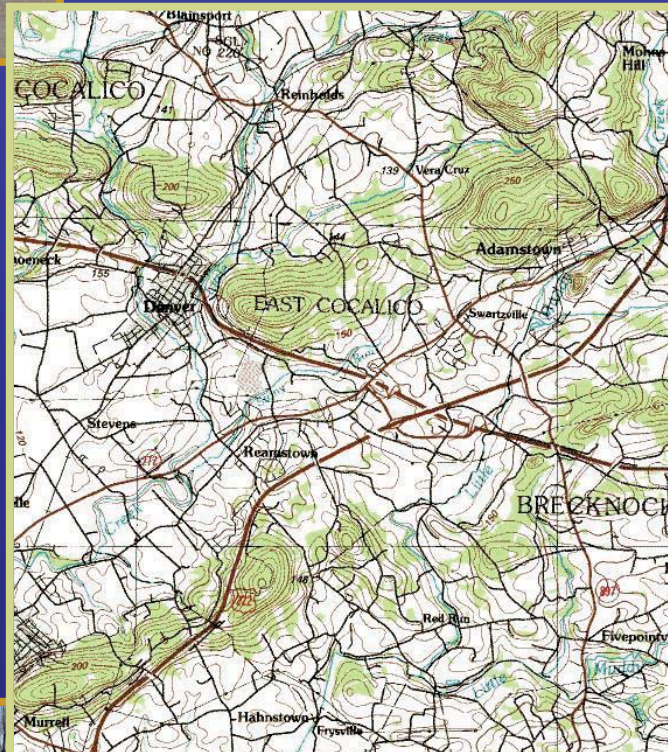


EAST COCALICO TOWNSHIP TRANSPORTATION IMPACT FEE PROGRAM

PART 2: ROADWAY SUFFICIENCY ANALYSIS



TRANSPORTATION IMPACT FEE PROGRAM

ROADWAY SUFFICIENCY ANALYSIS

LANCASTER COUNTY, PENNSYLVANIA

PREPARED FOR:
EAST COCALICO TOWNSHIP
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EAST COCALICO TOWNSHIP
TRANSPORTATION IMPACT FEE PROGRAM
ROADWAY SUFFICIENCY ANALYSIS

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EXECUTIVE SUMMARY

ROADWAY SUFFICIENCY ANALYSIS

Introduction

The following *Roadway Sufficiency Analysis* has been prepared in accordance with the requirements set forth in Pennsylvania Act 209 of 1990 on behalf of East Cocalico Township, Lancaster County, Pennsylvania. Under this Act, municipalities are able to assess impact fees to new development within each municipality. Impact fees are clearly defined in Act 209 as “a fee imposed by a municipality against new development to generate revenue for funding the cost of transportation capital improvements necessitated by and attributable to new development.” This *Roadway Sufficiency Analysis* is one part of the four-component Transportation Impact Fee Program. The purpose of the *Roadway Sufficiency Analysis* is to develop a program of improvements that safely and efficiently accommodate the anticipated traffic within the Township. Traffic data collection, field views of the roadway network, analysis of existing traffic conditions, traffic projections, analysis of future traffic conditions, and determination of necessary transportation improvements were all important tasks incorporated into this study. The results of the *Roadway Sufficiency Analysis* will serve as the basis for creating a comprehensive *Capital Improvements Plan*.

Transportation Service Areas

The Act 209 Legislation requires the establishment of Transportation Service Areas (TSA). These areas are limited to a maximum size of seven (7) square miles. Additionally, the impact fees collected by development in specific transportation service areas may only be applied to mitigations within that TSA. East Cocalico Township will be serviced by three (3) TSA less than seven (7) square miles in total developable land.

Traffic Data Collection

Traffic data was collected for twenty-nine (29) intersections and twenty-nine (29) roadway segments included within the study. Data including manual turning movement counts, automatic traffic recorder counts, roadway classifications, traffic control characteristics and geometrics of studied areas were collected by HRG personnel. This data served as the basis for determining existing deficiencies and developing a traffic demand model.

Preferred Level of Service

In accordance with Act 209 of 1990, East Cocalico Township has established a preferred level of service for all study intersections and study roadway segments. A preferred level of service “D” has been established for all study intersections, therefore any intersection that operates at a level of service “E” or “F” is considered to be deficient. A preferred level of service “C” has been established for all study roadway segments within the Township, therefore any segment that operates at a level of service “D”, “E” or “F” is considered to be deficient.

Analysis of Current Traffic Conditions

The study intersections and study roadway segments were analyzed to determine existing deficiencies. The following list summarizes the existing deficient intersections and roadway segments as well as the recommended mitigation:

- *Intersection 9 – Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902) – Interim mitigation could include prohibiting the southbound left turns, however plans for signalization are currently being prepared as part of a land development process.*
- *Intersection 13 – Route 272 & Hill Road (T-846) – Signalize.*
- *Intersection 14 – Route 272 & Muddy Creek Road (T-816) – Signalize.*
- *Intersection 18 – Route 272 & Pepperidge Farm Driveway – Prohibit westbound left turn movement (this mitigation is not required once 2034 Development mitigations are in place).*
- *Roadway Segment 26 – Route 272 south of Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes.*
- *Roadway Segment 27 – Route 272 north of Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes.*

Traffic Projections

Traffic volumes for 2034 were projected utilizing a computer based travel demand model. The model incorporated the existing roadway network, current traffic volumes and future land use recommendations included in the adopted *Land Use Assumptions Report* to develop future traffic volumes. These traffic projections were utilized in determining all future deficiencies and appropriate mitigations attributable to both pass-through and new development traffic.

2034 Deficiencies as a Result of Base Traffic

By utilizing the projected base traffic volumes, each of the twenty-nine (29) intersections and twenty-nine (29) roadway segments were re-studied to determine the deficiencies as a result of the projected base traffic. The following list details the 2034 anticipated deficient intersections and the appropriate mitigation as a result of background traffic:

- *Intersection 3 – Church Street (SR 1051) & Reamstown Road (T-700) - Construct a westbound thru, creating dual lanes (this mitigation is not required once 2034 Development mitigations are in place).*
- *Intersection 6 – Colonel George Howard Boulevard (SR 1040) & Lesher Road (T-949) – Channelize the southbound right turn lane.*
- *Intersection 7 – Colonel George Howard Boulevard (SR 1040) & Route 222 Southbound Ramps – Construct a cloverleaf interchange.*
- *Intersection 8 – Colonel George Howard Boulevard (SR 1040) & Route 222 Northbound Ramps – Construct a cloverleaf interchange.*
- *Intersection 10 – Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700) – Channelize the northbound right turn lane (this mitigation is not required once 2034 Development mitigations are in place).*
- *Intersection 11 – Colonel George Howard Boulevard (SR 1040) / Denver Road (T-901) & Route 272 – Construct a westbound left, creating dual lanes and channelize the westbound right turn lane.*
- *Intersection 15 – Route 272 & Route 897 – Construct an additional northbound left and westbound left, creating dual lanes; construct an eastbound right turn lane.*

- *Intersection 19 – Route 897 & Rosemont Drive (T-721) / Proposed Roadway – Should be signalized if a new roadway is constructed opposite Rosemont Drive.*
- *Intersection 25 – Stevens Road (SR 1045) & Wabash Road (T-669) / Indiantown Road (West Cocalico Township) – Signalize.*
- *Intersection 26 – Stevens Road (SR 1045) / Line Road (SR 1045) & Stevens Road (SR 1030) / South Main Street (West Cocalico Township) – Signalize.*
- *Roadway Segment 24 – Route 897 east of Route 272 – Construct additional thru lanes.*
- *Roadway Segment 29 – Church Street (SR 1051) between Napierville and Red Run Road (SR 1044) – Widen to 24' cartway with 4' shoulders.*

2034 Deficiencies as a Result of New Development Traffic

By utilizing the projected traffic volumes, each of the twenty-nine (29) intersections and twenty-nine (29) roadway segments were re-studied to determine the deficiencies as a result of the projected new development traffic. The following list details the 2034 anticipated deficient intersections and the appropriate mitigation as a result of development traffic:

- *Intersection 3 – Church Street (SR 1051) & Reamstown Road (T-700) – Signalize and no previous mitigations are required.*
- *Intersection 4 – Church Street (SR 1051) & Route 272 – Construct westbound and eastbound left turn lanes.*
- *Intersection 9 – Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902) – Construct dual southbound left turn lanes; construct a northbound left, a northbound right and a southbound right, each creating dual lanes; construct a westbound and eastbound thru, creating triple lanes.*
- *Intersection 10 – Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700) – Signalize and no previous mitigations are required.*
- *Intersection 11 – Colonel George Howard Boulevard (SR 1040) / Denver Road (T-901) & Route 272 – Prohibit left turns and thru movements exiting the eastbound approach. The Denver Road Connector to Route 272 is required prerequisite or concurrently. Construct a northbound right and a westbound right, creating dual lanes.*
- *Intersection 18 – Route 272 & Pepperidge Farm Driveway – Realign with Hill Road to provide signalization.*
- *Intersection 22 – Muddy Creek Road (SR 1059) & Trost Road (T-953) – Install all-way stop control and channelize the eastbound right turn lane.*
- *Intersection 23 – Muddy Creek Road (SR 1059) & Stone Hill Road (T-862) – Install all-way stop control.*
- *Roadway Segment 1 – Denver Road Bridge (T-901) over Stony Run – Upgrade to Community Collector. Widen to 24' cartway with 6' shoulders.*
- *Roadway Segment 5 – Route 897 west of Route 272 – Widen to 24' cartway with 6' shoulders.*
- *Roadway Segment 22 – Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes.*
- *Roadway Segment 26 – Route 272 south of Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes.*
- *Roadway Segment 27 – Route 272 north of Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes.*
- *Roadway Segment 28 – Church Street (SR 1051) between Route 272 and Red Run Road (SR 1044) – Widen to 22' cartway with 4' shoulders.*

Introduction

On December 19, 1990, Pennsylvania Act 209 was effectively signed into law. Under this Act, municipalities are able to assess impact fees to new development within the municipality. Impact fees are clearly defined in Act 209 as “a fee imposed by a municipality against new development to generate revenue for funding the cost of transportation capital improvements necessitated by and attributable to new development.” In order to institute the Act, a four component Transportation Impact Fee Program must be developed and implemented by the municipality. The Transportation Impact Fee Program consists of a *Land Use Assumptions Report*, a *Roadway Sufficiency Analysis*, a *Capital Improvements Plan* and an *Adoption Ordinance*. The process is directed by a Transportation Impact Fee Advisory Committee, which is established by the Board of Supervisors. East Cocalico Township Board of Supervisor’s made public its intention to develop an impact fee program and established the Impact Fee Advisory Committee by Resolution No. 2009-24 on October 15, 2009. The following *Roadway Sufficiency Analysis* has been prepared on behalf of East Cocalico Township, Lancaster County, Pennsylvania and has been completed in accordance with Pennsylvania Act 209 of 1990.

Purpose

The *Roadway Sufficiency Analysis* is an integral part of the Impact Fee Program. This evaluation was performed through a detailed study of specific critical roadways and intersections within East Cocalico Township. The objective of this analysis is to develop a program of improvements that safely and efficiently accommodate the anticipated future traffic. Traffic data collection, field views of the roadway network, analysis of existing traffic conditions, traffic projections, analysis of future traffic conditions, and determination of necessary transportation improvements were all important tasks incorporated into this report. The findings from this *Roadway Sufficiency Analysis* will serve as the basis for creating a comprehensive *Capital Improvements Plan*.

Transportation Service Areas

The Act 209 Legislation requires the establishment of Transportation Service Areas (TSA). These areas are limited to a maximum size of seven (7) square miles. Additionally, the impact fees collected by development in specific TSA may only be applied to mitigations within that TSA.

Since the total land available for development within East Cocalico Township is less than twenty-one (21) square miles, it was divided into three (3) TSA. **Map 1** illustrates the TSA.

Traffic Data Collection

To maximize the utility of the *Roadway Sufficiency Analysis*, twenty-nine (29) intersections and twenty-nine (29) roadway segments within East Cocalico Township were selected for traffic analysis. **Map 2** illustrates the roadway network including study intersections and study roadway segments. The segments and intersections were selected based on input from Township staff and the Advisory Committee regarding existing operating or safety deficiencies and potential for deficiencies as a result of anticipated development growth.

The twenty-nine (29) study intersections are as follows:

Please note: Intersections depicted in bold are signalized intersections.

- 1) Church Street (SR 1051) & Red Run Road (SR 1044)

EAST COCALICO TOWNSHIP

Transportation Impact Fee Program

Roadway Sufficiency Analysis

- 2) Church Street (SR 1051) & Park Street (T-851)
- 3) Church Street (SR 1051) & Reamstown Road (T-700)
- 4) **Church Street (SR 1051) & Route 272**
- 5) Church Street (SR 1051) & Stevens Road (SR 1030)
- 6) Colonel George Howard Boulevard (SR 1040) & Leshner Road (T-949)
- 7) **Colonel George Howard Boulevard (SR 1040) & Route 222 Southbound Ramps**
- 8) **Colonel George Howard Boulevard (SR 1040) & Route 222 Northbound Ramps**
- 9) Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902)
- 10) Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700)
- 11) **Colonel George Howard Boulevard (SR 1040) / Denver Road (T-901) & Route 272**
- 12) **Route 272 & Wabash Road (T-669)**
- 13) Route 272 & Hill Road (T-846)
- 14) Route 272 & Muddy Creek Road (T-816)
- 15) **Route 272 & Route 897**
- 16) Route 272 & Park Street (T-851) / Kurtz Road (T-849)
- 17) **Route 272 & Garden Spot Road (T-941)**
- 18) Route 272 & Pepperidge Farm Driveway
- 19) Route 897 & Rosemont Drive (T-721) / Proposed Roadway
- 20) Route 897 & Smokestown Road (SR 1034)
- 21) Route 897 & Adamstown Road (T-965)
- 22) Muddy Creek Road (SR 1059) & Trost Road (T-953)
- 23) Muddy Creek Road (SR 1059) & Stone Hill Road (T-862)
- 24) Muddy Creek Road (SR 1059) & Proposed Roadway
- 25) Stevens Road (SR 1045) & Wabash Road (T-669) / Indiantown Road (West Cocalico Township)
- 26) Stevens Road (SR 1045) / Line Road (SR 1045) & Stevens Road (SR 1030) / West Main Street (West Cocalico Township)
- 27) Reamstown Road (T-700) & Park Street (T-851)
- 28) Reamstown Road (T-700) & Lausch Road (T-963)
- 29) Kurtz Road (T-849) & Denver Road (T-901)

The twenty-nine (29) study roadway segments are as follows:

Please note: Segments depicted in bold are State owned and maintained roadway segments.

- 1) Denver Road Bridge (T-901)
- 2) Buzzard Road (T-970)
- 3) Indiandale Road (T-858)
- 4) Holtzman Road (T-856)
- 5) **Route 897**
- 6) **Reinholds Road (SR 1055)**
- 7) Pin Oak Drive (T-873)
- 8) Hickory Lane (T-842)
- 9) Miller Road (T-966)
- 10) **Reinholds Road (SR 1055)**
- 11) **Church Street (SR 1051) at Township boundary with Denver Borough**
- 12) Reamstown Road (T-700)
- 13) Glenwood Drive (T-670)
- 14) Ridge Avenue (T-937)

- 15) **Church Street (SR 1051) at Township boundary with Ephrata Township**
- 16) Napierville Road (T-674) west of Frysville Road (T-810)
- 17) Martin Road (T-957)
- 18) Landis Road (T-878)
- 19) Pieffer Hill Road (T-850)
- 20) Kramer Mill Road (T-876)
- 21) **Muddy Creek Road (SR 1059)**
- 22) Spur Road / Colonel George Howard Boulevard away from Turnpike
- 23) Spur Road / Colonel George Howard Boulevard towards Turnpike
- 24) **Route 897 east of Bill Drive (T-708)**
- 25) **Smokestown Road (SR 1034) south of Dogwood Drive (T-814)**
- 26) **Route 272 south of Church Street (SR 1051)**
- 27) **Route 272 north of Kurtz Road (T-849)**
- 28) **Church Street (SR 1051) west of Chestnut Hill Road (T-852)**
- 29) **Church Street (SR 1051) east of Red Run Road (SR 1044)**

Field data was collected from November 2009 to April 2010. Collection activities performed by HRG personnel included:

- Field view of all study roadway segments to verify the functional roadway classification, posted speed limits, lane configurations, and roadway geometries.
- Site review and documentation of existing geometric and operational traffic control characteristics for study intersections.
- Manual turning movement counts were conducted at twenty-nine (29) intersections during typical weekday AM (7-9) and PM (4-6) peak hour periods.
- Twenty-four hour, bi-directional automatic traffic recorder (ATR) counts were conducted at twenty-nine (29) critical locations for various roadway segments. Vehicle classifications were also conducted at these locations in order to determine truck traffic percentages necessary for the capacity analysis.

All supporting data collection information can be found detailed within the *Roadway Sufficiency Analysis Technical Appendix*. The *Technical Appendix* is a companion document, separately bound from this report. Please reference **Appendix A** for information pertaining to study intersections. **Appendix B** contains data collected for study roadway segments.

Existing Transportation Network

The transportation network of East Cocalico Township consists of three types of roadways: state roadways, county roadways and township roadways. Of the twenty-nine (29) roadway segments, over 40 percent are owned and maintained by The Pennsylvania Department of Transportation (PennDOT). The remaining roadway segments are owned and maintained by the Township.

The township roadways function as a system of collectors and local roads that provide access to the major state routes. The roadways are rural in nature with winding alignments and steep grades. The township roadways have pavement widths ranging from sixteen (16) feet to thirty-six (36) feet, minimal shoulders, open drainage ditches immediately off the pavement edge, and obstructions/hazards within the clear zone, limited sight distance, and fair to good pavement condition with limited isolated pavement failures (potholes). Township roads carry traffic volumes ranging from less than 300 to over 7,700

vehicles per day and are generally posted at 35 mph.

For the purposes of simplicity within this study, the directional orientation of study roadways was assumed according to **Table 1** below:

TABLE 1: ASSUMED DIRECTIONAL ORIENTATION OF STUDY ROADWAYS	
ROADWAY	ORIENTATION
Church Street (SR 1051)	Westbound/Eastbound
Red Run Road (SR 1044)	Northbound/Southbound
Park Street (T-851)	Northbound/Southbound
Reamstown Road (T-851)	Northbound/Southbound
Reading Road (SR 0272)	Northbound/Southbound
Stevens Road (SR 1030)	Northbound/Southbound
Colonel George Howard Blvd (SR 1040)	Westbound/Eastbound
Leshar Road	Northbound/Southbound
Route 222 Ramps	Northbound/Southbound
Pepperidge Farm Blvd (T-902)	Northbound/Southbound
Wabash Road (T-669)	Westbound/Eastbound
Hill Road (T-846)	Westbound/Eastbound
Muddy Creek Road (T-816)	Westbound/Eastbound
Swartzville Road (SR 0897)	Westbound/Eastbound
Kurtz Road (T-849)	Westbound/Eastbound*
Garden Spot Road (T-941)	Westbound/Eastbound
Rosemont Drive (T-721)	Northbound/Southbound
Smokestown Road (SR 1034)	Northbound/Southbound
Adamstown Road (T-965)	Northbound/Southbound
Trost Road (T-953)	Northbound/Southbound
Muddy Creek Road (SR 1059)	Westbound/Eastbound
Stone Hill Road (T-862)	Northbound/Southbound
Lausch Road (T-709)	Westbound/Eastbound
Denver Road (T-901)	Westbound/Eastbound*

* Denver Road is assumed Northbound/Southbound at its intersection with Kurtz Road.

Analysis of Existing Traffic Conditions

The analysis of the existing conditions included unsignalized intersection analysis, signalized intersection analysis, signal warrant analysis, and roadway segment analysis. A mitigation analysis was also conducted where specific areas did not meet the preferred level of service set forth by the Township.

Intersection Capacity Analysis

The acceptable methodology of analyzing both signalized and unsignalized intersections is to utilize the Highway Capacity Manual 2000 (HCM2000), published by the Transportation Research Board, and Synchro 6 Software. The methodology expresses the operations of an intersection in terms of Level of Service (LOS). This complex measure depends on factors including driver discomfort, fuel consumption,

frustration and lost travel time. For intersections, LOS is described in terms of average control delay in seconds per vehicle. **Table 2** details the ranges of average control delay for each LOS for an unsignalized intersection and their characteristics.

TABLE 2: UNSIGNALIZED INTERSECTIONS – LOS CRITERIA		
LEVEL OF SERVICE	AVERAGE CONTROL DELAY (SEC/VEH)	EXPECTED DELAY TO MINOR STREET TRAFFIC
A	< 10	Little or no delay
B	> 10 and ≤ 15	Short traffic delays
C	> 15 and ≤ 25	Average traffic delays
D	> 25 and ≤ 35	Long traffic delays
E	> 35 and ≤ 50	Very long delays
F	> 50	Volume exceeds capacity

Table 3 details the range of average control delay for each LOS for a signalized intersection and their characteristics.

TABLE 3: SIGNALIZED INTERSECTIONS – LOS CRITERIA		
LEVEL OF SERVICE	AVERAGE CONTROL DELAY (SEC/VEH)	EXPECTED DELAY TO MINOR STREET TRAFFIC
A	< 10	Very low delay. Occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all.
B	> 10 and ≤ 20	Occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A.
C	> 20 and ≤ 35	Higher delays result from fair progression and/or long cycle lengths. Individual cycle failures may begin to appear in this level. Significant numbers of vehicles stop although many still pass through the intersection without stopping.
D	> 35 and ≤ 55	Longer delays may result from unfavorable progression, long cycle lengths and/or high volume to capacity (v/c) ratios. Many vehicles stop and the proportion of vehicles not stopping declines.
E	> 55 and ≤ 80	Considered to be the limit of acceptable delay, these high delay values generally indicate poor progression, long cycle lengths and high v/c ratios. Individual cycle failures are frequent occurrences.
F	> 80	Considered to be unacceptable to most drivers, this condition often occurs with over-saturation. It may also occur at high v/c ratios below 1.00 with many individual cycle failures.

In accordance with Pennsylvania Act 209 of 1990, the Impact Fee Advisory Committee for East Cocalico Township has established a preferred LOS for the study intersections. LOS “D” has been established for both signalized and unsignalized study intersections. Therefore, any intersection operating at a LOS “E”

or “F” is considered deficient. **Table 4** summarizes the intersections that currently operate below the preferred LOS.

TABLE 4: EXISTING DEFICIENT INTERSECTIONS				
INTERSECTION			PEAK HOUR LOS	
TRANSPORTATION SERVICE AREA	NUMBER	NAME	AM PEAK	PM PEAK
Eastern/Southern	9	Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902)	D	E (40.3)
Eastern/Western	13	Route 272 & Hill Road (T-846)	D	F (56.0)
Eastern/Western	14	Route 272 & Muddy Creek Road (T-816)	F (82.9)	F (93.4)
Eastern/Western	18	Route 272 & Pepperidge Farm Driveway	D	F (63.2)

The *Technical Appendix* includes the analysis used to derive the LOS for each intersection. **Map 3** illustrates the locations of the existing deficient intersections.

Signal Warrant Analysis

A signal warrant evaluation was completed using the criteria set forth in PENNDOT Publication 201, Engineering and Traffic Studies for Warrant 3, Peak Hour Volume. This evaluation determines if signals are warranted at existing unsignalized intersections using future traffic volumes. Unsignalized intersections that are expected to experience peak hour capacity deficiencies during future traffic conditions were chosen for the signal warrant analysis. **Table 5** summarizes this evaluation.

TABLE 5: EXISTING SIGNAL WARRANT ANALYSIS				
INTERSECTION			WARRANTED?	
TRANSPORTATION SERVICE AREA	NUMBER	NAME	AM PEAK	PM PEAK
Eastern/Southern	9	Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902)	No	No
Eastern/Western	13	Route 272 & Hill Road (T-846)	Yes	Yes
Eastern/Western	14	Route 272 & Muddy Creek Road (T-816)	No	Yes
Eastern/Western	18	Route 272 & Pepperidge Farm Driveway	No	No

See the *Technical Appendix* for the detailed signal warrant analysis.

Roadway Segment Analysis

The Highway Capacity Manual 2000 (HCM2000) provides an analysis for two-lane rural highways and an analysis for urban streets but does not provide an analysis specifically for local roads. The two-lane rural highways analysis is limited to roadways that have average travel speeds greater than 40 miles per hour. The urban street analysis is intended to analyze arterial roadways with numerous signalized intersections. The local township roadways may not be appropriately analyzed using any of the HCM methodologies. With that said, a methodology was applied utilizing volume to capacity ratios. This method compares the volume of traffic to the theoretical maximum volume and assigns a LOS to the roadway segment based on that ratio.

The volume to capacity ratio is a measure of the density of the traffic stream. This is a surrogate measure for driver comfort and ease as well as the ability to maneuver within the traffic stream. As volume reaches full capacity, queuing delays and travel times will increase. **Table 6** details the range of the volume to capacity ratio for each LOS.

TABLE 6: ROADWAY SEGMENTS – LOS CRITERIA		
LEVEL OF SERVICE	INTERPRETATION	VOLUME TO CAPACITY RATIO
A	Low volumes; primarily free-flow operations. Density is low, and vehicles can freely maneuver within the traffic stream. Drivers can maintain their desired speeds with little or no delay.	0.00 - 0.15
B	Stable flow with potential for some restriction of operating speeds due to traffic conditions. Maneuvering is only slightly restricted. The stopped delays are not bothersome, and drives are not subject to appreciable tension.	0.16 - 0.27
C	Stable operations; however, the ability to maneuver is more restricted by the increase in traffic volumes. Relatively satisfactory operating speeds prevail, but adverse signal coordination or longer queues cause delays.	0.28 - 0.43
D	Approaching unstable traffic flow, where small increases in volume could cause substantial delays. Most drivers are restricted in their ability to maneuver and in their selection of travel speeds. Comfort and convenience are low but tolerable.	0.44 - 0.64
E	Operations characterized by significant approach delays and average travel speeds of one-half to one-third the free-flow speed. Flow is unstable and potential for stoppages of brief duration. High signal density, extensive queuing, or progression/timing is the typical causes of the delays.	0.65 – 1.00
F	Forced-flow operations with high approach delays at critical signalized intersections. Speeds are reduced substantially, and stoppages may occur for short or long periods of time because of downstream congestion.	>1.00

The Impact Fee Advisory Committee for East Cocalico Township has established a preferred LOS “C” for the study roadway segments. Therefore, any roadway segment operating at a LOS “D”, “E” or “F” is considered deficient. The results of the volume to capacity ratio based analysis are summarized in **Table 7**, on the following page.

TABLE 7: EXISTING DEFICIENT ROADWAY SEGMENTS				
TSA	SEGMENT NUMBER	ROADWAY SEGMENT NAME	V/C	LOS
Western/Southern	26	Route 272 south of Colonel George Howard Boulevard (SR 1040)	0.47	D
Western/Eastern	27	Route 272 north of Colonel George Howard Boulevard (SR 1040)	0.46	D
TSA – Transportation Service Area				

See the *Technical Appendix* for detailed calculations of the methodology used to derive the LOS for the study roadway segments. **Map 3** illustrates the locations of the existing deficient segments.

Mitigation of Existing Deficient Intersections and Deficient Roadway Segments

The existing deficiencies are the sole responsibility of the Township. The Township may not use any Impact Fee Program monies to fund the mitigation of currently deficient intersections or roadway segments. Pennsylvania Act 209 clearly states,

“Impact fees shall not be imposed or used for costs associated with any of the following: Upgrading, updating, expanding or replacing existing capital improvements to remedy deficiencies in service to existing development or fund deficiencies in existing municipal capital improvements resulting from a lack of adequate municipal funding over the years for maintenance or capital construction costs.”

The four (4) deficient intersections previously described were re-analyzed to develop possible mitigations that would result in acceptable levels of service. **Table 8**, on the following page, represents the existing mitigations required and ensuing LOS.

TABLE 8: MITIGATION ANALYSIS OF EXISTING DEFICIENT INTERSECTIONS					
INTERSECTION			MITIGATION DESCRIPTION	PEAK HOUR LOS	
TSA	NO.	NAME		AM	PM
Eastern/ Southern	9	Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902)	Interim mitigation could include prohibiting the southbound left turns, however plans for signalization are currently being prepared as part of a land development process.	B	B
Eastern/ Western	13	Route 272 & Hill Road (T-846)	Signalize.	B	B
Eastern/ Western	14	Route 272 & Muddy Creek Road (T-816)	Signalize.	B	B
Eastern/ Western	18	Route 272 & Pepperidge Farm Driveway	Prohibit westbound left turn.*	B	C
TSA – Transportation Service Area * – This mitigation is not required once 2034 Development mitigations are in place.					

Table 9 summarizes the results of the mitigation analysis for the two (2) existing deficient roadway segments in terms of LOS that can be attained.

TABLE 9: MITIGATION ANALYSIS OF EXISTING DEFICIENT ROADWAY SEGMENTS				
ROADWAY SEGMENT			MITIGATION DESCRIPTION	MITIGATED LOS
TSA	NO.	ROADWAY SEGMENT NAME		
Western/ Southern	26	Route 272 south of Colonel George Howard Boulevard (SR 1040)	Construct additional thru lanes.	B
Western/ Eastern	27	Route 272 north of Colonel George Howard Boulevard (SR 1040)	Construct additional thru lanes.	B
TSA – Transportation Service Area				

The *Technical Appendix* includes detailed capacity analysis for the mitigation of deficient intersections and deficient roadway segments. Please reference **Map 4** for an illustration of the mitigations.

Travel Modeling Process

Regional Travel Modeling

In the United States, regional travel modeling procedures were developed in the 1960s and 1970s in response to the 1962 Federal-Aid Highway Act. Through its Urban Planning Division, the Bureau of Public Roads (BPR) developed a system of computerized programs intended to standardize the modeling

of regional travel, according to the following four sequential steps:

- Trip Generation
- Trip Distribution
- Mode Split
- Traffic Assignment

Through the regional modeling process, various attributes of travel, the traveler, and the transportation system are used to predict the patterns and amount of travel that occur during each day and/or during certain “peak” hours of the day. Before the model is applied to forecast future year volumes, each step in the model is “calibrated” and “validated” to ensure that the model can accurately reproduce the travel patterns and volumes observed in recent years. Once the model has been adequately validated, attributes of the future year—population growth, shifts in travel patterns, new transportation facilities, etc.—are coded into the model to forecast future travel on the transportation system. **Table 10** details the advantages and disadvantages of regional models.

TABLE 10: REGIONAL MODEL ADVANTAGES & DISADVANTAGES	
ADVANTAGES	DISADVANTAGES
Accounts for shifts in travel that result from long-term growth/decline in population, employment, and regional land development.	Lacks sensitivity to local land use decisions and site design attributes (e.g. roadway access, mixed-uses, etc.)
Is able to simulate region-wide shifts in travel volume that result from new transportation facilities.	Frequently lacks the detail required to forecast travel on collector and local streets as well as intersections.
Distributes and assigns traffic according to sophisticated, and logical mathematical formulations, rather than engineering judgment.	Relies heavily on inflexible mathematical expressions, when travel decisions are not always made based on logical mathematical factors.

Small-Area and Site Impact Travel Modeling

Small-area travel models and/or site impact traffic studies are typically required in the Commonwealth of Pennsylvania when a parcel of land is developed or re-developed. Each municipality or metropolitan planning organization (MPO) may have its own rule of practice and set of requirements, which are often a part of their zoning or subdivision and land development ordinances. The study is local in nature, with the conclusions providing detailed analysis of the roadways and intersections where traffic from the new land development is likely to affect transportation operations. Frequently, specific transportation improvements are suggested in the study, and the developer may be required to pay for the improvements. Forecasted traffic volumes are commonly the summation of the following:

- Existing traffic volumes
- Future “background” traffic growth, that is attributed to regional growth
- Future “other development” traffic, that is generated by other, local land development that is approved or pending approval
- “Site development” traffic, which is generated by the new development itself

Table 11 details the advantages and disadvantages of small-area models and site impact traffic studies.

TABLE 11: SMALL-AREA & SITE IMPACT MODEL ADVANTAGES & DISADVANTAGES	
ADVANTAGES	DISADVANTAGES
Provides a quicker and easier method for obtaining short-term forecasts of future traffic volumes.	Ignores regional factors that are significant in accurately forecasting traffic patterns and volumes.
Is more flexible in the distribution and assignment of traffic by allowing engineering judgment and local knowledge to be factored into the process.	May allow too many subjective “adjustments” that lack sufficient justification.
Provides adequate detail to trace new trips through the transportation network and assess the impact of those new trips on traffic operations.	Frequently neglects the effect of regional transportation improvements on local trip making.

East Cocalico Township Travel Model Process

For the East Cocalico Township modeling process, it was important to maintain consistency and objectivity in forecasting future development trips and distributing those trips on the roadway network. For instance, since developers are likely to complete their traffic impact analysis using the peak hour trip generation rates published by the Institute of Transportation Engineers (ITE), it was important that the travel model use the same trip-making rates so that the transportation impact fee would have the same basis as the number of new trips generated by a new development project. Consistency is necessary in both developing and ultimately assessing the transportation impact fee.

Regarding the trip distribution step, objectivity is a key issue. Occasionally, site impact traffic studies may be questioned for their trip distribution methodology, since the distributions are frequently subjective, relying heavily on engineering judgment or local knowledge of trip making. To avoid this pitfall and provide more objective travel forecasts, the East Cocalico Township Travel Model was formulated to use the logical, mathematical trip distribution capabilities of the regional modeling approach—i.e., the gravity model.

With these issues in mind, the East Cocalico Township travel modeling process was formulated to take advantage of the strengths and avoid the weaknesses of both the regional and small-area modeling processes. According to model flow chart in **Figure 1**, the model begins with a regional, three-step¹ modeling process that estimates daily (24-hour) traffic volumes. Then, the trip distribution and traffic assignment information from the three-step model are used to inform the site impact model’s distribution and assignment of AM and PM peak hour trips, which are generated using ITE trip generation rates.

Both the three-step model and the site impact model prepared for East Cocalico Township are consistent with the estimation techniques outlined in the National Cooperative Highway Research Program (NCHRP) Report 365, Travel Estimation Techniques for Urban Planning, which is published by the Transportation Research Board. NCHRP Report 365 provides “a thorough review of the four-step travel

¹ The East Cocalico Township travel model does not include the “mode split” step, since the automobile overwhelmingly dominates all other motorized modes, and pedestrian facilities are not evaluated in this study.

demand process and transferable parameters that can be used in simple planning analyses.”²

Travel Modeling Software

The three-step model component of the East Cocalico Township travel model was developed using the PC-based TransCAD software, developed and maintained by Caliper Corporation. Information from the Lancaster County Planning Commission (LCPC), the local municipal planning organization, was used as a basis for developing the regional travel model.

To implement the site-impact portion of the East Cocalico Township travel model, the Transportation Service Areas (TSA) were divided into Traffic Analysis Zones. Using a proprietary spreadsheet model, information on specific developments proposed within the Township was used to add traffic to the roadway network. The *Land Use Assumptions* Report was used to determine how much development will occur and where it will occur.

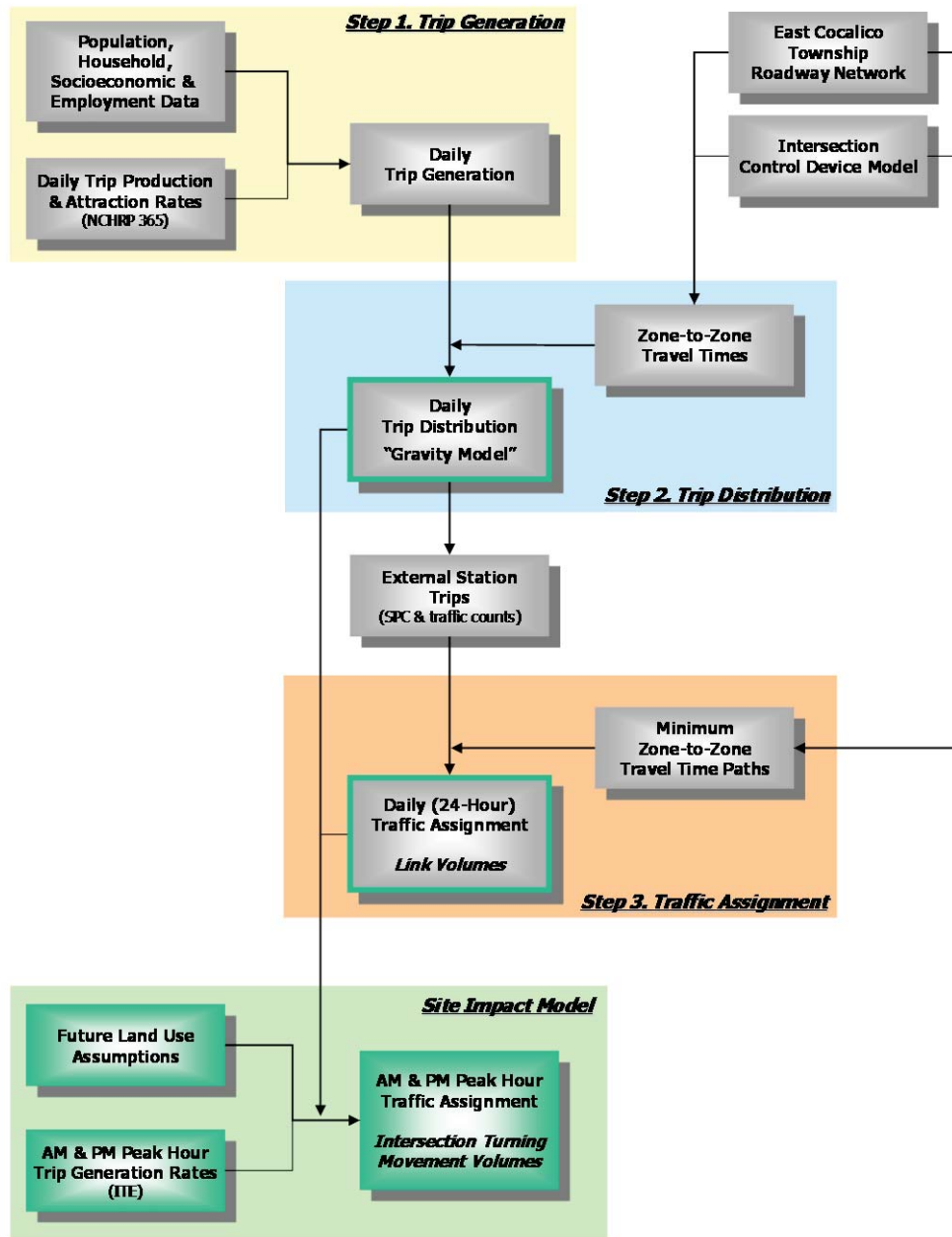
The traffic volumes developed in the site-impact portion of the East Cocalico Township travel model were combined with the regional travel to develop the total traffic on the roadways of East Cocalico Township. Using this modeling method, pass-through traffic was also determined. Pass-through traffic represents traffic that does not have an origin or destination within the respective TSA. This pass-through traffic is important as Act 209 only allows traffic generated by developments within the TSA to be included in the impact fee calculations.

2034 Future Traffic Projections

The results of the above modeling process are AM and PM peak hour traffic projections for each study intersection and roadway segment for the year 2034 with both base and development conditions. The future base traffic projections were used for the year 2034 analysis to determine future deficiencies and appropriate mitigation resulting from background growth and pass-through traffic. Once analysis and mitigation were completed using future base traffic projections, the future development traffic projections were analyzed to determine deficiencies and the resulting mitigations that impact fees can be collected toward.

² Travel Estimation Techniques for Urban Planning, National Cooperative Highway Research Report #365, Transportation Research Board, Washington, DC, 1998.

FIGURE 1: EAST COCALICO TOWNSHIP TRAVEL MODEL FLOW CHART



Analysis of Projected Future Base Traffic Conditions

A 25-year horizon for future traffic conditions in the Township was selected for study. The roadway network was analyzed to identify projected transportation deficiencies (i.e. intersection and roadway segment deficiencies) that can be expected to result from anticipated pass-through traffic. A pass-through trip, defined by Article V-A of the MPC, is a trip that has both an origin and destination outside of a respective Transportation Service Area. The identification of forecasted deficiencies resulting from pass-through trips is important since mitigation for the deficiencies resulting from pass-through traffic cannot be funded by impact fees. The analysis was conducted for projected 2034 base traffic conditions within East Cocalico Township using the same analysis methodologies described in the *Analysis of Existing Traffic Conditions*. Traffic volumes for the various analyses were developed by the computer based traffic assignment model discussed in the previous section.

Map 5 illustrates improvements that are anticipated to be in place as part of base traffic conditions.

Intersection Capacity Analysis

The analysis of the existing intersection geometrics utilizing 2034 future base traffic volumes was conducted using the same methodologies as the *Analysis of Existing Traffic Conditions Intersection Capacity*. The preferred level of service (LOS) for all East Cocalico Township intersections is LOS “D”. Therefore, any intersection operating at a LOS “E” or “F” is considered deficient. Intersections that were determined to be deficient are summarized in **Table 12**, on the following page. These intersections were thoroughly examined to determine appropriate mitigation.

TABLE 12: 2034 BASE DEFICIENT INTERSECTIONS

INTERSECTION			PEAK HOUR LOS	
TRANSPORTATION SERVICE AREA	NUMBER	NAME	AM PEAK	PM PEAK
Southern	3	Church Street (SR 1051) & Reamstown Road (T-700)	C	F (67.4)
Eastern/Southern	6	Colonel George Howard Boulevard (SR 1040) & Leshar Road (T-949)	F (52.7)	F (455.3)
Eastern/Southern	7	Colonel George Howard Boulevard (SR 1040) & Route 222 Southbound Ramps	F (207.5)	F (280.5)
Eastern/Southern	8	Colonel George Howard Boulevard (SR 1040) & Route 222 Northbound Ramps	F (249.9)	F (324.8)
Eastern/Southern	10	Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700)	E (39.3)	C
Eastern/Western/Southern	11	Colonel George Howard Boulevard (SR 1040) / Denver Road (T-901) & Route 272	F (265.1)	F (179.3)
Eastern/Western	15	Route 272 & Route 897	F (92.9)	F (210.7)
Eastern	19	Route 897 & Rosemont Drive (T-721) / Proposed Roadway	E (43.1)	F (216.1)
Western	25	Stevens Road (SR 1045) & Wabash Road (T-669) / Indiantown Road (West Cocalico Township)	F (Err)*	F (897.8)
Western	26	Stevens Road (SR 1045) / Line Road (SR 1045) & Stevens Road (SR 1030) / West Main Street (West Cocalico Township)	D	F (55.7)

* (Err) indicates delay greater than 999.9 seconds

The *Technical Appendix* contains the detailed HCS Capacity Analysis. **Map 6** illustrates the location of each deficient intersection.

Signal Warrant Analysis

A signal warrant evaluation was completed using the criteria set forth in PENNDOT Publication 201, Engineering and Traffic Studies for Warrant 3, Peak Hour Volume. This evaluation determines if signals are warranted at existing unsignalized intersections using future traffic volumes. Unsignalized intersections that are expected to experience peak hour capacity deficiencies during future traffic conditions were chosen for the signal warrant analysis. **Table 13**, on the following page, summarizes this evaluation.

TABLE 13: 2034 BASE SIGNAL WARRANT ANALYSIS				
INTERSECTION			WARRANTED?	
TRANSPORTATION SERVICE AREA	NUMBER	NAME	AM PEAK	PM PEAK
Southern	3	Church Street (SR 1051) & Reamstown Road (T-700)	No	Yes
Eastern/Southern	6	Colonel George Howard Boulevard (SR 1040) & Leshar Road (T-949)	Yes	Yes
Eastern/Southern	10	Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700)	Yes	Yes
Eastern	19	Route 897 & Rosemont Drive (T-721) / Proposed Roadway	No	Yes
Western	25	Stevens Road (SR 1045) & Wabash Road (T-669) / Indiantown Road (West Cocalico Township)	Yes	Yes
Western	26	Stevens Road (SR 1045) / Line Road (SR 1045) & Stevens Road (SR 1030) / West Main Street (West Cocalico Township)	No	Yes

See the *Technical Appendix* for the detailed signal warrant analysis.

Roadway Segment Analysis

As described in *Existing Roadway Segment Analysis*, a volume to capacity methodology was applied. This methodology was consistently applied to all roadways within the Township. The Impact Fee Advisory Committee for East Cocalico Township has established a preferred LOS of “C” for the study roadway segments. Therefore, any roadway segment operating at a LOS “D”, “E” or “F” is considered deficient. The results of the volume to capacity ratio based analysis are summarized in **Table 14**.

TABLE 14: 2034 BASE DEFICIENT ROADWAY SEGMENTS				
TSA	SEGMENT NUMBER	ROADWAY SEGMENT NAME	V/C	LOS
Eastern	24	Route 897 east of Route 272	0.51	D
Southern	29	Church Street (SR 1051) between Napierville and Red Run Road (SR 1044)	0.51	D
TSA – Transportation Service Area				

See the *Technical Appendix* for the detailed analysis of the study roadway segments. **Map 6** illustrates the location of each deficient roadway segment.

Mitigation of 2034 Base Traffic Deficient Intersections and Roadway Segments

The 2034 future base deficiencies are created by the increase in traffic related to background growth projected within the Township as well as the surrounding area. Thus, Impact Fees may not be used to

offset the cost attributed to mitigating these deficiencies. The following mitigation analysis will determine what type of mitigation will be required to ensure that a preferred LOS is met at each deficient area.

The ten (10) deficient intersections and two (2) deficient roadway segments defined as operating below the Township's preferred LOS were re-analyzed to determine a mitigation scenario that results in an acceptable LOS. The table on the following page, **Table 15**, details the mitigation required to achieve a preferred LOS at the deficient intersections.

TABLE 15: MITIGATION ANALYSIS OF 2034 BASE DEFICIENT INTERSECTIONS					
INTERSECTION			MITIGATION DESCRIPTION	PEAK HOUR LOS	
TSA	NO.	NAME		AM	PM
Southern	3	Church Street (SR 1051) & Reamstown Road (T-700)	Construct a westbound thru, creating dual lanes.*	B	D
Eastern/Southern	6	Colonel George Howard Boulevard (SR 1040) & Leshner Road (T-949)	Channelize the southbound right turn lane.	A	A
Eastern/Southern	7	Colonel George Howard Boulevard (SR 1040) & Route 222 Southbound Ramps	Construct a cloverleaf interchange.	C	D
Eastern/Southern	8	Colonel George Howard Boulevard (SR 1040) & Route 222 Northbound Ramps	Construct a cloverleaf interchange.	D	D
Eastern/Southern	10	Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700)	Channelize the northbound right turn lane.*	D	C
Eastern/Western/Southern	11	Colonel George Howard Boulevard (SR 1040) / Denver Road (T-901) & Route 272	Construct a westbound left, creating dual lanes and channelize the westbound right turn lane.	D	D
Eastern/Western	15	Route 272 & Route 897	Construct an additional northbound left and westbound left, creating dual lanes; construct an eastbound right turn lane.	D	D
Eastern	19	Route 897 & Rosemont Drive (T-721) / Proposed Roadway	Should be signalized if a new roadway is constructed opposite Rosemont Drive.	B	B
Western	25	Stevens Road (SR 1045) & Wabash Road (T-669) / Indiantown Road (West Cocalico Township)	Signalize.	B	B
Western	26	Stevens Road (SR 1045) / Line Road (SR 1045) & Stevens Road (SR 1030) / West Main Street (West Cocalico Township)	Signalize.	B	B
TSA – Transportation Service Area					
* – This mitigation is not required once 2034 Development mitigations are in place.					

Table 16, on the following page, summarizes the results of the mitigation analysis for future deficient roadway segments in terms of LOS that can be attained.

TABLE 16: MITIGATION ANALYSIS OF 2034 BASE DEFICIENT ROADWAY SEGMENTS				
ROADWAY SEGMENT			MITIGATION DESCRIPTION	MITIGATED LOS
TSA	NO.	ROADWAY SEGMENT NAME		
Eastern	24	Route 897 east of Route 272	Construct additional thru lanes.	B
Southern	29	Church Street (SR 1051) between Napierville and Red Run Road (SR 1044)	Widen to 24' cartway with 4' shoulders.	C
TSA – Transportation Service Area				

The *Technical Appendix* includes detailed capacity analysis for the mitigation of deficient intersections and deficient roadway segments. Please reference **Map 7** for an illustration of the mitigations.

Analysis of Projected Future Development Traffic Conditions

Just as with the future base traffic conditions, a 25-year horizon was selected for study. The roadway network was analyzed to identify projected transportation deficiencies (i.e. intersection and roadway segment deficiencies) that can be expected to result from anticipated site development traffic. The analysis was conducted for projected 2034 development traffic conditions within East Cocalico Township using the same analysis methodologies described in the *Analysis of Existing Traffic Conditions*. Traffic volumes for the various analyses were developed by the computer based traffic assignment model discussed in the previous section. Improvements identified to mitigate 2010 existing deficiencies as well as forecasted 2034 base deficiencies were assumed to be in place.

Intersection Capacity Analysis

The analysis of the existing intersection geometrics utilizing 2034 future traffic volumes was conducted using the same methodologies as the *Analysis of Existing Traffic Conditions Intersection Capacity*. The preferred level of service (LOS) for all East Cocalico Township intersections is LOS “D”. Therefore, any intersection operating at a LOS “E” or “F” is considered deficient. Intersections that were determined to be deficient are summarized in **Table 17**, on the following page. These intersections were thoroughly examined to determine appropriate mitigation.

TABLE 17: 2034 DEVELOPMENT DEFICIENT INTERSECTIONS

INTERSECTION			PEAK HOUR LOS	
TRANSPORTATION SERVICE AREA	NUMBER	NAME	AM PEAK	PM PEAK
Southern	3	Church Street (SR 1051) & Reamstown Road (T-700)	C	F (57.0)
Western/Southern	4	Church Street (SR 1051) & Route 272	E (70.0)	F (127.5)
Eastern/Southern	9	Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902)	F (181.1)	F (206.3)
Eastern/Southern	10	Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700)	F (61.2)	E (41.9)
Eastern/Western/Southern	11	Colonel George Howard Boulevard (SR 1040) / Denver Road (T-901) & Route 272	F (409.7)	F (397.8)
Eastern/Western	18	Route 272 & Pepperidge Farm Driveway	B	F (85.0)
Eastern/Southern	22	Muddy Creek Road (SR 1059) & Trost Road (T-953)	F (459.2)	F (399.0)
Eastern	23	Muddy Creek Road (SR 1059) & Stone Hill Road (T-862)	F (75.0)	E (41.0)

The *Technical Appendix* contains the detailed HCS Capacity Analysis. **Map 8** illustrates the location of each deficient intersection.

Signal Warrant Analysis

A signal warrant evaluation was completed using the criteria set forth in PENNDOT Publication 201, Engineering and Traffic Studies for Warrant 3, Peak Hour Volume. This evaluation determines if signals are warranted at existing unsignalized intersections using future traffic volumes. Unsignalized intersections that are expected to experience peak hour capacity deficiencies during future traffic conditions were chosen for the signal warrant analysis. **Table 18** summarizes this evaluation.

TABLE 18: 2034 DEVELOPMENT SIGNAL WARRANT ANALYSIS

INTERSECTION			WARRANTED?	
TRANSPORTATION SERVICE AREA	NUMBER	NAME	AM PEAK	PM PEAK
Southern	3	Church Street (SR 1051) & Reamstown Road (T-700)	Yes	Yes
Eastern/Southern	9	Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902)	Yes	Yes
Eastern/Southern	10	Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700)	Yes	Yes
Eastern/Western	18	Route 272 & Pepperidge Farm Driveway	No	Yes
Eastern/Southern	22	Muddy Creek Road (SR 1059) & Trost Road (T-953)	Yes	Yes
Eastern	23	Muddy Creek Road (SR 1059) & Stone Hill Road (T-862)	Yes	Yes

See the *Technical Appendix* for the detailed signal warrant analysis.

Roadway Segment Analysis

As described in *Existing Roadway Segment Analysis*, a volume to capacity methodology was applied. This methodology was consistently applied to all roadways within the Township. The Impact Fee Advisory Committee for East Cocalico Township has established a preferred LOS of “C” for the study roadway segments. Therefore, any roadway segment operating at a LOS “D”, “E” or “F” is considered deficient. The results of the volume to capacity ratio based analysis are summarized in **Table 19**, on the following page.

TABLE 19: 2034 DEVELOPMENT DEFICIENT ROADWAY SEGMENTS

TSA	SEGMENT NUMBER	ROADWAY SEGMENT NAME	V/C	LOS
Western	1	Denver Road Bridge (T-901) over Stony Run	0.81	E
Western/ Eastern	5	Route 897 west of Route 272	0.46	D
Eastern/ Southern	22	Colonel George Howard Boulevard (SR 1040)	0.45	D
Western/ Southern	26	Route 272 south of Colonel George Howard Boulevard (SR 1040)	0.93	E
Western/ Eastern	27	Route 272 north of Colonel George Howard Boulevard (SR 1040)	0.96	E
Southern	28	Church Street (SR 1051) between Route 272 and Red Run Road (SR 1044)	0.44	D
TSA – Transportation Service Area				

See the *Technical Appendix* for the detailed analysis of the study roadway segments. **Map 8** illustrates the location of each deficient roadway segment.

Mitigation of 2034 New Development Deficient Intersections and Roadway Segments

The 2034 future development deficiencies are created by the increase in traffic directly related to growth projected within the Township. Thus, Impact Fees may offset the cost attributed to mitigating these deficiencies. The following mitigation analysis will determine what type of mitigation will be required to ensure that a preferred LOS is met at each deficient area. The resulting list of mitigations will be instrumental in developing the *Capital Improvement Plan* for East Cocalico Township.

The eight (8) deficient intersections and six (6) deficient roadway segments, defined as operating below the Township's preferred LOS, were re-analyzed to determine a mitigation scenario that results in an acceptable LOS.

Table 20, on the following page, summarizes the results of the mitigation analysis for 2034 deficient intersections in terms of LOS that can be expected.

TABLE 20: MITIGATION ANALYSIS OF 2034 DEVELOPMENT DEFICIENT INTERSECTIONS					
INTERSECTION			MITIGATION DESCRIPTION	PEAK HOUR LOS	
TSA	NO.	NAME		AM	PM
Southern	3	Church Street (SR 1051) & Reamstown Road (T-700)	Signalize the intersection and no previous mitigations are required.	A	A
Western/Southern	4	Church Street (SR 1051) & Route 272	Construct westbound and eastbound left turn lanes.	D	D
Eastern/Southern	9	Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902)	Construct dual southbound left turn lanes; construct a northbound left, a northbound right and a southbound right, each creating dual lanes; construct a westbound and eastbound thru, creating triple lanes.	D	D
Eastern/Southern	10	Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700)	Signalize the intersection and no previous mitigations are required.	D	C
Eastern/Western/Southern	11	Colonel George Howard Boulevard (SR 1040) / Denver Road (T-901) & Route 272	Prohibit left turns and thru movements exiting the eastbound approach. The Denver Road Connector to Route 272 is required prerequisite or concurrently. Construct a northbound right and a westbound right, creating dual lanes.	D	D
Eastern/Western	18	Route 272 & Pepperidge Farm Driveway	Realign with Hill Road to provide signalization.	D	D
Eastern/Southern	22	Muddy Creek Road (SR 1059) & Trost Road (T-953)	Install all-way stop control and channelize the eastbound right turn lane.	C	D
Eastern	23	Muddy Creek Road (SR 1059) & Stone Hill Road (T-862)	Install all-way stop control.	C	D
TSA – Transportation Service Area					

Table 21, on the following page, summarizes the results of the mitigation analysis for future deficient roadway segments in terms of LOS that can be attained.

TABLE 21: MITIGATION ANALYSIS OF 2034 DEVELOPMENT DEFICIENT ROADWAY SEGMENTS				
ROADWAY SEGMENT			MITIGATION DESCRIPTION	MITIGATED LOS
TSA	NO.	ROADWAY SEGMENT NAME		
Western	1	Denver Road Bridge (T-901) over Stony Run	Upgrade to Community Collector. Widen to 24' cartway with 6' shoulders.	C
Western/ Eastern	5	Route 897 west of Route 272	Widen to 24' cartway with 6' shoulders.	C
Eastern/ Southern	22	Colonel George Howard Boulevard (SR 1040)	Construct additional thru lanes between Route 272 and the first Route 222 Ramp.	C
Western/ Southern	26	Route 272 south of Colonel George Howard Boulevard (SR 1040)	Construct additional thru lanes.	C
Western/ Eastern	27	Route 272 north of Colonel George Howard Boulevard (SR 1040)	Construct additional thru lanes.	C
Southern	28	Church Street (SR 1051) between Route 272 and Red Run Road (SR 1044)	Widen to 22' cartway with 4' shoulders.	C
TSA – Transportation Service Area				

The *Technical Appendix* includes detailed capacity analysis for the mitigation of deficient intersections and deficient roadway segments. Please reference **Map 9** for an illustration of the mitigations.

Conclusions

The objective of the *Roadway Sufficiency Analysis* is to develop a program of candidate transportation improvements that safely and efficiently accommodate the anticipated traffic within East Cocalico Township. The analysis entailed establishment of the existing traffic volumes and existing operations of study intersections and study roadway segments. A preferred level of service (LOS) was established which became the standard for which all study roadway segments and intersections were compared. The preferred LOS for all East Cocalico Township intersections and roadway segments is LOS “C”.

Existing Deficiencies & Mitigation

Of the twenty-nine (29) intersections and twenty-nine (29) roadway segments studied, four (4) intersections and two (2) roadway segments were determined to be deficient under their existing condition. The following list details the existing deficient intersections and the recommended mitigation:

- *Intersection 9 – Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902) – Interim mitigation could include prohibiting the southbound left turns, however plans for signalization are currently being prepared as part of a land development process.*
- *Intersection 13 – Route 272 & Hill Road (T-846) – Signalize.*
- *Intersection 14 – Route 272 & Muddy Creek Road (T-816) – Signalize.*
- *Intersection 18 – Route 272 & Pepperidge Farm Driveway – Prohibit westbound left turn movement (this mitigation is not required once 2034 Development mitigations are in place).*

The following list details the existing deficient roadway segments and the appropriate mitigation:

- *Roadway Segment 26 – Route 272 south of Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes.*
- *Roadway Segment 27 – Route 272 north of Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes.*

Act 209 of 1990 strictly forbids the use of Impact Fee monies to fund the mitigation of existing deficiencies.

Traffic Modeling

Traffic volumes for 2034 were projected utilizing a computer based travel demand model. The model incorporated the existing roadway network, existing traffic volumes and future land use recommendations included in the adopted *Land Use Assumptions* Report to develop separate future traffic volumes for both the base and development scenarios. These traffic projections were utilized in determining all future deficiencies and appropriate mitigations.

2034 Deficiencies & Mitigations as a Result of Background Traffic

By utilizing the projected base traffic volumes, each of the twenty-nine (29) intersections and twenty-nine (29) roadway segments were re-studied to determine the deficiencies as a result of the projected base traffic. The following list details the 2034 anticipated deficient intersections and the appropriate mitigation as a result of background traffic:

- *Intersection 3 – Church Street (SR 1051) & Reamstown Road (T-700) - Construct a westbound thru, creating dual lanes (this mitigation is not required once 2034 Development mitigations are in place).*
- *Intersection 6 – Colonel George Howard Boulevard (SR 1040) & Leshner Road (T-949) – Channelize the southbound right turn lane.*
- *Intersection 7 – Colonel George Howard Boulevard (SR 1040) & Route 222 Southbound Ramps – Construct a cloverleaf interchange.*
- *Intersection 8 – Colonel George Howard Boulevard (SR 1040) & Route 222 Northbound Ramps – Construct a cloverleaf interchange.*
- *Intersection 10 – Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700) – Channelize the northbound right turn lane (this mitigation is not required once 2034 Development mitigations are in place).*
- *Intersection 11 – Colonel George Howard Boulevard (SR 1040) / Denver Road (T-901) & Route 272 – Construct a westbound left, creating dual lanes and channelize the westbound right turn lane.*
- *Intersection 15 – Route 272 & Route 897 – Construct an additional northbound left and westbound left, creating dual lanes; construct an eastbound right turn lane.*
- *Intersection 19 – Route 897 & Rosemont Drive (T-721) / Proposed Roadway – Should be signalized if a new roadway is constructed opposite Rosemont Drive.*
- *Intersection 25 – Stevens Road (SR 1045) & Wabash Road (T-669) / Indiantown Road (West Cocalico Township) – Signalize.*

- *Intersection 26 – Stevens Road (SR 1045) / Line Road (SR 1045) & Stevens Road (SR 1030) / West Main Street (West Cocalico Township) – Signalize.*

The following list details the 2034 anticipated deficient roadway segments and the appropriate mitigation as a result of background traffic:

- *Roadway Segment 24 – Route 897 east of Route 272 – Construct additional thru lanes.*
- *Roadway Segment 29 – Church Street (SR 1051) between Napierville and Red Run Road (SR 1044) – Widen to 24' cartway with 4' shoulders.*

Act 209 of 1990 strictly forbids the use of Impact Fee monies to fund the mitigation of future deficiencies resulting from pass-through traffic.

2034 Deficiencies & Mitigations as a Result of New Development Traffic

By utilizing the projected development traffic volumes, each of the twenty-nine (29) intersections and twenty-nine (29) roadway segments were re-studied to determine the deficiencies as a result of the projected growth within the Township. The following list details the 2034 anticipated deficient intersections and the appropriate mitigation as a result of development traffic:

- *Intersection 3 – Church Street (SR 1051) & Reamstown Road (T-700) – Signalize and no previous mitigations are required.*
- *Intersection 4 – Church Street (SR 1051) & Route 272 – Construct westbound and eastbound left turn lanes.*
- *Intersection 9 – Colonel George Howard Boulevard (SR 1040) & Pepperidge Farm Boulevard (T-902) – Construct dual southbound left turn lanes; construct a northbound left, a northbound right and a southbound right, each creating dual lanes; construct a westbound and eastbound thru, creating triple lanes.*
- *Intersection 10 – Colonel George Howard Boulevard (SR 1040) & Reamstown Road (T-700) – Signalize and no previous mitigations are required.*
- *Intersection 11 – Colonel George Howard Boulevard (SR 1040) / Denver Road (T-901) & Route 272 – Prohibit left turns and thru movements exiting the eastbound approach. The Denver Road Connector to Route 272 is required prerequisite or concurrently. Construct a northbound right and a westbound right, creating dual lanes.*
- *Intersection 18 – Route 272 & Pepperidge Farm Driveway – Realign with Hill Road to provide signalization.*
- *Intersection 22 – Muddy Creek Road (SR 1059) & Trost Road (T-953) – Install all-way stop control and channelize the eastbound right turn lane.*
- *Intersection 23 – Muddy Creek Road (SR 1059) & Stone Hill Road (T-862) – Install all-way stop control.*

The following list details the 2034 anticipated deficient roadway segments and the appropriate mitigation as a result of development traffic:

- *Roadway Segment 1 – Denver Road Bridge (T-901) over Stony Run – Upgrade to Community Collector. Widen to 24' cartway with 6' shoulders.*
- *Roadway Segment 5 – Route 897 west of Route 272 – Widen to 24' cartway with 6' shoulders.*

EAST COCALICO TOWNSHIP

Transportation Impact Fee Program

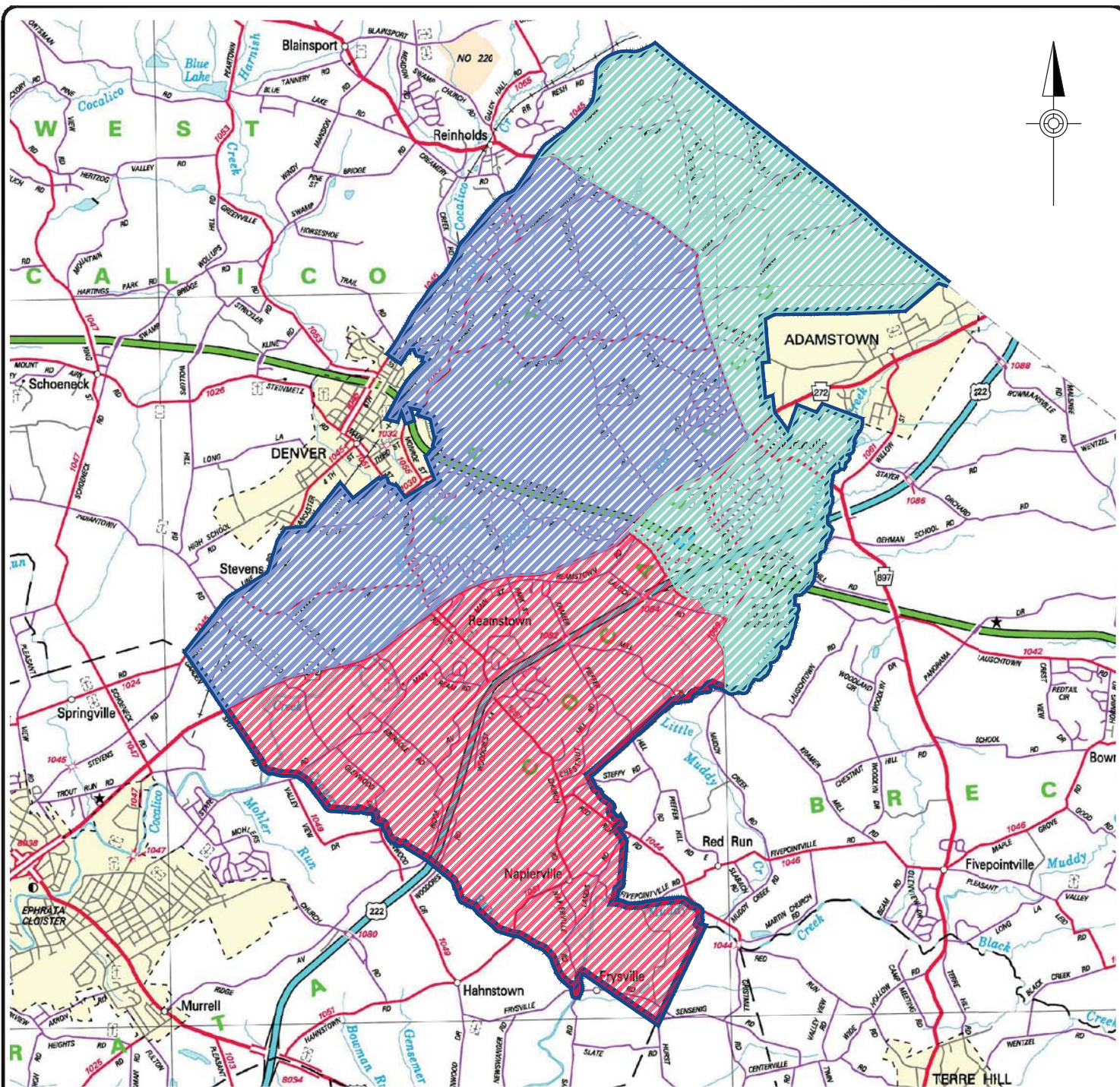
Roadway Sufficiency Analysis

- *Roadway Segment 22 – Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes between Route 272 and the first Route 222 Ramp.*
- *Roadway Segment 26 – Route 272 south of Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes.*
- *Roadway Segment 27 – Route 272 north of Colonel George Howard Boulevard (SR 1040) – Construct additional thru lanes.*
- *Roadway Segment 28 – Church Street (SR 1051) between Route 272 and Red Run Road (SR 1044) – Widen to 22' cartway with 4' shoulders.*

Additional Mitigations

Although the aforementioned mitigations improve the transportation network within East Cocalico Township, the mitigations improve individual intersections or roadway segments. For complete mitigation of the Township's transportation network, an access management plan and a traffic corridor management plan should be developed. These plans will determine optimal placement of traffic signals and driveways, potential frontage roadways, medians, signal coordination, etc.

MAPS



LEGEND

- EASTERN TSA
- WESTERN TSA
- SOUTHERN TSA



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TRANSPORTATION SERVICE AREAS FOR EAST COCALICO TOWNSHIP CIP

EAST COCALICO TOWNSHIP LANCASTER COUNTY PENNSYLVANIA

PROJ. MGR. - MJR
DESIGN - BDE
CADD - BDE
CHECKED - MJR
SCALE - NTS
DATE - NOV. 2010

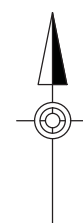
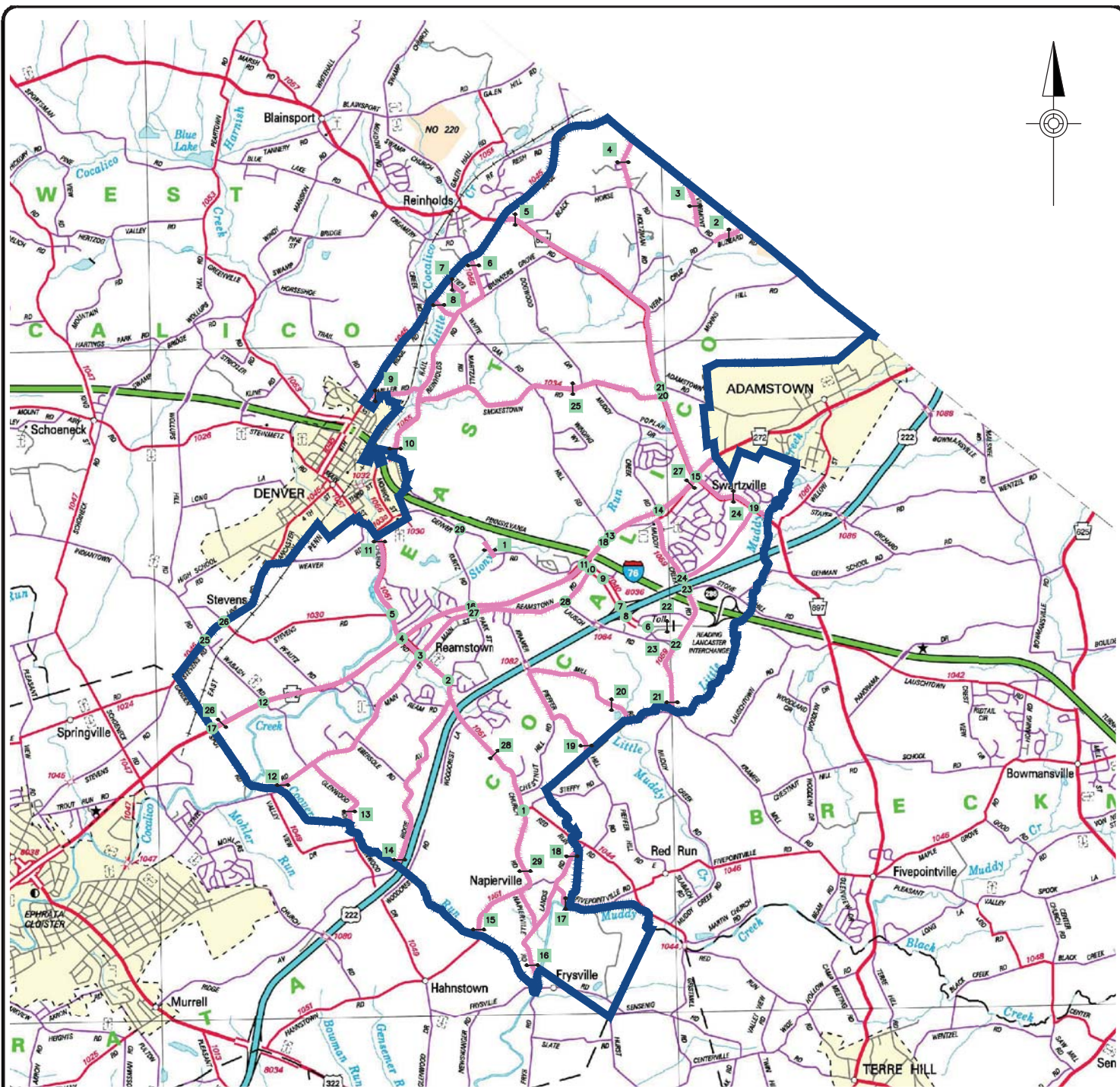
DRAWING NO.

1

SHEET NO.

1 OF 9

PROJECT R000866.0431



LEGEND

- STUDY INTERSECTION
- ⊗ INTERSECTION / ATR REFERENCE NUMBER
- STUDY SEGMENTS
- ATR LOCATION



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STUDY INTERSECTIONS & SEGMENTS FOR EAST COCALICO TOWNSHIP CIP

EAST COCALICO TOWNSHIP LANCASTER COUNTY PENNSYLVANIA

PROJ. MGR. - MJR
DESIGN - BDE
CADD - BDE
CHECKED - MJR
SCALE - NTS
DATE - NOV. 2009

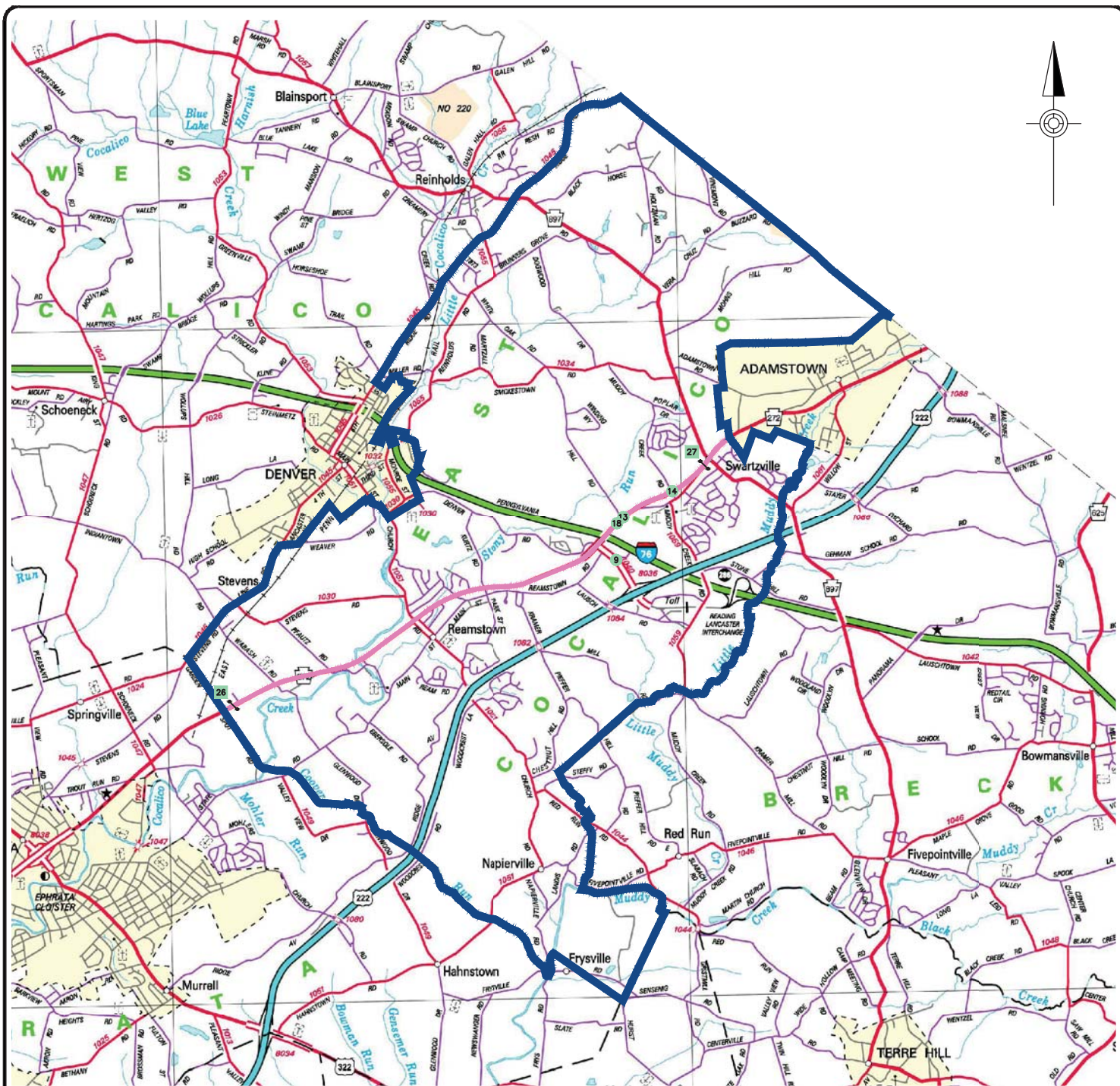
DRAWING NO.

2

SHEET NO.

2 OF 9

PROJECT R000866.0431



LEGEND

- DEFICIENT STUDY INTERSECTION
- ⊗ INTERSECTION / SEGMENT REFERENCE NUMBER
- DEFICIENT STUDY SEGMENTS
- ATR LOCATION



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2010 EXISTING DEFICIENT STUDY INTERSECTIONS AND SEGMENTS FOR EAST COCALICO TOWNSHIP CIP

EAST COCALICO TOWNSHIP LANCASTER COUNTY PENNSYLVANIA

PROJ. MGR. - MJR
DESIGN- BDE
CADD- BDE
CHECKED- MJR
SCALE- NTS
DATE- NOV. 2010

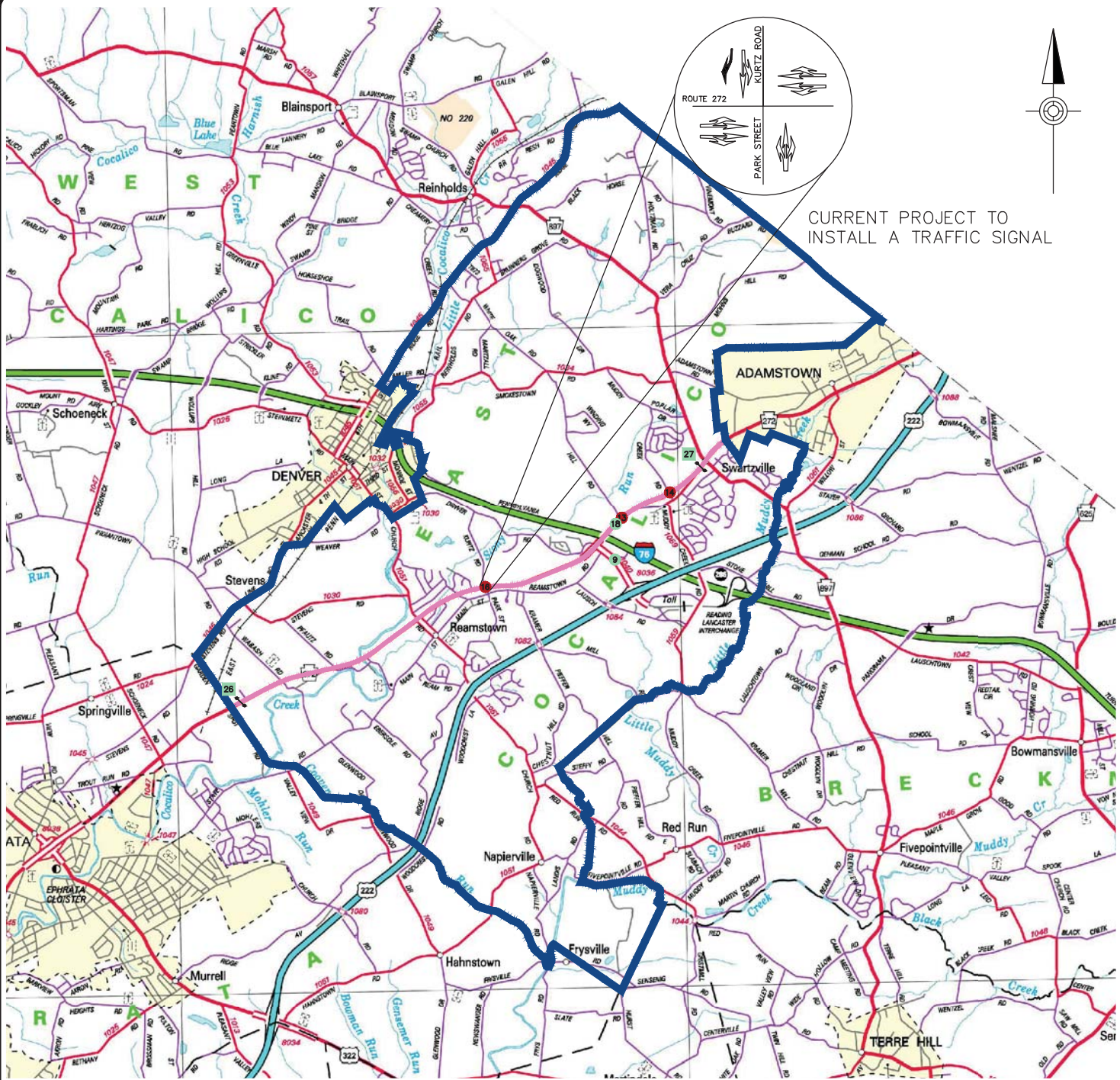
DRAWING NO.

3

SHEET NO.

3 OF 9

PROJECT R000866.0431



CURRENT PROJECT TO
INSTALL A TRAFFIC SIGNAL

LEGEND

- PROHIBIT MINOR APPROACH LEFT TURN MOVEMENT
- INSTALL A TRAFFIC SIGNAL
- X INTERSECTION/ATR REFERENCE NUMBER
- EXISTING LANE CONFIGURATION
- PROPOSED LANE CONFIGURATION
- CONSTRUCT ADDITIONAL THRU LANES

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2010 MITIGATION OF INTERSECTIONS AND SEGMENTS FOR EAST COCALICO TOWNSHIP CIP

EAST COCALICO TOWNSHIP LANCASTER COUNTY PENNSYLVANIA

PROJ. MGR. - MJR
DESIGN - BDE
CADD - BDE
CHECKED - MJR
SCALE - NTS
DATE - NOV. 2010

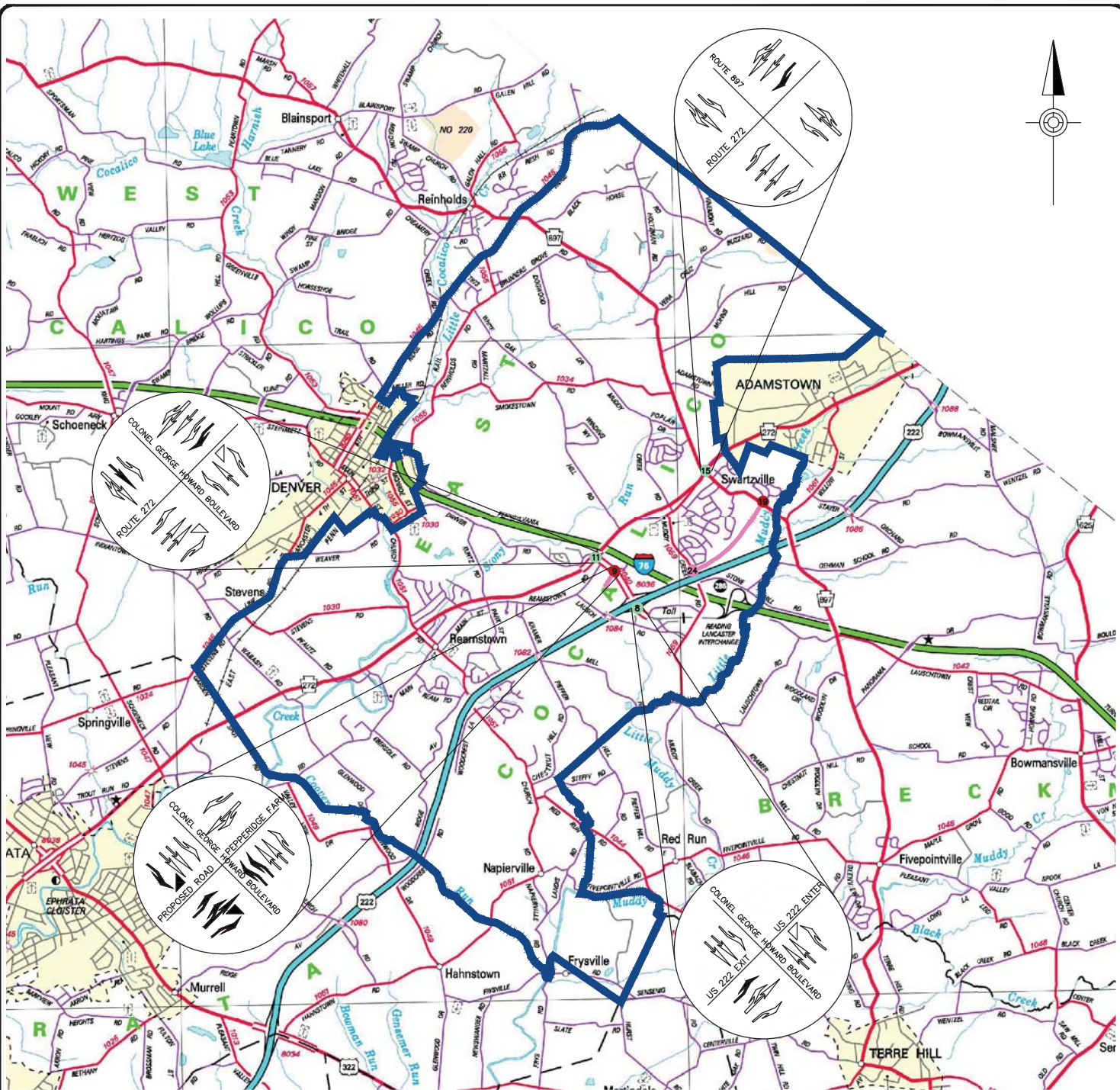
DRAWING NO.

4

SHEET NO.

4 OF 9

PROJECT R000866.0431



LEGEND

- NEW INTERSECTION
- INSTALL A TRAFFIC SIGNAL
- X INTERSECTION/ATR REFERENCE NUMBER
- EXISTING LANE CONFIGURATION
(INCLUDES EXISTING MITIGATION, WHERE APPLICABLE)
- PROPOSED LANE CONFIGURATION
- NEW ROADWAY SEGMENT

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IMPROVEMENTS AS PART OF BACKGROUND DEVELOPMENTS EAST COCALICO TOWNSHIP CIP

EAST COCALICO TOWNSHIP LANCASTER COUNTY PENNSYLVANIA

PROJ. MGR. - MJR
DESIGN- BDE
CADD- BDE
CHECKED- MJR
SCALE- NTS
DATE- NOV. 2010

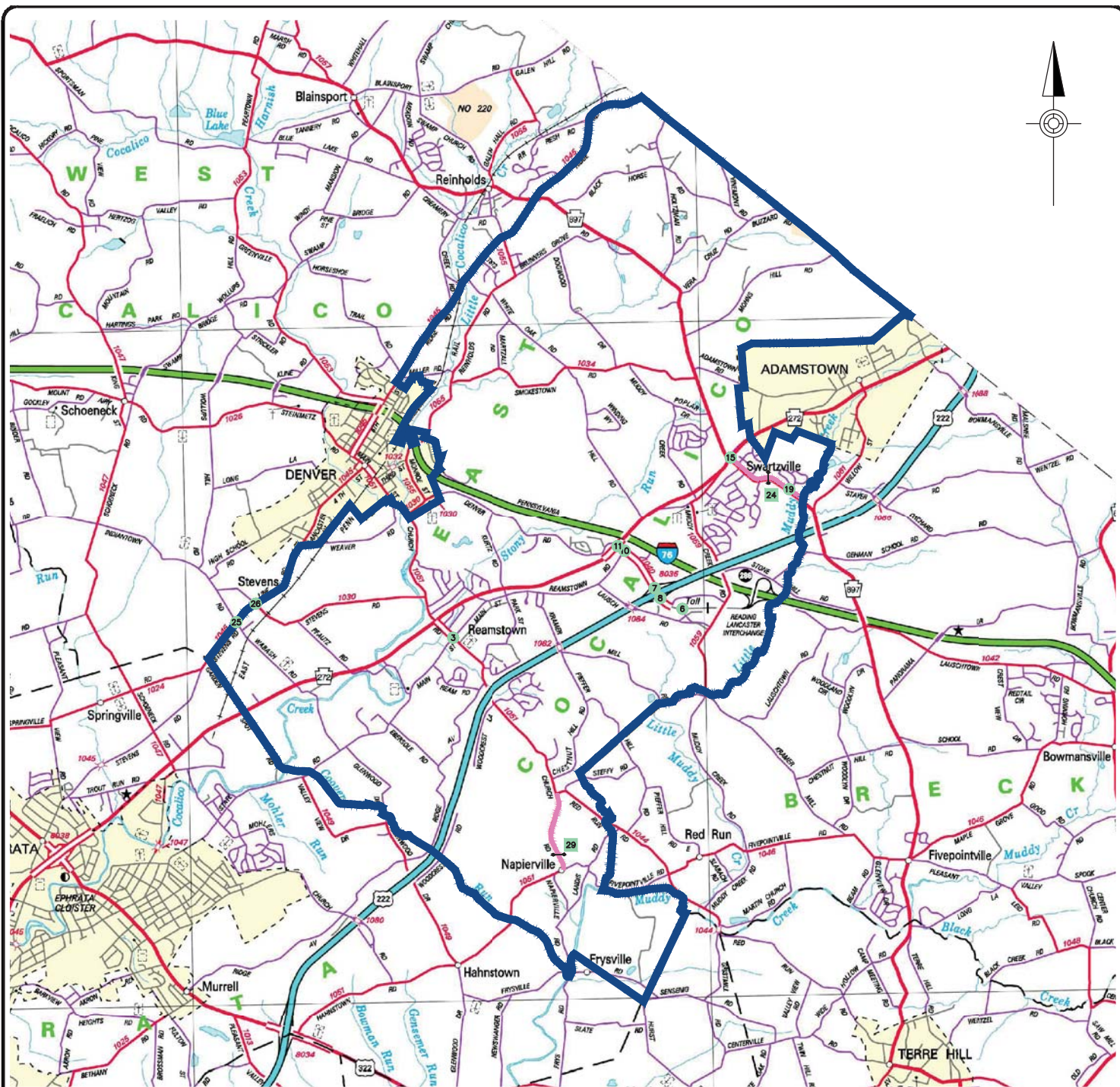
DRAWING NO.

5

SHEET NO.

5 OF 9

PROJECT R000866.0431



LEGEND

- DEFICIENT STUDY INTERSECTION
- X INTERSECTION / SEGMENT REFERENCE NUMBER
- DEFICIENT STUDY SEGMENTS
- ATR LOCATION



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2034 BASE DEFICIENT STUDY INTERSECTIONS AND SEGMENTS FOR EAST COCALICO TOWNSHIP CIP

EAST COCALICO TOWNSHIP LANCASTER COUNTY PENNSYLVANIA

PROJ. MGR. - MJR
DESIGN- BDE
CADD- BDE
CHECKED- MJR
SCALE- NTS
DATE- NOV. 2010

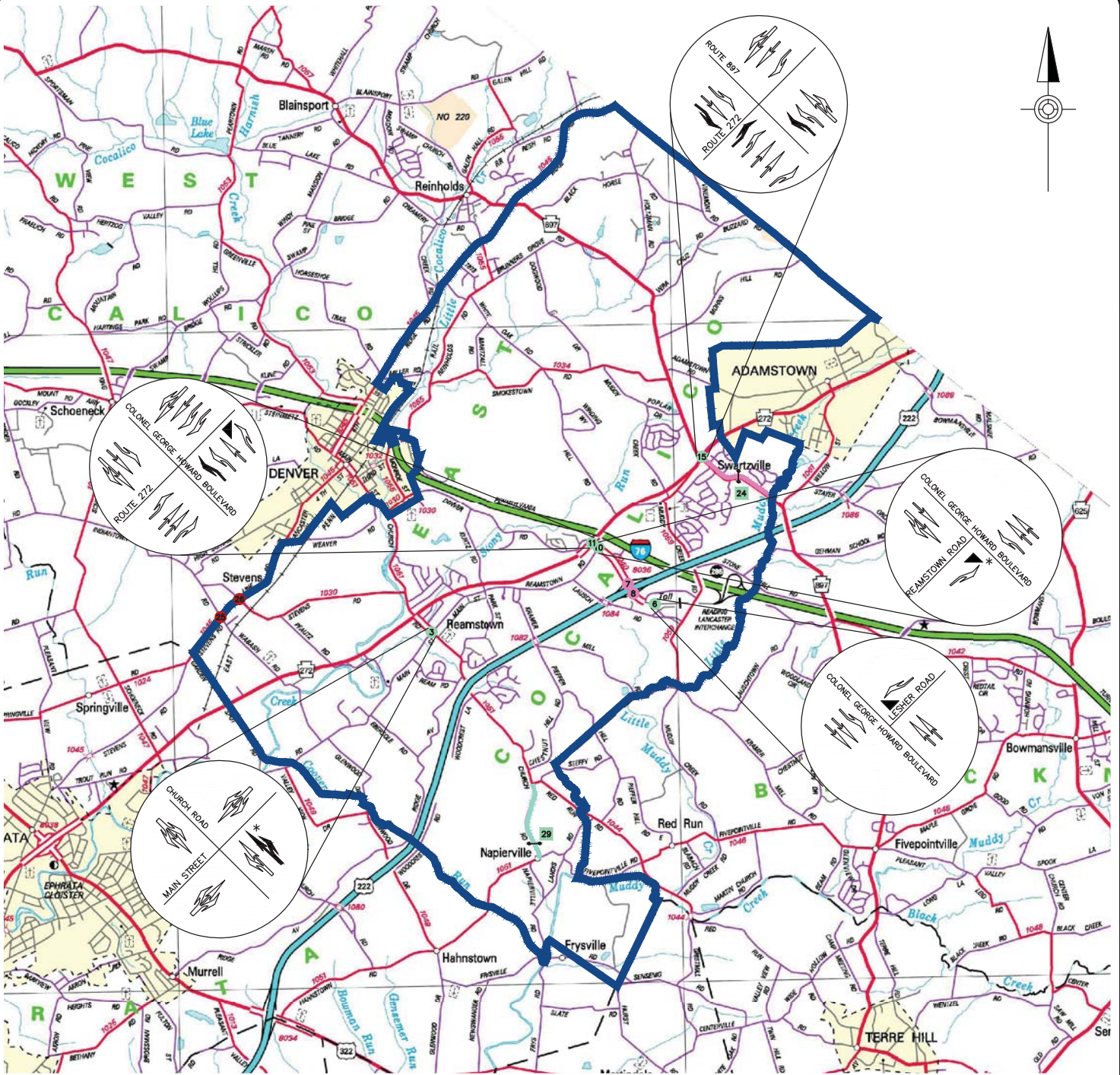
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6

SHEET NO.

6 OF 9

PROJECT R000866.0431



LEGEND

- CONSTRUCT A CLOVERLEAF INTERCHANGE
- INSTALL A TRAFFIC SIGNAL
- X INTERSECTION/ATR REFERENCE NUMBER
- EXISTING LANE CONFIGURATION
(INCLUDES EXISTING MITIGATION, WHERE APPLICABLE)
- PROPOSED LANE CONFIGURATION

- CONSTRUCT ADDITIONAL THRU LANES
- WIDEN TO 24' CARTWAY WITH 4' SHOULDERS

* NO MITIGATION IS REQUIRED AT THIS INTERSECTION
ONCE 2034 DEVELOPMENT MITIGATIONS ARE IN PLACE.



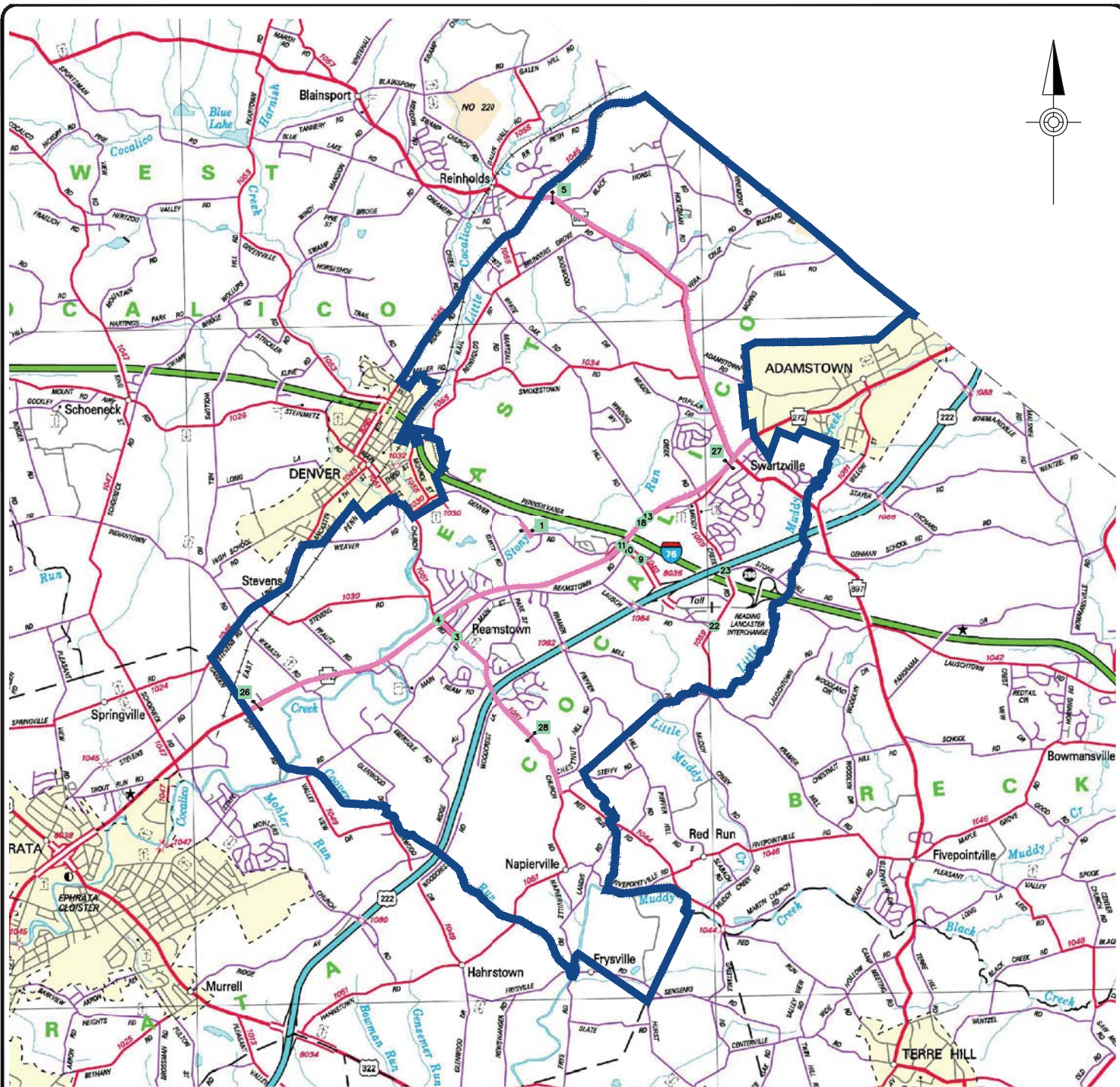
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2034 BASE MITIGATION FOR INTERSECTIONS AND SEGMENTS FOR EAST COCALICO TOWNSHIP CIP

EAST COCALICO TOWNSHIP LANCASTER COUNTY PENNSYLVANIA

PROJ. MGR. - MJR
DESIGN - BDE
CADD - BDE
CHECKED - MJR
SCALE - NTS
DATE - NOV. 2010

DRAWING NO.
7
SHEET NO.
7 OF **9**
PROJECT R000866.0431



LEGEND

- DEFICIENT STUDY INTERSECTION
- ⊗ INTERSECTION / SEGMENT REFERENCE NUMBER
- DEFICIENT STUDY SEGMENTS
- ATR LOCATION



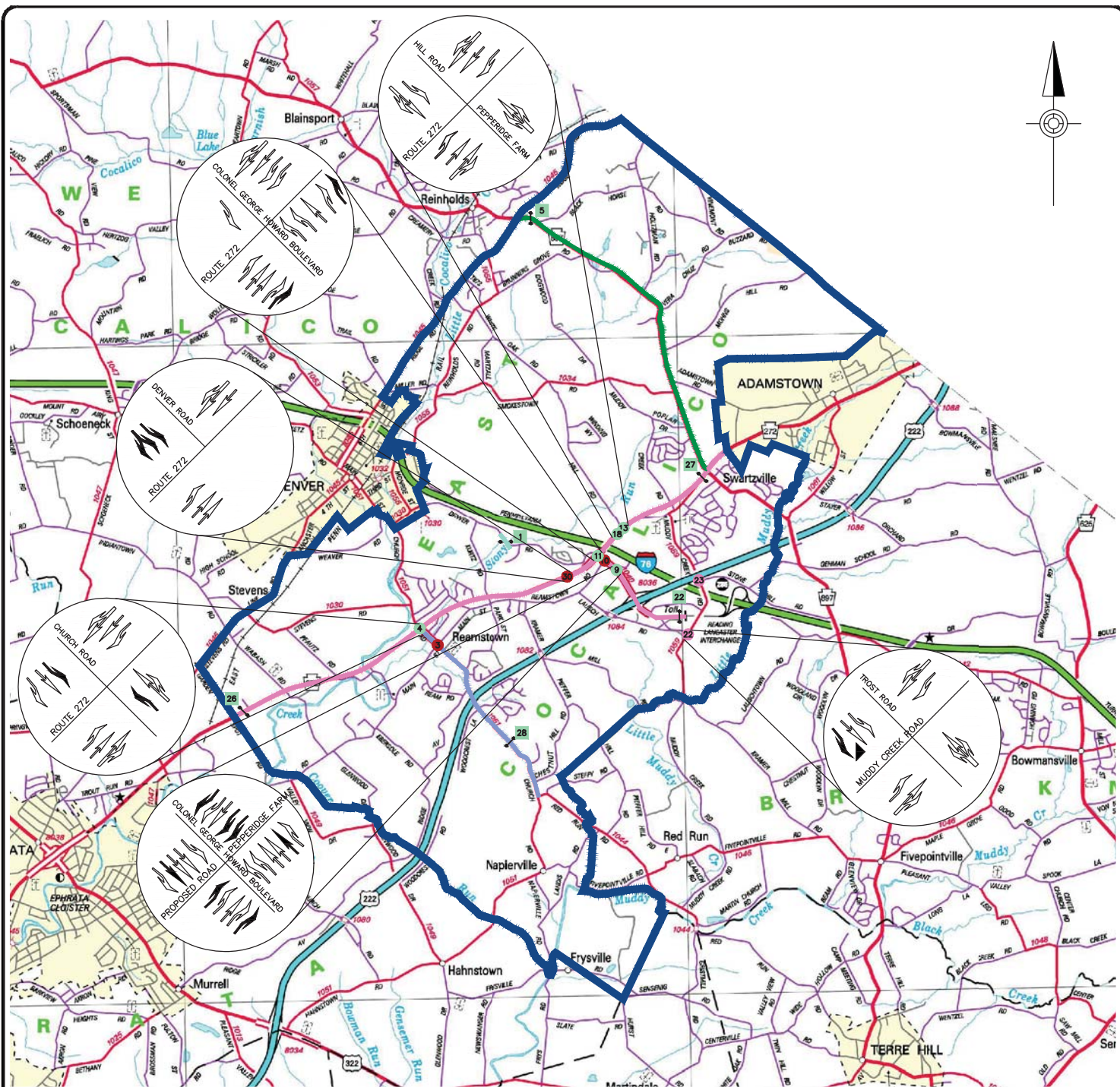
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2034 DEVELOPMENT DEFICIENT STUDY INTERSECTIONS AND SEGMENTS FOR EAST COCALICO TOWNSHIP CIP

EAST COCALICO TOWNSHIP LANCASTER COUNTY PENNSYLVANIA

PROJ. MGR. - MJR
DESIGN - BDE
CADD - BDE
CHECKED - MJR
SCALE - NTS
DATE - NOV. 2010

DRAWING NO.
8
SHEET NO.
8 OF 9
PROJECT R000866.0431



LEGEND

- CONVERT TO ALL-WAY STOP CONTROL
- INSTALL A TRAFFIC SIGNAL
- X INTERSECTION/ATR REFERENCE NUMBER
- EXISTING LANE CONFIGURATION (INCLUDES EXISTING AND 2034 BASE MITIGATION, WHERE APPLICABLE)
- PROPOSED LANE CONFIGURATION

- CONSTRUCT ADDITIONAL THRU LANES
- UPGRADE TO COMMUNITY COLLECTOR WIDEN TO 24' CARTWAY WITH 6' SHOULDERS
- WIDEN TO 24' CARTWAY WITH 6' SHOULDERS
- WIDEN TO 22' CARTWAY WITH 4' SHOULDERS

NOTE: INTERSECTIONS #3 & #10 DO NOT REQUIRE ANY PREVIOUS MITIGATIONS AS A RESULT OF 2034 DEVELOPMENT MITIGATION.



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2034 DEVELOPMENT MITIGATION FOR INTERSECTIONS AND SEGMENTS FOR EAST COCALICO TOWNSHIP CIP

EAST COCALICO TOWNSHIP LANCASTER COUNTY PENNSYLVANIA

PROJ. MGR. - MJR
DESIGN - BDE
CADD - BDE
CHECKED - MJR
SCALE - NTS
DATE - NOV. 2010

DRAWING NO.

9

SHEET NO.

9 OF 9

PROJECT R000866.0431

APPENDIX A
INTERSECTION SUMMARY SHEETS

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Intersection 1: Church Street (S.R. 1051) & Red Run Road (S.R. 1044)

Intersection Type: “T” Intersection

Transportation Service Area: Southern

Existing 2010 Intersection Description:

Church Street is a state owned roadway with approximately 20 feet of pavement made up of two travel lanes (one travel lane in each direction). The northbound approach has a downgrade of 7 percent while the westbound approach has an upgrade of 10 percent. The shoulders are between 1 and 2 feet in width. The posted speed limit is 35 mph for the roadway. Red Run Road is also a state owned roadway with one travel lane in each direction and a pavement width of 20 feet. The southbound approach has an upgrade of 1 percent.



1 → Photo Location

⊙ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - None
- To provide for anticipated future development traffic:
 - None



1. Church Street eastbound approach



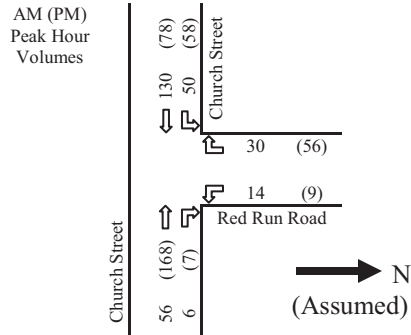
2. Church Street westbound approach



Welcome to East Cocalico Township

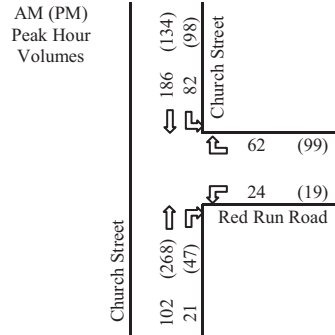
2010 Traffic Summary

(Existing Volumes)



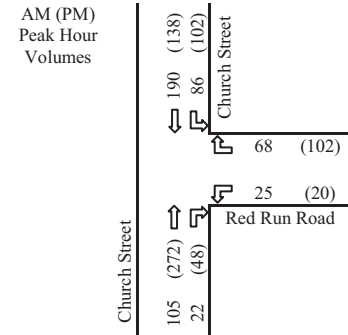
2034 Traffic Summary

(Base Volumes)



2034 Traffic Summary

(Development Volumes)



Level of Service Summary							
Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Red Run Road (S.R. 1044)	Southbound						
	Left/Right	A	A	B	B	B	B
Church Street (S.R. 1051)	Eastbound						
	Left/Thru	A	A	A	A	A	A



3. Red Run Road SB approach

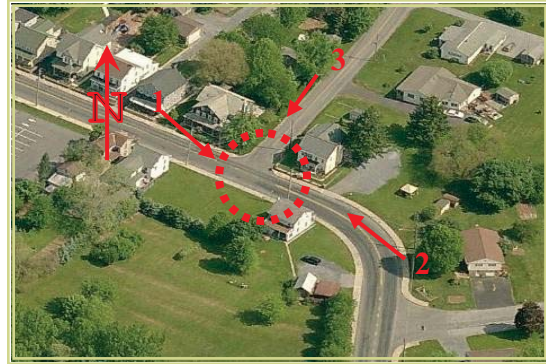
Intersection 2: Church Street (S.R. 1051) & Park Street (T-851)

Intersection Type: “T” Intersection

Transportation Service Area: Southern

Existing 2010 Intersection Description:

Church Street is a state owned roadway with approximately 28 feet of pavement made up of two travel lanes (one travel lane in each direction). The eastbound approach has an upgrade of 3 percent while the westbound approach has a downgrade of 3 percent. The shoulders are between 1 and 2 feet in width. The posted speed limit is 35 mph for the roadway. Park Street is a Township owned roadway with one travel lane in each direction and a pavement width of 20 feet. The southbound approach has a downgrade of 2 percent.



1 → Photo Location

⊙ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - None
- To provide for anticipated future development traffic:
 - None



1. Church Street eastbound approach



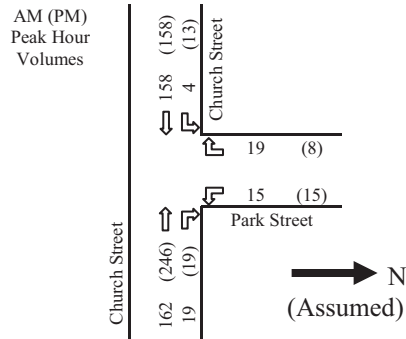
2. Church Street westbound approach



Welcome to East Cocalico Township

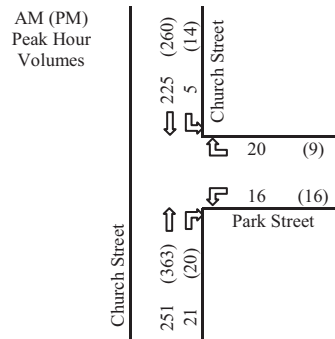
2010 Traffic Summary

(Existing Volumes)



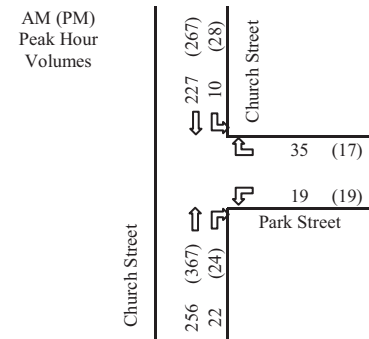
2034 Traffic Summary

(Base Volumes)



2034 Traffic Summary

(Development Volumes)



Level of Service Summary							
Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Park Street	Southbound						
	Left/Right	B	B	B	B	B	B
Church Street	Eastbound						
	Left/Thru	A	A	A	A	A	A



3. Park Street southbound approach

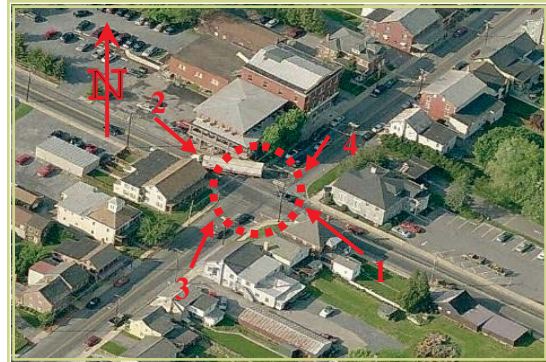
Intersection 3: Church Street (S.R. 1051) & Reamstown Road (T-851)

Intersection Type: “+” Intersection

Transportation Service Area: Southern

Existing 2010 Intersection Description:

Church Street is a state owned roadway with approximately 32 feet of pavement made up of two travel lanes (one travel lane in each direction). The eastbound approach has a downgrade of 2 percent while the westbound approach has an upgrade of 1 percent. The shoulders are between 1 and 2 feet in width. Reamstown Road is a Township owned roadway with one travel lane in each direction and a pavement width of 32 feet. The northbound approach has an upgrade of 1 percent and the southbound approach is level. The posted speed limit is 35 mph for both roadways.



1 → Photo Location

⊗ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - Construct a westbound thru, creating dual lanes
- To provide for anticipated future development traffic:
 - Signalize the intersection and no previous mitigations are required



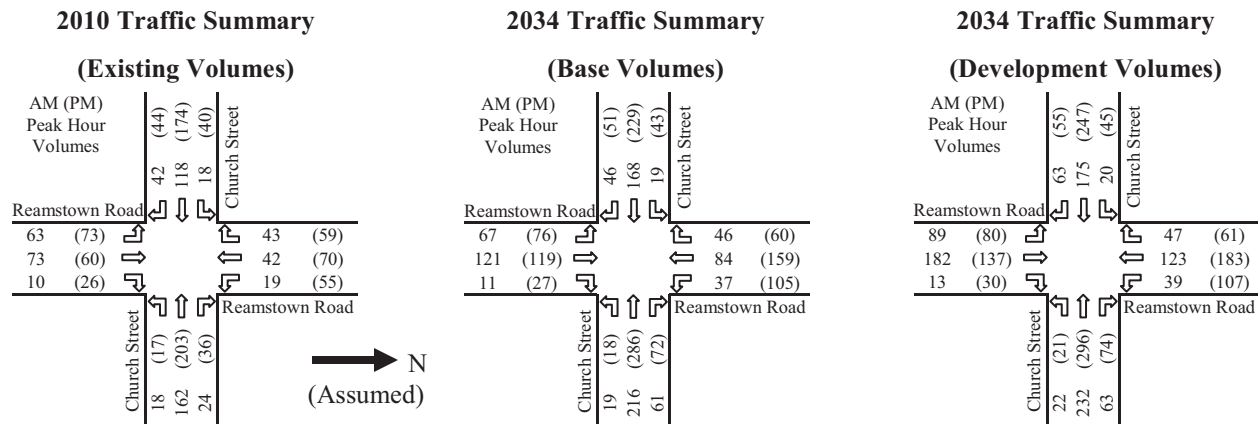
1. Church Street westbound approach



2. Church Street eastbound approach



Welcome to East Cocalico Township



Level of Service Summary							
Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Reamstown Road (T-700)	Northbound						
	Left/Thru/Right	B	B	B	D	C	D
	Southbound						
	Left/Thru/Right	A	B	B	E	C	F
Church Street (S.R. 1051)	Westbound						
	Left/Thru/Right	B	B	C	F	B	C
	Eastbound						
	Left/Thru/Right	A	B	B	E	C	F



3. Reamstown Road northbound approach



4. Reamstown Road southbound approach

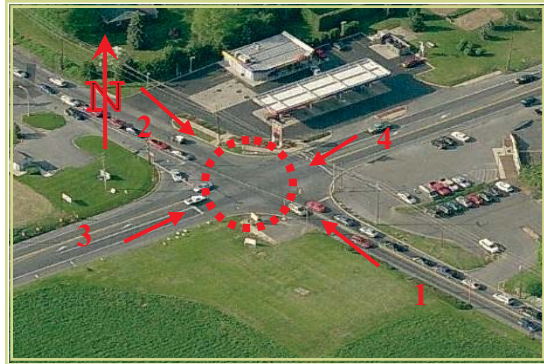
Intersection 4: Church Street (S.R. 1051) & Route 272

Intersection Type: Signalized “+” Intersection

Transportation Service Area: Western/Southern

Existing 2010 Intersection Description:

Church Street is a state owned roadway with approximately 27 feet of pavement made up of two travel lanes (one travel lane in each direction). The eastbound approach has a downgrade of 1 percent while the westbound approach has an upgrade of 3 percent. The shoulders are between 1 and 2 feet in width. The posted speed limit is 35 mph. Route 272 is also a state owned roadway with one travel lane in each direction. The width of the pavement is 24 feet, with shoulders between 9 and 11 feet wide. The northbound and southbound approaches are level. The posted speed limit is 45 mph.



- 1 → Photo Location
⊙ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - None
- To provide for anticipated future development traffic:
 - Construct westbound and eastbound left turn lanes



1. Church Street westbound approach



2. Church Street eastbound approach

Welcome to East Cocalico Township

2010 Traffic Summary

(Existing Volumes)

AM (PM) Peak Hour Volumes	78 (112) 159 (159) 88 (90)	Church Street
Route 272	↔ ↔ ↔	
54 (106)	↔	55 (79)
229 (416)	↔	335 (451)
32 (118)	↔	33 (46)
Church Street	↔ ↔ ↔	Route 272
61 (89) 183 (223) 54 (47)		
	↔	

➔ N
(Assumed)

2034 Traffic Summary

(Base Volumes)

AM (PM) Peak Hour Volumes	163 (177) 196 (191) 89 (91)	Church Street
Route 272	↔ ↔ ↔	
123 (182)	↔	60 (84)
617 (744)	↔	596 (855)
44 (135)	↔	34 (47)
Church Street	↔ ↔ ↔	Route 272
72 (104) 219 (290) 55 (48)		
	↔	

2034 Traffic Summary

(Development Volumes)

AM (PM) Peak Hour Volumes	179 (195) 220 (209) 113 (107)	Church Street
Route 272	↔ ↔ ↔	
137 (202)	↔	91 (99)
793 (1014)	↔	825 (1054)
49 (156)	↔	35 (48)
Church Street	↔ ↔ ↔	Route 272
86 (113) 257 (300) 56 (49)		
	↔	

Level of Service Summary							
Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Route 272	Northbound						
	Approach	A	B	B	C	C	C
	Southbound						
	Approach	B	B	B	C	E	F
Church Street	Westbound						
	Left/Thru/Right	B	B	B	C	D	E
	Eastbound						
	Approach	B	B	B	C	C	C



3. Route 272 northbound approach



4. Route 272 southbound approach

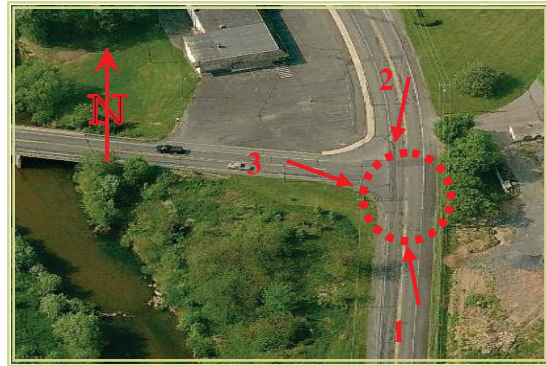
Intersection 5: Church Street (S.R. 1051) & Stevens Road (S.R. 1030)

Intersection Type: “T” Intersection

Transportation Service Area: Western

Existing 2010 Intersection Description:

Church Street is a state owned roadway with approximately 27 feet of pavement made up of two travel lanes (one travel lane in each direction). The eastbound approach has an upgrade of 3 percent while the westbound approach is level. The shoulders are between 1 and 2 feet in width. The posted speed limit is 35 mph for the roadway. Stevens Road is also a state owned roadway with one travel lane in each direction and a pavement width of 22 feet. The northbound approach has an upgrade of 3 percent.



1 → Photo Location

⊛ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - None
- To provide for anticipated future development traffic:
 - None



1. Church Street westbound approach



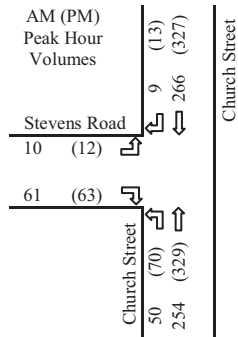
2. Church Street eastbound approach



Welcome to East Cocalico Township

2010 Traffic Summary

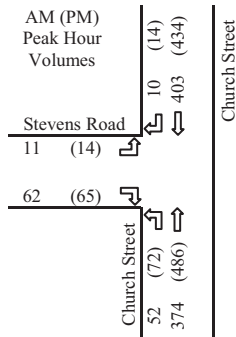
(Existing Volumes)



➔ N
(Assumed)

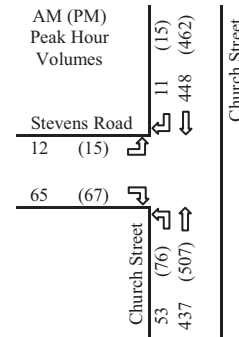
2034 Traffic Summary

(Base Volumes)



2034 Traffic Summary

(Development Volumes)



Level of Service Summary							
Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Stevens Road	Northbound						
	Left/Thru/Right	B	B	B	C	C	C
Church Street	Westbound						
	Left/Thru/Right	A	A	A	A	A	A



3. Stevens Road northbound approach

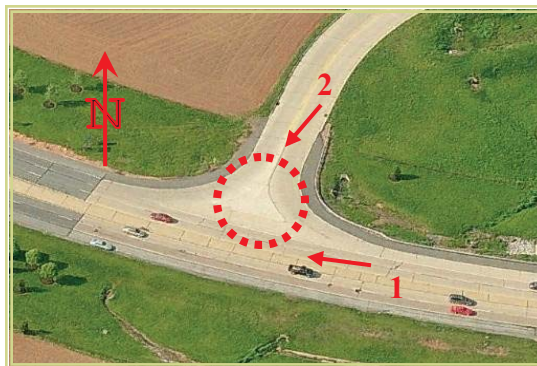
Intersection 6: Colonel George Howard Boulevard (S.R. 1040) & Leshar Road (T-949)

Intersection Type: “T” Intersection

Transportation Service Area: Eastern/Southern

Existing 2010 Intersection Description:

Colonel George Howard Boulevard is a state owned roadway with approximately 48 feet of pavement made up of four travel lanes (two travel lanes in each direction). The westbound and eastbound approaches are level and the shoulders are between 10 and 11 feet in width. The posted speed limit is 50 mph. Leshar Road is a Township owned roadway with one travel lane in each direction. The width of pavement is 32 feet and the southbound approach has a downgrade of 4 percent.



1 → Photo Location

⊗ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - Channelize the southbound right turn lane
- To provide for anticipated future development traffic:
 - None

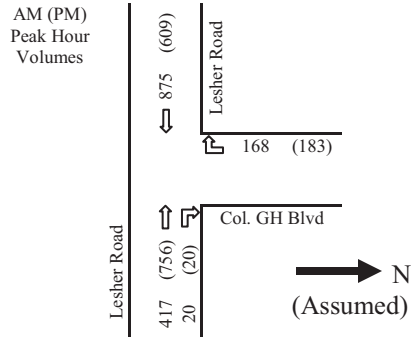


1. Colonel George Howard Blvd WB approach

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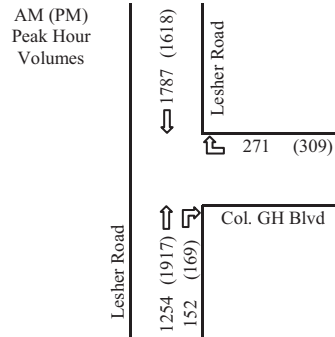
2010 Traffic Summary

(Existing Volumes)



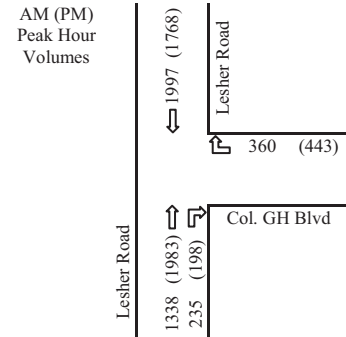
2034 Traffic Summary

(Base Volumes)



2034 Traffic Summary

(Development Volumes)



Level of Service Summary

Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Colonel George Howard Boulevard (S.R. 1040)	Southbound						
	Right	B	C	F	F	A	A



2. Leshher Road southbound approach

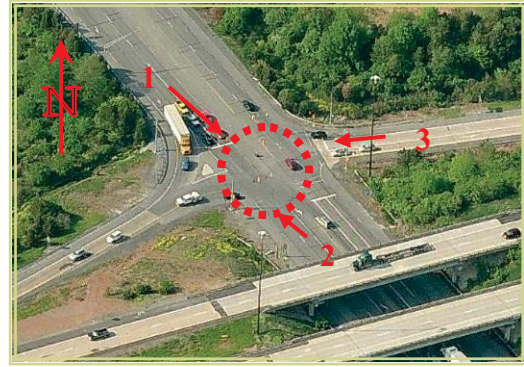
Intersection 7: Colonel George Howard Boulevard (S.R. 1040) & Route 222 Southbound Ramps

Intersection Type: Signalized “+” Intersection

Transportation Service Area: Eastern/Southern

Existing 2010 Intersection Description:

Colonel George Howard Boulevard is a state owned roadway with approximately 46 feet of pavement made up of four travel lanes (two travel lanes in each direction). The westbound and eastbound approaches are level. The shoulders are between 10 and 11 feet in width and the posted speed limit is 50 mph. The US Route 222 southbound ramp is also a state owned roadway. The width of pavement is 27 feet and the southbound approach is level.



1 → Photo Location

⊙ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - Construct a cloverleaf interchange
- To provide for anticipated future development traffic:
 - None



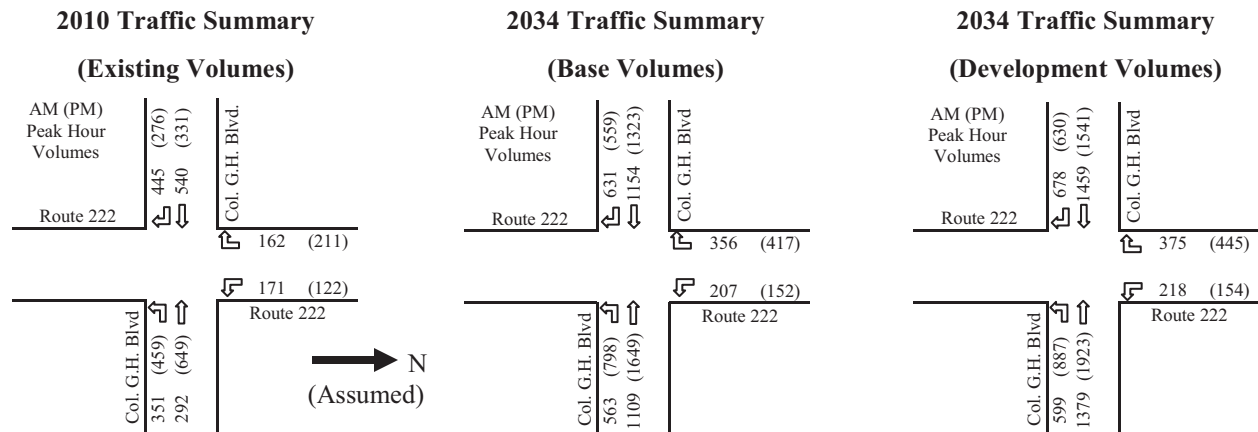
1. Colonel George Howard Blvd EB approach



2. Colonel George Howard Blvd WB approach



Welcome to East Cocalico Township



Level of Service Summary							
Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Route 222 Southbound Ramps	Southbound						
	Approach	C	C	E	F	-	-
Colonel George Howard Boulevard (S.R. 1040)	Westbound						
	Approach	A	A	F	F	-	-
	Eastbound						
	Approach	D	C	E	F	-	-



3. Route 222 southbound approach

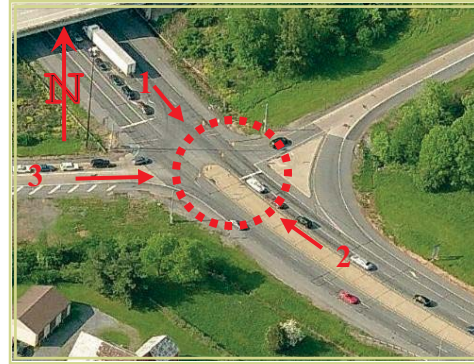
Intersection 8: Colonel George Howard Boulevard (S.R. 1040) & Route 222 Northbound Ramps

Intersection Type: Signalized “+” Intersection

Transportation Service Area: Eastern/Southern

Existing 2010 Intersection Description:

Colonel George Howard Boulevard is a state owned roadway with approximately 46 feet of pavement made up of four travel lanes (two travel lanes in each direction). The westbound approach is level and the eastbound approach has a downgrade of 1 percent. The shoulders are between 10 and 11 feet in width and the posted speed limit is 50 mph. The US Route 222 northbound ramp is also a state owned roadway. The width of pavement is 27 feet and the northbound approach is level.



1 → Photo Location



Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - Construct a cloverleaf interchange
- To provide for anticipated future development traffic:
 - None



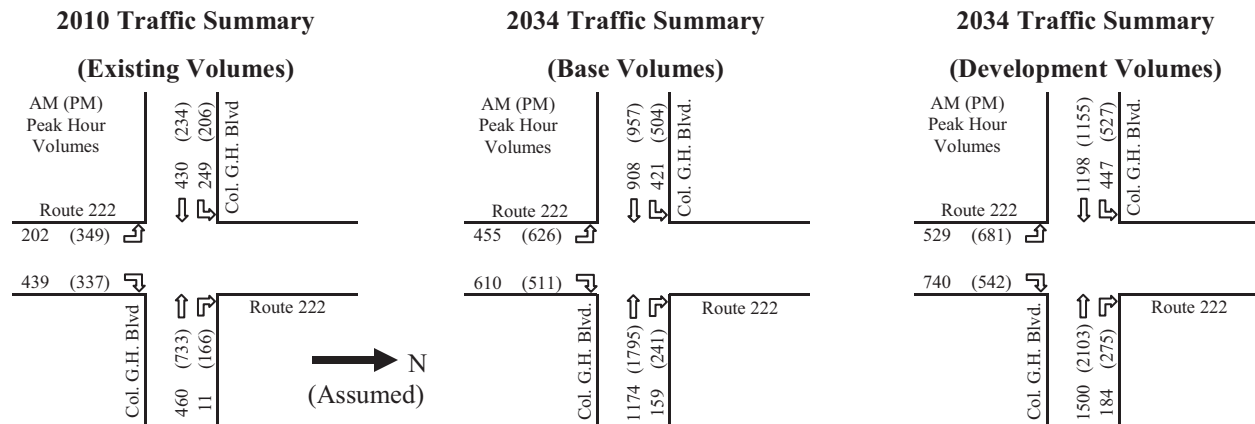
1. Colonel George Howard Blvd EB approach



2. Colonel George Howard Blvd WB approach



Welcome to East Cocalico Township



Level of Service Summary							
Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Route 222 Northbound Ramps	Northbound						
	Approach	C	C	F	F	-	-
Colonel George Howard Boulevard (S.R. 1040)	Westbound						
	Approach	C	C	F	F	-	-
	Eastbound						
	Approach	A	A	D	F	-	-



3. Route 222 northbound approach

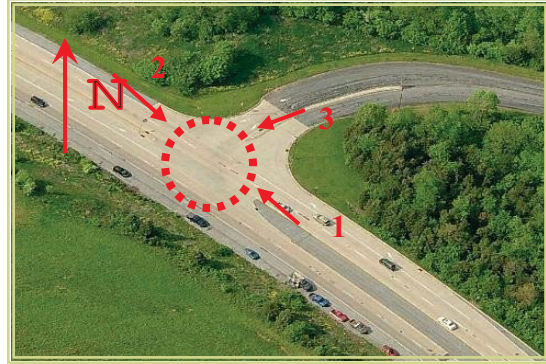
Intersection 9: Colonel George Howard Boulevard (S.R. 1040) & Pepperidge Farm Boulevard (T-902)

Intersection Type: Unsignalized “+” Intersection

Transportation Service Area: Eastern/Southern

Existing 2010 Intersection Description:

Colonel George Howard Boulevard is a state owned roadway with approximately 48 feet of pavement made up of four travel lanes (two travel lanes in each direction). The westbound approach has an upgrade of 1 percent and the eastbound approach has a downgrade of 1 percent. The shoulders are between 10 and 11 feet in width and the posted speed limit is 50 mph. Pepperidge Farm Boulevard is a Township owned roadway with one travel lane in each direction. The width of pavement is 24 feet and the southbound approach has a downgrade of 4 percent.



1 → Photo Location

⊙ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - Interim mitigation could include prohibiting the southbound left turns, however plans for signalization are currently being prepared as part of a land development process
- To provide for anticipated future background traffic:
 - None
- To provide for anticipated future development traffic:
 - Construct dual southbound left turn lanes
 - Construct a northbound left, a northbound right and a southbound right, each creating dual lanes
 - Construct a westbound and eastbound thru, creating triple lanes



1. Colonel George Howard Blvd WB approach



2. Colonel George Howard Blvd EB approach

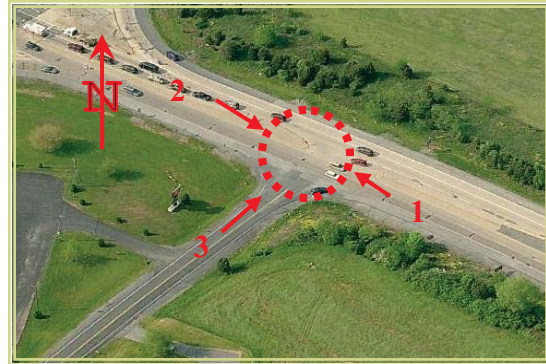
Intersection 10: Colonel George Howard Boulevard (S.R. 1040) & Reamstown Road (T-700)

Intersection Type: Unsignalized “+” Intersection

Transportation Service Area: Eastern/Southern

Existing 2010 Intersection Description:

Colonel George Howard Boulevard is a state owned roadway with approximately 48 feet of pavement made up of four travel lanes (two travel lanes in each direction). The westbound approach has an upgrade of 1 percent and the eastbound approach has a downgrade of 1 percent. The shoulders are between 10 and 11 feet in width and the posted speed limit is 50 mph. Reamstown Road is a Township owned roadway with one travel lane in each direction. The width of pavement is 32 feet and the northbound approach has a downgrade of 6 percent. The posted speed limit is 35 mph.



- 1 → Photo Location
- ⊙ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - Channelize the northbound right turn lane
- To provide for anticipated future development traffic:
 - Signalize the intersection and no previous mitigations are required



1. Colonel George Howard Blvd WB approach



2. Colonel George Howard Blvd EB approach

Welcome to East Cocalico Township

2010 Traffic Summary

(Existing Volumes)

AM (PM) Peak Hour Volumes	18 (21) 888 (509)	Col. G.H. Blvd.
Reamstown Rd	↔ ↔	
107 (58)	↘ ↗	
Col. G.H. Blvd.	↗ ↘	
41 (84) 427 (769)		

➔ N
(Assumed)

2034 Traffic Summary

(Base Volumes)

AM (PM) Peak Hour Volumes	35 (41) 1674 (1621)	Col. G.H. Blvd.
Reamstown Rd	↔ ↔	
119 (105)	↘ ↗	
Col. G.H. Blvd.	↗ ↘	
65 (104) 1343 (1899)		

2034 Traffic Summary

(Development Volumes)

AM (PM) Peak Hour Volumes	41 (59) 2021 (1801)	Col. G.H. Blvd.
Reamstown Rd	↔ ↔	
166 (133)	↘ ↗	
Col. G.H. Blvd.	↗ ↘	
79 (150) 1507 (2169)		

Level of Service Summary							
Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Reamstown Road (T-700) Colonel George Howard Boulevard (S.R. 1040)	Northbound						
	Right	C	B	E	C	A	A
	Westbound						
	Left	B	A	D	C	F	E



3. Reamstown Road NB approach

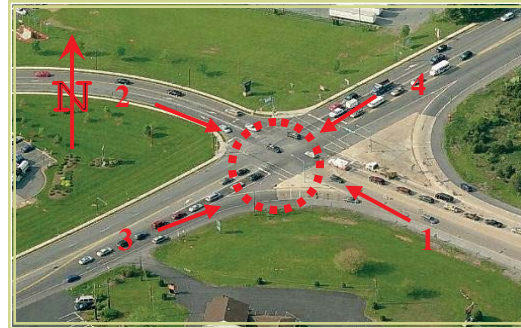
Intersection 11: Colonel George Howard Boulevard (S.R. 1040)/Denver Road & Route 272

Intersection Type: Signalized “+” Intersection

Transportation Service Area: Eastern/Western/Southern

Existing 2010 Intersection Description:

Colonel Howard Boulevard is a state owned roadway with approximately 42 feet of pavement made up of four travel lanes (two travel lanes in each direction). The westbound approach has an upgrade of 1 percent and the shoulders are between 10 and 11 feet in width. The posted speed limit is 50 mph. Route 272 is also a state owned roadway. It has one travel lane in each direction and a posted speed limit of 45 mph. The width of the pavement is 24 feet, with shoulders between 9 and 11 feet wide. The northbound approach has a downgrade of 2 percent and the southbound approach has an upgrade of 2 percent. Denver Road is a Township owned roadway with one travel lane in each direction. The width of pavement is 24 feet and the eastbound approach has an upgrade of 3 percent.



- 1 → Photo Location
⊙ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - Construct a westbound left, creating dual lanes
 - Channelize the westbound right turn lane
- To provide for anticipated future development traffic:
 - Prohibit left turns and thru movements exiting the eastbound approach.
 - Construct a northbound right and a westbound right, creating dual lanes



1. Colonel Howard Blvd WB approach



2. Colonel Howard Blvd EB approach



Welcome to East Cocalico Township

2010 Traffic Summary

(Existing Volumes)

AM (PM) Peak Hour Volumes		Denver Road	
Route 272		40 (28)	236 (177)
31 (32)	↔	↔	↔
161 (355)	↔	↔	↔
327 (204)	↔	↔	↔
		148 (111)	245 (262)
		338 (150)	
Col. G.H. Blvd.	↔	↔	↔
148 (271)	↔	↔	↔
141 (214)	↔	↔	↔
96 (329)	↔	↔	↔

→ N
(Assumed)

2034 Traffic Summary

(Base Volumes)

AM (PM) Peak Hour Volumes		Denver Road	
Route 272		41 (29)	370 (319)
32 (33)	↔	↔	↔
192 (393)	↔	↔	↔
550 (452)	↔	↔	↔
		194 (153)	388 (417)
		569 (397)	
Col. G.H. Blvd.	↔	↔	↔
279 (533)	↔	↔	↔
266 (385)	↔	↔	↔
261 (751)	↔	↔	↔

2034 Traffic Summary

(Development Volumes)

AM (PM) Peak Hour Volumes		Denver Road	
Route 272		53 (246)	513 (472)
45 (47)	↔	↔	↔
275 (560)	↔	↔	↔
869 (840)	↔	↔	↔
		306 (198)	505 (535)
		676 (551)	
Col. G.H. Blvd.	↔	↔	↔
656 (871)	↔	↔	↔
279 (486)	↔	↔	↔
346 (906)	↔	↔	↔

Level of Service Summary							
Road Name	Approach/ Movement	2010 Existing		2034 Base		2034 New Development	
		AM	PM	AM	PM	AM	PM
Route 272	Northbound						
	Approach	C	C	C	C	F	F
	Southbound						
	Approach	C	C	F	F	E	F
Colonel George Howard Boulevard (S.R. 1040)/Denver Road (T-901)	Westbound						
	Approach	C	C	C	F	F	F
	Eastbound						
	Approach	C	C	C	C	D	D



3. Route 272 northbound approach



4. Route 272 southbound approach

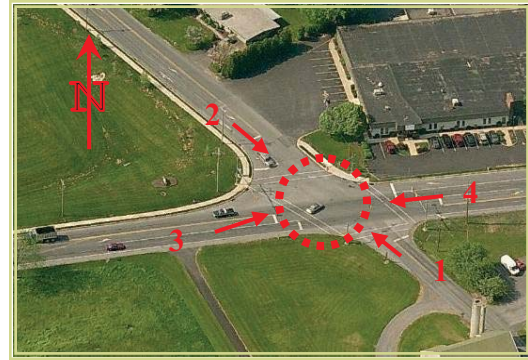
Intersection 12: Route 272 & Wabash Road (T-669)

Intersection Type: Signalized “+” Intersection

Transportation Service Area: Western/Southern

Existing 2010 Intersection Description:

Route 272 is a state owned roadway with approximately 24 feet of pavement made up of two travel lanes (one travel lane in each direction). There are also 11 foot left turn lanes on both approaches. The northbound approach has an upgrade of 1 percent while the southbound approach has a downgrade of 1 percent. The shoulders are between 9 and 11 feet in width. The posted speed limit is 45 mph for the roadway. Wabash Road is a Township owned roadway with one travel lane in each direction and a pavement width of 24 feet. The westbound approach has an upgrade of 6 percent and the eastbound approach has a downgrade of 3 percent.



- 1 → Photo Location
 ⊛ Intersection Location

Recommended Transportation Improvements:

- To provide for existing traffic at this intersection:
 - None
- To provide for anticipated future background traffic:
 - None
- To provide for anticipated future development traffic:
 - None



1. Wabash Road westbound approach



2. Wabash Road eastbound approach