APPENDIX F:
Traffic Forecasting Technical Memorandum

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	KYTC Division of Planning		Stantec Consulting Services
File:	West Richmond SUA Study Traffic Forecasting Tech Memo	Date:	July 14, 2023

Reference: West Richmond SUA Study Traffic Forecasting Technical Memorandum

PROJECT DESCRIPTION

As part of the West Richmond Small Urban Area (SUA) Study, Stantec has developed traffic forecasts to assist in the evaluation of improvement concepts. Historical traffic data, population trends, traffic impact studies, and results from the Lexington Area Metropolitan Organization (LAMPO) Travel Demand Model were used to develop the forecasts.

This memorandum presents the methodology and assumptions used in the development of the traffic forecasts for the corridor.

STUDY AREA

The study area includes the area west of I-75 in Richmond, KY, as shown in red on **Figure 1**.

HISTORICAL TRAFFIC DATA

Historical KYTC traffic count data on study area roadways were analyzed to determine traffic growth patterns over the past 20 years. As shown in **Figure 2,** daily traffic on KY 876 (Barnes Mill Road) ranges from 1,700 vehicles per day (VPD) in the rural western portion of the study area to 29,600 VPD east of the I-75 interchange. Goggins Lane carries 1,400 VPD north of KY 169 and 7,500 VPD to the south of KY 169. Daily traffic on KY 169 (Tates Creek Road) ranges from 1,750 VPD to 5,600 VPD.

Compound annual growth rates (CAGR) for medium-term (around 10 years) periods were calculated to determine historical growth trends in the study area. Historical trends for study area KYTC count stations are presented in **Table 1** and shown graphically in **Figure 3.** Most of the count stations show slight growth over the past 10-15 years, except for the KY 169 station west of Goggins Lane showing a significant decline in traffic. The red text in Table 1 represents traffic counts from 2020, which are not an accurate representation of recent traffic patterns due to COVID shutdowns in 2020. The 2020 traffic counts are provided for reference but were not used to estimate the compound annual growth rates.
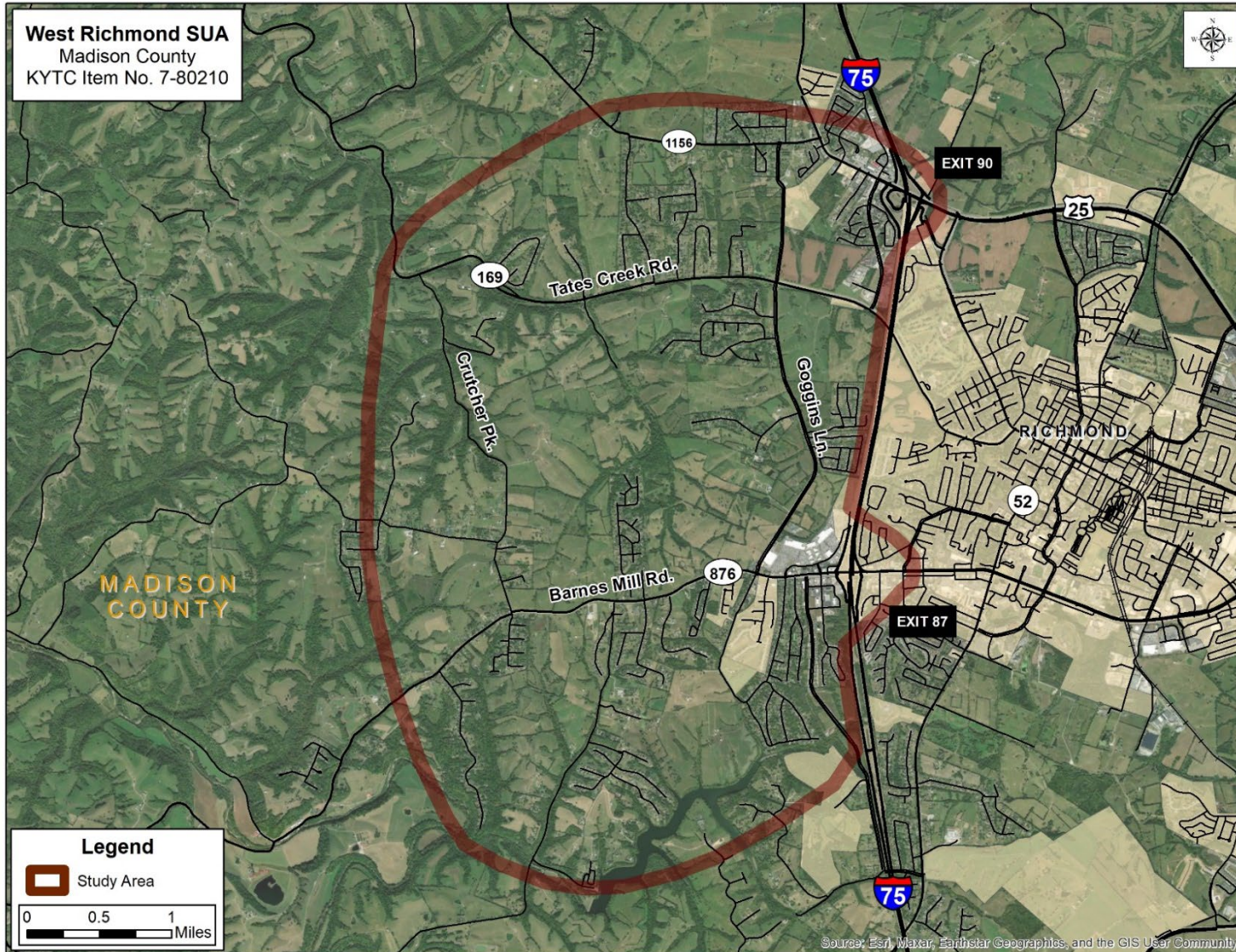
Figure 1: Study Area

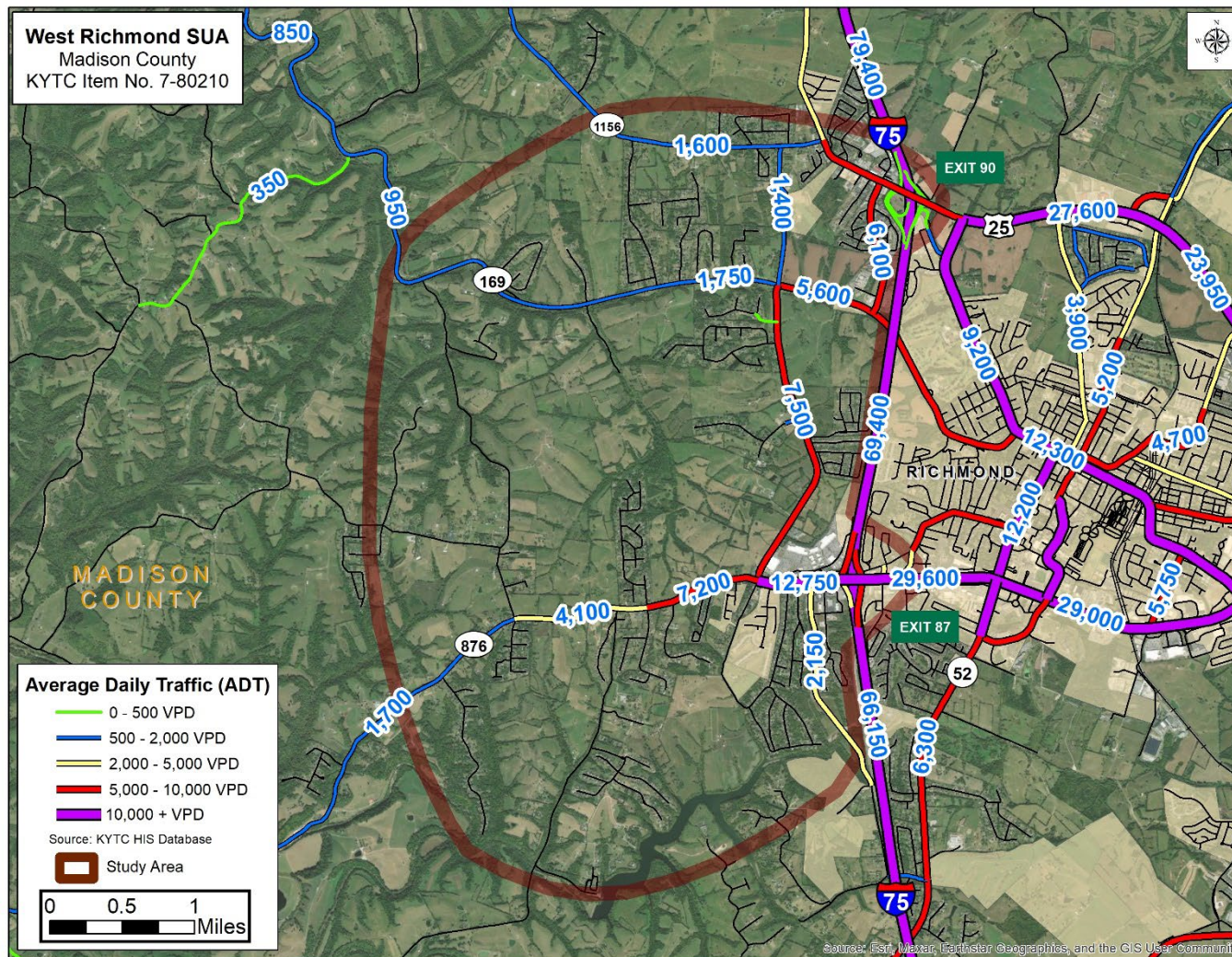**Reference:** **West Richmond SUA Study Traffic Forecasting Technical Memorandum**

Figure 2: KYTC Traffic Station Average Daily Traffic (ADT)

Table 1: KYTC Historical Traffic Counts

Year	KY 169 (West) Sta. 076799	KY 169 (East) Sta. 076A82	KY 876 (West) Sta. 076576	KY 876 (Central) Sta. 076635	KY 876 (East) Sta. 076A03	Goggins Lane N Sta. 076825	Goggins Lane S Sta. 076762	KY 1156 Sta. 076781
2008	3,380	4,650	3,310	6,520	11,600			
2009				8,100				
2010		5,470		7,190				1,620
2011								
2012	2,685					1,158	6,429	
2013		5,330	5,338			1,111	6,682	1,580
2014	2,514		5,112		16,957	1,120	6,662	
2015								
2016		5,433		7,511				1,595
2017	1,772		4,111		12,731	1,389	7,506	
2018								
2019		5,678		7,502				1,551
2020	1,374		4,548		11,791	1,323	6,757	
2021								
2022		5,717	6,876					1,648
Medium term % CAGR	-6.92%	0.37%	5.36%	0.47%	1.04%	3.70%	3.15%	0.14%

Source: Kentucky Transportation Cabinet (KYTC)
*2020 counts not used in growth rate calculations

Reference: **West Richmond SUA Study Traffic Forecasting Technical Memorandum**
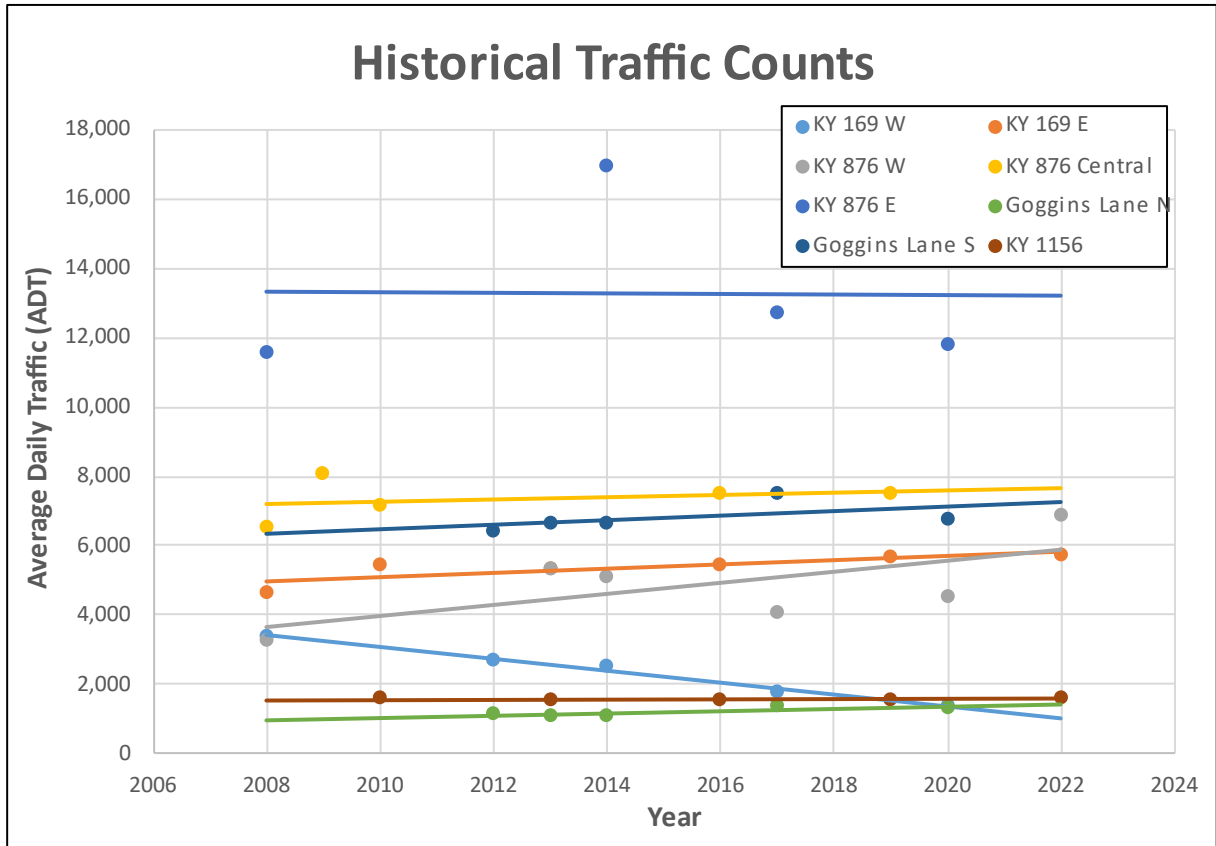

Figure 3: Historical KYTC Traffic Counts

POPULATION GROWTH

Population estimates and projections for the City of Richmond, Madison County, and the state of Kentucky were obtained from the Kentucky State Data Center (KSDC), as shown in **Table 2**. Between 2000 and 2020, both Richmond and Madison County grew at a higher rate than the rest of the state. The KSDC projects this high growth to continue to 2050, with Madison County expecting annual population growth of 0.75 percent per year, as shown in **Figure 4**.

Table 2: Population Projections

Area	Census Estimates			Annual Growth	Projection	Annual Growth
	2000	**2010**	**2020**	**2000 - 2020**	**2050**	**2020 - 2050**
Kentucky	4,041,769	4,339,367	4,505,836	0.54%	4,785,233	0.20%
Madison County	70,872	82,916	92,701	1.35%	116,156	0.75%
Richmond	27,152	31,364	34,585	1.22%	N/A	

Reference: West Richmond SUA Study Traffic Forecasting Technical Memorandum
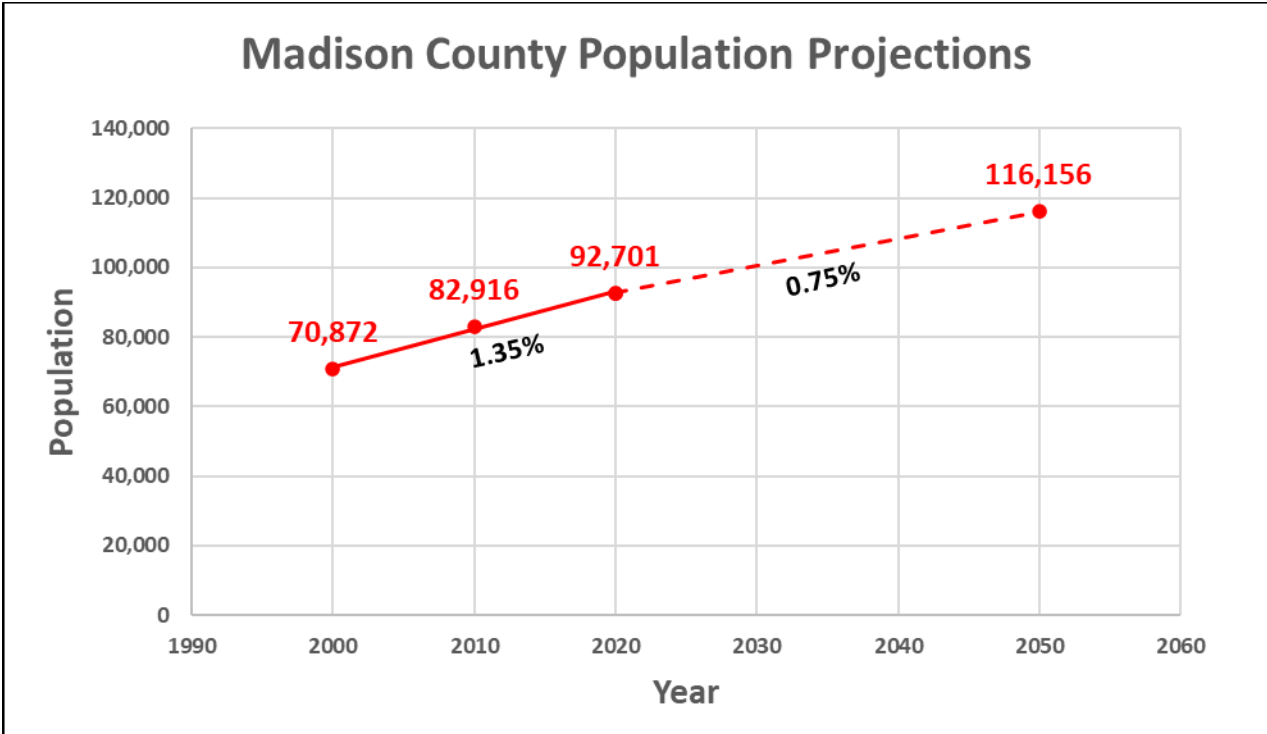

Figure 4: Population Projections

LAMPO TRAVEL DEMAND MODEL

The Lexington Area Metropolitan Planning Organization (LAMPO) regional travel demand model was updated to better reflect existing and future land use. The first step in this process was to update the existing network to reflect current conditions. The future model was then updated based on conversations with local officials and stakeholders.

2020 LAMPO TDM UPDATES

The existing (2020) model network within the study area was first reviewed to ensure accuracy. This network review resulted in the speed limit on Goggins Lane being updated from 35 miles per hour (mph) to 45 mph. Additionally, a centroid connector was added to traffic analysis zone (TAZ) 5076018 to reflect the entrance on Goggins Lane, as shown in **Figure 5**.

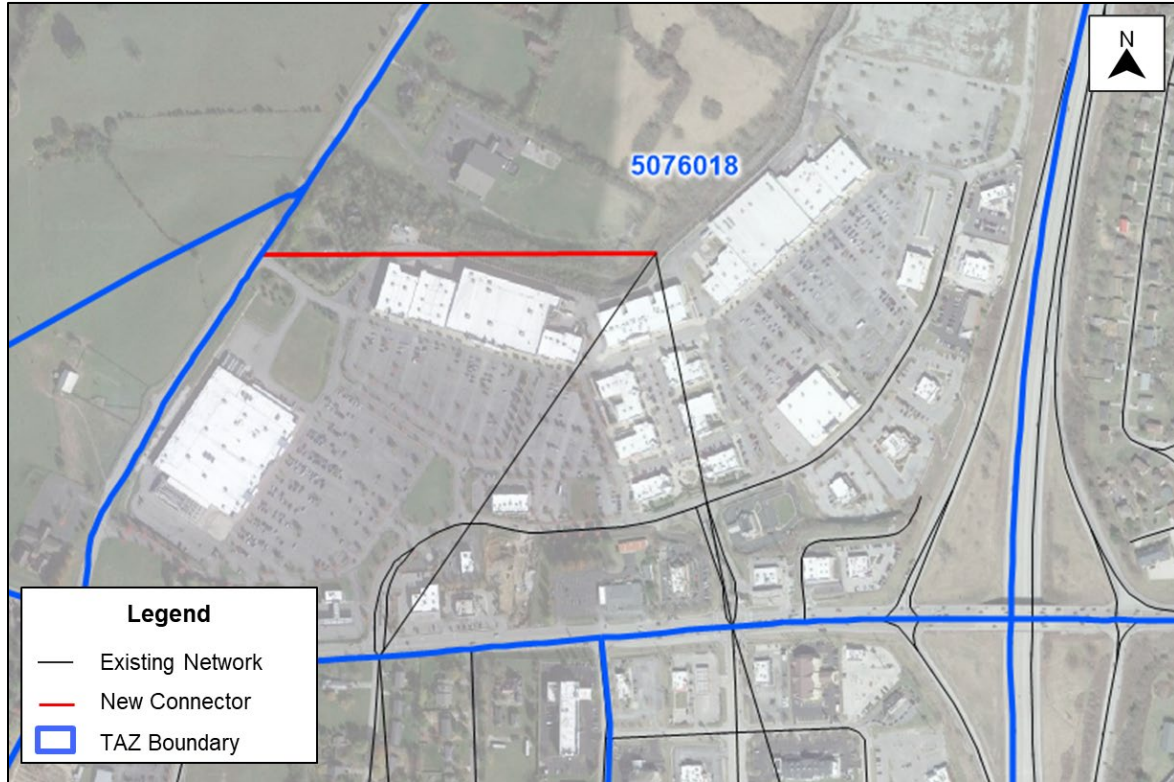**Reference: West Richmond SUA Study Traffic Forecasting Technical Memorandum**

Figure 5: Existing LAMPO Model Network Update

The model's socioeconomic data within the study area was also reviewed. Over the past 5-10 years, there has been moderate residential growth in TAZ 3076081 and TAZ 3076082. These zones had 80 and 231 occupied households in 2020 model. To maintain the county totals, households were shifted from TAZ 5076112, which had 236 households even though it contains a non-residential golf course. **Table 3** presents a summary of the reapportioned households.

Table 3: 2020 LAMPO TDM Socioeconomic Updates

TAZ ID	Original	Updated
	HU_occupied	
5076112	236	36
3076082	231	331
3076081	80	180

Expected Developments

Based on the latest information from Richmond and Madison County planning staff, it is estimated that there are 11 sites in and around the study area expected to develop, as shown in **Figure 6**. These developments include residential, commercial, and athletic fields and will attract varying levels of traffic to the area.
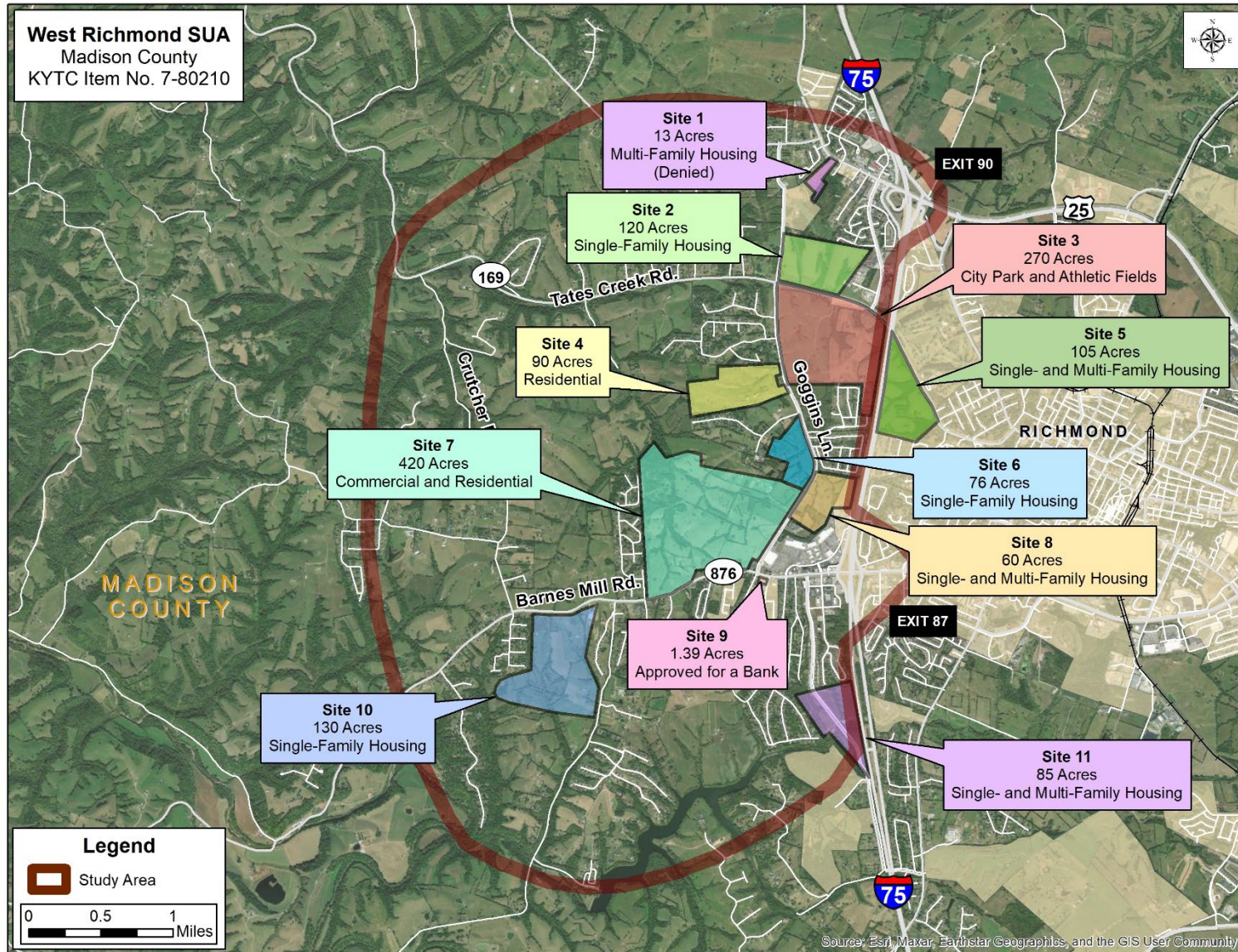
Design with community in mind

Figure 6: Expected Developments

2045 LAMPO TDM

TAZ Boundary Updates

The 2045 socioeconomic data was updated to reflect the current expectation of future land use in the study area. The first step in this process was to split TAZs based on current and future land use. **Figure 7** presents the updated TAZ boundaries. These new TAZs were created based on expected developments shown in Figure 6.
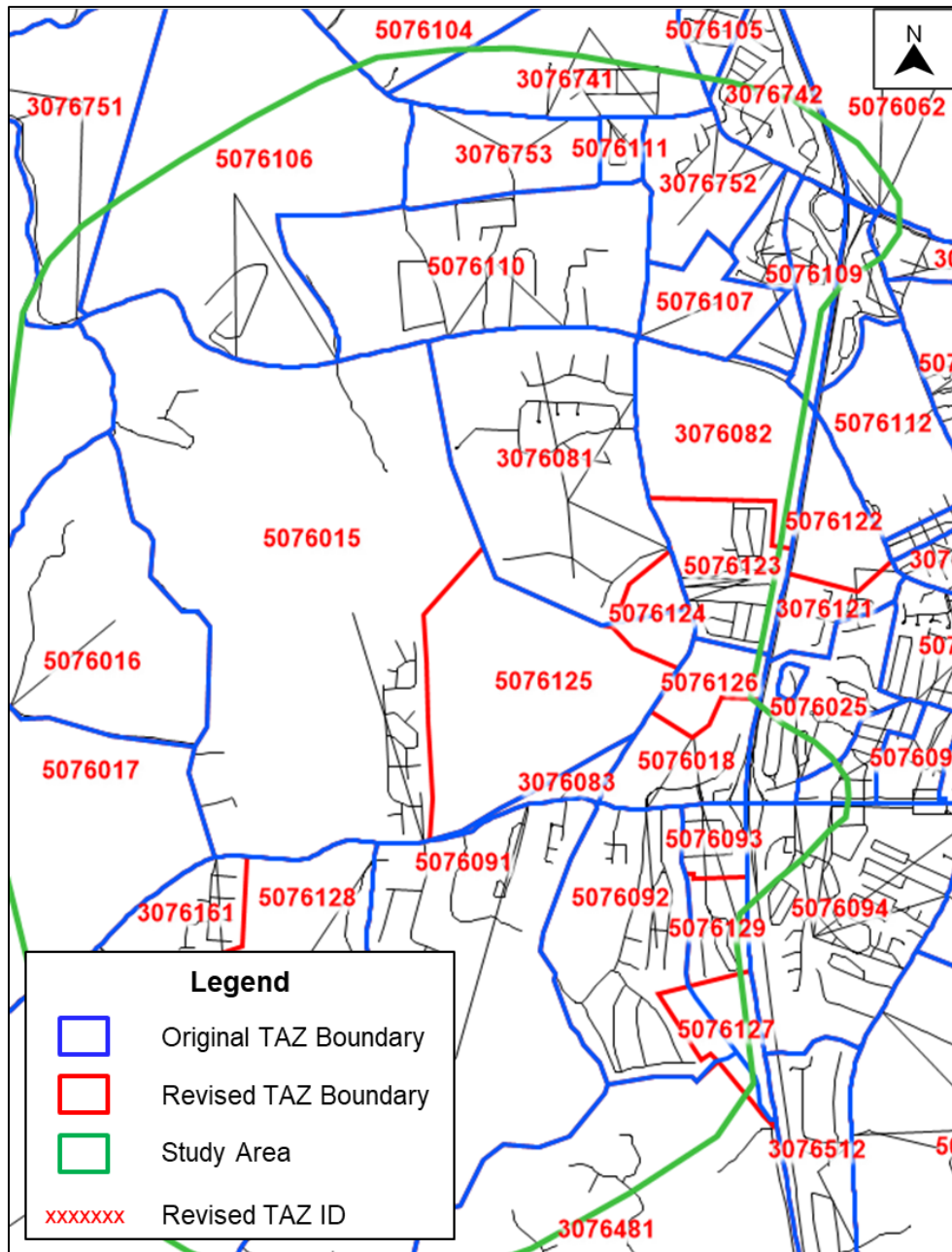

Figure 7: Revised TAZ Boundaries

Reference: **West Richmond SUA Study Traffic Forecasting Technical Memorandum**

Socioeconomic Updates – County Total Method

Once the TAZ boundaries were revised to reflect future land use, the 2045 socioeconomic data was reproportioned to reflect expected households and employment in the zones. To maintain control totals for total growth in Madison County, households and employment from other TAZs were reduced using professional judgement of existing land and development trends. Much of the household growth was shifted from built out areas in Richmond and areas east of Richmond to the study area. **Table 4** presents a summary of the socioeconomic revisions for the 2045 TAZs with the new zones highlighted.

Table 4: Summary of Socioeconomic Revisions

TAD ID	Original Model					Revised Model				
	HU_Occupied	Serv_EMP	Ret_EMP	Nret_EMP	TOT_EMP	Occupied_HH	Serv_EMP	Ret_EMP	Nret_EMP	TOT_EMP
3040011	716	18	2	0	20	530	18	2	0	20
3076011	869	62	1	0	63	467	62	1	0	63
3076051	977	123	15	1	139	741	123	15	1	139
3076081	676	1	7	2	10	986	1	7	2	10
3076082	209	3	0	0	3	0	3	0	50	53
3076111	288	299	4832	0	5131	288	299	4332	0	4631
3076121	486	1	0	0	1	360	1	0	0	1
3076311	846	1	0	0	1	118	1	0	0	1
3076481	765	8	2	0	10	567	8	2	0	10
3076512	657	2	3	0	5	487	2	3	0	5
3076742	560	932	294	32	1258	560	813	294	32	1139
5076012	841	32	45	0	77	560	32	45	0	77
5076015	327	15	1	0	16	156	15	1	0	16
5076018	96	194	1572	6	1772	96	194	1522	6	1722
5076020	555	32	187	2	221	411	32	187	2	221
5076025	485	255	11	0	266	359	255	11	0	266
5076064	51	39	55	620	714	51	39	55	570	664
5076092	150	50	198	0	248	150	100	248	0	348
5076093	66	0	394	0	394	35	0	394	0	394
5076094	1742	654	913	2	1569	1290	654	913	2	1569
5076097	234	11	0	0	11	128	11	0	0	11
5076107	238	0	0	0	0	276	0	0	0	0
5076108	185	4	382	197	583	185	3	382	197	582
5076109	196	149	419	84	652	196	116	419	84	619
5076112	404	0	11	0	11	99	0	11	0	11
5076122						450	0	0	0	0
5076123						309	3	0	0	3
5076124						325	0	0	0	0
5076125						1150	100	500	0	600
5076126						276	0	0	0	0
5076127						387	0	0	0	0
5076128						560	0	0	0	0
5076129						66	0	0	0	0
Total	13,348	2,885	9,344	1,039	13,268	13,348	2,885	9,344	1,039	13,268

Reference: West Richmond SUA Study Traffic Forecasting Technical Memorandum

The updated 2020 and 2045 LAMPO models were then run and compared to determine annual growth on study area roadways. **Figure 8** presents the annual growth rates.
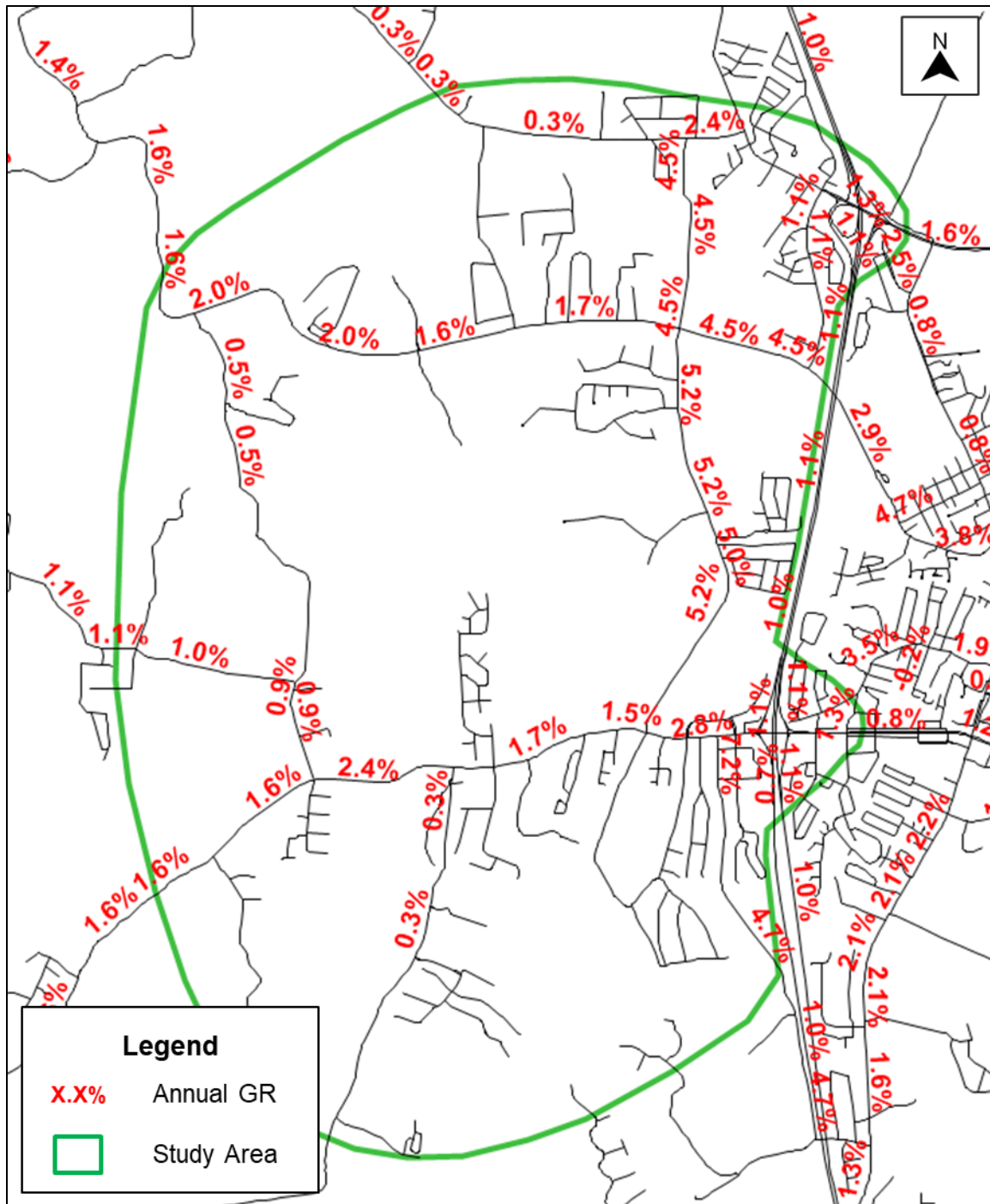

Figure 8: LAMPO TDM Annual Growth Rates – County Totals Method (2020 – 2045)

Reference: **West Richmond SUA Study Traffic Forecasting Technical Memorandum**

Socioeconomic Updates – Trendline Method

As a means of comparison, the socioeconomic data for 90 zones in and around the study area, as shown in **Figure 9**, were updated using a trendline analysis. This method first applies the employment growth trend from 2012 to 2020 to calculate a new base-year (2020) employment estimate. Employment growth is then distributed proportionally in a way that keeps the original county employment total amongst the zones to produce 2045 employment. Adjustments are made on a case-by-case basis if there are anomalies in the trend or if the calculated employment is negative. Base-year households and population were then updated using block-level data from the Bureau of the Census. 2045 households and population were calculated by using growth proportional to the expected 2045 county totals supplied by the Kentucky State Data Center.
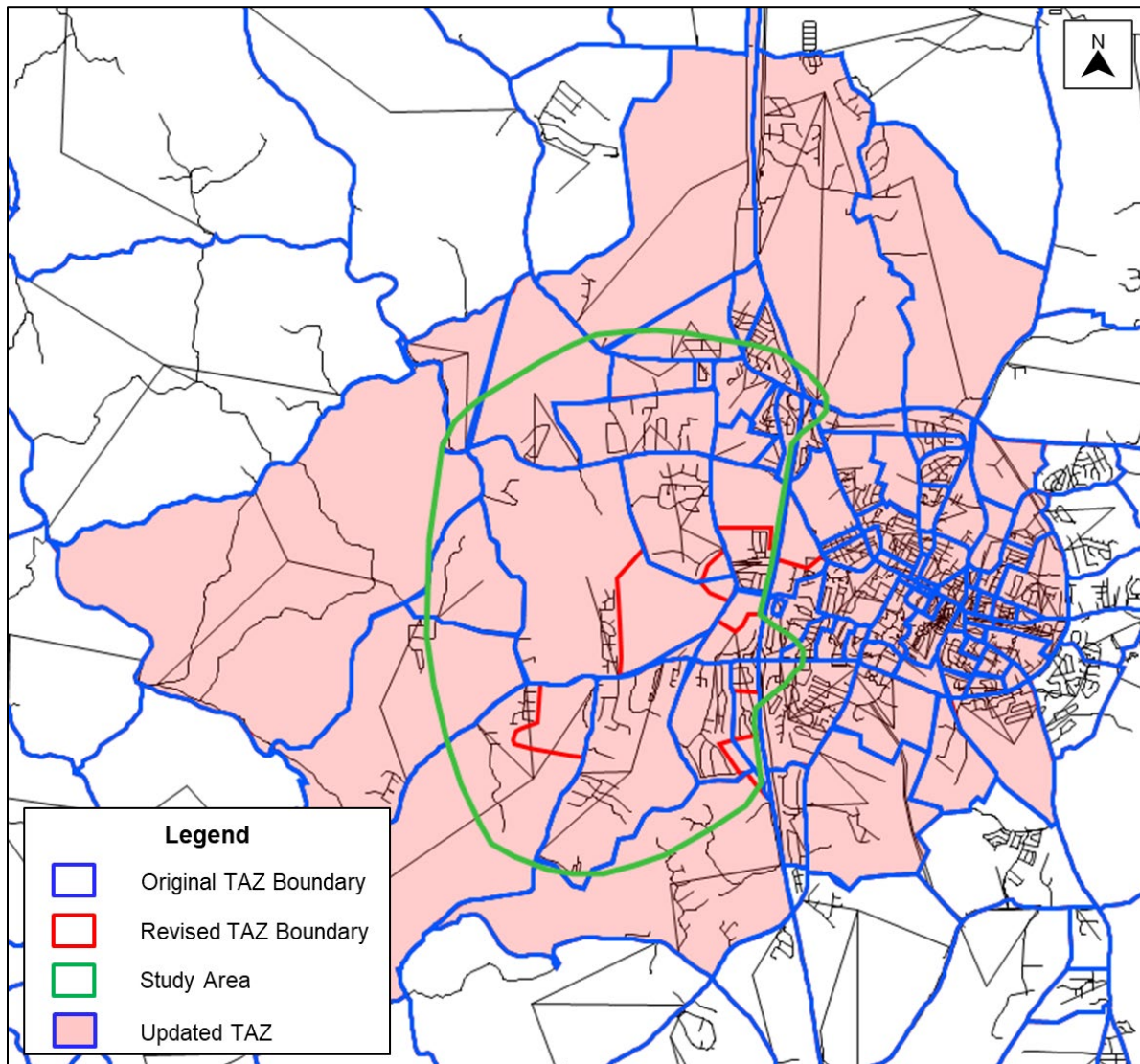

Figure 9: LAMPO Updated TAZs – Trendline Method

Reference: West Richmond SUA Study Traffic Forecasting Technical Memorandum

The updated 2020 and 2045 LAMPO models were then run and compared to determine annual growth on study area roadways. **Figure 10** presents the annual growth rates.
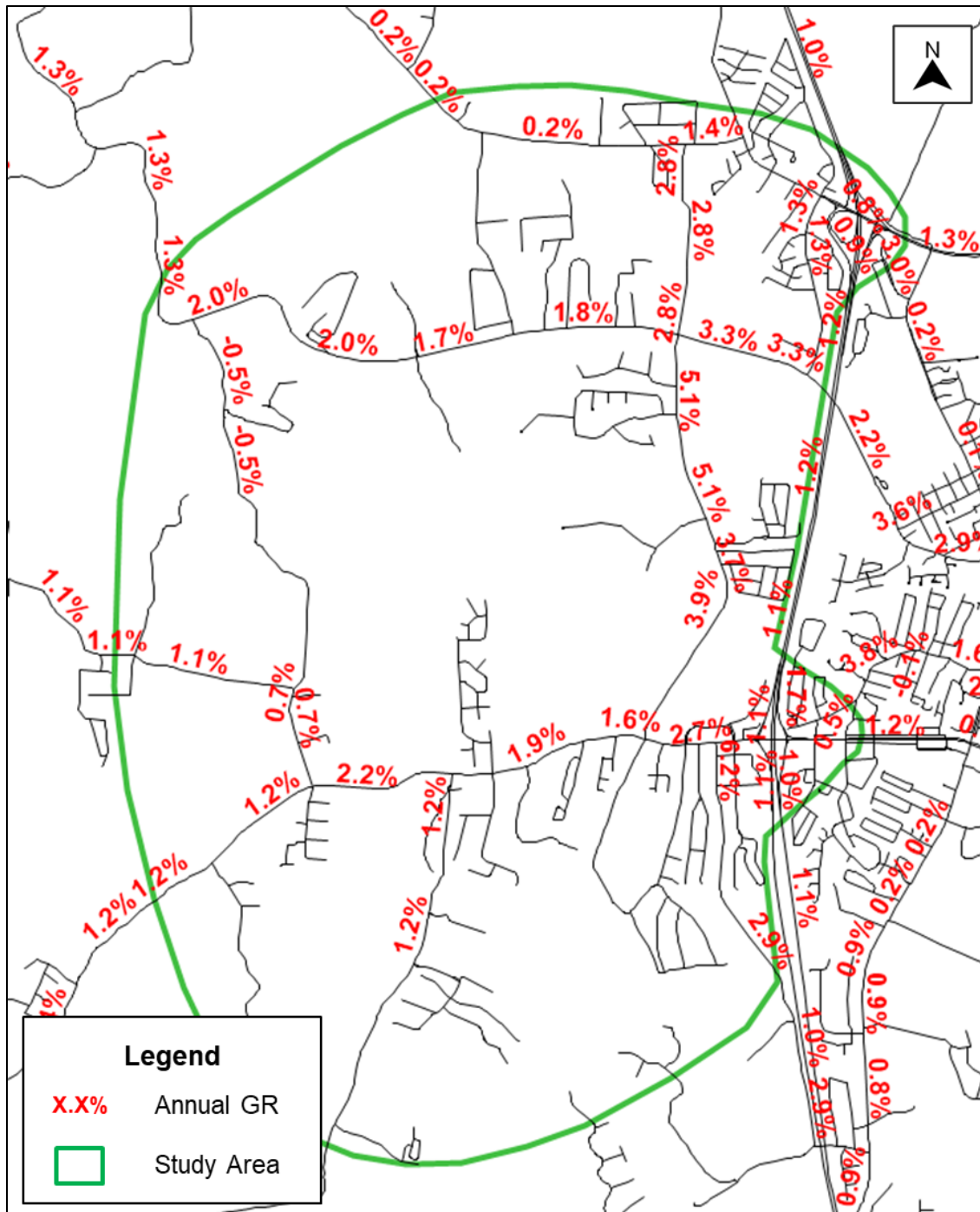

Figure 10: LAMPO TDM Annual Growth Rates – Trendline Method (2020 – 2045)

Reference: West Richmond SUA Study Traffic Forecasting Technical Memorandum

ANNUAL GROWTH RATES

Based on historical traffic trends, regional population trends, expected developments, and results from the updated LAMPO Regional Travel Demand Model, the following annual growth rates are proposed for developing future year traffic volumes:

- Goggins Lane: 2% (2017 – 2023), 5% (2023 – 2035), 2% (2035 – 2045)
- West of I-75: 2%
- East of I-75: 0.8%
- I-75 Mainline: 1%

2045 DAILY TRAFFIC FORECASTS

The annual growth rates were applied to the latest KYTC daily traffic counts to develop 2045 daily traffic forecasts, as shown in **Figure 11**.

SIMULATION MODEL GROWTH

In addition to developing 2045 daily traffic forecasts, Stantec also developed 2035 AM and PM peak hour simulation model scenarios using the annual growth rates developed from historical traffic trends, regional population trends, expected developments, and results from the LAMPO model. Based on discussions at the modeling scoping meeting, Site 7 and the relocated middle school were included in the 2035 peak hour model due to their high peak hour traffic generation. As shown in **Figure 12**, entrances for Site 7 were coded in the model as shown in the development plat (Nodes 32, 33, 35, and 37) and the middle school traffic was loaded onto the northern Goggins Lane external node (Node 9). As the middle school's regular hours are from 8 AM to 3 PM and do not fall within the simulation model's PM peak hour, trips to represent school traffic were only added for the AM peak hour.

New traffic volumes calculated from the application of the identified growth rates were loaded onto the network. The traffic volumes associated with Site 7 and the middle school were found to be substantially lower than peak hour traffic estimates calculated from the ITE Trip Generation Manual 11th Edition. Therefore, separate matrices were developed for Site 7 and the middle school to supplement traffic to match the ITE estimates. The following presents the trips added via the separate matrices:

- AM Peak – 650 trips (Site 7) / 231 trips (Middle School)
- PM Peak – 727 trips (Site 7)

Table 5 presents a summary of the added trips. Mainline I-75 trips were not included in the calculations.
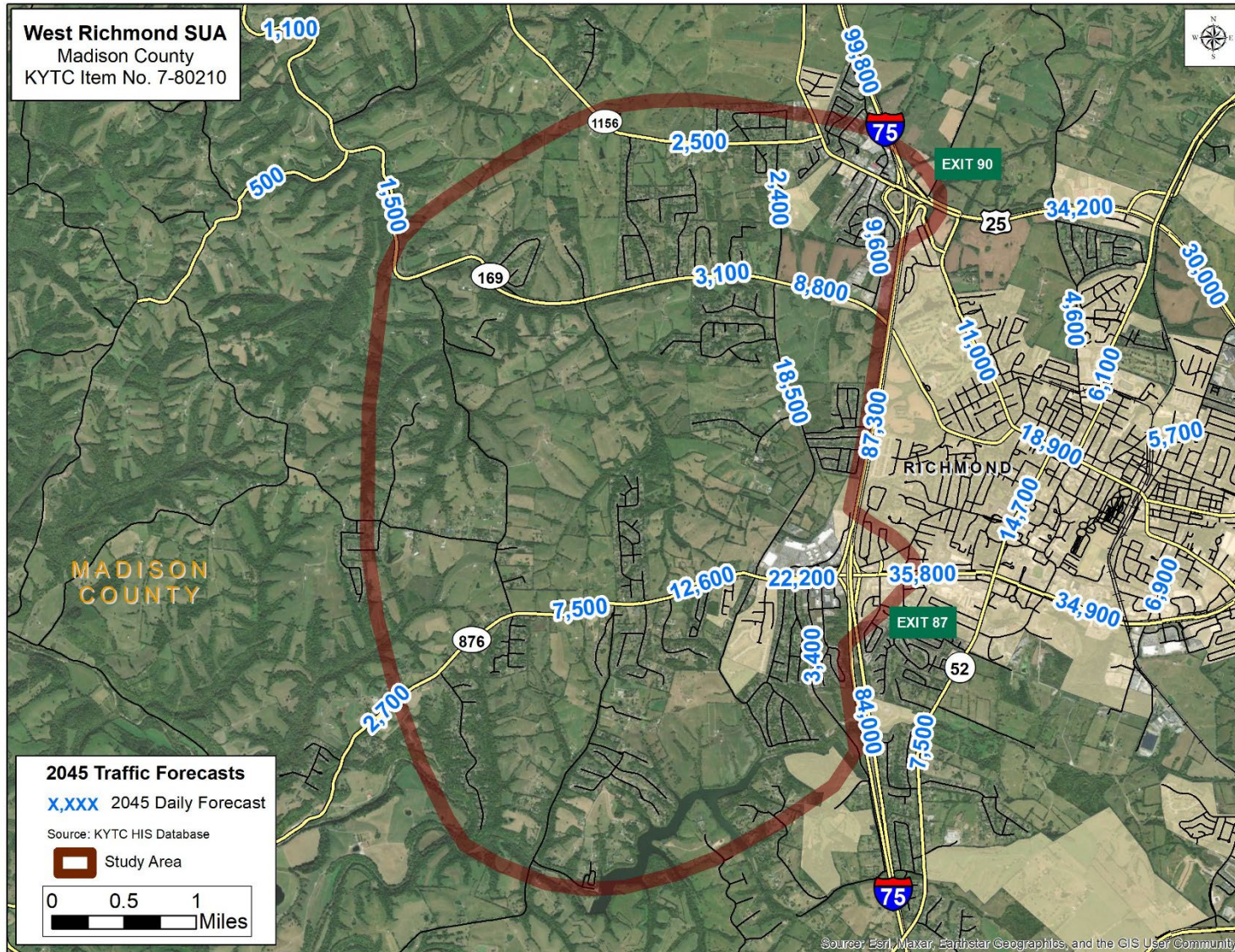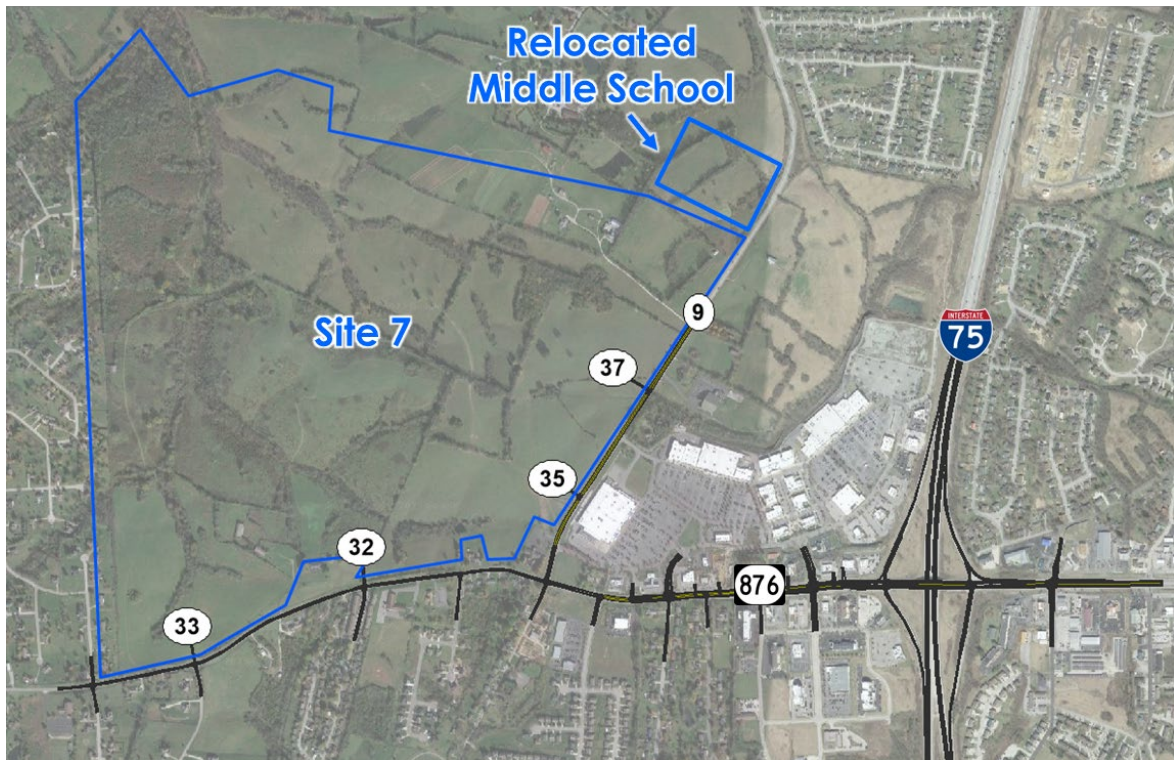
Figure 11: 2045 Daily Traffic Forecasts

Figure 12: 2035 No-Build Simulation Model Network

Table 5: 2035 AM & PM Simulation Model Trip Summary

Scenario	Initial 2035 Trips	Added Trips	Total 2035 Trips
AM Peak	5,265	882	6,147
PM Peak	7,454	727	8,181

NEXT STEPS

The next step is to analyze the Build scenarios with the 2035 simulation model and updated 2045 LAMPO TDM.

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