

TRAFFIC PLANNING AND DESIGN, INC.



Roadway Sufficiency Analysis

Limerick Township, Montgomery County, PA

For Submission To:
Limerick Township

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Resolution No. 2021-30

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INTRODUCTION

Traffic Planning and Design, Inc. (TPD) has completed a Roadway Sufficiency Analysis Report for Limerick Township in compliance with the Pennsylvania Impact Fee Law as defined in sections 501-A through 506-A of the Municipal Planning Code (MPC). Sections 501-A through 506-A of the MPC were added to the code on December 19, 1990, via Act 209 of 1990 and were amended via Act 68 of 2000. The MPC authorizes municipalities within the Commonwealth to enact, amend and repeal impact fee ordinances and to charge impact fees to cover the cost of off-site road improvements necessitated by new land development. This report is an update to the 2011 Roadway Sufficiency Analysis that TPD prepared for Limerick Township.

As shown in **Figure 1**, Limerick Township, Montgomery County, PA is bordered by Lower and Upper Fredrick Townships to the north, Perkiomen Township to the east, Royersford Borough and the Schuylkill River to the south, and New Hanover and Lower Pottsgrove Townships to the west.

The growth projections for the Township are documented in the January 2021 Land Use Assumptions Report. The Limerick Township Board of Supervisors adopted the Land Use Assumptions Report, prepared by Traffic Planning and Design, Inc. on January 25, 2021. The Roadway Sufficiency Analysis and eventual Capital Improvement Plan (CIP) have been completed to ensure that the Township is equipped to provide the necessary infrastructure to accommodate the expected growth as outlined in the Land Use Assumptions Report.

STUDY AREA

Transportation Service Areas (TSA)

In compliance with the MPC (Section 504-A(b)(1)), Limerick Township established two Transportation Service Areas (TSA) for the roadway sufficiency analysis. Section 501-A of the MPC stipulates that a TSA cannot exceed an area of seven square miles. Both TSAs for Limerick Township, as shown in **Figure 2**, are less than seven square miles in size.

Several areas were excluded from the TSA because these areas are already fully developed. Excluding these areas also helped maximize the TSA and still keep the TSA under the 7 square mile limit.

EXISTING CONDITIONS

Existing Road Network

A survey of the existing roadway system in the service area is as follows:

Ridge Pike (SR 4031) is a two-lane, urban principal arterial roadway running in an east-west direction through the Township. Ridge Pike has a posted speed limit of 45 mph east of Airport Road and 55 mph west of Airport Road.

Airport Road (T-206) is a two-lane local roadway running in a north-south direction with a posted speed limit of 35 mph through the study area.

Neiffer Road (SR 4018) is a two-lane, urban collector roadway running in a north-south direction and has a posted speed limit of 40 mph through the study area.

Kugler Road (T-320) is a two-lane local roadway running in a north-south direction with a posted speed limit of 40 mph through the study area. At its signalized intersection with Ridge Pike, it aligns with Limerick Center Road.

Swamp Pike (County) is a two-lane, urban principal arterial roadway running in a northwest direction and has a posted speed limit of 45 mph through the study area.

Zeigler Road (T-321) is a two-lane local roadway with a posted speed limit of 25 mph.

Lewis Road (SR 4022/4013) is a two-lane, urban minor arterial roadway. Lewis Road has a posted speed limit of 35 mph east of Royersford Road and a posted speed limit of 45 mph west of Royersford Road.

Limerick Road (SR 4016/T-318) is a two-lane, urban collector roadway running in a north-south direction with a posted speed limit of 30 mph north of Ridge Pike. South of Ridge Pike, Limerick Road becomes a township road with a posted speed limit of 35 mph.

Country Club Road (T-403) is a two-lane, urban Township roadway running in a north-south direction and has a posted speed limit of 25 mph through the study area.

Royersford Road (T-409) is a two-lane local roadway running in a north-south direction and has a posted speed limit of 35 mph through the study area. At its intersection with Linfield-Trappe Road, the northbound and southbound legs of the intersection are offset by approximately 100 feet.

Township Line Road (SR 4014) is an urban minor arterial roadway running in a north-south direction with a posted speed limit of 45 mph. Township Line Road is a two-lane roadway north of Buckwalter Road and widens to four lanes south of Buckwalter Road.

Pottstown Expressway (SR 0422) is a four-lane, urban expressway running in an east-west direction and has a posted speed limit of 55 mph through the study area.

Linfield-Trappe Road (North) (SR 4017) is a two-lane, urban collector roadway from Lewis Road to Ridge Pike running in an east-west direction. East of Lewis Road, Linfield-Trappe Road is classified as an urban Township roadway. Linfield-Trappe Road has a posted speed limit of 45 mph through the study area.

Linfield-Trappe Road (South) (SR 4022) is a two-lane, urban minor arterial roadway running in a north-south direction and has a posted speed limit of 40 mph through the study area.

Benner Road (T-312) is a two-lane local roadway running in an east-west direction with a posted speed limit of 35 mph through the study area.

Buckwalter Road (T-410) is a two-lane local roadway running in an east-west direction with a posted speed limit of 25 mph through the study area.

Fruitville Road (T-209) is a two-lane, urban Township roadway running in a north-south direction and has a posted speed limit of 35 mph through the study area.

Limerick Center Road (SR 4024) is a two-lane, urban minor collector roadway running in a north-south direction and has a posted speed limit of 45 mph through the study area.

Longview Road (T-200) is a two-lane, urban Township roadway running in a north-south direction and has a posted speed limit of 35 mph through the study area.

Possum Hollow Road (T-204) is a two-lane, urban Township roadway running in a north-south direction and has a posted speed limit of 25 mph through the study area.

Evergreen Road (SR 4026) is an urban local roadway running in a north-south direction. South of Lightcap Road, Evergreen Road is a two-lane roadway and has a posted speed limit of 35 mph. North of Lightcap Road, Evergreen Road is a four-lane roadway and has a posted speed limit of 45 mph.

Lightcap Road is a four-lane, urban Township roadway running in an east-west direction and has a posted speed limit of 35 mph through the study area.

King Road (T-402) is a two-lane, urban Township roadway running in a north-south direction and has a posted speed limit of 35 mph through the study area.

Existing lane configurations and intersection control within the service areas are shown in **Figures 12A & 12B**. Throughout the report, figure numbers ending in an "A" refer to Transportation Service Area One while those figure numbers ending in a "B" refer to Transportation Service Area Two.

Transportation Service Area One:

Signalized Intersections:

- » Lewis Road & Linfield-Trappe Road/ Rt. 422 EB On-Ramp
- » Lewis Road & Rt. 422 WB Ramps
- » Lewis Road & Linfield-Trappe Road/Pottstown Honda Driveway
- » Ridge Pike & Airport Road
- » Ridge Pike & Evergreen Road/Rupert Road
- » Evergreen Road & Rupert Road/Rt. 422 Westbound Off-Ramp
- » Evergreen Road & Rt. 422 EB Ramps
- » Evergreen Road & Lightcap Road

Unsignalized Intersections:

- » Lewis Road & Rt. 422 EB Off-Ramp
- » Ridge Pike & Neiffer Road
- » Ridge Pike & Fruitville Road
- » Ridge Pike & Penn Road/Futura Road
- » Evergreen Road & Rt. 422 WB On-Ramp
- » Sanatoga Road & Evergreen Road
- » Sanatoga Road & Possum Hollow Road
- » Sanatoga Road & Longview Road
- » Lightcap Road & Possum Hollow Road
- » Airport Road & Lightcap Road
- » Main Street & Church Road
- » Church Road & Longview Road
- » Main Street & Longview Road
- » Main Street & Limerick Center Road

Transportation Service Area Two:

Signalized Intersections:

- » Swamp Pike & Neiffer Road
- » Ridge Pike & Swamp Pike/Lewis Road
- » Ridge Pike & East Arcadia Drive
- » Ridge Pike & Limerick Road
- » Royersford Road & Linfield-Trappe Road
- » Township Line Road & Buckwalter Road
- » Township Line Road & Rt. 422 WB Ramps
- » Township Line Road & Rt. 422 EB Ramps
- » Ridge Pike & Kugler Road/Limerick Center Road

Unsignalized Intersections:

- » Swamp Pike & Kugler Road
- » Swamp Pike & Zeigler Road
- » Ridge Pike & Royersford Road
- » Lewis Road & Country Club Road/King Road
- » Linfield-Trappe Road & Country Club Road
- » Lewis Road & Benner Road

Existing Traffic Volumes

Manual turning movement counts were conducted by TPD from 4:00 P.M. to 6:00 P.M., or what is commonly referred to as the afternoon peak travel time. A growth factor of 0.24% per year was applied to all manual counts to account for growth that may have occurred from the time the counts were conducted until 2031. The growth factor was obtained from the PennDOT Bureau of Planning and Research. The manual traffic count sheets are included in **Appendix A. Tables 1 and 2** below list the dates of the manual counts for TSA 1 and TSA 2, respectively. The 2021 Existing Condition traffic volumes for the weekday P.M. Peak Hour are shown in **Figures 3A and 3B**.

Table 1
TSA 1 Manual Traffic Counts

INTERSECTION	DATE OF P.M. COUNT
Lewis Road & Linfield-Trappe Road/ Rt. 422 EB On-Ramp	March 2, 2021
Lewis Road & Rt. 422 WB Ramps	March 2, 2021
Lewis Road & Linfield-Trappe Road/Pottstown Honda Driveway	March 2, 2021
Lewis Road & Rt. 422 EB Off-Ramp	March 2, 2021
Ridge Pike & Neiffer Road	March 4, 2021
Ridge Pike & Airport Road	March 4, 2021
Ridge Pike & Fruitville Road	March 4, 2021
Ridge Pike & Penn Road/Futura Road	March 4, 2021
Ridge Pike & Evergreen Road/Rupert Road	March 4, 2021
Evergreen Road & Rupert Road/Rt. 422 Westbound Off-Ramp	March 4, 2021
Evergreen Road & Rt. 422 WB On-Ramp	March 4, 2021
Evergreen Road & Rt. 422 EB Ramps	March 4, 2021
Evergreen Road & Lightcap Road	March 4, 2021
Sanatoga Road & Evergreen Road	March 4, 2021
Sanatoga Road & Possum Hollow Road	March 4, 2021
Sanatoga Road & Longview Road	March 4, 2021
Lightcap Road & Possum Hollow Road	March 4, 2021
Airport Road & Lightcap Road	March 4, 2021
Main Street & Church Road	March 4, 2021
Church Road & Longview Road	March 4, 2021
Main Street & Longview Road	March 4, 2021
Main Street & Limerick Center Road	March 4, 2021

Table 2
TSA 2 Manual Traffic Counts

INTERSECTION	DATE OF P.M. COUNT
Swamp Pike & Neiffer Road	March 2, 2021
Swamp Pike & Kugler Road	March 2, 2021
Swamp Pike & Zeigler Road	March 2, 2021
Ridge Pike & Swamp Pike/Lewis Road	March 2, 2021
Ridge Pike & East Arcadia Drive	March 2, 2021
Ridge Pike & Limerick Road	March 2, 2021
Ridge Pike & Royersford Road	March 2, 2021
Royersford Road & Linfield-Trappe Road	March 2, 2021
Township Line Road & Buckwalter Road	March 2, 2021
Township Line Road & Rt. 422 WB Ramps	March 2, 2021
Township Line Road & Rt. 422 EB Ramps	March 4, 2021
Lewis Road & Country Club Road/King Road	March 2, 2021
Linfield-Trappe Road & Country Club Road	March 2, 2021
Lewis Road & Benner Road	March 2, 2021
Ridge Pike & Kugler Road/Limerick Center Road	March 4, 2021

Count Adjustment

Due to COVID-19, traffic volumes are generally not representative of “typical traffic conditions”. To account for lower traffic volumes, TPD increased the existing volumes by 10% during the P.M. peak hour.

PLANNED IMPROVEMENTS

Planned Improvements on the PennDOT Twelve Year Transportation Program

Based on a review of the Pennsylvania Transportation Improvement Program (TIP), there are programmed roadway improvements along Linfield Road north of Ferndale Lane. The planned improvements include the rehabbing the existing bridge north of the intersection.

VOLUME DEVELOPMENT METHODOLOGY

Study Year

Section 504-A(c)(2)(ii) of the MPC stipulates that the Land Use Assumptions Report and Roadway Sufficiency Analysis report should analyze projected growth in the Township “over a period of at least the next five years”. In compliance with the legislation, a study year of 2031, the next 10 years, was selected.

Volume Development Overview

As stipulated in the MPC, the calculation of a traffic impact fee for a municipality can only be based on improvements needed to accommodate future development in the TSA. This means that the costs associated with improvements which are necessary to remedy deficiencies due to the following traffic **cannot be included** in the calculation of the traffic impact fee:

- » Existing traffic;
- » Future growth due to increased traffic passing thru the municipality (pass-thru traffic);
- » Traffic due to growth in the municipality that is not within the specific TSA being studied;

- » Traffic due to developments that had preliminary or tentative applications for land development, subdivision or PRD with the municipality on or before the first publication of the municipality's intention to adopt an impact fee ordinance (MPC Section 505-A(c)(2)).

In order to determine the improvements, which are necessary to remedy LOS deficiencies due to each scenario separately, it was necessary to develop volumes in the following order:

1. 2021 Existing Conditions;
2. 2031 Base Conditions which include the following:
 - » Future growth due to increased traffic passing thru the municipality (pass-thru traffic);
 - » Traffic due to growth in the municipality that is not within the TSA;
 - » Traffic due to developments that had preliminary or tentative applications for land development, subdivision, or PRD with the municipality on or before the first publication of the municipality's intention to adopt an impact fee ordinance (MPC Section 505-A(c)(2));
3. 2031 Projected Conditions that are equal to the 2031 Base Conditions plus traffic from all "new" projected developments in the TSA.

Pass Through Traffic

The PennDOT Bureau of Planning and Research (BPR) recommends utilizing an annual growth percentage of 0.24% per year for Montgomery County. According to the BPR, growth values were determined utilizing an average of the last 9 years of growth information and comparing it to an average calculated from 9 years of historical growth. These rates account for growth in traffic passing thru an area plus growth due to nearby future developments.

Approved Development Trip Generation

Table 3 from the Land Use Assumptions Report (included in **Appendix B**) summarizes all major developments that are approved and proposed within the Township. **Table 4** from the Land Use Assumptions Report (included in **Appendix B**) summarizes all additional development that is projected to occur in the TSA in the next ten years. Because the Township has an existing traffic impact fee ordinance, all developments presented in **Appendix B** are categorized as projected developments if they fall within one of the two proposed Transportation Service Areas.

Trip generation rates for these base developments were obtained from the manual Trip Generation, Tenth Edition, 2017, an Institute of Transportation Engineers (ITE) Informational Report. The statistics in Trip Generation are empirical data based on more than 4,800 trip generation studies. The data are categorized by Land Use Codes, with total vehicular trips for a given land use estimated using an independent variable and statistically generated rates or equations. More detailed trip generation data is contained in **Appendix C**, which is available at the Township administration office.

Table 3
P.M. Peak Hour Trip Generation
Base Development

LAND USE CODE	LAND USE	TOTAL UNITS/SIZE	P.M. PEAK HOUR		
			ENTER	EXIT	TOTAL
RESIDENTIAL					
210	Single Family Detached	55 units	35	19	54
220	Multifamily Housing – Low Rise	255 units	96	52	148
255	Continuing Care Retirement Community	274 units	17	27	44
Total Residential Trips			148	98	246
OFFICE/INDUSTRIAL					
140	Manufacturing	35.129 ksf	8	18	26
150	Warehousing	19.224 ksf	1	3	4
110	General Light Industrial	130.95 ksf	1	1	2
Total Office/Industrial Trips			10	22	32
COMMERCIAL/MIXED USE					
820	Shopping Center	90.156 ksf	104	115	219
Local Data	Building Materials and Lumber Store	63.143 ksf	30	29	59
022	General Aviation Airport	29 employees	25	21	46
Local Data	Soccer Complex	4 fields	17	9	26
930	Fast Casual Restaurant	4.1 ksf	17	12	29
Total Other Trips			193	186	379
TOTAL BASE DEVELOPMENT TRIPS			351	306	657

Approved Development Trip Distribution

Trips generated by the base developments were distributed according to the methodology described in the section “2031 Projected Development Trip Distribution”. The trip distributions for the base developments were entered into the volume development worksheets, which are included in **Appendix D**.

2031 Base Condition Volume Development

In order to develop 2031 Base Condition traffic volumes, the trips due to pass-thru traffic and the base developments were added to the 2021 Existing Condition traffic volumes. Additionally, trips generated by all projected developments outside of the Transportation Service Area being evaluated were included in 2031 Base Condition traffic volumes. For example, if an intersection is located in TSA 1, then any traffic at the intersection generated by developments in TSA 2 was included in 2031 Base Condition traffic volumes at the intersection. The 2031 Base Condition P.M. peak hour traffic volumes are shown in **Figure 4**, and the volume worksheets are included in **Appendix D**.

2031 Projected Development Trip Generation

From the list of developments presented in **Appendix B**, all projected developments located in TSA 1 are summarized in **Table 4**, and all projected developments located in TSA 2 are summarized in **Table 5**. These developments were included in the Projected Condition analyses. More detailed trip generation is contained in **Appendix C**.

Trip generation rates for these projected developments were obtained from the Trip Generation manual, 10th Edition, 2017, an Institute of Transportation Engineers (ITE) informational report. For the purposes of this study, only new trips were considered unless a proposed development that typically has pass-by trips is located on a corner of an intersection that is included in the study. Pass-by trips were included for the corner sites because pass-by trips can affect turning volumes at intersections by providing a means for vehicles to “cut-through” the site. Pass-by trips were not treated as new trips for sites located mid-block or at intersections that were not included in the study, because volumes at the study intersections will not be affected by these trips.

Table 4
P.M. Peak Hour Trip Generation
Projected Development – TSA 1

LAND USE CODE	LAND USE	TOTAL UNITS/SIZE	P.M. PEAK HOUR		
			ENTER	EXIT	TOTAL
RESIDENTIAL					
210	Single Family Detached	79 units	51	30	81
220	Multifamily Housing – Low Rise	53 units	12	9	21
Total Residential Trips			63	39	102
OFFICE/INDUSTRIAL					
110	Light Industrial	978 ksf	63	417	480
710	General Office	806 ksf	139	733	872
Total Office/Industrial Trips			202	1150	1352
COMMERCIAL/MIXED USE					
820	Shopping Center	353 ksf	417	455	872
840	New Car Sales	34 ksf	33	50	83
Total Commercial/Mixed Use Trips			450	505	955
TOTAL PROJECTED DEVELOPMENT TRIPS			715	1694	2409

Table 5
P.M. Peak Hour Trip Generation
Projected Development – TSA 2

LAND USE CODE	LAND USE	TOTAL UNITS/SIZE	P.M. PEAK HOUR		
			ENTER	EXIT	TOTAL
RESIDENTIAL					
210	Single Family Detached	215 units	139	83	222
251	Senior Adult Housing – Detached	350 units	78	50	128
Total Residential Trips			217	133	350
OFFICE/INDUSTRIAL					
710	General Office	200 ksf	33	184	217
Total Office/Industrial Trips			33	184	217
COMMERCIAL/MIXED USE					
820	Shopping Center	265 ksf	311	333	644
Total Commercial/Mixed Use Trips			311	333	644
TOTAL PROJECTED DEVELOPMENT TRIPS			561	650	1211

2031 Projected Development Trip Distribution

The distribution and assignment of new trips generated by each of the identified developments was based upon an analysis of the following: (1) existing traffic patterns and distributions within the study area; (2) available routes for travel; and (3) the possible site driveway locations. For the residential and non-residential portions of each proposed development, a gravity model analysis was performed using the latest available census data. The origins of commuters traveling to Limerick Township for employment and destinations of workers who live in the township were determined from the Census data. Travel routes were then determined to/from each of the surrounding municipalities. Distribution percentages were calculated for each of the travel routes by determining the percentage of vehicles using each route to/from the surrounding municipalities. The result of this analysis was the directional distribution chart shown in **Table 6**, which was used for the distribution of primary trips to/from the future developments. The assignment of trips within the local roadway network was based upon the proposed use of the site and driveway locations. The gravity model information is included in **Appendix D**.

Table 6
Trip Distribution Percentages

Direction - To/From	Assignment (To/From)	Distribution Percentage	
		Non-Residential Portion	Residential Portion
East	via Ridge Pike	4%	10%
	via Linfield-Trappe Road	1%	1%
	via Buckwalter Road	1%	1%
	via Graterford Road	0%	1%
	via Route 422	27%	64%
West	via Sanatoga Road	1%	0%
	via Route 422	23%	5%
	via Ridge Pike	20%	5%
	via Swamp Pike	9%	0%
North	via Township Line Road	1%	7%
South	via Walnut Street	8%	3%
	via Linfield-Trappe Road	5%	3%

The trip distributions for the projected developments were entered into the volume development worksheets, which are included in **Appendix D**.

2031 Projected Condition Volume Development

To simplify the distribution of traffic, it was assumed all new traffic generated by developments would originate or be destined to locations outside of the TSA boundaries.

In order to develop 2031 Projected Condition traffic volumes, the trips generated by the projected developments with adjustments were added to the 2031 Base Condition traffic volumes. The 2031 Projected Condition P.M. peak hour traffic volumes are shown in **Figure 5** and the volume worksheets in **Appendix D**.

LEVELS OF SERVICE (LOS) FOR AN INTERSECTION

For analysis of intersections, level of service is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. LOS criteria is stated in terms of control delay per vehicle for a one-hour analysis period. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The criteria are shown in **Table 7**. Delay, as it relates to level of service, is a complex measure and is dependent upon a number of variables. For signalized intersections, these variables include the quality of vehicle progression, the cycle length, the green time ratio, and the volume/capacity ratio for the lane group in question. For unsignalized intersections, delay is related to the availability of gaps in the flow of traffic on the major street and the driver's discretion in selecting an appropriate gap for a particular movement from the minor street (straight across, left or right turn).

Table 7
Level of Service Criteria
Unsignalized and Signalized Intersections¹

Level of Service	Control Delay Per Vehicle (Seconds)	
	Signalized	Unsignalized
A	< 10	< 10
B	> 10 and < 20	> 10 and < 15
C	> 20 and < 35	> 15 and < 25
D	> 35 and < 55	> 25 and < 35
E	> 55 and < 80	> 35 and < 50
F	> 80 or v/c > 1.0	> 50 or v/c > 1.0

¹ Obtained from Exhibits 19-8, 19-9, 20-2, and 20-3 of the Transportation Research Board's *Highway Capacity Manual*, 6th Edition

It is important to understand that the level of service criteria outlined in **Table 7** represent merely a guideline for quantifying the acceptability of delay to drivers, which is highly subjective and varies from region to region, usually according to the intensity of development in an area. A more universal measure of acceptability to drivers is the number of cycles (the time it takes for the signal to go through all of its phases one time) through which they must wait before proceeding through an intersection. In general, if a driver is able to proceed through a signalized intersection within one complete cycle of the signal, the delay experienced is usually considered acceptable.

PREFERRED LEVEL OF SERVICE (LOS)

The MPC requires that the traffic impact fee advisory committee adopt a preferred LOS for the TSA. A preferred LOS D was established for the Limerick Township TSA 1 and TSA 2.

In each of the conditions (2021 Existing, 2031 Base, and 2031 Projected), each intersection approach, each lane group and the overall intersection that is analyzed must operate at the preferred LOS or better. If an intersection approach, lane group or the overall intersection did not operate at the preferred LOS or better, improvements were identified in order to return the intersection approach, lane group or the preferred LOS. Improvements necessary to bring the Existing Conditions and 2031 Base Conditions to the preferred LOS are the responsibility of the Township. Impact fees in a TSA can be used only for improvements needed to accommodate the 2031 Projected Condition traffic volumes within the TSA.

CAPACITY ANALYSIS METHODOLOGY

The goal of the Roadway Sufficiency Analysis Report is to determine what roadway improvements will be needed in the next ten years in order to accommodate the level of growth that was projected in the Land Use Assumptions report. In order to determine the level of improvements due to "new" development, capacity analyses were conducted for the P.M. peak hour conditions at the study area intersections.

These analyses were conducted according to the methodologies contained in the *Highway Capacity Manual*, 6th Edition (HCM) using *Synchro 10* software, a Trafficware product. The following conditions were analyzed, as applicable:

- » Existing Conditions – Figure 6;
- » Existing Conditions with improvements – Figure 7;
- » 2031 Base Conditions – Figure 8;
- » 2031 Base Conditions with improvements – Figure 9;
- » 2031 Projected Conditions – Figure 10;
- » 2031 Projected Conditions with improvements – Figure 11.

The capacity analysis worksheets are included in **Appendix E**.

CAPACITY ANALYSIS RESULTS

Existing Condition

The results of the Existing Condition capacity analyses are shown in **Figures 6A and 6B**. As shown in **Figures 6A and 6B**, several movements do not operate at the preferred level of service.

Existing Condition with Improvements

A detailed description of the improvements needed to bring these deficient movements up to the preferred level of service or better are listed in **Tables 8 and 9** for TSA 1 and TSA 2, respectively. The new LOS with improvements are shown in **Figures 7A and 7B**.

2031 Base Condition

The results of the 2031 Base Condition capacity analyses are shown in **Figures 8A and 8B**. Note that the improvements that were identified in the Existing Condition with improvements are assumed to be completed and are included in the 2031 Base Condition analyses. As shown in **Figures 8A and 8B**, several movements do not operate at the preferred level of service.

2031 Base Condition w/ Improvements

A detailed description of the improvements needed to bring these deficient movements up to the preferred level of service or better are listed in **Tables 8 and 9** for TSA 1 and TSA 2, respectively. The new LOS with improvements are shown in **Figures 9A and 9B**.

2031 Projected Condition

The results of the 2031 Projected Condition capacity analyses are shown in **Figures 10A and 10B**. Note that the improvements that were identified in the 2031 Base Conditions with improvements are assumed to be completed and are included in the 2031 Projected Condition analyses. As shown in **Figures 10A and 10B**, several movements do not operate at the preferred level of service.

2031 Projected Condition w/ Improvements

A detailed description of the improvements needed to bring these deficient movements up to the preferred level of service or better are listed in **Tables 8 and 9** for TSA 1 and TSA 2, respectively. The new LOS with improvements are shown in **Figures 11A and 11B**.

Table 8
Improvement Summary – TSA 1

Intersection	2021 Existing Conditions	2031 Base Conditions	2031 Projected Conditions
Swamp Pike & Neiffer Road	--	Retime Signal	--
Swamp Pike & Kugler Road	Signalize	--	--
Swamp Pike & Ziegler Road	Signalize	--	--
Ridge Pike & Swamp Pike/Lewis Road	Retime Signal	--	--
Ridge Pike & East Arcadia Drive	--	Retime Signal	--
Ridge Pike & Limerick Center Road/Kugler Road	--	--	Add NBL lane
Ridge Pike & Neiffer Road	--	Signalize	Add channelized SBR lane
Ridge Pike & Airport Road	--		Realign Intersections
Ridge Pike & Fruitville Road	--		
Ridge Pike & Penn Road/Futura Road	Signalize		Restripe WB approach to provide WBLT/WBTR
Ridge Pike & Evergreen Road/Rupert Road	--	Retime Signal	Retime Signal
Evergreen Road & 422 WB Off Ramp	Restripe SB approach to provide SB L/R, R turn lane	--	Add EBL, NBL lanes
Evergreen Road & 422 WB On Ramp	--	--	--
Evergreen Road & 422 EB Ramps	--	--	Realign EB Off-Ramp to act as west leg of intersection
Evergreen Road & Lightcap Road	--	--	--
Sanatoga Road & Evergreen Road	--	--	--
Sanatoga Road & Possum Hollow Road	--	--	--
Sanatoga Road & Longview Road	--	--	--
Lightcap Road & Possum Hollow Road	--	--	--
Airport Road & Lightcap Road	--	--	--
Main Street & Church Road	Add WB Limerick Center Road traffic	--	Signalize with Main Street/Limerick Center Road
Church Road & Longview Road	--	--	--
Main Street & Longview Road	--	--	Signalize
Main Street & Limerick Center Road	Eliminate WB approach	--	Signalize with Main Street/Church Road

Table 9
Improvement Summary – TSA 2

Intersection	2021 Existing Conditions	2031 Base Conditions	2031 Projected Conditions
Ridge Pike & Limerick Road	Retime Signal	--	Add WBT lane
Ridge Pike & Royersford Road	--	Channelize NBR	Signalize
Royersford Road & Linfield Trappe Road	Retime Signal	Retime Signal	Realign intersection
Township Line Road & Buckwalter Road	--	--	Add SBR lane
Township Line Road & 422 WB Ramps	--	--	--
Township Line Road & 422 EB Ramps	--	--	--
Lewis Road & King Road/Country Club Road	Signalize	--	--
Linfield Trappe Road & Country Club Road	--	--	--
Lewis Road & Benner Road	--	--	Signalize
Lewis Road & Linfield Trappe Road/422 EB On Ramp	--	Retime Signal	Add EBL lane
Lewis Road & 422 WB Ramps	--	--	Add NBL lane
Lewis Road & Linfield Road	--	--	--
Lewis Road & 422 EB Off Ramp	--	--	--

IMPROVEMENTS

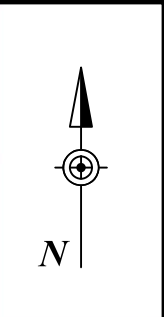
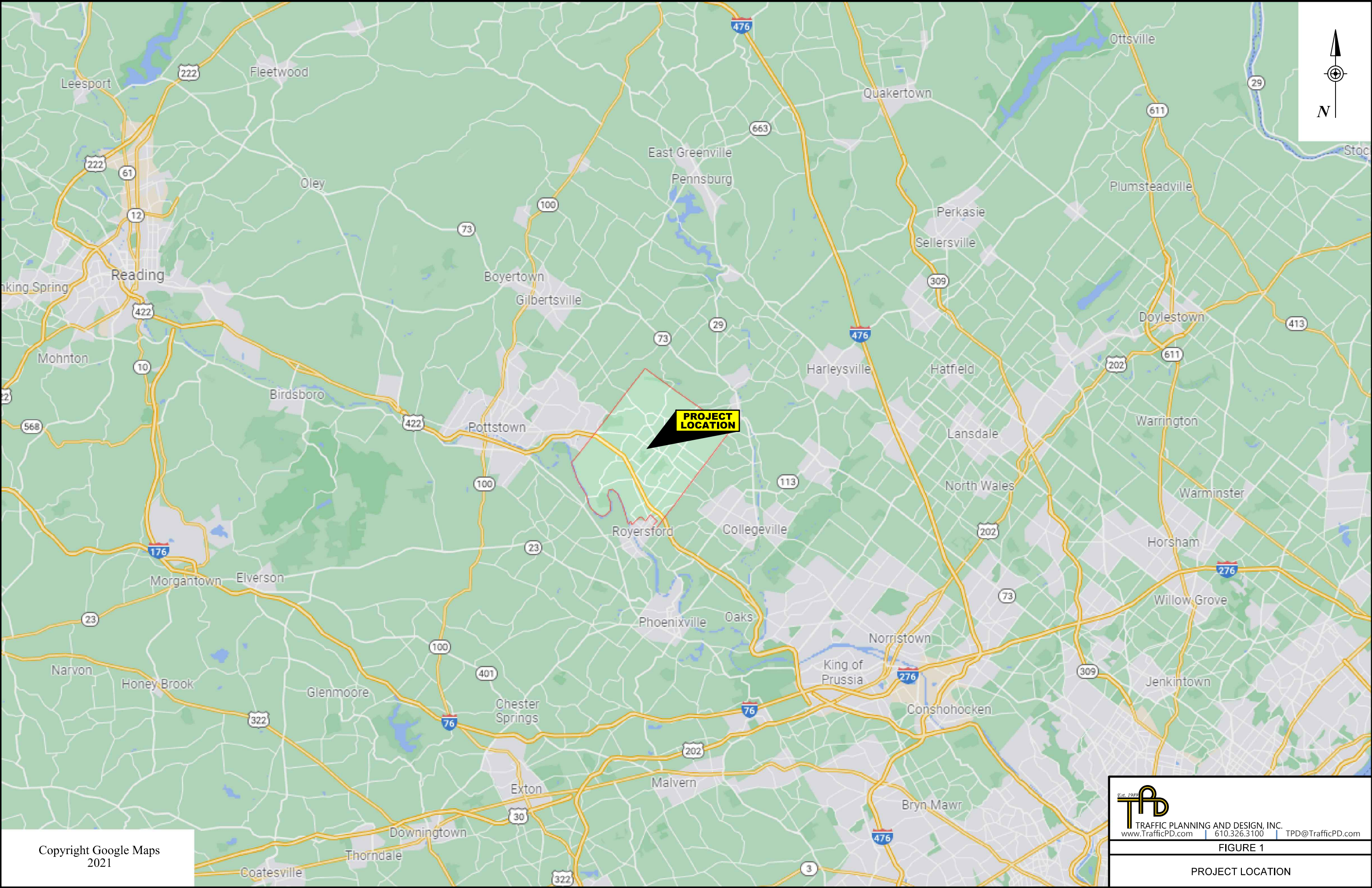
Based on the results of the Roadway Sufficiency Analysis, many improvements have been identified.

The next step in adopting a traffic impact fee ordinance is to develop a Capital Improvement Plan (CIP), which will provide cost estimates and list the potential funding sources for the improvements identified in this roadway sufficiency analysis and provide a schedule of implementation.

The funding collected through traffic impact fees cannot be used to fund improvements that have been identified to maintain the preferred level of service for each intersection approach, each lane group and the overall intersection for the Existing Conditions and for the 2031 Base Conditions. The fees will, however, be utilized to fund the improvements which are necessary to maintain the preferred level of service for the 2031 Projected Conditions, which includes the traffic that will be generated by "new" development within Limerick Township in the next ten years.

The improvements that will be necessary to maintain the preferred LOS for Existing Conditions, 2031 Base Conditions, and 2031 Projected Conditions are listed in Tables 8 and 9. Note that only the improvements needed for 2031 Projected Conditions can be funded by the traffic impact fees collected.

The next step that will be taken in order to adopt the traffic impact fee is the preparation of the CIP. Cost estimates, a list of recommended funding sources, and an implementation schedule will be provided in the CIP. The traffic impact fee to be collected for each new P.M. peak hour trip generated by new developments in the Limerick Township TSA will also be calculated in the CIP.



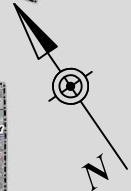
**PROJECT
LOCATION**

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FIGURE 1

PROJECT LOCATION



Legend

- : TSA 1
- : TSA 2

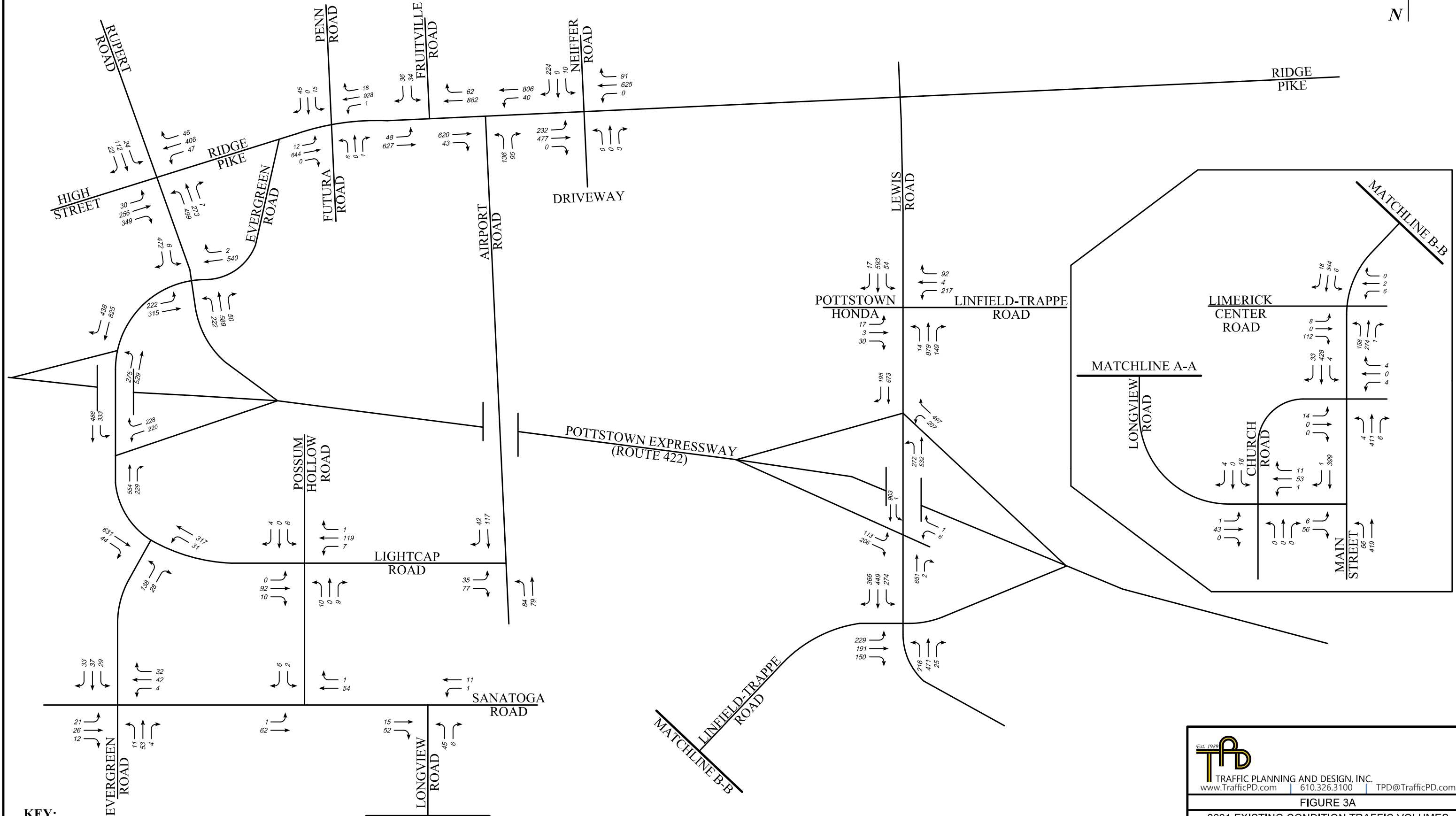
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FIGURE 2

TSA LOCATIONS



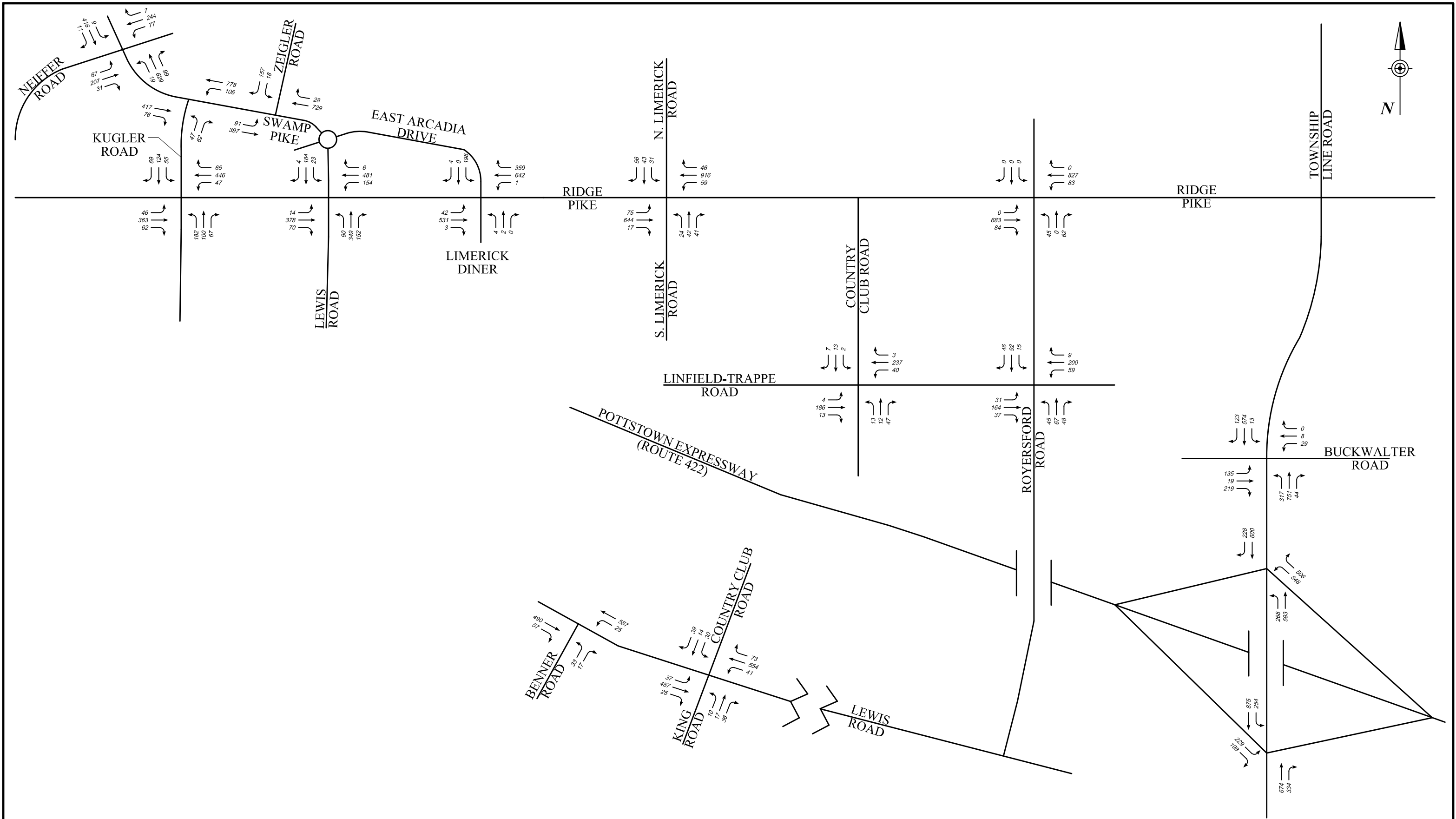
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FIGURE 3A

2021 EXISTING CONDITION TRAFFIC VOLUMES
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 1

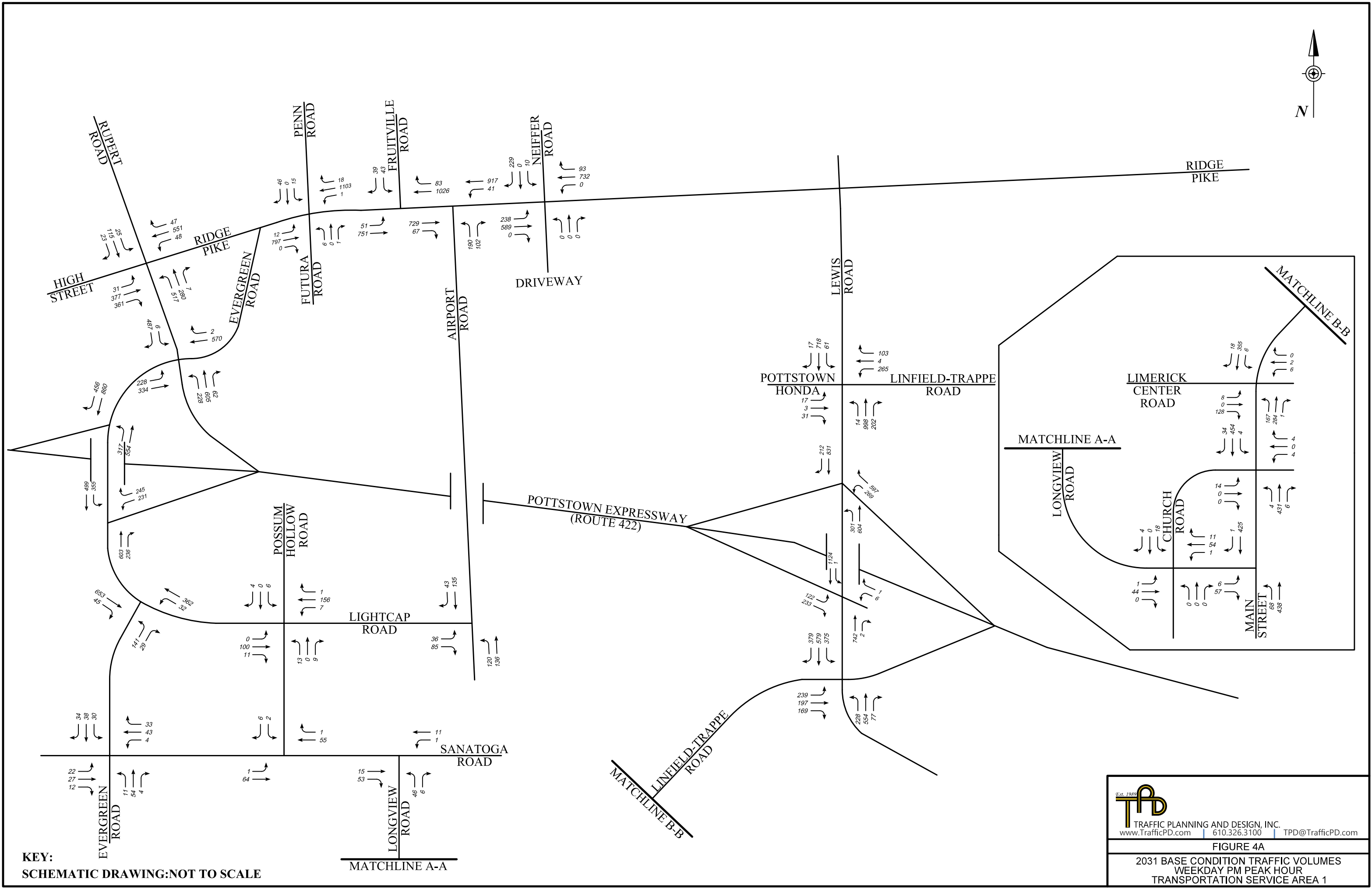
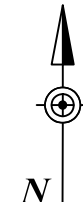





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FIGURE 3B

2021 EXISTING CONDITION TRAFFIC VOLUMES
 WEEKDAY PM PEAK HOUR
 TRANSPORTATION SERVICE AREA 2

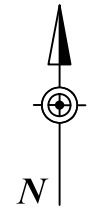
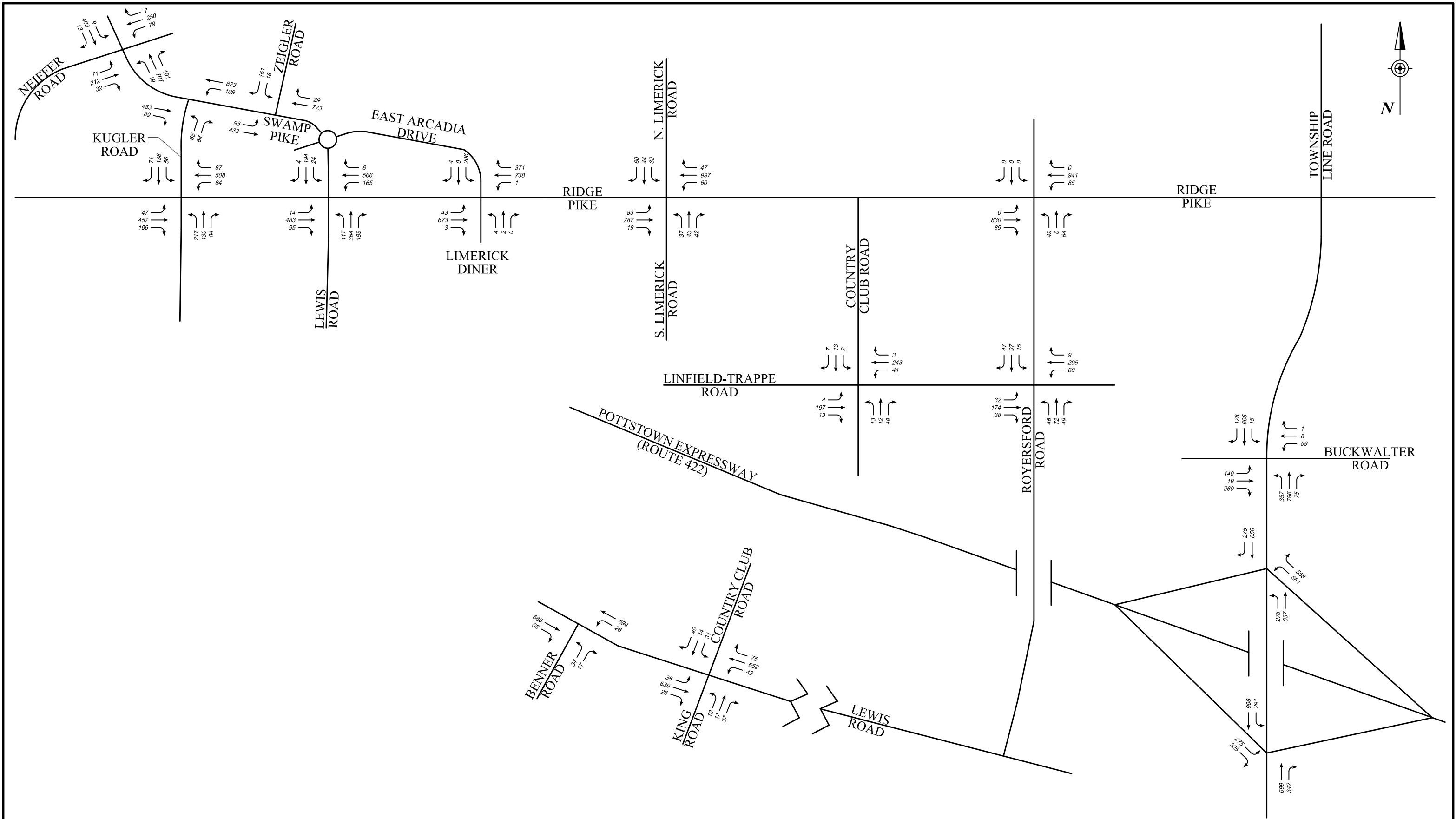





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FIGURE 4A

2031 BASE CONDITION TRAFFIC VOLUMES
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 1

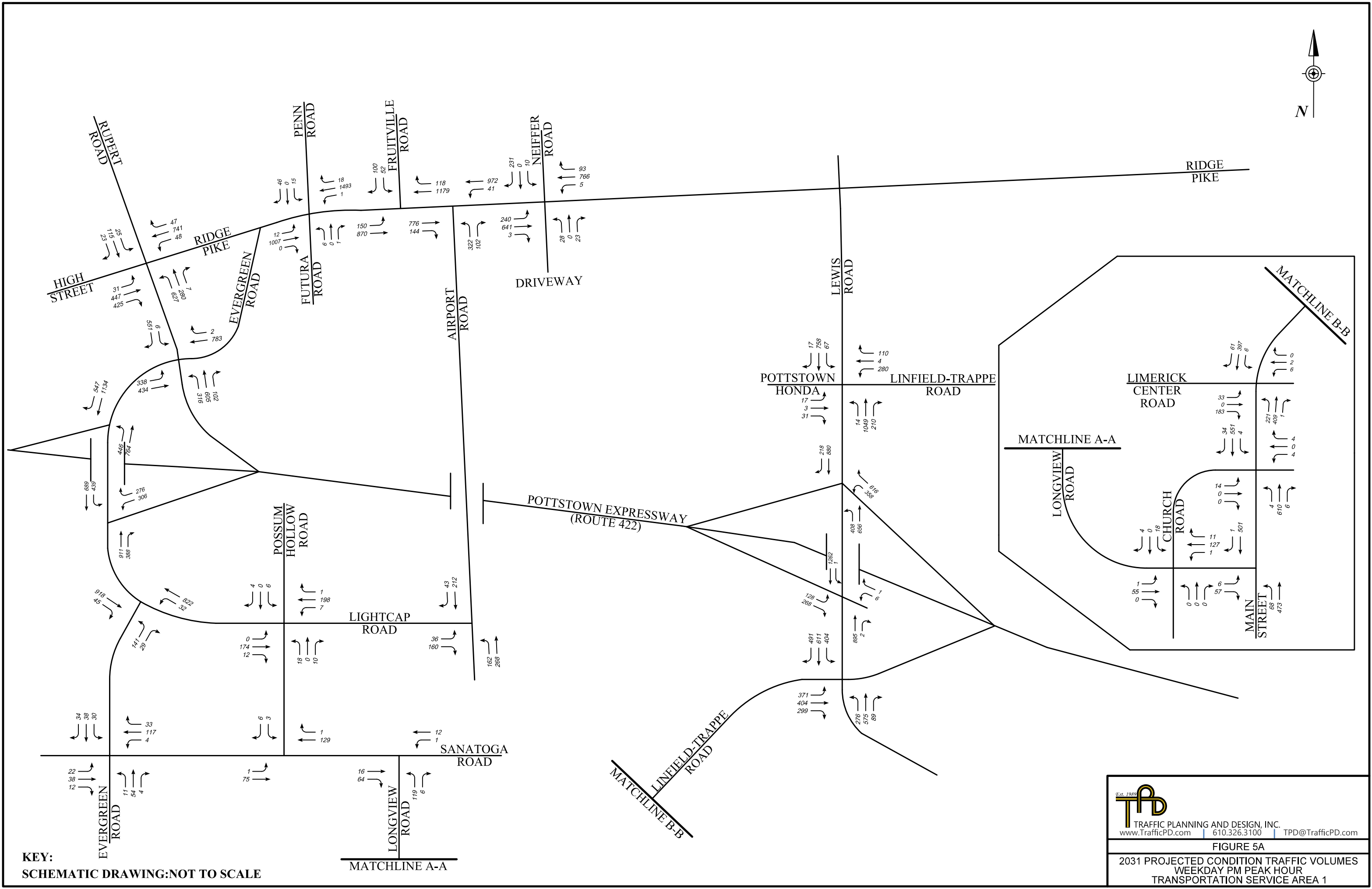
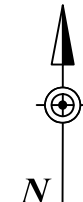





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FIGURE 4B

2031 BASE CONDITION TRAFFIC VOLUMES
 WEEKDAY PM PEAK HOUR
 TRANSPORTATION SERVICE AREA 2



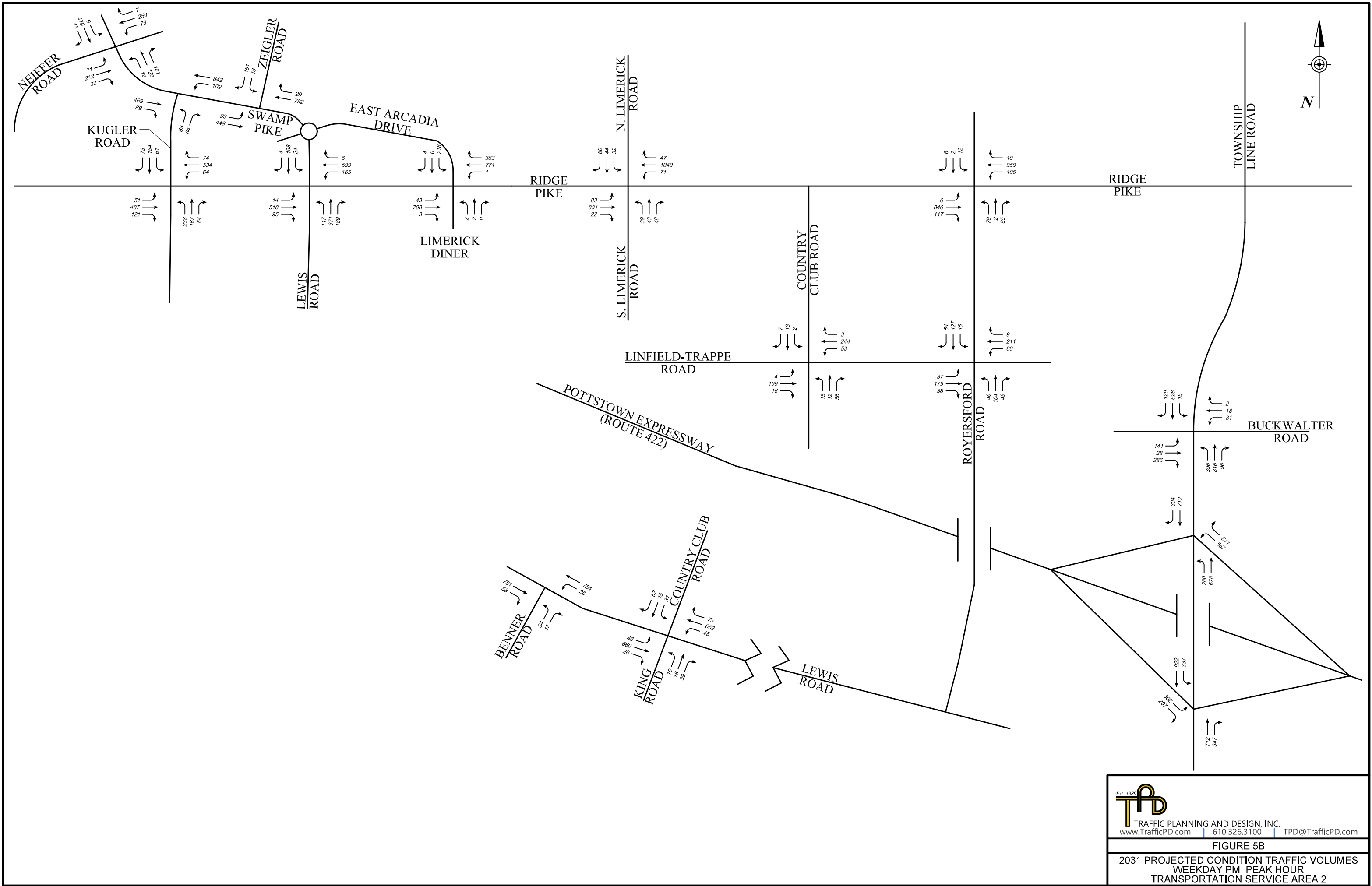
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FIGURE 5A

2031 PROJECTED CONDITION TRAFFIC VOLUMES
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 1

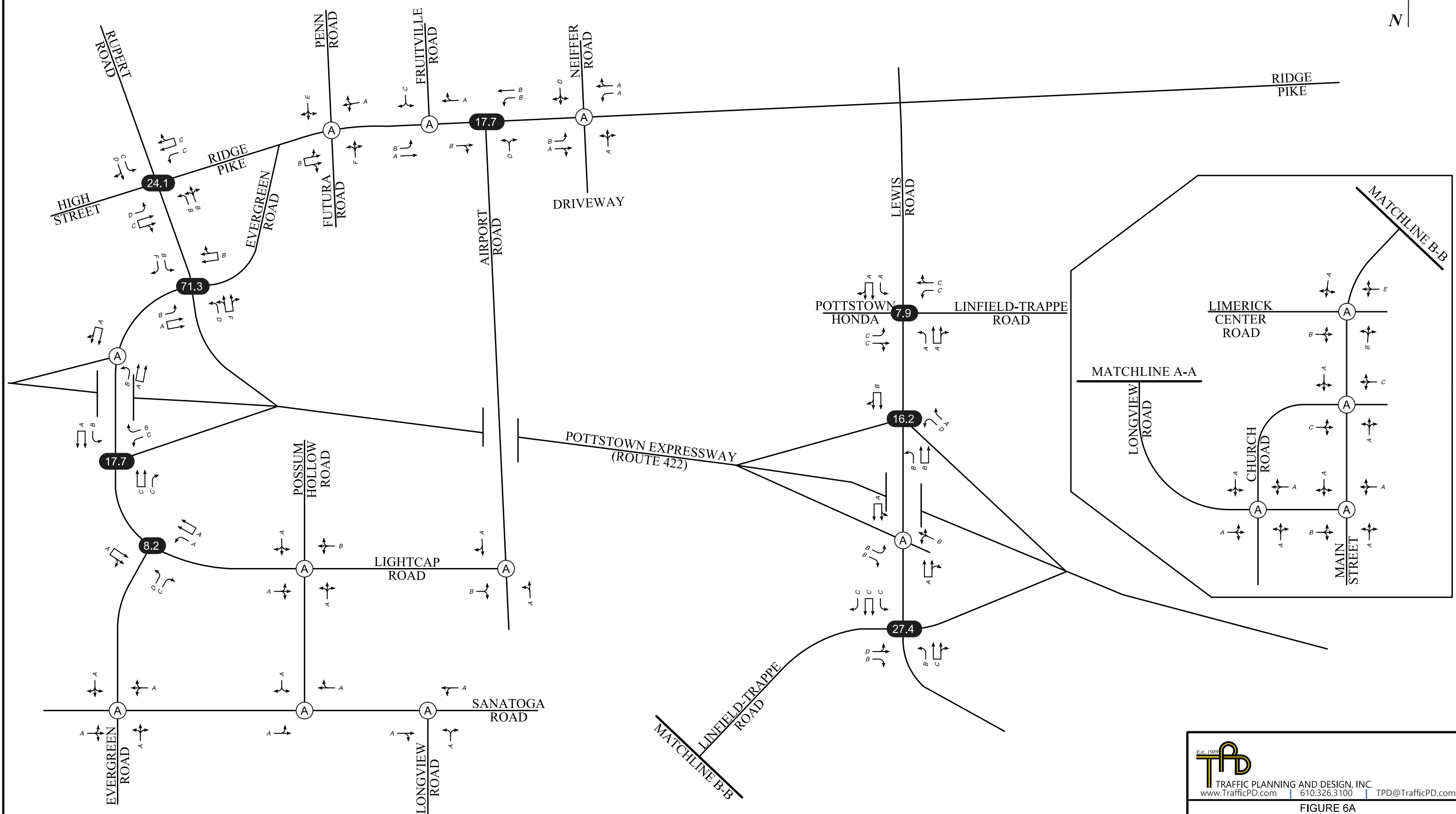
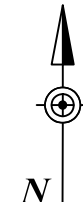





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FIGURE 5B

2031 PROJECTED CONDITION TRAFFIC VOLUMES
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 2



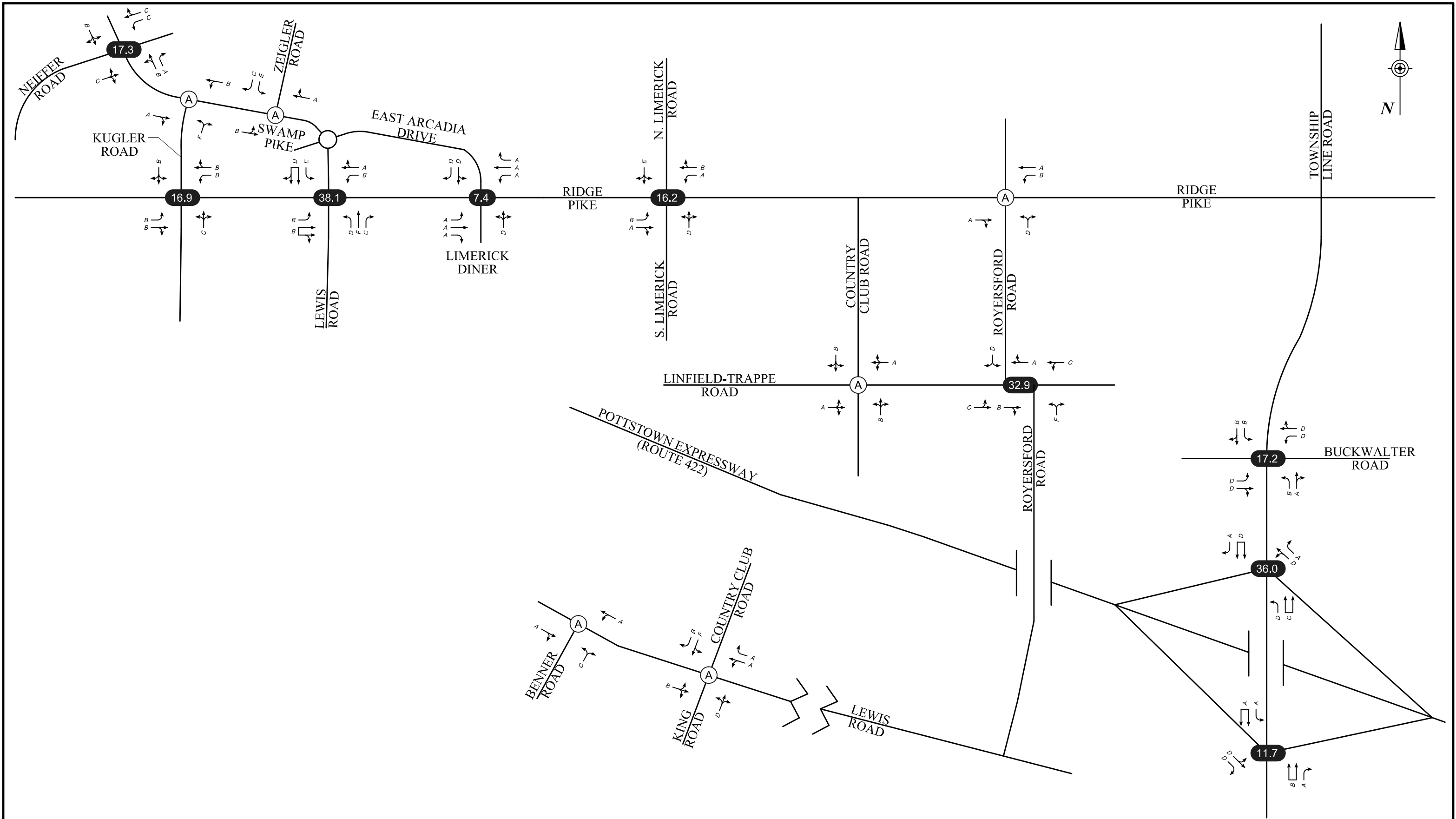
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FIGURE 6A

2021 EXISTING CONDITION
LEVELS OF SERVICE
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 1

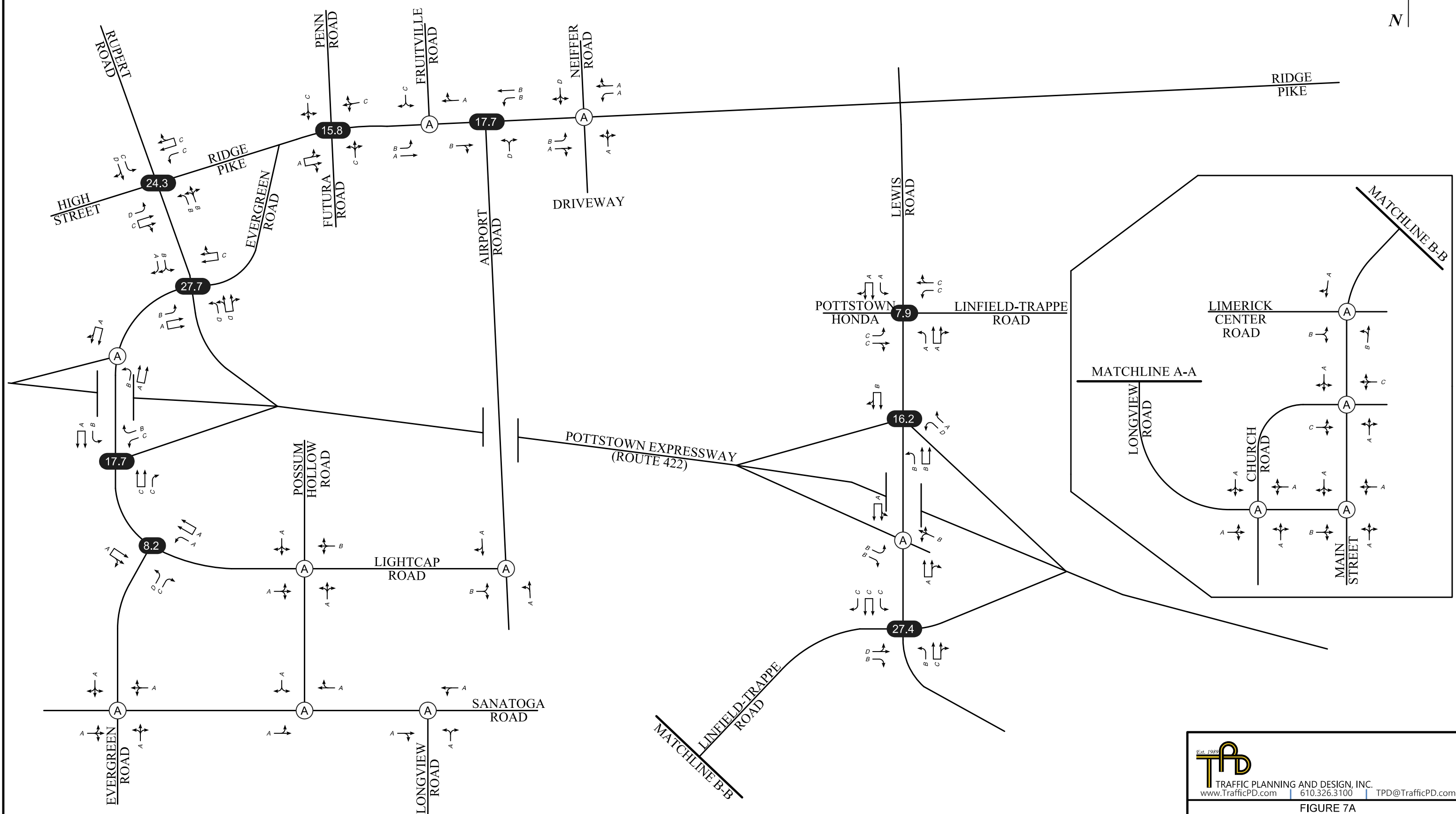
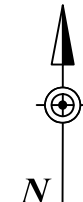





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FIGURE 6B

2021 EXISTING CONDITION
 LEVELS OF SERVICE
 WEEKDAY PM PEAK HOUR
 TRANSPORTATION SERVICE AREA 2



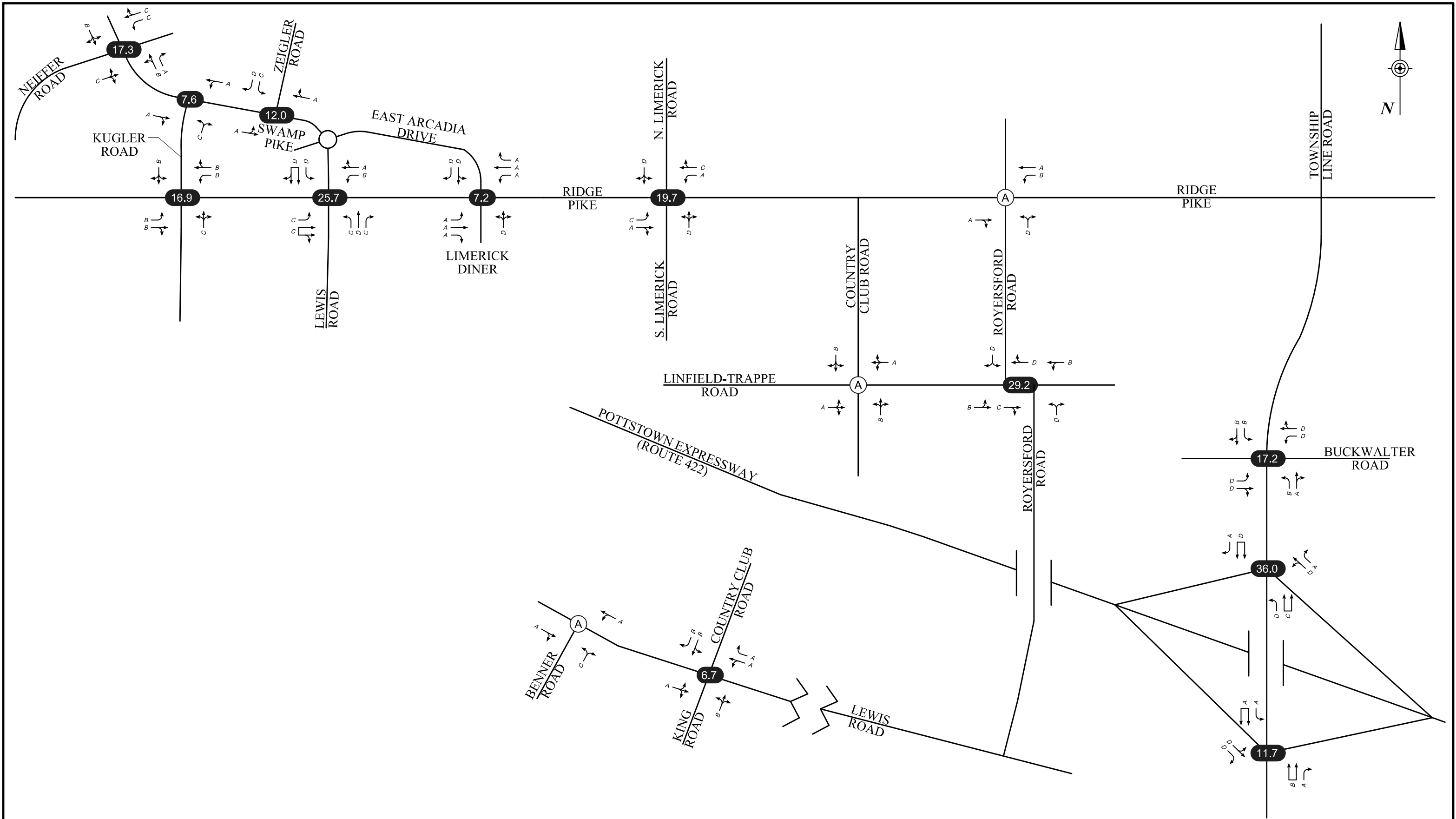
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FIGURE 7A

2021 EXISTING CONDITION WITH IMPROVEMENTS
LEVELS OF SERVICE
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 1

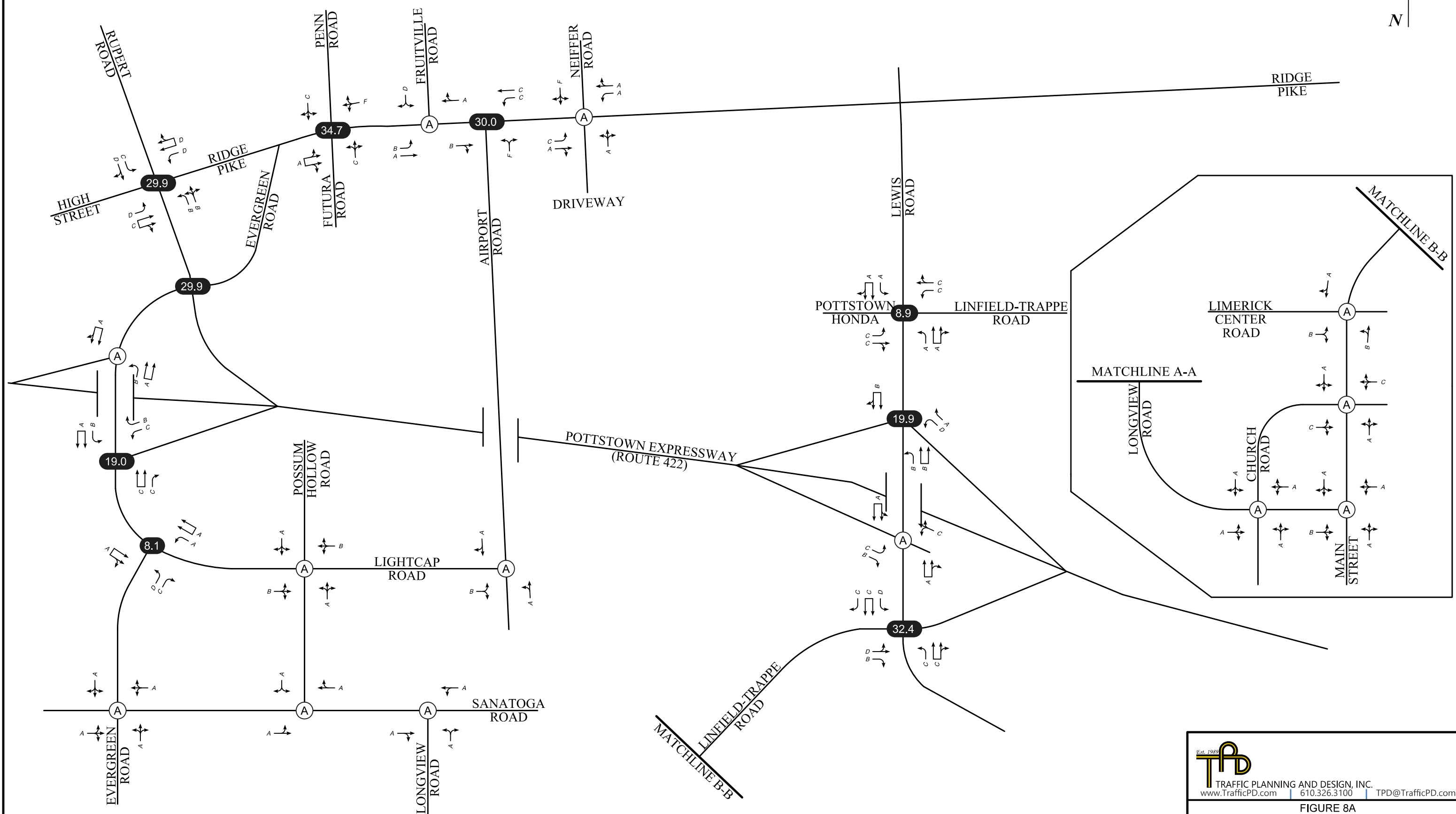
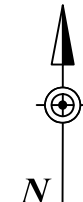





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FIGURE 7B

2021 EXISTING CONDITION WITH IMPROVEMENTS
 LEVELS OF SERVICE
 WEEKDAY PM PEAK HOUR
 TRANSPORTATION SERVICE AREA 2

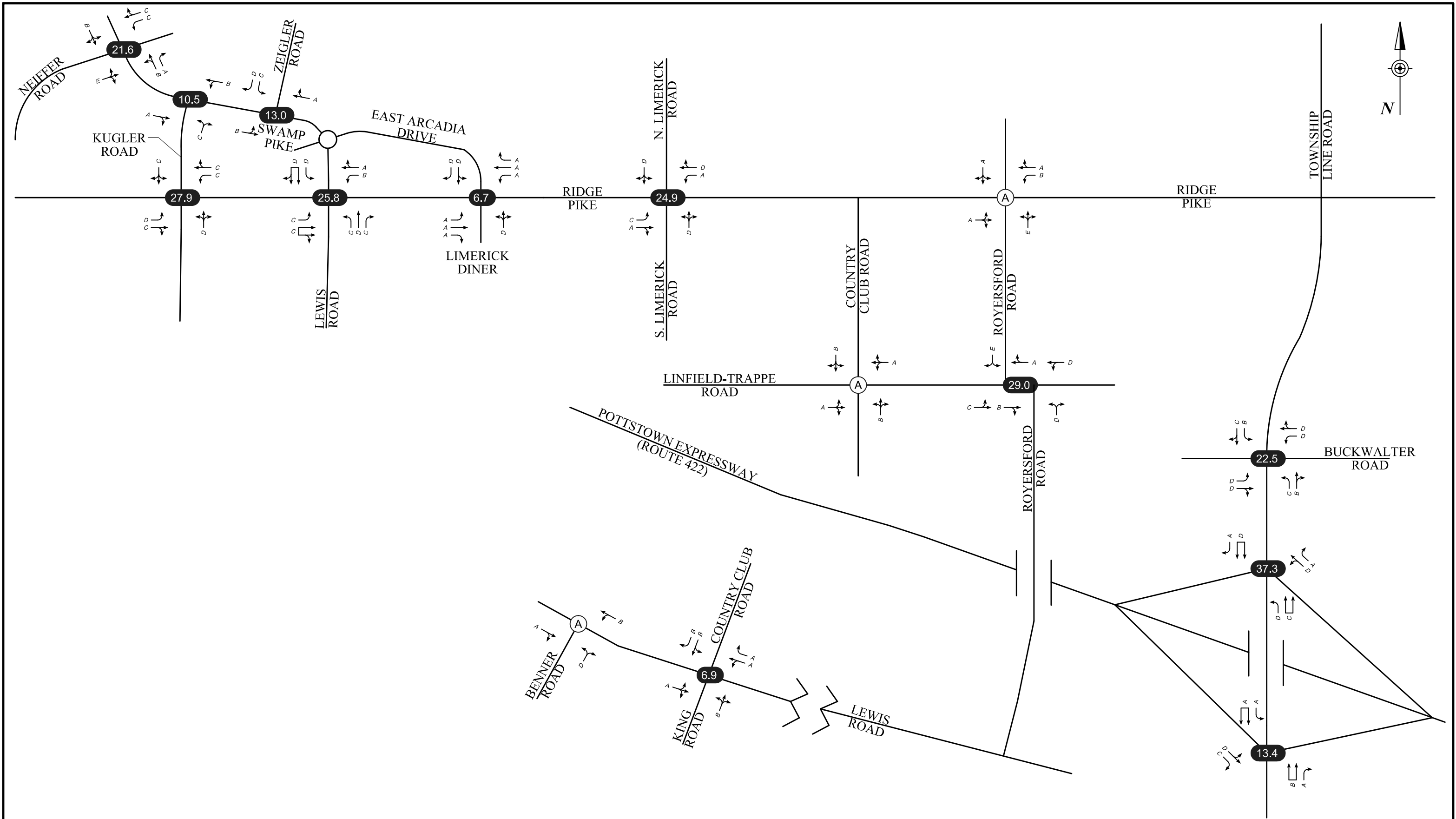





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FIGURE 8A

2031 BASE CONDITION
LEVELS OF SERVICE
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 1

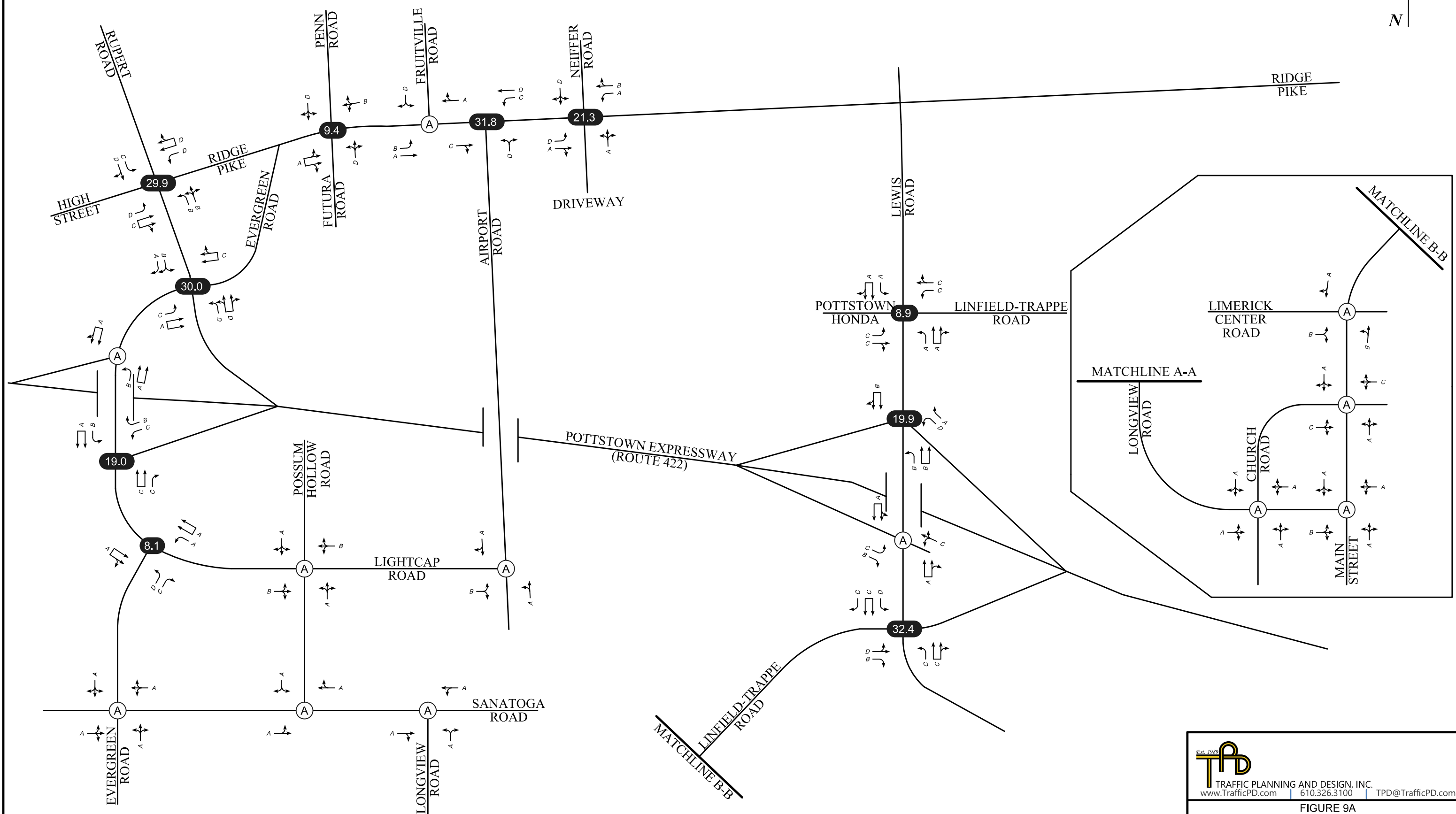
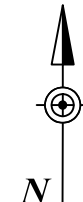





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FIGURE 8B

2031 BASE CONDITION
 LEVELS OF SERVICE
 WEEKDAY PM PEAK HOUR
 TRANSPORTATION SERVICE AREA 2



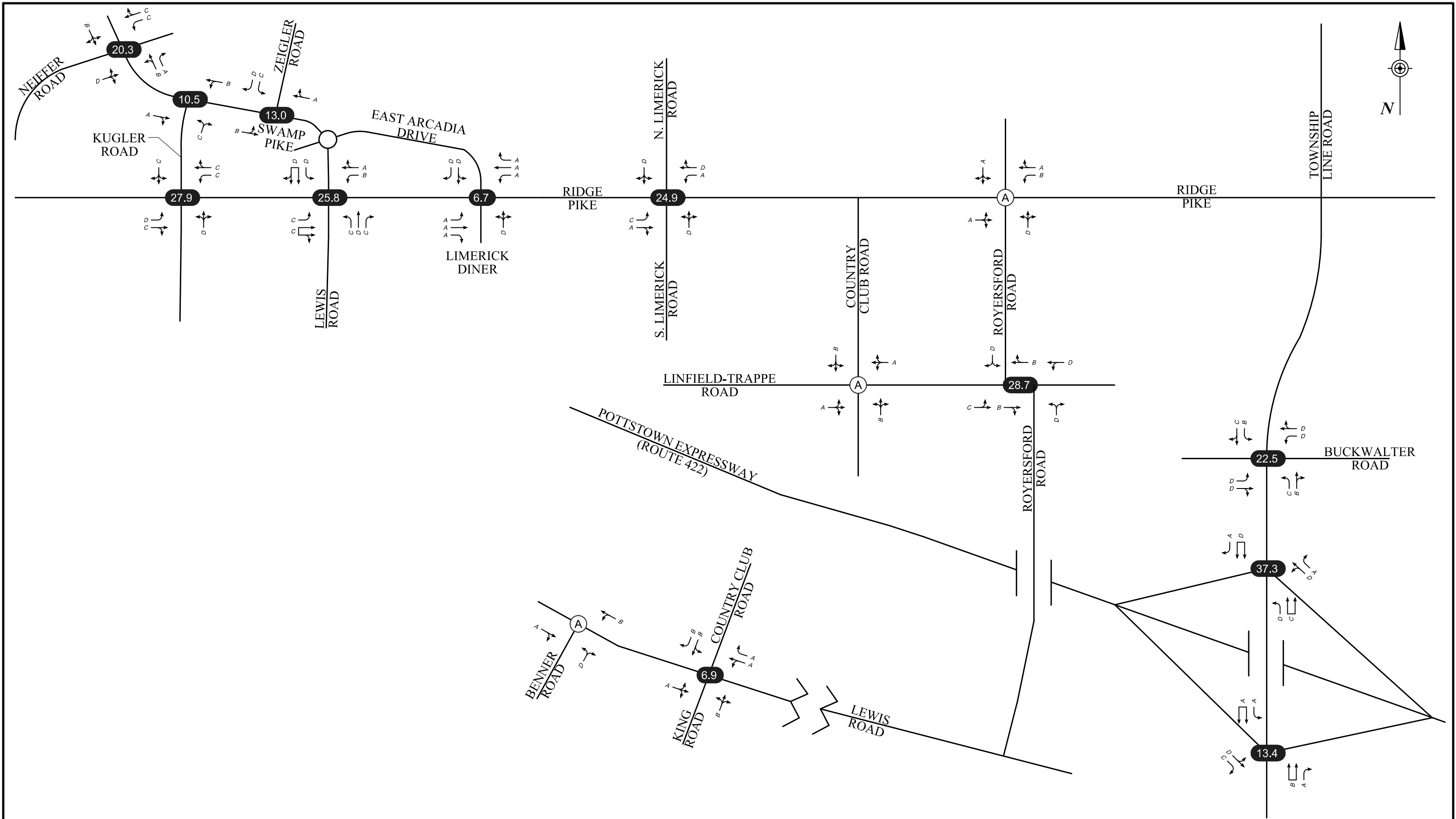
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FIGURE 9A

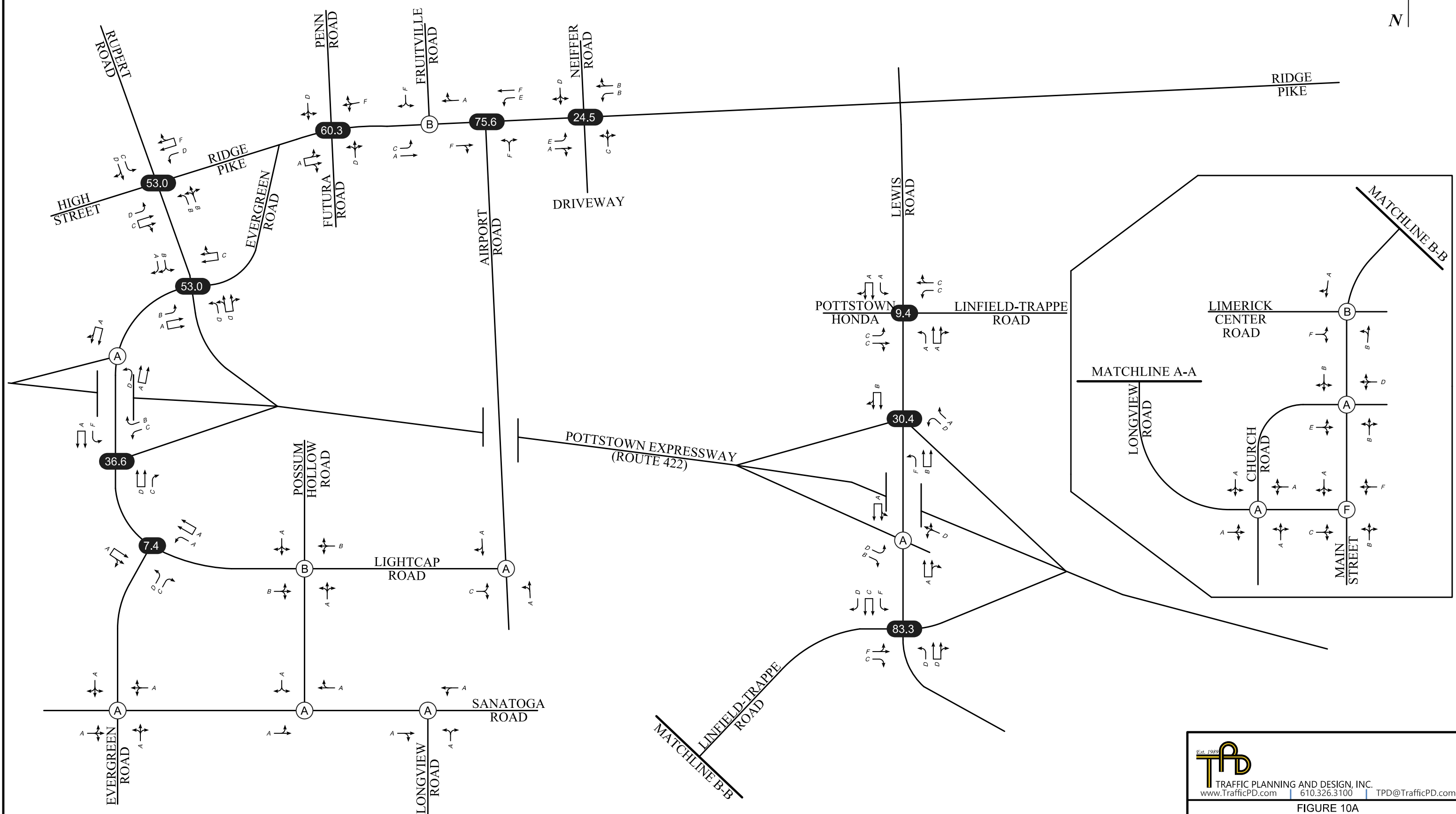
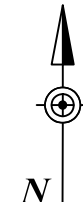
2031 BASE CONDITION WITH IMPROVEMENTS
LEVELS OF SERVICE
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 1




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FIGURE 9B

2031 BASE CONDITION WITH IMPROVEMENTS
 LEVELS OF SERVICE
 WEEKDAY PM PEAK HOUR
 TRANSPORTATION SERVICE AREA 2



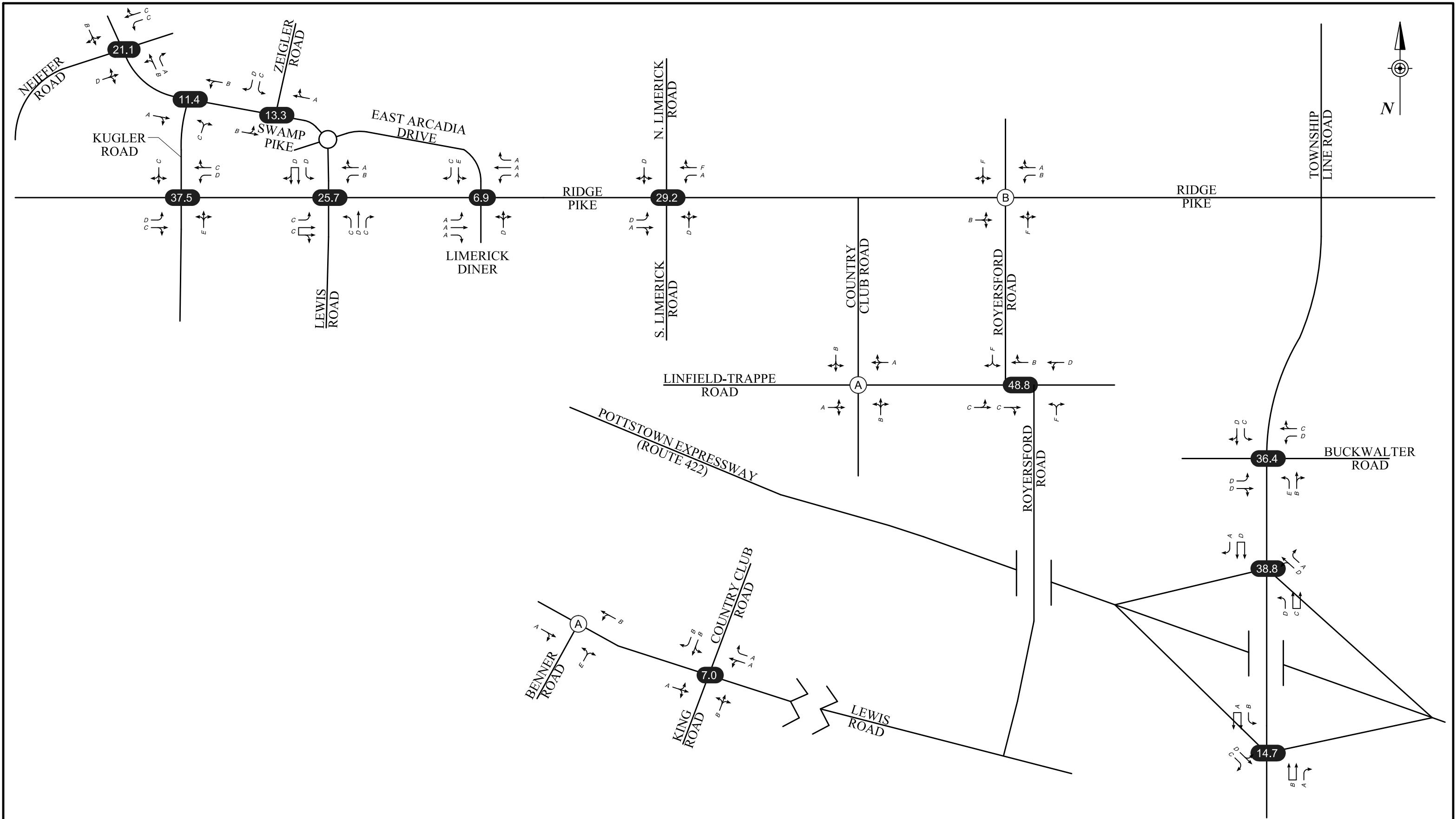
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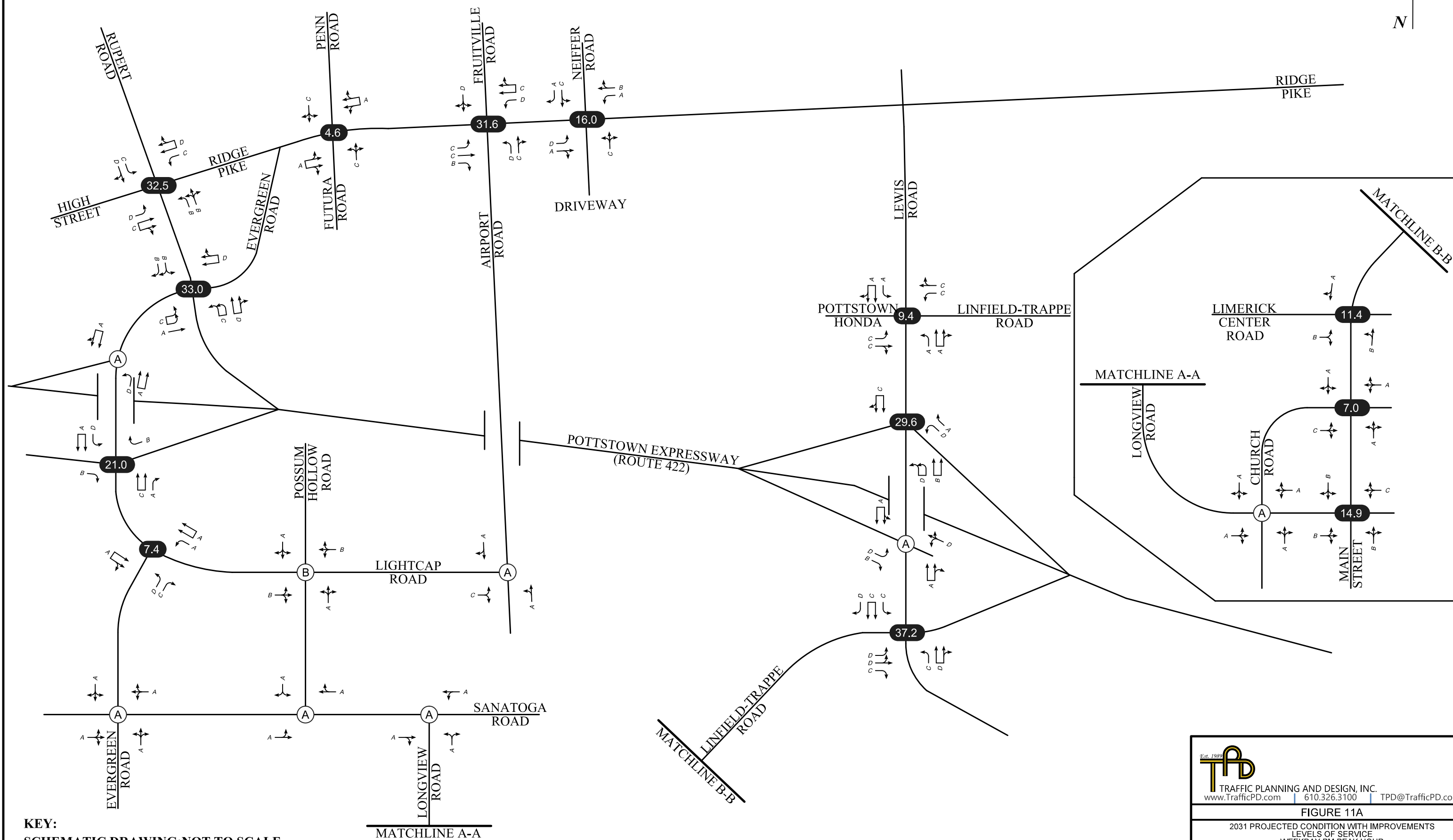
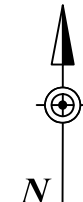


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FIGURE 10A

2031 PROJECTED CONDITION
LEVELS OF SERVICE
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 1





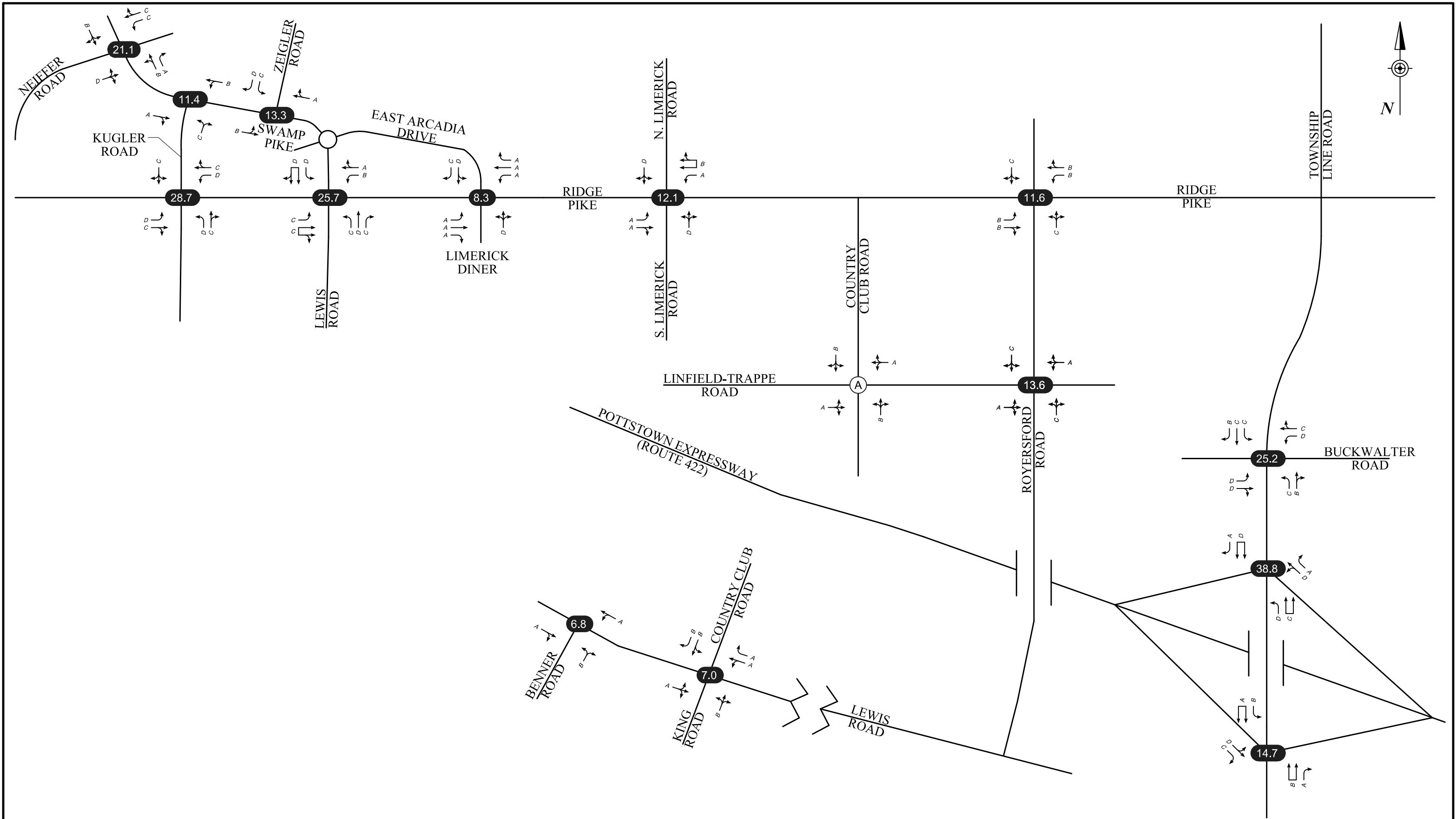
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FIGURE 11A

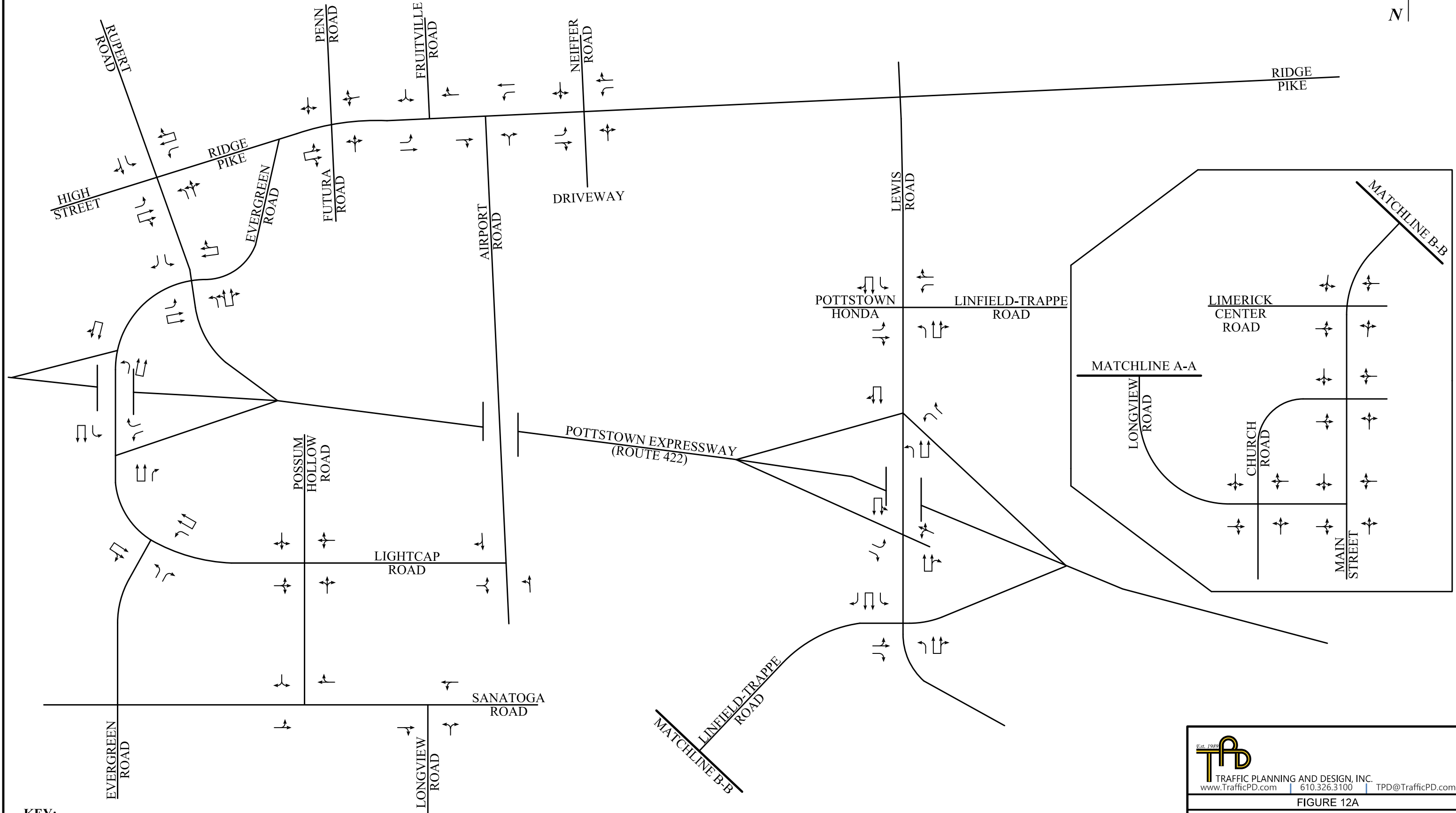
2031 PROJECTED CONDITION WITH IMPROVEMENTS
LEVELS OF SERVICE
WEEKDAY PM PEAK HOUR
TRANSPORTATION SERVICE AREA 1




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FIGURE 11B

2031 PROJECTED CONDITION WITH IMPROVEMENTS
 LEVELS OF SERVICE
 WEEKDAY PM PEAK HOUR
 TRANSPORTATION SERVICE AREA 2



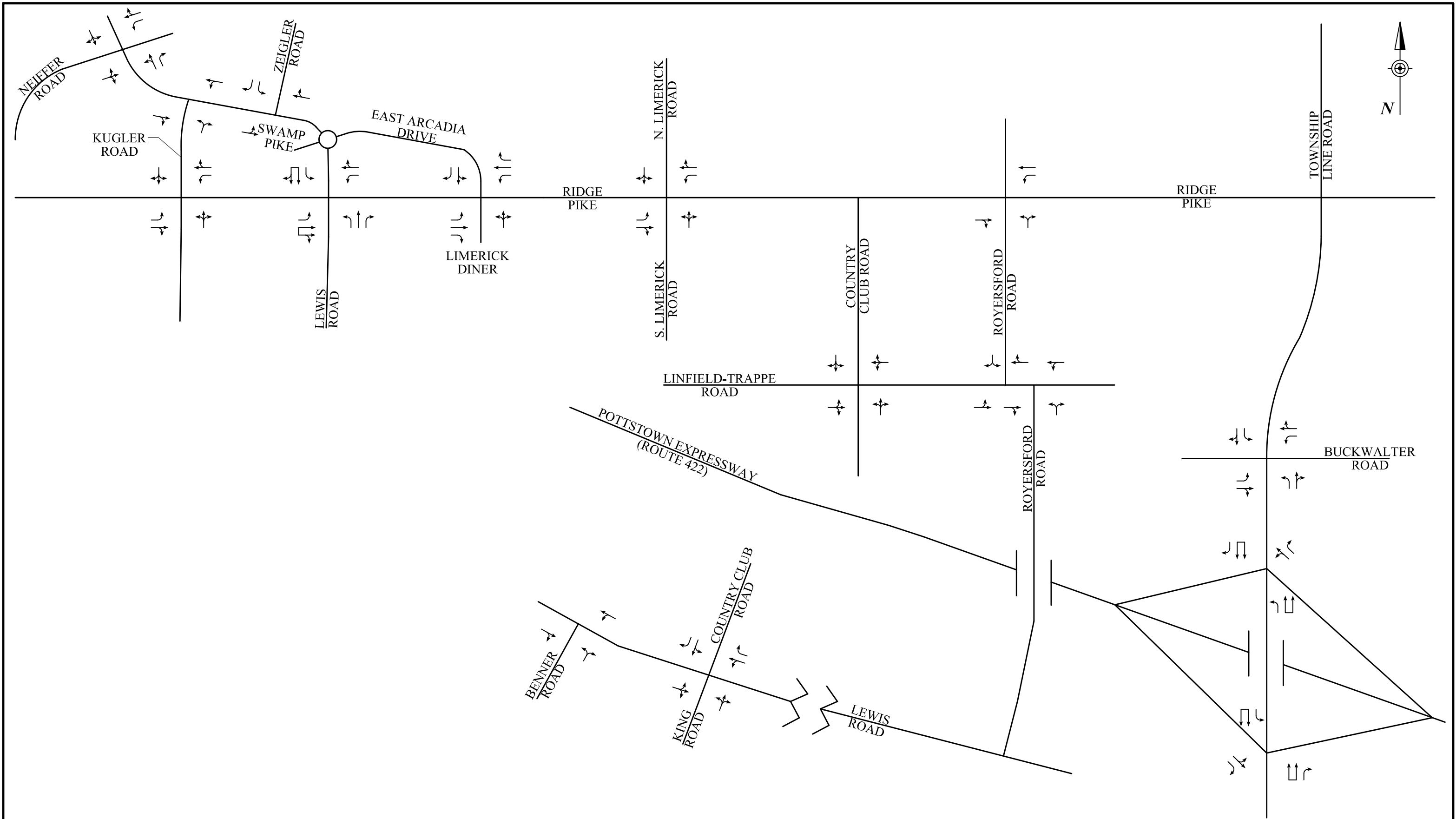
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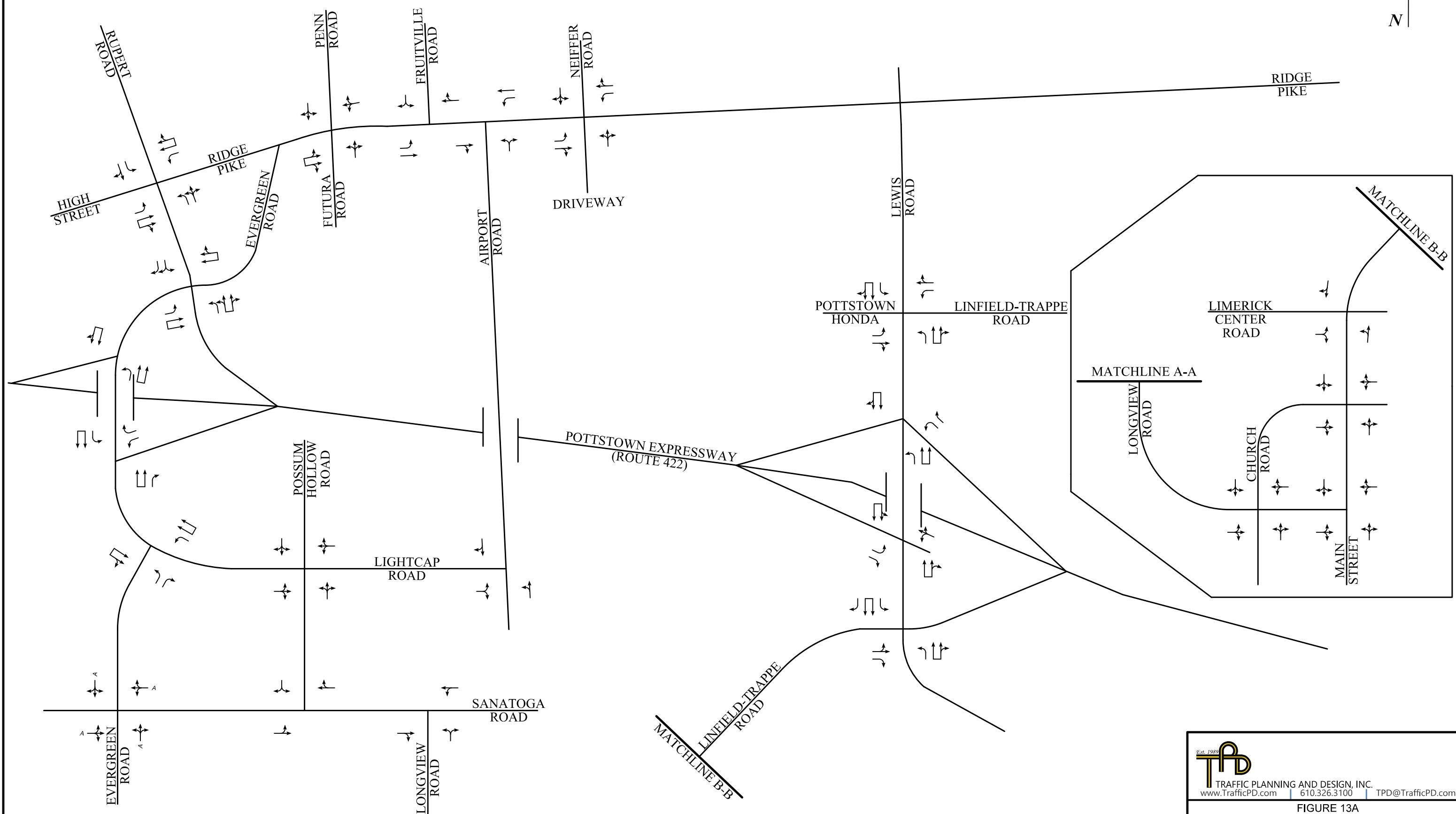
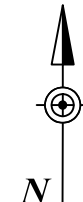


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FIGURE 12A

2021 EXISTING CONDITION LANE CONFIGURATION
TRANSPORTATION SERVICE AREA 1





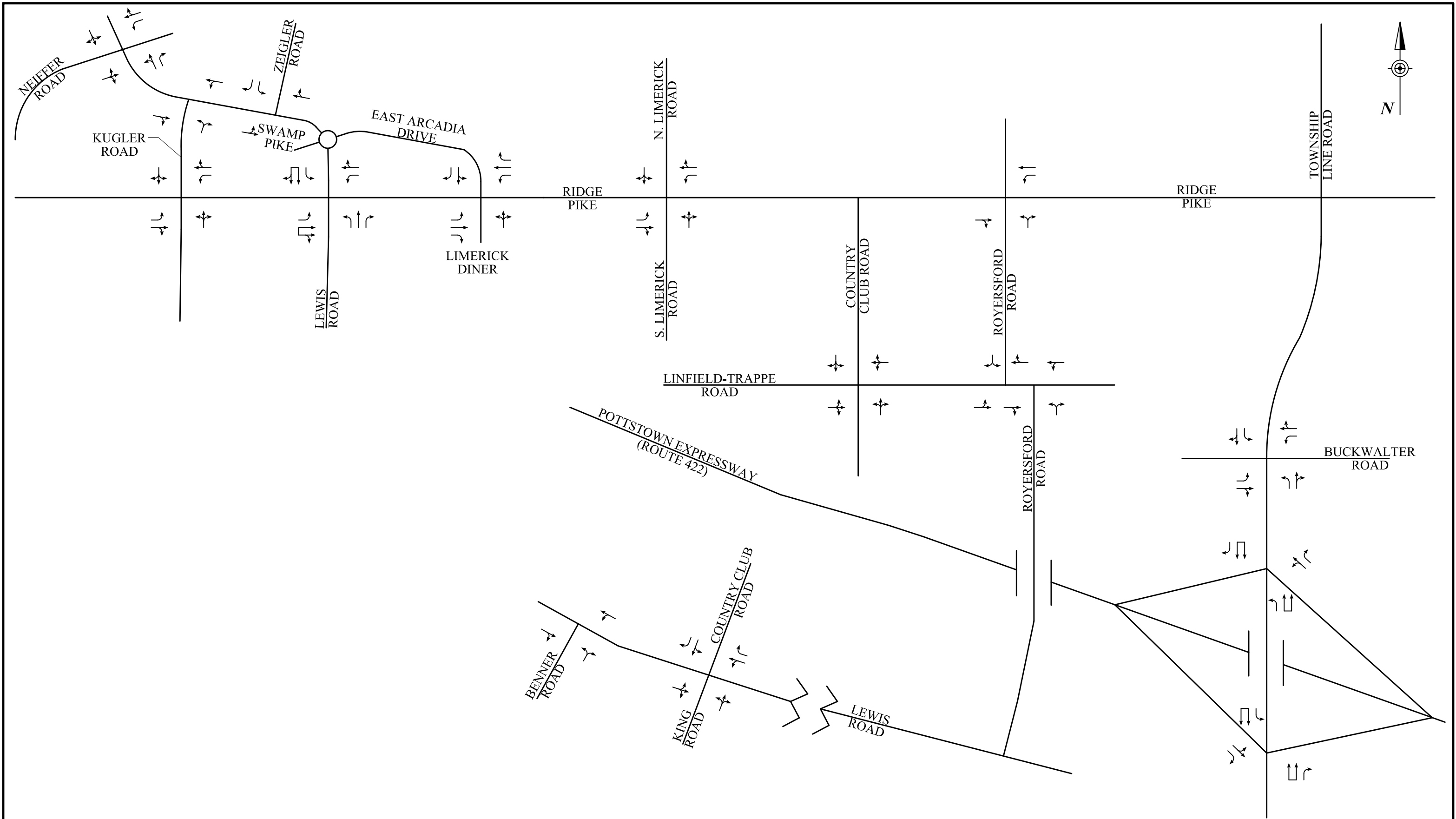
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FIGURE 13A

2021 EXISTING CONDITION LANE CONFIGURATION
WITH IMPROVEMENTS
TRANSPORTATION SERVICE AREA 1

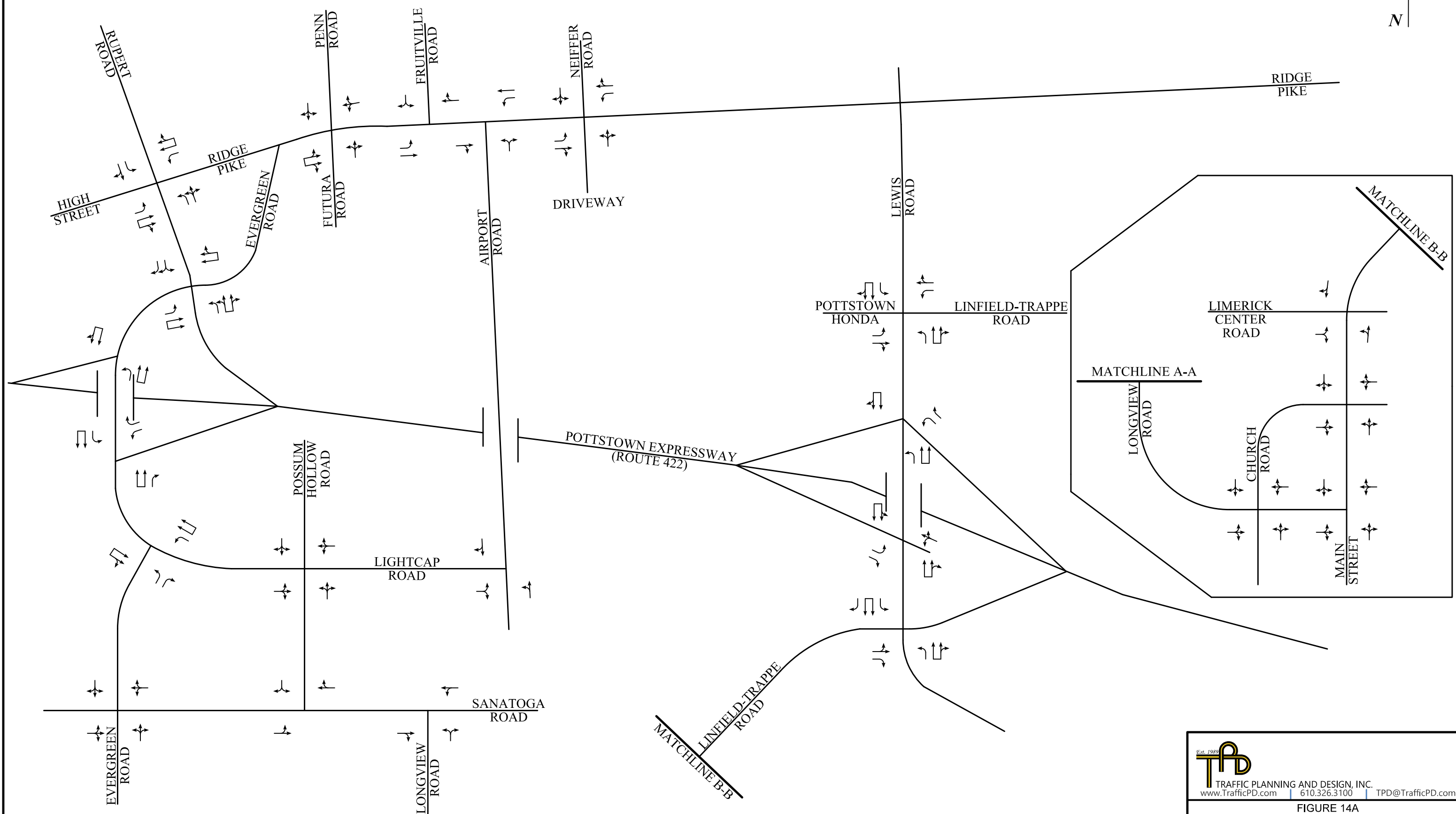
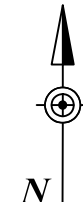





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FIGURE 13B

2021 EXISTING CONDITION LANE CONFIGURATION
 WITH IMPROVEMENTS
 TRANSPORTATION SERVICE AREA 2



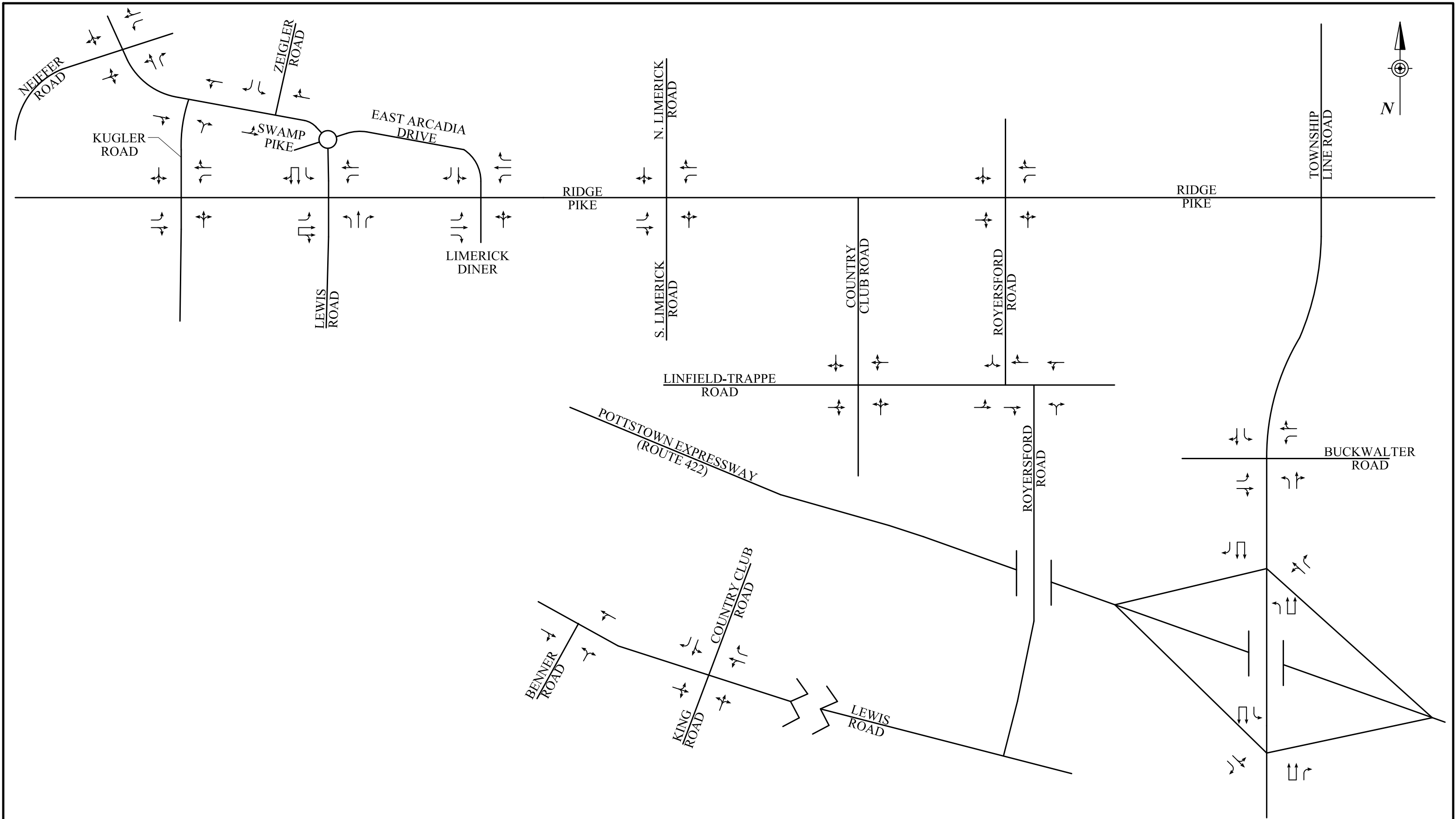
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FIGURE 14A

2031 BASE CONDITION LANE CONFIGURATION
WITH IMPROVEMENTS
TRANSPORTATION SERVICE AREA 1

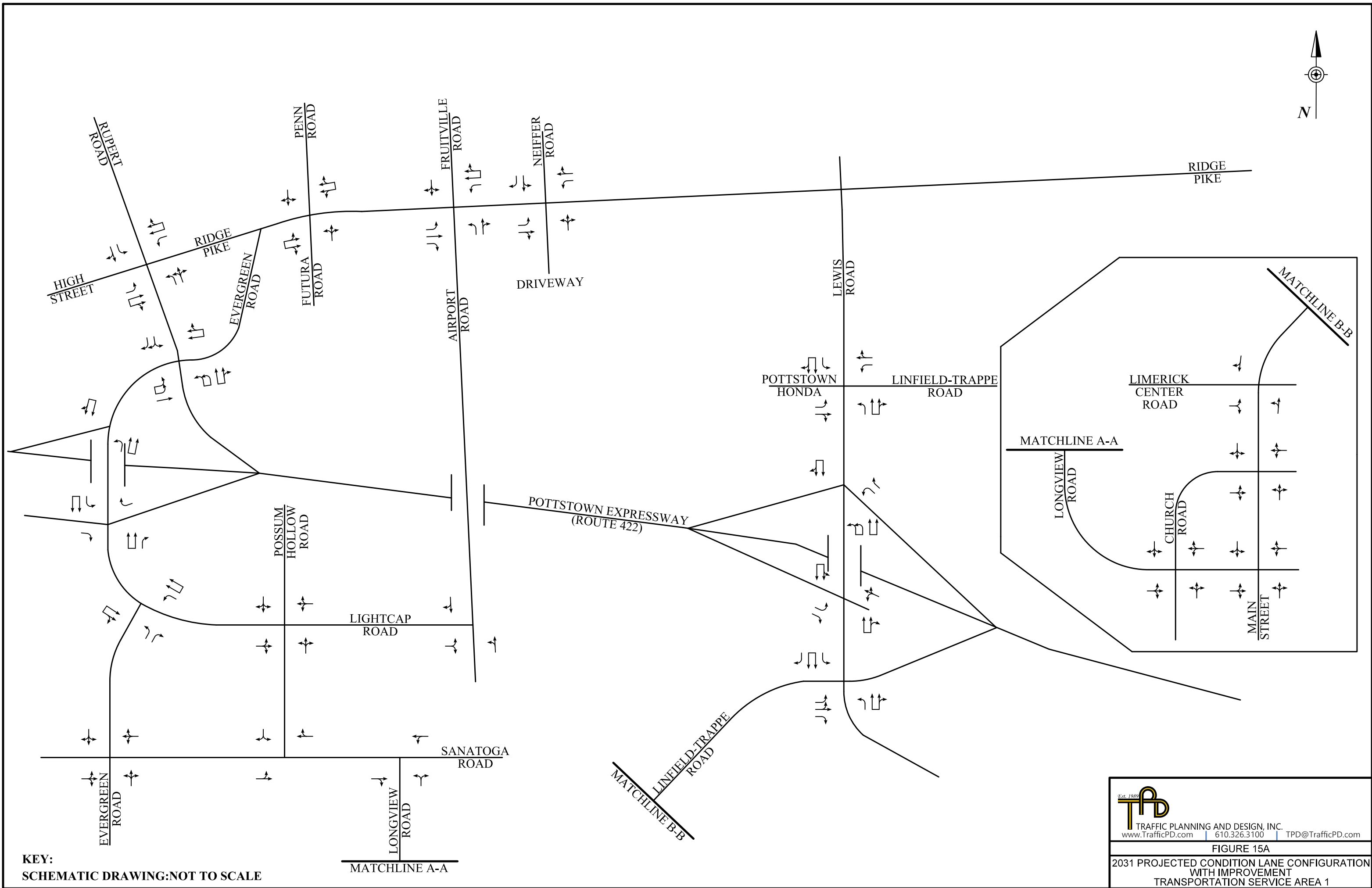


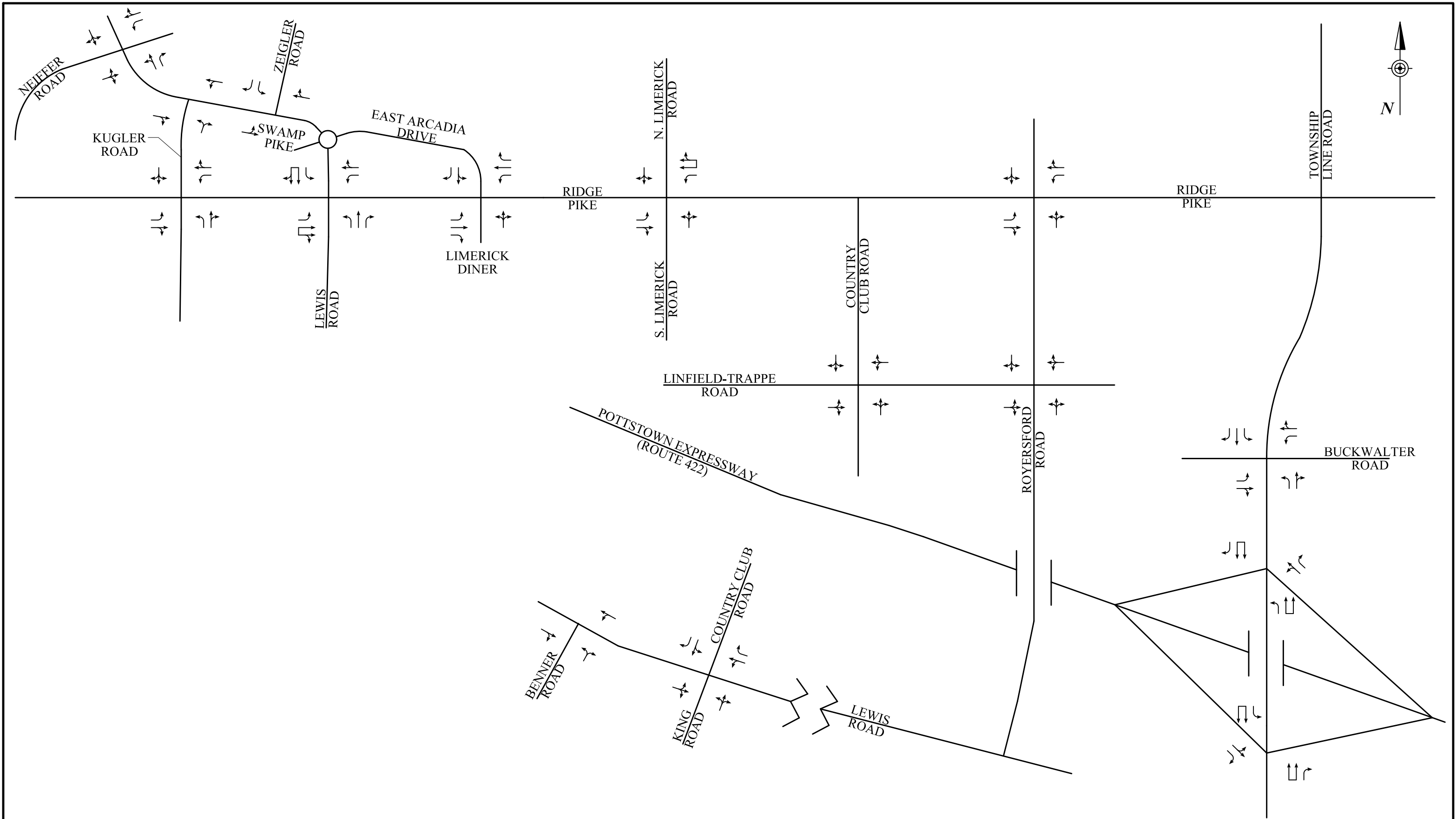


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FIGURE 14B

2031 BASE CONDITION LANE CONFIGURATION
 WITH IMPROVEMENTS
 TRANSPORTATION SERVICE AREA 2





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FIGURE 15B

2031 PROJECTED CONDITION LANE CONFIGURATION
WITH IMPROVEMENTS
TRANSPORTATION SERVICE AREA 2