Andy Beshear
GOVERNOR

TRANSPORTATION CABINET
200 Mero Street
Frankfort, Kentucky 40601

Jim Gray
SECRETARY

MEMORANDUM

TO: Steve Gunnell, P.E.
Chief District Engineer
District 9 – Flemingsburg

ATTN: Michael Read, P.E.

FROM: Mikael Pelfrey, P.E. MBP
Director
Division of Planning

DATE: October 23, 2023

SUBJECT: Nicholas County Traffic Forecast
KY 32 Corridor Study
Item No. 9-8812.00

In response to your request, we are supplying the following forecasts on the attached report:

- 2023 and 2045 Average Daily Traffic
- 2023 and 2045 Design Hourly Volumes
- 2023 and 2045 Truck Volumes and Percentages
- 2023 and 2045 Turn Movements

If you have any questions, please contact Dasha Korostina of this Division at (502) 782-5055 or David Souleyrette of this Division at (502) 782-5090.

Attachments

c/att: Darrin Eldridge, P.E.
Blake Jones, P.E.
Randy Turner, P.E.
Brad Frazier, P.E.

Executive Summary

Traffic Forecast Technical Report
Nicholas County
KY 32 Corridor Study
Item No. 9-8812.00

Prepared for:

TEAM KENTUCKY®
TRANSPORTATION CABINET

Prepared by:
Dasha Korostina
David Souleyrette
Division of Planning
Kentucky Transportation Cabinet
October 18, 2023

Table of Contents

Commonly Used Abbreviations and Their Descriptions

ADT	Average Daily Traffic	Without any adjustment
DHV	Design Hourly Volume	30th highest hour of a year
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 hourly counts
K-Factor	K-30th 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
AADT	Annual Average Daily Traffic	The total volume of traffic for one year/365
AADTT	Annual Average Daily Truck Traffic	The total volume of truck traffic for a year/365
BCI	Bicycle Comfort Index	A level of service concept for bicyclists

Vicinity Map

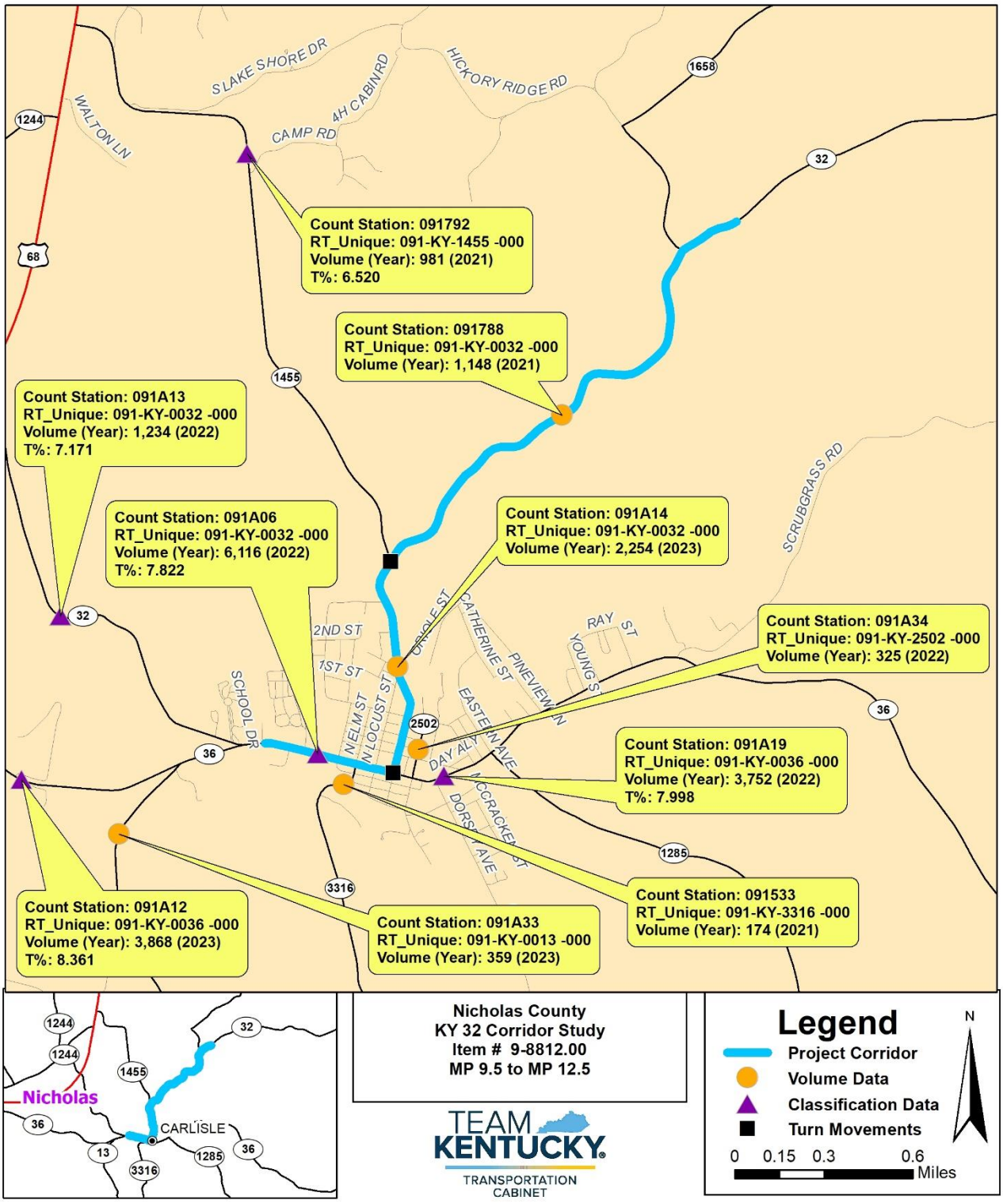


Figure 1.

Traffic Forecast Executive Summary
Nicholas County: KY 32 Corridor Study
Item No. 9-8812.00

FORECAST SUMMARY

This project proposed to improve safety along KY 32 from MP 9.5 to MP 12.5 in Nicholas County. KYTC District 9 requested this forecast to analyze traffic volumes in the base-year and future-year scenarios.

FORECAST TYPE

The following types of forecasts were developed:

- 2023 and 2045 ADT values
- 2023 and 2045 DHV values
- 2023 and 2045 AADTT values
- 2023 and 2045 truck DHV values
- 2045 daily and design-hourly build alternate turn movements

CURRENT-YEAR VOLUMES

The current-year volumes shown on Page 6 were developed (that is, adjusted based on historical growth rates) from the most recent traffic counts collected at Stations 091A06, 091A14, and 091788.

DESIGN-YEAR/GROWTH FACTORS

Design-year growth rates were decided based on the population projections in Table 1 on Page 4, the historical growth rates of the stations in Figure 1, and the results presented by 2019 and 2045 KYSTM scenario runs. Figure 2 shows the KYSTM version used. The population data gathered from the Kentucky State Data Center suggested an annual growth rate of 0.41% from 2022 to 2045 in Nicholas County.

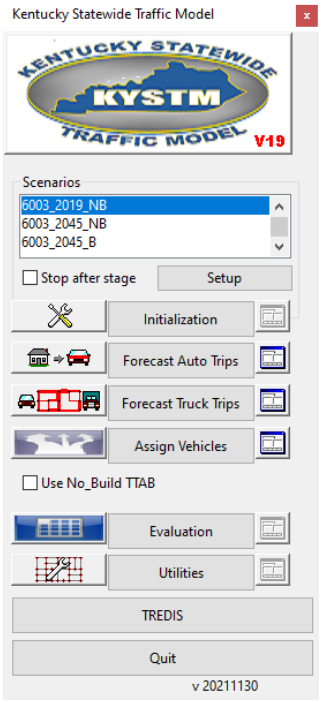


Figure 2. Kentucky Statewide Model Graphical User Interface.

Table 1. Population Summary (projected from the data from the US Bureau of the Census and the Kentucky State Data Center).

Place	2010 Census	2020 Census	Annual GR 2010-2020	2045 Projection	Annual GR 2022-2045
Kentucky	4,339,367	4,505,836	0.38%	4,750,369	0.22%
Nicholas County	7,135	7,537	0.55%	8,580	0.41%

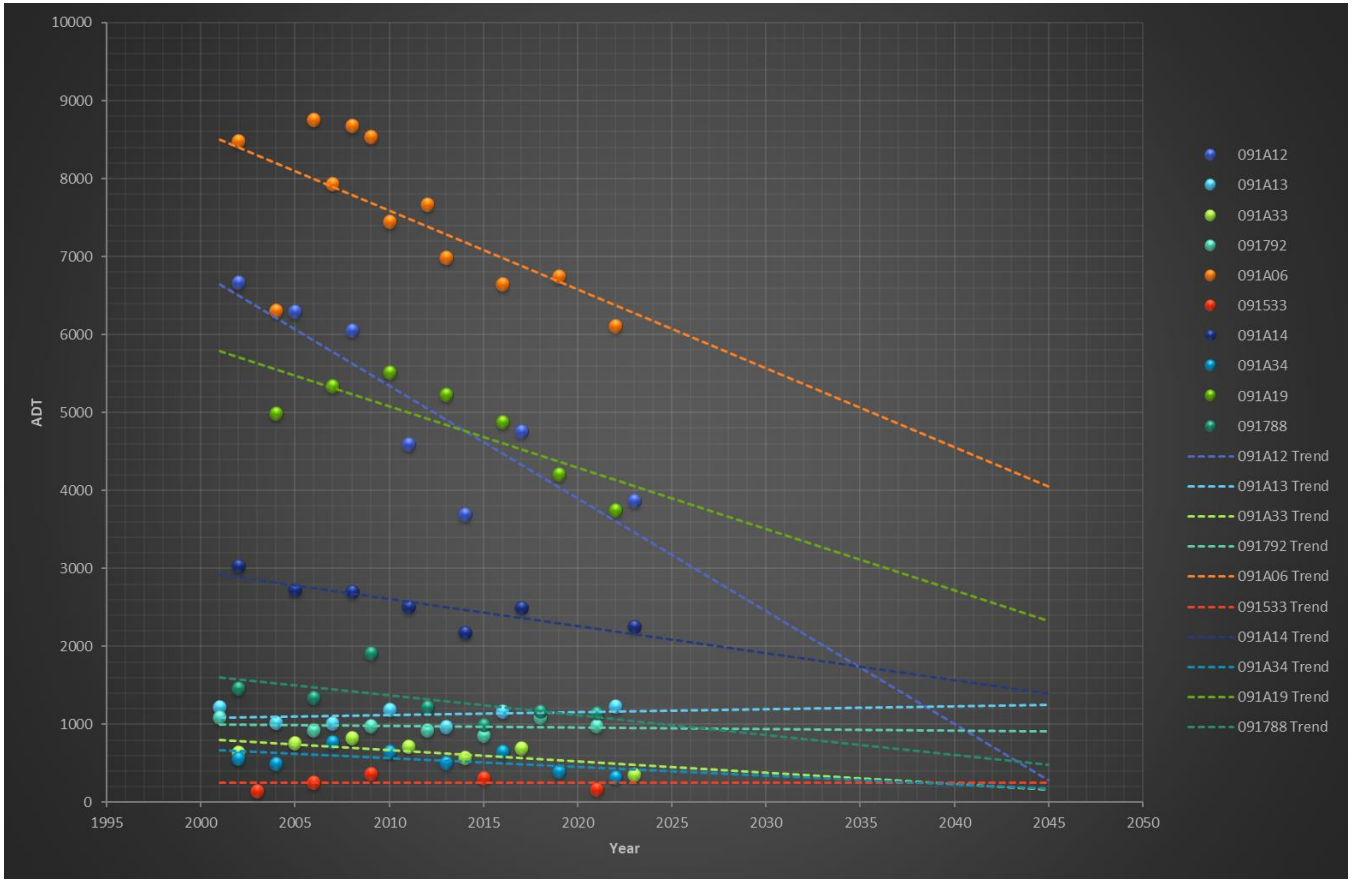


Figure 3. Figure 1 Traffic Count Stations' Historical Growth. Note that Station 091A12's 2020 ADT values and Station 091A14's 2020 ADT values were excluded, as the values were not within each of these stations' expected ADT ranges due to the economic effects of the COVID-19 pandemic of 2020.

Most of the traffic count stations had negative growth rates, with the average GR for these stations being about -1.63%, but Station 091A13 had a positive GR of about 0.3% while Station 091533 had a flat GR. Additionally, the KYSTM showed a GR of about 0.3% for the project corridor, therefore for the purposes of this forecast, a total volume GR of 0.3% was used. With this GR, Section 1 of the project corridor (as defined by Figure 4 on Page 6) had an estimated 2045 ADT of 6,500, Section 2 had an estimated 2045 ADT of 2,400, and Section 3 had an estimated 2045 ADT of 1,200.

DESIGN HOURLY FACTORS FOR 2045

Section 1 had a K-factor of 9.69%., Section 2 had a K-factor of 10.0%, and Section 3 had a K-factor of 11.4%. Each K-factor came from the calculated turn movements from either the beginning or end of each section.

TRUCK VOLUMES AND PERCENTAGES FOR 2045

Truck growth rate and volumes were based on a classification count at Station 091A06. These sections' truck volumes and percentages are a part of Tables 3-5 on Pages 7-9. A GR of 0.3% was used for the trucks of the corridor.

TURN MOVEMENTS

Turn movements were collected at the intersections of KY 32 with KY 36 and KY 32 with KY 1455 in September 2023 while schools were in session. Figures 5-8 show the current and future turn movements at these intersections.

Summary Map

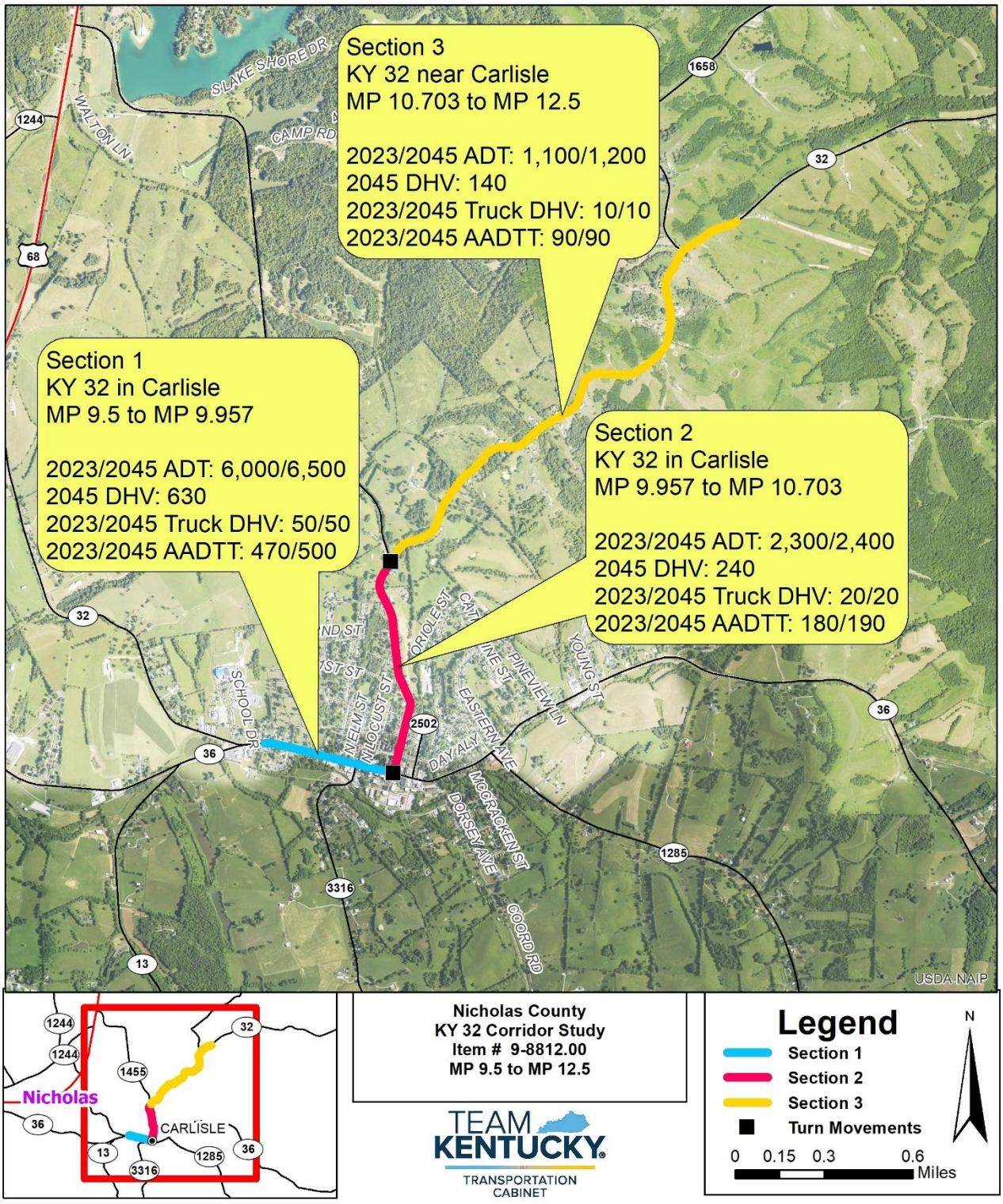


Figure 4.

Pavement Design Factors for Section 1

Project Information:

Date of Forecast	10/18/2023
Name of Forecaster	Dasha Korostina and David Souleyrette
Item Number	9-8812.00
County Name	Nicholas
County Number	91
District	9
eMARS Number	1528401P
Function	FD04
Fund	1100
Project Type	Safety
Current Year	2023
Letting Year	
Construction Year	2024
Design Year	2045

Project Description: Safety improvements along KY 32 from MP 9.5 to MP 12.5 to correct horizontal, vertical, and pavement deficiencies

Route Information:

Route ID	091-KY-0032 -000
Road Name	KY 32
BMP	9.500
EMP	9.957
Functional Class	5 - Major Collector
Total Lanes (Both Ways)	2
One or Two Ways	Two Ways
Pavement Type	Asphault
Are Trucks Prohibited in a Lane?	No

Volume Information:

Volume ADT Station	091A06
Current-Year Volume	6,000
Design-Year Volume	6,500

Truck Count and Truck Volume Information:

Truck Count Station	091A06
Truck Volume in Design Direction	270
Truck Volume in Design Lane of Design Direction	270
Current-Year AADTT	**470**
Design-Year AADTT	**500**

Truck % of ADT	7.8%
FC Average Truck %	10.0%
% of Trucks in Design Direction	57.5%
% of Trucks in Design Lane of Design Direction	100.0%
Truck Volume Growth Rate	**0.3%**

Distribution Factors for Functional Class:

5 - Major Collector

Truck Percent Year: 2022

Daily Volume Distribution Factors by Vehicle Class

Vehicle Class		Truck Volume	Truck Percent
Bus	4	59	12.52%
2 Axles, 6 Tires Single Unit	5	269	57.26%
3 Axles Single Unit	6	24	5.17%
4 or More Axles, Single Unit	7	17	3.58%
3-4 Axles, Single Trailer	8	81	17.30%
5 Axles Single Trailer	9	12	2.58%
6 or More Axles, Single Trailer	10	4	0.80%
5 or Less Axles, Multi-Trailer	11	2	0.40%
6 Axles, Multi-Trailer	12	0	0.00%
7 or More Axles, Multi-Trailer	13	2	0.40%
All Vehicle Classes		470	100.00%

Coal Haul Information:

Annual Coal Tonnage for 2022:	
Coal Trucks per Day:	
Percentage of Trucks that Are Coal:	
Percentage of All Vehicles that Are Coal:	

TEAM KENTUCKY TRANSPORTATION CABINET

Hourly Volume Distribution Factors

0	12 AM to 1 AM	1	0.20%
1	1 AM to 2 AM	0	0.00%
2	2 AM to 3 AM	2	0.40%
3	3 AM to 4 AM	1	0.20%
4	4 AM to 5 AM	6	1.19%
5	5 AM to 6 AM	8	1.79%
6	6 AM to 7 AM	23	4.97%
7	7 AM to 8 AM	49	10.34%
8	8 AM to 9 AM	28	5.96%
9	9 AM to 10 AM	35	7.36%
10	10 AM to 11 AM	27	5.77%
11	11 AM to 12 PM	22	4.77%
12	12 PM to 1 PM	25	5.37%
13	1 PM to 2 PM	25	5.37%
14	2 PM to 3 PM	24	5.17%
15	3 PM to 4 PM	51	10.93%
16	4 PM to 5 PM	52	11.13%
17	5 PM to 6 PM	31	6.56%
18	6 PM to 7 PM	26	5.57%
19	7 PM to 8 PM	16	3.38%
20	8 PM to 9 PM	7	1.39%
21	9 PM to 10 PM	3	0.60%
22	10 PM to 11 PM	4	0.80%
23	11 PM to 12 AM	4	0.80%
	All Hours	470	100.00%

Table 3.

Pavement Design Factors for Section 2

Project Information:

Date of Forecast	10/18/2023
Name of Forecaster	Dasha Korostina and David Souleyrette
Item Number	9-8812.00
County Name	Nicholas
County Number	91
District	9
eMARS Number	1528401P
Function	FD04
Fund	1100
Project Type	Safety
Current Year	2023
Letting Year	
Construction Year	2024
Design Year	2045

Project Description: Safety improvements along KY 32 from MP 9.5 to MP 12.5 to correct horizontal, vertical, and pavement deficiencies

Route Information:

Route ID	091-KY-0032 -000
Road Name	KY 32
BMP	9.957
EMP	10.703
Functional Class	5 - Major Collector
Total Lanes (Both Ways)	2
One or Two Ways	Two Ways
Pavement Type	Asphault
Are Trucks Prohibited in a Lane?	No

Volume Information:

Volume ADT Station	091A14
Current-Year Volume	2,300
Design-Year Volume	2,400

Truck Count and Truck Volume Information:

Truck Count Station	091A06
Truck Volume in Design Direction	100
Truck Volume in Design Lane of Design Direction	100
Current-Year AADTT	**180**
Design-Year AADTT	**190**

Truck % of ADT	7.8%
FC Average Truck %	10.0%
% of Trucks in Design Direction	57.5%
% of Trucks in Design Lane of Design Direction	100.0%
Truck Volume Growth Rate	**0.3%**

Distribution Factors for Functional Class:

5 - Major Collector

Truck Percent Year: 2022

Daily Volume Distribution Factors by Vehicle Class

Vehicle Class		Truck Volume	Truck Percent
Bus	4	23	12.52%
2 Axles, 6 Tires Single Unit	5	103	57.26%
3 Axles Single Unit	6	9	5.17%
4 or More Axles, Single Unit	7	6	3.58%
3-4 Axles, Single Trailer	8	31	17.30%
5 Axles Single Trailer	9	5	2.58%
6 or More Axles, Single Trailer	10	1	0.80%
5 or Less Axles, Multi-Trailer	11	1	0.40%
6 Axles, Multi-Trailer	12	0	0.00%
7 or More Axles, Multi-Trailer	13	1	0.40%
All Vehicle Classes		180	100.00%

Coal Haul Information:

Annual Coal Tonnage for 2022:	
Coal Trucks per Day:	
Percentage of Trucks that Are Coal:	
Percentage of All Vehicles that Are Coal:	

TEAM KENTUCKY TRANSPORTATION CABINET

Hourly Volume Distribution Factors

0	12 AM to 1 AM	0	0.20%
1	1 AM to 2 AM	0	0.00%
2	2 AM to 3 AM	1	0.40%
3	3 AM to 4 AM	0	0.20%
4	4 AM to 5 AM	2	1.19%
5	5 AM to 6 AM	3	1.79%
6	6 AM to 7 AM	9	4.97%
7	7 AM to 8 AM	19	10.34%
8	8 AM to 9 AM	11	5.96%
9	9 AM to 10 AM	13	7.36%
10	10 AM to 11 AM	10	5.77%
11	11 AM to 12 PM	9	4.77%
12	12 PM to 1 PM	10	5.37%
13	1 PM to 2 PM	10	5.37%
14	2 PM to 3 PM	9	5.17%
15	3 PM to 4 PM	20	10.93%
16	4 PM to 5 PM	20	11.13%
17	5 PM to 6 PM	12	6.56%
18	6 PM to 7 PM	10	5.57%
19	7 PM to 8 PM	6	3.38%
20	8 PM to 9 PM	3	1.39%
21	9 PM to 10 PM	1	0.60%
22	10 PM to 11 PM	1	0.80%
23	11 PM to 12 AM	1	0.80%
	All Hours	180	100.00%

Table 4.

Pavement Design Factors for Section 3

Project Information:

Date of Forecast	10/18/2023
Name of Forecaster	Dasha Korostina and David Souleyrette
Item Number	9-8812.00
County Name	Nicholas
County Number	91
District	9
eMARS Number	1528401P
Function	FD04
Fund	1100
Project Type	Safety
Current Year	2023
Letting Year	
Construction Year	2024
Design Year	2045

Project Description: Safety improvements along KY 32 from MP 9.5 to MP 12.5 to correct horizontal, vertical, and pavement deficiencies

Route Information:

Route ID	091-KY-0032 -000
Road Name	KY 32
BMP	10.703
EMP	12.500
Functional Class	5 - Major Collector
Total Lanes (Both Ways)	2
One or Two Ways	Two Ways
Pavement Type	Asphault
Are Trucks Prohibited in a Lane?	No

Volume Information:

Volume ADT Station	091788
Current-Year Volume	1,100
Design-Year Volume	1,200

Truck Count and Truck Volume Information:

Truck Count Station	091A06
Truck Volume in Design Direction	50
Truck Volume in Design Lane of Design Direction	50
Current-Year AADTT	**90**
Design-Year AADTT	**90**

Truck % of ADT	7.8%
FC Average Truck %	10.0%
% of Trucks in Design Direction	57.5%
% of Trucks in Design Lane of Design Direction	100.0%
Truck Volume Growth Rate	**0.3%**

Distribution Factors for Functional Class:

5 - Major Collector

Truck Percent Year: 2022

Daily Volume Distribution Factors by Vehicle Class

Vehicle Class		Truck Volume	Truck Percent
Bus	4	11	12.52%
2 Axles, 6 Tires Single Unit	5	52	57.26%
3 Axles Single Unit	6	5	5.17%
4 or More Axles, Single Unit	7	3	3.58%
3-4 Axles, Single Trailer	8	16	17.30%
5 Axles Single Trailer	9	2	2.58%
6 or More Axles, Single Trailer	10	1	0.80%
5 or Less Axles, Multi-Trailer	11	0	0.40%
6 Axles, Multi-Trailer	12	0	0.00%
7 or More Axles, Multi-Trailer	13	0	0.40%
All Vehicle Classes		90	100.00%

Coal Haul Information:

Annual Coal Tonnage for 2022:	
Coal Trucks per Day:	
Percentage of Trucks that Are Coal:	
Percentage of All Vehicles that Are Coal:	

Hourly Volume Distribution Factors

0	12 AM to 1 AM	0	0.20%
1	1 AM to 2 AM	0	0.00%
2	2 AM to 3 AM	0	0.40%
3	3 AM to 4 AM	0	0.20%
4	4 AM to 5 AM	1	1.19%
5	5 AM to 6 AM	2	1.79%
6	6 AM to 7 AM	4	4.97%
7	7 AM to 8 AM	9	10.34%
8	8 AM to 9 AM	5	5.96%
9	9 AM to 10 AM	7	7.36%
10	10 AM to 11 AM	5	5.77%
11	11 AM to 12 PM	4	4.77%
12	12 PM to 1 PM	5	5.37%
13	1 PM to 2 PM	5	5.37%
14	2 PM to 3 PM	5	5.17%
15	3 PM to 4 PM	10	10.93%
16	4 PM to 5 PM	10	11.13%
17	5 PM to 6 PM	6	6.56%
18	6 PM to 7 PM	5	5.57%
19	7 PM to 8 PM	3	3.38%
20	8 PM to 9 PM	1	1.39%
21	9 PM to 10 PM	1	0.60%
22	10 PM to 11 PM	1	0.80%
23	11 PM to 12 AM	1	0.80%
	All Hours	90	100.00%

TEAM KENTUCKY TRANSPORTATION CABINET

Table 5.

PROJECT: KY 32 Corridor Study
ITEM NUMBER: 9-8812.00
MARS NUMBER: 1528401P
REQUEST DATE: Tuesday, August 8, 2023
ANALYSTS: Dasha Korostina and David Souleyrette
YEAR: **2023 ADT and Design Hour Volumes**
INTERSECTION: KY 32/KY 36/S Broadway/N Broadway

NOTE: Directional distributions were determined from a 2023 turning movement count.

TURN MOVEMENT 1 (2023)

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

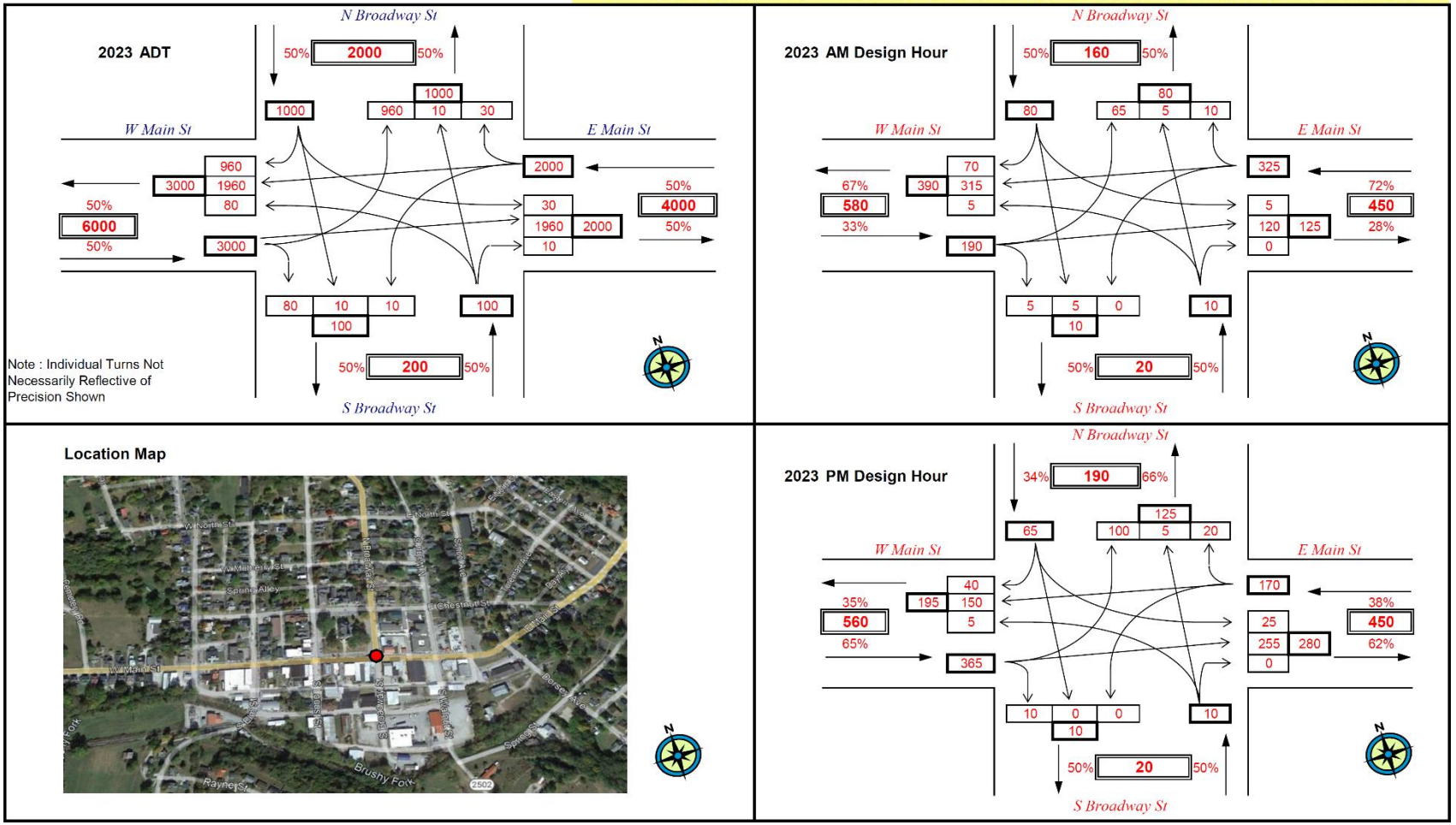


Figure 5. Current Turn Movements for the Intersection of KY 32, KY 36, South Broadway Street, and North Broadway Street.

PROJECT: KY 32 Corridor Study
ITEM NUMBER: 9-8812.00
MARS NUMBER: 1528401P
REQUEST DATE: Tuesday, August 8, 2023
ANALYSTS: Dasha Korostina and David Souleyrette
YEAR: **2045 ADT and Design Hour Volumes**
INTERSECTION: KY 32/KY 36/S Broadway/N Broadway

NOTE: Directional distributions were determined from a calculated turning movement count.

TURN MOVEMENT 1 (2045)

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

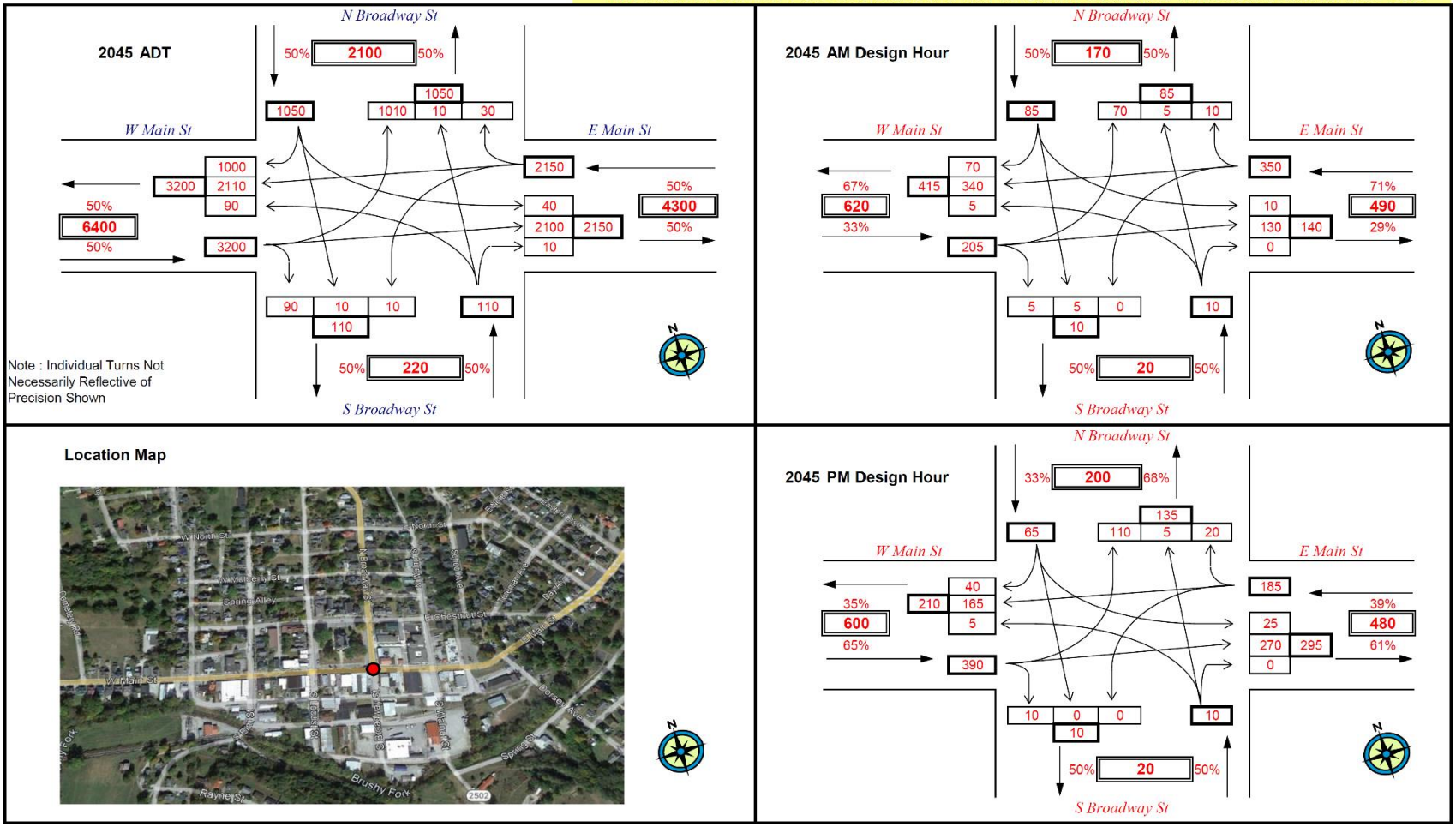


Figure 6. Future Turn Movements for the Intersection of KY 32, KY 36, South Broadway Street, and North Broadway Street.

PROJECT: KY 32 Corridor Study
ITEM NUMBER: 9-8812.00
MARS NUMBER: 1528401P
REQUEST DATE: Tuesday, August 8, 2023
ANALYST: Dasha Korostina and David Souleyrette
YEAR: **2023** **ADT and Design Hour Volumes**
INTERSECTION: KY 32/KY 1455

NOTE: Directional distributions were determined from a 2023 turning movement count.

TURN MOVEMENT 2 (2023)

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

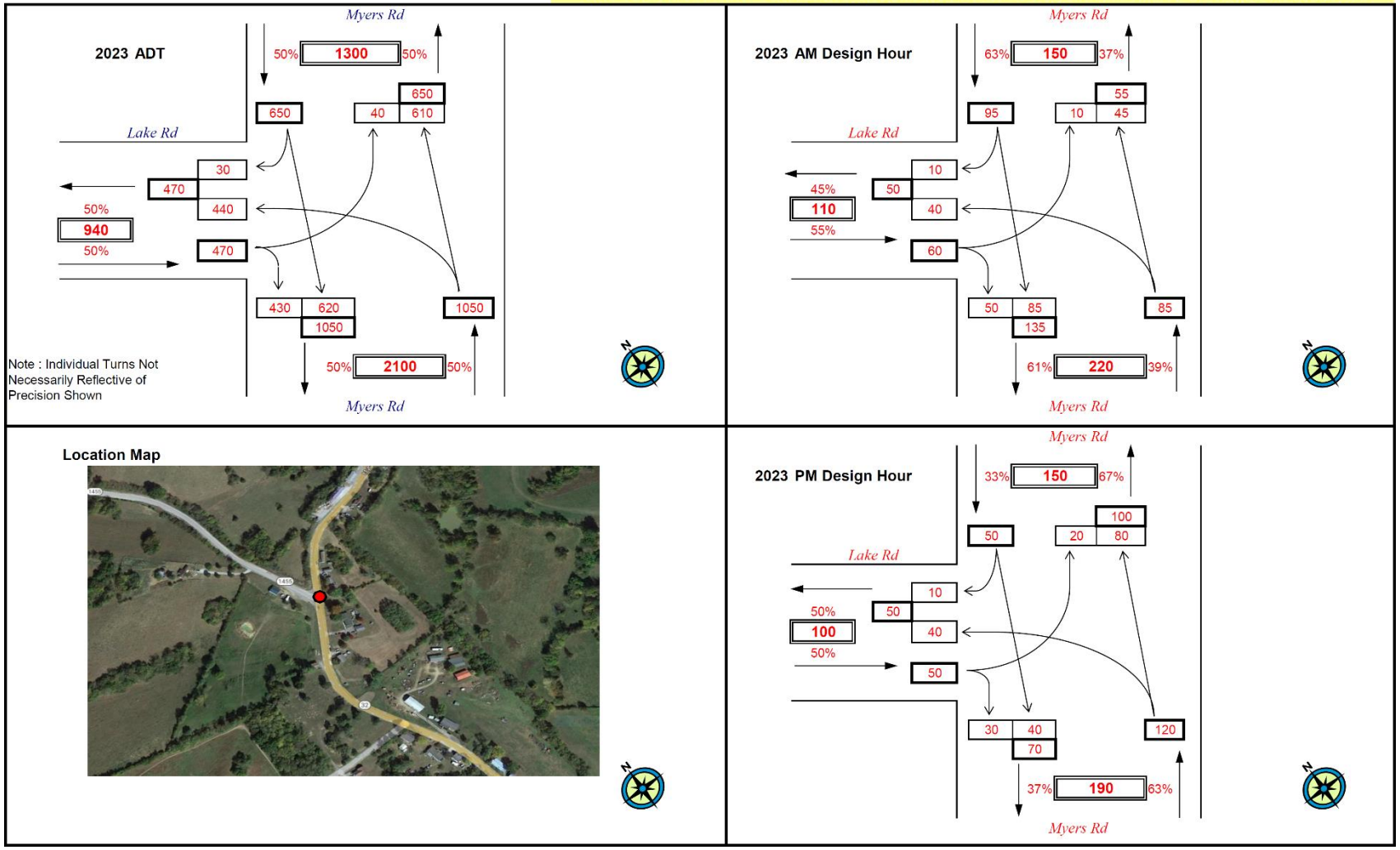


Figure 7. Current Turn Movements for the Intersection of KY 32 and KY 1455.

PROJECT: KY 32 Corridor Study
ITEM NUMBER: 9-8812.00
MARS NUMBER: 1528401P
REQUEST DATE: Tuesday, August 8, 2023
ANALYST: Dasha Korostina and David Souleyrette
YEAR: **2045 ADT and Design Hour Volumes**
INTERSECTION: KY 32/KY 1455

NOTE: Directional distributions were determined from a calculated turning movement count.

TURN MOVEMENT 2 (2045)

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

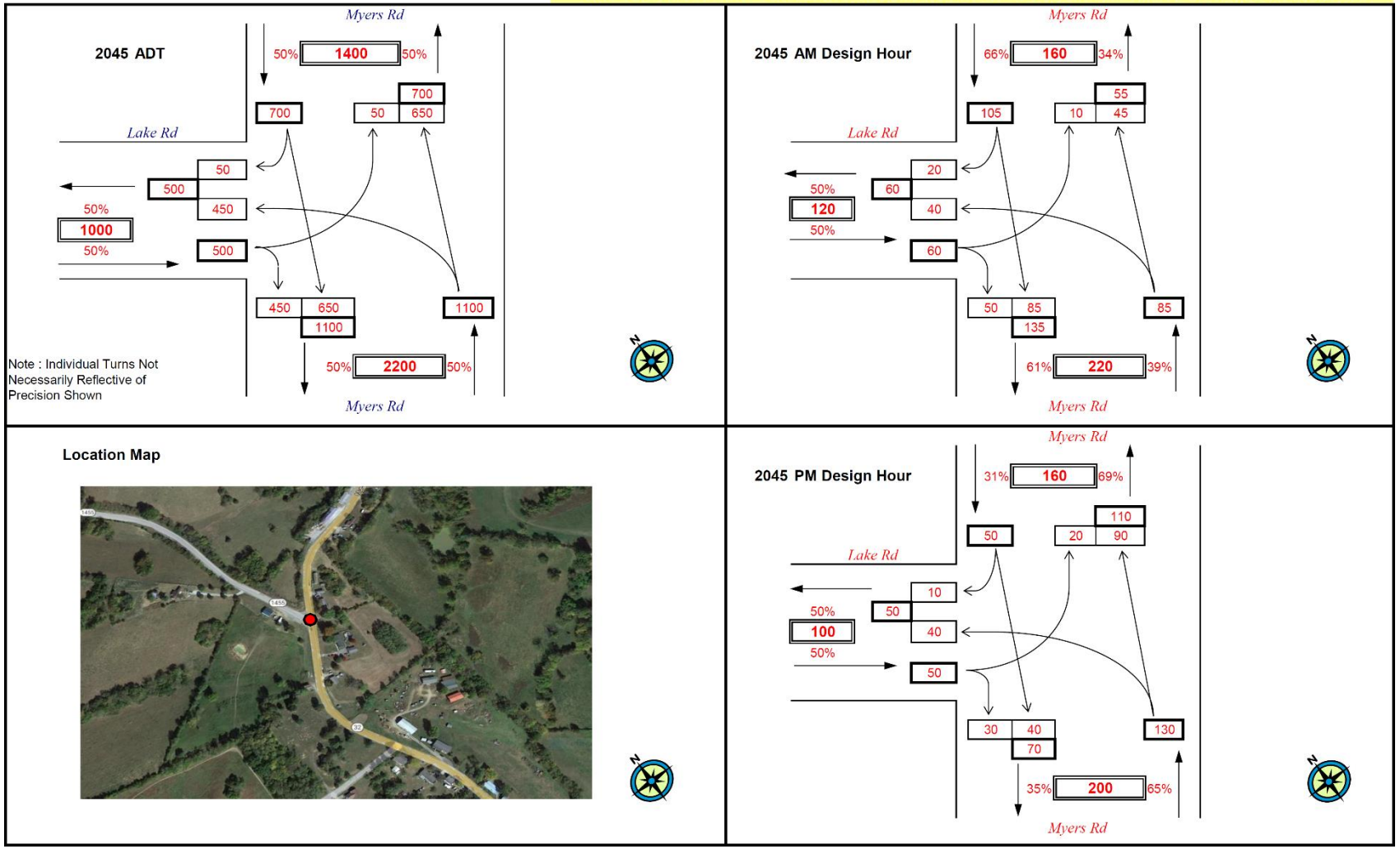


Figure 8. Future Turn Movements for the Intersection of KY 32 and KY 1455.

Appendix A: Pedestrian & Bicycle Consideration Review

Nicholas County
Item #9-8812.00
KY 32

Prepared for: Blake Jones

Requested by:
District 9

Bicycle and Pedestrian Consideration Review
Item No. 9-8812.00

Project Overview:

Safety improvements along KY 32 from Lake Road (MP 9.5) to Scrubgrass Creek Road (MP 12.5) to correct horizontal, vertical, pavement deficiencies.

Local/regional Bicycle & Pedestrian Planning:

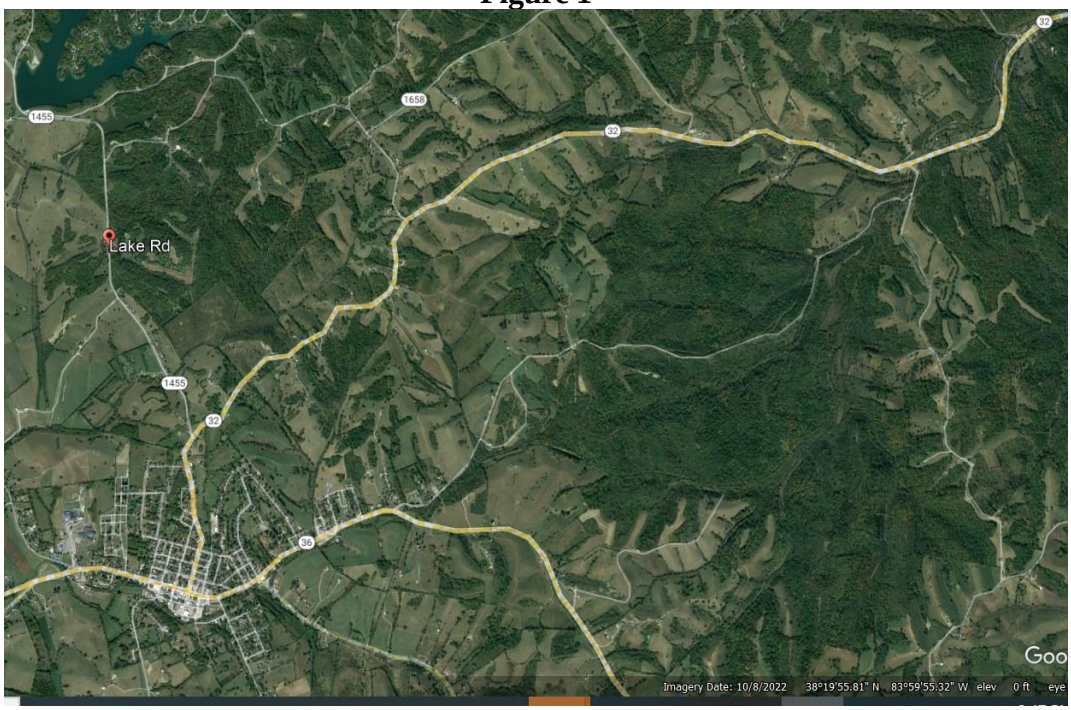
Neither Carlisle nor Nicholas County have a Pedestrian or Bike Master Plan.

Existing Conditions:

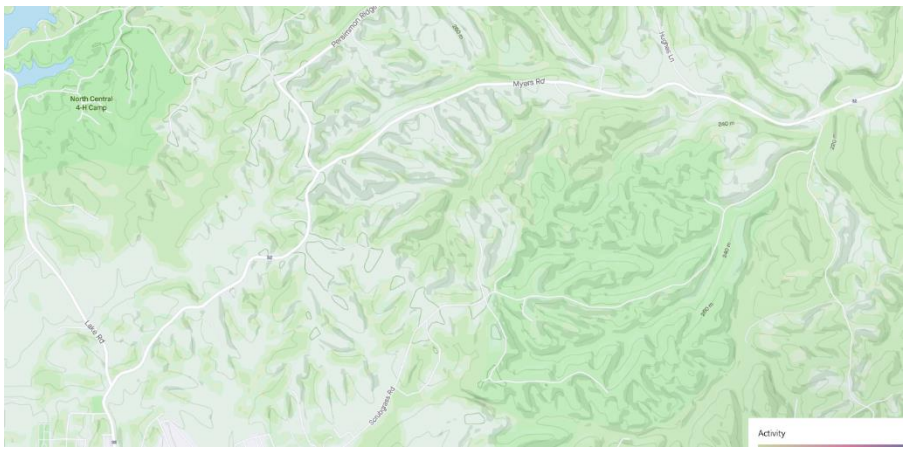
091-KY-0032 -000

a. **ADT:** 1,148 (2021) to 6,116 (2022)
b. **Heavy Truck Percentage:** 6.08% to 8.57%
c. **Posted Speed Limit** is 35 to 55 mph
d. Rural Area
e. Functional Class: Major Collector
f. Bicycle Comfort Index average rating is Level E
g. Pedestrian Comfort Index average rating is Level C downtown and Level E for remainder of the project
h. Strava Heat Map indicates no bicycle activity in the project area (Figure 3)
i. Strava Heat Map indicates shows pedestrian activity downtown and no pedestrian activity in the remainder of the project area. (Figure 4)

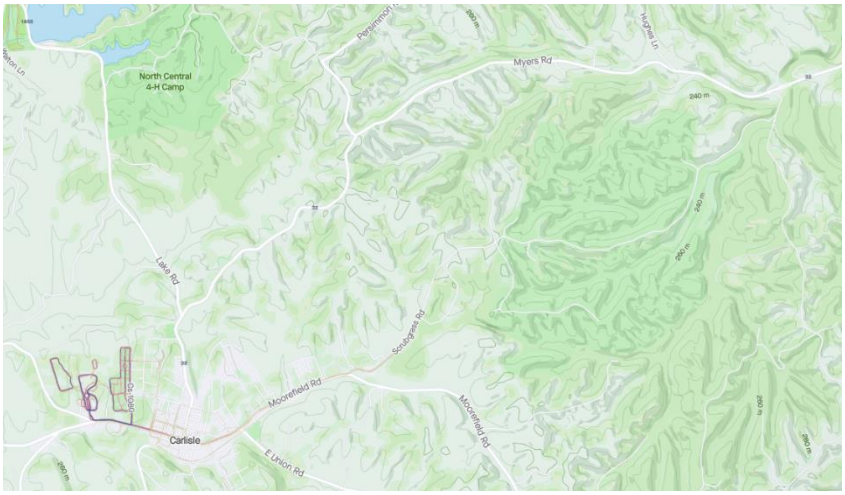
Project Area
Figure 1



Google Image
Figure 2



(Figure 3)
Strava Heat Map showing no bicycle activity in project area



(Figure 4)
Strava Heat Map showing pedestrian activity in the downtown area of the project area

The KYTC Bicycle and Pedestrian program team recommendations are:

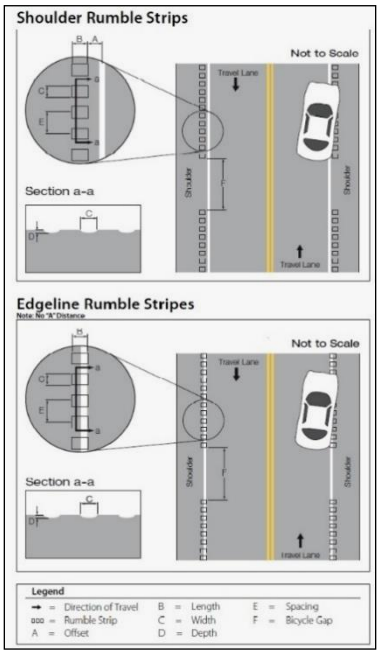
There are 2 cross sections for KY 32. Within the city limits there is an urban section with curb and sidewalk in various locations but not continuous. Leaving the downtown area, the cross section is rural.

Best: For the downtown and the residential area the project should incorporate the Complete Streets requirements into the project. It is recommended that continuous sidewalks (5' or wider) be constructed on both sides of the road to complete the pedestrian network connections and comply with ADA access. Include as appropriate mid block crossings. Create an agreement or update an existing agreement with the local government regarding the pedestrian facility maintenance responsibilities. Due to low volume and low speeds in the downtown and residential area bike facilities are not necessary.

For the rural area, paved shoulders (8' or wider) should be added on both sides of the roadway to better accommodate pedestrian and bicycle travel along this roadway corridor. Place 10' gaps every 40-50' in the rumbles strips to better accommodate bicycle travel (Figure 4). The BCI average increase from Level E to Level C and the PCI average would increase from Level E to Level C.

Good: For the downtown and the residential area the project should incorporate the Complete Streets Policy requirements into the project. It is recommended that continuous sidewalks (4' or wider) be constructed on both sides of the road to complete the pedestrian network connections and comply with ADA access. Include as appropriate mid-block crossings. Create an agreement or update an existing agreement with the local government regarding the pedestrian facility maintenance responsibilities. Due to low volume and low speeds in the downtown and residential area bike facilities are not necessary.

Construct paved shoulders (6' or wider) on both sides of the roadway to better accommodate pedestrian and bicycle travel along this roadway corridor. Place 10' gaps every 40-50' in the rumbles strips to better accommodate bicycle travel (Figure 4). The BCI average would be Level C and the PCI average would be a level C (for the project area).



(Figure 5) Bicycle Gap Sapce in Rumble Strips

1 KY Complete Streets Policy: https://transportation.ky.gov/BikeWalk/Documents/Complete%20Streets%20Policy.pdf

2 BCI: https://transportation.ky.gov/BikeWalk/Documents/BCI%20Metadata%20Page%20Updated%202018.pdf

3 PCI: https://transportation.ky.gov/BikeWalk/Documents/Metadata%20Page%20PCI%202019.pdf

4 Rumble Strips https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/bike_fs/

Prepared by:
Keith Lovan, Bicycle & Pedestrian Coordinator
Division of Planning, Kentucky Transportation Cabinet
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