected condition traffic volumes for the weekday AM and PM peak hours are illustrated and included in the appendix as part of **Figures 5c and 5d**. Opening year - projected condition (build) LOS for the weekday AM and PM peak hours are illustrated and included in the appendix as part of **Figures 5g and 5h**. **Table 1** details the LOS for each intersection within the study area.

BUILD FUTURE TRAFFIC VOLUMES (DESIGN HORIZON YEAR)

The site-generated trips for the proposed development were added to the 2027 horizon year - base condition (no-build) to calculate 2027 horizon year - projected (full build out) conditions. Projected condition traffic volumes for the weekday AM and PM peak hours are illustrated and included in the appendix as part of **Figures 6c and 6d**. Horizon year - projected condition (build) LOS for the weekday AM and PM peak hours are illustrated and included in the appendix as part of **Figures 6g and 6h**. **Table 1** details the LOS for each intersection within the study area.

CAPACITY ANALYSIS

Level of Service (LOS) generally describes operational characteristics in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort and convenience and safety. Six Levels of Service are defined for each type of traffic facility, ranging from A to F. Level of Service "A" indicates free flow; Level of Service "B" indicates stable flow; Level of Service "C" indicates stable, but inhibited flow; Level of Service "D" indicates high density, restricted stable flow; Level of Service "E" indicates operation at or near capacity; Level of Service "F" is indicative of flow breakdown. Levels of Service criteria are also quantified in terms of average control delay as illustrated in **Table 5** per vehicle for a one-hour period. PennDOT policy sets acceptable LOS for intersections as overall intersection LOS C in rural areas and overall intersection LOS D in urban areas. Individual municipalities may have defined differing values for acceptable LOS by ordinance.

TABLE 5
Control Delay per Levels Of Service

Level-of-Service	Control Delay Per Vehicle (Seconds)	
	Signalized Intersections	Un-Signalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Signalized and un-signalized intersection capacity analysis was conducted utilizing SYNCRO 10.3 Software, build 151, revision 0. HCM data sheets are included in a separately tabbed section of the appendix. Capacity analysis is conducted per methodologies and procedures outlined in the Transportation Research Board publication HCM 6.

As previously stated above for opening year and design horizon year, the projected conditions (build) LOS for the weekday AM and PM peak hours and Saturday mid-day peak hour are illustrated and included in the appendix as part of **Figures 5g, 5h, 6g and 6h**, respectively. For comparison, existing LOS for the weekday AM and PM peak hours and Saturday mid-day peak hour are illustrated and included in the appendix as part of **Figure 3**. Levels of Service (LOS) for intersections within the study area have been summarized in **Table 1**. The summaries have been prepared outlining existing 2020 baseline conditions, opening year 2022 base (no-build) and projected (build) conditions, and design horizon year 2027 base (no-build) and projected (build) conditions. ‘Baseline’ refers to the existing development scenario represented by the measured traffic volumes listed in the *Existing traffic volumes and analysis* section of this report. ‘No-Build’ refers to a development scenario whereby traffic growth on the adjacent street is the only additional development. ‘Build’ refers to a development scenario that consists of the addition of the commercial and residential facilities, related driveway construction and removal of the existing “Maggie’s” restaurant and the residential homes. ‘No-Build w/ ADJ DEV’ refers to a development scenario whereby traffic growth on the adjacent street with estimated traffic from the proposed development across Gettysburg Pike is the only additional development. ‘Build w/ ADJ DEV’ refers to a development scenario that consists of the addition of the commercial and retail facilities, related driveway construction and removal of the existing “Maggie’s” restaurant and the residential homes, and the addition of estimated traffic from the proposed development across Gettysburg Pike. Additional information regarding the adjacent development is included in a separate section of the appendix.

During the future 2022 and 2027 design years, the following five study intersections are estimated to operate at varying levels of service dependent upon a specific peak hour.

- **South Market Street (SR 0114) & Gettysburg Pike –**

During the AM peak hour, the intersection of S Market Street SR 0114 and Gettysburg Pike currently operates at an acceptable LOS 'B' and is estimated to operate at LOS 'C' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to operate at an LOS 'D' or better. Intersection delay is estimated to only increase by approximately 8 seconds as a result of the LOS drop.

During the PM peak hour, the intersection of S Market Street SR 0114 and Gettysburg Pike currently operates at an acceptable LOS 'B' and is estimated to operate at LOS 'C' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to continue to operate at an LOS 'C'.

During the Saturday peak hour, the intersection of S Market Street SR 0114 and Gettysburg Pike currently operates at an acceptable LOS 'B' and is estimated to continue to operate at LOS 'B' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to operate at an LOS 'C'. Intersection delay is estimated to only increase by approximately 10 seconds as a result of the LOS drop.

Intersection improvements are required for this intersection to mitigate the LOS drop.

- **South Market Street (SR 0114) & US 15 Southbound Ramps –**

During the AM peak hour, the intersection of S Market Street SR 0114 and US 15 Southbound Ramp currently operates at an acceptable LOS 'B' and is estimated to continue to operate at LOS 'B' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to continue to operate at an LOS 'B' or better.

During the PM peak hour, the intersection of S Market Street SR 0114 and US 15 Southbound Ramp currently operates at an acceptable LOS 'B' and is estimated to operate at LOS 'C' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to continue to operate at an LOS 'C' or better.

During the Saturday mid-day peak hour, the intersection of S Market Street SR 0114 and US 15 Southbound Ramp currently operates at an acceptable LOS 'A' and is estimated to continue to operate at LOS 'A' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to operate at an LOS 'B'. Intersection delay is estimated to only increase by approximately 3 seconds as a result of the LOS drop.

- **South Market Street (SR 0114) & US 15 Northbound Ramps –**

During the AM peak hour, the intersection of S Market Street SR 0114 and US 15 Northbound Ramp currently operates at an acceptable LOS 'B' and is estimated to continue to operate at LOS 'B' under 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to operate at a LOS 'C' or better. The LOS drop is within PennDOT's 10 second delay variance as the delay is estimated to increase by approximately 9 seconds.

During the PM peak hour, the intersection of S Market Street SR 0114 and US 15 Northbound Ramp currently operates at an acceptable LOS 'B' and is estimated to continue to operate at LOS 'B' under 2022 and 2027 design years without the development. With the addition of the development generated traffic, the intersection is estimated to operate at a LOS 'C' or better. The LOS drop is within PennDOT's 10 second delay variance as the delay is estimated to increase by approximately 9 seconds.

During the Saturday mid-day peak hour, the intersection of S Market Street SR 0114 and US 15 Northbound Ramp currently operates at an acceptable LOS 'A' and is estimated to continue to operate at LOS 'A' under the 2022 and 2027 design years without the development. With the addition of the development generated traffic the intersection is estimated to operate at a LOS 'B' under the 2022 and 2027 design years. The LOS drop is within PennDOT's 10 second delay variance as the delay is estimated to increase by approximately 3 seconds.

- **Site Driveway 1 & Gettysburg Pike –** During the both the AM and PM peak hours, this intersection is estimated to operate at LOS 'B' under the opening 2022 and horizon 2027 design years with the development. During the Saturday mid-day peak hour, this intersection is estimated to operate at LOS 'A' under the opening 2022 and horizon 2027 design years with the development. All external movements are estimated to operate at LOS 'B' or better and all internal movements are estimated to operate at LOS 'E' or better for all build scenarios.
- **Site Driveway 2 & South Market Street SR 0114 –** During the AM, PM, and the Saturday mid-day peak hours this intersection is estimated to operate at LOS 'A' under the opening 2022 and horizon 2027 design years with the development. Average intersection delay is estimated to be negligible being 1 second or less with the development. All movements are estimated to operate at LOS 'A' or better for all build scenarios.
- **Site Driveways 3 and 4 & Gettysburg Pike –** During the AM, PM, and the Saturday mid-day peak hours this intersection is estimated to operate at LOS 'A' under the opening 2022 and horizon 2027 design years with the development. Average intersection delay is estimated to be negligible being 2 seconds or less with the development. All external movements are estimated to operate at LOS 'B' or better and all internal movements are estimated to operate at LOS 'C' or better for all build scenarios.

TURN LANE WARRANT ANALYSIS

Turn lane warrant analysis was conducted for site driveways 1, 2, 3, and 4 for the 2027 build scenario, per the requirements within PennDOT's publication 46, chapter 11. Exceptions include: left turn lane warrant analysis was not performed for site driveway 4 as the left turn movements are restricted, right turn lane warrant analysis was not performed for site driveway 3 as right turning vehicles into the south lot are assigned to site driveway 4. Turn lane warrant analysis worksheets are included in a separately tabbed section of the appendix.

Analysis indicates that right turn lanes are warranted for site driveway 2 during the AM, PM, and Saturday peak hours at a length of 175 feet. Analysis indicates that left turn lanes are warranted for site driveway 3 during the AM peak hour at a length of 100 feet, during the PM peak hour at a length of 75 feet, and during the Saturday peak hour at 150 feet.

TURN RESTRICTION WARRANT ANALYSIS

Turn restriction warrants were evaluated per 67 PA Code § 212.111 for the proposed site driveway intersection. None of the six warrants were met for the build development scenarios.

QUEUE ANALYSIS

Queue lengths were calculated utilizing SYNCRO 10 Software based on HCM methodology. Calculated 95th% queue lengths based on HCM 6 methodology for each movement at each intersection are indicated in **Table 6a** for the peak hours. Calculated 50th% queue lengths based on HCM 6 methodology for each movement at each signalized intersection are indicated in **Table 6b** for the peak hours. Calculated 95th% queue lengths based on Synchro methodology for each movement at each signalized intersection are indicated in **Table 6c** for the peak hours.

Queuing analysis indicates that vehicle queue lengths for the southbound left at the intersection of South Market Street and Gettysburg Pike, the eastbound through at the intersection of South Market Street and US15 Southbound Ramp, and the eastbound left at the intersection of South Market Street and US15 Northbound Ramp exceed available storage lengths.

Timing improvements to the two signalized intersection will improve the vehicle queue lengths (HCM6 methodology) for both the 95th% and 50th% criteria. The eastbound left turn lane at the US15 Northbound Ramp will require a storage length of 225 feet.

TABLE 6a
HCM 6 CALCULATED 95TH % QUEUE LENGTHS

Intersection	Move ment	Storage Length	AM Peak Hour										
			2020 Base	2022					2027				
				Base		Projected			Base		Projected		
				No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike	EBL	175	18	15	30	73	75	73	18	18	73	78	78
	EBT	1000+	213	188	203	210	160	98	208	173	218	170	108
	EBR	225			13		40	100		18		43	110
	WBL	200	60	50	88	140	143	120	63	53	148	150	128
	WBT	480	48	40	193	373	435	380	210	48	400	470	423
	WBR	185	3	3	5	13	10	10	20	3	15	13	10
	NBL	175	93	93	110	125	130	148	100	113	130	135	145
	NBT	1000+	273	485	408	560	518	100	473	568	608	560	103
	NBR	200*						225					230
	SBL	150 260*	35	35	40	160	160	135	38	38	163	160	133
	SBT/R	1000+	70	75	85	225	210	270	80	88	225	228	275
S Market Street SR 0114 - Southbound Ramp US 15	EBT	480	185	185	330	225	228	100	200	205	240	243	108
	EBR	125	0	0	0	0	0	0	0	0	0	0	0
	WBL	100	10	10	28	10	10	10	10	10	10	10	10
	WBT	500	460	25	160	165	515	15	13	480	175	383	385
	SBLTR	1000+	180	165	190	190	190	195	185	185	195	195	195
S Market Street SR 0114 - Northbound Ramp US 15	EBL	125 450*	100	133	150	208	160	175	110	130	273	278	300
	EBT	500	3	103	130	153	5	5	3	3	158	160	168
	WBT	580	248	238	263	285	333	330	285	303	305	350	350
	WBR	260	0	0	0	0	0	0	0	0	0	0	0
	NBLTR	1000+	165	158	185	218	225	230	173	185	228	223	233
S Market Street SR 0114 - Site Driveway 1	WBL	125	NA	NA	NA	90	90	90	NA	NA	93	95	93
	WBR	125	NA	NA	NA	5	5	5	NA	NA	5	5	5
	NBT/R	300	NA	NA	NA	0	0	0	NA	NA	0	0	0
	SBL	75	NA	NA	NA	3	3	3	NA	NA	3	3	3
	SBT	1000+						0					0
S Market Street SR 0114 - Site Driveway 2	WBT	250	NA	NA	NA	0	0	0	NA	NA	0	0	0
	WBR	200	NA	NA	NA	0	0	0	NA	NA	0	0	0
S Market Street SR 0114 - Site Driveway 3	WBL	50	NA	NA	NA	5	5	5	NA	NA	5	5	5
	WBR	50	NA	NA	NA	8	8	8	NA	NA	8	8	8
	NBT/R	1000+	NA	NA	NA	0	0	0	NA	NA	0	0	0
	SBL	150	NA	NA	NA	10	10	10	NA	NA	10	10	10
	SBT	500						0					0
S Market Street SR 0114 - Site Driveway 4	WBR	100	NA	NA	NA	8	8	8	NA	NA	8	8	8
	NBT/R	80	NA	NA	NA	0	0	0	NA	NA	0	0	0
	SBT	300	NA	NA	NA	0	0	0	NA	NA	0	0	0

Lengths are in feet.

■ = Length greater than storage length.

* Indicates mitigation lane length.

TABLE 6a (CONT'D)
HCM 6 CALCULATED 95TH % QUEUE LENGTHS

Intersection	Move ment	Storage Length	PM Peak Hour										
			2020 Base	2022					2027				
				Base		Projected			Base		Projected		
				No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike	EBL	175	20	18	20	65	68	55	18	20	65	68	58
	EBT	1000+	303	275	260	305	270	140	290	273	320	283	153
	EBR	225			28		48	140		28		50	153
	WBL	200	73	63	60	143	143	98	65	63	155	153	105
	WBT	480	45	50	55	163	175	140	53	58	173	185	153
	WBR	185	18	18	15	45	35	28	20	15	50	38	33
	NBL	175	50	43	45	65	65	50	45	45	65	68	58
	NBT	1000+	185	253	253	338	340	58	280	280	360	365	63
	NBR	200*						108					123
	SBL	150 260*	103	88	90	220	213	148	90	93	233	225	170
	SBT/R	1000+	125	110	113	208	205	180	115	118	213	213	195
S Market Street SR 0114 - Southbound Ramp US 15	EBT	480	348	340	385	443	493	188	368	415	480	535	203
	EBR	125	0	0	0	0	0	0	0	0	0	0	0
	WBL	100	30	25	28	30	33	28	28	30	33	33	30
	WBT	500	15	13	155	93	195	245	85	163	100	95	173
	SBLTR	1000+	390	328	340	383	383	288	345	353	398	403	318
S Market Street SR 0114 - Northbound Ramp US 15	EBL	125 450*	270	120	173	195	293	235	153	225	333	480	300
	EBT	500	8	13	180	100	223	25	78	183	230	230	25
	WBT	580	165	235	228	273	305	275	245	255	333	363	333
	WBR	260	0	0	0	0	0	0	0	0	0	0	0
	NBLTR	1000+	213	190	193	255	258	230	198	210	263	265	248
S Market Street SR 0114 - Site Driveway 1	WBL	125	NA	NA	NA	115	115	113	NA	NA	120	123	120
	WBR	125	NA	NA	NA	5	5	5	NA	NA	5	5	5
	NBT/R	300	NA	NA	NA	0	0	0	NA	NA	0	0	0
	SBL	75	NA	NA	NA	5	5	5	NA	NA	5	5	5
	SBT	1000+				0	0	0			0	0	0
S Market Street SR 0114 - Site Driveway 2	WBT	250	NA	NA	NA	0	0	0	NA	NA	0	0	0
	WBR	200	NA	NA	NA	0	0	0	NA	NA	0	0	0
S Market Street SR 0114 - Site Driveway 3	WBL	50	NA	NA	NA	5	5	5	NA	NA	5	5	5
	WBR	50	NA	NA	NA	5	5	5	NA	NA	5	5	5
	NBT/R	1000+	NA	NA	NA	0	0	0	NA	NA	0	0	0
	SBL	150	NA	NA	NA	8	8	8	NA	NA	10	10	10
	SBT	500						0					0
S Market Street SR 0114 - Site Driveway 4	WBR	100	NA	NA	NA	5	5	5	NA	NA	5	5	5
	NBT/R	80	NA	NA	NA	0	0	0	NA	NA	0	0	0
	SBT	300	NA	NA	NA	0	0	0	NA	NA	0	0	0

Lengths are in feet.

■ = Length greater than storage length.

* Indicates mitigation lane length.

TABLE 6a (CONT'D)
HCM 6 CALCULATED 95TH % QUEUE LENGTHS

Intersection	Move ment	Storage Length	SATURDAY Peak Hour											
			2020 Base	2022						2027				
				Base		Projected			Base		Projected			
				No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	
S Market Street SR 0114 - Gettysburg Pike	EBL	175	10	10	10	50	58	38	10	10	55	55	40	
	EBT	1000+	163	158	140	210	188	78	170	148	235	190	83	
	EBR	225			13		35	78		13		35	83	
	WBL	200	25	25	25	88	103	65	25	25	100	98	68	
	WBT	480	15	15	15	188	210	148	15	15	213	210	158	
	WBR	185	3	3	3	38	30	23	3	3	43	30	23	
	NBL	175	43	43	43	78	88	65	45	45	83	83	65	
	NBT	1000+	118	163	163	270	260	75	173	173	260	250	75	
	NBR	200*						83					83	83
	SBL	150 260*	80	83	83	210	208	175	85	88	205	208	178	
SBT/R	1000+	78	83	83	165	175	148	85	85	170	170	153		
S Market Street SR 0114 - Southbound Ramp US 15	EBT	480	178	183	183	245	255	103	190	193	263	263	108	
	EBR	125	0	0	0	0	0	0	0	0	0	0	0	
	WBL	100	13	13	13	13	15	13	13	13	15	15	13	
	WBT	500	15	15	15	18	18	283	15	15	20	20	293	
	SBLTR	1000+	158	160	160	188	208	148	165	165	203	203	153	
S Market Street SR 0114 - Northbound Ramp US 15	EBL	125 450*	18	18	18	38	43	3	18	18	43	43	40	
	EBT	500	13	13	13	13	13	255	13	13	13	13	263	
	WBT	580	130	135	135	203	213	190	145	145	218	218	200	
	WBR	260	0	0	0	0	0	0	0	0	0	0	0	
	NBLTR	1000+	123	125	125	208	228	168	128	128	223	223	175	
S Market Street SR 0114 - Site Driveway 1	WBL	125	NA	NA	NA	83	83	80	NA	NA	88	88	85	
	WBR	125	NA	NA	NA	3	3	3	NA	NA	3	3	3	
	NBT/R	300	NA	NA	NA	0	0	0	NA	NA	0	0	0	
	SBL	75	NA	NA	NA	3	3	3	NA	NA	3	3	3	
	SBT	1000+				0	0	0			0	0	0	
S Market Street SR 0114 - Site Driveway 2	WBT	250	NA	NA	NA	0	0	0	NA	NA	0	0	0	
	WBR	200	NA	NA	NA	0	0	0	NA	NA	0	0	0	
S Market Street SR 0114 - Site Driveway 3	WBL	50	NA	NA	NA	8	8	8	NA	NA	8	8	8	
	WBR	50	NA	NA	NA	10	10	10	NA	NA	10	10	10	
	NBT/R	1000+	NA	NA	NA	0	0	0	NA	NA	0	0	0	
	SBL	150	NA	NA	NA	18	18	18	NA	NA	18	18	18	
	SBT	500				0	0	0			0	0	0	
S Market Street SR 0114 - Site Driveway 4	WBR	100	NA	NA	NA	8	8	8	NA	NA	8	8	8	
	NBT/R	80	NA	NA	NA	0	0	0	NA	NA	0	0	0	
	SBT	300	NA	NA	NA	0	0	0	NA	NA	0	0	0	

Lengths are in feet.

■ = Length greater than storage length.

* Indicates mitigation lane length.

TABLE 6b
HCM 6 CALCULATED 50TH % QUEUE LENGTHS

Intersection	Move ment	Storage Length	AM Peak Hour										
			2020 Base	2022					2027				
				Base		Projected			Base		Projected		
				No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike	EBL	175	10	8	18	40	43	40	10	10	40	43	43
	EBT	1000+	123	105	115	120	90	55	118	95	128	95	60
	EBR	225			8		23	55		10		23	60
	WBL	200	33	28	48	78	80	68	35	30	83	83	70
	WBT	480	28	23	115	245	293	250	128	25	265	323	285
	WBR	185	0	0	3	8	5	5	10	0	8	8	5
	NBL	175	50	53	60	70	73	83	55	63	73	75	80
	NBT	1000+	168	308	268	378	355	55	305	360	408	380	58
	NBR	200						130					135
	SBL	150 260*	20	20	23	90	88	75	20	23	90	90	75
	SBT/R	1000+	40	40	48	133	120	165	45	48	130	133	170
S Market Street SR 0114 - Southbound Ramp US 15	EBT	480	105	108	215	133	133	55	118	120	143	145	60
	EBR	125	0	0	0	0	0	0	0	0	0	0	0
	WBL	100	5	5	15	5	5	5	5	5	5	5	5
	WBT	500	330	15	98	103	408	10	8	365	113	300	300
	SBLTR	1000+	100	93	105	105	105	108	103	103	110	110	110
S Market Street SR 0114 - Northbound Ramp US 15	EBL	125 450*	55	75	83	128	93	98	63	73	180	185	193
	EBT	500	3	58	73	85	3	3	3	3	93	93	93
	WBT	580	148	143	158	175	213	213	175	190	193	228	228
	WBR	260	0	0	0	0	0	0	0	0	0	0	0
	NBLTR	1000+	93	88	103	125	133	135	98	103	133	138	138

Lengths are in feet.



= Length greater than storage length.

* Indicates mitigation lane length.

TABLE 6b (CONT'D)
HCM 6 CALCULATED 50TH % QUEUE LENGTHS

Intersection	Move ment	Storage Length	PM Peak Hour										
			2020 Base	2022					2027				
				Base		Projected			Base		Projected		
				No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike	EBL	175	13	10	10	35	38	30	10	10	35	38	33
	EBT	1000+	190	170	158	193	165	78	180	168	205	175	85
	EBR	225			15		28	78		15		28	85
	WBL	200	40	35	33	80	80	55	35	35	85	85	58
	WBT	480	25	28	30	90	98	78	30	33	95	103	85
	WBR	185	10	10	8	25	20	15	10	8	28	20	18
	NBL	175	28	23	25	35	38	28	25	25	38	38	33
	NBT	1000+	103	153	153	215	220	33	170	170	235	238	35
	NBR	200						60					68
	SBL	150 260*	58	50	50	128	123	83	50	50	138	130	95
	SBT/R	1000+	70	63	63	118	118	100	65	65	123	120	110
S Market Street SR 0114 - Southbound Ramp US 15	EBT	480	240	235	268	300	340	103	258	298	330	378	115
	EBR	125	0	0	0	0	0	0	0	0	0	0	0
	WBL	100	18	15	15	18	18	15	15	15	18	18	15
	WBT	500	8	8	90	50	123	168	48	98	55	55	113
	SBLTR	1000+	258	208	218	253	253	178	223	228	265	268	203
S Market Street SR 0114 - Northbound Ramp US 15	EBL	125 450*	185	80	123	143	235	153	110	170	270	408	205
	EBT	500	5	8	128	65	175	15	48	135	178	183	15
	WBT	580	93	138	133	168	193	170	148	155	213	238	213
	WBR	260	0	0	0	0	0	0	0	0	0	0	0
	NBLTR	1000+	123	108	108	153	155	135	113	120	160	160	148

Lengths are in feet.



= Length greater than storage length.

* Indicates mitigation lane length.

TABLE 6b (CONT'D)
HCM 6 CALCULATED 50TH % QUEUE LENGTHS

Intersection	Move ment	Storage Length	SATURDAY Peak Hour										
			2020 Base	2022					2027				
				Base		Projected			Base		Projected		
				No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike	EBL	175	5	5	5	28	33	20	5	5	30	30	23
	EBT	1000+	90	88	78	120	105	43	95	83	140	105	45
	EBR	225			8		20	43		8		20	45
	WBL	200	15	13	13	48	58	35	15	15	55	55	38
	WBT	480	10	8	8	105	120	83	8	8	123	120	88
	WBR	185	3	0	0	20	18	13	0	0	23	18	13
	NBL	175	23	25	25	43	48	35	25	25	45	45	38
	NBT	1000+	65	90	90	165	158	43	95	95	158	150	43
	NBR	200						45					45
	SBL	150 260*	45	45	48	120	118	98	48	48	118	118	100
	SBT/R	1000+	43	45	45	93	98	83	48	48	95	95	85
S Market Street SR 0114 - Southbound Ramp US 15	EBT	480	100	103	103	148	153	58	110	110	160	160	60
	EBR	125	0	0	0	0	0	0	0	0	0	0	0
	WBL	100	8	8	8	8	8	8	8	8	8	8	8
	WBT	500	8	8	8	10	10	185	8	8	10	10	193
	SBLTR	1000+	88	90	90	103	118	83	93	93	115	115	85
S Market Street SR 0114 - Northbound Ramp US 15	EBL	125 450*	10	10	10	23	23	23	10	10	23	23	23
	EBT	500	8	8	8	8	8	160	8	8	8	8	168
	WBT	580	73	75	75	115	120	105	80	80	128	128	113
	WBR	260	0	0	0	0	0	0	0	0	0	0	0
	NBLTR	1000+	68	70	70	118	135	93	70	70	130	130	98

Lengths are in feet.



= Length greater than storage length.

* Indicates mitigation lane length.

TABLE 6c
SYNCHRO CALCULATED 95TH % QUEUE LENGTHS

Intersection	Move ment	Storage Length	AM Peak Hour										
			2020 Base	2022					2027				
				Base		Projected			Base		Projected		
				No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike	EBL	175	19	16	18	52	53	49	17	17	52	54	51
	EBT	1000+	173	159	143	147	116	63	171	142	154	122	70
	EBR	225			2		12	63		3		13	70
	WBL	200	42	19	25	39	50	74	71	22	42	53	42
	WBT	480	379	337	385	226	327	233	360	390	261	339	279
	WBR	185	1	0	0	1	6	1	7	1	2	6	5
	NBL	175	64	67	77	87	89	94	72	77	89	91	95
	NBT	1000+	170	195	208	255	247	78	213	227	270	262	80
	NBR	200						31					30
	SBL	150 260*	28	29	32	104	104	92	31	32	106	106	91
	SBT/R	1000+	45	46	51	79	75	86	49	50	79	80	90
S Market Street SR 0114 - Southbound Ramp US 15	EBT	480	139	143	104	244	248	147	278	151	279	255	169
	EBR	125	10	7	0	24	17	30	12	8	20	17	28
	WBL	100	1	7	6	5	3	1	24	4	7	1	1
	WBT	500	21	225	213	233	197	119	324	173	275	13	83
	SBLTR	1000+	199	146	170	193	198	273	163	168	192	208	208
S Market Street SR 0114 - Northbound Ramp US 15	EBL	125 450*	244	288	315	359	372	296	189	332	386	353	352
	EBT	500	24	13	34	24	26	16	107	20	23	30	38
	WBT	580	236	262	298	345	374	355	343	334	355	393	393
	WBR	260	33	37	39	41	42	40	41	39	41	43	43
	NBLTR	1000+	217	211	232	262	272	281	223	242	284	284	284

Lengths are in feet. = Length greater than storage length.

* Indicates mitigation lane length.

TABLE 6c (CONT'D)
SYNCHRO CALCULATED 95TH % QUEUE LENGTHS

Intersection	Move ment	Storage Length	PM Peak Hour										
			2020 Base	2022					2027				
				Base		Projected			Base		Projected		
				No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike	EBL	175	21	17	18	51	52	51	17	18	51	53	53
	EBT	1000+	290	244	224	254	217	111	256	234	268	228	125
	EBR	225			5		17	111		6		18	125
	WBL	200	72	33	26	51	49	68	36	31	66	46	70
	WBT	480	125	58	83	56	87	91	55	76	57	79	96
	WBR	185	9	0	5	1	4	1	0	5	1	5	1
	NBL	175	42	39	40	52	52	38	40	41	53	53	42
	NBT	1000+	117	143	143	193	194	52	150	150	202	202	55
	NBR	200						40					45
	SBL	150 260*	79	74	74	181	167	99	76	76	187	173	108
	SBT/R	1000+	111	136	137	156	156	120	142	142	160	159	128
S Market Street SR 0114 - Southbound Ramp US 15	EBT	480	405	395	399	465	506	203	401	417	482	512	202
	EBR	125	21	11	19	38	49	41	13	15	40	45	49
	WBL	100	47	18	8	19	8	6	4	7	15	6	11
	WBT	500	153	178	13	202	122	130	99	27	210	123	178
	SBLTR	1000+	438	365	386	457	461	331	395	406	480	494	375
S Market Street SR 0114 - Northbound Ramp US 15	EBL	125 450*	122	5	70	124	276	269	5	15	125	220	290
	EBT	500	185	36	13	15	21	28	16	11	15	19	34
	WBT	580	135	195	220	238	252	219	229	202	274	288	248
	WBR	260	19	30	30	32	33	29	31	30	33	34	31
	NBLTR	1000+	167	151	153	209	211	170	162	171	222	225	194

Lengths are in feet.

■ = Length greater than storage length.

* Indicates mitigation lane length.

TABLE 6c (CONT'D)
SYNCHRO CALCULATED 95TH % QUEUE LENGTHS

Intersection	Move ment	Storage Length	SATURDAY Peak Hour										
			2020 Base	2022					2027				
				Base		Projected			Base		Projected		
				No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.	No- Build	W/ ADJ. DEV	Build	W/ ADJ. DEV	With Improv.
S Market Street SR 0114 - Gettysburg Pike	EBL	175	15	12	12	39	50	41	12	12	45	48	41
	EBT	1000+	180	153	133	172	154	70	160	139	198	155	73
	EBR	225			0		1	70		0		16	73
	WBL	200	32	21	24	33	62	35	12	9	48	57	35
	WBT	480	196	101	130	129	140	123	118	106	140	144	133
	WBR	185	12	13	26	13	23	4	9	17	17	23	6
	NBL	175	33	40	40	60	58	46	41	41	60	58	46
	NBT	1000+	69	107	107	219	207	61	113	113	219	200	61
	NBR	200						29					30
	SBL	150 260*	59	70	70	183	163	103	73	72	177	175	105
	SBT/R	1000+	69	91	91	148	140	112	96	96	145	140	114
S Market Street SR 0114 - Southbound Ramp US 15	EBT	480	137	244	233	260	295	157	177	202	301	306	158
	EBR	125	1	1	4	7	11	16	1	0	9	8	16
	WBL	100	17	23	15	11	11	19	10	10	12	12	19
	WBT	500	135	154	124	171	182	204	114	114	185	185	210
	SBLTR	1000+	144	144	144	200	216	155	146	146	211	211	168
S Market Street SR 0114 - Northbound Ramp US 15	EBL	125 450*	8	1	6	33	24	9	23	23	36	36	19
	EBT	500	117	103	114	149	151	126	153	153	159	159	160
	WBT	580	171	169	169	215	235	203	177	177	239	239	206
	WBR	260	27	27	27	29	30	29	27	27	30	30	29
	NBLTR	1000+	105	107	107	161	176	137	110	110	172	172	140

Lengths are in feet.

■ = Length greater than storage length.

* Indicates mitigation lane length.

SIGHT DISTANCE ANALYSIS

A sight distance analysis was performed for the site driveway intersections. In general, recommended safe sight distances depend upon the posted speed limit, roadway grades, and the number of travel lanes. The measured existing sight distances were compared to PennDOT's safe stopping sight distance (SSSD) standard as calculated by the following equation:

$$SSSD = 1.47VT + V^2/[30(f \pm g)]$$

SSSD = safe stopping sight distance (acceptable sight distance)

V = Velocity of Vehicle (posted)

T = Perception Reaction Time of Driver (2.5 seconds)

f = Coefficient of Friction for Wet Pavements (average of 0.30)

g = Percent of Roadway Grade Divided by 100

PennDOT's safe stopping sight distance standards both exceed the stopping sight distance requirements as specified in A Policy on Geometric Design of Highways and Streets, of the American Association of State Highway and Transportation Officials (AASHTO), Chapter III, "Elements of Design," 2004. The existing sight distances at the site driveways were measured and compared to the minimum sight distance standards as specified in Title 67 of the PA Code, Chapter 441, "Access to and Occupancy of Highways by Driveways and Local Roads," August, 1996. **Table 7** shows the measured, designed, and calculated sight distances at site driveways 1, 3 and 4 for vehicles entering and exiting the site. Site driveway 2 is not included or applicable as there are no exiting movements or entering left turns.

TABLE 7
SIGHT DISTANCE ANALYSIS FOR GETTYSBURG PIKE –
SITE DRIVEWAY 1 UN-SIGNALIZED INTERSECTION

	<i>Direction</i>	Speed (mph)	Approach Vehicle Grade (%)	Acceleration Vehicle Grade (%)	<i>Sight Distances (feet)</i>		
					Desirable	Design	Calculated MIN
Exiting Right Turns	<i>To the left</i>	25	-1	-1	250 T1 (Met)	770 (330 to Intersection)	NA Desirable Met
Exiting Left Turns	<i>To the right</i>	35	+1	+1	350 T1 (Met)	1,025	NA Desirable Met
Entering Left Turns	<i>From Behind</i>	35	+1	NA	NA	1,025	245 (Met)
Entering Left turns	<i>Opposing</i>	25	-1	NA	190 T5 (Met)	760 (340 to Intersection)	NA Desirable Met

T1: Table 1 441.8(h)(1)

T5: Table 5 441.8(h)(1)

* Speed limits are posted 25mph northbound (to the left) and 35mph southbound (to the right)

TABLE 7 Continued
SIGHT DISTANCE ANALYSIS FOR GETTYSBURG PIKE –
SITE DRIVEWAY 3 UN-SIGNALIZED INTERSECTION

	Direction	Speed (mph)	Approach Vehicle Grade (%)	Acceleration Vehicle Grade (%)	Sight Distances (feet)		
					Desirable	Design	Calculated MIN
Exiting Right Turns	<i>To the left</i>	25	-7	-7	125 T1a (Met)	445	NA Desirable Met
Exiting Left Turns	<i>To the right</i>	25	+7	+7	332 T1b (Met)	370 (340 to Intersection)	NA Desirable Met
Entering Left Turns	<i>From Behind</i>	25	+7	NA	NA	370 (320 to Intersection)	138 (Met)
Entering Left turns	<i>Opposing</i>	25	+7	NA	190 T5 (Met)	445	NA Desirable Met

T1: Table 1 441.8(h)(1)

T1a: Table 1 441.8(h)(2)(iii)(D)

T1b: Table 1 441.8(h)(2)(iii)(B)

T5: Table 5 441.8(h)(1)

TABLE 7 Continued
SIGHT DISTANCE ANALYSIS FOR GETTYSBURG PIKE –
SITE DRIVEWAY 4 UN-SIGNALIZED INTERSECTION (RIGHT IN / RIGHT OUT)

	Direction	Speed (mph)	Approach Vehicle Grade (%)	Acceleration Vehicle Grade (%)	Sight Distances (feet)		
					Desirable	Design	Calculated MIN
Exiting Right Turns	<i>To the left</i>	25	-7	-7	125 T1a (Met)	290	NA Desirable Met

RECOMMENDED IMPROVEMENTS

Based on the analysis, roadway improvements are recommended as follows:

Both a roundabout and upgraded signalized intersection improvements were evaluated to mitigate the South Market Street, Gettysburg Pike intersection. Based on discussions and correspondence with PennDOT, an upgraded signalized intersection is recommended to be constructed at this intersection as follows: Construct an exclusive northbound right turn lane 200 feet in length with a turn bay taper of 75 feet in length. Provide 2 lane use control signs (R3-8B, L-S-R) 48"x30" for the northbound approach. Modify the traffic signals to provide right turn overlap phase for the northbound approach. Extend the southbound left turn lane by 110 feet. Relocate the existing lane use control signs for southbound approach consistent with PennDOT's requirements. Extend the westbound right turn lane to the turn bay taper for site driveway 2. Relocate the existing lane use control signs for westbound approach consistent with PennDOT's requirements. Per PennDOT, convert the exclusive eastbound right turn lane (recently constructed by others) to a combined through-right turn lane and provide 2 lane use control signs (R3-8B, L-S-SR) 48"x30". Additional right-of-way will be required for the traffic signal improvements.

To mitigate the storage length deficiency at the South Market Street, US 15 intersection, eastbound capacity improvements are recommended as follows: Construct dual eastbound through lanes along South Market Street from the intersection with Gettysburg Pike to the intersection with the US 15 northbound ramp. At the intersection with the northbound ramp, the leftmost through lane transitions to an exclusive left turn lane. Reconstruct the eastbound approach to the US 15 southbound ramp to maintain the eastbound right turn (sweep) lane. At the eastbound approach to the US 15 southbound ramp provide 2 lane use control signs (R3-8B, S-S-R) 48"x30". Provide appropriate signing and pavement markings as determined during the design phase. Relocate the existing lane use control signs for eastbound approach to the northbound ramp consistent with PennDOT's requirements. Provide coordinated signal retiming for the entire signal system (I-0010) with the lane extensions.

Site driveway 1 shall be designed / constructed with an exclusive exiting right turn lane 12 feet in width and an exclusive exiting left turn lane 11 feet in width. Both lanes are to be 125 feet in length as shown on the Land Development Plan. Provide 2 stop signs (R1-1) 30"x30" for the exiting movements. Construct a southbound entering left turn lane 75 feet in length with a turn bay taper of 75 feet in length. Additional right-of-way will be required for this improvement. Provide 2 lane use control signs (R3-8A, L-S) 30"x30".

Site driveway 2 shall be designed / constructed to prohibit left turning entering movements by use of a raised center median along South Market Street and a swept entrance 200 feet in length that will accommodate entering right turns by delivery vehicles. Include a turn bay taper along South Market Street 75 feet in length. Provide 2 do not enter signs (R5-1) 30"x30" for the exiting approach. Per discussions with PennDOT this configuration is based upon PennDOT's preference of options provided.

Site driveway 3 shall be designed / constructed with an exclusive exiting right turn lane 12 feet in width and an exclusive exiting left turn lane 12 feet in width. Both lanes are to be 50 feet in length as shown on the Land Development Plan. Provide 2 stop signs (R1-1)

30"x30" for the exiting movements. Construct a southbound entering left turn lane, 150 feet in length, with a turn bay taper of 75 feet in length. Provide 2 lane use control signs (R3-8A, L-S) 30"x30" for the entering left turn movement. Provide median island signing keep right and object marker signs (R4-7) 24"x30" (OM1-3) 18"x18".

Site driveway 4 shall be designed / constructed with a raised 'porkchop' concrete island to restrict turning movements to right-in right-out. Lanes shall be 12 feet in width as shown on the Land Development Plan. Provide a stop sign (R1-1) 30"x30", and a no left turn sign (R3-2) 24"x24" for the exiting movement. Provide 2 do not enter signs (R5-1) 30"x30" and a no left turn sign (R3-2) 24"x24" for the entrance visible to the southbound approach. Provide median island signing keep right and object marker signs (R4-7) 24"x30" (OM1-3) 18"x18".

The recommended improvements are preliminarily estimated to cost approximately 1,700,000 dollars and shall be constructed prior to the opening of the development. The recommended improvements are anticipated to begin construction at the same time as the site work construction, approximately fall of 2022. The Highway Occupancy Permittee shall fund and have the improvements constructed. The Pennsylvania Department of Transportation requires the statement that *'all improvements will be constructed to accommodate non-motorized access/circulation and be ADA-compliant unless otherwise approved by the Department.'* In summary, the proposed development and improvements will have minimal traffic impact on the study intersections which will continue to operate at existing levels of service, capacity, and safety.



- LANE IMPROVEMENTS
- SHOULDER IMPROVEMENTS
- CONCRETE MEDIAN

DESIGN :	MEA
DRAWN :	MEA
CHECKED :	X.X.
DATE :	07-22-2020
REV :	11-19-2021

ALPHA

ALPHA CONSULTING ENGINEERS, INC.

PLANNING • ENGINEERING • SURVEYING

115 LIMEKILN RD., P.O. BOX "G"

NEW CUMBERLAND, PA 17070

PHONE: 717.770 - 2500

FAX: 717.770 - 2400

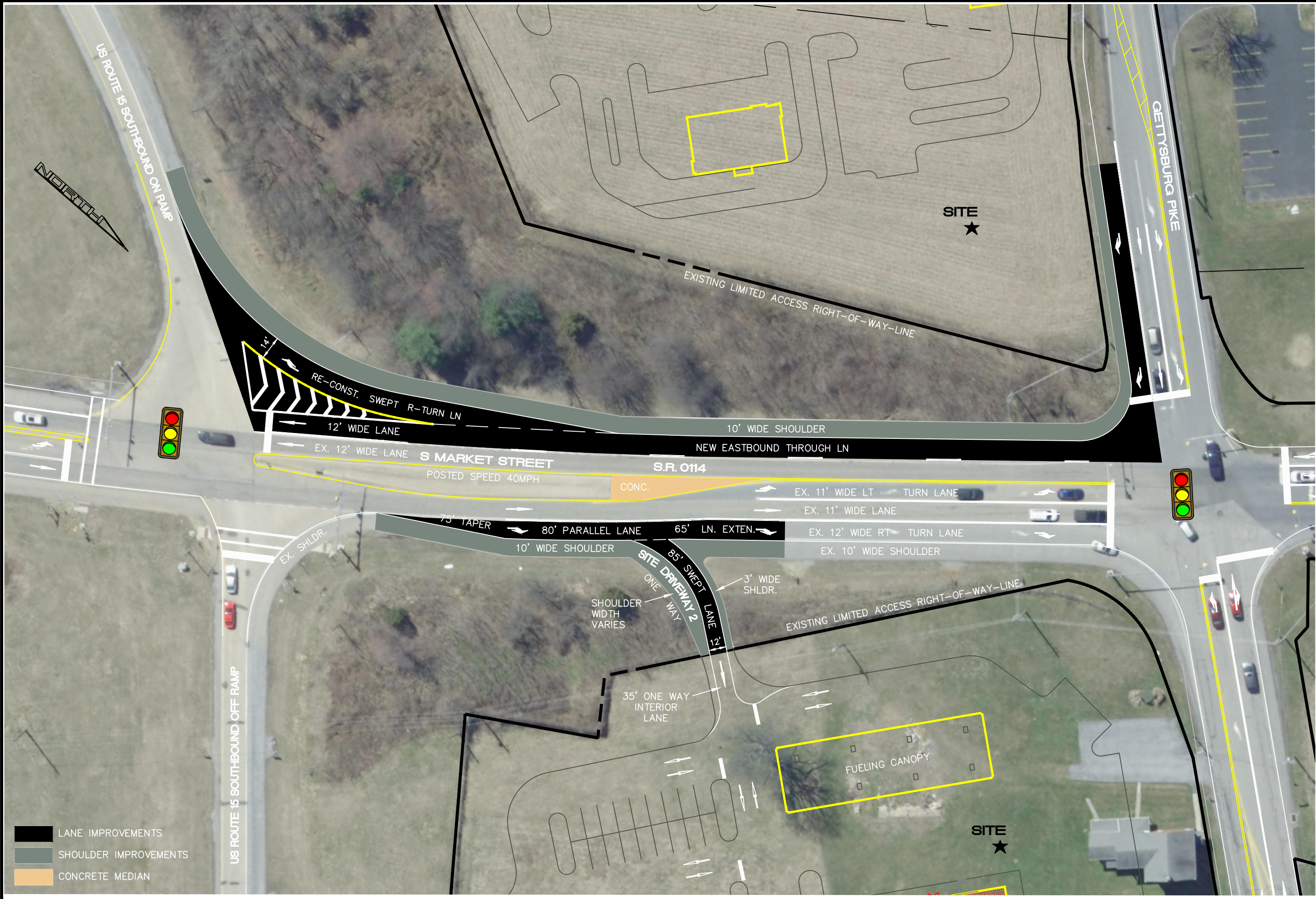
WWW.ALPHACON.COM

CONCEPTUAL IMPROVEMENTS SKETCH
SOUTH MARKET STREET MID INTERCHANGE

151 - 225 GETTYSBURG PIKE

UPPER ALLEN TOWNSHIP, CUMBERLAND COUNTY, PENNSYLVANIA

PROJECT NO.	319590
SURVEY BOOK :	Z:\Surveyor\Year\Project\
SCALE :	1" = 50'
DWG FILE :	H:\151\1519590.dwg
FILE :	Dwg\Plans\151\1519590.dwg
SHEET	IMP-1



- LANE IMPROVEMENTS
- SHOULDER IMPROVEMENTS
- CONCRETE MEDIAN

DESIGN :	MEA
DRAWN :	MEA
CHECKED :	X.X.
DATE :	07-22-2020
REV :	11-19-2021

ALPHA

ALPHA CONSULTING ENGINEERS, INC.

PLANNING • ENGINEERING • SURVEYING

115 LIMEKILN RD., P.O. BOX "G"

NEW CUMBERLAND, PA 17070

PHONE: 717.770.2500

FAX: 717.770.2400

WWW.ALPHACON.COM

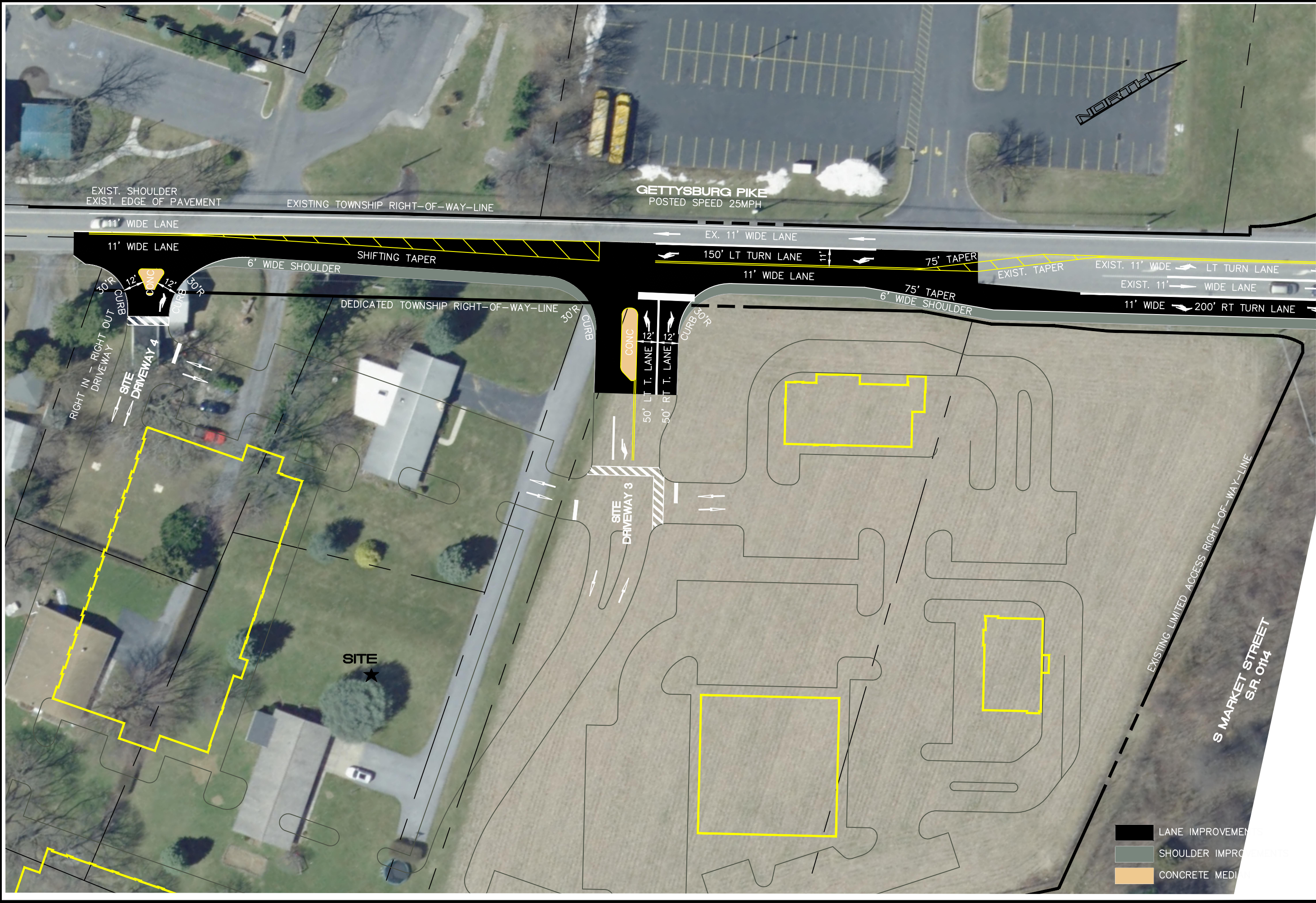
CONCEPTUAL IMPROVEMENTS SKETCH

SOUTH MARKET STREET AND SITE DRIVEWAY 2

151 - 225 GETTYSBURG PIKE

UPPER ALLEN TOWNSHIP, CUMBERLAND COUNTY, PENNSYLVANIA

PROJECT NO.	319590
SURVEY BOOK :	
SCALE :	1" = 50'
DWG FILE	00_115_ROW.dwg
SHEET	IMP-2



DESIGN :	MEA
DRAWN :	MEA
CHECKED :	X.X.
DATE :	07-22-2020
REV :	11-19-2021



ALPHA CONSULTING ENGINEERS, INC.
PLANNING • ENGINEERING • SURVEYING
116 LIMEKILN RD., P.O. BOX "G"
NEW CUMBERLAND, PA 17070
PHONE: (717) 770 - 2500
FAX: (717) 770 - 2400
WWW.ALPHACON.COM

CONCEPTUAL IMPROVEMENTS SKETCH
GETTYSBURG PIKE AND SITE DRIVEWAYS 3 AND 4

151 - 225 GETTYSBURG PIKE

UPPER ALLEN TOWNSHIP, CUMBERLAND COUNTY, PENNSYLVANIA

PROJECT NO.	319590
SURVEY BOOK :	Z:\Surveyor\Year\Project\
SCALE :	1" = 50'
DWG FILE :	119-019590.dwg
FILE :	Dwg\Plans\WOP\115\00-115-ROW.dwg
SHEET	IMP-3

