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UPPER MERION TOWNSHIP TRANSPORTATION STUDY AREA

ROADWAY SUFFICIENCY ANALYSIS & CAPITAL IMPROVEMENT PLAN

UPPER MERION TOWNSHIP MONTGOMERY COUNTY, PA

Prepared for:

Upper Merion Township Transportation Authority
175 West Valley Forge Road
King of Prussia, PA 19406

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UPRM 1201

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I. INTRODUCTION

This document has been prepared for the Upper Merion Township Transportation Authority in support of the preparation of a Transportation Impact Fee Ordinance for the Upper Merion Transportation Service Area (TSA) in Upper Merion Township, Montgomery County. This work is being performed as required within ARTICLE V-A, entitled “Municipal Capital Improvement”, Act 209 of the Pennsylvania Municipalities Planning Code. The first phase was the formation of the Transportation Service Area Advisory Committee (TSAAC). The second phase was the preparation of the Land Use Assumption Report (LUAR) for the TSA, which was adopted by Upper Merion Township on September 12, 2012.

A map showing the limits of the Upper Merion Transportation Service Area (TSA) is contained within **APPENDIX A**.

This report summarizes the analysis of traffic conditions within the TSA, including existing conditions, projected future conditions without specific development within the TSA, and projected future conditions with specific development within the TSA. These conditions were analyzed at 30 intersections along Valley Forge Road (SR 0023), S. Gulph Road (SR 3020), Matsonford Road (SR 3016), Dekalb Pike (SR 0202), Allendale Road, Swedesford Road (SR 3036), Croton Road (SR 3024), Henderson Road (SR 3029), Swedeland Road (SR 0320 & SR 3041), Church Road, and Crooked Lane. **FIGURE 1** illustrates the location of the study intersections within the Township.

This report also addresses the program of traffic related improvements (selected by the Transportation Service Area Advisory Committee – TSAAC) from the Roadway Sufficiency Analysis (RSA), which Upper Merion Township intends to pursue over the next ten (10) years. As part of the Capital Improvement Plan, project descriptions, project cost estimates, implementation schedules

BACKGROUND

According to ARTICLE V-A, as enabled by PA Act 209 (effective 12/19/1990), traffic impact fee ordinances must be systematically developed, based upon and directed toward traffic related improvements attributable to new land-development related traffic within the TSA. Traffic related improvements that are presently required or which would result from on-going regional development (beyond the boundary of the Transportation Service Area) must be financed with other sources other than impact fees.

Preceding the preparation of this report, two fundamental stages were completed. First and foremost, the township had appointed a steering committee called the Transportation Service Area Advisory Committee (TSAAC), a knowledgeable and impartial body to guide the overall effort. Second, a Land Use Assumptions Report was commissioned for the purpose of predicting the most realistic future development scenario anticipated for the Upper Merion TSA.

The Roadway Sufficiency Analysis (RSA) portion of this report establishes the existing and future traffic engineering needs of the TSA based upon the Preferred Level of Service for the area. The incremental traffic improvements identified to accommodate existing, on-going regional growth (i.e., pass-through traffic, without specific development in the TSA) and the



expected future traffic demands (including expected development specifically within the TSA) are enumerated herein.

The Capital Improvements Plan (CIP) portion of this report outlines the selected roadway and intersection projects that the Township intends to complete. The plan includes cost estimates, sources of financing (including Development Impact Fees) and anticipated implementation schedules for each project.

Following the acceptance of this report, the final steps required to formally establish the transportation impact fee within the TSA will be the drafting and approval of the actual Transportation Impact Fee Ordinance. The Impact Fee Ordinance synthesizes the elements of all preceding phases, focusing on expected new development traffic impact, legally enabling the municipality to collect and use impact fees for transportation network improvements.

II. ROADWAY SUFFICIENCY ANALYSIS

A. EXISTING TRAFFIC CONDITIONS

The Existing Traffic Conditions Scenario includes the inventory and assessment of transportation facilities and travel demands as they occurred during Spring 2012 (April-June 2012) within the Upper Merion Transportation Service Area (TSA). The existing conditions scenario is often the most readily understood traffic scenario since it reflects the current day-to-day experiences, and influences the perceptions, of the area motorists.

EXISTING TRANSPORTATION FACILITIES

Regional Network

Upper Merion Township is approximately 17 square miles and is located in the southern portion of Montgomery County, approximately 15 miles northwest of center city Philadelphia. The intersections within the Transportation Service Area (TSA) are strategically located in relation to major commercial and cultural centers in Philadelphia and Montgomery County. The TSA is located at the junction of several major interstate and regional transportation routes. The primary interstate transportation routes in Upper Merion are the Schuylkill Expressway (I-76) and the Pennsylvania Turnpike (I-276), which provide convenient access to Philadelphia and the New Jersey/New York area. A second major interstate route, though located just outside of Upper Merion, is the “Blue Route” (I-476), which provides access to the Philadelphia International Airport, Northern Delaware, and the Baltimore/Washington area via I-95. Regional transportation routes include U.S. Route 202 and U.S. 422, which provides access to locations throughout southeastern Pennsylvania.

Upper Merion Township contains numerous destinations that attract tourists, commuters and potential residents to the area including Valley Forge National Historic Park, the King of Prussia Mall, and several large corporations.

Public Mass Transit

High speed rail from the Southeastern Pennsylvania Transportation Authority (SEPTA) provides transit service to and from Philadelphia, while 7 SEPTA bus routes service the main business areas of the township. Two supplemental transit systems, one operated by the Greater Valley Forge Transportation Management Authority (GVFTMA) and one operated by the King of Prussia Business Improvement District (KOPBID), provides local service to Upper Merion residents and key businesses. Also, it is worth noting that there is currently an effort being led by SEPTA to potentially extend the Norristown High Speed Line up to the King of Prussia Mall and into the Business Park.

Roadway Features

TABLE 1 summarizes selected characteristics of the primary TSA roadways as determined through document research and field reconnaissance performed in May/June 2012.

**TABLE 1
STUDY AREA
ROADWAY CHARACTERISTICS**

	ROADWAY	ROADWAY CLASSIFICATION	ROADWAY OWNERSHIP	POSTED SPEED LIMIT (MPH)
1	Valley Forge Road (SR 0023)	Minor Arterial	PennDOT	35 MPH
2	S. Gulph Road (SR 3039)	Principal Arterial	PennDOT	35 – 40 MPH
3	Matsonford Road (SR 3016)	Minor Arterial	PennDOT	35 MPH
4	Dekalb Pike (SR 0202)	Principal Arterial	PennDOT	45 MPH
5	Allendale Road	Minor Arterial	Upper Merion Township	35 MPH
6	Swedesford Road (SR 3036)	Principal Arterial	PennDOT	40 MPH
7	Croton Road (SR 3024)	Urban Collector	PennDOT	35 MPH
8	Henderson Road (SR 3029)	Principal Arterial	PennDOT	35 – 40 MPH
9	Swedeland Road (SR 0320 & SR 3041)	Minor Arterial	PennDOT	35 MPH
10	Church Road (SR 3038/T-801)	Urban Collector	PennDOT (S. Gulph-S. Henderson) U. Merion Twp (S. Henderson-Flint Hill)	35 MPH
11	Crooked Lane (SR 3027)	Urban Collector	PennDOT	35 MPH
12	Beidler Road (SR 3029)	Urban Collector	PennDOT U. Merion Twp (Abrams-Brownlee)	35 MPH
13	Brooks Road (SR 3038)	Urban Collector	PennDOT	Not Posted
14	Gypsy Lane	Local Road	Upper Merion Township	25 MPH
15	Upper Gulph Road (SR 3030)	Urban Collector	PennDOT	35 MPH
16	Mall Boulevard	Urban Collector	Upper Merion Township	35 MPH
17	Wills Boulevard	Local Road	Upper Merion Township	35 MPH
18	Court Boulevard	Local Road	Upper Merion Township	Not Posted
19	S. Warner Road	Urban Collector	Upper Merion Township	30 MPH
20	Shoemaker Road	Local Road	Upper Merion Township	25 MPH
21	Holstein Road (SR 0320)	Minor Arterial	PennDOT	35 MPH
22	Jones Road	Local Road	Upper Merion Township	35 MPH
23	I-76 EB On-Off Ramp	Interstate Highway	PennDOT	35 MPH
24	Trinity Road (SR 0320)	Minor Arterial	PennDOT	35 MPH
25	Weadley Road	Local Road	Upper Merion Township	25 MPH
26	Horizon Drive	Local Road	Upper Merion Township	35 MPH
27	Yerkes Road	Local Road	Upper Merion Township	25 MPH
28	Saulin Boulevard	Local Road	Upper Merion Township	35 MPH
29	Prince Frederick Street	Local Road	Upper Merion Township	25 MPH
30	Caley Road	Local Road	Upper Merion Township	25 MPH
31	SR 0422 EB Off Ramps	Other Freeways and Expressways	PennDOT	35 MPH
32	N. Gulph Road (SR 3033)	Minor Arterial	PennDOT	35 MPH

Thirty (30) study intersections were selected by the Upper Merion Transportation Service Area Advisory Committee (TSAAC) to be evaluated and included in the Roadway Sufficiency Analysis and Capital Improvements Plan. The study intersections are listed in **TABLE 2**.

**TABLE 2
STUDY INTERSECTIONS**

	INTERSECTION	EXISTING CONTROL
1	Valley Forge Road (SR 0023) and Beidler Road (SR 3029)	Unsignalized
2	Valley Forge Road (SR 0023) and Henderson Road	Signalized
3	S. Gulph Road (SR 3039) and Brooks Road (SR 3028)	Signalized
4	S. Gulph Road (SR 3039) and Church Road (SR 3038)	Unsignalized
5	S. Gulph Road (SR 3039) and S. Henderson Road (SR 3029)	Signalized
6	S. Gulph Road (SR 3039) and Crooked Lane (SR 3027)	Signalized
7	S. Gulph Road (SR 3039) and Gypsy Lane	Signalized
8	S. Gulph Road (SR 3039) and Swedeland Road (SR 3041)	Unsignalized
9	S. Gulph Road (SR 3039) and Upper Gulph Road (SR 3030)	Signalized
10	S. Gulph Road (SR 3039) and Matsonford Road (SR 3016)	Signalized
11	Matsonford Road (SR 3016) and New Gulph/Upper Gulph Road (SR 3030)	Signalized
12	DeKalb Pike (SR 0202) and Mall Boulevard	Signalized
13	DeKalb Pike (SR 0202) and Allendale Road	Signalized
14	DeKalb Pike (SR 0202) and Henderson Road (SR 3029)	Signalized
15	Allendale Road and Wills Boulevard	Signalized
16	Allendale Road and Court Boulevard	Signalized
17	Swedesford Road (SR 3036) and S. Warner Road	Signalized
18	Croton Road (SR 3024) and Brooks Road (SR 3028)	Signalized
19	Henderson Road (SR 3029) and Shoemaker Road	Signalized
20	Swedeland Road (SR 0320 & SR 3041) and Holstein Road (SR 0320) and Jones Road	Signalized
21	S. Gulph Road (SR 3039) and I-76 EB On-Off Ramp / Trinity Road (SR 0320)	Signalized
22	S. Gulph Road (SR 3039) and Shoemaker Road / Weadley Road	Signalized
23	Church Road and Crooked Lane (SR 3027)	Signalized
24	Church Road and Horizon Drive	Signalized
25	Crooked Lane and Yerkes Road	Unsignalized
26	DeKalb Pike (SR 0202) and Saulin Boulevard	Signalized
27	Henderson Road (SR 3029) and Prince Frederick Street	Signalized
28	Valley Forge Road (SR 0023) and Caley Road	Unsignalized
29	Valley Forge Road (SR 0023) and SR 0422 EB off Ramps	Signalized
30	Valley Forge Road (SR 0023) and N. Gulph Road (SR 3033)	Signalized

EXISTING TRAFFIC VOLUMES

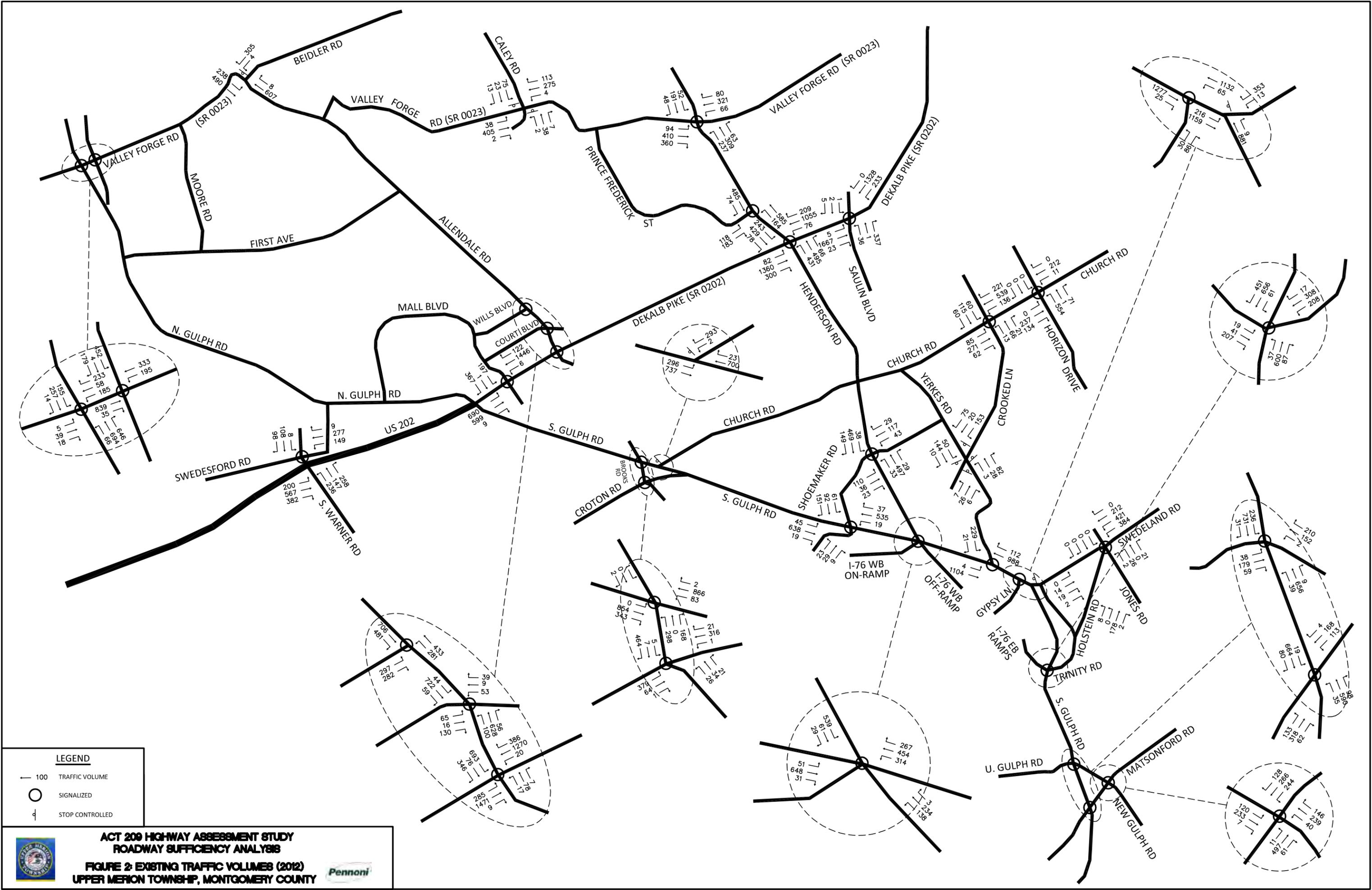
Traffic count data was collected during April - June 2012 to determine peak hour traffic volumes at each of the study intersections. 24-hour Average Daily Traffic (ADT) count data was collected using Automatic Traffic Recorders (ATRs) placed at the following seven (7) locations:

1. South Gulph Road (SR 0320), south of I-76;
2. Schuylkill River Road (SR 0023), south of Swedeland Road (SR 0320);
3. Port Kennedy Road (SR 0023), north of Valley Forge Road (SR 0023);
4. Valley Forge Road (SR 0023), west of Dannehower Bridge;

5. Dekalb Pike (SR 0202), east of Henderson Road (SR 3029);
6. Croton Road (SR 3024), west of Warner Road;
7. King of Prussia Road (SR 3035), south of Croton Road (SR 3024).

Manual turning movement traffic counts were also conducted during the weekday afternoon commuter peak hours (4:00-6:00 PM) at each of the study intersections.

Tabulated traffic volumes from the four highest consecutive 15-minute intervals during the afternoon count period constitute the PM peak hour traffic volumes. The traffic count data is provided in **APPENDIX B. FIGURE 2** illustrates the PM peak hour traffic volumes along the corridors as well as the Average Daily Traffic volume.



LEGEND

- 100 TRAFFIC VOLUME
- SIGNALIZED
- ⊥ STOP CONTROLLED

ASSESSMENT OF EXISTING TRAFFIC OPERATIONS

Peak hour operations were evaluated at the study intersections for existing conditions. The analyses were performed in accordance with the procedures outlined in the Highway Capacity Manual, Special Report 209, published by the Transportation Research Board, Washington, D.C., using Trafficware’s Synchro Software. The results of these analyses provide Level of Service (LOS) designation, volume/capacity ratios, and average seconds of delay experienced by motorists for each intersection movement at each study intersection.

Level of Service is a measure of vehicle operator satisfaction with the driving experience. For a signalized intersection this has been quantified with designations “A” through “F” based on the average vehicle delay per approach and the overall intersection. For an unsignalized intersection this has been quantified with designations “A” through “F” also based upon average vehicle delay per approach and the overall intersection for all-way stop-controlled intersections. The LOS concept is a rating system established to objectively evaluate the operational adequacy of an intersection or roadway. The definitions of Levels of Service “A” through “F” for signalized and unsignalized intersections are contained in **TABLE 3** and **TABLE 4** below.

**TABLE 3
LEVEL OF SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS**

Levels of Service (LOS)	Stopped Delay Per Vehicle (Seconds)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

**TABLE 4
LEVEL OF SERVICE CRITERIA
FOR UNSIGNALIZED INTERSECTIONS**

Levels of Service (LOS)	Stopped Delay Per Vehicle (Seconds)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Average Delay refers to the time a vehicle arriving at the intersection must wait before proceeding through the intersection. The volume/capacity (V/C) ratio compares the number of

vehicles attempting to utilize an approach or intersection to the capacity of the approach or intersection for a specific time period. As the traffic volumes near the capacity of the approach or intersection, congestion occurs. A V/C of 1.0 indicates that the volumes equal the estimated capacity of the intersection or approach.

From a traffic engineering perspective, stable and predictable traffic operations are generally encountered when volumes are equal or less than capacity. Yet it is possible for traffic to experience LOS “F” conditions with V/C ratios below 1.0 if, for example, a low volume minor street approach is governed by a traffic signal with a very long cycle length. Conversely, theoretical capacity may be exceeded by demand volume, while average delays are maintained at LOS “E” or better by providing good traffic progression through adjacent signalized intersections.

FIGURE 3 illustrates the existing Level of Service during the PM peak hour. **TABLE 5** summarizes the overall performance at the thirty (30) study intersections within the TSA. Summary outputs for the analysis software are provided in **APPENDIX C**. In addition, a detailed Level of Service report for the PM peak hour for each study intersection movement/approach can be found in **APPENDIX D**.

**TABLE 5
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(EXISTING WEEKDAY PM PEAK CONDITIONS)**

	INTERSECTION	LOS ¹	DELAY (SEC) ²
1	Valley Forge Road (SR 0023) and Beidler Road (SR 3029)	B	15.4
2	Valley Forge Road (SR 0023) and Henderson Road	C	30.6
3	S. Gulph Road (SR 3039) and Brooks Road (SR 3038)	F	168.5
4	S. Gulph Road (SR 3039) and Church Road (SR 3038)	E	58.9
5	S. Gulph Road (SR 3039) and S. Henderson Road (SR 3029)	E	58.5
6	S. Gulph Road (SR 3039) and Crooked Lane (SR 3027)	C	30.1
7	S. Gulph Road (SR 3039) and Gypsy Lane	B	17.0
8	S. Gulph Road (SR 3039) and Swedeland Road (SR 3041)	F	1507.3
9	S. Gulph Road (SR 3039) and Upper Gulph Road (SR 3030)	D	40.9
10	S. Gulph Road (SR 3039) and Matsonford Road (SR 3016)	F	103.2
11	Matsonford Road (SR 3016) and Upper Gulph Road (SR 3030)	F	105.7
12	DeKalb Pike (SR 0202) and Mall Boulevard	C	23.4
13	DeKalb Pike (SR 0202) and Allendale Road	F	84.2
14	DeKalb Pike (SR 0202) and Henderson Road (SR 3029)	F	85.9
15	Allendale Road and Wills Boulevard	C	24.9
16	Allendale Road and Court Boulevard	B	13.9
17	Swedesford Road (SR 3036) and S. Warner Road	F	98.2
18	Croton Road (SR 3024) and Brooks Road (SR 3028)	B	14.7
19	Henderson Road (SR 3029) and Shoemaker Road	B	14.6
20	Swedeland Road (SR 0320 & SR 3041) and Holstein Road (SR 0320) and Jones Road	F	92.8

TABLE 5 (continued)
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(EXISTING WEEKDAY PM PEAK CONDITIONS)

	INTERSECTION	LOS ¹	DELAY (SEC) ²
21	S. Gulph Road (SR 3039) and I-76 EB On-Off Ramp / Trinity Road (SR 0320)	C	33.1
22	S. Gulph Road (SR 3039) and Shoemaker Road / Weadley Road	<i>E</i>	56.6
23	Church Road and Crooked Lane (SR 3027)	B	16.9
24	Church Road and Horizon Drive	C	29.3
25	Crooked Lane and Yerkes Road	B	10.4
26	DeKalb Pike (SR 0202) and Saulin Boulevard	B	15.4
27	Henderson Road (SR 3029) and Prince Frederick Street	B	14.5
28	Valley Forge Road (SR 0023) and Caley Road	A	8.6
29	Valley Forge Road (SR 0023) and SR 0422 EB off Ramps	C	33.5
30	Valley Forge Road (SR 0023) and N. Gulph Road (SR 3033)	D	50.0

¹Level of Service, see Tables 3 and 4 for Description

²Delay measured in average seconds of delay per vehicle for overall intersection

ACCEPTABLE LEVELS OF SERVICE

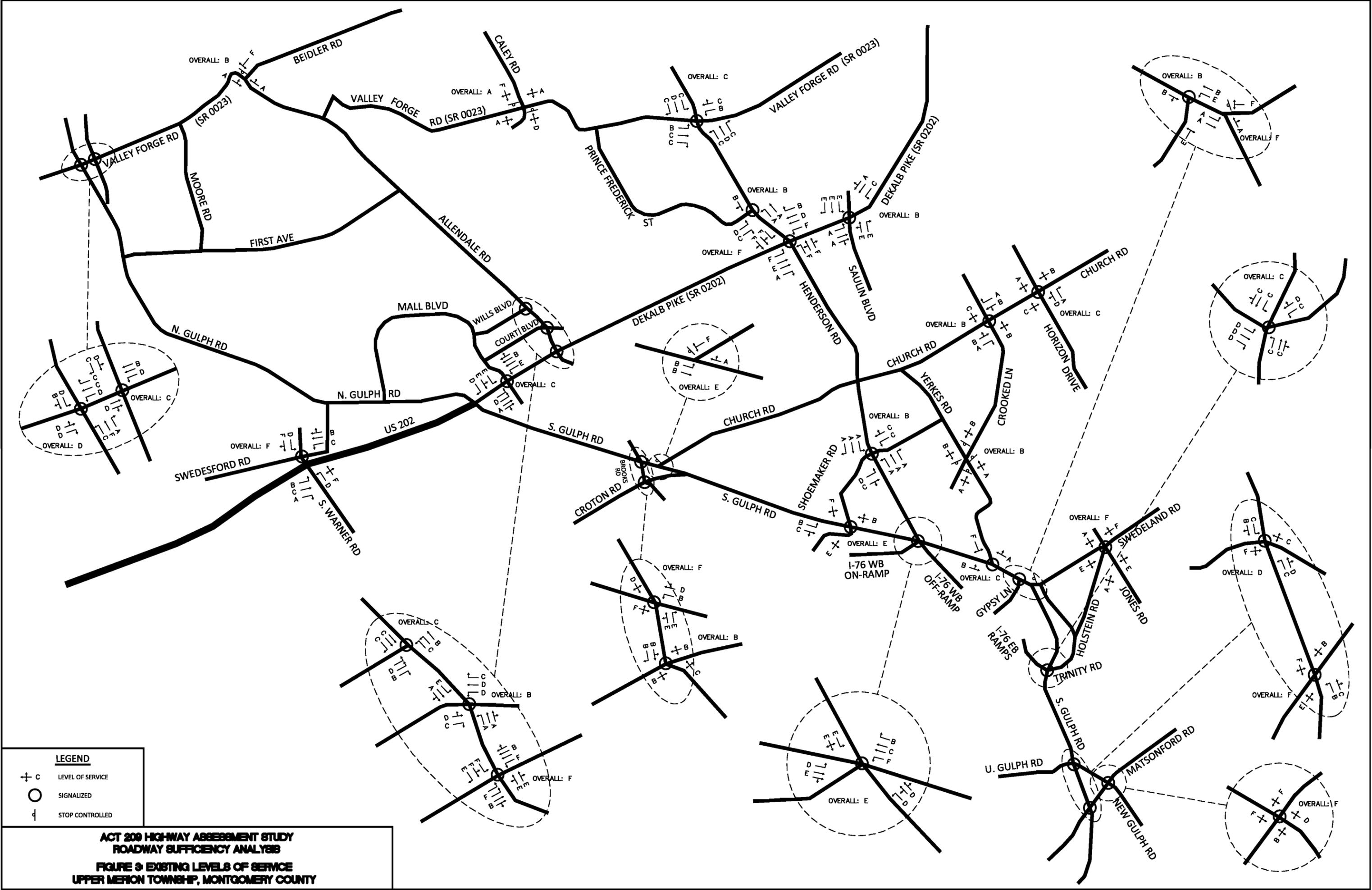
The Transportation Service Area Advisory Committee (TSAAC) has identified the preferred and/or minimum acceptable Peak Hour Levels of Service for the TSA study intersections under future conditions. Their decision is a policy determination based upon fostering and maintaining a desired quality of life (in so far as that may be reflected in traffic conditions) and prevent further deterioration of traffic operational conditions beyond that which will occur due to regional growth beyond the control of the Township.

TABLE 6 lists the Preferred Levels of Service adopted by the TSAAC and employed in the remainder of these analyses (which provides traffic related improvement recommendations necessary to attain these preferred thresholds given Existing Traffic volumes, projected 2022 pass-through traffic volumes (without specific TSA development) and projected 2022 total future traffic volumes (with specific TSA development).

TABLE 6
PREFERRED LEVELS OF SERVICE
AT STUDY INTERSECTIONS

	PREFERRED/MINIMUM ACCEPTABLE LOS¹
Overall Intersection	D

¹Level of Service, see Tables 3 and 4 for Description



LEGEND	
+	LEVEL OF SERVICE
○	SIGNALIZED
⊥	STOP CONTROLLED

**ACT 209 HIGHWAY ASSESSMENT STUDY
ROADWAY SUFFICIENCY ANALYSIS
FIGURE 9 EXISTING LEVELS OF SERVICE
UPPER MERION TOWNSHIP, MONTGOMERY COUNTY**

RECOMMENDED IMPROVEMENTS FOR EXISTING CONDITIONS

As shown in **TABLE 5**, the following intersections do not operate at or above the preferred/acceptable Levels of Service as defined in **TABLE 6**.

- S. Gulph Road (SR 3039) and Brooks Road (SR 3038)
- S. Gulph Road (SR 3039) and Church Road (SR 3038)
- S. Gulph Road (SR 3039) and S. Henderson Road (SR 3029)
- S. Gulph Road (SR 3039) and Swedeland Road (SR 3041)
- S. Gulph Road (SR 3039) and Matsonford Road (SR 3016)
- Matsonford Road (SR 3016) and Upper Gulph Road (SR 3030)
- DeKalb Pike (SR 0202) and Allendale Road
- DeKalb Pike (SR 0202) and Henderson Road (SR 3029)
- Swedesford Road (SR 3036) and S. Warner Road
- Swedeland Road (SR 0320 & SR 3041) and Holstein Road (SR 0320) and Jones Road
- S. Gulph Road (SR 3039) and Shoemaker Road / Weadley Road

Therefore, in order to achieve the preferred Levels of Service, the improvements as indicated in **TABLE 7** are recommended. The resulting Levels of Service and Delay with the implementation of the recommended improvements are also provided in **TABLE 7**. The Levels of Service during the PM peak hour is illustrated in **FIGURE 4**. Summary outputs for the analysis software are provided in **APPENDIX E**. In addition, a detailed Levels of Service report for the PM peak hour for each study intersection movement/approach can be found in **APPENDIX D**.

TABLE 7
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(EXISTING CONDITIONS WITH IMPROVEMENTS)

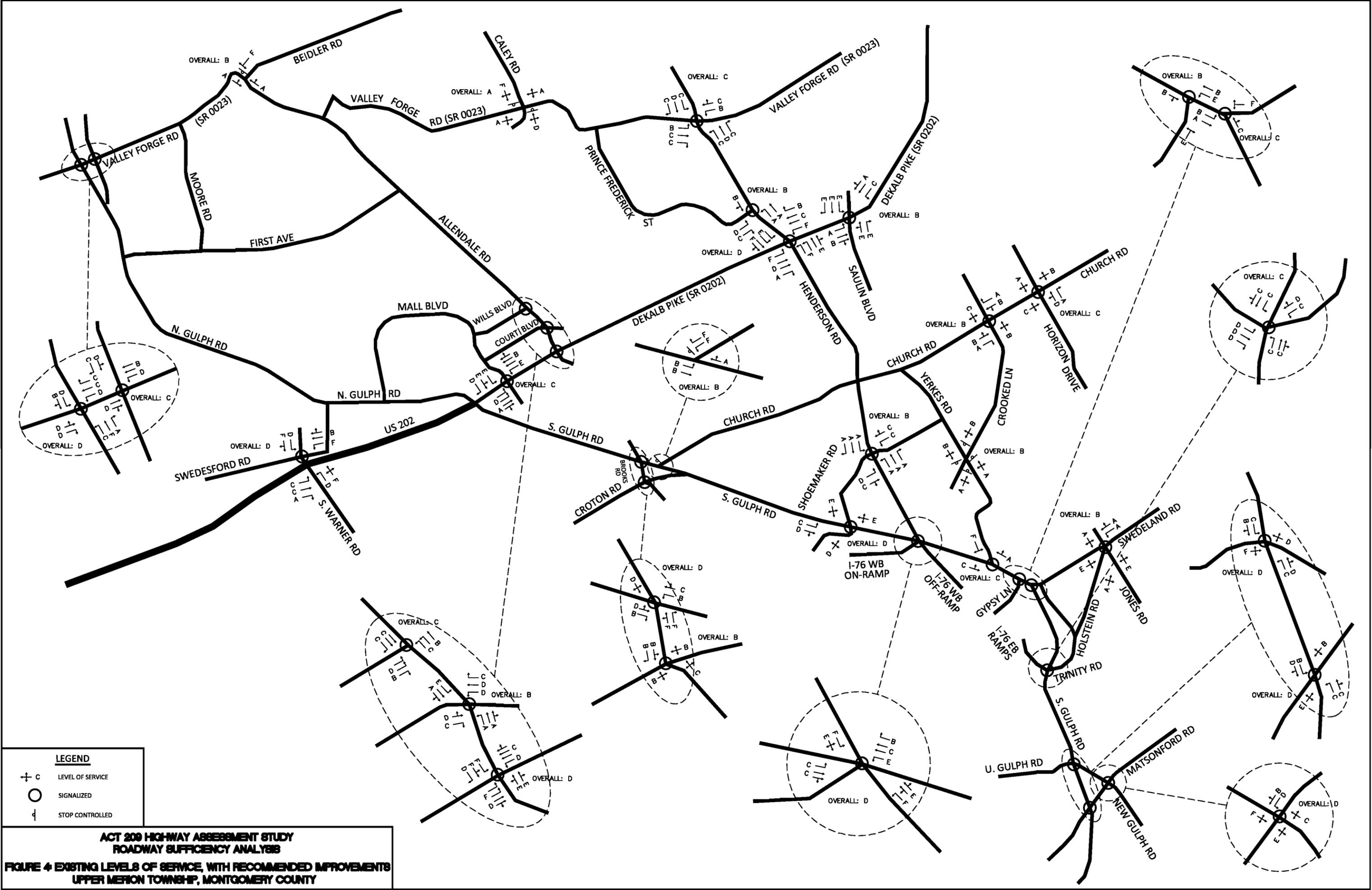
	INTERSECTION	RECOMMENDED IMPROVEMENTS	LOS ¹	DELAY (SEC) ²
1	Valley Forge Road (SR 0023) and Beidler Road (SR 3029)	• No modifications	B	15.4
2	Valley Forge Road (SR 0023) and Henderson Road	• No modifications	C	30.6
3	S. Gulph Road (SR 3039) and Brooks Road (SR 3038)	• Add eastbound right turn lane on S. Gulph Rd; • Optimize traffic signal timings;	D	51.0
4	S. Gulph Road (SR 3039) and Church Road (SR 3038)	• Add southbound left turn lane on Church Rd	B	23.7
5	S. Gulph Road (SR 3039) and S. Henderson Road (SR 3029)	• Optimize traffic signal timings;	D	50.4
6	S. Gulph Road (SR 3039) and Crooked Lane (SR 3027)	• No modifications	C	34.3
7	S. Gulph Road (SR 3039) and Gypsy Lane	• No modifications	B	15.4
8	S. Gulph Road (SR 3039) and Swedeland Road (SR 3041)	• Signalize intersection	C	23.5
9	S. Gulph Road (SR 3039) and Upper Gulph Road (SR 3030)	• No modifications	D	42.2

TABLE 7 (continued)
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(EXISTING CONDITIONS WITH IMPROVEMENTS)

	INTERSECTION	RECOMMENDED IMPROVEMENTS	LOS ¹	DELAY (SEC) ²
10	S. Gulph Road (SR 3039) and Matsonford Road (SR 3016)	<ul style="list-style-type: none"> Add southbound left turn lane on S. Gulph Rd; Optimize traffic signal timings 	D	39.3
11	Matsonford Road (SR 3016) and Upper Gulph Road (SR 3030)	<ul style="list-style-type: none"> Add westbound left turn lane on Matsonford Rd; Optimize traffic signal timings 	D	48.3
12	DeKalb Pike (SR 0202) and Mall Boulevard	<ul style="list-style-type: none"> No modifications 	C	22.9
13	DeKalb Pike (SR 0202) and Allendale Road	<ul style="list-style-type: none"> Optimize traffic signal timings 	D	54.0
14	DeKalb Pike (SR 0202) and Henderson Road (SR 3029)	<ul style="list-style-type: none"> Add northbound and southbound left turn lane on Henderson Road; Adjust signal phasing - Remove split phase; Optimize traffic signal timings 	D	51.8
15	Allendale Road and Wills Boulevard	<ul style="list-style-type: none"> No modifications 	C	24.9
16	Allendale Road and Court Boulevard	<ul style="list-style-type: none"> No modifications 	B	13.9
17	Swedesford Road (SR 3036) and S. Warner Road	<ul style="list-style-type: none"> Optimize traffic signal timings 	D	51.5
18	Croton Road (SR 3024) and Brooks Road (SR 3028)	<ul style="list-style-type: none"> No modifications 	B	16.8
19	Henderson Road (SR 3029) and Shoemaker Road	<ul style="list-style-type: none"> No modifications 	B	14.6
20	Swedeland Road (SR 0320 & SR 3041) and Holstein Road (SR 0320) and Jones Road	<ul style="list-style-type: none"> Add westbound left turn lane on Swedeland Rd; Optimize traffic signal timings 	B	13.7
21	S. Gulph Road (SR 3039) and I-76 EB On-Off Ramp / Trinity Road (SR 0320)	<ul style="list-style-type: none"> No modifications 	C	33.7
22	S. Gulph Road (SR 3039) and Shoemaker Road / Weadley Road	<ul style="list-style-type: none"> Optimize traffic signal timings 	D	50.6
23	Church Road and Crooked Lane (SR 3027)	<ul style="list-style-type: none"> No modifications 	B	16.9
24	Church Road and Horizon Drive	<ul style="list-style-type: none"> No modifications 	C	29.3
25	Crooked Lane and Yerkes Road	<ul style="list-style-type: none"> No modifications 	B	10.4
26	DeKalb Pike (SR 0202) and Saulin Boulevard	<ul style="list-style-type: none"> No modifications 	B	16.3
27	Henderson Road (SR 3029) and Prince Frederick Street	<ul style="list-style-type: none"> No modifications 	B	14.5
28	Valley Forge Road (SR 0023) and Caley Road	<ul style="list-style-type: none"> No modifications 	A	8.6
29	Valley Forge Road (SR 0023) and SR 0422 EB off Ramps	<ul style="list-style-type: none"> No modifications 	C	33.5
30	Valley Forge Road (SR 0023) and N. Gulph Road (SR 3033)	<ul style="list-style-type: none"> No modifications 	D	50.0

¹Level of Service, see Tables 3 and 4 for Description

²Delay measured in average seconds of delay per vehicle for overall intersection



B. PROJECTED PASS-THROUGH TRAFFIC CONDITIONS

Pass-Through traffic conditions (i.e., without specific development occurring within the TSA) have been evaluated for a 2022 study horizon, consistent with the Transportation Service Area Advisory Committee’s planning threshold and the target date of the Land Use Assumptions Report. Evaluation of the Pass-Through traffic scenario is important within the Act 209 planning process in that it defines the future traffic and transportation baseline for which Upper Merion Township and/or PENNDOT will be responsible. Pass-Through traffic volumes represent the incremental increase in traffic demand on Township arteries over existing volumes due to ongoing regional development beyond the Township’s boundaries for the duration of the planning period (in this case 10 years), but without specific development within the project corridor/TSA.

PASS-THROUGH TRAFFIC VOLUMES

Projections of traffic growth expected by 2022, due to on-going development outside Upper Merion Township, were formulated by applying a growth rate of 0.76% per year to the existing traffic volumes, based on information supplied by the PennDOT Bureau of Planning and Research, for a total growth rate of 7.87% (0.76% per year for 10 years). The resultant projected Pass-Through peak hour traffic volumes are illustrated on **FIGURE 5**.

ASSESSMENT OF PASS-THROUGH TRAFFIC OPERATIONS

TABLE 8 summarizes the overall results of the Level of Service analysis of Pass-Through volumes, assuming the implementation of optimized traffic signal timing, phasing, and coordination settings within the corridors (i.e., no physical roadway improvements) for the anticipated traffic volumes. These Levels of Service are also depicted on **FIGURE 6**. Summary outputs for the analysis software are provided in **APPENDIX F**. In addition, a detailed Levels of Service report for the PM peak hour for each study intersection movement/approach can be found in **APPENDIX D**. As expected, the projected increase in traffic volumes at the study area intersections result in an increase in delay on several movements. However, it is important to note that the overall Levels of Service at several intersections can be improved over that of existing conditions with traffic signal timing and phasing adjustments, particularly at the following intersections:

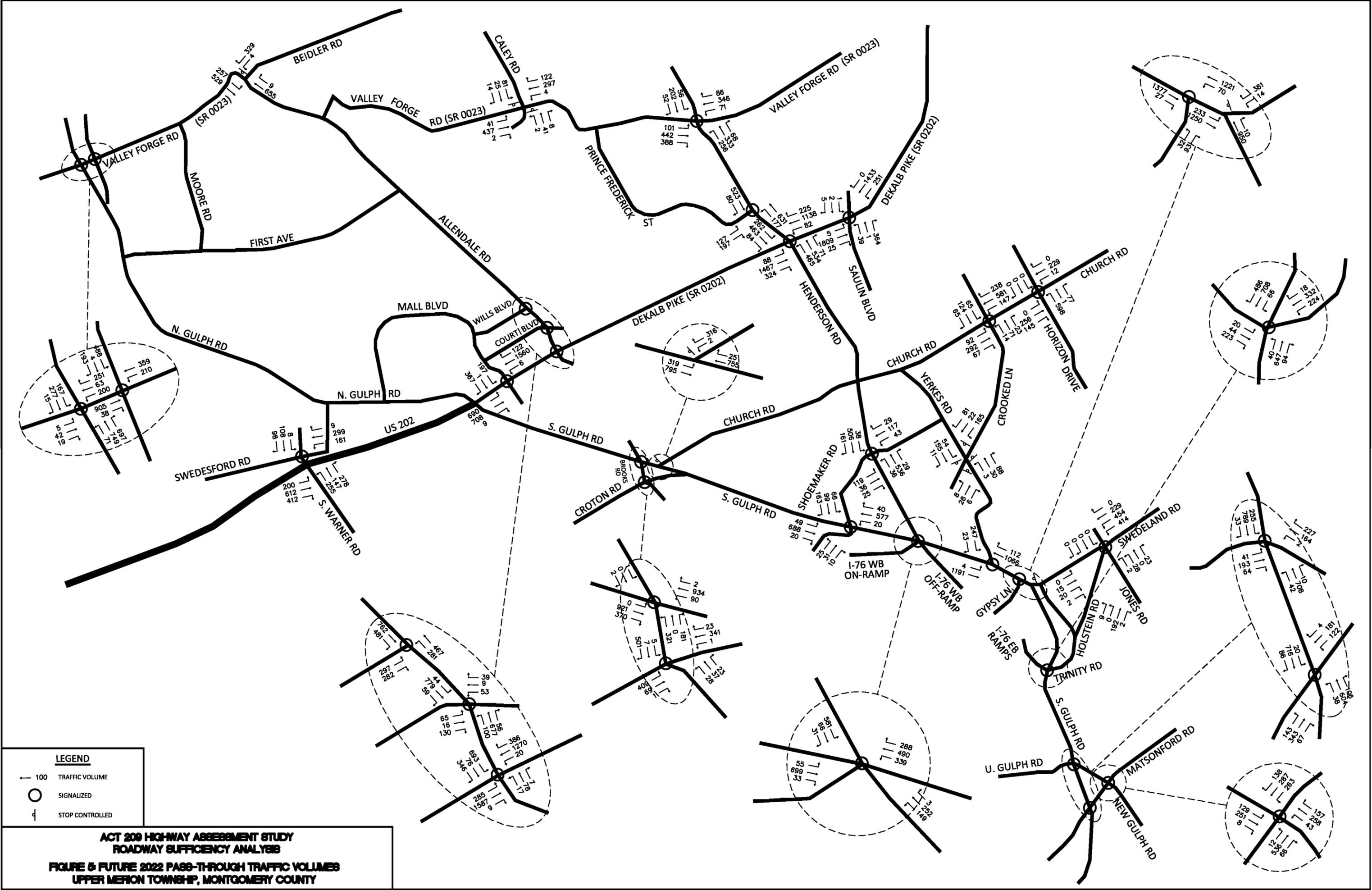
- S. Gulph Road (SR 3039) and Upper Gulph Road (SR 3030)
- DeKalb Pike (SR 0202) and Allendale Road
- Valley Forge Road (SR 0023) and N. Gulph Road (SR 3033)

**TABLE 8
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(2022 PASS-THROUGH CONDITIONS)**

	INTERSECTION	LOS ¹	DELAY (SEC) ²
1	Valley Forge Road (SR 0023) and Beidler Road (SR 3029)	C	25.5
2	Valley Forge Road (SR 0023) and Henderson Road	C	33.9
3	S. Gulph Road (SR 3039) and Brooks Road (SR 3038)	E	65.3
4	S. Gulph Road (SR 3039) and Church Road (SR 3038)	D	38.7
5	S. Gulph Road (SR 3039) and S. Henderson Road (SR 3029)	E	61.5
6	S. Gulph Road (SR 3039) and Crooked Lane (SR 3027)	D	43.0
7	S. Gulph Road (SR 3039) and Gypsy Lane	C	22.2
8	S. Gulph Road (SR 3039) and Swedeland Road (SR 3041)	D	35.8
9	S. Gulph Road (SR 3039) and Upper Gulph Road (SR 3030)	E	64.1
10	S. Gulph Road (SR 3039) and Matsonford Road (SR 3016)	E	58.1
11	Matsonford Road (SR 3016) and Upper Gulph Road (SR 3030)	E	75.7
12	DeKalb Pike (SR 0202) and Mall Boulevard	C	23.4
13	DeKalb Pike (SR 0202) and Allendale Road	F	83.4
14	DeKalb Pike (SR 0202) and Henderson Road (SR 3029)	E	64.5
15	Allendale Road and Wills Boulevard	C	25.0
16	Allendale Road and Court Boulevard	B	13.7
17	Swedesford Road (SR 3036) and S. Warner Road	E	63.3
18	Croton Road (SR 3024) and Brooks Road (SR 3028)	B	19.4
19	Henderson Road (SR 3029) and Shoemaker Road	B	14.8
20	Swedeland Road (SR 0320 & SR 3041) and Holstein Road (SR 0320) and Jones Road	B	14.9
21	S. Gulph Road (SR 3039) and I-76 EB On-Off Ramp / Trinity Road (SR 0320)	D	38.0
22	S. Gulph Road (SR 3039) and Shoemaker Road / Weadley Road	E	79.3
23	Church Road and Crooked Lane (SR 3027)	C	33.7
24	Church Road and Horizon Drive	D	38.4
25	Crooked Lane and Yerkes Road	B	11.0
26	DeKalb Pike (SR 0202) and Saulin Boulevard	C	21.9
27	Henderson Road (SR 3029) and Prince Frederick Street	B	15.8
28	Valley Forge Road (SR 0023) and Caley Road	B	13.3
29	Valley Forge Road (SR 0023) and SR 0422 EB off Ramps	D	41.5
30	Valley Forge Road (SR 0023) and N. Gulph Road (SR 3033)	E	64.4

¹Level of Service, see Tables 3 and 4 for Description

²Delay measured in average seconds of delay per vehicle for overall intersection

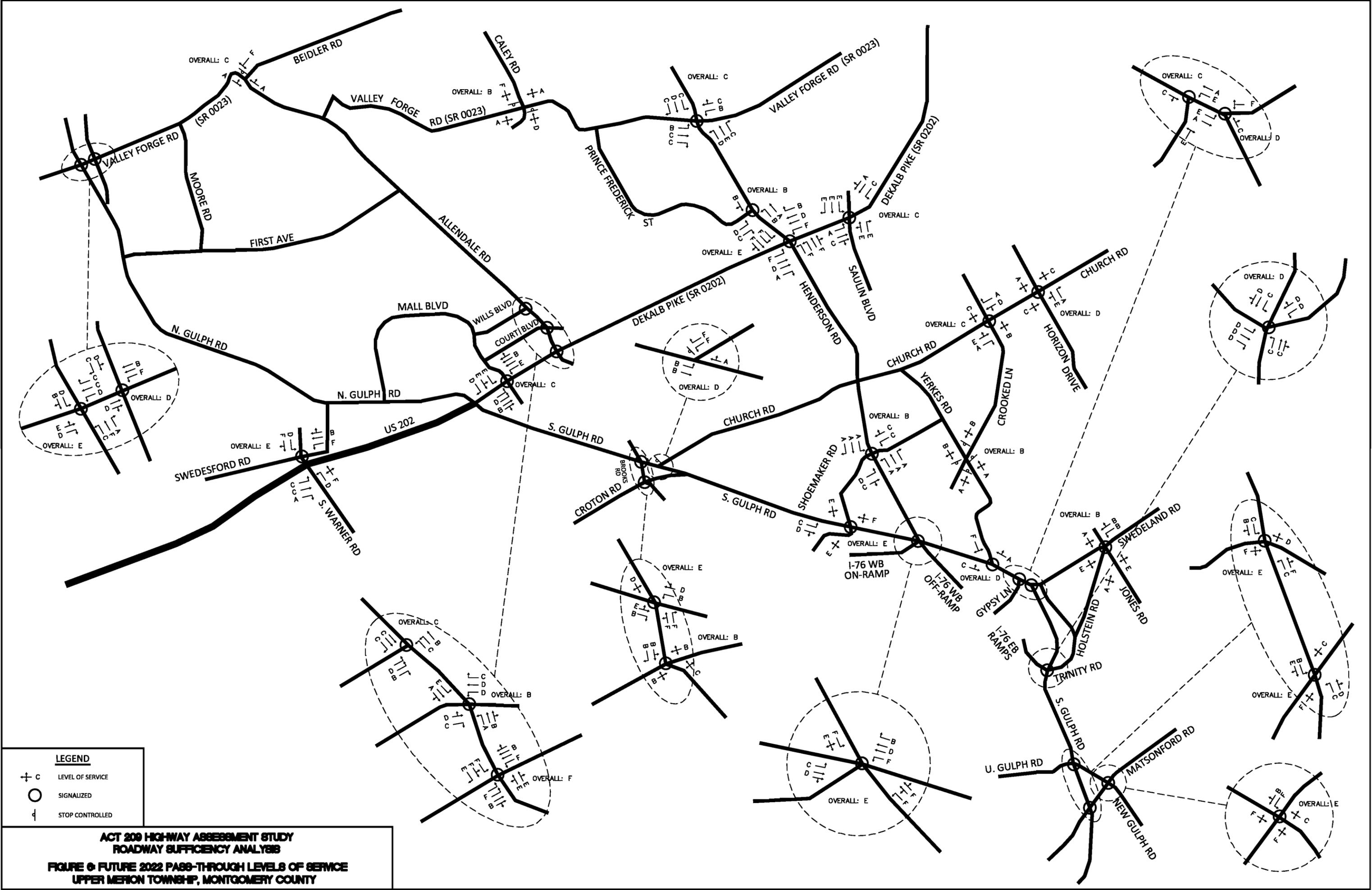


LEGEND

- 100 TRAFFIC VOLUME
- SIGNALIZED
- ⊥ STOP CONTROLLED

**ACT 209 HIGHWAY ASSESSMENT STUDY
ROADWAY SUFFICIENCY ANALYSIS**

**FIGURE 6 FUTURE 2022 PASS-THROUGH TRAFFIC VOLUMES
UPPER MERION TOWNSHIP, MONTGOMERY COUNTY**



LEGEND	
⊕ C	LEVEL OF SERVICE
○	SIGNALIZED
⊥	STOP CONTROLLED

**ACT 209 HIGHWAY ASSESSMENT STUDY
ROADWAY SUFFICIENCY ANALYSIS**

**FIGURE 6 FUTURE 2022 PASS-THROUGH LEVELS OF SERVICE
UPPER MERION TOWNSHIP, MONTGOMERY COUNTY**

RECOMMENDED IMPROVEMENTS FOR PASS-THROUGH CONDITIONS

As shown in **TABLE 8**, the following intersections do not operate at or above the preferred/acceptable Levels of Service as defined in **TABLE 6**.

- S. Gulph Road (SR 3039) and Brooks Road (SR 3038)
- S. Gulph Road (SR 3039) and S. Henderson Road (SR 3029)
- S. Gulph Road (SR 3039) and Upper Gulph Road (SR 3030)
- S. Gulph Road (SR 3039) and Matsonford Road (SR 3016)
- Matsonford Road (SR 3016) and Upper Gulph Road (SR 3030)
- DeKalb Pike (SR 0202) and Allendale Road
- DeKalb Pike (SR 0202) and Henderson Road (SR 3029)
- Swedesford Road (SR 3036) and S. Warner Road
- S. Gulph Road (SR 3039) and Shoemaker Road / Weadley Road
- Valley Forge Road (SR 0023) and N. Gulph Road (SR 3033)

Therefore, in order to achieve the preferred Levels of Service, the improvements as indicated in **TABLE 9** are recommended. The resulting Levels of Service and Delay with the implementation of the recommended improvements are also provided in **TABLE 9**. The Levels of Service during the PM peak hour are illustrated in **FIGURE 7**. Summary outputs for the analysis software are provided in **APPENDIX G**. In addition, a detailed Levels of Service report for the PM peak hour for each study intersection movement/approach can be found in **APPENDIX D**.

TABLE 9
OPERATIONAL SUMMARY AT STUDY INTERSECTIONS
(2022 PASS-THROUGH CONDITIONS WITH IMPROVEMENTS)

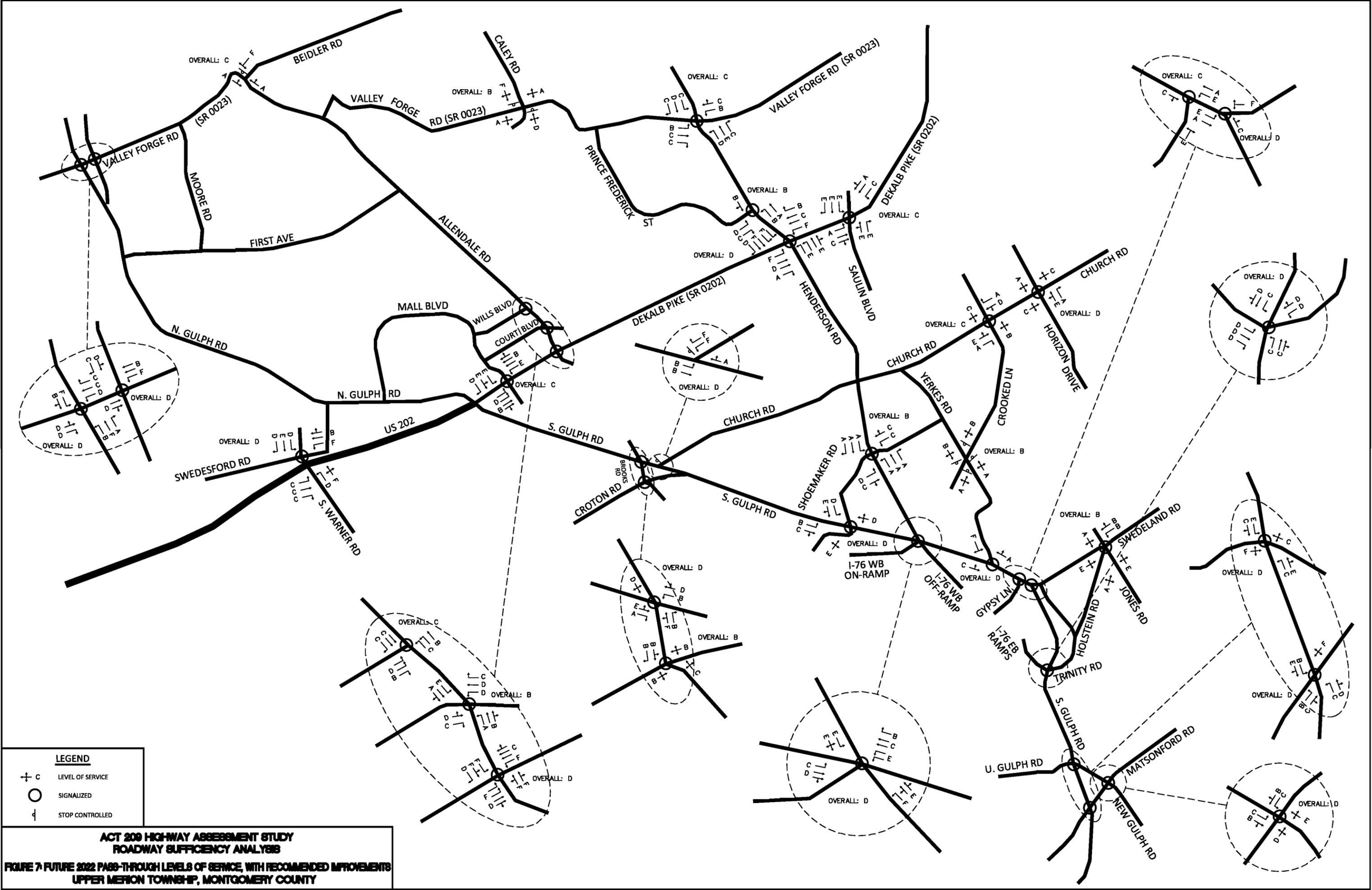
	INTERSECTION	RECOMMENDED IMPROVEMENTS	LOS ¹	DELAY (SEC) ²
1	Valley Forge Road (SR 0023) and Beidler Road (SR 3029)/Mancill Mill Road	<ul style="list-style-type: none"> • Signalize intersection with SB left-turn phase/WB overlap; • Add westbound left-turn lane; • Add southbound left-turn lane; 	C	25.5
2	Valley Forge Road (SR 0023) and Henderson Road	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	C	33.9
3	S. Gulph Road (SR 3039) and Brooks Road (SR 3038)	<ul style="list-style-type: none"> • Add eastbound right turn overlap phase on S. Gulph Rd; • Optimize traffic signal timings 	D	54.9
4	S. Gulph Road (SR 3039) and Church Road (SR 3038)	<ul style="list-style-type: none"> • No modifications; 	D	38.6
5	S. Gulph Road (SR 3039) and S. Henderson Road (SR 3029)	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	D	50.3
6	S. Gulph Road (SR 3039) and Crooked Lane (SR 3027)	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	D	40.8
7	S. Gulph Road (SR 3039) and Gypsy Lane	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	C	21.6
8	S. Gulph Road (SR 3039) and Swedeland Road (SR 3041)	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	D	35.9
9	S. Gulph Road (SR 3039) and Upper Gulph Road (SR 3030)	<ul style="list-style-type: none"> • Optimize traffic signal timings 	D	49.1

TABLE 9 (continued)
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(2022 PASS-THROUGH CONDITIONS WITH IMPROVEMENTS)

	INTERSECTION	RECOMMENDED IMPROVEMENTS	LOS ¹	DELAY (SEC) ²
10	S. Gulph Road (SR 3039) and Matsonford Road (SR 3016)	<ul style="list-style-type: none"> Add eastbound left turn lane on Matsonford Rd; Optimize traffic signal timings 	D	52.7
11	Matsonford Road (SR 3016) and Upper Gulph Road (SR 3030)	<ul style="list-style-type: none"> Add southbound left turn lane on Upper Gulph Road 	D	40.7
12	DeKalb Pike (SR 0202) and Mall Boulevard	<ul style="list-style-type: none"> Optimize traffic signal timings 	C	22.8
13	DeKalb Pike (SR 0202) and Allendale Road	<ul style="list-style-type: none"> Optimize traffic signal timings 	D	54.8
14	DeKalb Pike (SR 0202) and Henderson Road (SR 3029)	<ul style="list-style-type: none"> Add southbound right turn lane on Henderson Road; Add southbound right turn overlap phase on Henderson Rd; Optimize traffic signal timings 	D	54.3
15	Allendale Road and Wills Boulevard	<ul style="list-style-type: none"> Optimize traffic signal timings; 	C	25.0
16	Allendale Road and Court Boulevard	<ul style="list-style-type: none"> Optimize traffic signal timings; 	B	13.7
17	Swedesford Road (SR 3036) and S. Warner Road	<ul style="list-style-type: none"> Add southbound right turn lane on Bryce Lane; Optimize traffic signal timings; 	D	46.7
18	Croton Road (SR 3024) and Brooks Road (SR 3028)	<ul style="list-style-type: none"> Optimize traffic signal timings; 	B	19.0
19	Henderson Road (SR 3029) and Shoemaker Road	<ul style="list-style-type: none"> Optimize traffic signal timings; 	B	14.8
20	Swedeland Road (SR 0320 & SR 3041) and Holstein Road (SR 0320) and Jones Road	<ul style="list-style-type: none"> Optimize traffic signal timings; 	B	14.9
21	S. Gulph Road (SR 3039) and I-76 EB On-Off Ramp / Trinity Road (SR 0320)	<ul style="list-style-type: none"> Optimize traffic signal timings; 	D	37.7
22	S. Gulph Road (SR 3039) and Shoemaker Road / Weadley Road	<ul style="list-style-type: none"> Add southbound left turn lane on Shoemaker Rd; Optimize traffic signal timings 	D	41.6
23	Church Road and Crooked Lane (SR 3027)	<ul style="list-style-type: none"> Optimize traffic signal timings; 	C	33.7
24	Church Road and Horizon Drive	<ul style="list-style-type: none"> Optimize traffic signal timings; 	D	38.4
25	Crooked Lane and Yerkes Road	<ul style="list-style-type: none"> No modifications; 	B	11.0
26	DeKalb Pike (SR 0202) and Saulin Boulevard	<ul style="list-style-type: none"> Optimize traffic signal timings; 	C	23.2
27	Henderson Road (SR 3029) and Prince Frederick Street	<ul style="list-style-type: none"> Optimize traffic signal timings; 	B	15.8
28	Valley Forge Road (SR 0023) and Caley Road	<ul style="list-style-type: none"> No modifications; 	B	13.3
29	Valley Forge Road (SR 0023) and SR 0422 EB off Ramps	<ul style="list-style-type: none"> Optimize traffic signal timings; 	D	41.5
30	Valley Forge Road (SR 0023) and N. Gulph Road (SR 3033)	<ul style="list-style-type: none"> Optimize traffic signal timings 	D	54.4

¹Level of Service, see Tables 3 and 4 for Description

²Delay measured in average seconds of delay per vehicle for overall intersection



LEGEND	
⊕ C	LEVEL OF SERVICE
○	SIGNALIZED
⊥	STOP CONTROLLED

**ACT 209 HIGHWAY ASSESSMENT STUDY
ROADWAY SUFFICIENCY ANALYSIS**
**FIGURE 7 FUTURE 2022 PASS-THROUGH LEVELS OF SERVICE, WITH RECOMMENDED IMPROVEMENTS
UPPER MERION TOWNSHIP, MONTGOMERY COUNTY**

C. DEVELOPMENT GENERATED TRAFFIC

The Land Use Assumptions Report reflects projected changes in land use, densities, intensities and/or population within the Transportation Service Area (TSA). It is the “future” which best approximates development within the TSA for the planning horizon established by the Transportation Service Area Advisory Committee (TSAAC). In this situation, the Land Use Assumptions Report portrays the development scenario used in the projection of 2022 Total Future traffic volumes.

TRIP GENERATION

The development contained within the Land Use Assumptions Report was tabulated on a project specific basis of individual parcels believed to have development potential. Vehicular traffic generation analyses were performed by applying standard trip generation formulas, as documented by the Institute of Transportation Engineers (ITE) in their publication titled *Trip Generation*, to the identified uses and sizes of the anticipated “developments” portrayed within the Land Use Assumption Report along the TSA corridors. **TABLE 10** details the foreseen development within the next ten (10) years.

**TABLE 10
ANTICIPATED FUTURE DEVELOPMENT**

Property	Size (acres)	Residential Yield (Dwelling Units)	Non-Residential Yield (ft ²)	Type of Development
King of Prussia Mall	131	--	410,500	Retail
River Road Parcels	91	--	600,000	Office
Glasgow Tract	90.4	379	--	Residential
Out Parcels Inc.	4.43	--	50,000	Office
S. Henderson Road Corridor	202	--	400,000	Retail
Lockheed Martin	84.11	--	250,000	Office
KOP Business Park	415	--	500,000	Office
Turnpike Properties	9.2	--	14,000	Retail
S. Gulph Road Corridor	140.2	--	200,000	Office
Mancill Mill Road	11.2	513	--	Residential
Total	1,178.54	892	2,424,500	

The future development yield is subtotaled as residential and non-residential uses. **TABLE 11** shows the anticipated weekday PM peak hour trips associated with the anticipated residential and non-residential development. The detailed trip generation analyses are provided in **APPENDIX H**.

In performing the trip generation calculations, we also accounted for “Pass-By” traffic associated with some of the proposed development. “Pass-By” traffic is defined as traffic that is already on the roadway network that makes an intermediate stop at a site while ‘passing-by’, before

proceeding to their primary destination. Since these trips already exist and are merely diverted on their way to their primary destination, these trips do not actually represent additional traffic added to the roadway network. In accordance with the Institute of Transportation Engineers (ITE) *Trip Generation Handbook, 2nd edition*, a “Pass-by” value of 26% (during the evening peak hour) was included in the trip generation calculation for the anticipated retail development.

**TABLE 11
TRIP GENERATION**

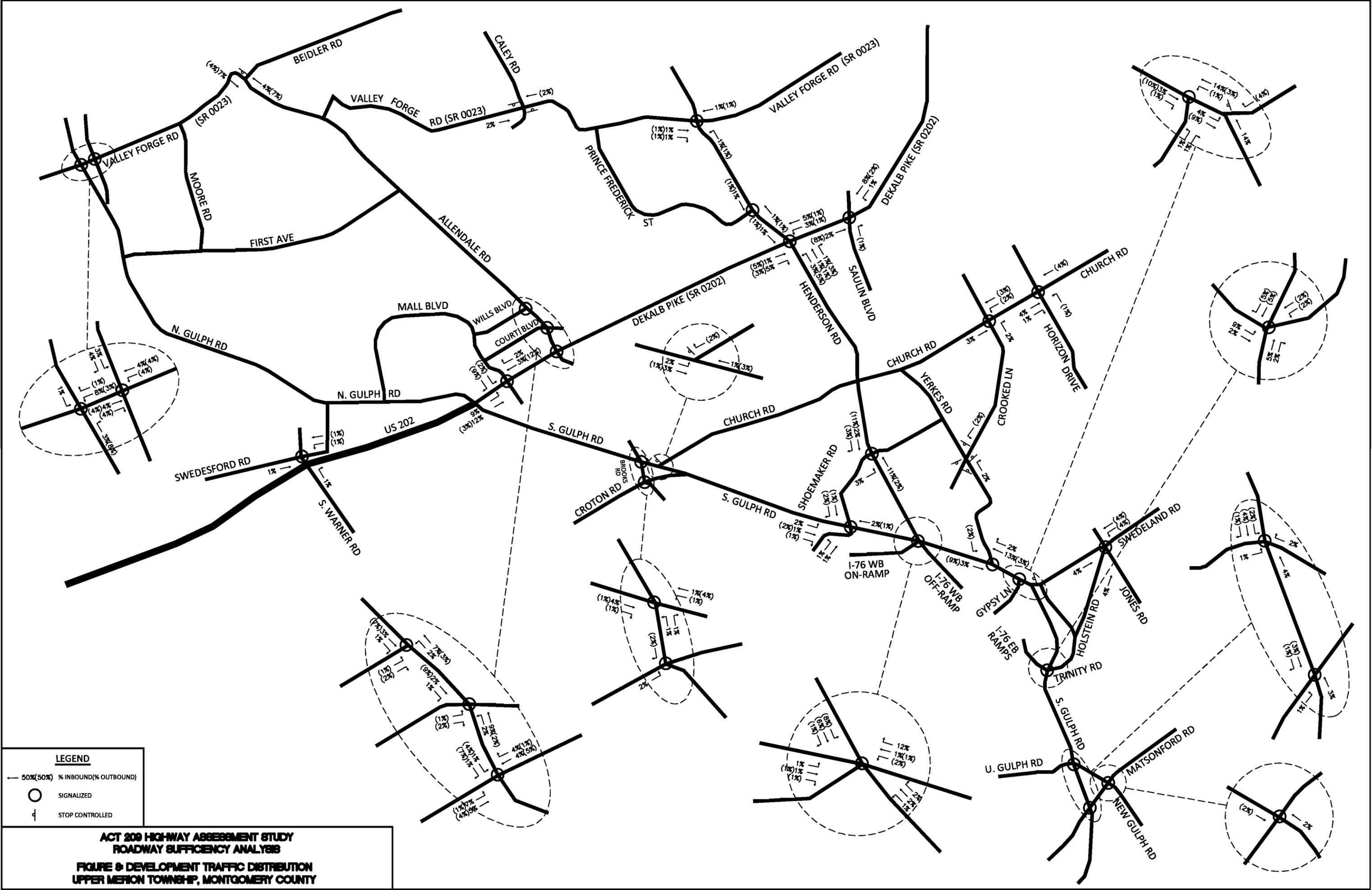
Land Use	Single Family Detached Housing	General Office Building	Shopping Center	TOTAL NON-RESIDENTIAL	
ITE Land Use Code	210	710	820		
	(Dwelling Units)	(Sq. Ft.)	(Sq. Ft.)	(Sq. Ft.)	
King of Prussia Mall			410,500	410,500	
River Road Parcels		600,000		600,000	
Glasgow Tract	379				
Out Parcels Inc.		50,000		50,000	
S. Henderson Road Corridor			400,000	400,000	
Lockheed Martin		250,000		250,000	
KOP Business Park		500,000		500,000	
Turnpike Properties			14,000	14,000	
S. Gulph Road Corridor		200,000		200,000	
Mancill Mill Road	513				
TOTAL	892	1,600,000	824,500	2,424,500	
TRIP GENERATION*				TOTAL	
Weekday PM Peak Hour	Total	807	2,187	2,530	5,524
	Enter	509	373	1,240	2,122
	Exit	298	1,814	1,290	3,402

* New trips only, pass-by reduction not shown

TRIP DISTRIBUTION

Trip distribution of new development trips was based on location of proposed development and proximity to existing roadway network. Additionally, a gravity model was used to further assign trips to the TSA roadway network accounting for adjacent municipalities.

FIGURE 8 provides an illustration of the percentage distribution of peak hour project traffic. **FIGURE 9** illustrates the assignment of development traffic to the study intersections.



LEGEND

— 50%(50%) % INBOUND(% OUTBOUND)

○ SIGNALIZED

⊥ STOP CONTROLLED

**ACT 209 HIGHWAY ASSESSMENT STUDY
ROADWAY SUFFICIENCY ANALYSIS**

**FIGURE 8 DEVELOPMENT TRAFFIC DISTRIBUTION
UPPER MERION TOWNSHIP, MONTGOMERY COUNTY**



LEGEND

- 100 TRAFFIC VOLUME
- SIGNALIZED
- T STOP CONTROLLED

**ACT 209 HIGHWAY ASSESSMENT STUDY
ROADWAY SUFFICIENCY ANALYSIS**

**FIGURE 9 DEVELOPMENT TRAFFIC VOLUMES
UPPER MERION TOWNSHIP, MONTGOMERY COUNTY**

D. PROJECTED TOTAL FUTURE TRAFFIC CONDITIONS

Projected 2022 Total Future Traffic conditions represent the cumulative effect of existing traffic, traffic resulting from on-going regional development (as quantified by Pass-Through traffic), and the traffic impact of the development expected to occur within the study area (as quantified by the assignment of the Land Use Assumption Report’s traffic).

FIGURE 10 illustrates the resultant evening total peak hour traffic volumes projected for 2022, including assignment of development traffic to the study intersections.

There are significant volume changes during the weekday PM peak hour as compared to the Existing and Pass-Through conditions. As such, the potential development related traffic will appreciably impact the study corridors.

ASSESSMENT OF TOTAL FUTURE TRAFFIC OPERATIONS

TABLE 12 summarizes the overall results of the Levels of Service analysis of total future traffic volumes, assuming the implementation of optimized traffic signal timing, phasing, and coordination settings within the corridors (i.e., no physical roadway improvements) for the anticipated traffic volumes. These Levels of Service are also depicted on **FIGURE 11**. Summary outputs for the analysis software are provided in **APPENDIX I**. In addition, a detailed Levels of Service report for the PM peak hour for each study intersection movement/approach can be found in **APPENDIX D**.

**TABLE 12
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(2022 TOTAL FUTURE TRAFFIC CONDITIONS)**

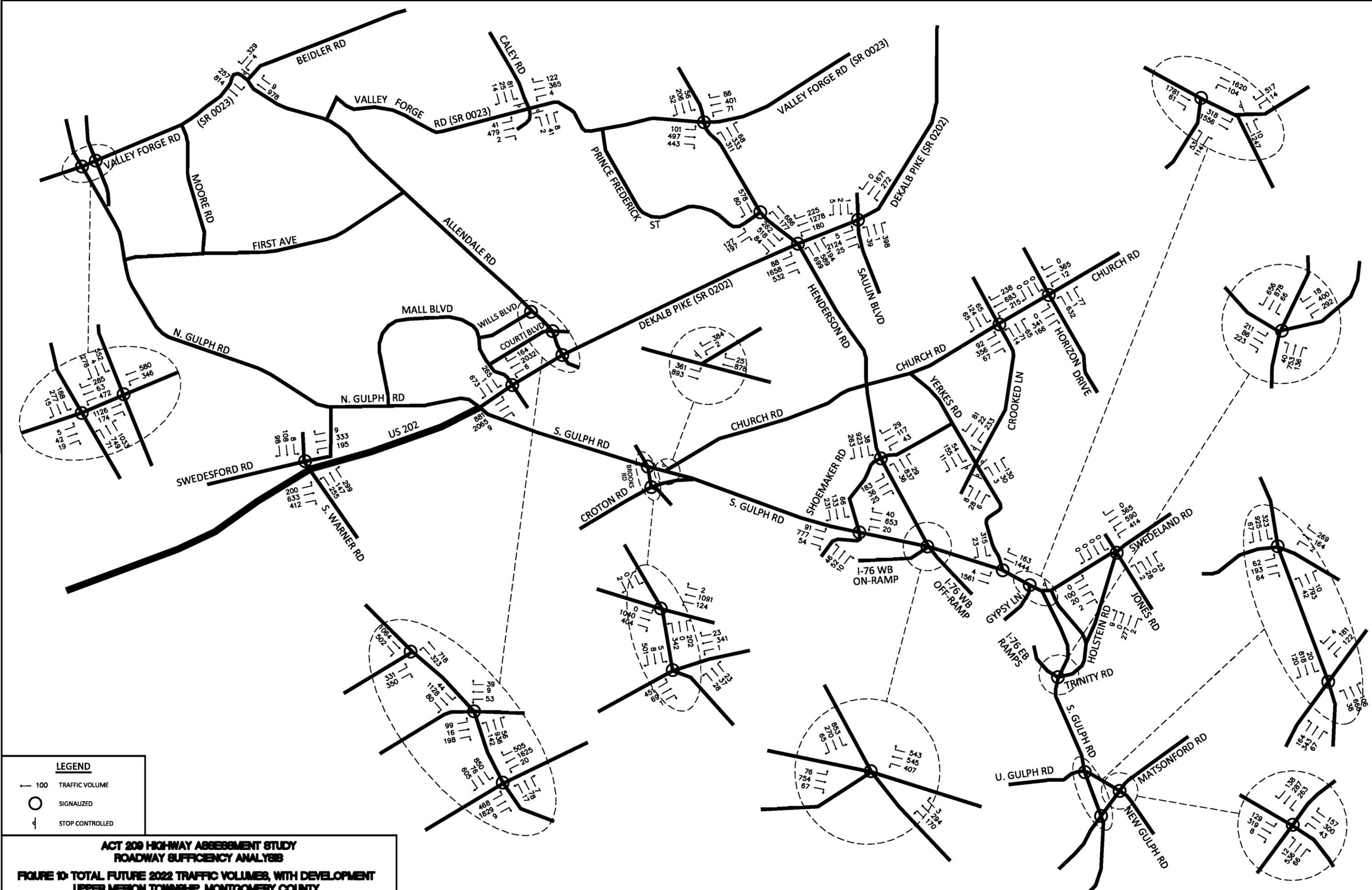
	INTERSECTION	LOS ¹	DELAY (SEC) ²
1	Valley Forge Road (SR 0023) and Beidler Road (SR 3029)	F	86.9
2	Valley Forge Road (SR 0023) and Henderson Road	D	40.3
3	S. Gulph Road (SR 3039) and Brooks Road (SR 3038)	F	109.3
4	S. Gulph Road (SR 3039) and Church Road (SR 3038)	F	95.4
5	S. Gulph Road (SR 3039) and S. Henderson Road (SR 3029)	F	148.0
6	S. Gulph Road (SR 3039) and Crooked Lane (SR 3027)	F	266.9
7	S. Gulph Road (SR 3039) and Gypsy Lane	F	129.6
8	S. Gulph Road (SR 3039) and Swedeland Road (SR 3041)	F	287.9
9	S. Gulph Road (SR 3039) and Upper Gulph Road (SR 3030)	F	105.2
10	S. Gulph Road (SR 3039) and Matsonford Road (SR 3016)	F	86.2
11	Matsonford Road (SR 3016) and Upper Gulph Road (SR 3030)	E	72.9
12	DeKalb Pike (SR 0202) and Mall Boulevard	E	61.0
13	DeKalb Pike (SR 0202) and Allendale Road	F	136.3
14	DeKalb Pike (SR 0202) and Henderson Road (SR 3029)	F	111.7
15	Allendale Road and Wills Boulevard	C	28.0
16	Allendale Road and Court Boulevard	B	16.1

TABLE 12 (continued)
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(2022 TOTAL FUTURE TRAFFIC CONDITIONS)

	INTERSECTION	LOS ¹	DELAY (SEC) ²
17	Swedesford Road (SR 3036) and S. Warner Road	<i>E</i>	<i>60.0</i>
18	Croton Road (SR 3024) and Brooks Road (SR 3028)	<i>C</i>	<i>20.6</i>
19	Henderson Road (SR 3029) and Shoemaker Road	<i>C</i>	<i>21.4</i>
20	Swedeland Road (SR 0320 & SR 3041) and Holstein Road (SR 0320) and Jones Road	<i>D</i>	<i>40.2</i>
21	S. Gulph Road (SR 3039) and I-76 EB On-Off Ramp / Trinity Road (SR 0320)	<i>F</i>	<i>131.6</i>
22	S. Gulph Road (SR 3039) and Shoemaker Road / Weadley Road	<i>F</i>	<i>144.1</i>
23	Church Road and Crooked Lane (SR 3027)	<i>F</i>	<i>259.0</i>
24	Church Road and Horizon Drive	<i>E</i>	<i>78.5</i>
25	Crooked Lane and Yerkes Road	<i>B</i>	<i>13.1</i>
26	DeKalb Pike (SR 0202) and Saulin Boulevard	<i>E</i>	<i>67.0</i>
27	Henderson Road (SR 3029) and Prince Frederick Street	<i>B</i>	<i>17.4</i>
28	Valley Forge Road (SR 0023) and Caley Road	<i>C</i>	<i>20.8</i>
29	Valley Forge Road (SR 0023) and SR 0422 EB off Ramps	<i>F</i>	<i>107.1</i>
30	Valley Forge Road (SR 0023) and N. Gulph Road (SR 3033)	<i>F</i>	<i>83.4</i>

¹Level of Service, see Tables 3 and 4 for Description

²Delay measured in average seconds of delay per vehicle for overall intersection

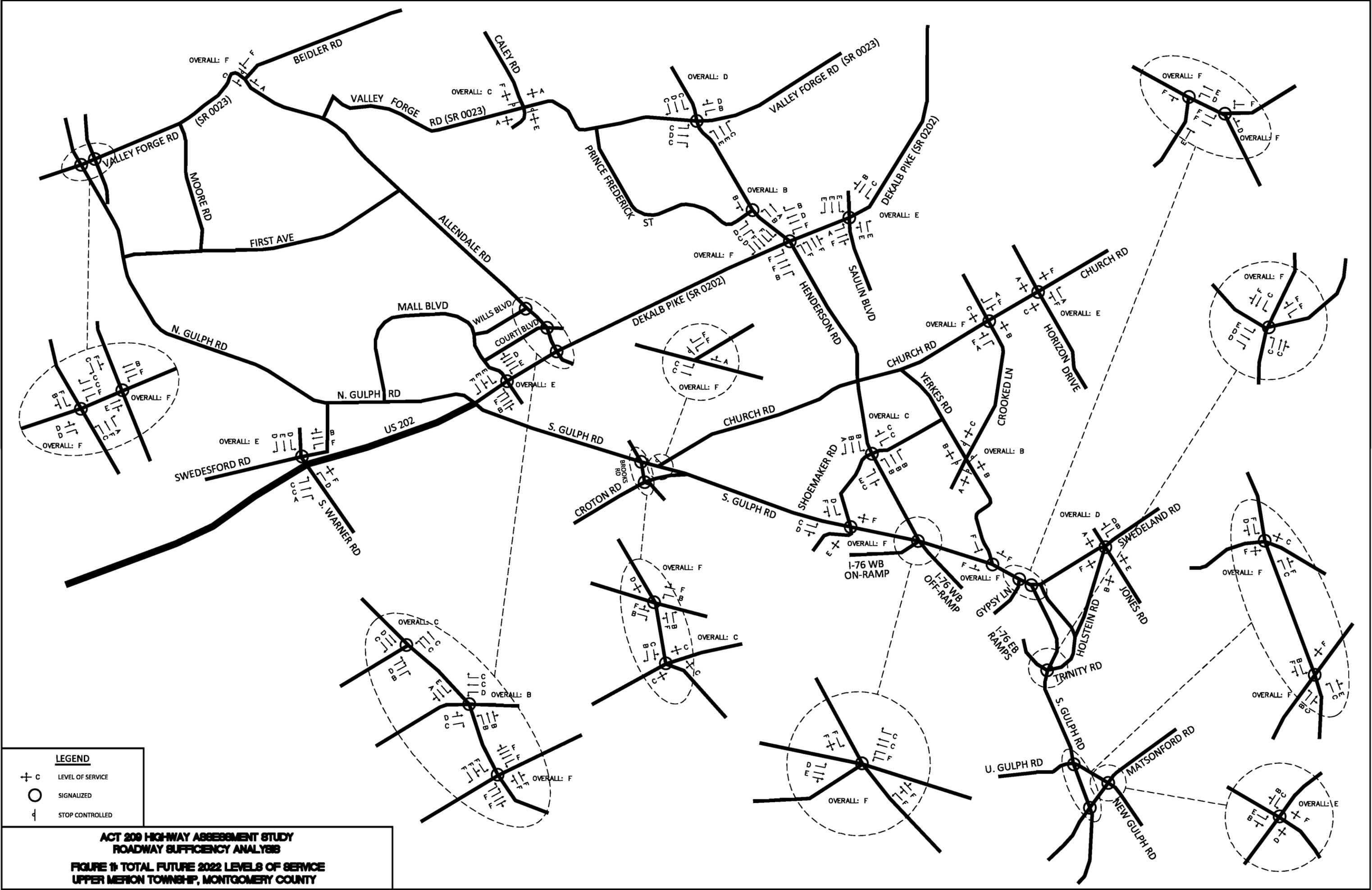


LEGEND

- 100 TRAFFIC VOLUME
- SIGNALIZED
- T STOP CONTROLLED

**ACT 209 HIGHWAY ASSESSMENT STUDY
ROADWAY SUFFICIENCY ANALYSIS**

**FIGURE 10: TOTAL FUTURE 2022 TRAFFIC VOLUMES, WITH DEVELOPMENT
UPPER MERION TOWNSHIP, MONTGOMERY COUNTY**



LEGEND

+	C	LEVEL OF SERVICE
○		SIGNALIZED
⊥		STOP CONTROLLED

**ACT 209 HIGHWAY ASSESSMENT STUDY
ROADWAY SUFFICIENCY ANALYSIS**

**FIGURE 11: TOTAL FUTURE 2022 LEVELS OF SERVICE
UPPER MERION TOWNSHIP, MONTGOMERY COUNTY**

RECOMMENDED IMPROVEMENTS FOR TOTAL FUTURE TRAFFIC CONDITIONS

As shown in **TABLE 12**, all but the following intersections do not operate at or above the preferred/acceptable Levels of Service as defined in **TABLE 6**, without additional physical improvements.

- Valley Forge Road (SR 0023) and Henderson Road
- Allendale Road and Wills Boulevard
- Allendale Road and Court Boulevard
- Croton Road (SR 3024) and Brooks Road (SR 3028)
- Henderson Road (SR 3029) and Shoemaker Road
- Swedeland Road (SR 0320 & SR 3041) and Holstein Road (SR 0320) and Jones Road
- Crooked Lane and Yerkes Road
- Henderson Road (SR 3029) and Prince Frederick Street
- Valley Forge Road (SR 0023) and Caley Road

Therefore, in order to achieve the preferred Levels of Service, the improvements as indicated in **TABLE 13** are recommended. The resulting Levels of Service and Delay with the implementation of the recommended improvements are also provided in **TABLE 13**. The Levels of Service during the PM peak hour are illustrated in **FIGURE 12**. Summary outputs for the analysis software are provided in **APPENDIX J**. In addition, a detailed Levels of Service report for the PM peak hour for each study intersection movement/approach can be found in **APPENDIX D**.

TABLE 13
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(2022 TOTAL FUTURE TRAFFIC CONDITIONS WITH IMPROVEMENTS)

	INTERSECTION	RECOMMENDED IMPROVEMENTS	LOS ¹	DELAY (SEC) ²
1	Valley Forge Road (SR 0023) and Beidler Road (SR 3029)	<ul style="list-style-type: none"> • Signalize intersection; • Add westbound left turn lane on Beidler Rd; • Add westbound right turn overlap phase on Beidler Rd; • Add southbound left turn lane with advance left turn phase on Valley Forge Rd; • Optimize traffic signal timings; 	D	50.8
2	Valley Forge Road (SR 0023) and Henderson Road	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	D	40.3
3	S. Gulph Road (SR 3039) and Brooks Road (SR 3038)	<ul style="list-style-type: none"> • Add eastbound through lane on S Gulph Rd; • Add westbound through lane on S Gulph Rd; • Optimize traffic signal timings 	C	23.2

**TABLE 13 (continued)
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(2022 TOTAL FUTURE TRAFFIC CONDITIONS WITH IMPROVEMENTS)**

	INTERSECTION	RECOMMENDED IMPROVEMENTS	LOS ¹	DELAY (SEC) ²
4	S. Gulph Road (SR 3039) and Church Road (SR 3038)	<ul style="list-style-type: none"> • Signalize intersection; • Add eastbound through lane on S Gulph Rd; • Add westbound through lane on S Gulph Rd; • Optimize traffic signal timings; 	B	18.0
5	S. Gulph Road (SR 3039) and S. Henderson Road (SR 3029)	<ul style="list-style-type: none"> • Add northbound/southbound lanes to Henderson Road; • Add eastbound right turn lane with channelizing island on S Gulph Rd; • Add westbound right turn channelizing island on S Gulph Rd; • Add southbound left turn lane on Henderson Rd; • Optimize traffic signal timings; 	D	46.3
6	S. Gulph Road (SR 3039) and Crooked Lane (SR 3027)	<ul style="list-style-type: none"> • Add eastbound through lane on S Gulph Rd; • Add westbound through lane on S Gulph Rd; • Add southbound right turn lane on Crooked Ln; • Optimize traffic signal timings; 	B	11.2
7	S. Gulph Road (SR 3039) and Gypsy Lane	<ul style="list-style-type: none"> • Add eastbound through lane on S Gulph Rd; • Add westbound through lane on S Gulph Rd; • Optimize traffic signal timings 	B	10.2
8	S. Gulph Road (SR 3039) and Swedeland Road (SR 3041)	<ul style="list-style-type: none"> • Add eastbound through lane on S Gulph Rd; • Add westbound through lane on S Gulph Rd; • Add eastbound advance left turn phase on S Gulph Rd; • Optimize traffic signal timings; 	C	34.7
9	S. Gulph Road (SR 3039) and Upper Gulph Road (SR 3030)	<ul style="list-style-type: none"> • Add eastbound left turn lane on Upper Gulph Rd; • Add westbound right turn lane on Upper Gulph Rd; • Optimize traffic signal timings; 	D	41.5
10	S. Gulph Road (SR 3039) and Matsonford Road (SR 3016)	<ul style="list-style-type: none"> • Add eastbound right turn lane on Matsonford Road; • Add southbound right turn lane on S. Gulph Road; • Optimize traffic signal timings; 	D	49.1
11	Matsonford Road (SR 3016) and Upper Gulph Road (SR 3030)	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	D	45.5

TABLE 13 (continued)
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(2022 TOTAL FUTURE TRAFFIC CONDITIONS WITH IMPROVEMENTS)

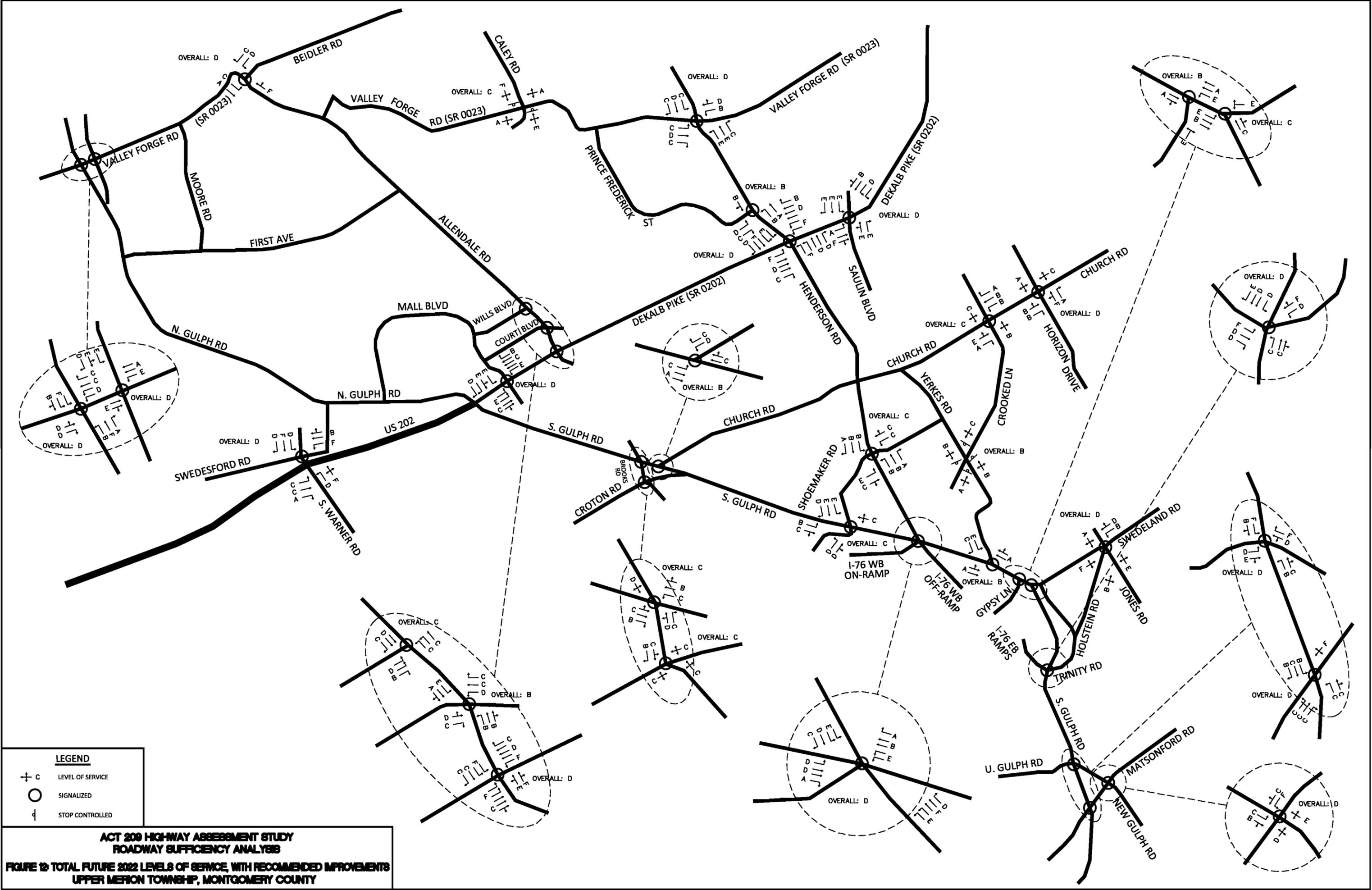
	INTERSECTION	RECOMMENDED IMPROVEMENTS	LOS¹	DELAY (SEC)²
12	DeKalb Pike (SR 0202) and Mall Boulevard	<ul style="list-style-type: none"> • Add westbound right turn lane on Dekalb Pk; • Add southbound right turn lane on Mall Blvd; • Optimize traffic signal timings; 	D	39.1
13	DeKalb Pike (SR 0202) and Allendale Road	<ul style="list-style-type: none"> • Add eastbound through lane on Dekalb Pk; • Add westbound right turn lane on Dekalb Pk; • Adjust signal phasing - Remove split phase; • Optimize traffic signal timings; 	D	53.9
14	DeKalb Pike (SR 0202) and Henderson Road (SR 3029)	<ul style="list-style-type: none"> • Add eastbound through lane on Dekalb Pk; • Add westbound left turn lane on Dekalb Pk; • Add westbound through lane on Dekalb Pk; • Add northbound right turn lane on Henderson Rd; • Optimize traffic signal timings; 	D	55.0
15	Allendale Road and Wills Boulevard	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	C	28.0
16	Allendale Road and Court Boulevard	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	B	16.1
17	Swedesford Road (SR 3036) and S. Warner Road	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	D	51.3
18	Croton Road (SR 3024) and Brooks Road (SR 3028)	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	C	21.0
19	Henderson Road (SR 3029) and Shoemaker Road	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	C	21.4
20	Swedeland Road (SR 0320 & SR 3041) and Holstein Road (SR 0320) and Jones Road	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	D	40.2
21	S. Gulph Road (SR 3039) and I-76 EB On-Off Ramp / Trinity Road (SR 0320)	<ul style="list-style-type: none"> • Add southbound right turn lane on S Gulph Rd; • Add southbound right turn overlap phase on S Gulph Rd; • Optimize traffic signal timings; 	D	51.0
22	S. Gulph Road (SR 3039) and Shoemaker Road / Weadley Road	<ul style="list-style-type: none"> • Add northbound left turn lane on Weadley Rd; • Add southbound right turn lane on Shoemaker Rd; • Optimize traffic signal timings; 	C	36.5
23	Church Road and Crooked Lane (SR 3027)	<ul style="list-style-type: none"> • Add westbound left turn lane on Church Rd; • Optimize traffic signal timings; 	C	26.9

TABLE 13 (continued)
OPERATIONAL SUMMARY
AT STUDY INTERSECTIONS
(2022 TOTAL FUTURE TRAFFIC CONDITIONS WITH IMPROVEMENTS)

	INTERSECTION	RECOMMENDED IMPROVEMENTS	LOS ¹	DELAY (SEC) ²
24	Church Road and Horizon Drive	<ul style="list-style-type: none"> • Add eastbound right turn lane on Church Rd; • Optimize traffic signal timings 	D	48.7
25	Crooked Lane and Yerkes Road		B	13.1
26	DeKalb Pike (SR 0202) and Saulin Boulevard	<ul style="list-style-type: none"> • Add westbound left turn lane on Dekalb Pk; • Optimize traffic signal timings; 	D	54.1
27	Henderson Road (SR 3029) and Prince Frederick Street	<ul style="list-style-type: none"> • Optimize traffic signal timings; 	B	17.4
28	Valley Forge Road (SR 0023) and Caley Road	<ul style="list-style-type: none"> • Add left-turn lanes on Valley Forge Road; • Install traffic signal; 	C	20.8
29	Valley Forge Road (SR 0023) and SR 0422 EB off Ramps	<ul style="list-style-type: none"> • Add southbound left turn lane on US 422 Off Ramp; • Optimize traffic signal timings; 	D	51.0
30	Valley Forge Road (SR 0023) and N. Gulph Road (SR 3033)	<ul style="list-style-type: none"> • Add westbound left turn lane on Valley Forge Rd; • Add southbound left turn lane on N Gulph Rd; • Optimize traffic signal timings; 	D	43.5

¹Level of Service, see Tables 3 and 4 for Description

²Delay measured in average seconds of delay per vehicle for overall intersection



LEGEND	
+	LEVEL OF SERVICE
○	SIGNALIZED
⊥	STOP CONTROLLED

**ACT 209 HIGHWAY ASSESSMENT STUDY
ROADWAY SUFFICIENCY ANALYSIS**

**FIGURE 12: TOTAL FUTURE 2022 LEVELS OF SERVICE, WITH RECOMMENDED IMPROVEMENTS
UPPER MERION TOWNSHIP, MONTGOMERY COUNTY**

E. RECOMMENDED IMPROVEMENTS

As outlined in the previous sections, recommended improvements were determined for each of the following scenarios:

- Existing Conditions
- Future ‘Pass-through’ Growth Conditions
- Future ‘With Development’ Conditions

Each of the recommended improvements was reviewed in detail with the Transportation Service Area Advisory Committee (TSAAC) and the Upper Merion Transportation Authority Engineer in order to determine the practicality of implementing the modifications at each study area intersection. Elements that were considered included technical issues such as right-of-way impacts, and non-technical issues such as the maintenance of existing roadway character, the potentially adverse effects of the improvements on pedestrian and bicycle usage, and the consideration of aesthetics in different areas of the Township. In addition, the combination of several individual intersection projects into larger projects was identified where logical, in an effort to address an entire corridor under one effort, which would potentially result in a more economical project from a design and construction perspective, and which would result in less disruption to the motoring public in a given area by eliminating multiple smaller projects at potentially different times.

Lastly, where constraints would likely prevent the implementation of the technically required improvements, the TSAAC and the UMTA Engineer worked to identify other area improvement projects that may indirectly yield a positive impact on the capacity and operation of the constrained intersections. Specifically, these locations included:

- DeKalb Pike (SR 0202) & Mall Boulevard
- DeKalb Pike (SR 0202) & Allendale Road
- DeKalb Pike (SR 0202) & Henderson Road
- DeKalb Pike (SR 0202) & Saulin Boulevard

III. CAPITAL IMPROVEMENTS PLAN

A. IMPLEMENTING MECHANISM

Three major funding and implementing sources are: the State/Federal Government, Upper Merion Township, and the land development community.

The State is a major participant because most improvements involve or impact State-owned highways, intensive improvement costs will require State assistance, and the State administers the Transportation Improvement Plan/12-year Plan, a priority ranking of transportation improvements that make use of State and Federal funds.

Upper Merion Township is also a responsible party in financing and implementing the Plan since the Township is the prime sponsor and administrator of the Capital Improvements Plan and will (through the successful completion of these Act 209 activities) will collect and expend traffic impact fees for the betterment of the Township's roadway infrastructure system.

Finally, the land development community has an active role in the Plan due to the fact that through its contributions (traffic impact fees) or provision of in-kind services (dedication of right-of-way and/or construction activities) it can indirectly or directly advance a project toward or through implementation.

Due to the capital-intensive nature of the overall improvement program, the implementation of the recommended improvements will depend upon the Twelve-year Transportation Improvement Program process. It should be noted that competition for State and Federal funding for local projects is significant, and that the anticipated schedule for the implementation of projects, even those that are approved for the Twelve-year Plan, is highly dependent upon available funding and often times schedule adjustments are necessary.

B. PROJECT COST ELEMENTS

Preliminary opinions of probable project related costs have been formulated to provide a sense of the expenditure necessary to realize the recommended plan improvements. The opinions of probable cost have been estimated for the following project components with the criteria noted below:

1. Planning Fees – Consultant fees associated with the satisfactory completion of the ACT 209 process plus estimates for possible annual monitoring, advisory and/or updating services, over the life of the Plan.
2. Administration Fees – Estimated legal fees to review the original ordinance and one possible annual revision over the planning period. In-house costs associated with monitoring, collection and use of the impact fees have been assumed to be costs borne within the Township's normal operating budget.
3. Debt Service Costs – not accounted for.

4. Engineering Design – 20% of total construction costs.
5. Right-of-Way Acquisition – Based upon per-acre costs for residential, commercial, and office real estate. For the purposes of this evaluation, either the latest county value assessments for affected properties, or a cost of \$200,000 per acre for residential and \$400,000 for commercial (if no assessed value) was utilized for the estimates.
6. Utility Relocation – per utility pole, hydrant, etc. as determined in the field.
7. Construction costs – based upon field views, estimated quantities taken from sketch plans, and unit prices obtained from recent bid packages for similar projects received by PENNDOT. Construction cost estimate totals include:
 - ❑ Mobilization & Insurance – 5% of construction cost.
 - ❑ Maintenance & Protection of Traffic – 10% of construction cost
 - ❑ Construction Contingencies – 20% of construction cost/mobilization/insurance/maintenance & protection of traffic
 - ❑ Construction Inspection – 10% of construction cost/mobilization/insurance/maintenance & protection of traffic/contingencies
 - ❑ Annual Inflation of 6.69% assessed to right-of-way acquisition, construction, and inspection related items to the anticipated construction completion year of 2022.
 - ❑ Annual Inflation of 6.69% assessed to engineering costs to the anticipated design completion year of 2022.

It should be noted that while each of the above project cost elements may be computed into the Capital Improvements Plan, only the costs directly related to implementing the project improvements (items 4-7) are reimbursable via the state administered State/Federal funded highway improvement process.

C. SELECTED IMPROVEMENT PROJECTS

As discussed in previous sections, the TSAAC and the UMTA Engineer worked to identify practical and implementable projects that would address the capacity and operational needs identified at the study area intersections. As part of this effort, recommended improvements to several intersections were combined into larger projects, and other area projects were identified that may offset the need for several recommended intersection improvements which were felt to be impractical due to existing constraints.

D. IMPROVEMENT PROGRAM

The determination and apportionment of project related costs, identification of funding sources, and assignment of implementation schedules are the elements of the Capital Improvements Plan. Programming considerations incorporated into the plan are listed below:

1. There are two improvement scenarios: Existing/Pass-through conditions, and Total Future conditions, which incorporate volume and improvements attributable to development traffic within the corridor.
2. Allocation of costs assumes that development impact fees are applicable only to a maximum of 50% of the cost attributable to improvements involving state highways.
3. Federal aid and state financial assistance do not apply to costs related to planning, administration, and debt service activities.
4. Funding apportionment does not impose programming responsibility upon county, state, or federal agencies.
5. Implementation time frames have been assessed and assigned based upon the relative need for the project, the ease of its implementation, and the degree to which right-of-way will be required.

TABLE 14 presents the Ten (10) Year Transportation Capital Improvements Plan for the Upper Merion Transportation Service Area (TSA).

Additionally, in the case of the Upper Merion Transportation Service Area, the TSAAC and UMTA determined that due to market conditions, the full 50% assessment of this impact fee to the private development community on every project will not be able to be facilitated. As such, a reduced limit of development related costs has been allocated to the impact fee calculation for selected projects.



TABLE 14 – PROPOSED 10 YEAR CAPITAL IMPROVEMENT PLAN

Intersection		Existing Conditions + 2022 Pass-Through Conditions		2022 ‘With Development’ Conditions		Maximum Development % Applicable to Act 209 Impact Fee (%)	CIP Development % Applicable to Act 209 Impact Fee (%)	Capital Improvement Plan Development Allocation (\$)	Anticipated Construction	Notes
		Recommended Improvements	Projected Cost of Improvements (\$)	Recommended Improvements	Projected Incremental Cost of Improvements (1) (\$)					
1	Valley Forge Road (SR 0023) & Beidler Road (SR 3029)/Mancill Mill Road	<ul style="list-style-type: none"> Signalize intersection Add westbound left turn lane on Beidler Rd Add westbound right turn overlap phase on Beidler Rd Add southbound left turn lane with advance left turn phase on Valley Forge Rd 	\$7,410,369.00	<ul style="list-style-type: none"> Add westbound through lane on Valley Forge Road Add eastbound left-turn lane on Valley Forge Road Optimize traffic signal timings 	\$11,319,631.00	50%	35%	\$3,961,870.85	2022	Currently funded on FY 2015 TIP, cost estimate prepared by UMTA
2	Valley Forge Road (SR 0023) & Henderson Road	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	50%	50%	\$3,750.00	2022	
3	S. Gulph Road (SR 3039) & Brooks Road (SR 3038)	<ul style="list-style-type: none"> Add eastbound right turn lane and overlap phase on S. Gulph Rd Optimize traffic signal timings 	\$912,128.00	<ul style="list-style-type: none"> Add eastbound through lane on S Gulph Rd Add westbound through lane on S Gulph Rd. 						
4	S. Gulph Road (SR 3039) & Church Road (SR 3038)	<ul style="list-style-type: none"> Add southbound left turn lane on Church Rd 	\$1,393,118.00	<ul style="list-style-type: none"> Signalize intersection Add eastbound through lane on S Gulph Rd Add westbound through lane on S Gulph Rd 	\$2,164,149.00	50%	50%	\$1,082,074.50	2022	Projects recommended to be completed together, and also include intersection 18

TABLE 14 – PROPOSED 10 YEAR CAPITAL IMPROVEMENT PLAN (Continued)

Intersection		Existing Conditions + 2022 Pass-Through Conditions		2022 ‘With Development’ Conditions		Maximum Development % Applicable to Act 209 Impact Fee (%)	CIP Development % Applicable to Act 209 Impact Fee (%)	Capital Improvement Plan Development Allocation (\$)	Anticipated Construction	Notes
		Recommended Improvements	Projected Cost of Improvements (\$)	Recommended Improvements	Projected Incremental Cost of Improvements (1) (\$)					
5	S. Gulph Road (SR 3039) & South Henderson Road (SR 3029)	<ul style="list-style-type: none"> Add westbound left turn lane on S Gulph Rd Optimize traffic signal timings 	\$1,978,955.00	<ul style="list-style-type: none"> Add northbound and southbound through lanes on Henderson Rd Optimize traffic signal timings 	\$2,422,174.00	50%	50%	\$1,211,087.00	2022	Complete with Intersection 19 (Shoemaker Road)
6	S. Gulph Road (SR 3039) & Crooked Lane (SR 3027)			<ul style="list-style-type: none"> Add eastbound through lane on S Gulph Rd Add westbound through lane on S Gulph Rd Add southbound right turn lane on Crooked Ln Optimize traffic signal timing 						Projects recommended to be completed together, and also include intersection 21, anticipated to be partially funded by PennDOT on TIP
7	S. Gulph Road (SR 3039) & Gypsy Lane			<ul style="list-style-type: none"> Add eastbound through lane on S Gulph Rd Add westbound through lane on S Gulph Rd Optimize traffic signal timings 	\$6,705,297.00	50%	50%	\$3,352,648.50	2022	
8	S. Gulph Road (SR 3039) & Swedeland Road (SR 3041)	<ul style="list-style-type: none"> Signalize intersection 	\$225,000	<ul style="list-style-type: none"> Add eastbound through lane on S Gulph Rd Add westbound through lane on S Gulph Rd Add eastbound advance left turn phase on S Gulph Rd Optimize traffic signal timings 						

TABLE 14 – PROPOSED 10 YEAR CAPITAL IMPROVEMENT PLAN (Continued)

Intersection		Existing Conditions + 2022 Pass-Through Conditions		2022 ‘With Development’ Conditions		Maximum Development % Applicable to Act 209 Impact Fee (%)	CIP Development % Applicable to Act 209 Impact Fee (%)	Capital Improvement Plan Development Allocation (\$)	Anticipated Construction	Notes
		Recommended Improvements	Projected Cost of Improvements (\$)	Recommended Improvements	Projected Incremental Cost of Improvements (1) (\$)					
9	S. Gulph Road (SR 3020) & Upper Gulph Road (SR 3030)	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	<ul style="list-style-type: none"> Add eastbound left turn lane on Upper Gulph Rd Add westbound right turn lane on Upper Gulph Rd Optimize traffic signal timings 	\$2,073,642.00	50%	50%	\$1,036,821.00	2022	Border with Lower Merion
10	S. Gulph Road (SR 3020) & Matsonford Road (SR 3016)	<ul style="list-style-type: none"> Add southbound left turn lane on S. Gulph Rd Add eastbound left turn lane on Matsonford Rd Optimize traffic signal timings 	\$1,623,869.00	<ul style="list-style-type: none"> Add eastbound right turn lane on Matsonford Road Add southbound right turn lane on S. Gulph Road Optimize traffic signal timings 	\$906,930.00	50%	50%	\$453,465.00	2022	
11	Matsonford Road (SR 3016) & Upper Gulph Road (SR 3030)	<ul style="list-style-type: none"> Add westbound left turn lane on Matsonford Rd Add southbound left turn lane on Upper Gulph Rd Optimize traffic signal timings 	\$2,398,194.00	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	50%	50%	\$3,750.00	2022	
12	Dekalb Pike (SR 0202) & Mall Boulevard			<ul style="list-style-type: none"> Add westbound right turn lane on Dekalb Pk Add southbound right turn lane on Mall Blvd Optimize traffic signal timings 	See Project TA1 (2)	50%				Limited ability to construct improvements, see Project TA1

TABLE 14 – PROPOSED 10 YEAR CAPITAL IMPROVEMENT PLAN (Continued)

Intersection		Existing Conditions + 2022 Pass-Through Conditions		2022 ‘With Development’ Conditions		Maximum Development % Applicable to Act 209 Impact Fee (%)	CIP Development % Applicable to Act 209 Impact Fee (%)	Capital Improvement Plan Development Allocation (\$)	Anticipated Construction	Notes
		Recommended Improvements	Projected Cost of Improvements (\$)	Recommended Improvements	Projected Incremental Cost of Improvements (1) (\$)					
13	Dekalb Pike (SR 0202) & Allendale Road	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	<ul style="list-style-type: none"> Add eastbound through lane on Dekalb Pk Add westbound right turn lane & overlap phase on Dekalb Pk Add southbound left turn lane on Allendale Rd Add southbound right turn overlap phase on Allendale Rd Reconfigure northbound approach to Left-Through/Right Adjust signal phasing - Remove split phase 	See Project TA1 (2)	50%				Limited ability to construct improvements, see Project TA1
14	Dekalb Pike (SR 0202) & Henderson Road (SR 3029)	<ul style="list-style-type: none"> Add northbound and southbound left turn lane Adjust signal phasing - Remove split phase Optimize traffic signal timings 		<ul style="list-style-type: none"> Add eastbound through lane on Dekalb Pk Add westbound left turn lane on Dekalb Pk Add westbound through lane on Dekalb Pk Add northbound right turn lane on Henderson Rd Add northbound right turn overlap phase on Henderson Rd Optimize traffic signal timings 	See Project TA2 (2)	50%				Limited ability to construct improvements, see Project TA2

TABLE 14 – PROPOSED 10 YEAR CAPITAL IMPROVEMENT PLAN (Continued)

Intersection		Existing Conditions + 2022 Pass-Through Conditions		2022 ‘With Development’ Conditions		Maximum Development % Applicable to Act 209 Impact Fee (%)	CIP Development % Applicable to Act 209 Impact Fee (%)	Capital Improvement Plan Development Allocation (\$)	Anticipated Construction	Notes
		Recommended Improvements	Projected Cost of Improvements (\$)	Recommended Improvements	Projected Incremental Cost of Improvements (1) (\$)					
15	Allendale Road & Wills Boulevard	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	100%	100%	\$7,500.00	2022	
16	Allendale Road & Court Boulevard	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	100%	100%	\$7,500.00	2022	
17	Swedesford Road (SR 3036) and S. Warner Road	<ul style="list-style-type: none"> Add southbound right turn lane on Bryce Lane Optimize traffic signal timings 	\$540,329.00	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	50%	50%	\$3,750.00	2022	
18	Croton Road (SR 3024) & Brooks Road (SR 3028)					50%	50%	\$0.00		See intersections 3, 4
19	Henderson Road (SR 3029) & Shoemaker Road					50%	50%	\$0.00		See intersection 5
20	Swedeland Road (SR 0320 & SR 3041) & Holstein Road (SR 0320) & Jones Road	<ul style="list-style-type: none"> Add westbound left turn lane on Swedeland Rd Optimize traffic signal timings 	\$1,265,378.00	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	50%	50%	\$3,750.00	2022	

TABLE 14 – PROPOSED 10 YEAR CAPITAL IMPROVEMENT PLAN (Continued)

Intersection	Existing Conditions + 2022 Pass-Through Conditions		2022 ‘With Development’ Conditions		Maximum Development % Applicable to Act 209 Impact Fee (%)	CIP Development % Applicable to Act 209 Impact Fee (%)	Capital Improvement Plan Development Allocation (\$)	Anticipated Construction	Notes	
	Recommended Improvements	Projected Cost of Improvements (\$)	Recommended Improvements	Projected Incremental Cost of Improvements (1) (\$)						
21	S. Gulph Road (SR 3039) & I-76 EB On-Off Ramp / Trinity Road (SR 0320)	<ul style="list-style-type: none"> Optimize traffic signal timings 	\$7,500.00	<ul style="list-style-type: none"> Add southbound right turn lane on S Gulph Rd Add southbound right turn overlap phase on S Gulph Rd Optimize traffic signal timings 	\$2,968,980	50%	50%	\$1,484,490	2022	Complete with intersections 6, 7, 8
22	S. Gulph Road (SR 3039) & Shoemaker Road / Weadley Road	<ul style="list-style-type: none"> Add southbound left turn lane on Shoemaker Rd Optimize traffic signal timings 	\$347,091.00	<ul style="list-style-type: none"> Add northbound left turn lane on Weadley Rd Optimize traffic signal timings 	\$781,389.00	50%	50%	\$390,694.50	2017	
23	Church Road & Crooked Lane (SR 3027)			<ul style="list-style-type: none"> Add westbound left turn lane on Church Rd Optimize traffic signal timings 	\$1,293,618.00	50%	50%	\$646,809.00	2017	
24	Church Road & Horizon Drive			<ul style="list-style-type: none"> Add eastbound right turn lane on Church Rd Optimize traffic signal timings 	\$690,572.00	100%	100%	\$690,572.00	2017	
25	Crooked Lane & Yerkes Road					100%	100%	\$0.00		
26	DeKalb Pike (SR 0202) & Saulin Boulevard			<ul style="list-style-type: none"> Add westbound left turn lane on Dekalb Pk Optimize traffic signal timings 	See Project TA2 (2)	50%	50%			Limited ability to construct improvements, see Project TA2

TABLE 14 – PROPOSED 10 YEAR CAPITAL IMPROVEMENT PLAN (Continued)

Intersection		Existing Conditions + 2022 Pass-Through Conditions		2022 ‘With Development’ Conditions		Maximum Development % Applicable to Act 209 Impact Fee (%)	CIP Development % Applicable to Act 209 Impact Fee (%)	Capital Improvement Plan Development Allocation (\$)	Anticipated Construction	Notes
		Recommended Improvements	Projected Cost of Improvements (\$)	Recommended Improvements	Projected Incremental Cost of Improvements (1) (\$)					
27	Henderson Road (SR 3029) & Prince Frederick Street					50%	50%	\$0.00		
28	Valley Forge & Caley Road			<ul style="list-style-type: none"> Add left-turn lanes on Valley Forge Road Install traffic signal 	\$950,000.00	50%	50%	\$475,000.00	2022	Cost estimate prepared by UMTA
29	Valley Forge (SR 0023) & 422 EB Off Ramps	<ul style="list-style-type: none"> Add southbound left turn lane on US 422 Off Ramp Optimize traffic signal timings 	\$1,463,551.00			50%	0%	\$0.00	2022	Will be funded as part of SR0023, Section 2NG (Relocated N. Gulph Road), \$13M total project cost estimate prepared by UMTA
30	Valley Forge (SR 0023) & N. Gulph Road (SR 3033)	<ul style="list-style-type: none"> Add westbound left turn lane on Valley Forge Rd Add southbound left turn lane on N Gulph Rd Optimize traffic signal timings 	\$3,111,540.00							
TA1	PA Turnpike & Henderson Road Interchange			<ul style="list-style-type: none"> Construct new full-access interchange to Henderson Road 	\$35,000,000.00	50%	10%	\$3,500,000.00	2022	Would potentially mitigate LOS at intersections 12, 13, cost estimate prepared by UMTA



TABLE 14 – PROPOSED 10 YEAR CAPITAL IMPROVEMENT PLAN (Continued)

Intersection		Existing Conditions + 2022 Pass-Through Conditions		2022 ‘With Development’ Conditions		Maximum Development % Applicable to Act 209 Impact Fee (%)	CIP Development % Applicable to Act 209 Impact Fee (%)	Capital Improvement Plan Development Allocation (\$)	Anticipated Construction	Notes
		Recommended Improvements	Projected Cost of Improvements (\$)	Recommended Improvements	Projected Incremental Cost of Improvements (1) (\$)					
TA2	Prince Frederick Road & Saulin Boulevard Extension			<ul style="list-style-type: none"> Construct loop road from intersection of DeKalb & Saulin to intersection of Henderson & Prince Frederick 	\$8,500,000.00	100%	20%	\$1,700,000.00	2022	Would potentially mitigate LOS at intersection 14, 26, cost estimate prepared by UMTA
		Total	\$22,714,522.00	Total	\$75,821,382.00			\$20,015,532.35		
Total Development PM Peak Hour Generated Trips (Table 11 Roadway Sufficiency Analysis)								5,524		
Project Impact Fee per PM Peak Hour Trip								\$3,623.38		
<p>(1) Estimated costs include only improvements attributable to development. 2012 Existing or 2022 Pass-Through Improvements are not included in these estimates.</p> <p>(2) DeKalb Pike intersections pending decision on Desirable LOS threshold and inclusion of UMTA projects.</p>										

E. TRANSPORTATION IMPACT FEE

According to Pennsylvania Act 209: “the impact fee for transportation capital improvements shall be based upon the total costs of the roadway improvements included in the adopted capital improvements plan within a given transportation service area attributable to and necessitated by new development within the service area...”. Calculation of the impact fee, expressed as a cost per peak hour trip, is accomplished with the following formula:

$$\text{Impact Fee (Per trip within TSA)} = \frac{\text{Total Cost of improvements attributable to new development within the Transportation Service Area}}{\text{Peak hour trips generated by new development within Transportation Service Area}}$$

In the case of Upper Merion Township, the impact fee is based upon the total (new) vehicular trips created by development during the typical weekday afternoon (PM) peak hour.

Tables 10 and 11, located in the Roadway Sufficiency Section of the report, summarizes the anticipated developments and the associated anticipated trip generation for each development during both the AM and PM peak hours. **Table 15** summarizes the calculation of the impact fee for the Transportation Service Area.

**TABLE 15
TRANSPORTATION IMPACT FEE
PER WEEKDAY PM PEAK HOUR TRIP CALCULATION**

Total Cost of Development Attributable Improvements	Anticipated PM Peak Hour Trips	Impact Fee (Per Trip)
\$20,015,532.35	5,524	\$3,623.38

IV. SUMMARY AND CONCLUSIONS

This report summarizes a systematic investigation into existing and projected 2022 traffic conditions within the Upper Merion Transportation Service Area (TSA) in Upper Merion Township, Montgomery County, PA. This work is being performed as required within ARTICLE V-A, entitled “Municipal Capital Improvement”, Act 209 of the Pennsylvania Municipalities Planning Code.

This Roadway Sufficiency Analysis (RSA) has analyzed existing, projected pass-through (future traffic volumes accounting for on-going regional growth but without specific development within the TSA) and projected total future traffic conditions (accounting for on-going regional growth and specific development along the study corridors per the adopted Land Use Assumption Report) at 30 study intersections within the Upper Merion TSA.

Future development generated traffic volume will add approximately 5,524 new vehicles during the PM peak travel hours. The anticipated impact to the roadways and intersections within the TSA will be appreciable. Improvements to 25 TSA study intersections are recommended to accommodate the anticipated total traffic volume conditions for the study horizon.

The Capital Improvement Plan (CIP) addresses the program of traffic related improvements, as selected by the Transportation Service Area Advisory Committee (TSAAC) from the Roadway Sufficiency Analysis (RSA), which Upper Merion Township will pursue over the next ten (10) years. As part of the CIP, project descriptions, project cost estimates, budgets, and funding sources have been defined to address existing, on-going regional growth (‘Pass-through’ traffic) and expected total future traffic, including expected development within the Transportation Service Area (TSA). Furthermore, traffic impact fee have been determined for the TSA from the analysis of anticipated development trip generation and improvement costs attributable to new development.

Traffic impact fees alone will not be sufficient to implement the entire plan (estimated to cost **\$98,535,904.00**). Implementation will require the resources of the Township as well as the participation and cooperation of the federal and state governments.

The remaining activity necessary to complete the Act 209 process and implement a traffic impact fee ordinance is the drafting/passage of the actual Transportation Impact Fee Ordinance. The Impact Fee Ordinance synthesizes the elements of all preceding phases, focusing on expected new development traffic impact, legally enabling the municipality to collect and use impact fees for transportation network improvements.

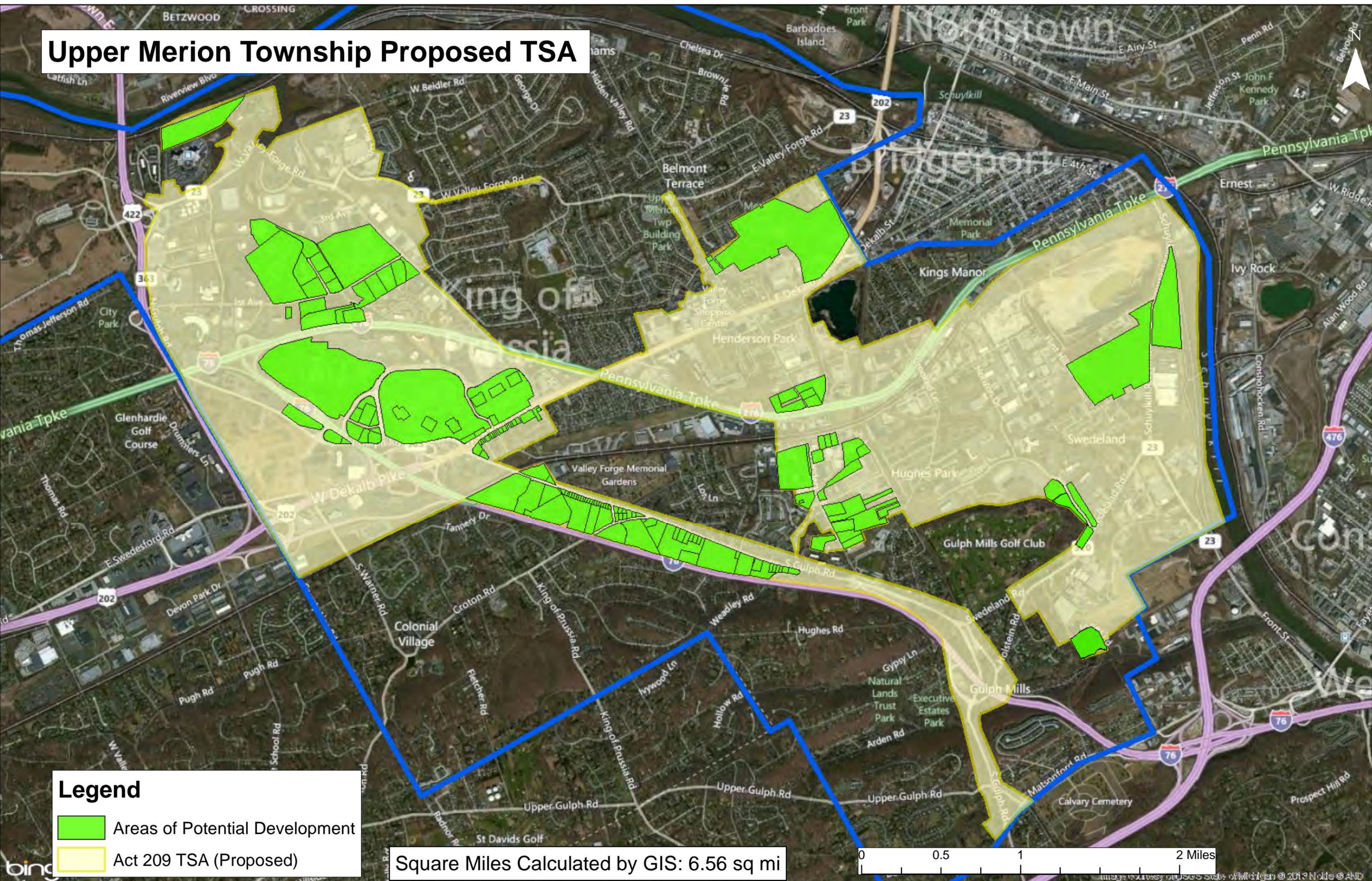
Continued surveillance of traffic and land use conditions should be regularly undertaken, over the life of the Plan, to monitor actual conditions. When needed, the plan should be revised to stay current. Vigilance and patience will also be necessary to effect the plan’s recommendations.



Appendix A

Transportation Service Area (TSA) Map

Upper Merion Township Proposed TSA



Legend

-  Areas of Potential Development
-  Act 209 TSA (Proposed)

Square Miles Calculated by GIS: 6.56 sq mi





Appendix B

Traffic Count Data



Appendix C

Capacity Analysis Report Existing Conditions



Appendix D

Capacity Analysis Report Existing Conditions with Improvements



Appendix E

Capacity Analysis Report Future 'Pass-Through' Conditions



Appendix F

Capacity Analysis Report Future 'Pass-Through' Conditions With Improvements



Appendix G

Trip Generation Analysis



Appendix H

Capacity Analysis Report Total Future Conditions



Appendix I

Capacity Analysis Report Total Future Conditions With Improvements

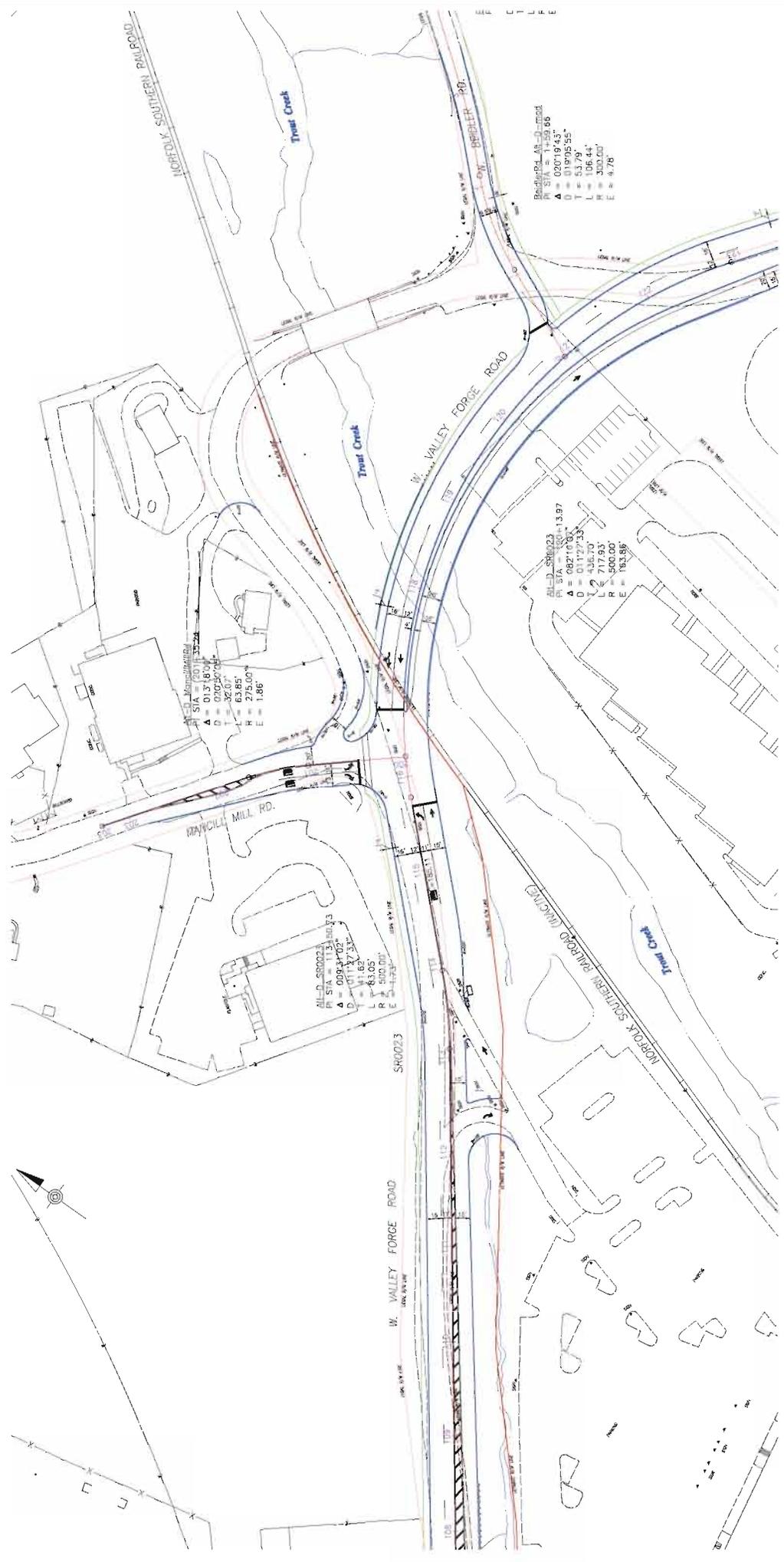


Appendix J

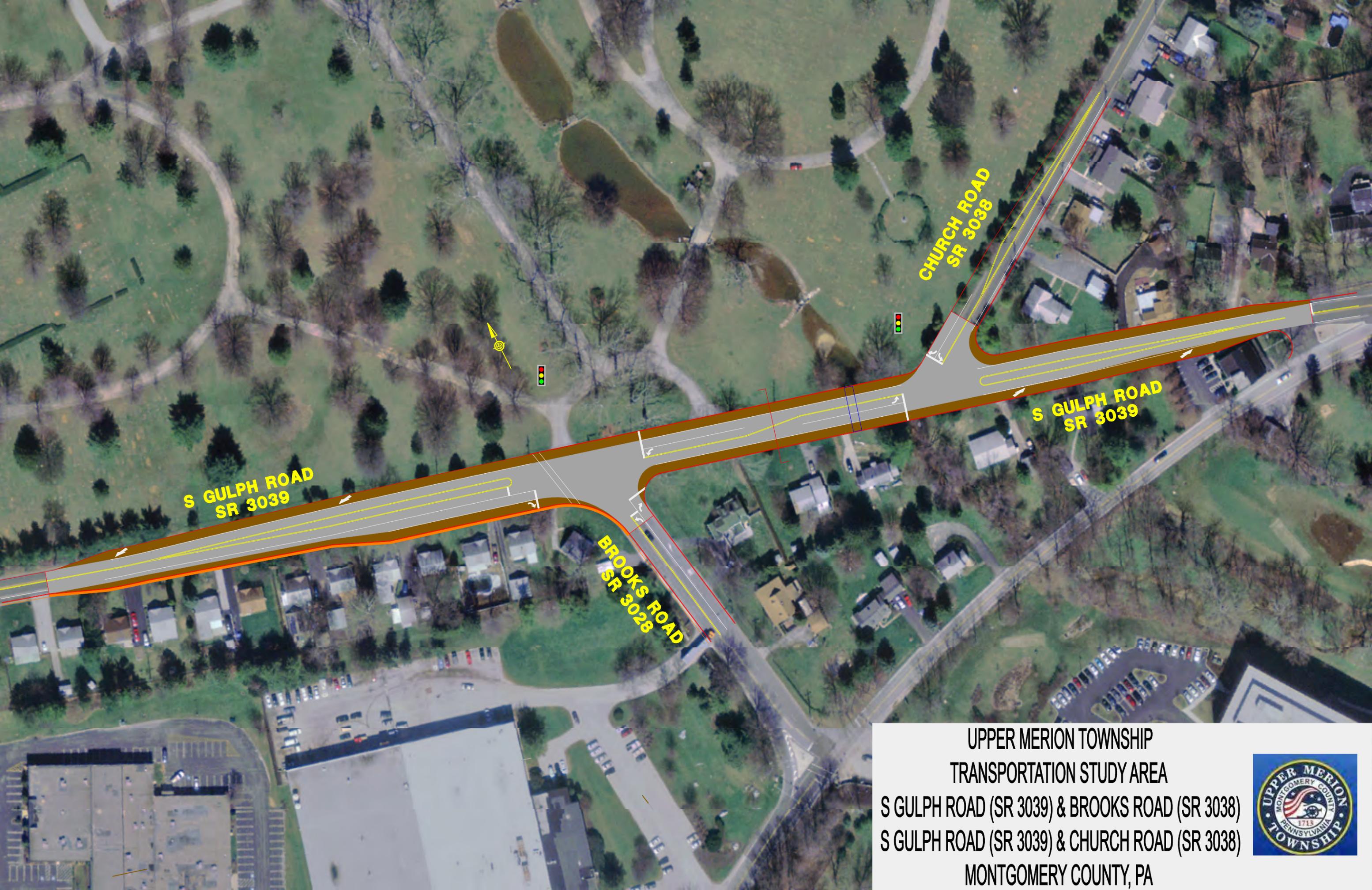
Recommended Improvement Concept Sketches Total Future Traffic Conditions

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
6-D	MONTGOMERY	0023	T-CB	1 OF 1
PROJECT NUMBER	UPPER MERKON TOWNSHIP		REVISES	
BY	DATE			

TROUT CREEK BRIDGE
OPTION D - MODIFIED



TRACED BY: _____



**S GULPH ROAD
SR 3039**

**CHURCH ROAD
SR 3038**

**S GULPH ROAD
SR 3039**

**BROOKS ROAD
SR 3028**

**UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
S GULPH ROAD (SR 3039) & BROOKS ROAD (SR 3038)
S GULPH ROAD (SR 3039) & CHURCH ROAD (SR 3038)
MONTGOMERY COUNTY, PA**





UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
S GULPH ROAD (SR 3039) &
S HENDERSON ROAD (SR 3029)
MONTGOMERY COUNTY, PA





CROOKED LANE
SR 3027

S GULPH ROAD
SR 3039

S GULPH ROAD
SR 3039

GYPSY LANE

UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
S GULPH ROAD (SR 3039) & CROOKED LANE (SR 3027)
S GULPH ROAD (SR 3039) & GYPSY LANE
MONTGOMERY COUNTY, PA





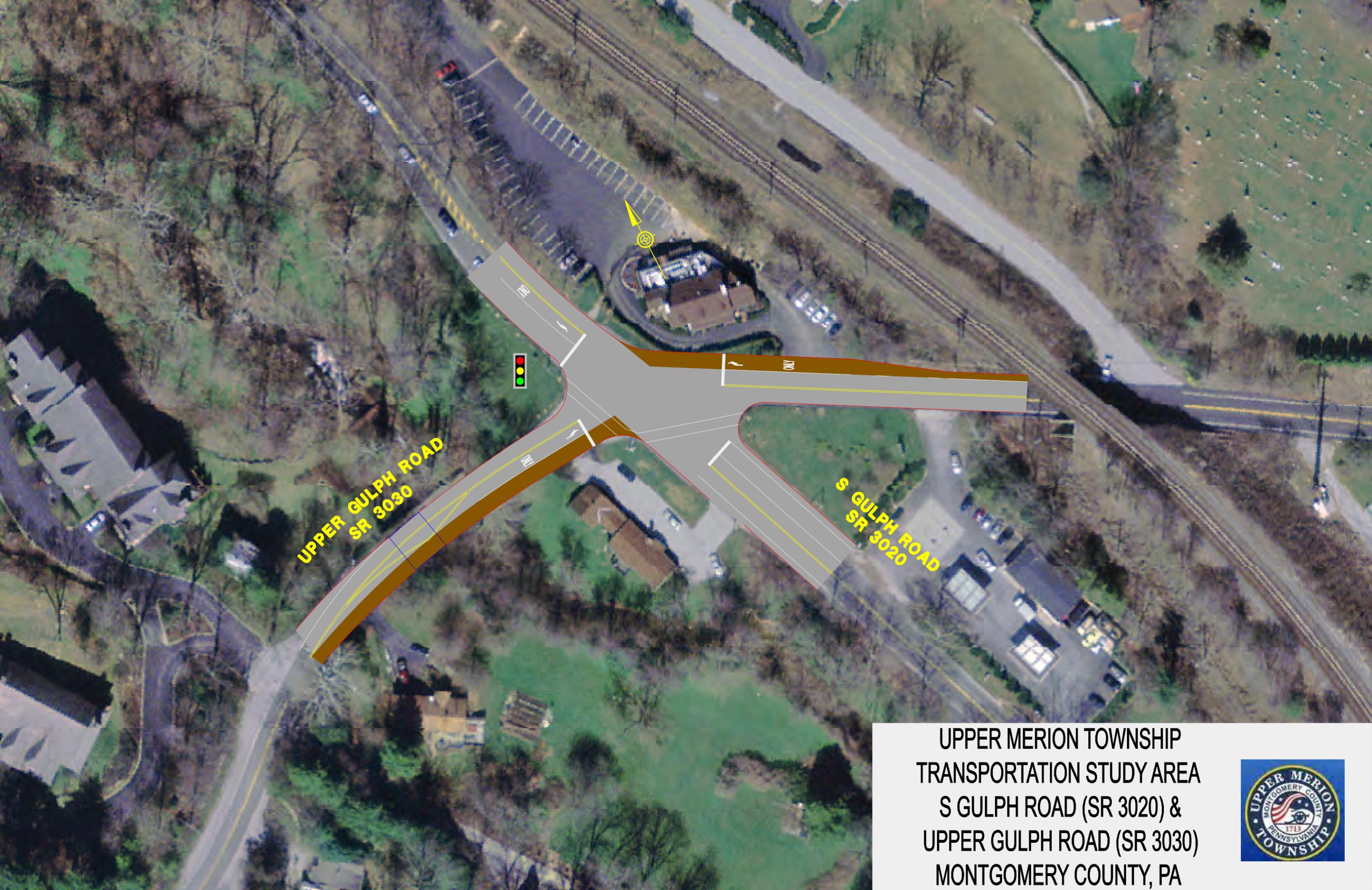
**SWEDELAND ROAD
SR 3041**

GYPSY LANE

**S GULPH ROAD
SR 3039**

**UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
S GULPH ROAD (SR 3039) &
SWEDELAND ROAD (SR 3041)
MONTGOMERY COUNTY, PA**



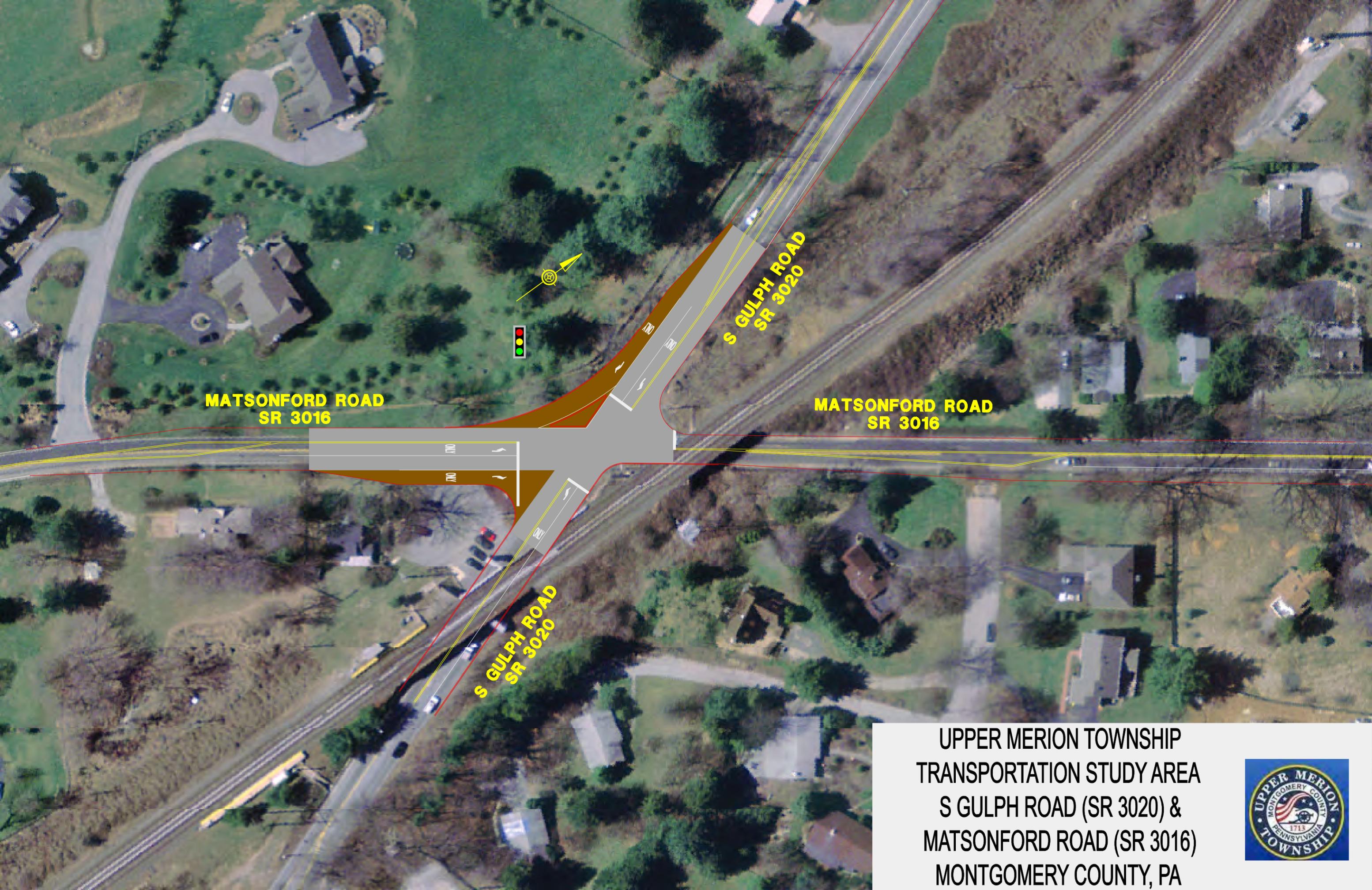


**UPPER GULPH ROAD
SR 3030**

**S GULPH ROAD
SR 3020**

**UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
S GULPH ROAD (SR 3020) &
UPPER GULPH ROAD (SR 3030)
MONTGOMERY COUNTY, PA**





**MATSONFORD ROAD
SR 3016**

**S GULPH ROAD
SR 3020**

**MATSONFORD ROAD
SR 3016**

**S GULPH ROAD
SR 3020**

UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
S GULPH ROAD (SR 3020) &
MATSONFORD ROAD (SR 3016)
MONTGOMERY COUNTY, PA





**SCHUYLKILL EXPRESSWAY
I-76**

**SCHUYLKILL EXPRESSWAY
I-76**

**S GULPH ROAD
SR 3039**

**I-76
ON-RAMP**

**TRINITY ROAD
SR 0320**

**UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
S GULPH ROAD (SR 3039) & I-76 EB ON-OFF RAMP/
TRINITY ROAD (SR 0320)
MONTGOMERY COUNTY, PA**





SHOEMAKER ROAD

**S GULPH ROAD
SR 3039**

**S GULPH ROAD
SR 3039**

WEADLEY ROAD

**UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
S GULPH ROAD (SR 3039) &
SHOEMAKER ROAD/WEADLEY ROAD
MONTGOMERY COUNTY, PA**





**CROOKED LANE
SR 3027**

CHURCH ROAD

**CROOKED LANE
SR 3027**

CHURCH ROAD



**UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
CHURCH ROAD &
CROOKED LANE (SR 3027)
MONTGOMERY COUNTY, PA**





CHURCH ROAD

CHURCH ROAD ONLY

HORIZON DRIVE ONLY

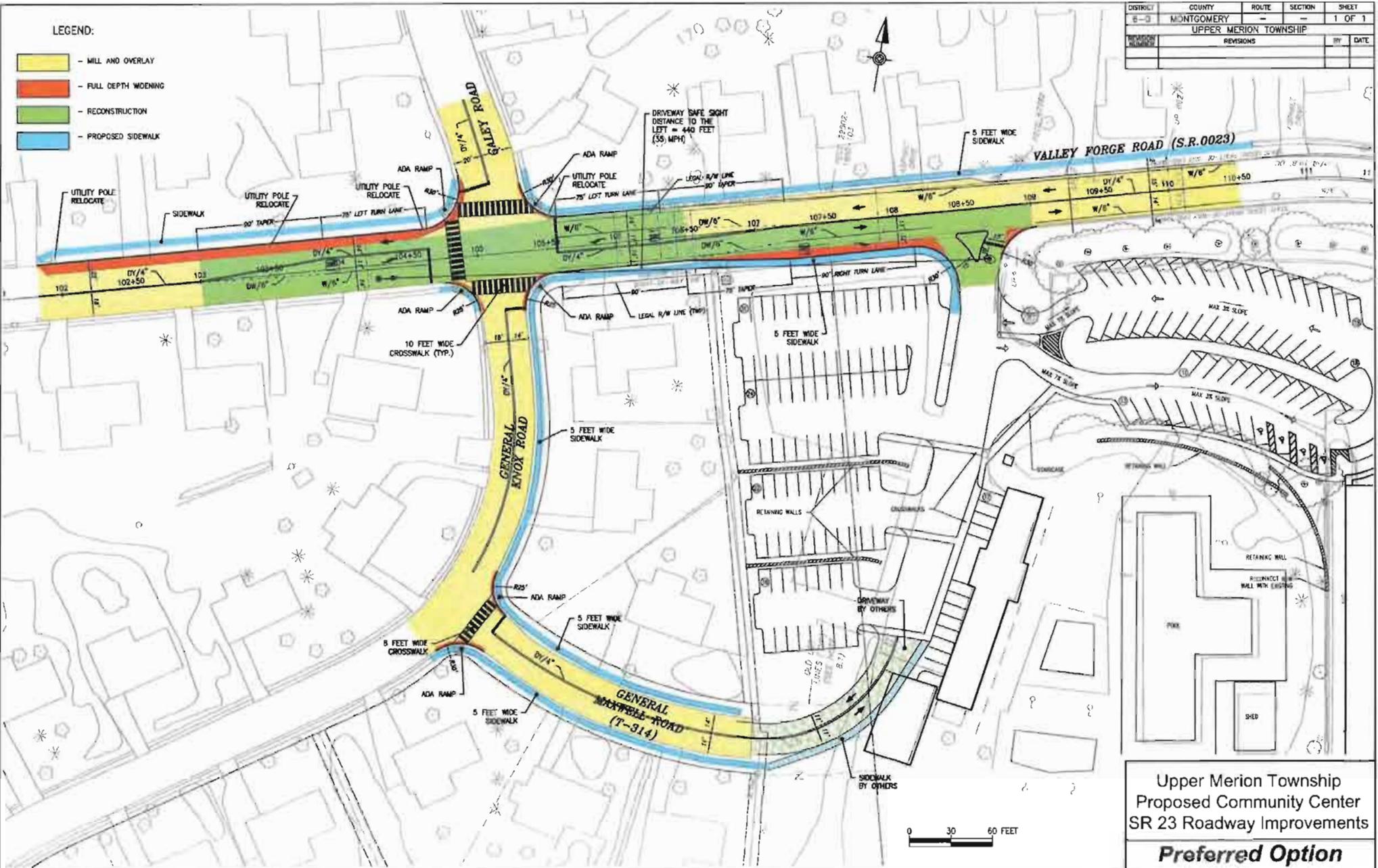


UPPER MERION TOWNSHIP
TRANSPORTATION STUDY AREA
CHURCH ROAD &
HORIZON DRIVE
MONTGOMERY COUNTY, PA

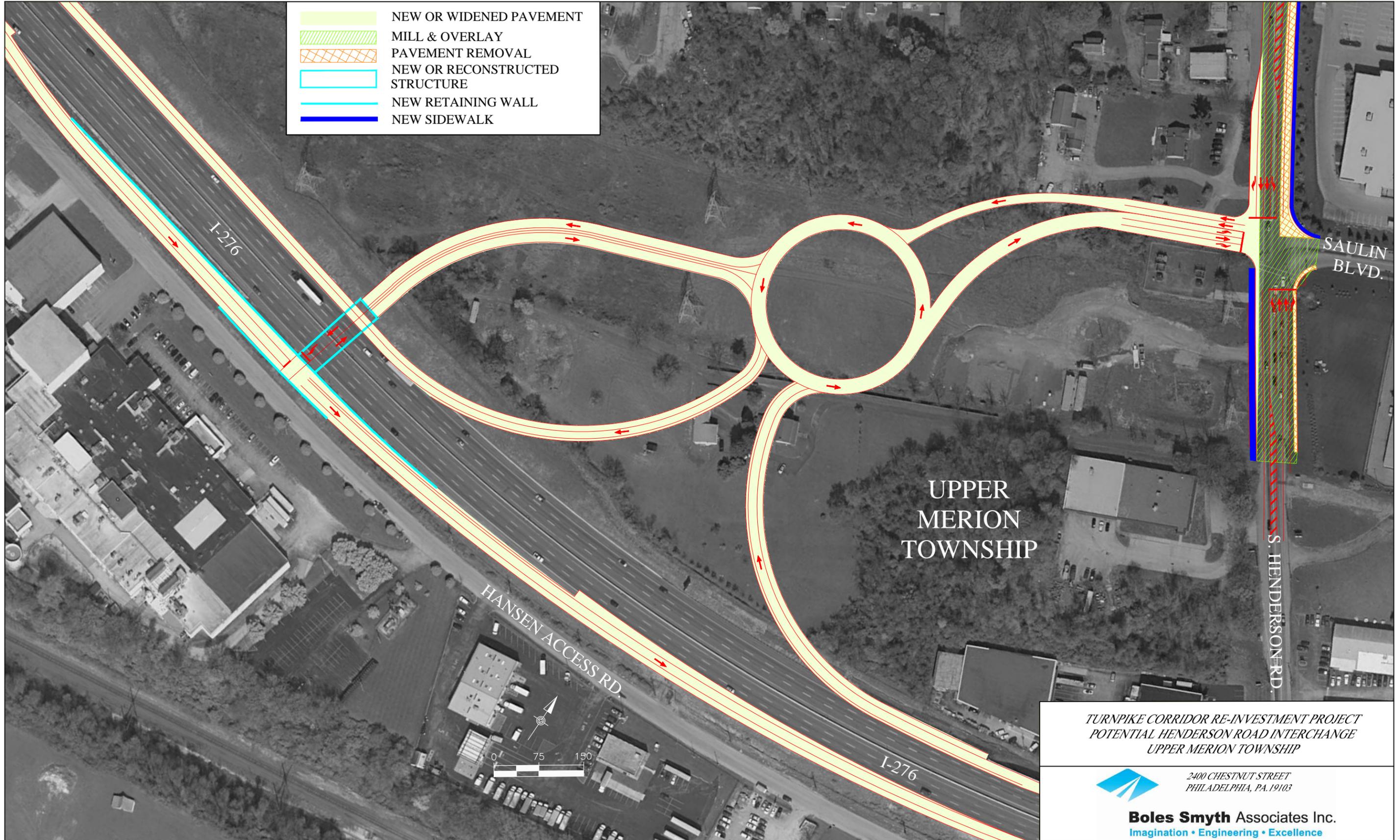


DISTRICT	COUNTY	ROUTE	SECTION	SHEET
6-3	MONTGOMERY	-	-	1 OF 1
UPPER MERION TOWNSHIP				
REVISIONS		BY	DATE	

- LEGEND:**
- MILL AND OVERLAY
 - FULL DEPTH WIDENING
 - RECONSTRUCTION
 - PROPOSED SIDEWALK



Upper Merion Township
 Proposed Community Center
 SR 23 Roadway Improvements
Preferred Option





Appendix K

Sample Transportation Impact Fee Ordinance