

## APPENDIX G



## TRANSPORTATION CABINET

Frankfort, Kentucky 40622  
www.transportation.ky.gov/

Steven L. Beshear  
Governor

Michael W. Hancock, P.E.  
Secretary

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### MEMORANDUM

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**TO:** Joseph McClearn, P.E.  
Chief District Engineer  
District 2 - Hopkinsville

**ATTN:** Jason Orange

**FROM:** Keith Dotson *Keith Dotson*  
Acting Director  
Division of Planning

**DATE:** December 9, 2013

**SUBJECT:** Christian County Traffic Forecast  
New Intersection on Interstate 24  
Item No. 02-8702.00

In response to your April 25, 2013 request, we are providing the following forecasts on the attached report:

- 2013 and 2040 No-Build Average Daily Traffic
- 2013 and 2040 Build Average Daily Traffic
- 2013 and 2040 Daily and Design Hour No-Build Turning Movements
- 2013 and 2040 Daily and Design Hour Build Turning Movements
- No-Build and Build Truck Percentages

If you have any questions, please contact Daniel Hulker of this Division at (502) 782-5064.

KD/DAH/BC

#### Attachments

c/att: Charles Martin  
Nick Hall  
John Rudd  
Dan Hite  
Paul Looney



# *Executive Summary*

## **Traffic Forecast Report Christian County New Interchange on I-24 at KY 107 Item No. 02-8702.00**

Prepared for:



Prepared by:  
**Daniel Hulker**  
Division of Planning  
Kentucky Transportation Cabinet  
December 9, 2013

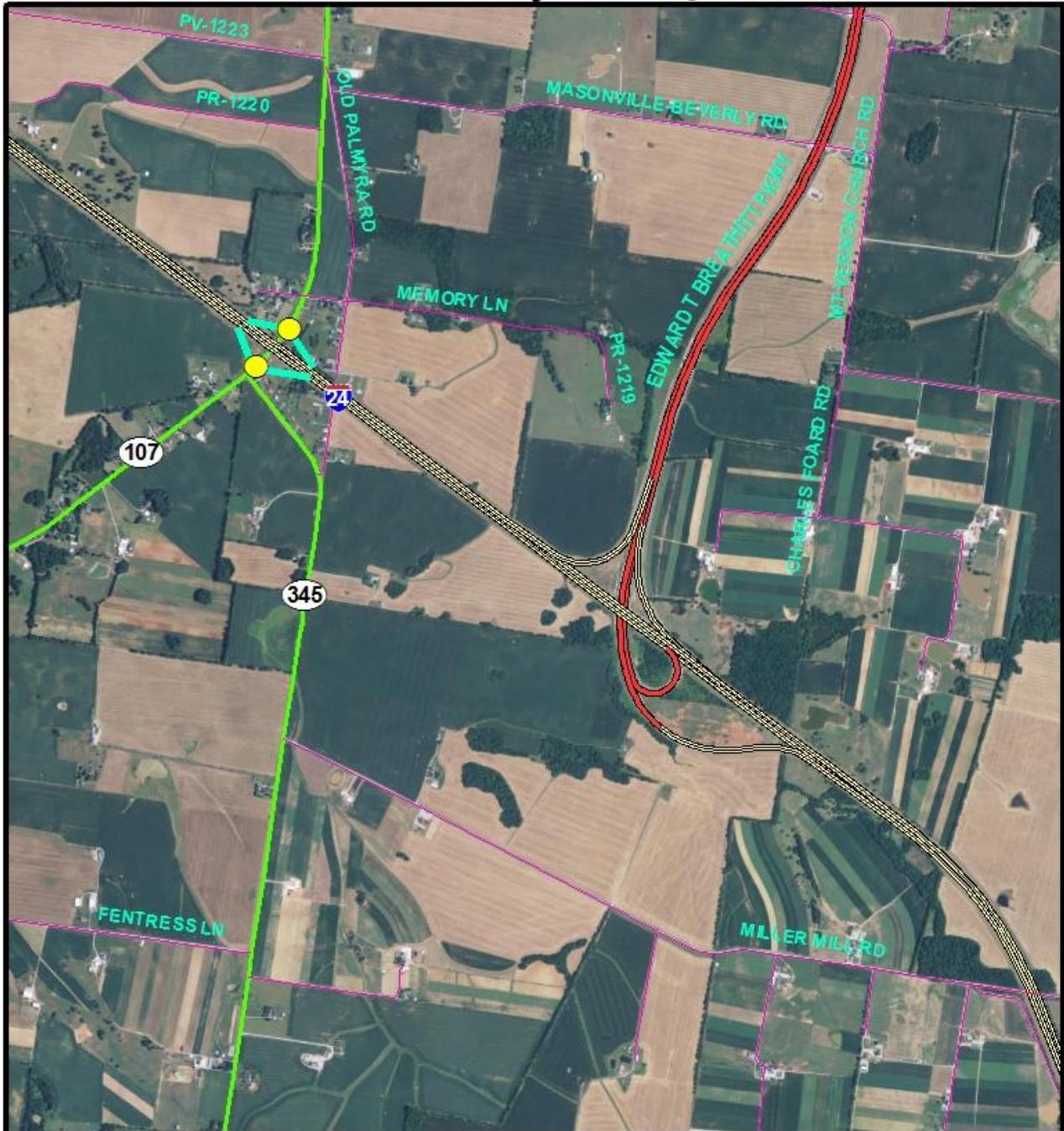
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## **Commonly Used Abbreviations and their Descriptions**

ADT	Average Daily Traffic	Without any adjustment
DHV	Design Hour Volume	30 <sup>th</sup> highest hour of a <u>year</u>
ESAL	Equivalent Single Axle Load	A measure of traffic's impact on roadway
%T	Truck Percentage	The percentage of trucks to total volume
FC	Functional Class	Refers to a road's importance
GR	Growth Rate	A value normally compounded annually
PHF	Peak Hour Factor	Considers a 15 minute spike in an hourly count
K-Factor	K-30 <sup>th</sup> hour Factor	DHV divided by ADT (DHV/ADT)
D-Factor	Directional Factor	Percentage of dominant flow to total
MP	Mile Point	Miles increase easterly and northerly
ATR	Automatic Traffic Recorder	A permanent & continuous recording station
KYSTM	Kentucky Statewide Model	A computerized representation of KY roads

# Vicinity Map



	<p><b>LEGEND</b></p> <ul style="list-style-type: none"> <li> New Ramp</li> <li> New Intersection</li> </ul>	<p>Christian County                  New interchange on I-24                  at KY 107 (Lafayette Rd.)                  Item # 02-8702.00</p>		
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## **Traffic Forecast Executive Summary**

### **Christian County: New Interchange on I-24 at KY 107**

#### **Item No. 02-8702.00**

#### **FORECAST SUMMARY**

This forecast calls for the construction of a new interchange on Interstate 24 at KY 107 just west of the Breathitt Parkway interchange.

#### **FORECAST TYPE**

The following types of forecasts were developed:

- 2013 and 2040 No-Build ADT and DHV values
- 2013 and 2040 Build ADT and DHV values
- 2013 and 2040 Daily and Design Hour No-Build Turn Movements
- 2013 and 2040 Daily and Design Hour Build Turn Movements
- 2013 and 2040 Truck Percentages

#### **CURRENT-YEAR VOLUMES**

Current year no-build volumes were based upon the existing traffic counts. Current year build volumes were based upon the Kentucky Statewide Model as well as existing traffic counts in the vicinity of the proposed interchange. The following traffic stations were considered (all in Christian County):

<b>Station</b>	<b>Count</b>	<b>Year</b>	<b>Route</b>	<b>Milepoint</b>
024-501	2,100	2011	024-KY-0107 -000	13.800
024-503	550	2011	024-KY-0345 -000	6.700
024-504	930	2012	024-KY-0107 -000	9.100
024-557	30,000	2011	024-I -0024 -000	83.500
024-565	20,000	2013	024-I -0024 -000	72.692
024-566	8,000	2013	024-EB-9004 -000	2.587
024-567	4,900	2013	024-I -0024 -421	0.370
024-568	4,100	2013	024-I -0024 -431	0.270
024-569	250	2013	024-I -0024 -441	0.280

These stations were compared to the corresponding assignment of segments in the current year Kentucky Statewide Model for a no-build scenario. To forecast current year build volumes on the proposed ramps, ramp segments were inserted into the Kentucky Statewide Model for a build scenario. All figures are subject to rounding.

### **DESIGN-YEAR/GROWTH FACTORS**

The design year volumes for the build and no-build scenarios were based on the projected growth rate of the area surrounding the proposed interchange. Christian County's population as a whole is projected to grow at a rate of 2.1% per year. However, much of the growth will likely occur in Hopkinsville to the north and the vicinity of Ft. Campbell to the south. Therefore, a 1% growth rate of traffic was used for this forecast.

### **DESIGN HOUR FACTORS**

The design hour was based upon the peak hour traffic of existing roads and the proportion of observed AM and PM peak hour traffic to observed daily totals. Please see the chart on page 5 for peak hours of each segment.

### **TRUCK PERCENTAGE**

The truck percentages were based upon the functional class average where there was no class count information available. Class counts were available for the Breathitt Parkway which indicated a 2013 truck percentage of 22%. Statewide research indicates a 1% annual growth rate for truck traffic may be applied as a component of overall traffic growth on rural principal arterials.

The truck percentage used for the new ramps is the same as KY 107, where all ramp traffic will enter and exit.

### **ESALs**

The ESAL values were not requested and therefore not included.

### **TURN MOVEMENTS**

One turning movement count was conducted at the intersection of KY 107 and KY 345 on 11/7/13. The other turning movements were estimated from the projected turning movements of the Kentucky Statewide Model. The Kentucky Statewide Model estimated turning proportions for the new interchange. These proportions were then applied to create turning movements for this forecast.

Traffic Forecast Technical Report  
 Christian County: New Interchange on I-24 at KY 107  
 Item No. 02-8702.00

NO BUILD SEGMENT INFORMATION		No Build ADT		No Build AM Peak		No Build PM Peak		No Build T%		Turn Movement	
ROUTE UNIQUE ID	RD NAME	2013	2040	2013	2040	2013	2040	2013	2040	2013	2040
024-I-0024-000	I-24 West of Parkway	20,000	26,000	1,400	1,600	1,500	1,800	22%	25%	N/A	N/A
024-EB-9004-000	Edward T Breathitt Pennyrite Parkway	8,500	11,000	530	680	590	750	22%	25%	N/A	N/A
024-I-0024-000	I-24 East of Parkway	30,000	39,000	1,800	2,400	2,000	2,700	22%	25%	N/A	N/A
024-I-0024-441	SB I-24 Ramp from Pkw to I-24	250	330	25	35	30	40	22%	25%	N/A	N/A
024-I-0024-431	NB I-24 Ramp from I-24 to Pkw	4,100	5,400	350	460	390	510	22%	25%	N/A	N/A
024-I-0024-421	SB I-24 Ramp from Parkway	4,500	5,900	320	410	350	460	22%	25%	N/A	N/A
024-EB-9004-000	NB Ramp from I-24 to EB Parkway	250	330	30	40	30	40	22%	25%	N/A	N/A
024-KY-0107-000	Lafayette Rd North of Memory Ln	2,200	2,900	300	430	300	380	9%	10%	Page 12	Page 14
024-KY-0107-000	Lafayette Rd South of Palmyra Rd	1,700	2,300	240	360	240	290	9%	10%	Page 13	Page 15
024-KY-0345-000	Palmyra Rd	700	1,000	100	130	100	150	9%	10%	Page 13	Page 15
BUILD SEGMENT INFORMATION		Build ADT		Build AM Peak		Build PM Peak		Build T%		Turn Movement	
ROUTE UNIQUE ID	RD NAME	2013	2040	2013	2040	2013	2040	2013	2040	2013	2040
024-I-0024-000	I-24 West of Intersection	20,200	26,400	1,400	1,700	1,600	1,900	22%	25%	N/A	N/A
024-I-0024-000	I-24 between KY 107 and Parkway	22,000	28,800	1,500	1,800	1,600	2,000	22%	25%	N/A	N/A
024-EB-9004-000	Edward T Breathitt Pennyrite Parkway	9,000	11,800	570	720	630	800	22%	25%	N/A	N/A
024-I-0024-000	I-24 East of Parkway	31,500	41,200	1,900	2,600	2,100	2,900	22%	25%	N/A	N/A
024-I-0024-441	SB I-24 Ramp from Pkw to I-24	500	650	55	70	60	80	22%	25%	N/A	N/A
024-I-0024-431	NB I-24 Ramp from I-24 to Pkw	4,100	5,400	350	460	390	510	22%	25%	N/A	N/A
024-I-0024-421	SB I-24 Ramp from Parkway	4,500	5,900	320	410	350	460	22%	25%	N/A	N/A
024-EB-9004-000	NB Ramp from I-24 to EB Parkway	500	650	55	70	60	80	22%	25%	N/A	N/A
024-KY-0107-000	Lafayette Rd North of Memory Ln	2,300	2,900	330	390	310	360	9%	10%	Page 17	Page 21
024-KY-0107-000	Lafayette Rd South of Palmyra Rd	2,100	2,700	300	370	300	360	9%	10%	Page 20	Page 24
024-KY-0345-000	Palmyra Rd	1,000	1,200	120	160	120	170	9%	10%	Page 20	Page 24
I-24 NEW RAMP	WB Ramp from KY 107 to I-24	200	300	30	50	30	40	9%	10%	Page 18	Page 22
I-24 NEW RAMP	EB Ramp from I-24 to KY 107	200	300	30	50	40	50	9%	10%	Page 19	Page 23
I-24 NEW RAMP	WB Ramp from I-24 to KY 107	1,000	1,300	100	130	110	150	9%	10%	Page 18	Page 22
I-24 NEW RAMP	EB Ramp from KY 107 to I-24	1,000	1,300	90	130	90	130	9%	10%	Page 19	Page 23

\* All Figures are subject to rounding and balancing and should not be taken as indicative of accuracy beyond two significant digits.

**HISTORICAL POPULATION SUMMARY**

	1960	1970	1980	1990	2000	2010	60 - 70	70 - 80	80 - 90	90 - 00	00 - 10
Population	3,038,156	3,220,711	3,660,334	3,686,892	4,041,769	4,339,367	Change 6.0%	Change 13.6%	Change 0.7%	Change 9.6%	Change 7.4%
Christian Co	-	56,224	66,878	68,941	72,265	73,955	-	18.9%	3.1%	4.8%	2.3%
							Pct	Pct	Pct	Pct	Pct

Sources: US Bureau of the Census; Kentucky State Data Center

**FUTURE POPULATION PROJECTIONS SUMMARY**

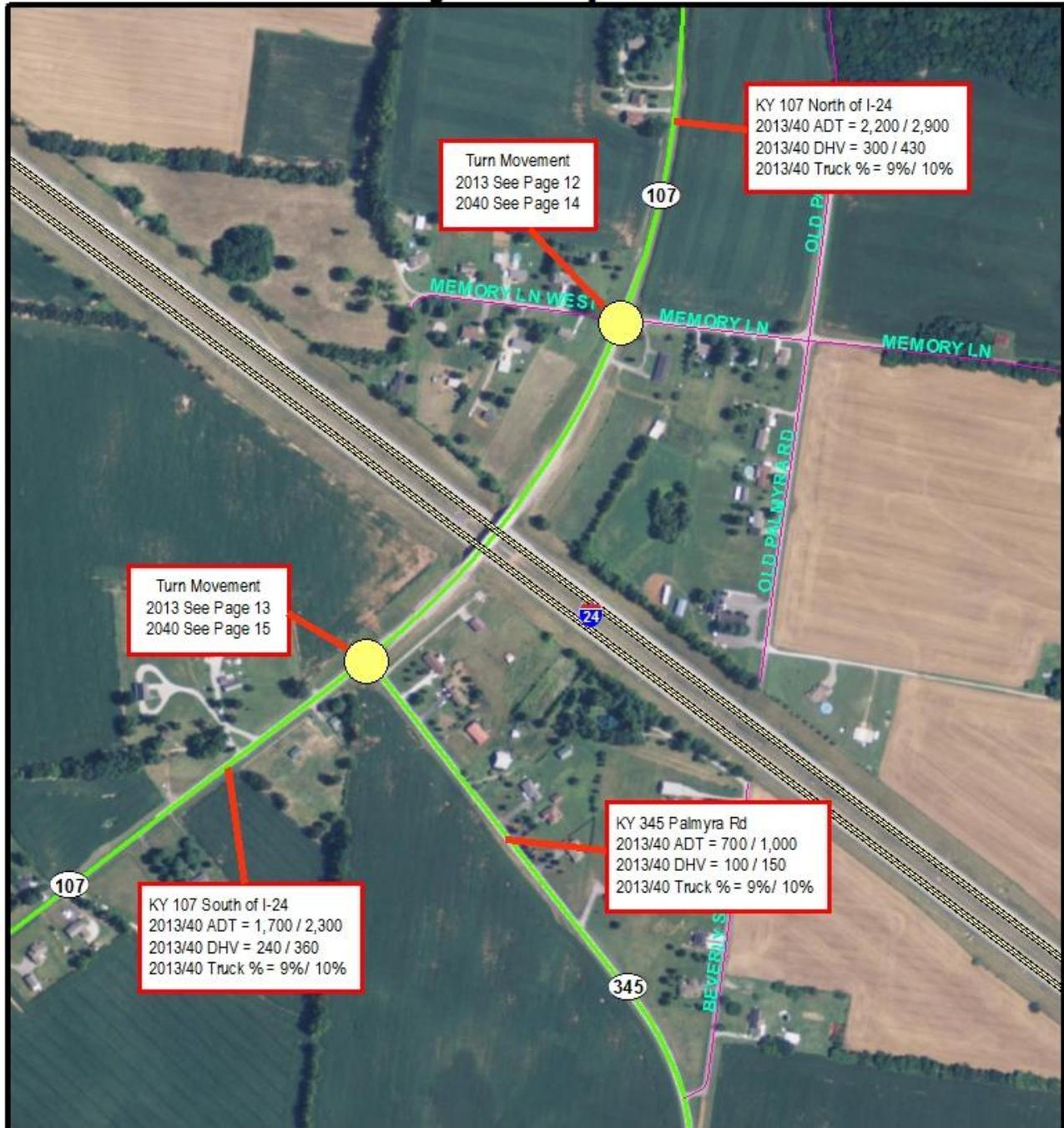
	2010	2015	2020	2025	2030	2035	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35
Projection	4,339,367	4,506,569	4,669,801	4,838,370	5,001,748	5,147,274	Change 3.9%	Change 3.6%	Change 3.6%	Change 3.4%	Change 2.9%
Christian Co	73,955	91,158	98,768	106,897	115,451	124,142	23.3%	8.3%	8.2%	8.0%	7.5%
							Pct	Pct	Pct	Pct	Pct

Sources: US Bureau of the Census; Kentucky State Data Center

**ANNUAL POPULATION GROWTH RATES FROM HISTORICAL DATA AND PROJECTIONS**

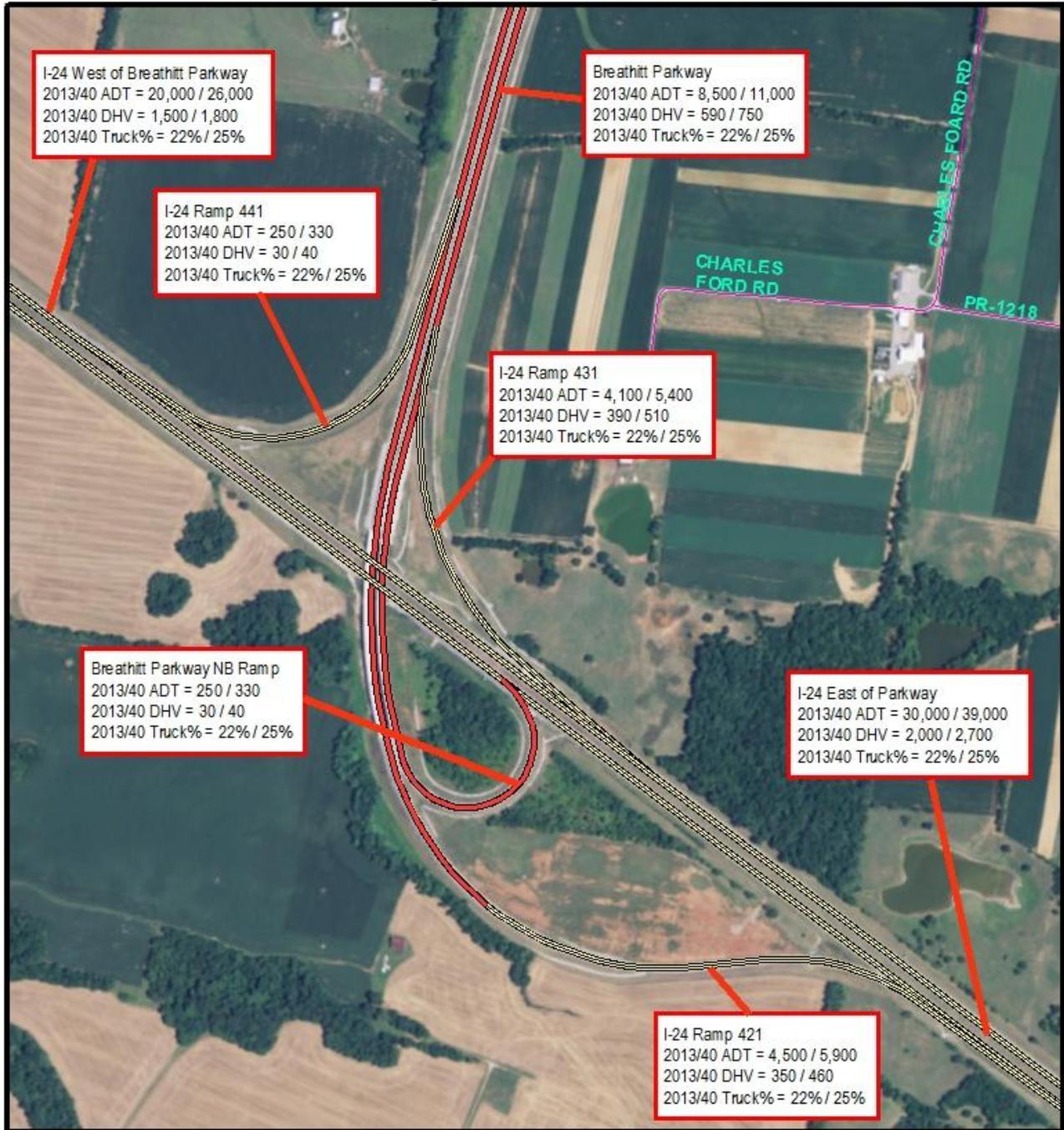
	60 - 70	70 - 80	80 - 90	90 - 00	05 - 10	10 - 15	15 - 20	20 - 25	25 - 30	10 - 30	10 - 35
GR	0.59%	1.29%	0.07%	0.92%	0.76%	0.71%	0.67%	0.58%	0.55%	0.69%	2.09%
Christian Co	-	1.75%	0.30%	0.47%	4.27%	1.62%	1.59%	1.46%	1.86%	1.86%	2.09%

# Summary Map No Build



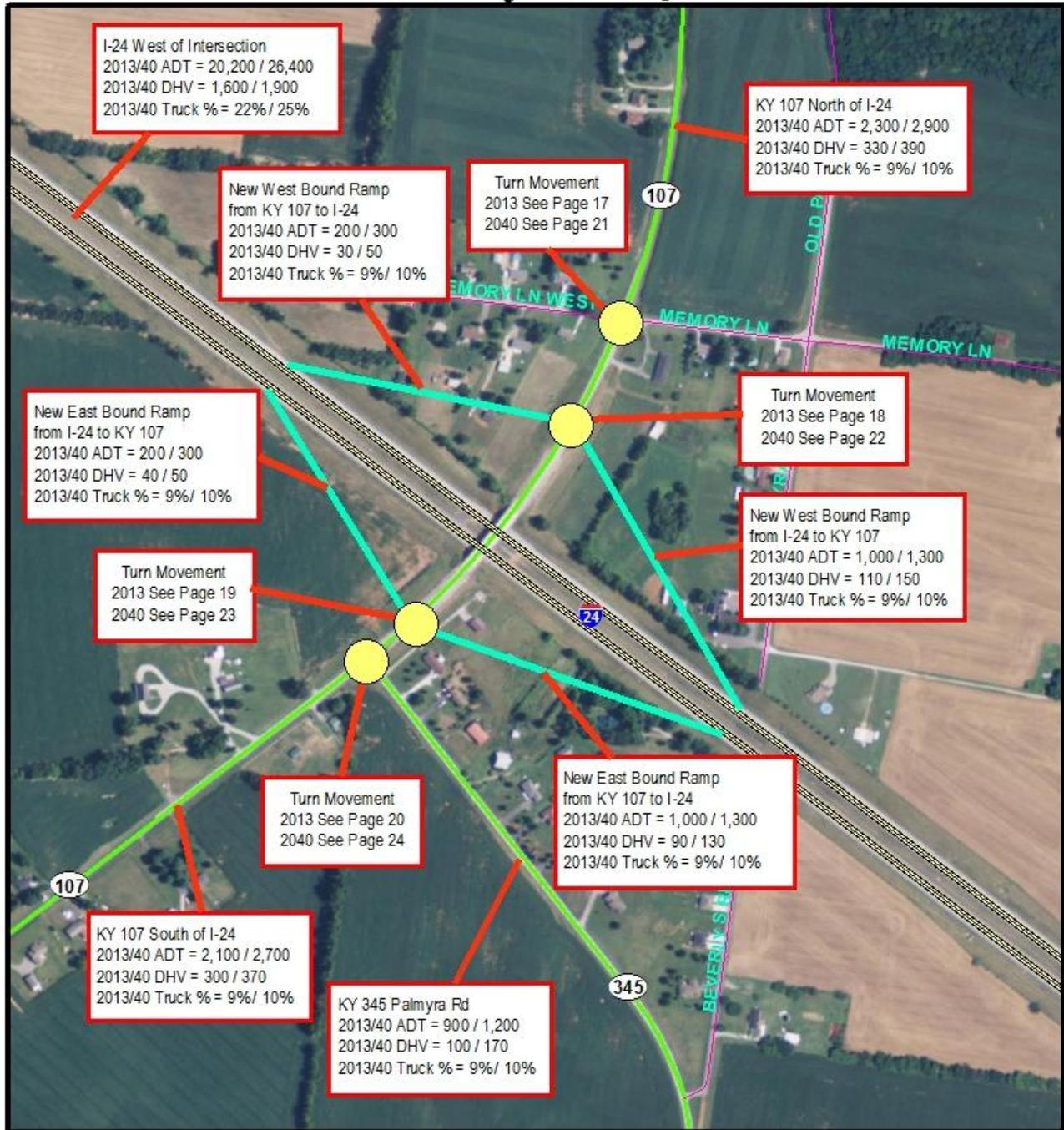
<p><b>LEGEND</b></p> <p> Proposed Ramps</p> <p> Turn Movements</p>	<p>Christian County                  New intersection at                  I-24 and KY 107                  Item # 02-8702.00</p>	  <p>0 0.05 0.1 0.2 Miles</p>
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# Summary Map No Build



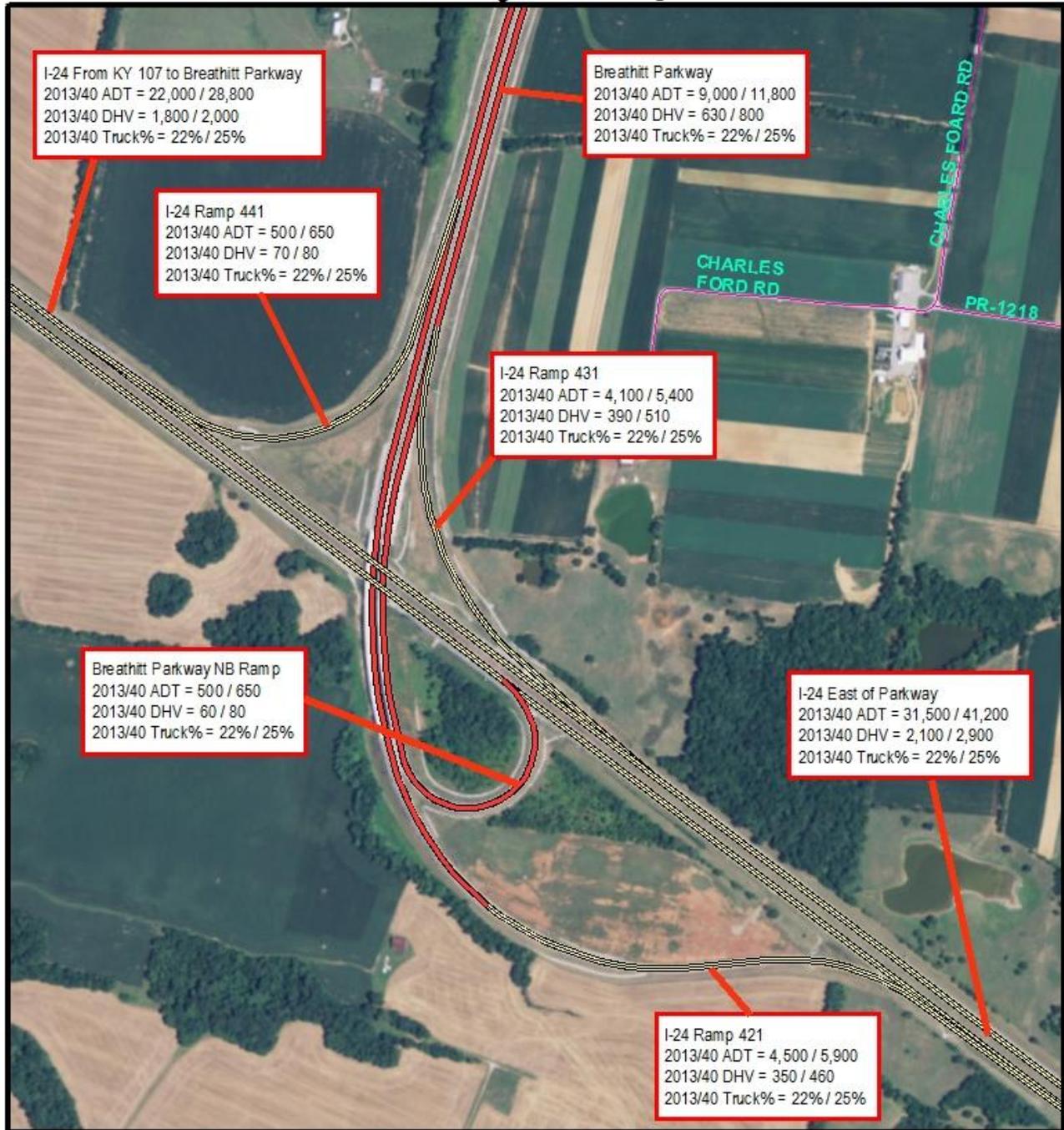
<p>N</p> <p><b>LEGEND</b></p> <p> Proposed Ramps</p> <p> Turn Movements</p>	<p>Christian County                  New intersection at                  I-24 and KY 107                  Item # 02-8702.00</p>	<p><b>Kentucky</b>                  UNBROKEN SPIRIT</p> <p>0 0.05 0.1 0.2 0.3 Miles</p>
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# Summary Map Build



<p><b>LEGEND</b></p> <p> Proposed Ramps</p> <p> Turn Movements</p>	<p>Christian County                  New intersection at                  I-24 and KY 107                  Item # 02-8702.00</p>	<p><b>Kentucky</b>                  UNBROKEN SPIRIT</p> <p>0 0.05 0.1 0.2 Miles</p>
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# Summary Map Build



<p>N</p> <p><b>LEGEND</b></p> <p> Proposed Ramps</p> <p> Turn Movements</p>	<p>Christian County                  New intersection at                  I-24 and KY 107                  Item # 02-8702.00</p>	<p><b>Kentucky</b>                  UNBROKEN SPIRIT</p> <p>0 0.05 0.1 0.2 0.3 Miles</p>
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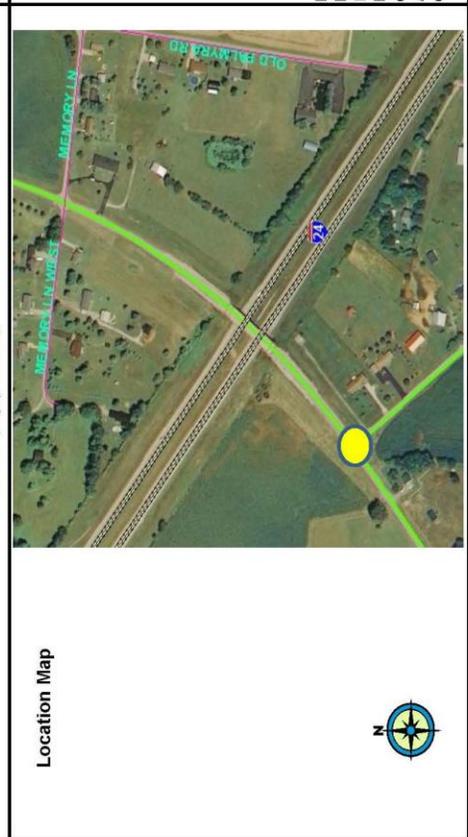
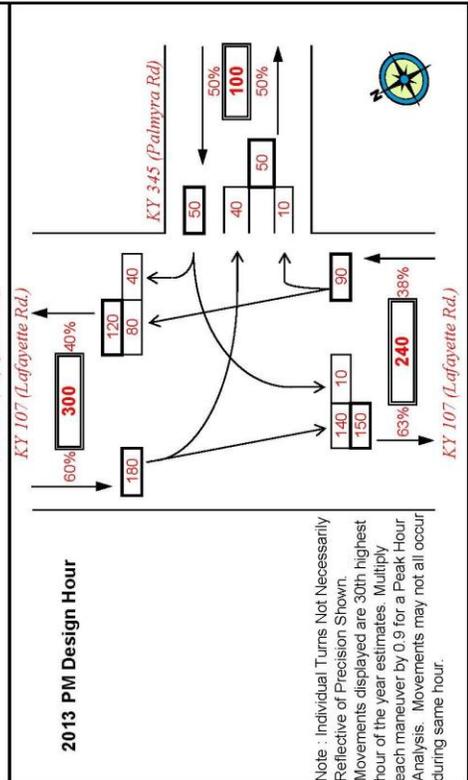
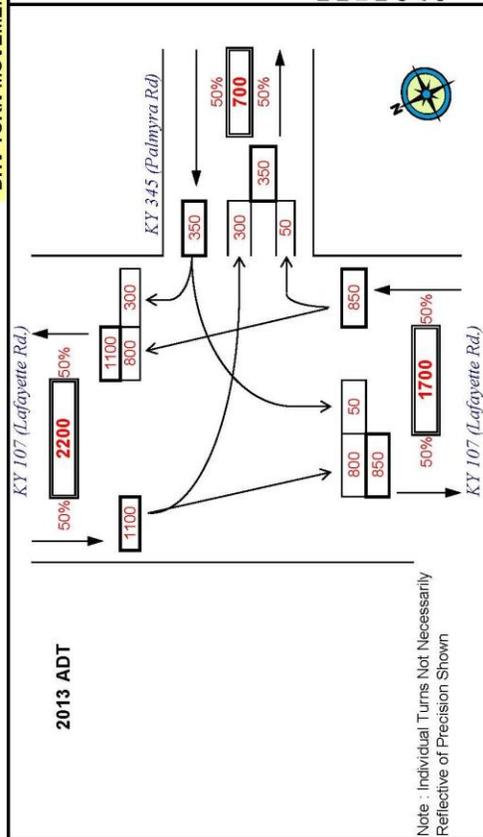
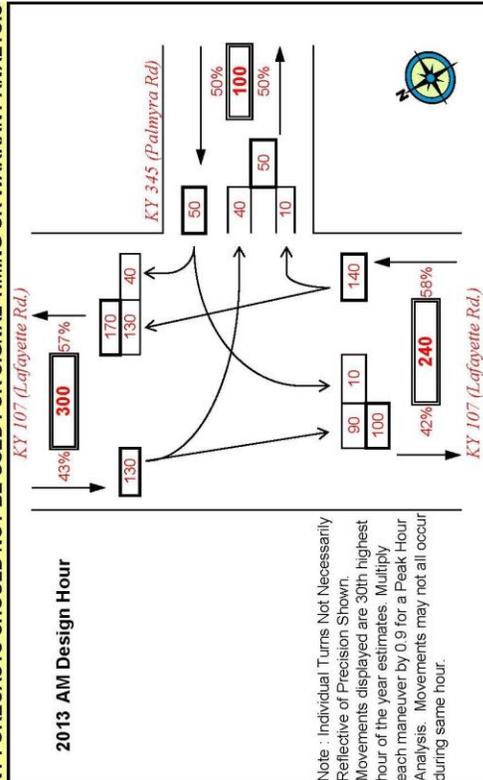
# NO BUILD TURN MOVEMENTS



PROJECT: Construct New Intersection on I-24  
 ITEM NUMBER: 02-8702.00  
 MARS NUMBER: 8767901P  
 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Hulker  
 SCENARIO: 2013 ADT and Design Hour Volumes  
 INTERSECTION: KY 107 and KY 345

**NO BUILD 2013**

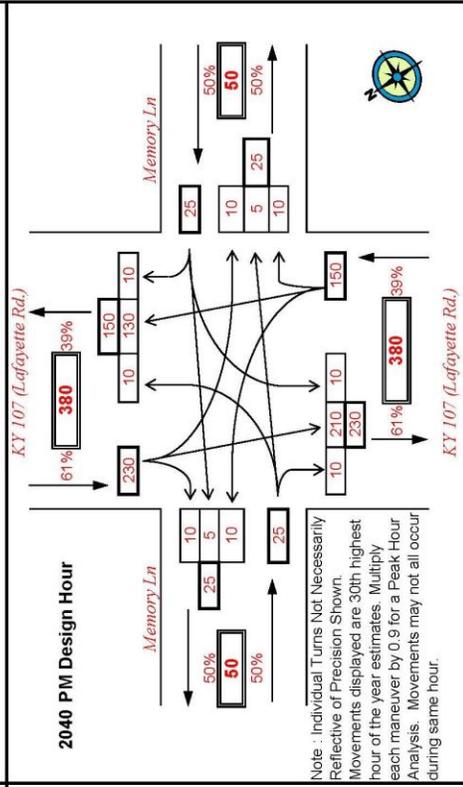
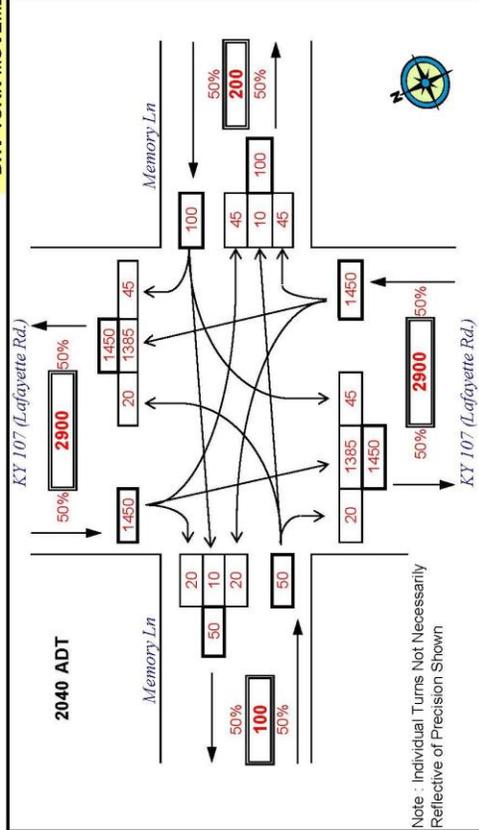
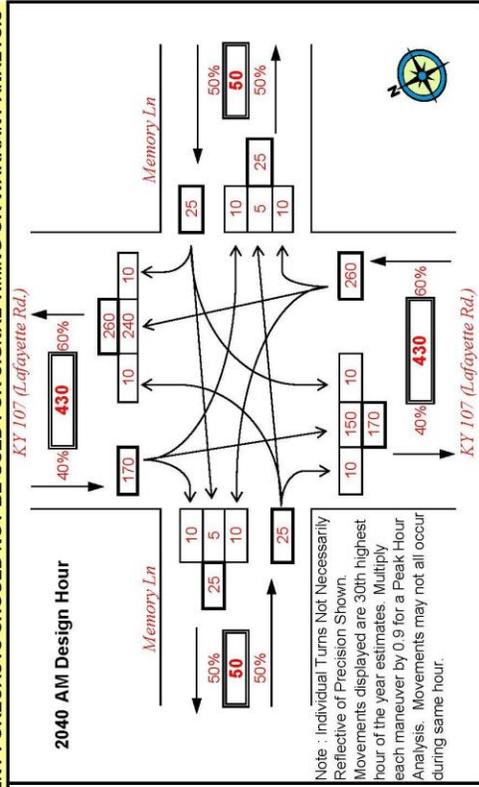
**\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**



PROJECT: Construct New Intersection on I-24  
 ITEM NUMBER: 02-8702.00  
 MARS NUMBER: 8767901P  
 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Huliker  
 SCENARIO: 2040 ADT and Design Hour Volumes  
 INTERSECTION: KY 107 and Memory Lane

**NO BUILD 2040**

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**

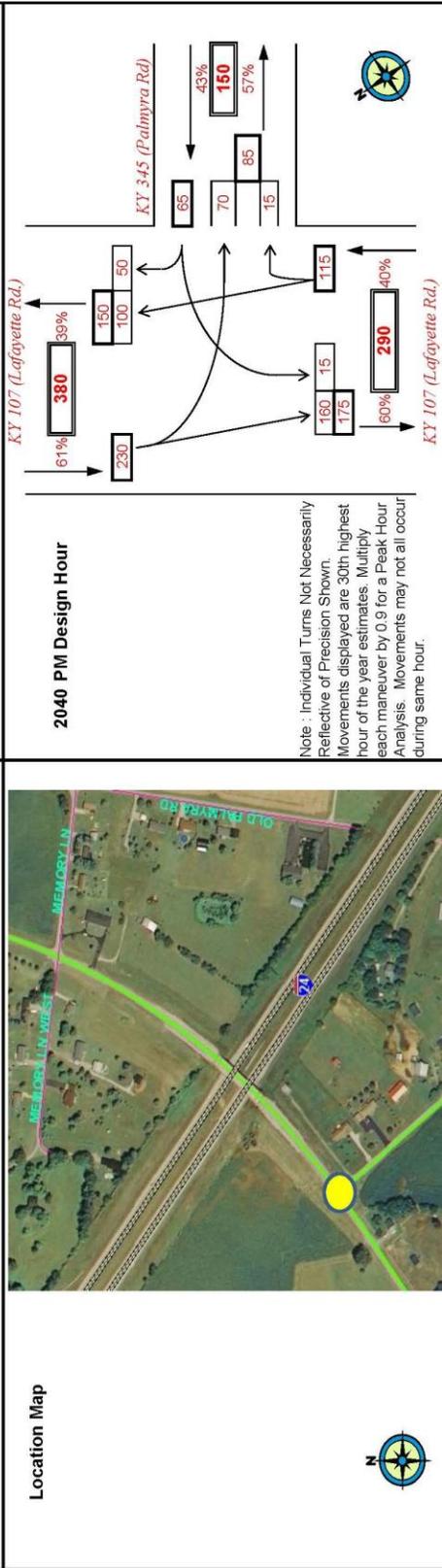
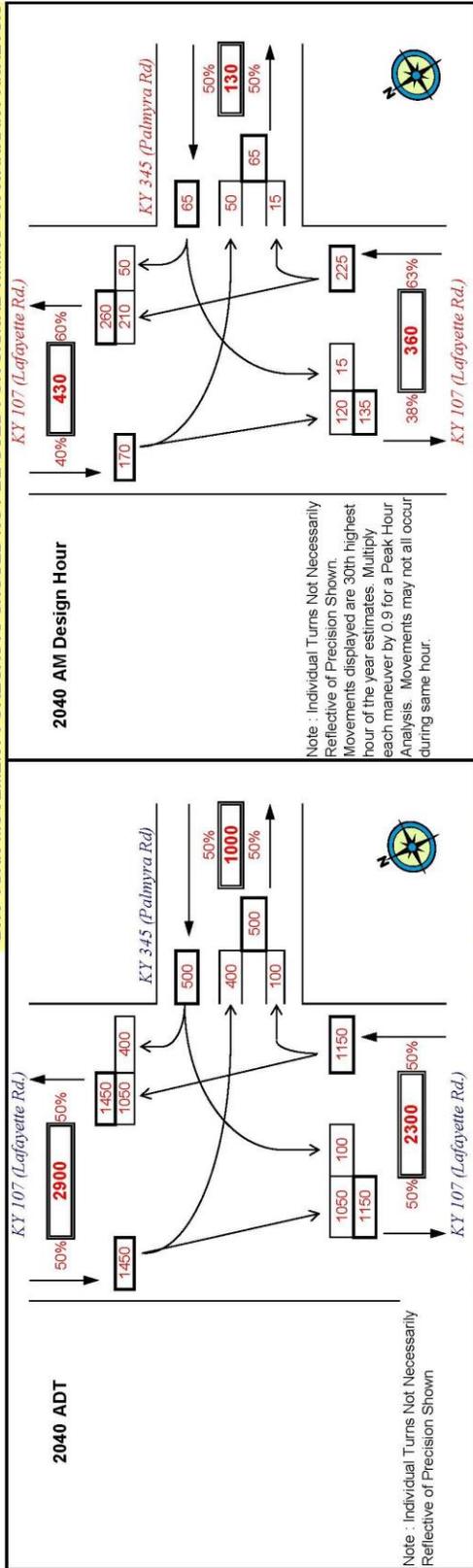


PROJECT: Construct New Intersection on I-24  
 ITEM NUMBER: 02-8702.00  
 MARS NUMBER: 8767901P  
 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Hulker  
 SCENARIO: 2040 ADT and Design Hour Volumes  
 INTERSECTION: KY 107 and KY 345

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2013 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

## NO BUILD 2040

**\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**



# BUILD TURN MOVEMENTS

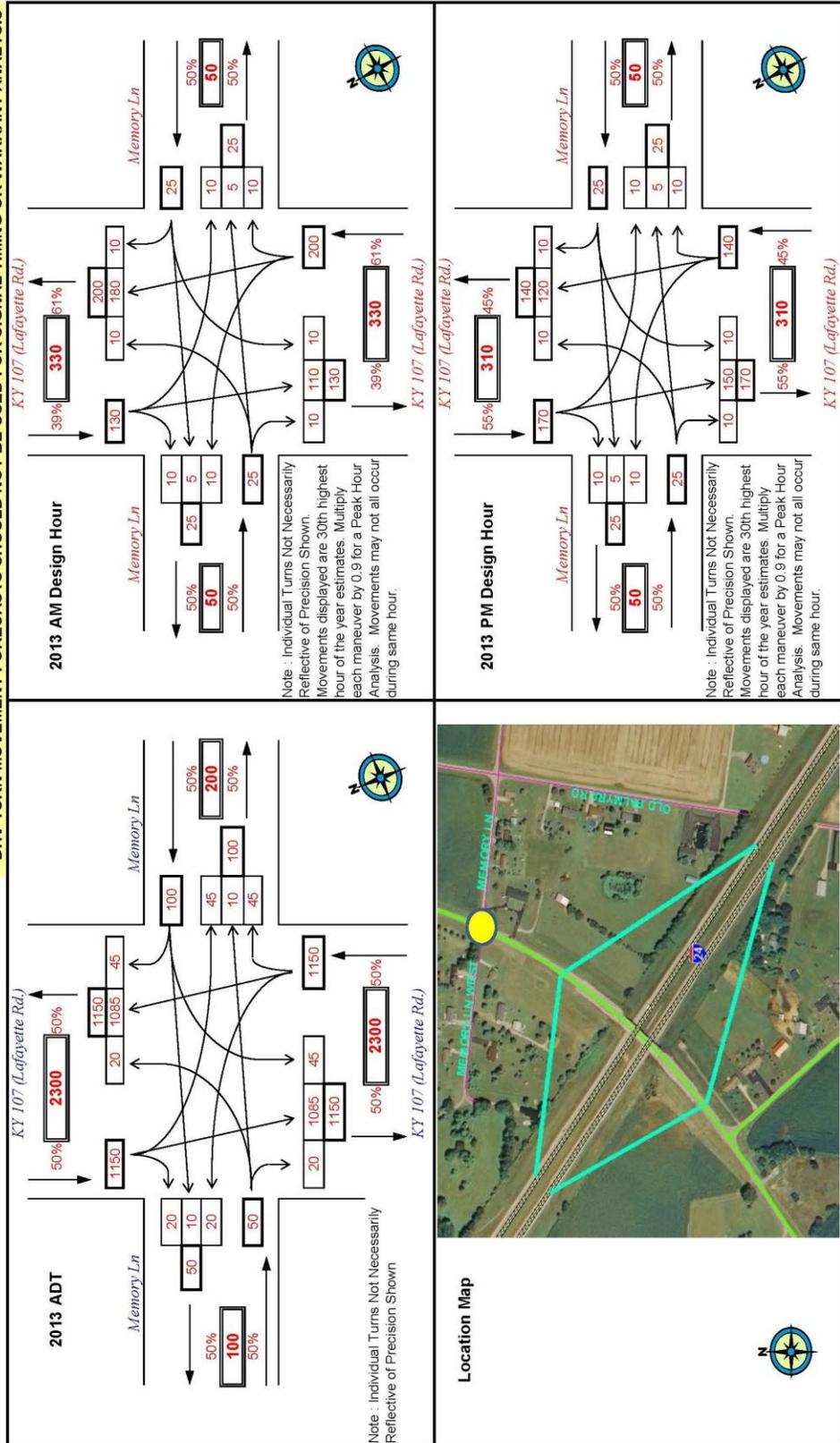
Traffic Forecast Technical Report  
 Christian County: New Interchange on I-24 at KY 107  
 Item No. 02-8702.00

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2013 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

**BUILD 2013**

PROJECT: Construct New Intersection on I-24  
 ITEM NUMBER: 02-8702.00  
 MARS NUMBER: 8767901P  
 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Hulker  
 SCENARIO: 2013 ADT and Design Hour Volumes  
 INTERSECTION: KY 107 and Memory Lane

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**

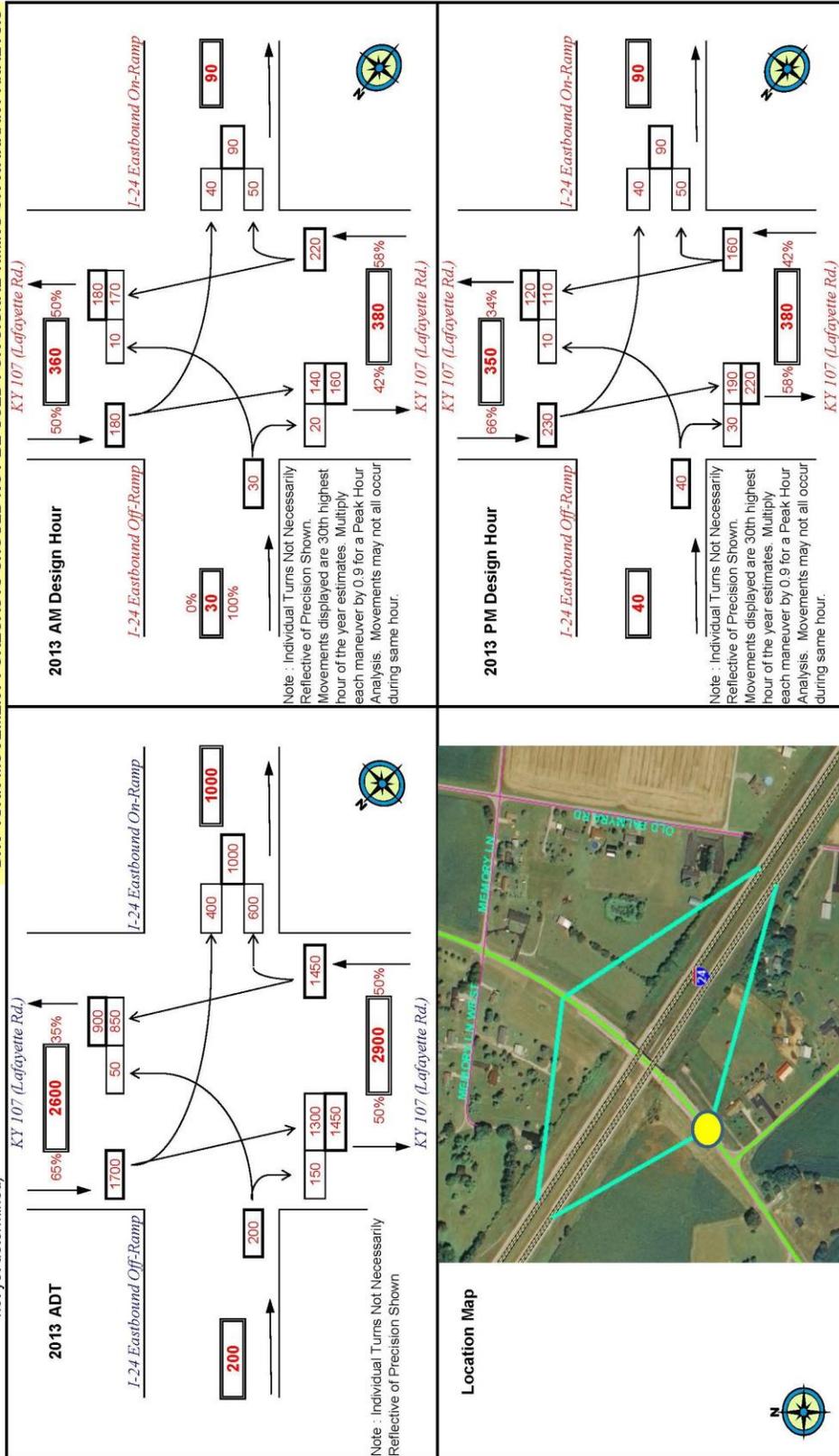




PROJECT: Construct New Intersection on I-24  
 ITEM NUMBER: 02-8702.00  
 MARS NUMBER: 8767901P  
 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Hulker  
 SCENARIO: 2013 ADT and Design Hour Volumes  
 INTERSECTION: New east bound ramps on I-24 at KY 107 (final alignment not yet determined)

**BUILD 2013**

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**

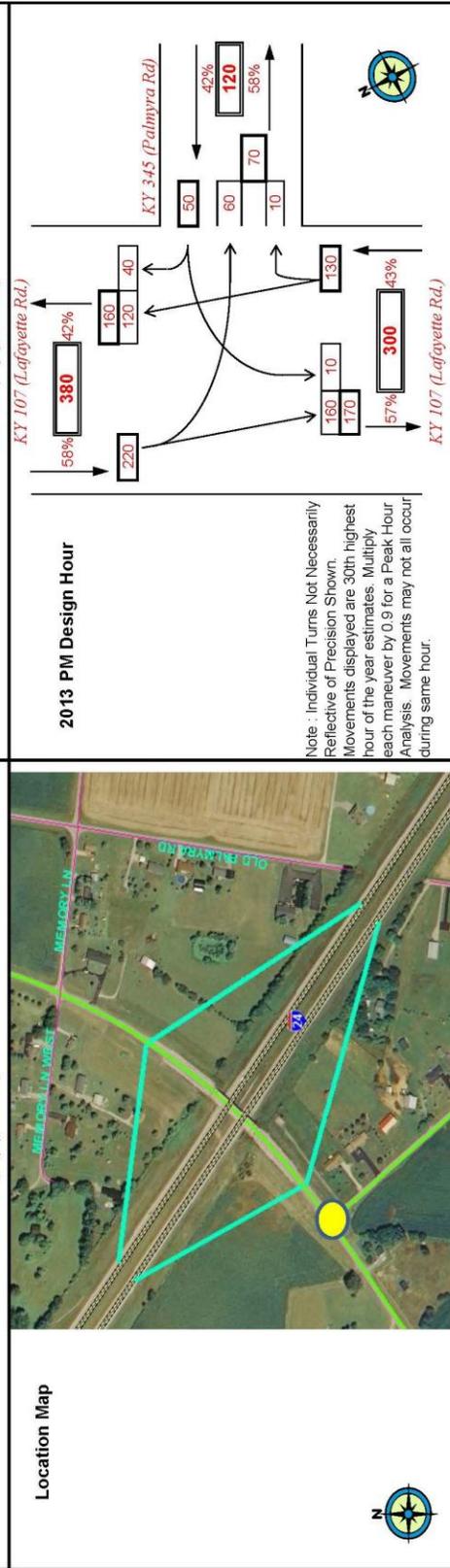
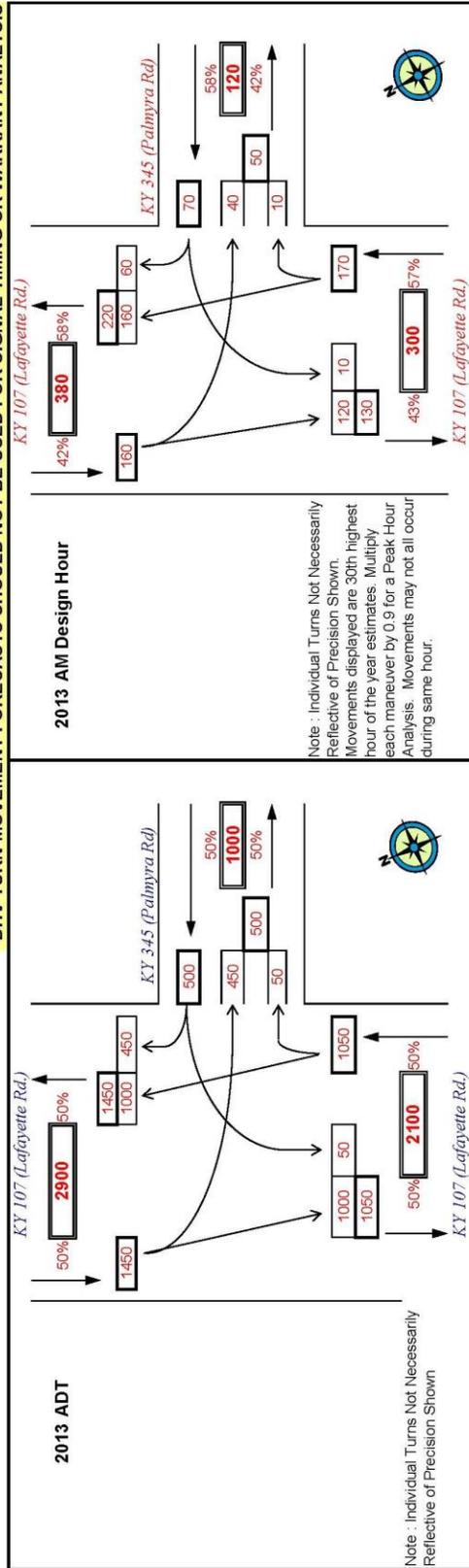


PROJECT: Construct New Intersection on I-24  
 ITEM NUMBER: 02-8702.00  
 MARS NUMBER: 8767901P  
 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Hulker  
 SCENARIO: 2013 ADT and Design Hour Volumes  
 INTERSECTION: KY 107 and KY 345

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2013 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

### BUILD 2013

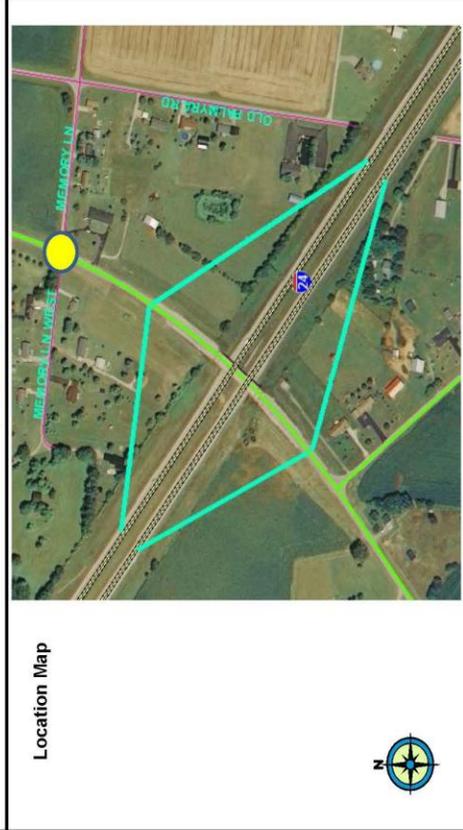
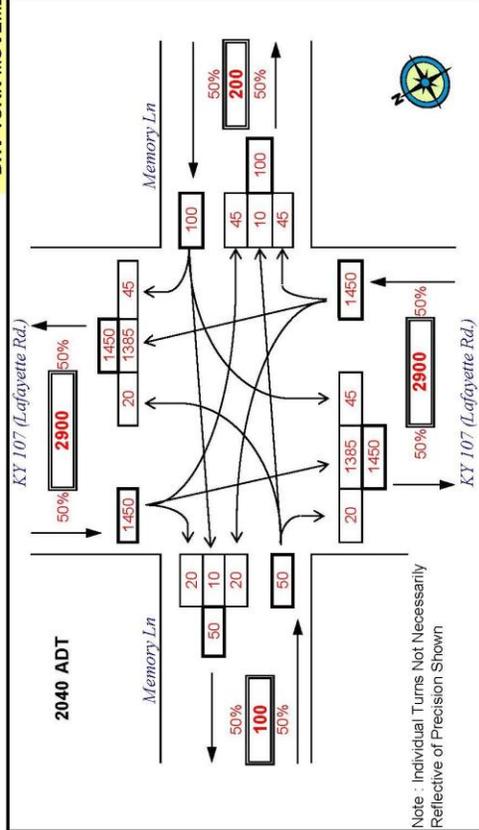
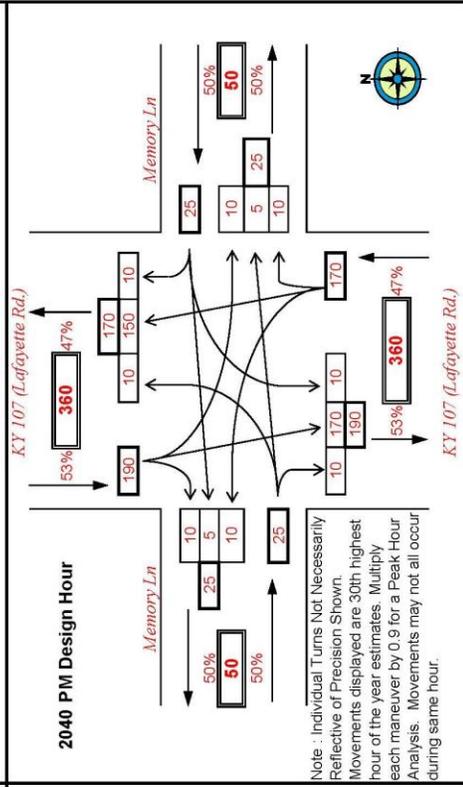
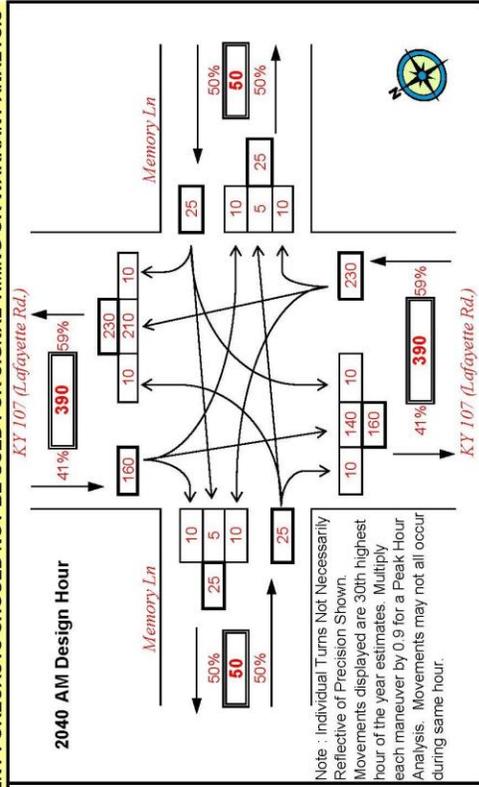
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PROJECT: Construct New Intersection on I-24  
 ITEM NUMBER: 02-8702.00  
 MARS NUMBER: 8767901P  
 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Huliker  
 SCENARIO: 2040 ADT and Design Hour Volumes  
 INTERSECTION: KY 107 and Memory Lane

**BUILD 2040**

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**

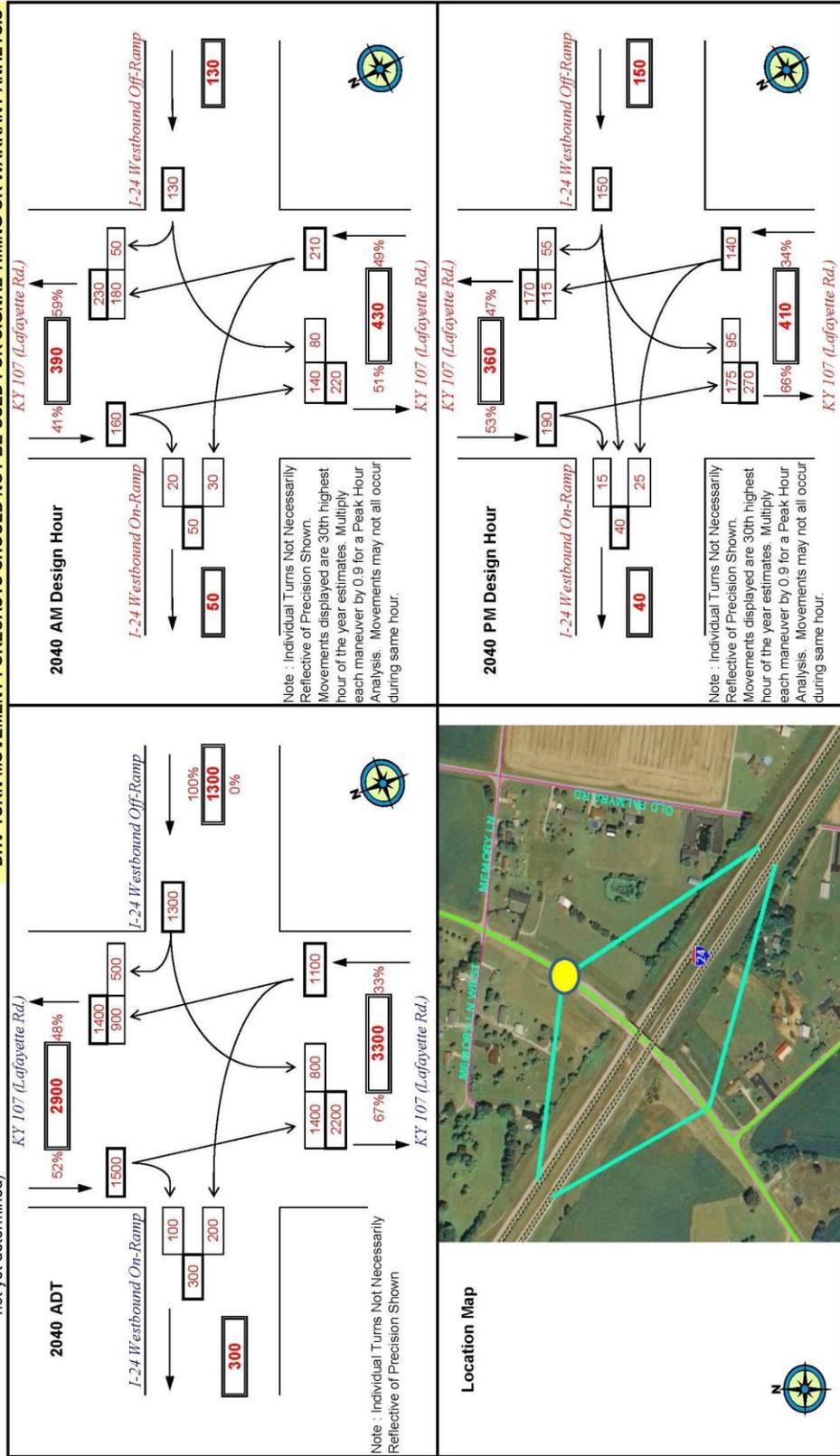


NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2013 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

PROJECT: Construct New Intersection on I-24  
 ITEM NUMBER: 02-8702.00  
 MARS NUMBER: 8767901P  
 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Hulker  
 SCENARIO: 2040 ADT and Design Hour Volumes  
 INTERSECTION: New west bound ramps on I-24 at KY 107 (final alignment not yet determined)

### BUILD 2040

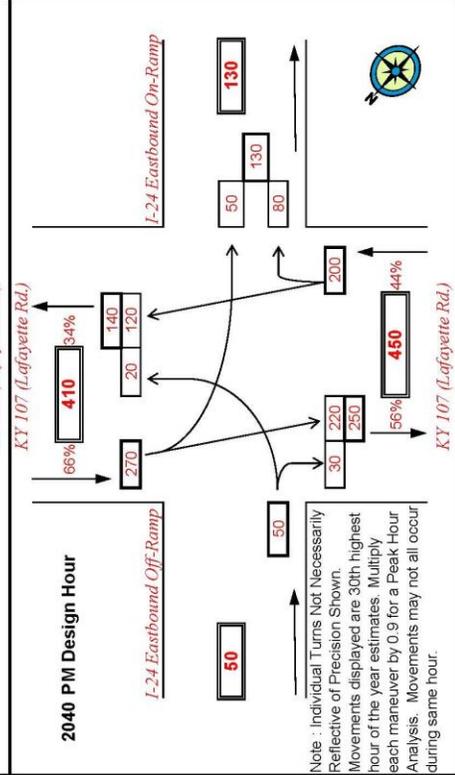
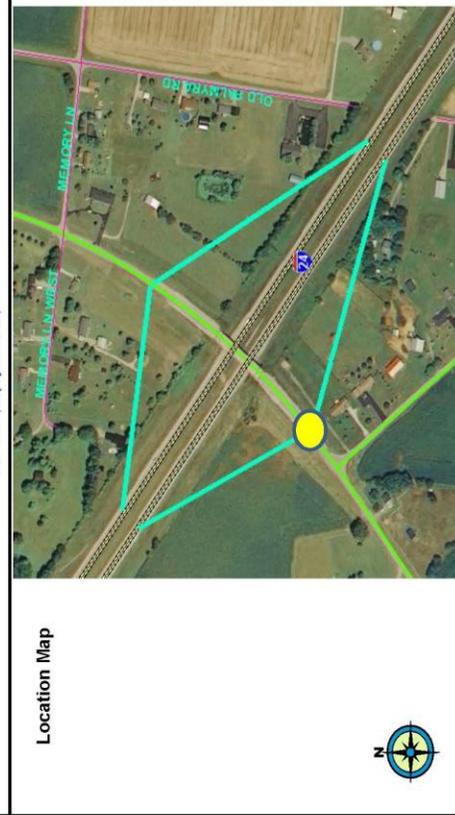
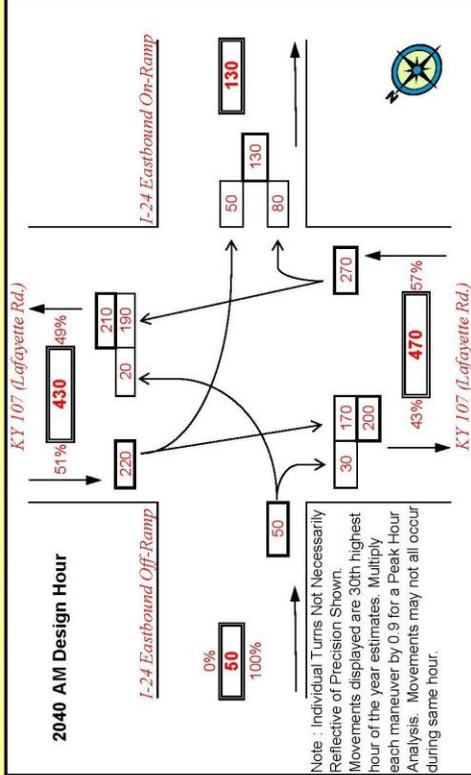
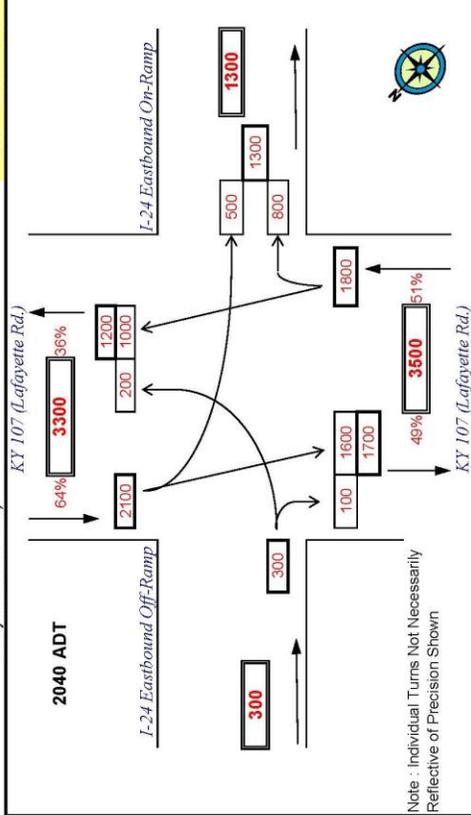
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PROJECT: Construct New Intersection on I-24  
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 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Hulker  
 SCENARIO: 2040 ADT and Design Hour Volumes  
 INTERSECTION: New east bound ramps on I-24 at KY 107 (final alignment not yet determined)

### BUILD 2040

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**



PROJECT: Construct New Intersection on I-24  
 ITEM NUMBER: 02-8702.00  
 MARS NUMBER: 8767901P  
 REQUEST DATE: 4/25/2012  
 ANALYST: Daniel Hulker  
 SCENARIO: 2040 ADT and Design Hour Volumes  
 INTERSECTION: KY 107 and KY 345

### BUILD 2040

**\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**

