

# Appendix E: Traffic Forecast Memorandum

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To: Connor Schurman  
KYTC Division of Planning

From: Graham Winchester  
Stantec

File: Murray Small Urban Area Study

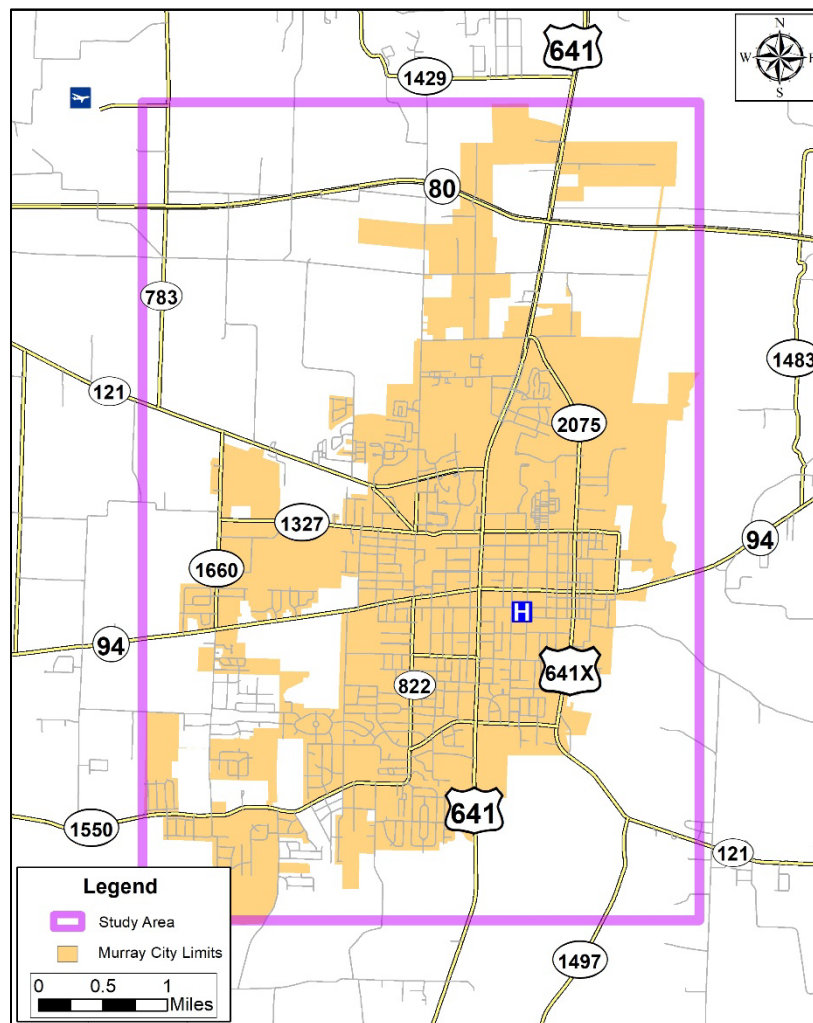
Date: November 22, 2021

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**Reference: Murray SUA Study - Traffic Forecasting Technical Memorandum**

## INTRODUCTION

As a part of the Murray Small Urban Area Study (SUA), Stantec was tasked with developing daily traffic forecasts within the study area to assist in the evaluation of improvement concepts. Regional population trends and growth rates from the Kentucky Statewide Travel Demand Model version 19 (KYSTMV19) were used to develop the forecasts. **Figure 1** presents the study area, which includes Murray, Kentucky in Calloway County.



**Figure 1: Murray SUA Study Area**

## POPULATION GROWTH

Over the past decade, Murray, Kentucky, has experienced moderate population growth of 0.96 percent per year, with 17,741 residents in 2010 growing to 19,327 residents in 2019, as shown in **Figure 2**. Calloway County has experienced a slightly lower annual growth of 0.6 percent per year over the past decade. Based on projections from the Kentucky State Data Center, Calloway County is expected to see slightly lower growth to 2040, with an annual growth rate of 0.5 percent from 2017 to 2040.

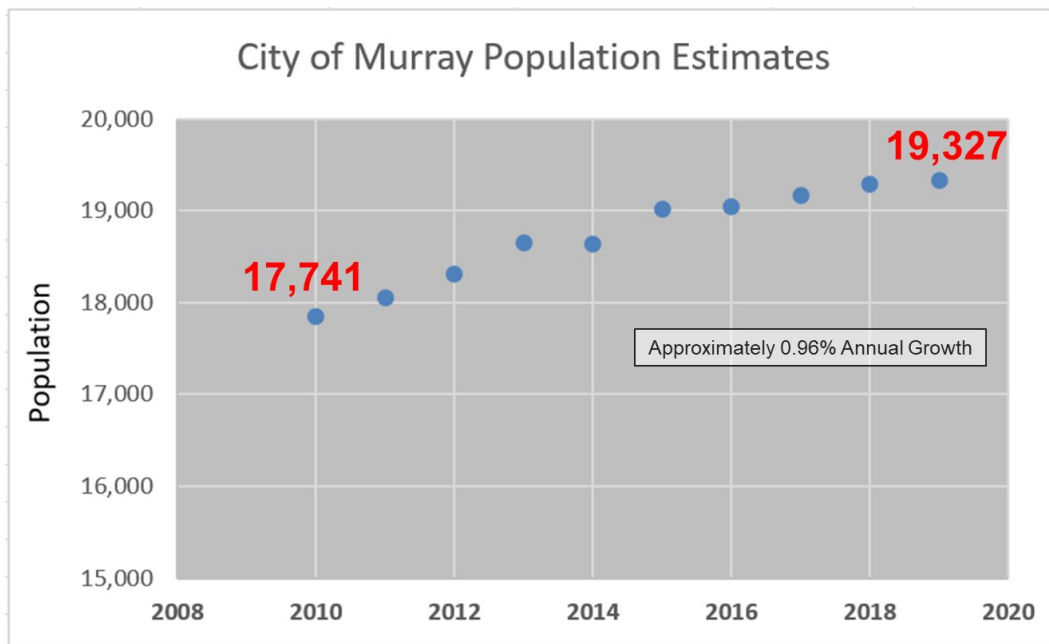


Figure 2: Murray Population Estimates (Source: KY State Data Center)

## KYSTM UPDATES

The KYSTM originally divided Calloway County into 33 traffic analysis zones (TAZs). These zones are used to allocate socioeconomic data such as households, employment, and population for trip productions and attractions. These data, and particularly the estimated projections, are fundamental to the forecast development process. The 2015 and 2045 KYSTM socioeconomic data in Calloway County are summarized in **Table 1**.

Table 1: KYSTM Socioeconomic Summary for Calloway County

Model Year	Households	Population	Employment
2015	15,957	38,343	15,188
2045	19,331	48,385	17,354

The original KYSTM root-mean-square-error (RMSE), which indicates the relative match of the model's assignments to the latest traffic counts, in Calloway County was 55.7. To lower this value and provide more accurate forecasts, the KYSTM was updated to reflect current conditions in

Reference: Murray SUA Study

Calloway County. These updates included an initial review and update of household data based on aerial photography, splitting TAZs, and reallocating future household and employment data based on feedback from the local Advisory Committee.

### INITIAL HOUSEHOLD UPDATES

Based on an initial review of the KYSTM socioeconomic data in Calloway County, it was evident that many of the 2045 household values did not match up with the corresponding 2015 values. For example, TAZ 1018321 showed a decrease of 1,047 households over the 30-year period, as shown in **Figure 3**, even though the area contained by the TAZ includes an established neighborhood in Murray not likely to experience such a steep decline. 2045 household data in Calloway County was therefore reallocated to reflect growth rates from the City of Murray or Calloway County, depending on the location. **Table 2** presents a summary of the updates. The 2045 Calloway County household total was held constant.

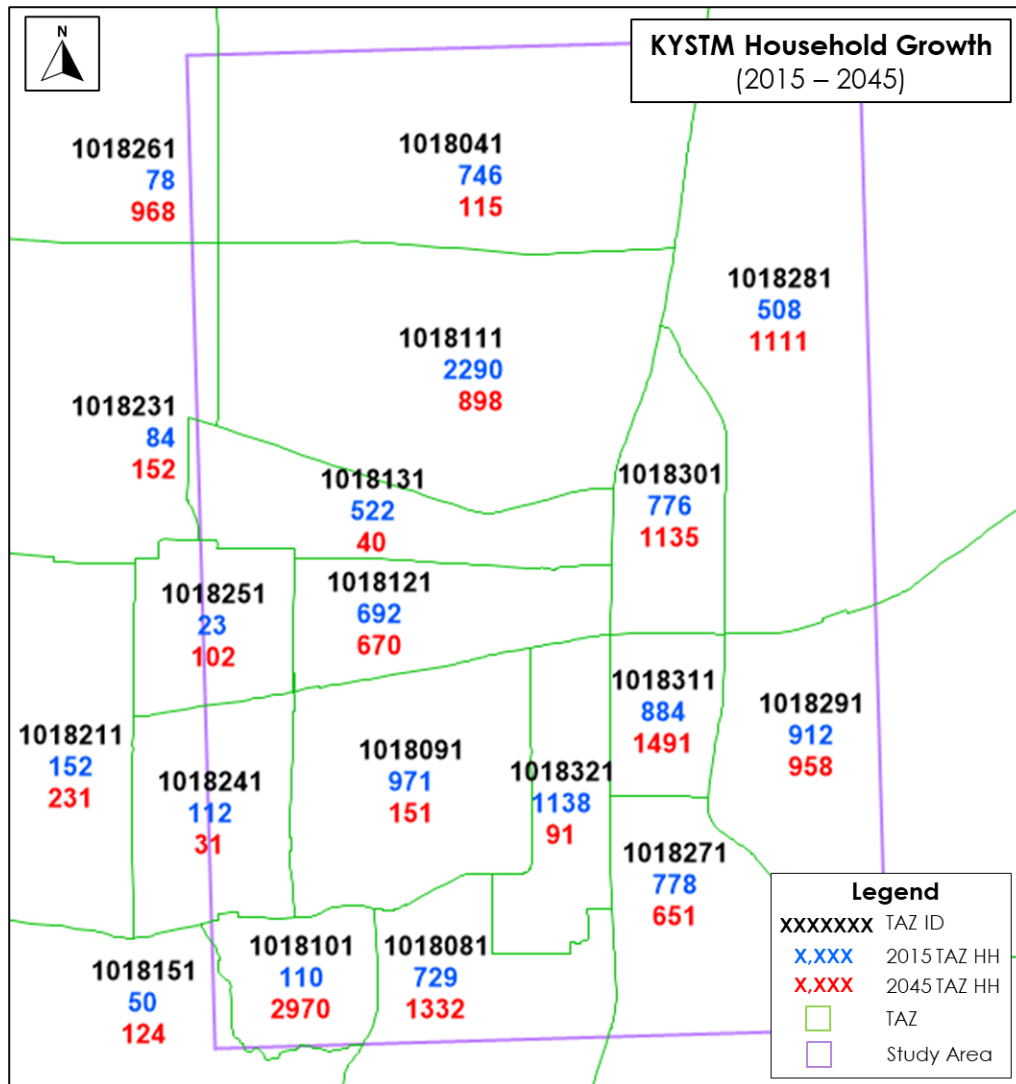


Figure 3: Original Household Distribution

Reference: Murray SUA Study

**Table 2: KYSTM Calloway County Household Updates**

TAZ ID	B_HH	F_HH	Ann GR	Proposed F_HH	Proposed Ann GR
1018011	934	1,012	0.27%	1,012	0.27%
1018021	1,134	1,058	-0.23%	1,058	-0.23%
1018031	835	1,000	0.61%	1,000	0.61%
1018041	746	116	-6.02%	900	0.63%
1018051	89	411	5.22%	110	0.70%
1018061	325	242	-0.98%	390	0.61%
1018071	190	964	5.56%	230	0.64%
1018081	730	1,332	2.03%	890	0.66%
1018091	972	152	-6.00%	1,295	0.96%
1018101	110	2,970	11.60%	150	1.03%
1018111	2,290	899	-3.07%	3,055	0.96%
1018121	693	671	-0.11%	920	0.95%
1018131	523	41	-8.14%	695	0.95%
1018141	30	71	2.91%	40	0.96%
1018151	50	125	3.08%	60	0.59%
1018161	95	278	3.63%	115	0.62%
1018171	207	291	1.15%	250	0.64%
1018181	228	71	-3.81%	71	-3.81%
1018191	50	28	-1.94%	28	-1.94%
1018201	26	213	7.31%	35	1.05%
1018211	153	232	1.40%	185	0.64%
1018221	179	108	-1.68%	108	-1.68%
1018231	85	153	1.98%	105	0.71%
1018241	112	32	-4.10%	150	0.97%
1018251	24	103	5.00%	35	1.29%
1018261	79	968	8.73%	95	0.63%
1018271	778	652	-0.59%	652	-0.59%
1018281	509	1,111	2.64%	868	1.80%
1018291	912	959	0.16%	959	0.16%
1018301	776	1,135	1.27%	1,035	0.96%
1018311	884	1,491	1.76%	1,180	0.97%
1018321	1,139	92	-8.05%	1,515	0.96%
1018331	70	295	4.92%	85	0.66%
<b>Total</b>	<b>15,957</b>	<b>19,276</b>	<b>0.63%</b>	<b>19,276</b>	<b>0.63%</b>

### TRAFFIC ANALYSIS ZONE SPLITS

Once the KYSTM Calloway County household values were updated, the TAZ boundaries were analyzed. Since the KYSTM is a statewide model, many TAZs in Calloway County covered large, varied areas of land. Several TAZs were split to reflect current and future land-use, as shown in **Figure 4**. The socioeconomic data within the original TAZs were split based on an aerial review of the study area, as shown in **Table 3**. The KYSTM originally had 33 TAZs in Calloway County. The updated KYSTM has 45 TAZs in Calloway County after the TAZ splits.

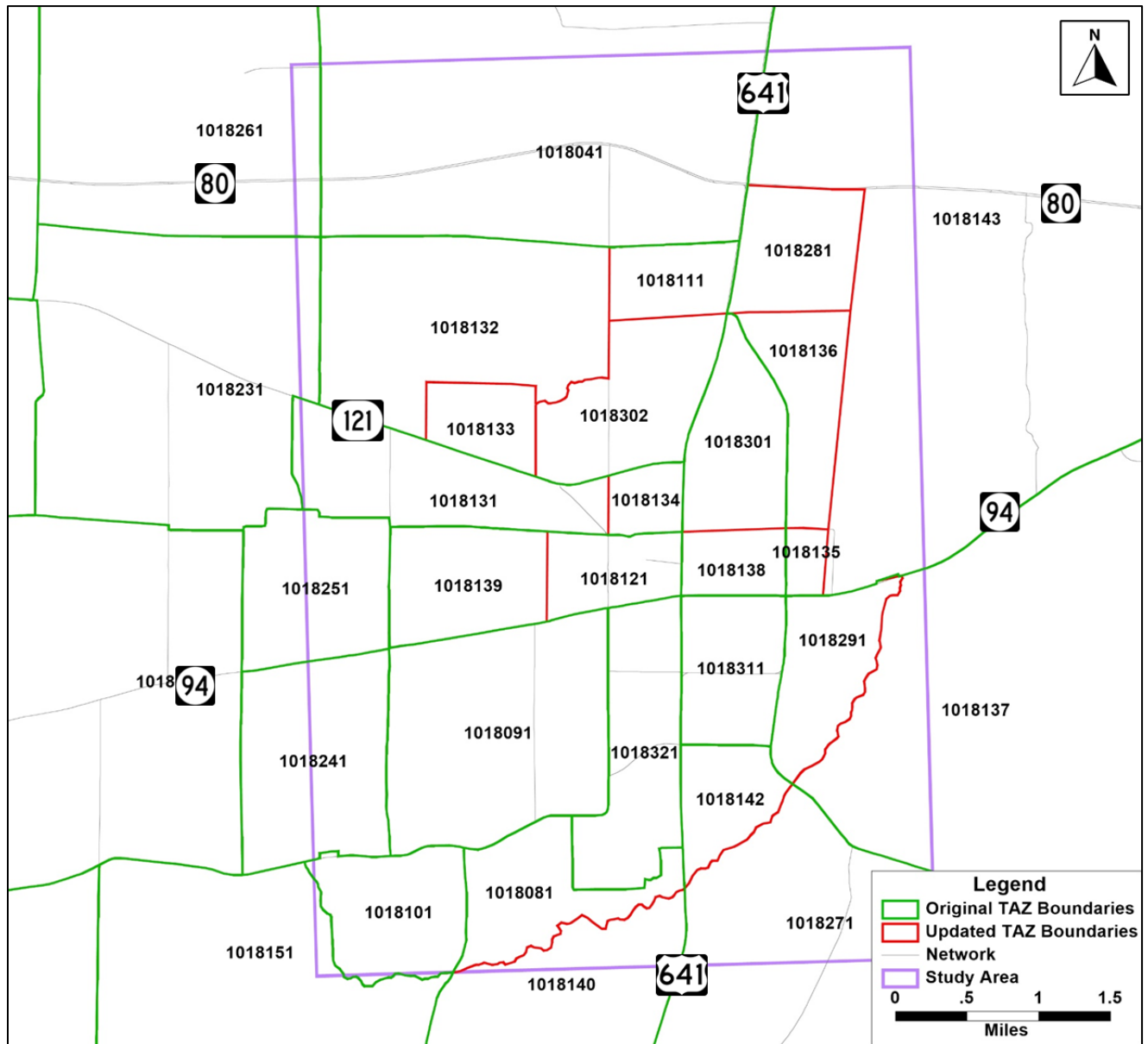


Figure 4: Traffic Analysis Zone (TAZ) Updates

**Table 3: Summary of TAZ Splits**

Original TAZ ID	2015 Households	Updated TAZ ID	2015 Households
1018111	2,290	1018111	550
		1018302	1,000
		1018133	550
		1018132	190
1018281	509	1018281	10
		1018143	99
		1018136	50
		1013135	350
1018301	776	1018301	200
		1018138	576
1018131	523	1018131	400
		1018134	123
1018121	693	1018121	543
		1018139	150
1018291	912	1018291	100
		1018137	812
1018271	778	1018271	628
		1018142	150
1018081	730	1018081	600
		1018140	130

### HOUSEHOLD & EMPLOYMENT UPDATES BASED ON PUBLIC SURVEY

Before the first Advisory Committee meeting, a survey was developed to solicit feedback from local officials and stakeholders in Murray. The survey asked respondents to indicate where residential and commercial growth is likely to occur within the study area over the next 20 years. Based on results from the Advisory Committee survey, residential growth in Murray is expected in the western and southern portions of the study area. KYSTM 2045 household values were reallocated to reflect this expected growth. **Figure 5** shows the original household growth in each Calloway County TAZ from 2015 to 2045, while **Figure 6** shows the updated growth. The 2045 Calloway County household total was held constant.

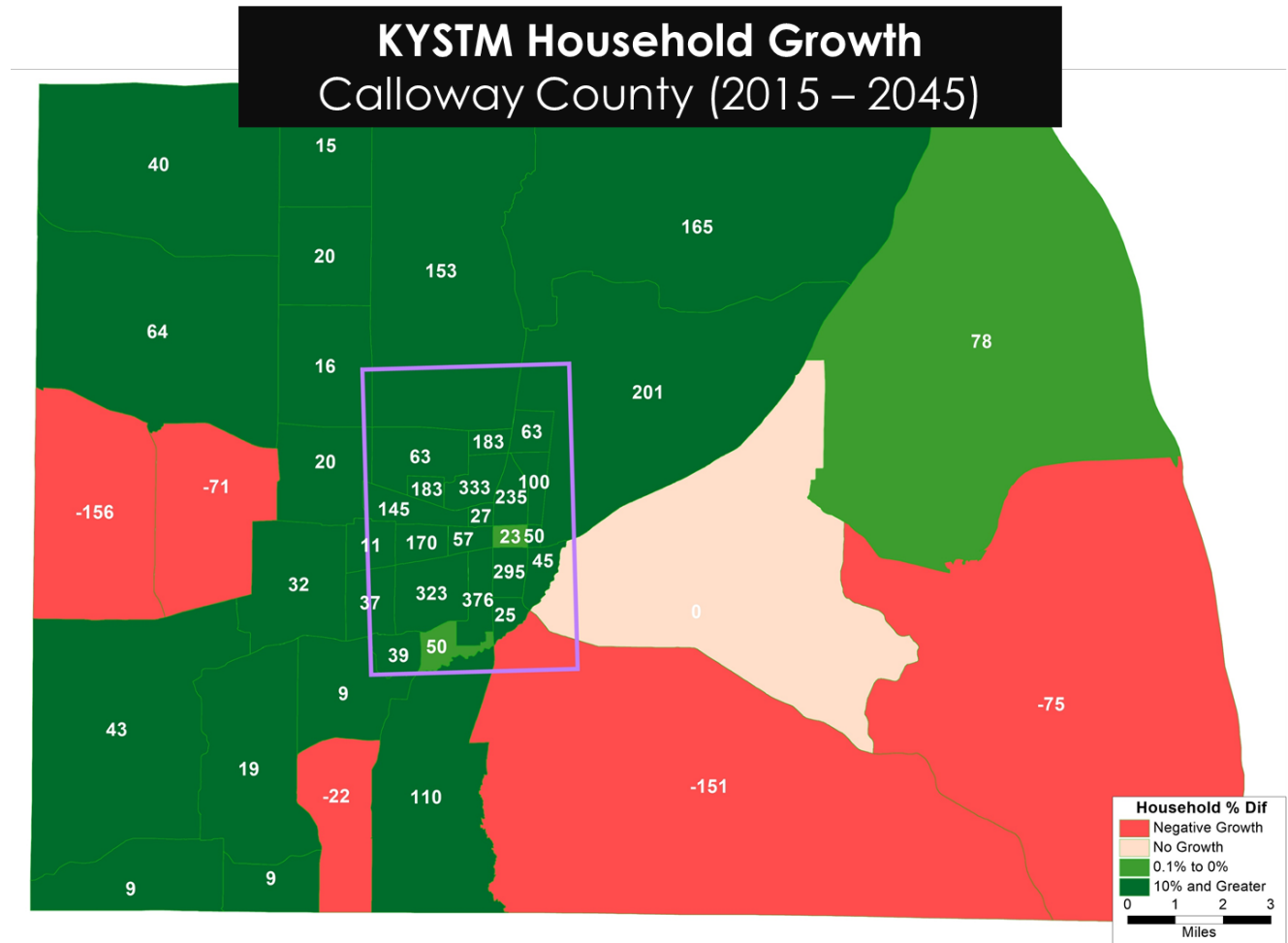
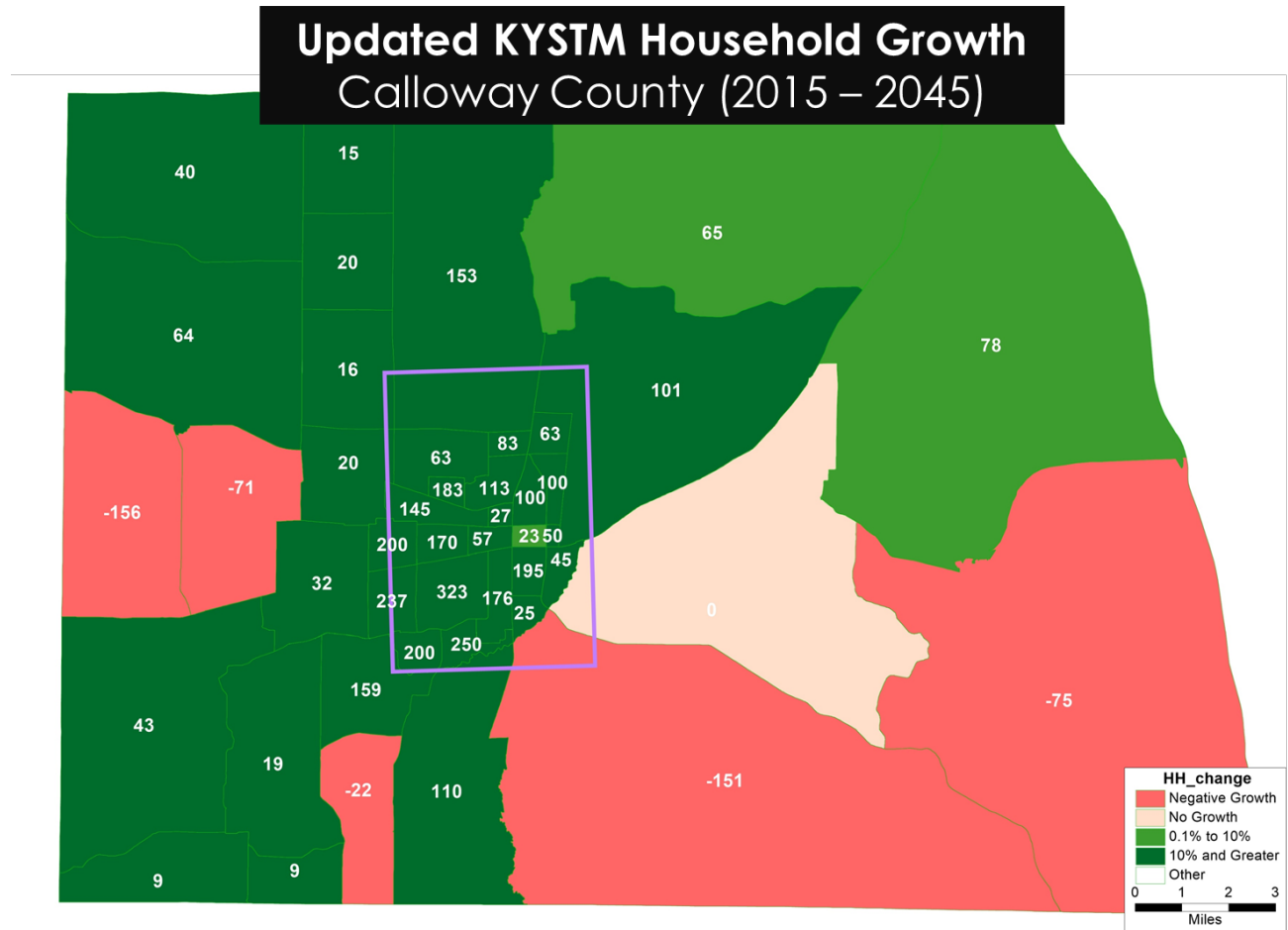


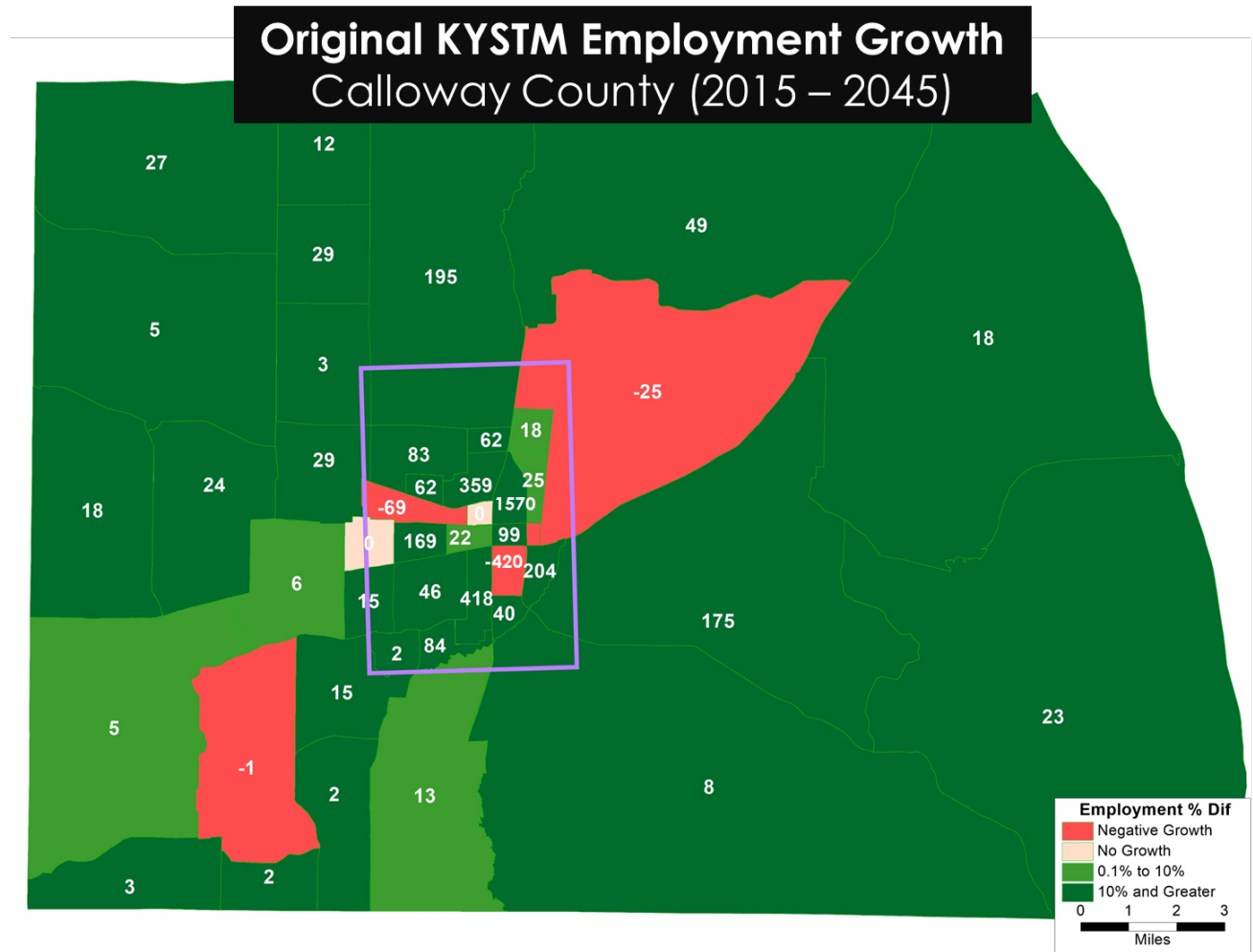
Figure 5: Original KYSTM Household Growth (2015 – 2045)





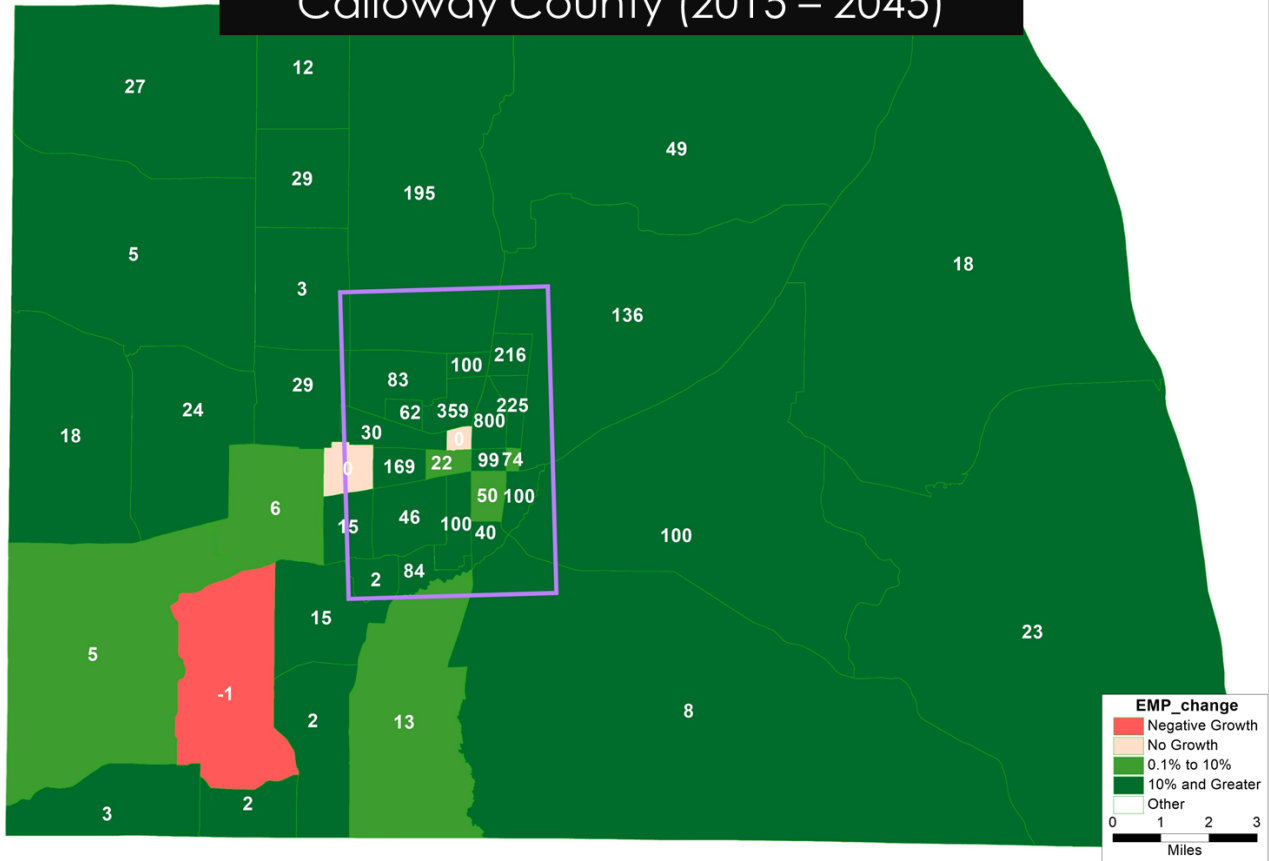
**Figure 6: Updated KYSTM Household Growth (2015 – 2045)**

Similarly, KYSTM employment growth was also updated based on results from the Advisory Committee survey. Commercial growth in Murray is expected in the eastern and northern portions of the study area, especially around KY 2075 and the KY 80/US 641 intersection. **Figure 7** shows the original employment growth in each Calloway County TAZ from 2015 to 2045, while **Figure 8** shows the updated growth. The 2045 Calloway County employment total was held constant.



**Figure 7: Original KYSTM Employment Growth (2015 – 2045)**

## Updated KYSTM Employment Growth Calloway County (2015 – 2045)



**Figure 8: Updated KYSTM Household Growth (2015 – 2045)**

## CONCLUSIONS

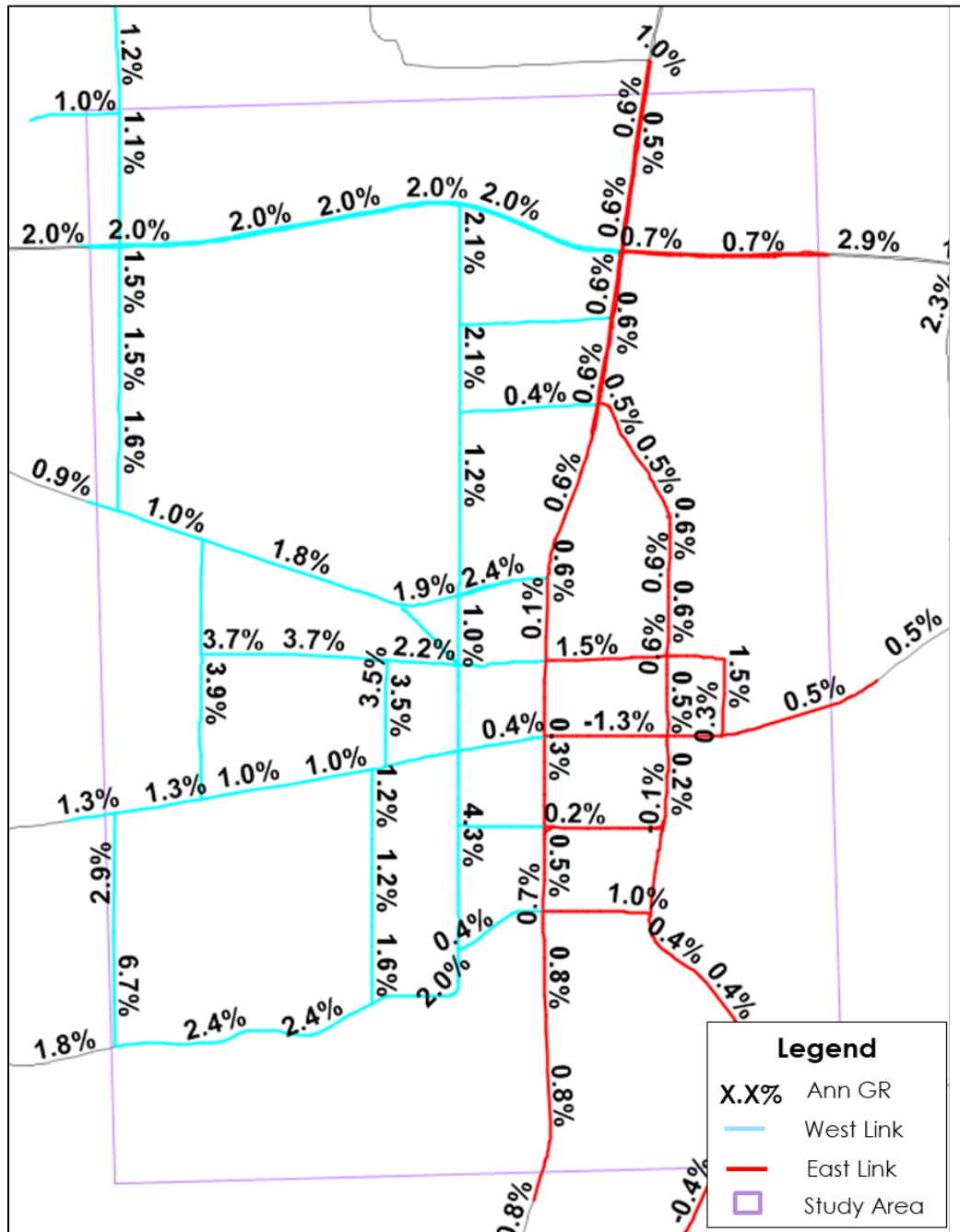
The updates to the KYSTM resulted in lowering the Calloway County RMSE from 56.31 to 36.78, as shown in **Table 4**. The percent difference between the flow and most recent traffic counts was also lowered from 5.8 percent to 2.8 percent.

**Table 4: RMSE Summary**

Model	Calloway RMSE	Counts	Flow	% Dif
KYSTM	56.31	468,621	495,728	5.8%
Updated KYSTM	36.78	468,621	481,879	2.8%

## KYSTM GROWTH RATES

The updated base year and future year models were then run and daily volumes were assigned to each link. Annual growth rates were calculated for each link, as shown in **Figure 9**.

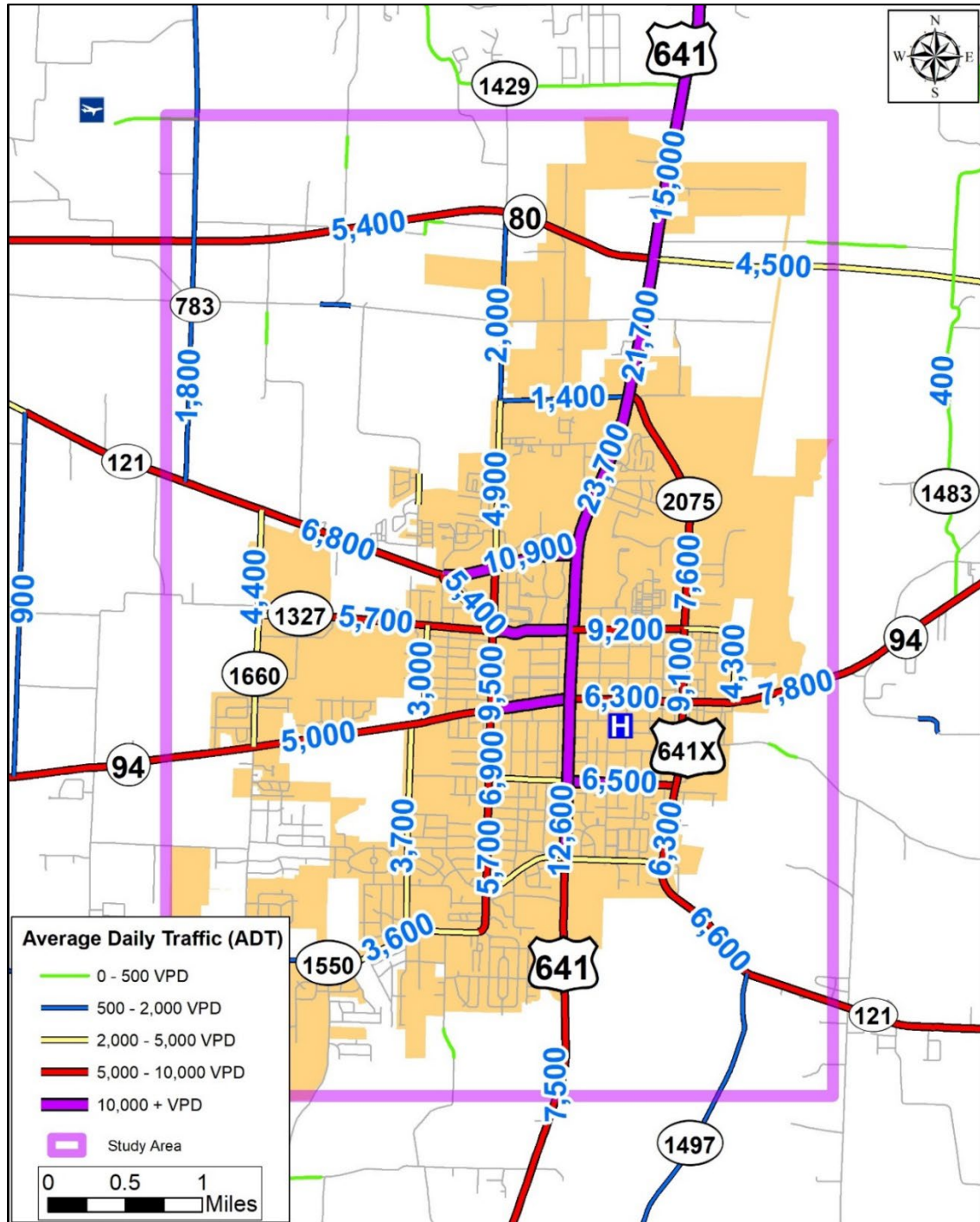


**Figure 9: KYSTM Growth Rates**

Based on the results, it is evident that routes in the western portion of the study area are expected to grow at a faster rate than those to the east, which matches what was shared by the local Advisory Committee. Therefore, average growth rates were calculated for the western and eastern portions of the study area, as shown in Figure 9. An annual growth rate of 1.35 percent was used for routes to the west (highlighted in aqua), and 0.6 percent was used for routes in the east (highlighted in red).

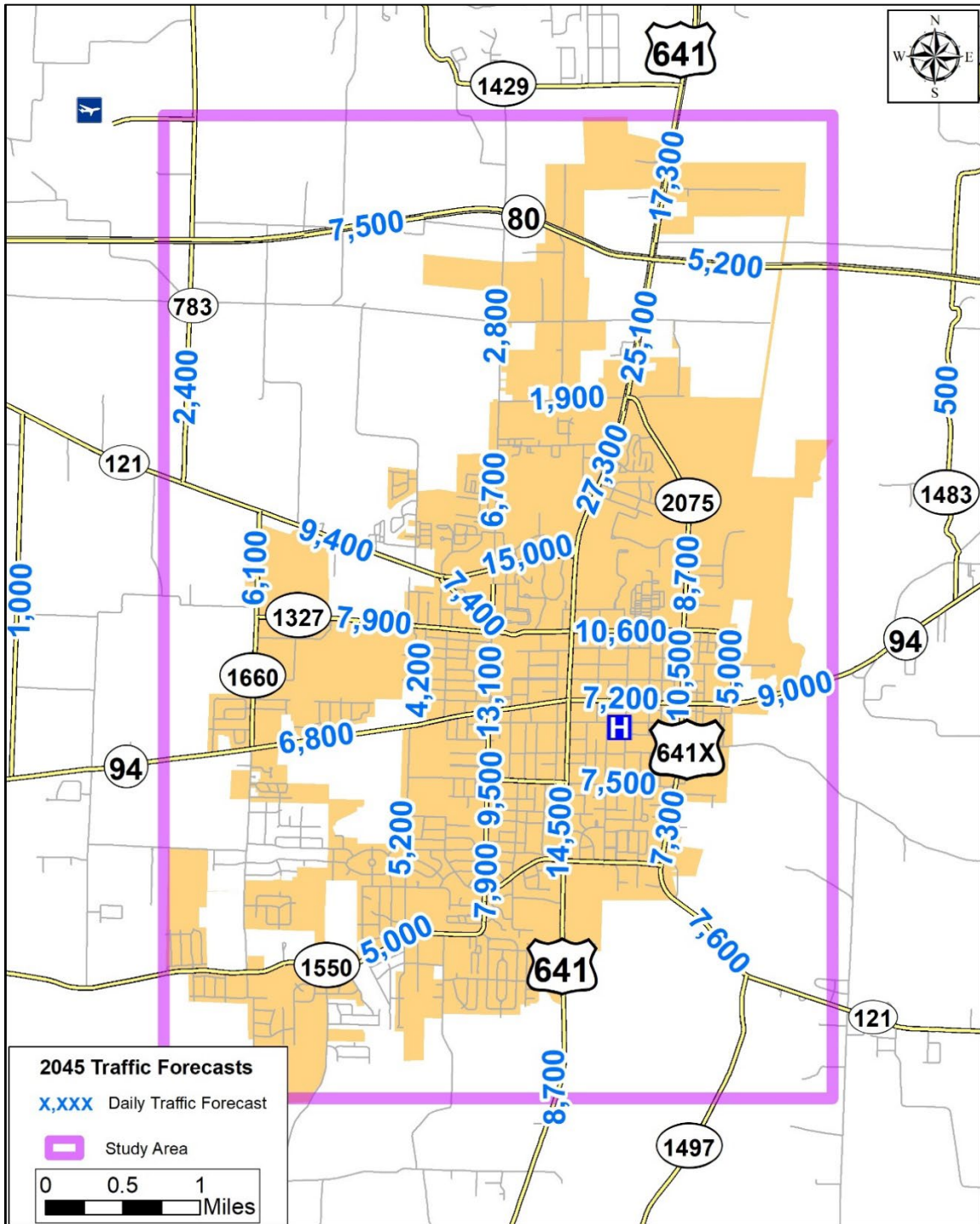
**2021 TRAFFIC VOLUMES**

The annual growth rates were then applied to the latest KYTC daily traffic counts (excluding 2020) to bring them all to a 2021 base year, as shown in **Figure 10**.



**2045 TRAFFIC FORECASTS**

The growth rates were also used to develop 2045 daily traffic forecasts, as shown in **Figure 11**.



**Figure 11: 2045 Daily Traffic Forecasts**



November 22, 2021

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**Reference: Murray SUA Study**

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A handwritten signature in black ink, appearing to read "Graham Winchester".

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