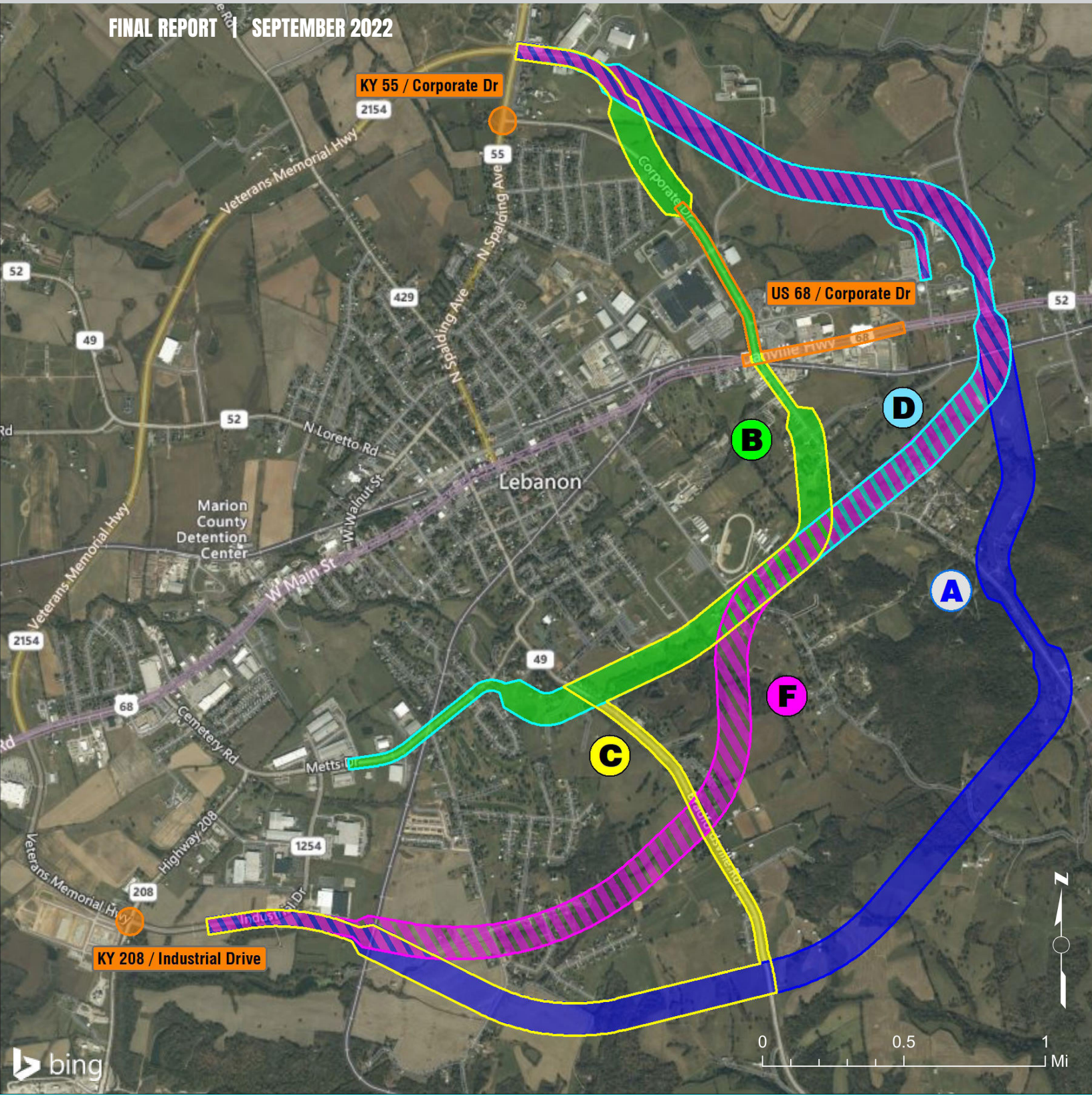
East Lebanon Connectivity Study

MARION COUNTY, KY | KYTC ITEM NO. 4-80153

TEAM KENTUCKY
TRANSPORTATION CABINET

IN PARTNERSHIP WITH
QK4
Engineering Planning

FINAL REPORT | SEPTEMBER 2022



EXECUTIVE SUMMARY

Study Background

The Kentucky Transportation Cabinet (KYTC) initiated the East Lebanon Connectivity Study to examine needs and consider opportunities to improve connectivity on the east side of Lebanon in Marion County, Kentucky. Nestled in the heart of bourbon country within a robust industrial sector, the city has seen substantial growth in recent decades with continued development on the horizon.

This planning study evolved from three separate KYTC projects:

- **Item 4-80152** to reduce congestion at the US 68 (East Main Street) intersection with KY 2154 (Corporate Drive).
- **Item 4-80153** to extend KY 2154 (Veterans Memorial Highway) from KY 208 (New Calvary Road) to KY 49 (Bradfordsville Road).
- **Item 4-80259** to improve connectivity and congestion between US 68 and KY 55.

To be sensitive to future needs of the community, this study looked at the bigger picture to understand the relationship between these separate projects—potentially as part of a larger future effort to "close the loop" for the Lebanon Bypass. Some local elected officials have advocated for such a connection. **Figure ES-1** illustrates the study area alongside the locations of the aforementioned Highway Plan projects in the vicinity.

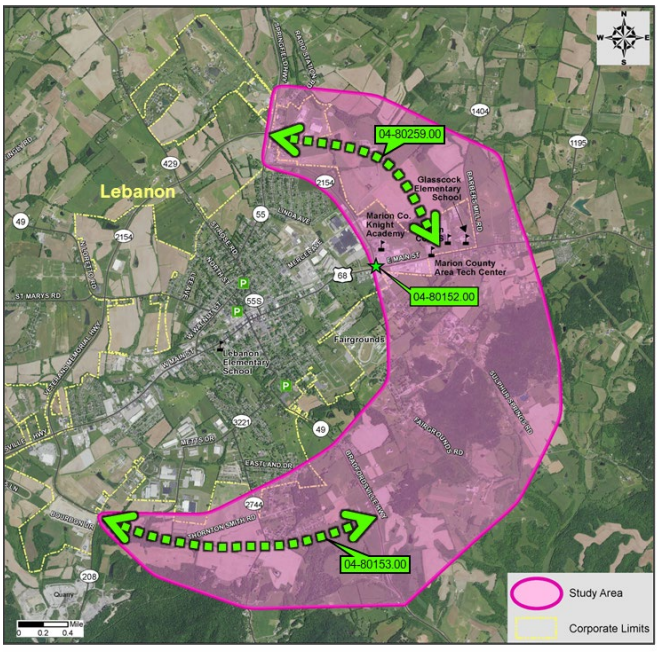


Figure ES-1: Study Area

Existing Highway Network

Three primary highways provide the highest level of mobility for the city.

- KY 55 is a principal arterial connecting Lebanon to Springfield. Approaching Lebanon, KY 55 has a four-lane undivided rural section and carries about 10,000 vehicles per day (vpd).

- West of town, US 68 is a principal arterial connecting Lebanon to Campbellsville. This section of US 68 has two lanes and carries 11,600 vpd. East of town, US 68 is a minor arterial that provides a connection towards Danville. Through the study area, the road has two to three lanes and provides access to the Independent Stave Company cooperage (a major tourist attraction and freight producer) and the Marion County Schools consolidated campus.

- Beyond the study area, KY 2154 (Veterans Memorial Highway) forms a western bypass of the city and is also designated a principal arterial. The roadway has a two-lane rural template and partial access control and carries 6,000 to 8,000 vpd along this section. Efforts are underway to reroute the federal truck route designation from downtown to the KY 2154 bypass west of town.

Within the study area, 207 crashes occurred from 2015 through 2020, including one fatality and 30 injury collisions. While a few scattered crashes occurred along more rural state-maintained highways in the southern portion of the study area, the bulk of study area crashes were concentrated on US 68, KY 55, and KY 2154 (Corporate Drive).

Level of Service of Safety (LOSS) is a statistical method used to evaluate safety needs, with higher ratings representing a greater potential to reduce crashes. The location with the highest LOSS rating within the study area corresponds to US 68 (East Main Street) from KY 2154 (Corporate Drive) to the Marion County Area Technology Center.

KYTC's latest statewide model[1] estimated future year growth for all study area roadway segments. Considering historic traffic growth rates, population projections, anticipated development, and model projections, a growth rate of 0.58% was applied to the 2021 Existing scenario to project future year 2045 No-Build traffic. For both 2021 existing and 2045 No-Build scenarios, most segments operate at acceptable levels during peak periods. Turn movements at individual intersections can be congested, especially busy moves at KY 2154 (Corporate Drive) intersections with KY 55 and US 68.

Study Goals and Objectives

The objective of this study is to develop conceptual options to improve connectivity for east Lebanon. Lebanon's robust industrial sector attracts truck traffic and leads to localized peak-period congestion during shift changes. Industrial sites are concentrated in two parks—one south of the city along KY 208 and the other northeast along KY 2154 (Corporate Drive). Ongoing and continued development will increase volumes and exacerbate current mobility concerns.

[1] Version v7_KYSTMv19 with an indicated release date of July 2020

Figure ES-2: Truck turning onto US 68 downtown

As shown in **Figure ES-2**, signal timing/phasing and tight turning radii at key intersections downtown limit mobility for large trucks trying to navigate between arterial corridors. Coupled with lower travel speeds and longer travel times, the City's vision for its quaint downtown character is inconsistent with a thru-route for heavy trucks.

Meanwhile, the city's spoke-and-wheel layout provides few connections beyond the urban core. Narrow, two-lane highways and local streets provide limited access to areas south of town. Residents south of US 68 must rely on a sparse network of collector and local routes to get around; often they must return to US 68 (Main Street) to access non-residential destinations. These constraints on mobility contribute to increased travel times—influenced by congested urban sections or circuitous rural routing. US 68 (East Main Street) provides access to the county's consolidated schools' campus and the largest tourist attraction—Independent Stave Company. Most traffic on the east side of town is funneled through the signalized US 68/KY 2154 (Corporate Drive) intersection, with few turn lanes and no left turn signal phases.

Another objective of this study is to consider the bigger picture to understand the relationship between separate Highway Plan projects, potentially forming part of a larger future effort to "close the loop" for the Lebanon Bypass.

Secondary goals supporting the primary project purpose—improved connectivity—include:

- Complementing local and regional economic development efforts
- Minimizing impacts to the community and natural environment

Improvement Concepts Considered

Improvement concepts were developed based on a combination of input from the project team, a review of existing conditions, community feedback, and field reconnaissance. Shown in **Figure ES-3**, five Build concepts were developed with corridors up to 600 feet wide to provide engineers with flexibility to refine designs during any future project development while staying within the footprints shown. In addition to the new connectors, improvements at three key intersections (shown in orange) were also considered with the Build concepts.

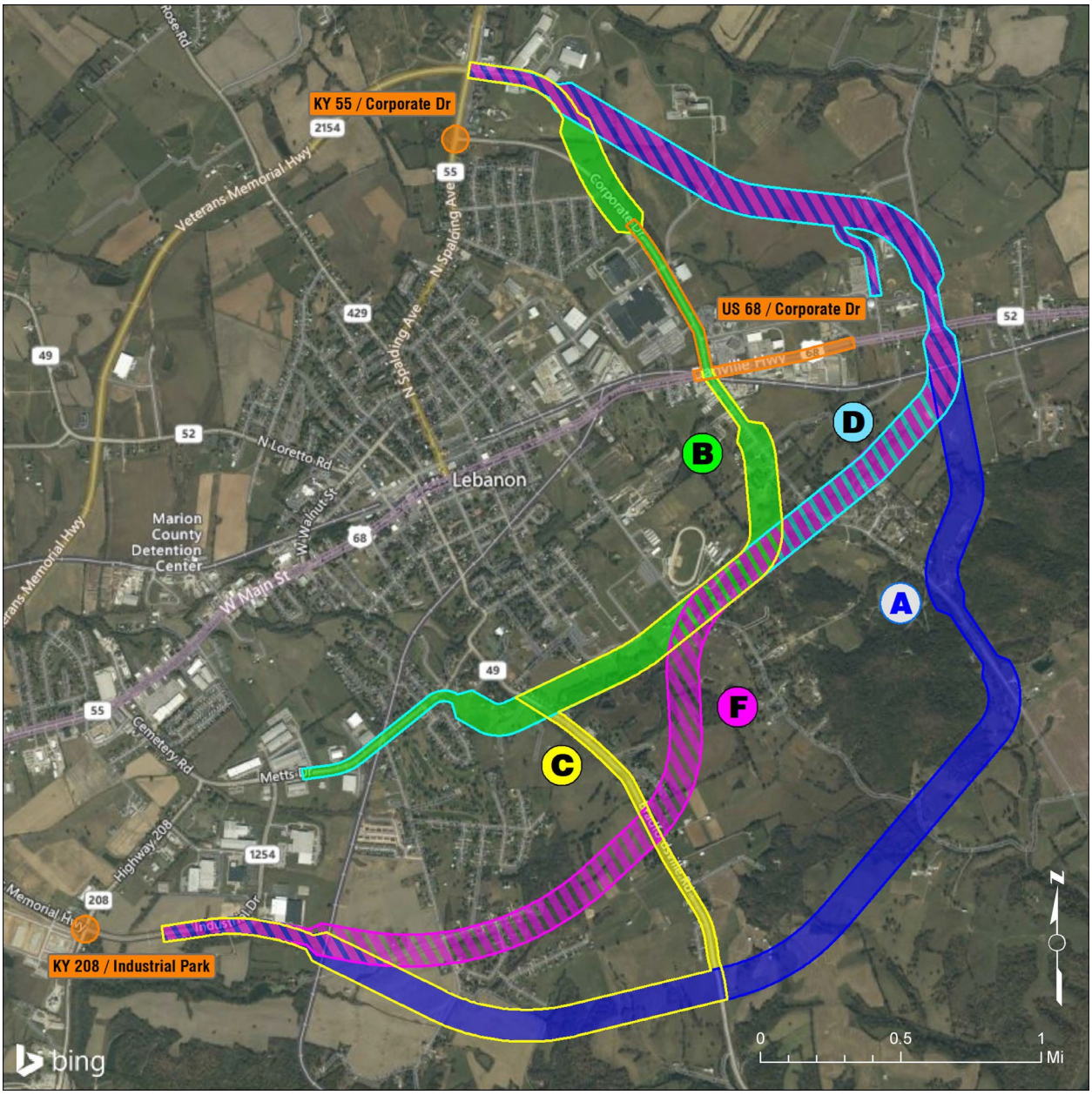


Figure ES-3: Build Concepts Considered

South of US 68, forecasts show that a new connector is expected to carry 1,600 to 2,800 vpd in 2045. North of US 68, a new connector could carry approximately 3,000 vpd and divert some volume from busy KY 2154 (Corporate Drive). An inner connector improves traffic moving through town while an outer connector benefits traffic near the schools and cooperage east of town.

The outermost option—Concept A—is the longest and most expensive of the corridors considered. Although it does not reduce travel times compared to using the existing highway network, the concept does increase access to mostly undeveloped areas. The innermost option—Concept B—is the shortest corridor considered with the lowest construction costs; however, right-

of-way costs and property impacts would be much higher as it passes through more developed residential areas. Concepts C, D, and F fall within the geographic area bounded by Concepts A and B, overlapping one or more segments of these inner and outer corridors. An initial concept E was eliminated as it resulted in higher costs and impacts without corresponding benefits compared to other combinations.

Coordination Meetings

Over the course of the study, the project team met three times. Two meetings were conducted with local officials and key stakeholders to identify study area needs and gather feedback on proposed options for Build corridors. In addition, public meetings were held at two milestones, supplemented by a project website (**www.EastLeb.com**) and surveys to engage with the larger community.

While 62% of 117 survey responders initially agreed on the need for a new connector in the study area, support decreased to 35% once concepts were shared. Top study area needs identified by the public were safety, connectivity, future development, and minimizing disruptions. Most survey responders agreed the northern portion of a potential connector—between KY 55 and US 68, corresponding to Item No. 4-80259—represented the highest priority and that improvements to US 68/KY 2154 (Corporate Drive)—corresponding to Item 4-80152—were needed.

Recommendations

In light of the study goals, anticipated costs, benefits to traffic, impacts to the human and natural environment, community input, and project team discussions, the northeast connector between KY 55 and US 68 (Item No. 4-80259) as well as capacity improvements at the US 68/KY 2154 (Corporate Drive) intersection (Item No. 4-80152) are recommended to advance to the next phase of project development. Ongoing efforts to reroute the federal truck route designation to the existing KY 2154 (Veterans Memorial Highway) bypass west of town should continue.[2] South of US 68, the No-Build concept is recommended. If a future northeast connector is constructed and truck routing adjusted, the need for a southern bypass extension (Item No. 4-80153) may be reconsidered. Another concept identified: realigning the US 68/KY 2154 intersection west of town to make the north-to-west movement predominant is beyond the scope of this study but is noted as a viable improvement for future consideration.

During future design phases, a preferred alignment for the outer northeast connector concept (**Figure ES-4**) should be refined. Appropriate design speeds, typical sections, and configurations for the connections to KY 55, KY 2154 (Corporate Drive), Knight's Way/Patriot Drive, and US 68 will be determined during the future phases of work. Construction costs for this section are

[2] Completed August 2022 via Official Order Number 112958 with continuing FHWA coordination.

estimated at $4.2 million in 2021 dollars. Red flag environmental resources to consider in future design phases include two tributaries to Cartwright Creek, a potential historic home along Teledyne Road, karst terrain, and the underlying geologic concerns associated with New Albany Shale.

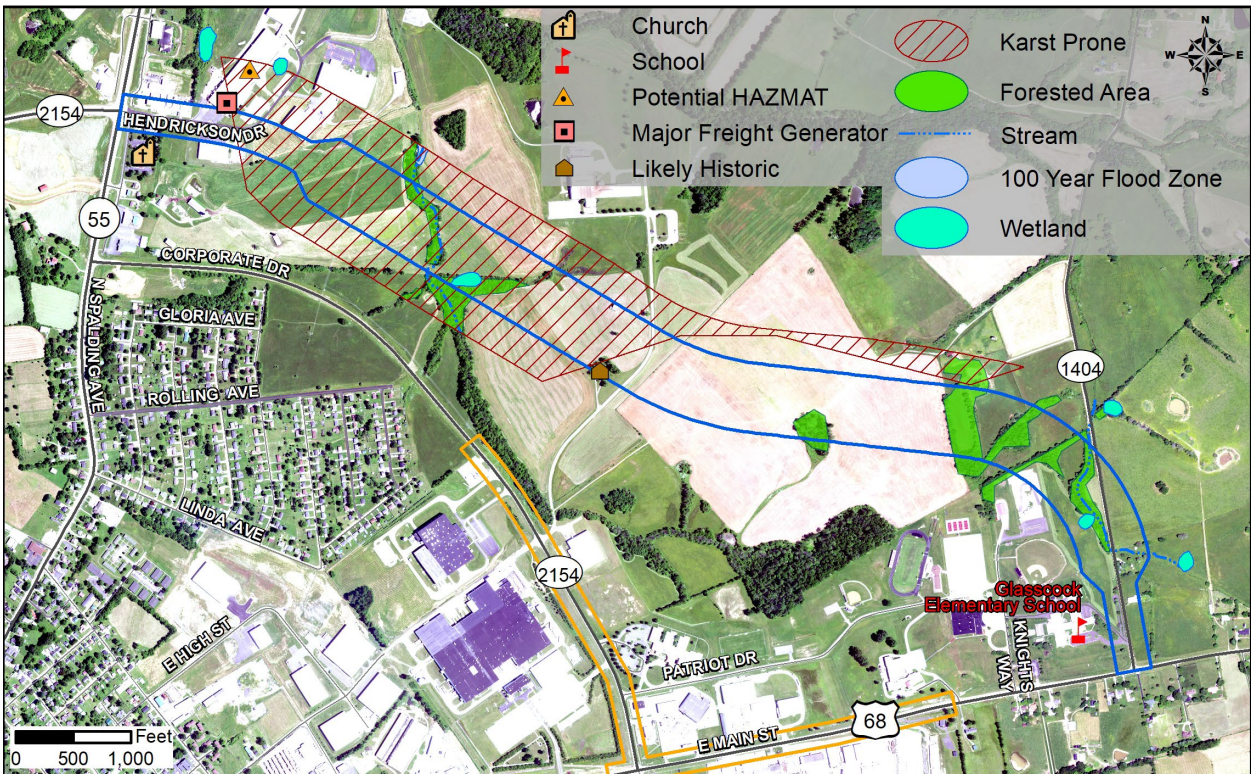


Figure ES-4: Recommended Northeast Connector

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

ACRONYMNS LIST

ADT	Average Daily Traffic
DHV	Design Hourly Volume
EEC	Excess Expected Crashes
FHWA	Federal Highway Administration
GPS	Global Positioning System
HCM	Highway Capacity Manual
HIS	Highway Information System
KHC	Kentucky Heritage Council
KYTC	Kentucky Transportation Cabinet
LEP	Limited English Proficiency
LOS	Level of Service
LOSS	Level of Service of Safety
LTADD	Lincoln Trail Area Development District
LWCF	Land and Water Conservation Fund
MP	Milepoint
mph	miles per hour
MSAT	Mobile Source Air Toxics
NEPA	National Environmental Policy Act
NHS	National Highway System
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NTN	National Truck Network
NWI	National Wetlands Inventory
STAA	Surface Transportation Assistance Act
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
VE	Value Engineering
v/c	Volume-to-Capacity Ratio
vpd	vehicles per day

1.0 INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) initiated the East Lebanon Connectivity Study to examine needs and consider opportunities to improve connectivity on the east side of Lebanon in Marion County, Kentucky. Nestled in the heart of bourbon country with a robust industrial sector, the city has seen substantial growth in recent decades with continued development on the horizon.

This planning study evolved from two different projects from Kentucky's *2020-2026 Enacted Highway Plan*:[3]

- **Item 4-80152** to reduce congestion at the US 68 (Main Street) intersection with KY 2154 (Corporate Drive).
- **Item 4-80153** to extend KY 2154 (Veterans Memorial Highway) from KY 208 (New Calvary Road) to KY 49 (Bradfordsville Road).

The *2022-2028 Enacted Highway Plan*[4] added a third project:

- **Item 4-80259** to improve connectivity and congestion between US 68 and KY 55.

Each project was awarded federal design funds to begin exploring solutions. To be sensitive to future needs of the community, this study looked at the bigger picture to understand the relationship between these separate projects—potentially as part of a larger future effort to "close the loop" for the Lebanon Bypass. Some local elected officials have advocated for such a connection.

Figure 1 illustrates the study area alongside the locations of the aforementioned Highway Plan projects in the vicinity.

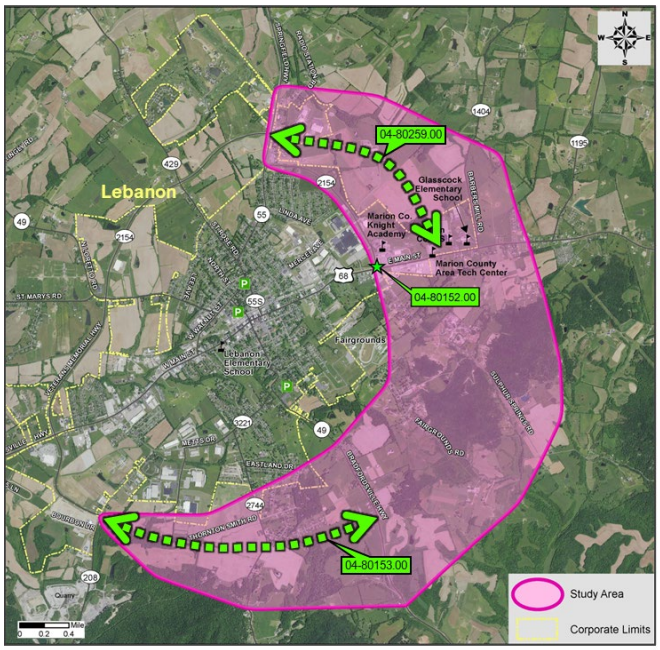


Figure 1: Study Area and Highway Plan Projects

[3] Online at https://transportation.ky.gov/Program-Management/Pages/2020-Highway-Plan.aspx
[4] Online at https://transportation.ky.gov/Program-Management/Pages/2022-Enacted-Highway-Plan.aspx

Summarized in **Figure 2**, study tasks are discussed in the following chapters.

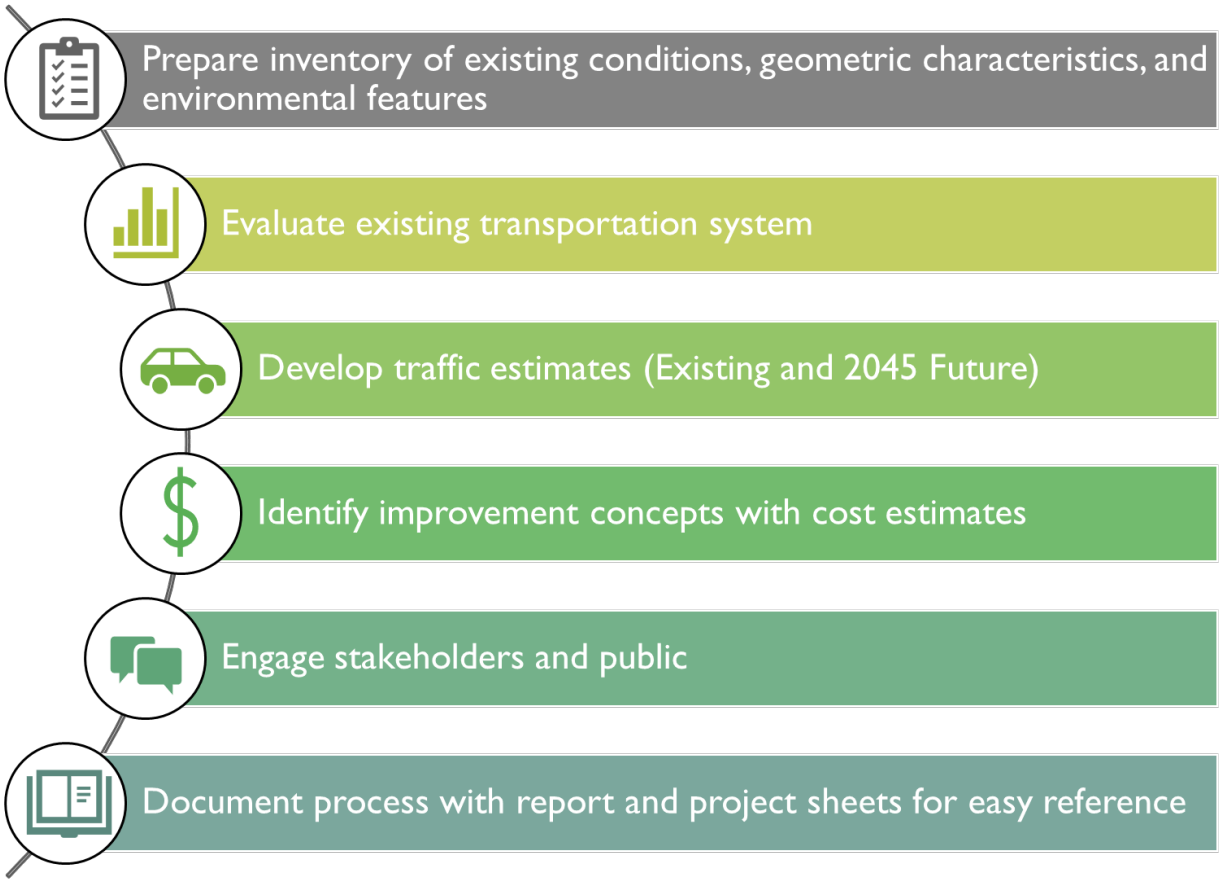


Figure 2: Study Tasks

2.0 EXISTING CONDITIONS

Existing transportation conditions within the study area are described in the following sections to understand the context of mobility in the region.

2.1 Roadway System Designations

Functional Classification is the process of grouping streets and highways according to the character of travel service and access to adjacent land use they provide. This classification system recognizes that travel involves movement through a hierarchical system of facilities that progress from lower classifications handling short, locally oriented trips to higher classifications serving longer distance travel at higher mobility levels. A roadway's classification is further designated as urban or rural based upon whether it is within the Federal Highway Administration's (FHWA) Adjusted Urban Area boundaries. The major functional classes are listed below.

Freeways & Interstates	Provide high speed, high mobility links for long distance trips.
Principal Arterials	Serve major centers for metropolitan areas, provide a high degree of mobility, and can also provide mobility through rural areas.
Minor Arterials	Provide service for trips of moderate length, serve geographic areas smaller than their Principal Arterial counterparts, and offer connectivity to the Principal Arterial system.
Collectors	Gather traffic from local roads and funnel to the arterial network. Classified as either a major or minor collector; generally serve intra-county travel and shorter trips.
Local Roads	Not intended for long distance travel, except at the origin or destination end of the trip, due to their direct access to abutting land. Often designed to discourage through traffic.

Additionally, functional classification is used as a tool for transportation agencies and designers. A roadway's functional class suggests expectations about roadway design: specifically, vehicle speed, capacity, and the roadway's relationship to land use development. Federal legislation uses functional classification in determining eligibility under the Federal-aid program. Transportation agencies typically describe roadway system performance, benchmarks, and goals by functional classification.

Functional Classifications. The highest mobility routes serving the area are KY 55, US 68, and KY 2154. [5]

- KY 55 is a principal arterial connecting Lebanon to Springfield, 8 miles to the north and to the Bluegrass Parkway beyond. Approaching Lebanon, KY 55 has a four-lane undivided rural section and carries approximately 10,000 vehicles per day (vpd).
- West of town, US 68 is a principal arterial connecting Lebanon to Campbellsville, 16 miles to the south and the Cumberland Parkway beyond. This section of US 68 has two lanes and carries 11,600 vpd.
- Between KY 55 and US 68, KY 2154 (Veterans Memorial Highway) forms a western bypass of the city and is also designated as a principal arterial. Built in 2008, the bypass has a two-lane rural template and partial access control. It carries 6,000 to 8,000 vpd along this section.
- East of town, US 68 (East Main Street) is a minor arterial that provides a connection towards Danville, 25 miles to the east. Through the study area, it has two to three lanes and provides access to the Independent Stave Company cooperage (a major tourist attraction and freight producer) and the Marion County Schools consolidated campus.

Figure 3 presents functional classifications for these routes and other state-maintained highways in the vicinity.

While US 68 and KY 55 downtown are also classified as minor arterial routes, tight turn radii and lack of protected left turn phases at signals create challenges for trucks to navigate these routes.

[5] Three distinct highway segments carry the KY 2154 shield: Corporate Drive from US 68 to KY 55 (MP 0.000-1.337), Veterans Memorial Highway from KY 55 to US 68 (MP 1.337-4.601) that forms a western bypass of the city, and Industrial Drive from US 68 to Metts Drive (MP 4.601-6.576).

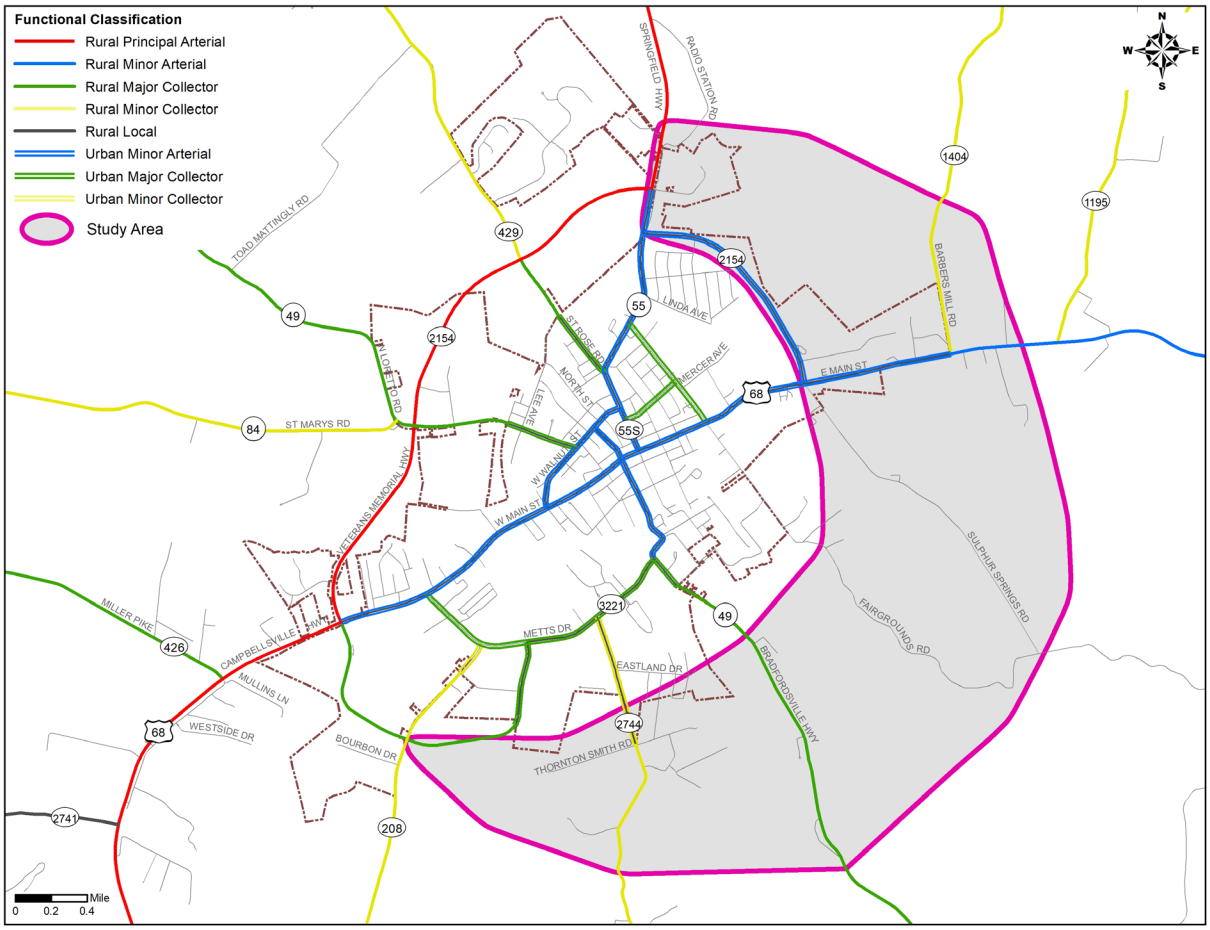


Figure 3: Functional Classification

Truck Routes. In compliance with the Surface Transportation Assistance Act of 1982 (STAA), Kentucky established a network of highways on which commercial vehicles with increased dimensions may operate. These "STAA" vehicles include semi-trucks with 53-foot-long trailers and single-unit trucks with a total length of 45 feet. STAA routing in Kentucky corresponds to the National Truck Network (NTN), plus state-maintained highways within five miles of the NTN, 15 miles from interstate or parkway interchanges, and one mile from the interchange on other public highways.

Figure 4 presents truck routes in the study area vicinity. Portions of US 68 and KY 55 are part of the federally designated NTN, which extends from Lexington/Fayette County to the Cumberland Parkway in Metcalfe County. Along with KY 2154 (Veterans Memorial Highway) and KY 3221 (Metts Drive), these routes are also listed on Kentucky's Highway Freight Network.

Currently, efforts are underway to reroute the federal truck route designation from downtown to the KY 2154 (Veterans Memorial Highway) bypass west of town.[6]

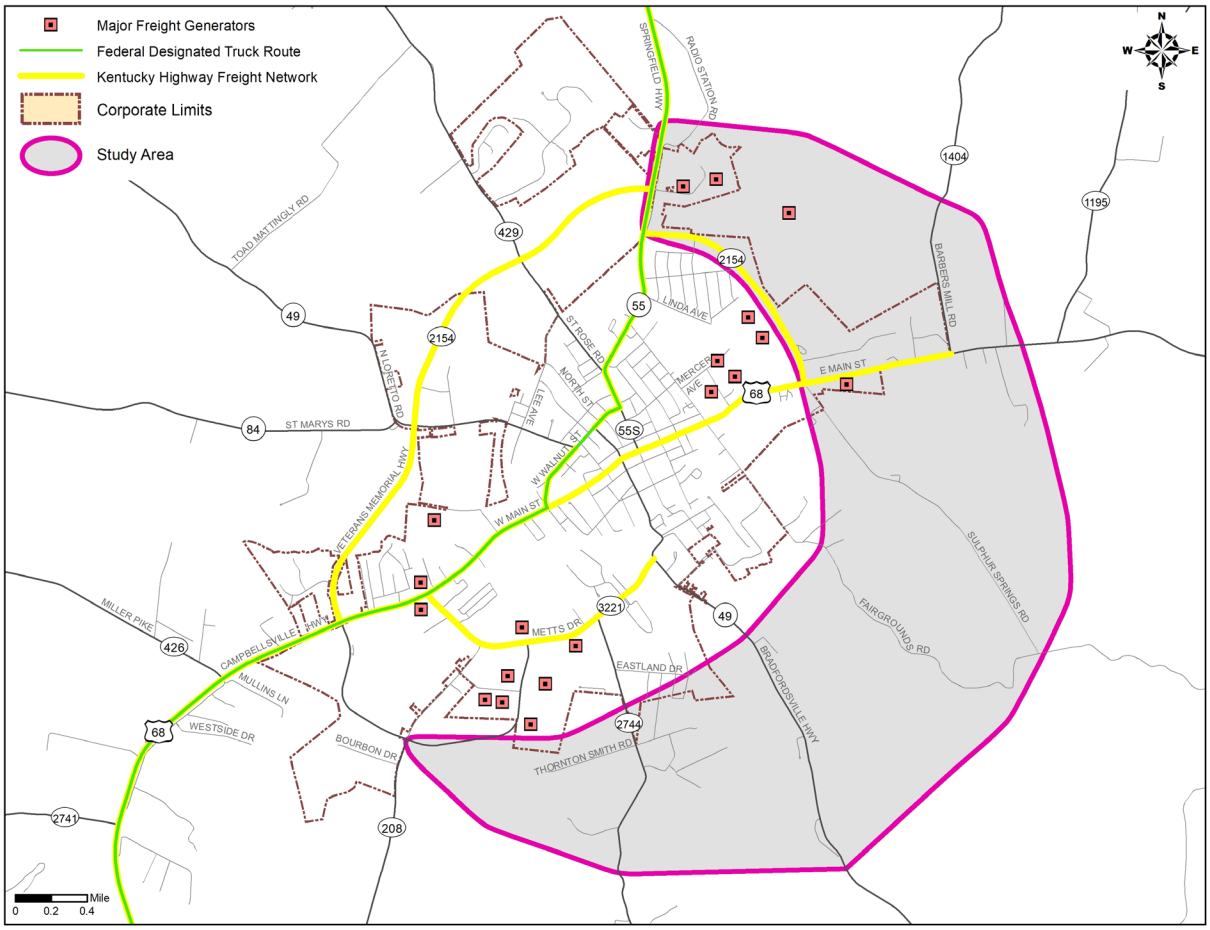


Figure 4: Designated Truck Routes

For reference, major freight generators are also shown on the map. These are largely clustered in two industrial parks: one along KY 208 and Metts Drive south of town and the other along KY 2154 (Corporate Drive) in the northeast.

Highway Systems. The National Highway System (NHS) includes roadways important to the nation's economy, defense, and mobility. The Kentucky State Highway System classifies state-maintained roadways by the type of service and function they provide. US 68, KY 55, and KY 2154 (Veterans Memorial Highway) are listed on the Enhanced NHS.

[6] Completed August 2022 via Official Order Number 112958 with continuing FHWA coordination.

FHWA tracks a series of performance measures statewide, including pavement and bridge conditions for NHS routes, delay, truck travel time reliability, emissions, and more. Any improvements to these routes would have an incremental effect on these metrics.

2.2 2021 Traffic Volumes and Operations

Available existing traffic volumes for the study area roadways, including truck percentages, K-factors[7], and peak-hour direction distributions were reviewed. Year 2021 segment volumes were calculated based on applicable historical trends, adjusting pre-2020 volumes to create a consistent 2021 dataset while minimizing influence of the COVID pandemic on observed traffic volumes. Existing 2021 average daily traffic (ADT) volumes for state-maintained highways within the study area are shown in **Figure 5**; black circles represent study intersections, discussed below.

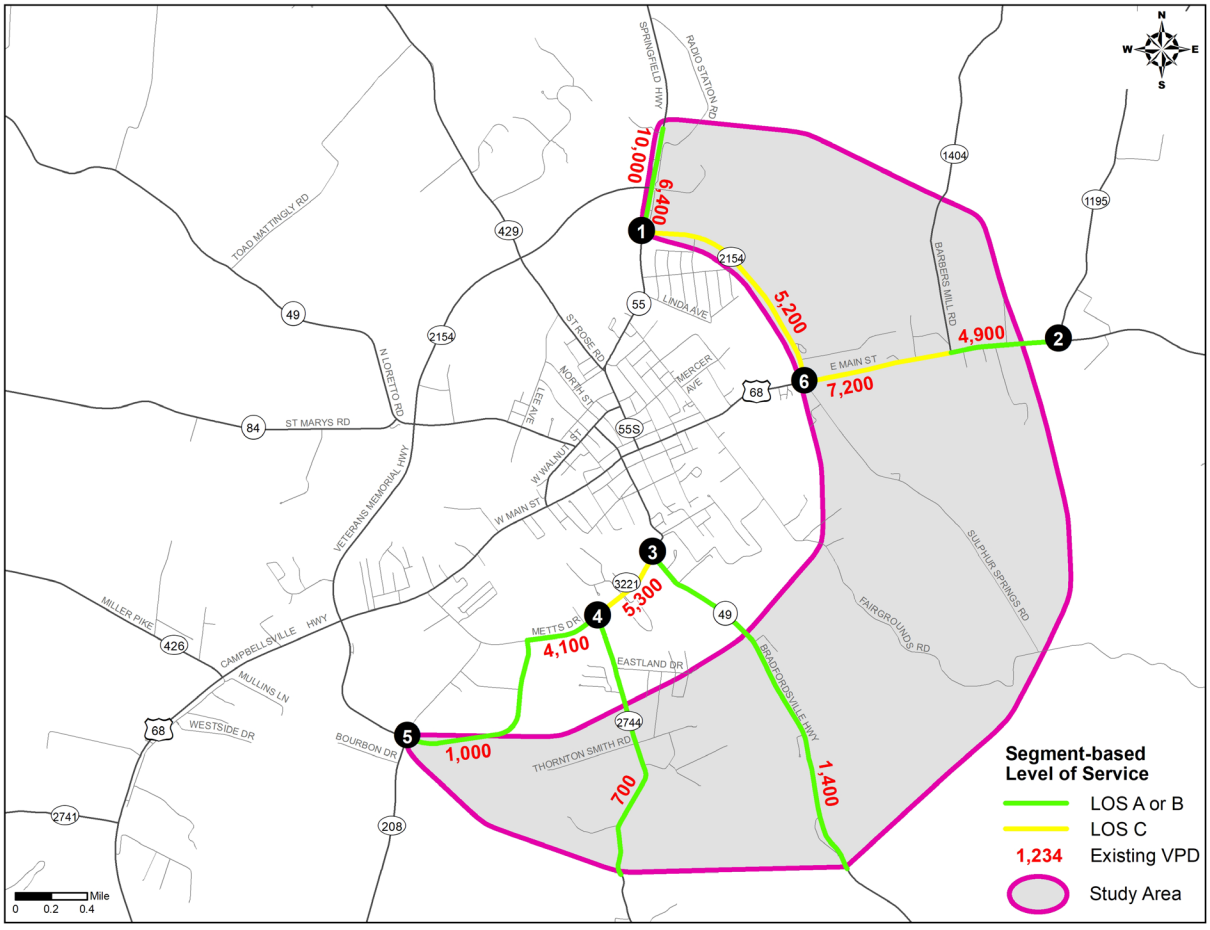


Figure 5: 2021 Existing Traffic and Level of Service (LOS) for Study Area Highway Segments

In addition, 12-hour turning movement counts were collected at six intersections during September 2021, classifying vehicles into one of five categories: motorcycles, cars, buses, single-

[7] K-factor is defined as the proportion of annual average daily traffic occurring in the design hour.

unit trucks, and articulated trucks. The only signalized intersection counted was US 68 at KY 2154 (Corporate Drive); all others are stop-controlled. Additional traffic information is presented in the *Traffic Forecast Report* in **Appendix A**.

2.2.1 Traffic Operations

Two commonly applied highway performance indicators, level of service (LOS) and volume-to-capacity (v/c) ratios, were calculated to describe traffic operations along the corridor. Computations were performed in accordance with *Highway Capacity Manual* (HCM) *6th Edition* procedures for study route segments.

Level of Service. LOS is a qualitative measure that describes traffic conditions based on measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience. LOS typically represents a driver's perspective of traffic conditions based on perceived congestion. As illustrated in **Figure 6**, LOS A is associated with free flow conditions, high freedom to maneuver, and little or no delay. Conditions at or near capacity typically are associated with LOS E. LOS F represents oversaturated traffic conditions beyond capacity, with low travel speeds, little or no freedom to maneuver, and lengthy delays. LOS D is generally considered acceptable for urban areas.

LOS is also calculated for intersections, resulting in an overall LOS for signalized intersections and a LOS for each stop-controlled approach at unsignalized intersections.

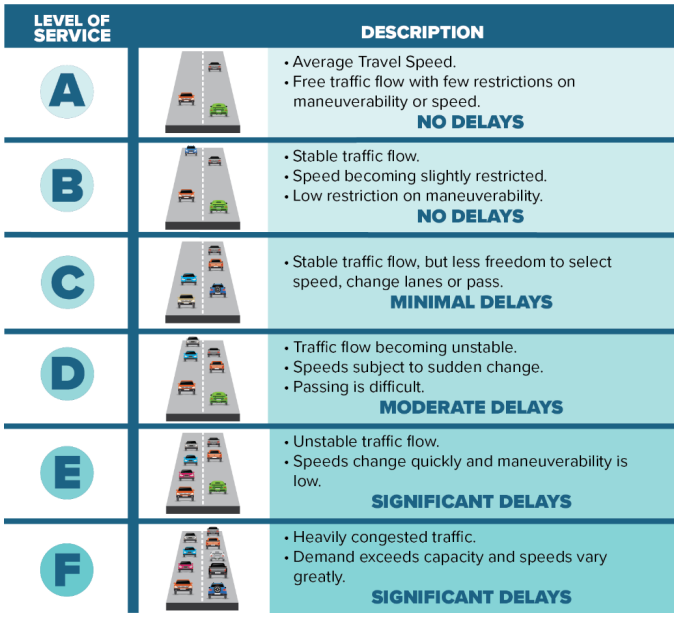


Figure 6: Level of Service (LOS)

Volume-to-Capacity. Another measure, v/c, compares traffic volume using a facility to its theoretical capacity over a specific duration, one hour in this instance. A v/c ratio greater than 1.0 indicates a route has exceeded its theoretical capacity and additional lanes may be justified. As v/c is measured over an hour period by segment, a roadway or intersection could be congested during peak commuter periods but show a relatively low v/c averaged over a longer duration.

Results. For highway segments within the study area, existing LOS was determined for the highest traffic hour based on design hourly volume (DHV) calculations, applying hourly and directional adjustments to ADT counts to approximate peak hourly flows. As shown in **Figure 5**, results show segments operate at LOS C or better. The maximum v/c of all segments evaluated was 0.38, suggesting adequate peak-hour capacity is generally available. Intersection operations are summarized in **Table 1** corresponding to the numbered intersections in **Figure 5**.

Table 1: 2021 Existing Intersection Operations

Intersection	Control	AM Peak		PM Peak	
		LOS	Worst v/c	LOS	Worst v/c
1. KY 55 at KY 2154 Corporate Dr.	2-way stop (WB)	F	1.4	C	0.4
2. US 68 at KY 1195 Short Line Rd.	2-way stop (SB)	B	0.1	B	0.0
3. KY 49 at Country Club Rd.	2-way stop (EB)	C	0.5	B	0.4
4. Metts Dr. at Country Club Rd.	2-way stop (NB)	B	0.4	B	0.2
5. KY 2154 Veterans Memorial Hwy. at KY 208	4-way stop	A	0.2	A	0.2
6. US 68 at KY 2154 Corporate Dr.	Signal	C	0.9 WB 0.7 SB	B	0.8 WB 0.7 SB

As shown, most intersections operate at LOS C or better and have adequate v/c ratios. However, there are two exceptions to note:

- During the morning rush hour, left turns from KY 2154 (Corporate Drive) towards downtown must cross KY 55 thru traffic, which does not stop. While the westbound KY 2154 (Corporate Drive) approach provides separate left- and right-turn lanes, this left-turn movement is over capacity.
- Based on the existing geometric layout and signal timing, the US 68 westbound approach at the KY 2154 (Corporate Drive) signal—coming from the schools—is approaching capacity in both peak hours. Maximum queue lengths are 500 feet in the morning and 300 feet in the afternoon. The southbound KY 2154 (Corporate Drive) approach is also approaching capacity, with peak-hour v/c ratios of 0.7 to 0.8. Both the westbound and southbound approaches have a single lane approaching the signal.

2.2.2 Travel Time Data

To understand real-time traffic conditions, key routes around town were driven during September 2021 to capture travel times via GPS technology. These GPS-based runs (**Figure 7**) provided location and speed data each second, highlighting the periodic slowdowns at intersections and through downtown.

This information can be applied to calculate travel times between key origin/destination pairs—and illustrate the city's limited highway connectivity. For example, it takes about 7 minutes to drive along the existing bypass from the southern industrial park to KY 55 leaving town to the north, versus 8.5 to 9.5 minutes to make the same trip through downtown. The shortest connection between residential neighborhoods south of town to the county schools' consolidated campus takes an estimated 6.5 minutes; however, there are no other obvious routes connecting these endpoints.

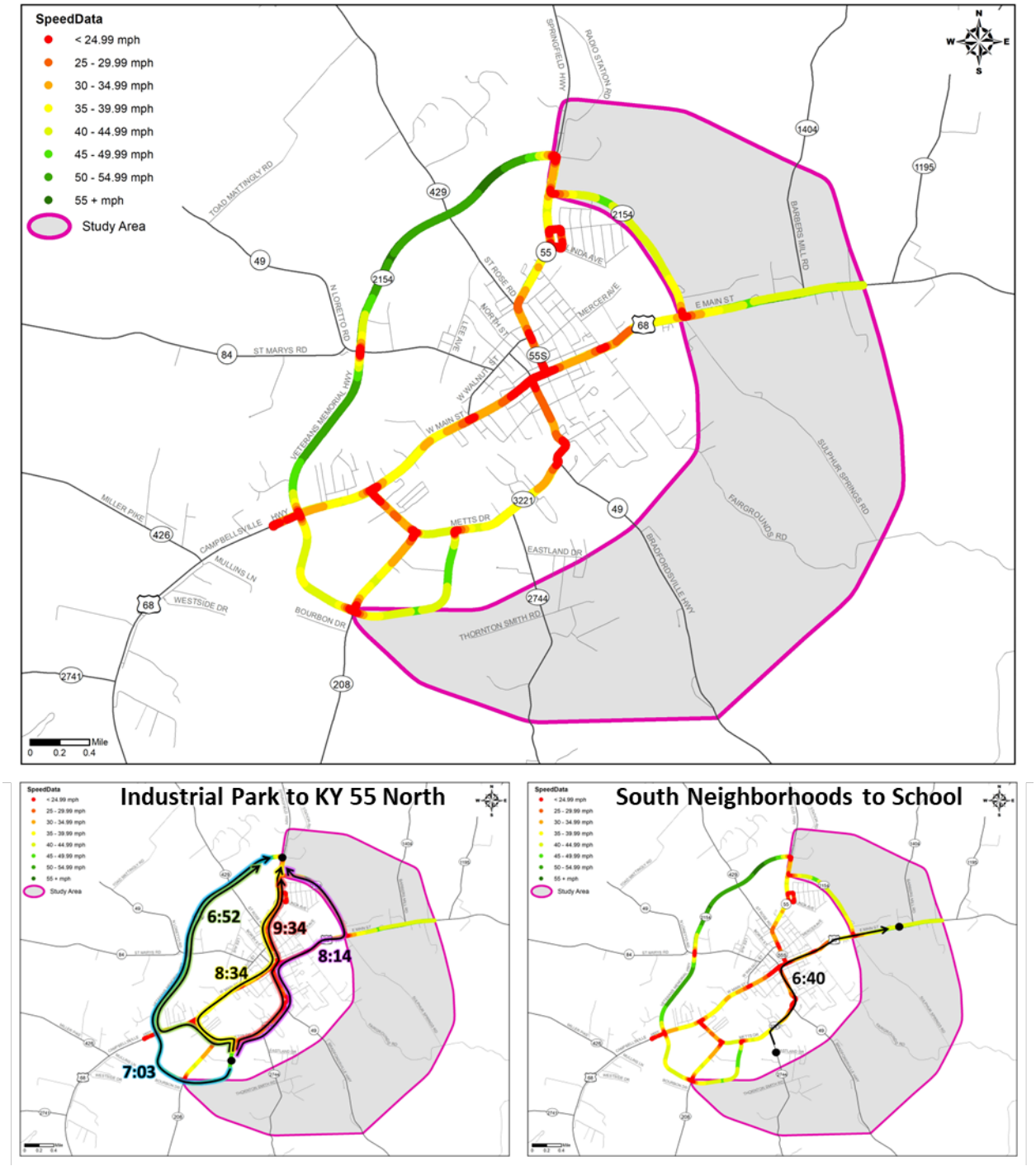


Figure 7: GPS-based Travel Time Data, September 2021

2.3 Crash History

Historical crash data retrieved from KYTC's Transportation Enterprise Database were evaluated for key routes in and around the study area roadways for a six-year period (January 2015 through December 2020). **Figure 8** shows crash locations by severity (denoted by shape) and manner of collision (denoted by color). In the heat map of crash distributions (**Figure 9**), the darker red colors represent the highest crash rates—concentrated at intersections on higher volume roadways.

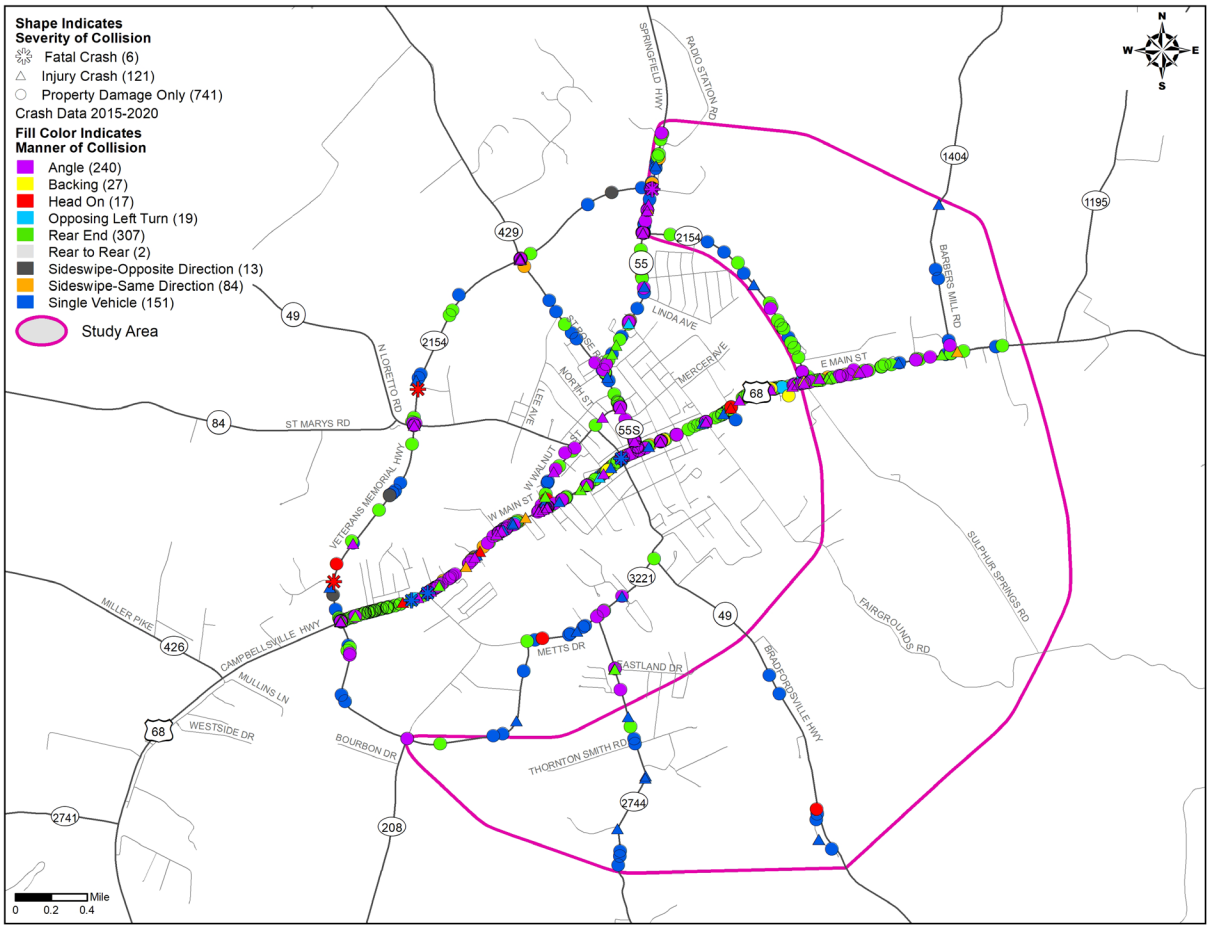


Figure 8: Crashes by Severity and Manner of Collision

Figure 9: Crash Density

The distribution of the 207 study area crashes by year (**Figure 10**), shows a marked decrease in overall crash rates following 2017. Both traffic volumes and the overall crash rate showed a further decline in 2020. However, this trend is not reflected in the larger dataset, which includes the additional 661 crashes that occurred in the city beyond the study area limits.

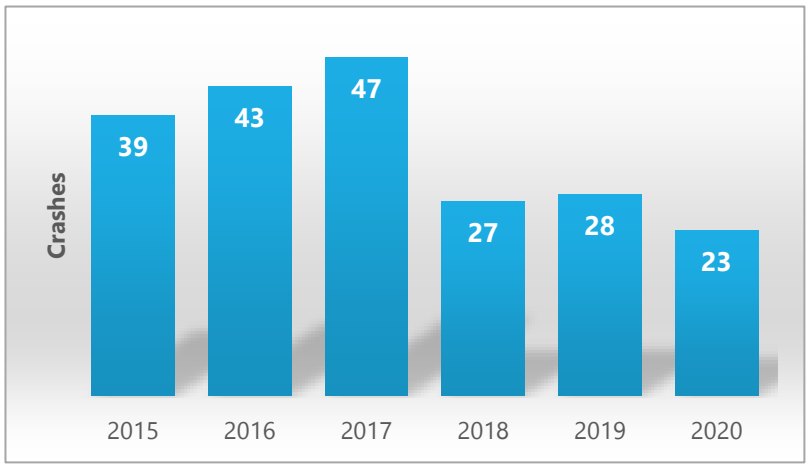
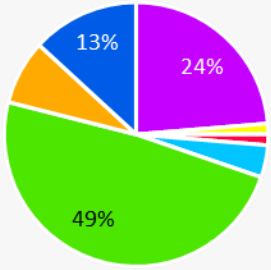
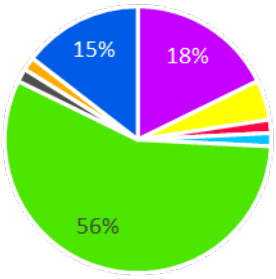
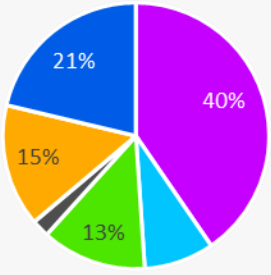


Figure 10: Study Area Crashes by Year

Within the study area limits, one fatality was recorded during the six-year analysis period: an angle collision in dry conditions at the KY 55/KY 2154 (Veterans Memorial) intersection during December 2015. There were 30 injury collisions, representing 14% of study area crashes. Overall, 21% of study area crashes occurred after dark, 22% were on wet pavement, one crash involved a pedestrian, and 3% involved deer.

While there are a few scattered crashes along rural, state-maintained highways in the southern portion of the study area, the bulk of study area crashes were concentrated on US 68, KY 55, and KY 2154 (Corporate Drive). **Table 2** provides a side-by-side comparison of key crash statistics for the sections of these three routes within the study area.

Table 2: Crash Trends on Key Study Area Routes

Route	Length	Lanes	ADT	Total Crashes	Fatal or Injury	Crash Type	
US 68	1.2 mi	2-3	4,900 – 7,200	76	11 inj. 14%		49% Rear Ends 24% Angle 13% Single Vehicle 8% Sideswipe 4% Opposing Left 1% Backing 1% Head On
KY 2154	1.3 mi	2	5,200	62	1 fatal, 4 inj. 8%		56% Rear Ends 18% Angle 15% Single Vehicle 4% Backing 3% Sideswipe 2% Head On 2% Opposing Left
KY 55	0.6 mi	5	6,400-10,000	47	9 inj. 19%		40% Angles 21% Single Vehicle 17% Sideswipe 13% Rear Ends 9% Opposing Left

2.3.1 Level of Service of Safety

Level of Service of Safety (LOSS) is a refined statistical methodologies in the *Highway Safety Manual* and used to evaluate safety needs. It replaces the former critical rate factor analyses. Excess Expected Crashes (EEC) is based on a crash prediction model estimating the number of crashes expected at an intersection or on a roadway segment of a given type and length. It represents the number of excess crashes a segment is experiencing compared to other roadways of its type, adjusting for traffic volumes and a statistical correction. EEC is positive when more crashes are occurring than expected and negative when fewer crashes are occurring than expected.

EECs are grouped into one of four categories, identified as the LOSS. Summarized graphically in **Figure 11**, LOSS categories I and II represent sites with fewer than anticipated crashes, while categories III and IV represent sites with more than anticipated crashes. As the figure illustrates, LOSS-IV has above 1.5 standard deviations more crashes than expected. Because LOSS-IV sites experience such elevated crash rates, there is a higher probability that safety countermeasures at these locations will result in larger improvements.

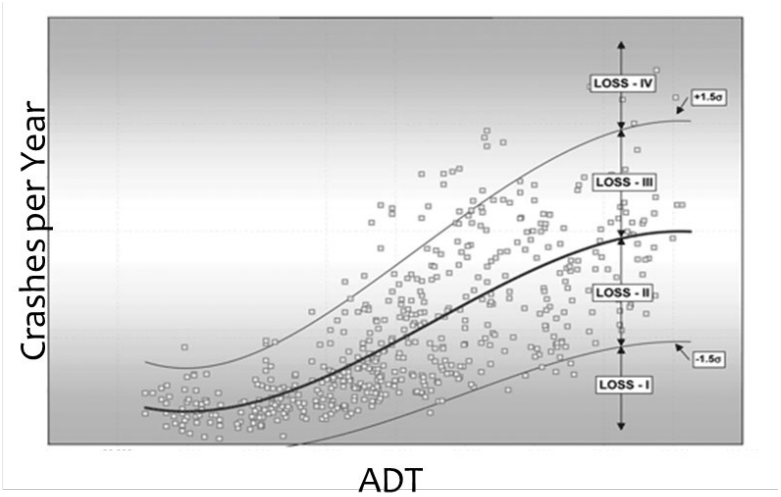


Figure 11: LOSS Categorical Thresholds

Figure 12 presents LOSS for roadways in and around the study area. The two shades of red represent calculations for severe crashes—fatalities, severe injuries, and minor injuries—while the yellow and orange represent calculations based on non-severe crashes. The highest LOSS rating (i.e., site with the greatest potential to improve safety) within the study area corresponds to US 68 (East Main Street) from KY 2154 (Corporate Drive) to the Marion County Area Technology Center.

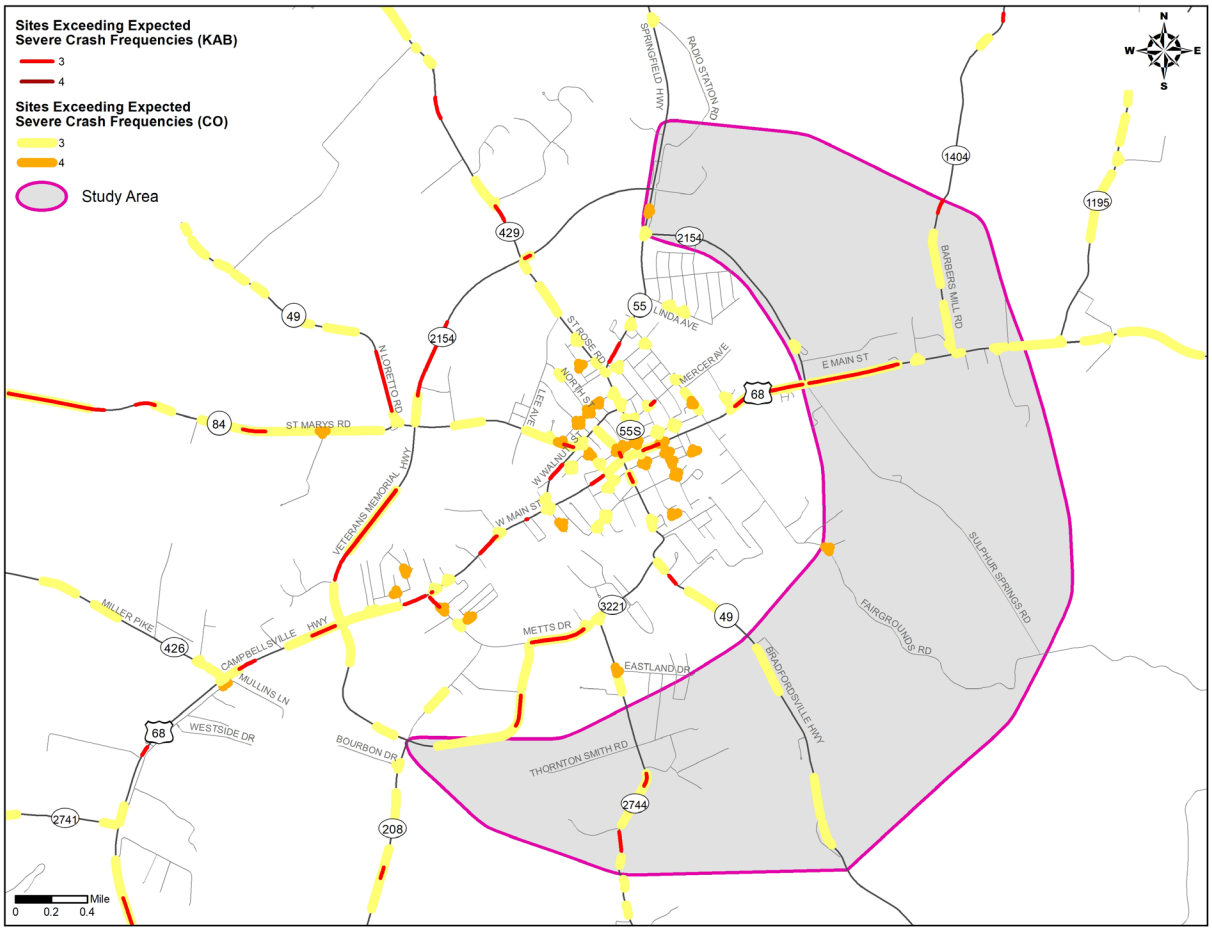


Figure 12: LOSS Ratings

3.0 ENVIRONMENTAL

An environmental overview was prepared to identify resources for consideration during the development of transportation improvement concepts. Natural and human environmental resources were identified from available literature, database review, and site visits. Study area resources are identified in **Figure 13** and are summarized in the following sections. Corresponding appendices provide additional information for each topic:

- **Appendix C**: General Environmental Overview Technical Memorandum
- **Appendix D**: Geotechnical Overview Report
- **Appendix E**: Planning Level Overview of Cultural Historic Resources
- **Appendix F**: Overview of Archaeological Resources (on file with KYTC)
- **Appendix G**: Socioeconomic Report

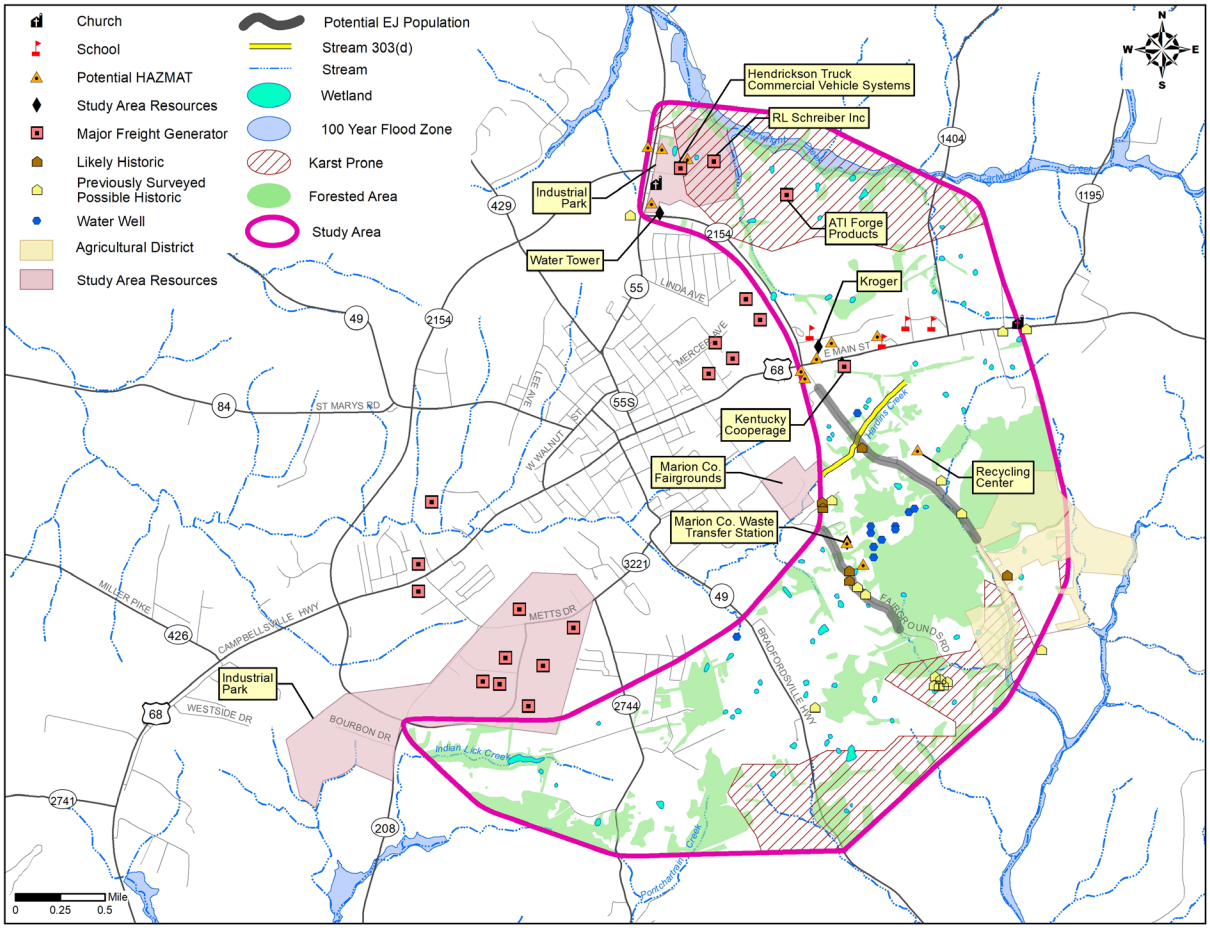


Figure 13: Environmental Overview Map

The purpose of this overview was not to quantify potential environmental impacts, but instead to identify potential environmental issues to consider during any future project development process. This information should aid the project team in making decisions to avoid, minimize, and/or plan for mitigation of potential project impacts, as appropriate. Should future projects develop following this study, additional environmental studies will likely be required.

If there is a federal nexus (e.g., federal funds, lands, permits, etc.) on a future project, then the procedures established from the National Environmental Policy Act (NEPA) must be followed. NEPA requires, to the fullest practicable extent, that federal actions be interpreted and administered in accordance with its environmental protection goals. It requires an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment. The potential environmental impacts and need for safe and efficient transportation must be considered to reach a decision that is in the best overall public interest.

3.1 Natural Environment

The natural environment includes all living and non-living things occurring naturally (not artificial or human-built). This includes aquatic ecology, such as rivers, streams, and wetlands; threatened and endangered species; farmlands; and geotechnical resources.

Water Resources. The study area is in the Rolling Fork watershed. Named streams in the study area are Cartwright, Hardins, Pontchartrain, and Indian Lick creeks. No federally designated Wild or Scenic Rivers or Outstanding State Resource Waters exist in the study area. The National Wetlands Inventory (NWI) lists 85 palustrine wetlands scattered throughout the study area, including numerous farm ponds. There are also 16 water wells: 2 domestic supplies, and 14 monitoring wells surrounding a local landfill.

Impacts to streams and wetlands require permit coordination with the US Army Corps of Engineers, US Coast Guard, and/or Kentucky Division of Water, depending on the scale of the water resource and potential disturbance.

Listed Species. The US Fish and Wildlife Service (USFWS) maintains a database of federally protected species—listed as endangered or threatened under the *Endangered Species Act*. There are three listed bat species and eight mussel species that have the potential to occur within the study area. Additionally, the monarch butterfly is under consideration for official listing. Listing statuses for all species are shown in **Table 3**. There is no designated critical habitat within the study area.

Table 3: Listed Threatened and Endangered Species

Group	Name	Scientific Name	Status
Mammals	Gray bat	*Myotis grisescens*	Endangered
Mammals	Indiana bat	*Myotis sodalis*	Endangered
Mammals	Northern long-eared bat	*Myotis septentrionalis*	Threatened
Clams	Clubshell	*Pleurobema clava*	Endangered
Clams	Fanshell	*Cyprogenia stegaria*	Endangered
Clams	Northern riffleshell	*Epioblasma torulosa rangiana*	Endangered
Clams	Orangefoot pimpleback	*Plethobasus cooperianus*	Endangered
Clams	Pink mucket	*Lampsilis abrupta*	Endangered
Clams	Rabbitsfoot	*Quadrula cylindrica cylindrica*	Threatened
Clams	Ring pink	*Obovaria retusa*	Endangered
Clams	Snuffbox	*Epioblasma triquetra*	Endangered
Insect	Monarch butterfly	*Danaus plexippus*	Candidate

A habitat assessment should be completed in the early stages of future project development efforts to assess potential project impact to threatened and endangered species. Projects that occur within an area of known bat habitat will require project-specific evaluation to assess appropriate minimization/mitigation measures. For other federally listed species, specific ecological surveys may be required for projects that have the potential to impact habitat. Coordination with the USFWS Kentucky Field Office will be necessary to determine the need for future project-specific surveys.

Farmland Classifications. Natural Resource Conservation Service (NRCS) soil survey maps were reviewed to identify farmland classifications within the study area. The geographic distribution of the farmland classifications is shown in **Figure 14**. The study area includes approximately 26% prime farmland soils. An additional 17% of soils would be considered prime farmland under certain conditions (e.g., drained or not frequently flooded during the growing season). The remaining 57% are made up of soils not considered prime farmland.

Two protected agricultural districts are at the easternmost outer limit of the study area, abutting Sulphur Springs Road. Both certifications are current through February 2024. No additional protected easements or agricultural districts were identified within the study area. Should federal funds be used on future projects, the *Farmland Protection Policy Act* must be followed. If there is potential to convert farmland, coordination with the local NRCS office would be required.

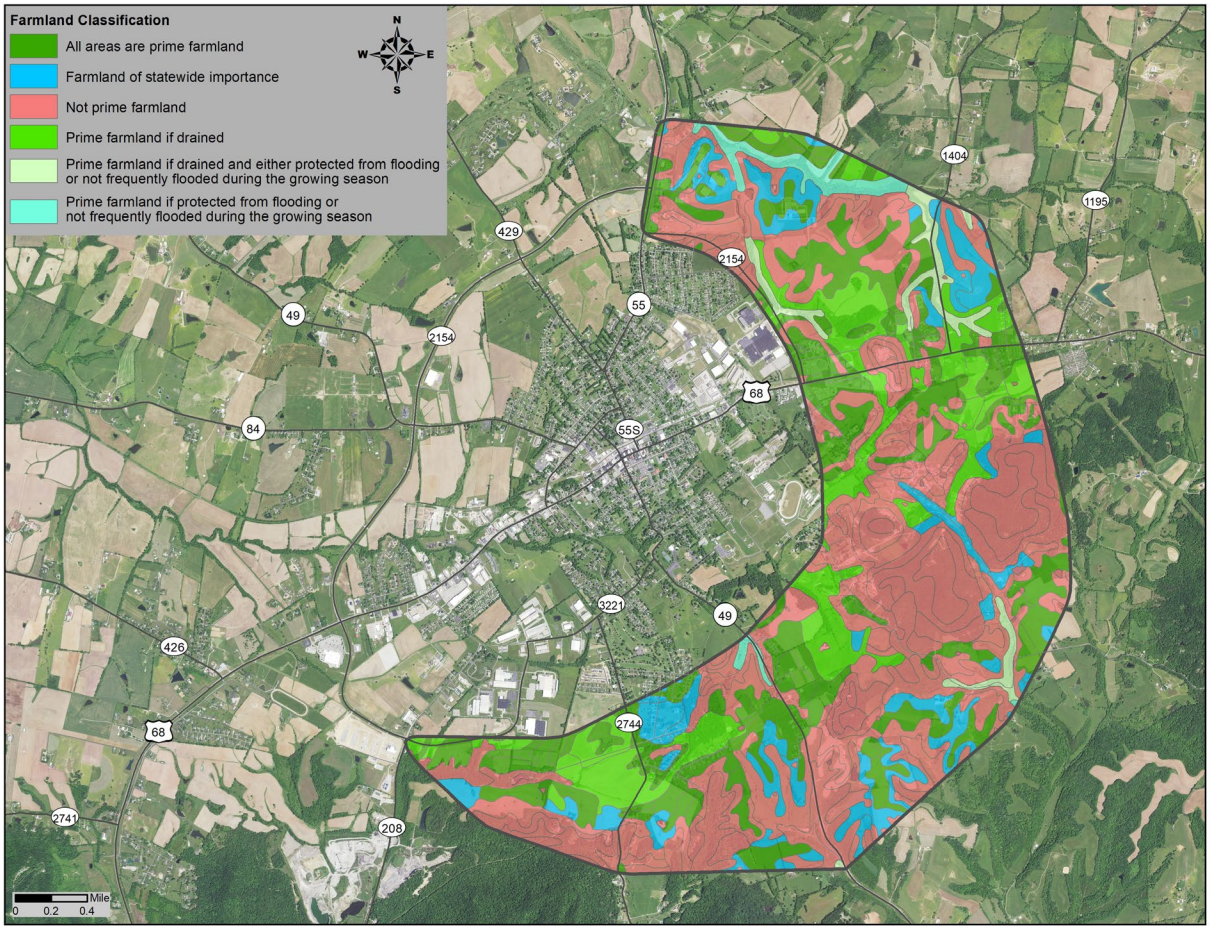


Figure 14: NRCS Farmland Soil Classifications

3.1.1 Geotechnical Overview

KYTC Geotechnical Branch prepared a *Geotechnical Overview Report* to help identify geotechnical concerns that may affect potential future project designs. A summary of those findings is provided here, with the full report in **Appendix D**.

The study area is located within the Outer Bluegrass/Knobs physiographic region—an upland area primarily consisting of interbedded limestones and shales. The Knobs region consists of hundreds of independent, steep-sloping, often conical hills lying at the outer edge of the Bluegrass region.

- Geological mapping shows the study area is underlain primarily by Middle Devonian New Albany shale and Upper Ordovician bedrock in fluvial channels.
- There is limited karst potential.
- One fault transects the southern study area limits but no geotechnical concerns are associated with the fault.

- Haydon Materials operates the Lebanon Quarry southwest of the study area, along KY 208, extracting limestone for crushed aggregates.

- The abundance of shale restricts surface drainage and facilitates ponding. Extreme or prolonged precipitation events can result in extremely wet soils, ponding, and flooding of low-lying areas.

Pyrite oxidation in the New Albany Shale (light brown in **Figure 15**) can cause serious geotechnical and environmental problems. This formation contains iron-sulfide minerals (pyrite) that can react with water to form sulfates and a mild sulfuric acid. Consequences of pyritic oxidation include heave, concrete degradation, steel corrosion, environmental damage, acid drainage, and accelerated weathering of rock. Non-corrosive materials and sulfate resistant cement for subsurface structures are required in locations where there is contact with the New Albany Shale.

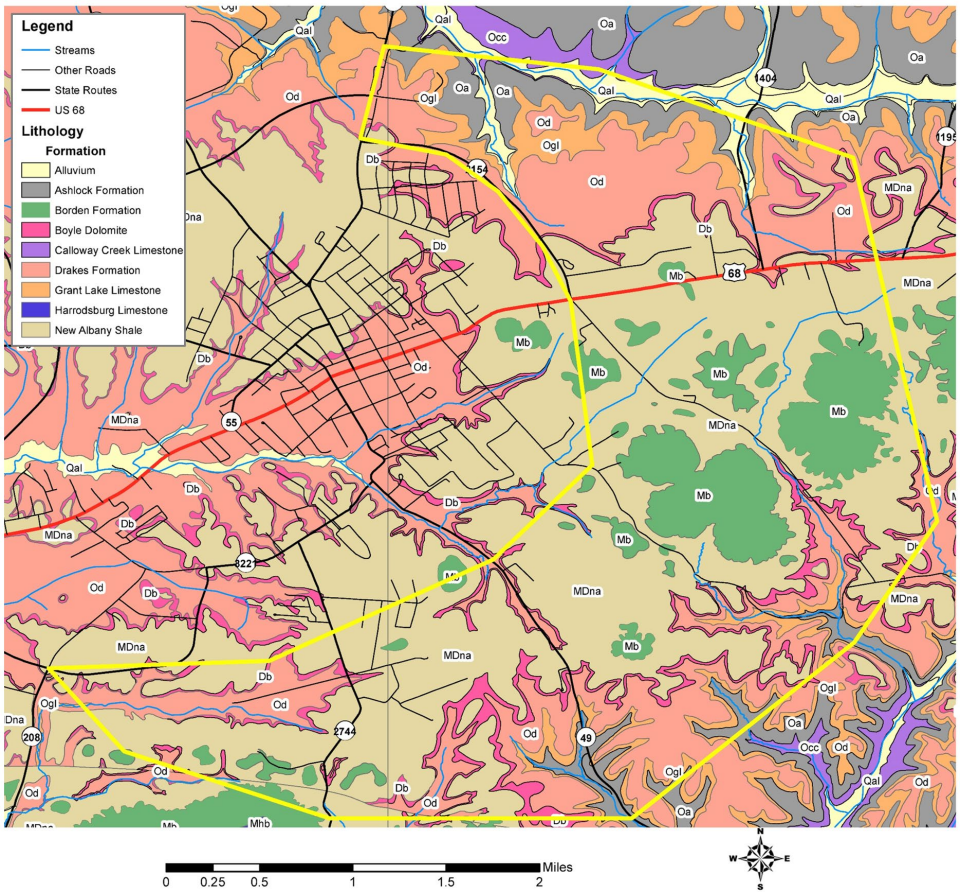


Figure 15: Geological Map

Additional recommendations for embankments, cut slopes, structures, and soil stability during construction are included in the appendix. A complete geotechnical investigation including

drilling, sampling, and testing of materials would be needed to anticipate and plan for any special treatment of issues encountered during any future project phases.

3.2 Human Environment

The human environment includes people and the resources they define: land use, community features, cultural historic resources, pollution (hazardous materials, air quality, noise), etc. Each could potentially be impacted by any future projects. The following sections identify these resources for consideration during the project development process.

Land Use. The study area is primarily rural with large tracts of farmland and forested areas intermixed with residential properties. Developed areas surround the major highways (KY 55 and US 68), providing access to numerous commercial operations, industrial facilities, and schools in the northern section of the study area. The southern and eastern portions of the study area are almost exclusively rural: however, one residential neighborhood, locally known as January Woods, overlaps the study area boundary.

The most recent zoning map for the city is shown in **Figure 16**.

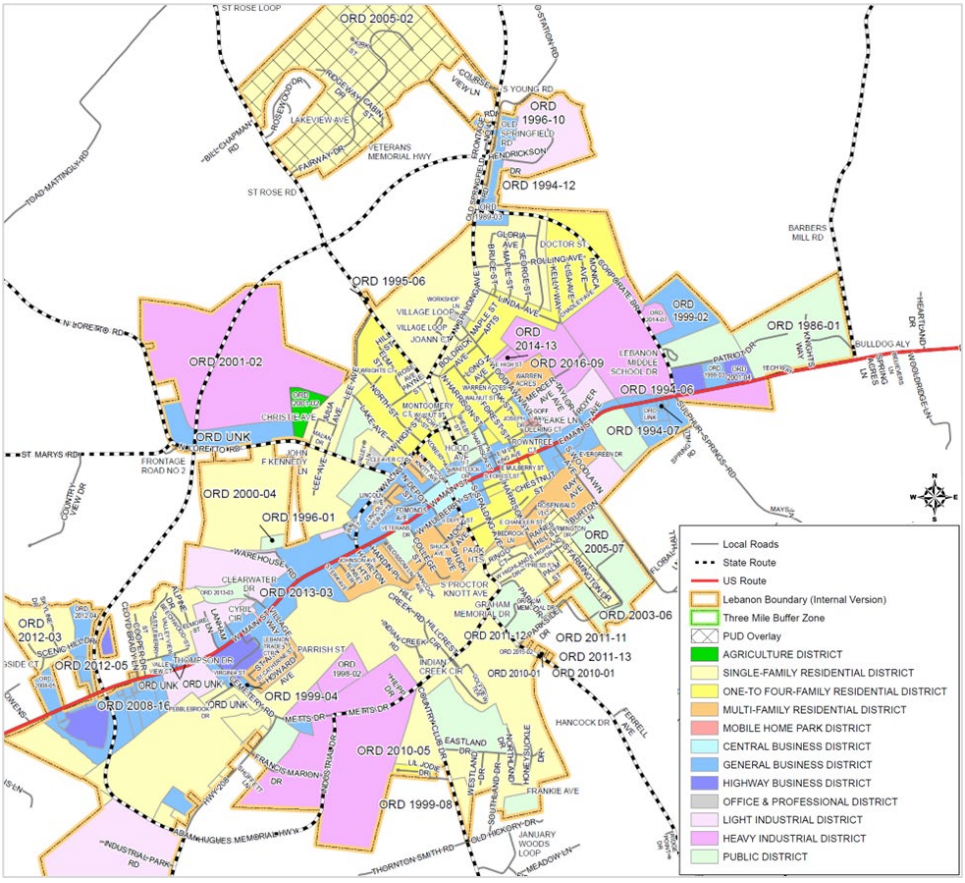


Figure 16: Lebanon Zoning Map

Community Features. Most community resources are in the more developed northern section of the study area.

Tourism. The Kentucky Cooperage, also known as the Independent Stave Company, builds barrels used around the world and is important part of the region's bourbon industry. The cooperage is a popular tourist attraction, with tours provided daily as part of the Kentucky Bourbon Trail and the Bourbon Trail Craft Tour. The cooperage is also a major employer in the community. The Cooperage property is on both sides of US 68, although the operation plants are primarily to the south. The County received state funding in 2022 to construct a structure along US 68 near MP 12.7 to provide a grade-separated underpass to connect both sides of the property, currently divided by US 68.

Schools. The consolidated Marion County Public Schools' campus covers 125 acres north of US 68 from KY 2154 (Corporate Drive) to KY 1404 (Barbers Mill Road). Within this area are Glasscock Elementary School, the Knight Academy (middle school), Marion County High School, a technology center, numerous athletic fields, a school administration building, and the county's school bus garage.

Churches and Cemeteries. There are two churches in the study area.

- The Open Arms Community Church is on the north side of US 68 at the outer edge of the study area.
- The Church of Jesus Christ of Latter-Day Saints is east of KY 55 at the northern end of the study area, south of the KY 2154/Hendrickson Drive intersection.


Open Arms Church


LDS Church

No known cemeteries have been identified in the study area although it is possible unknown or unmarked burial sites could be encountered in rural areas.

Parks. While there are no parks or recreational facilities within the study area limits, three facilities abut its limits.

- The nine-hole, private Lebanon Country Club golf course is accessed off Country Club Drive, located just west of the study area limits.

- Graham Memorial Park is located east of KY 49 between Park and Park Side drives, just west of the study area limits. The city-owned complex features an indoor aquatic center, basketball courts, tennis courts, playground, and several ball fields.
- The county fairgrounds are located off Fairgrounds Road, abutting the study area's western boundary. A new sports complex near the fairgrounds has also been proposed.

While grocery stores are not typically considered community resources, the Kroger grocery store northeast of the US 68/KY 2154 (Corporate Drive) intersection is one of the few groceries in the county.

Historic Resources. A *Cultural Historic Overview* was completed for the study area to identify properties within the study area that are listed or eligible for listing on the National Register of Historic Places (NRHP). A Kentucky Heritage Council (KHC) records review identified 16 previously recorded resources within or adjacent to the study area. A windshield survey was also completed to assess individual resources and potential historic districts and to identify potentially significant properties that will require additional research to formally evaluate their eligibility for listing in the NRHP.

Four resources were identified as potentially NRHP-eligible, summarized in **Table 4**.

Table 4: Potentially Historic Resources in Study Area Vicinity

Property/Description	Site Photo
Clement Sidney Hill/O'Bryan House KHC #MN-10 1670 Sulphur Springs Road	
Joseph Spaulding House KHC #MN-12 706 North Spaulding Avenue	

Property/Description	Site Photo
Multiple Property Group KHC #s MN-738, -740, -742, -745, -746 Along Hood Lane and Fairgrounds Road	
19th Century House Teledyne Road	

Should federal monies or permits be included in future projects, a field survey and coordination with KHC will be required to assess project impacts to cultural historic resources.

There is a historic marker along US 49, about 400 feet south of Park Side Drive, noting the homesite of J. Proctor Knott, governor of Kentucky during 1883–1887.

Archaeological Resources Potential. An *Archaeological Overview* was prepared for the study area. A records review indicated little of the current study area has been surveyed during 12 past studies overlapping the area. Within a 1.2-mile buffer, 35 archaeological sites have been recorded, 10 of which are within the study area. Based on this research, archaeological remnants within the study area may reflect historic settlement and agricultural land use between the mid-19th and 20th centuries, as well as Native American land use from the Late Paleoindian (8500 to 8000 BC), the entire Archaic occupation (8000 to 1000 BC), and the Middle Woodland subperiod (200 BC to AD 500). Two sites have undefined Paleoindian components, making them rare within the state of Kentucky.

Site visits and background research indicate additional archaeological sites may be located within the study area, including 24 areas of interest consisting of 2 areas on uplands above a creek; 19 buildings and 12 structures, some of which were still standing at the time of the survey; and remnants of buildings that were razed over time.

Field surveys and coordination with the KHC will be required should federal permits or funds be required for future project development phases. **Appendix F**, on file with KYTC, includes additional information about the *Archaeological Overview*. To protect identified resources, known site locations are not included on public mapping.

Socioeconomic Profile. Lincoln Trace Area Development District (LTADD) completed a socioeconomic study for the corridor (**Appendix G**) to highlight potential areas statistically likely to contain elevated concentrations of minority, elderly, economically disadvantaged, limited English proficiency (LEP), and/or disabled populations. The study area covers portions of seven US Census block groups, some of which extend well beyond the study area limits. Statistical block group geographies are shown in **Figure 17**. Statistics are reported from the 2019 American Community Survey's five-year estimates.

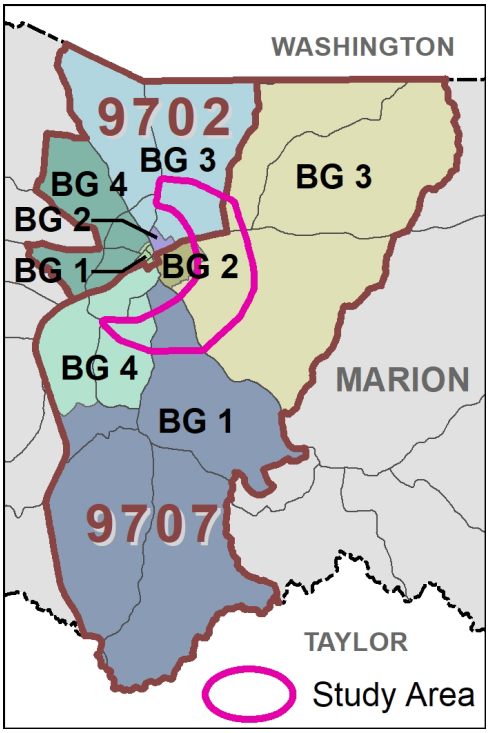


Figure 17: Census Block Groups for Socioeconomic Analysis

All but one of the study area block groups exceed the reference threshold for the LTADD region in one or more categories.

- Low-income population concentrations exceed the LTADD threshold (16.8%) for all areas except Tract 9707 block group 4, located at the far west end of the study area.
- Minority population concentrations exceed the LTADD threshold (10.2%) for three areas: Tract 9702 block group 1 downtown, Tract 9707 block group 2 in east Lebanon, and Tract 9702 block group 3, the large area north of town.
- The concentration of persons over age 65 exceed the LTADD threshold (16%) for three areas: Tract 9702 block group 2 east of downtown, Tract 9707 block group 2 in east Lebanon, and Tract 9702 block group 3, the large area north of town.
- Disability statistics are available only at the tract level. Both tracts show rates over the LTADD threshold (16.8%).
- LEP is not a major concern; only Tract 9702 block group 1 downtown exceeds the LTADD threshold (0.6%). This block group has an estimated 3% of its population who speak English less than very well, representing less than three individuals.

Beyond the LTADD study, field observations noted potential low-income population clusters along portions of Fairgrounds and Sulphur Springs roads. Executive Order 12898 protects

environmental justice populations—including minority and low-income groups—from bearing adverse and disproportionate effects by federal actions. It also promotes "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income."

Additional analysis and coordination will be warranted if a Build solution advances as part of a future project development phase.

Section 4(f). Section 4(f) of the Department of Transportation Act of 1966 is a substantive law that applies to federally funded projects using land from publicly owned parks, recreation areas, wildlife and waterfowl refuges, and public or private historic sites eligible for or listed on the NRHP. A federally funded highway project that uses a Section 4(f) property can only be approved after a determination is made that no prudent or feasible alternative to the use of the property exists and that project planning minimizes harm to Section 4(f) sites.

Potential Section 4(f) protected properties within the study area are cultural historic and archaeological sites eligible for listing or listed on the NRHP. No parks, recreational facilities, or wildlife/waterfowl refuges are within the study area limits

Section 6(f). Section 6(f) of the Land and Water Conservation Fund (LWCF) Act applies to both state and federally funded projects. The LWCF provides federal grants to acquire land for outdoor recreation, protect important natural areas, and develop or renovate outdoor recreation facilities (campgrounds, picnic areas, swimming facilities, etc.). Impacts must be addressed when projects result in permanent conversion of outdoor recreation property that was acquired or developed using LWCF grant assistance.

No properties that have received LWCF funds were identified in the vicinity.

Hazardous Materials Considerations. US Environmental Protection Agency (USEPA) records and a windshield survey identified numerous sites with the potential for hazardous materials located within and surrounding the study area. Most sites are along KY 55 or US 68; however, the rural section of the study area southwest of Lebanon includes a recycling center, the Marion County Waste Transfer Station, and a junkyard. The western limits of the study area avoid the industrial area that contains several hazardous material sites.


Marion Co Transfer Station

Air Quality Considerations. USEPA has established National Ambient Air Quality Standards for six criteria pollutants: ozone, lead, nitrogen dioxide, sulfur dioxide, carbon monoxide, and particulate matter ($PM_{2.5}$ and PM_{10}). Marion County is in attainment for all criteria pollutants.

The study area is not located within a metropolitan area; therefore, any federally funded transportation projects should be included in the statewide transportation improvement program (STIP) to ensure air quality conformity requirements are satisfied. Future federal projects may need to analyze potential Mobile Source Air Toxics (MSAT) impacts based on the project type. FHWA has developed a tiered approach for three categories to analyze MSAT in NEPA documents, depending on specific project circumstances. The three tiers and associated level of analysis are no potential/exempt projects requiring no analysis, low potential requiring a qualitative analysis, and higher potential requiring quantitative analysis. Based on traffic volumes, any proposed improvements most likely fall into the no- or low-potential categories.

Noise Considerations. There are noise sensitive receptors in the vicinity of potential future improvements. Noise sensitive receptors include all outdoor areas of frequent human use such as residential areas, parks, cemeteries, hospitals, churches, schools, and some commercial properties with exterior uses.

Specific traffic noise impact analyses may be required during future project development activities. State funded projects do not require a traffic noise impact analysis, unless directed by the legislature. However, federally funded projects that add capacity or shift traffic closer to sensitive receptors do require the consideration of traffic noise impacts.

4.0 INITIAL COORDINATION EFFORTS

Collaborative project team, local officials/stakeholders, and online public engagement efforts were held through the course of the study. The project team included KYTC District 4 and Central Office staff from various disciplines, LTADD staff, and consultant personnel. Coordination efforts were essential for identifying areas of concern and potential improvement opportunities. Summaries of all meetings are in **Appendix H**.

4.1 Project Team Meeting No.1

The project team met November 8, 2021, to review existing conditions information and prepare for the upcoming community outreach. The team reviewed existing conditions including roadway geometry, traffic flow, high crash locations, and environmental resources. Most state-maintained study routes and key intersections operate at LOS C or better during both peak hours. Crash data shows the highest concentrations of crashes occur in the more developed northeastern section of the study area.

Discussed further in **Chapter 5.0**, the draft Purpose and Need statement for Item No. 4-80153 is to improve connectivity east of Lebanon. The spoke/wheel layout of the city's highway network provides few connections beyond the downtown core; funneling traffic downtown increases congestion and travel times. Meanwhile, narrow two-lane roads beyond the city center provide limited access and can be challenging for larger vehicles. Beyond the primary transportation purpose, other goals include complementing regional/local economic development efforts and minimizing impacts to the environment. The purpose and need may continue to evolve as community input is gathered.

The team also discussed potential US 68 widening concepts in the study area, proactively addressing the future needs of this stretch of highway; for example, the cooperage has expressed interest in constructing an underpass to connect its facilities currently separated by US 68.

KYTC plans to conduct a value engineering review as part of the planning process, prior to a second round of community outreach.

4.2 Local Official and Stakeholder Meeting No.1

On December 14, 2021, the project team held a meeting with local officials and other stakeholders in Lebanon. The purpose of this meeting was to review the existing conditions information collected, walk through the website[8] created for the study, and discuss the set up for the public meeting later the same evening.

[8] Online at EastLeb.com

The group identified large-scale development plans that could impact the background growth assumptions in the travel demand model. The Diageo distillery, located south of KY 2154 beyond the study area limits, is expanding its current campus and adding up to 30 employees; new residential developments are planned off Country Club Drive; and Calvary Elementary School will likely be rebuilt on the same property as the existing school.

Attendees also shared concerns they regularly hear about getting around the city:

- Semi-trucks and tractor trailers traveling through town are a recurring problem, causing backups and property damage.
- US 68 (Main Street) near the schools/cooperage is busy during peak times.
- There's a need for dedicated left-turn arrows and updated phasing at multiple intersections.
- KY 2154 at KY 429 was identified as a problem intersection, with local interest in signalization.

4.3 Public Engagement

The first public meeting for the study was held December 14, 2021, at the Centre Square Gym near downtown Lebanon. To accommodate social distancing protocols, the meeting had no formal presentation and was laid out with stations around the venue. The project website contained the same information and survey questions as the in-person meeting for those who preferred not to attend in person. Project team members were at each station to discuss the study with members of the public and answer their questions. In total, 37 community members attended the meeting in addition to the project team.

Public comments were collected—in-person and online—throughout December. Over the 30-day comment period, 117 surveys were completed and responders added several digital pins to the online maps. The pins identified locations of interest/concern.

- 84% of survey responders travel in the study area daily, suggesting the audience is very familiar with the current highway network and its transportation needs.
- Survey participants were asked to weigh existing needs versus demands from future growth, given a five-point scale. Most would prefer any future improvements balance tackling existing issues and planning for future growth, weighted slightly towards addressing existing issues.
- The majority (62%) agreed that a new connector road in the study area is needed. Of the 68 responders who agreed, 17 mentioned avoiding congested sections of Main Street or downtown and 13 cited school traffic as a reason to pursue a new connector. Of the 41 responders who disagreed, seven cited underuse of the existing bypass.

- Participants were also asked to identify the top three priority issues that a new eastern connector should address. Illustrated in **Figure 18**, top needs were safety (73 responses), followed by connectivity (52), future development (48), and minimizing disruptions (45).

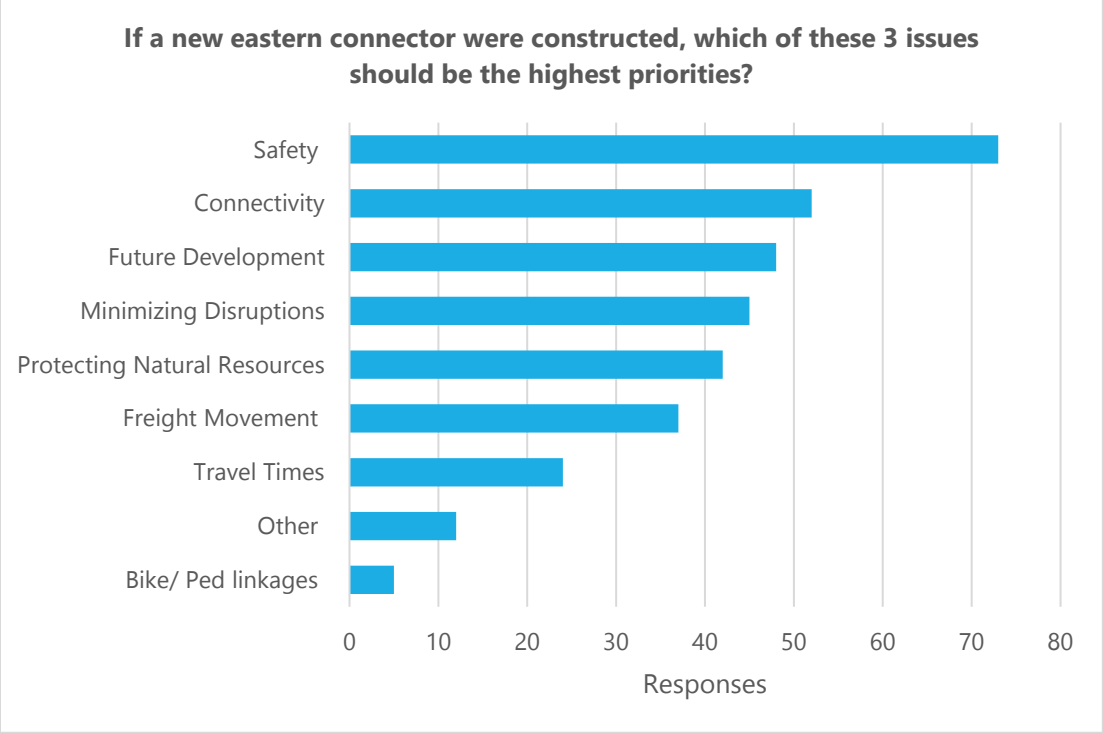


Figure 18: Priority Issues for New Eastern Connector

- Individuals were asked about their concerns at the US 68/KY 2154 (Corporate Drive) intersection. The highest rated concern was congestion (85 responses), followed by lane/shoulder widths (53).

A discussion of all comments provided is included in **Appendix H**.

Figure 19 presents location-specific comments compiled from the online GIS applications and in-person meeting boards.

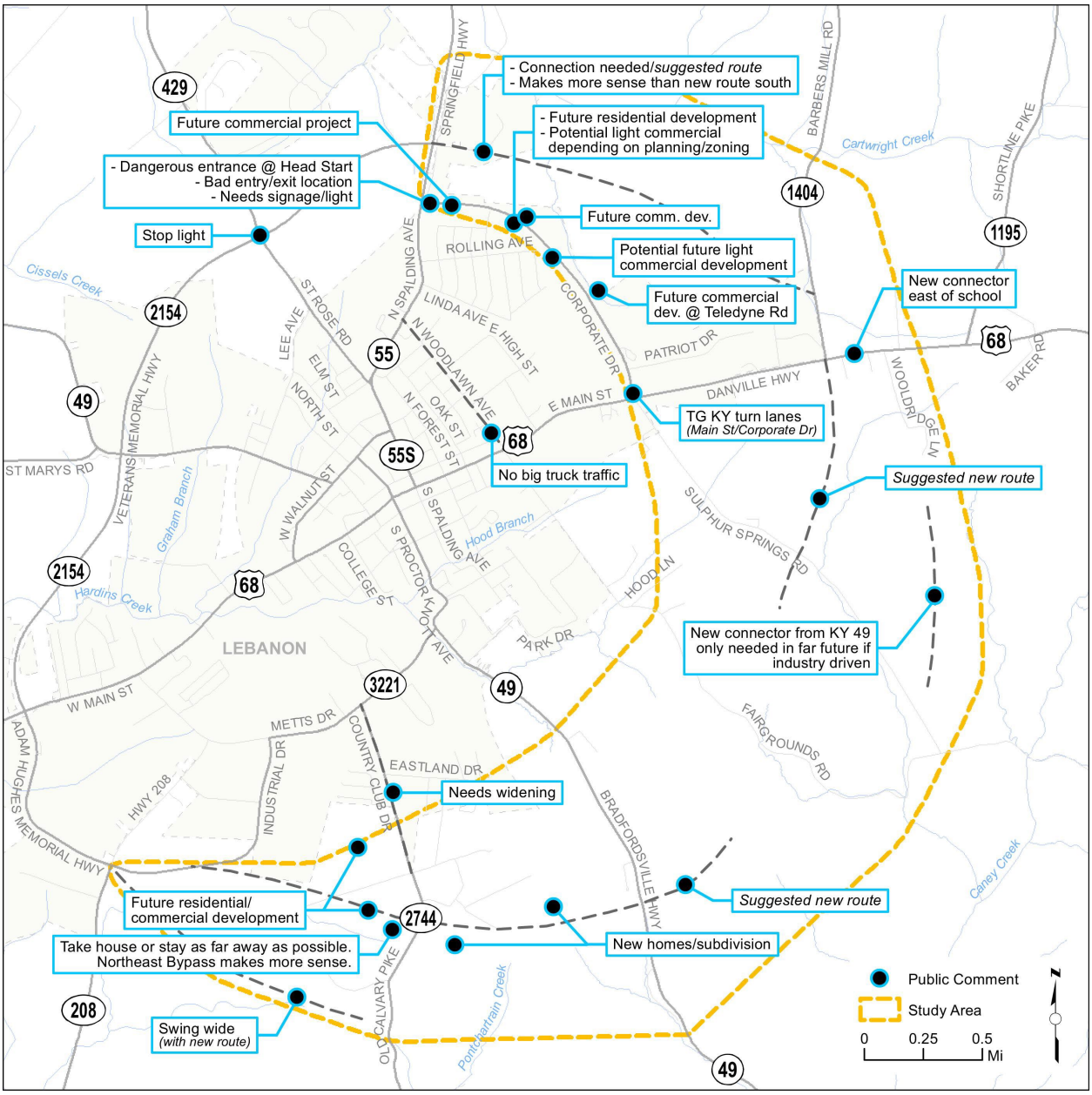


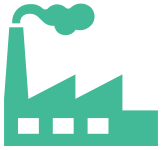
Figure 19: Location-specific Public Comments, December 2021

5.0 STUDY GOALS AND OBJECTIVES

A project's Purpose and Need statement defines the transportation problem a project is intended to solve. It sets the stage for the range of solutions considered and helps identify which represent the best options available to advance for further development. In the planning phase, the study describes to goals and objectives a concept should satisfy, evolving into a Purpose and Need statement if a future project advances.

The objective of this study is to develop conceptual options to improve connectivity for east Lebanon. Specifically, the purposes of the resulting projects are to improve connectivity east of Lebanon and access to its industrial parks (Item No. 4-80153) and to reduce congestion at the US 68 intersection with KY 2154 (Corporate Drive) (Item No. 4-80152).

The needs are illustrated by the existing conditions discussed in **Chapter 2.0**:



Lebanon's robust industrial sector attracts truck traffic and leads to localized peak-period congestion during shift changes. Ongoing and continued development will increase volumes and exacerbate current mobility concerns.

The city's spoke-and-wheel layout provides few connections beyond the urban core. Narrow two-lane highways and local streets provide limited access for areas south of town. Residents south of US 68 must rely on a sparse network of collector and local routes to get around, more often than not returning to US 68 Main Street to access non-residential destinations. This contributes to increased travel times—influenced by congested urban sections or circuitous rural routing.

Busy highway segments along US 68, KY 55, and KY 2154 (Corporate Drive) exhibit elevated crash trends. US 68 approaching Corporate Drive from both directions has a LOSS-IV rating for severe crashes.

US 68 (East Main Street) provides access to the county's consolidated school campus and the largest tourist attraction—Independent Stave Company. Most traffic on the east side of town is funneled through the signalized US 68/Corporate Drive intersection, with few turn lanes and no left turn signal phases.

At key intersections downtown, signal timing/phasing and tight turning radii limit mobility for large trucks trying to navigate between arterial corridors. Coupled with lower travel speeds and longer travel times, conditions associated with heavy truck traffic are inconsistent with the city's vision for a quaint downtown character.

For Item No. 4-80153, secondary goals supporting the primary project purpose include:

- Complementing local and regional economic development efforts
- Minimizing impacts to the community and natural environment

6.0 2045 TRAFFIC FORECAST AND NO-BUILD OPERATIONS

KYTC's statewide travel demand model (version 5976 in TransCAD 7), along with 2021 traffic counts, formed the basis of future year 2045 traffic projections. The complete *Traffic Forecast Report* is in **Appendix A**.

6.1 Future Year Traffic Assumptions

KYTC's statewide model estimated future year growth for all study area roadway segments. The model simulates a 24-hour period, relying on hourly and directional factors to derive DHV. At a high level, the model overlays the roadway network over anticipated changes in household and employment levels for geographic zones to project changes in traffic flows.

Prior to the analysis, KYTC adjusted the model's geographic zones to provide a more refined level of detail around the city. Socioeconomic assumptions were reviewed and adjusted by KYTC to reflect current background growth assumptions. One transportation improvement project was included in the No-Build network assumption—widening US 68 to three lanes near the schools' campus which is included as part of the Item No. 4-80152 project.

6.2 2045 No-Build Traffic and Operations

Considering historic traffic growth rates, population projections, anticipated development, and model projections, a growth rate of 0.58% was applied to the 2021 Existing scenario to project future 2045 No-Build traffic. **Figure 20** presents 2045 No-Build segment ADT volumes and LOS; despite projected growth, peak hour LOS between scenarios does not change.

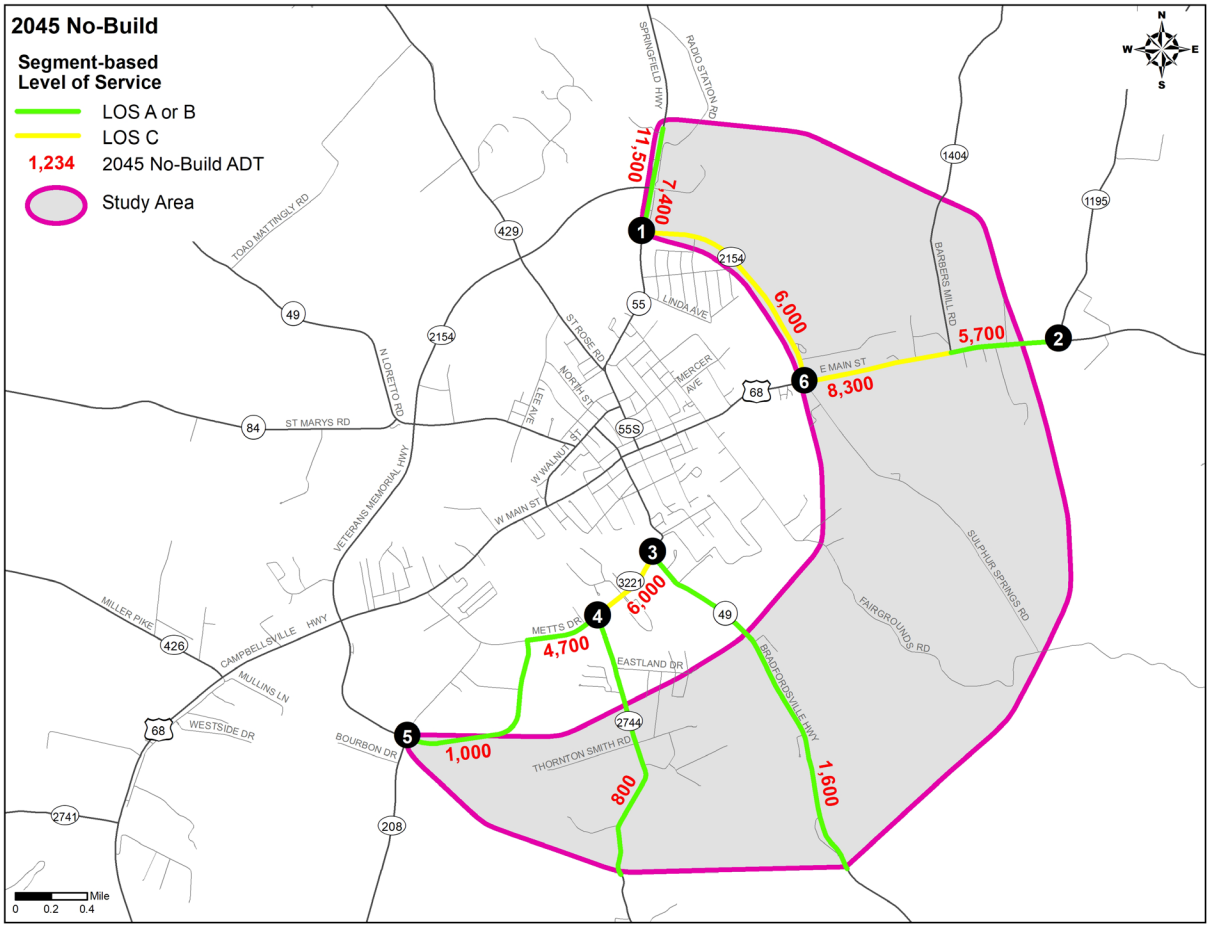


Figure 20: 2045 No-Build ADT and LOS for Study Area Highway Segments

Table 5 summarizes operations at study intersections in the 2045 No-Build scenario. As in the 2021 scenario, most intersections operate at LOS C or better. During the morning peak hours, the US 68/KY 2154 (Corporate Drive) signal and left turns from Corporate Drive onto KY 55 approach/exceed available capacity.

Table 5: 2045 No-Build Operations at Study Intersections

Intersection	Control	AM Peak		PM Peak	
		LOS	Worst v/c	LOS	Worst v/c
1. KY 55 at KY 2154 Corporate Dr.	2-way stop (WB)	F	2.8	C	0.6
2. US 68 at KY 1195 Short Line Rd.	2-way stop (SB)	B	0.2	B	0.1
3. KY 49 at Country Club Rd.	2-way stop (EB)	C	0.6	C	0.5
4. Metts Dr. at Country Club Rd.	2-way stop (NB)	B	0.4	B	0.3
5. KY 2154 Veterans Memorial Hwy. at KY 208	4-way stop	A	0.3	A	0.3
6. US 68 at KY 2154 Corporate Dr.	Signal	D	0.9 WB 0.9 SB	C	0.9 WB 0.8 SB

7.0 CONCEPT DEVELOPMENT

Improvement concepts were developed based on a combination of input from the project team, a review of existing conditions, community feedback, and field reconnaissance. While this report focuses on the connector, improvements at the US 68/KY 2154 (Corporate Drive) intersection were considered as they relate to the larger effort.

7.1 Initial Connector Concepts Considered

The initial range of connector concepts considered grew from an outer connection, inner connection, or combination thereof.

- Shown in blue in **Figure 21**, the outer concept stretches from the southern industrial park outside the city's developed areas to KY 55 opposite the existing KY 2154 (Veterans Memorial Highway) bypass. This concept closely aligns with the preliminary vision of the elected officials who introduced funding for this study. The outer loop is longer than the inner loop concept, resulting in higher travel times and increased construction costs. However, it opens new areas for potential development with fewer property impacts within existing neighborhoods.

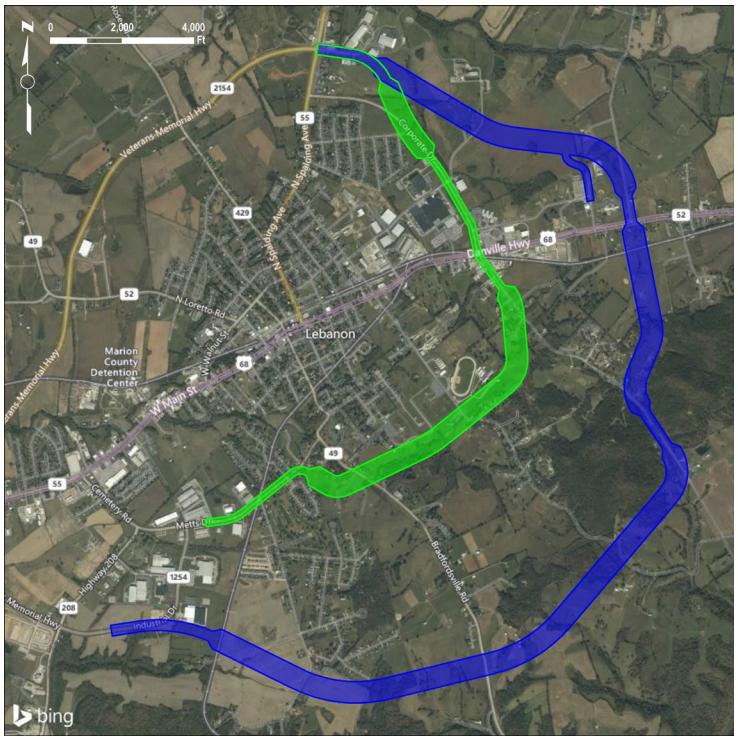


Figure 21: Initial Inner and Outer Concepts

- Shown in green in **Figure 21**, the inner concept connects from Metts Drive, outside the park and fairgrounds, to follow a section of KY 2154 (Corporate Drive). The inner loop is shorter, resulting in lower travel times and decreased construction costs. However, it passes through more developed residential areas with increased property impacts and right-of-way costs. Portions of the inner concept lie beyond the study area limits.

An initial set of build concepts grew from these two basic corridors, representing different combinations and connections between individual pieces of each as shown in **Figure 22**.

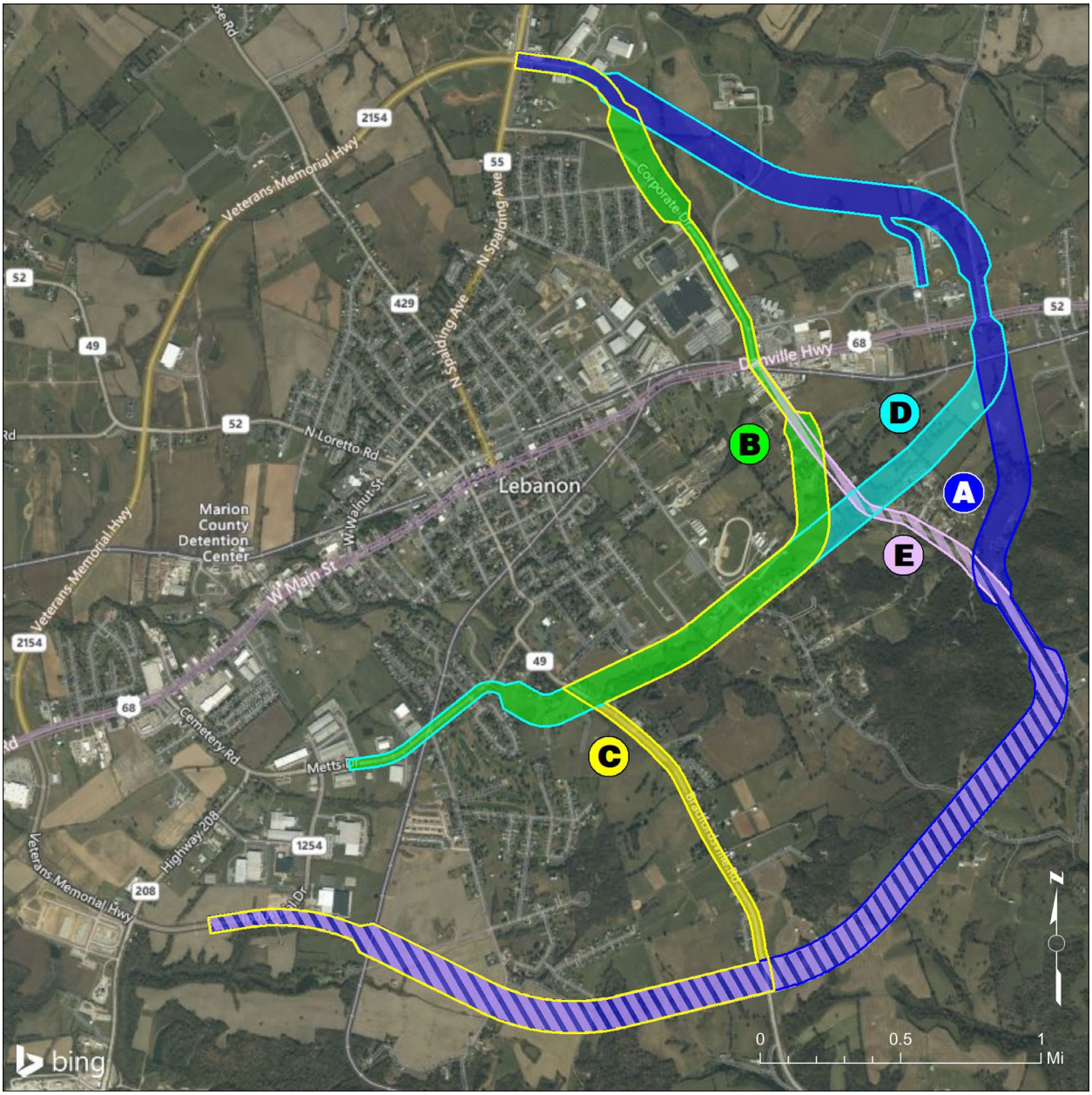


Figure 22: Initial Build Concepts Considered

Corridors shown are 600 feet wide bands on new alignment sections to provide engineers with flexibility to refine designs during any future project development efforts while staying within the footprints shown.

This concept is explained graphically in **Figure 23**.

On sections that follow existing roadways, narrower bands are shown since any widening will happen on one side of the existing pavement or the other.

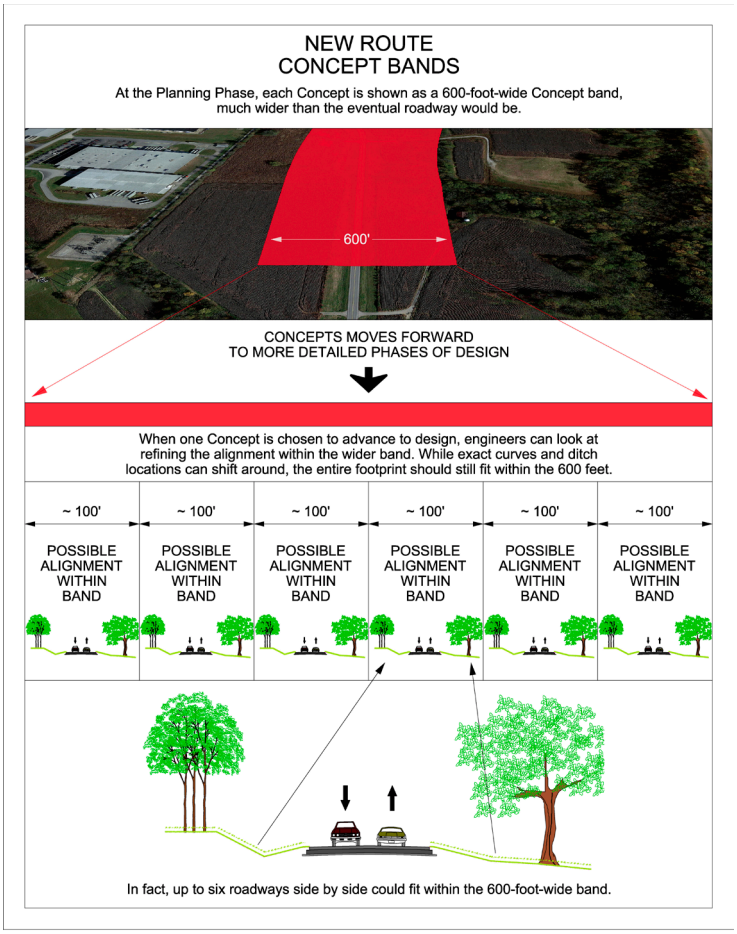


Figure 23: Planning-Level Corridor Bands

7.2 Value Engineering (VE) Review

The five initial build concepts (Concepts A–E) advanced to a Value Engineering (VE) review in March 2022. KYTC's VE program began in 1995 to look at projects with a fresh set of eyes and see if there are any potential ways to reduce unnecessary costs or improve concepts while still meeting the desired objectives. VE reviews usually occur later in the project development process, but this planning study was selected as a pilot project to determine if it could add benefit during earlier phases of work.

Discussed at length in **Appendix I**, the review included a multi-disciplinary team of independent reviewers who assessed the planning progress to date. The team applied a mathematical formula to weigh performance attributes including mainline operations, local operations, maintainability, schedule, environmental impacts, traffic operations, and economic development. Each concept was assigned a numeric performance score, weighted against its construction cost.

The review resulted in a sixth alignment—Concept F, shown below—added for consideration alongside the first five. Other recommendations included improvements along the existing KY

2154 bypass and Corporate Drive to streamline truck routing, traffic calming and pedestrian amenities for the downtown area, and numerous intersections that could be reconstructed as roundabouts. Prioritizing the northeast section of a new connector (KY 55 to US 68) was also recommended. Components from the VE study that were incorporated into the planning process are discussed in more detail in the following sections.

7.3 Project Team Meeting No. 2

The project team met March 10, 2022, to discuss and refine the preliminary improvement concepts described above. A summary of the meeting is included in **Appendix H**.

The consultant presented the connector concepts developed to date (**Figure 22**):

- Concept A, which follows the blue outer corridor in **Figure 21**, provides a "backdoor" connection to the school campus.
- Concept B, which follows the green inner corridor in **Figure 21.**
- Concept C, which matches A on the south, follows KY 49, then matches B on the north.
- Concept D, which matches B on the south and then A on the north.
- Concept E, which matches A on the south, follows Sulphur Springs Road, and then matches B on the north.

The typical section for each concept is assumed to match existing KY 208: two 12-foot-wide lanes with 10-foot-wide shoulders (3 feet paved), although widths may need to be adjusted if the northeast section advances as a higher or separate priority.

The team agreed Concept E provides minimal benefits versus Concept A and results in higher costs and likely environmental justice impacts; therefore, it was **dismissed** from further consideration. Discussions focused on the upcoming community meetings and best practices to present the planning-level concepts.

7.4 Build Concepts Advanced for Community Input

Shown in **Figure 24**, five Build concepts advanced for community engagement alongside the No-Build. In addition to the new connectors, improvements at three key intersections (shown in orange) were also considered with the build concepts.

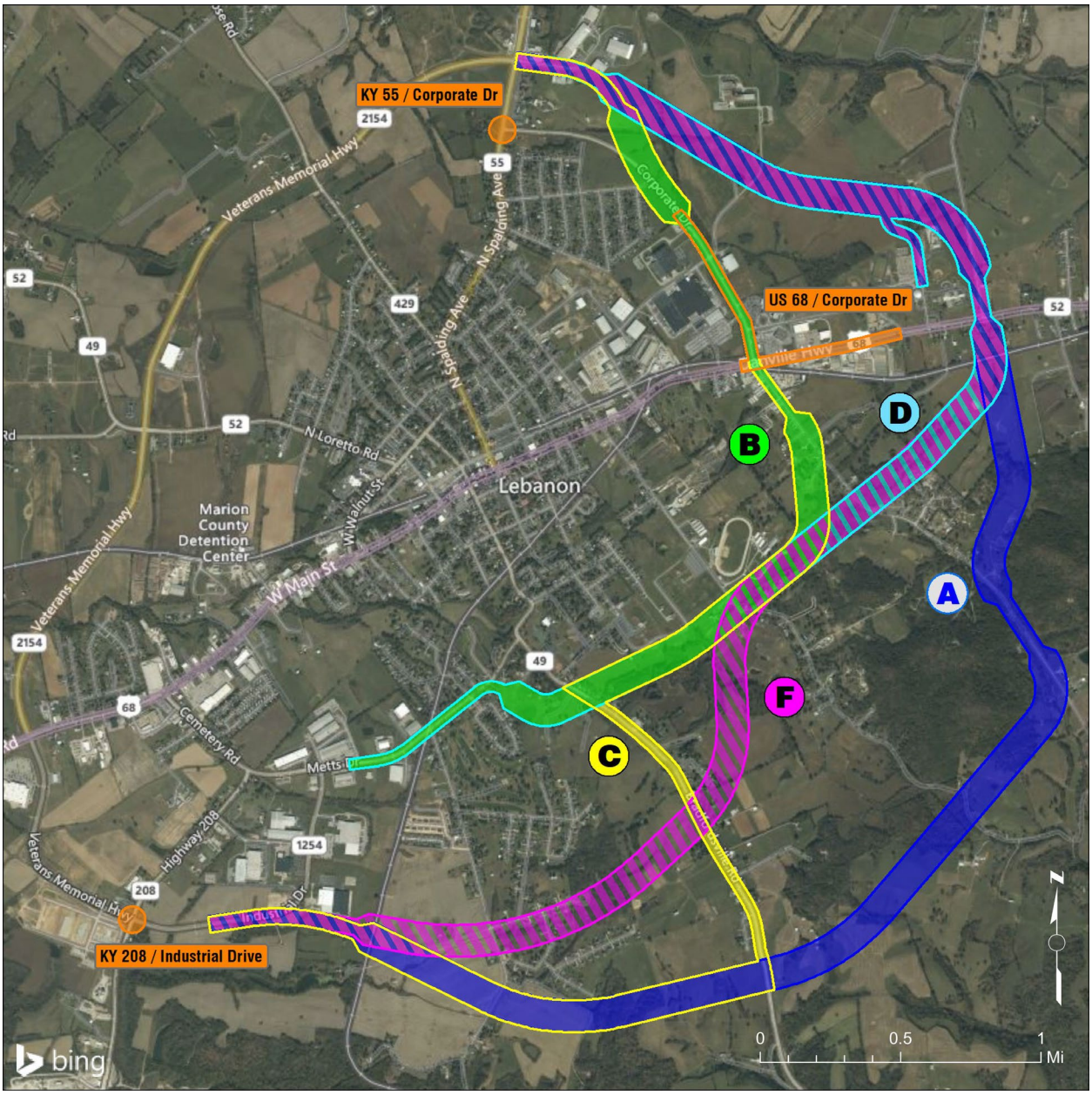


Figure 24: Build Concepts Advanced for Community Engagement

At KY 208/KY 2154 (Industrial Drive) and KY 55/KY 2154 (Corporate Drive), roundabouts were considered in combination with build concepts that affect these locations. For instance, Concepts A/C/F increase the amount of traffic using the KY 208/Industrial Drive intersection so other configurations/improvements were considered to improve traffic flow through this intersection.

US 68 at KY 2154 (Corporate Drive) is funded as a separate standalone project (Item No. 4-80152), addressed in **Section 7.5**. However, Concepts B and C intersect US 68 at the Corporate Drive intersection, requiring coordination between conceptual design efforts.

7.4.1 2045 Build Scenario Traffic

Concepts A–D and F were coded into KYTC's statewide travel demand model to determine how the proposed connector options would influence future traffic. It should be noted that the model does not include an economic development component; background housing and employment trends in the No-Build model were applied without adjusting for any potential new growth that might occur along a new alignment section.

Figure 25 compares the forecasted 2045 daily traffic volumes for Concepts A and B, which span the geographic range of the concepts considered.

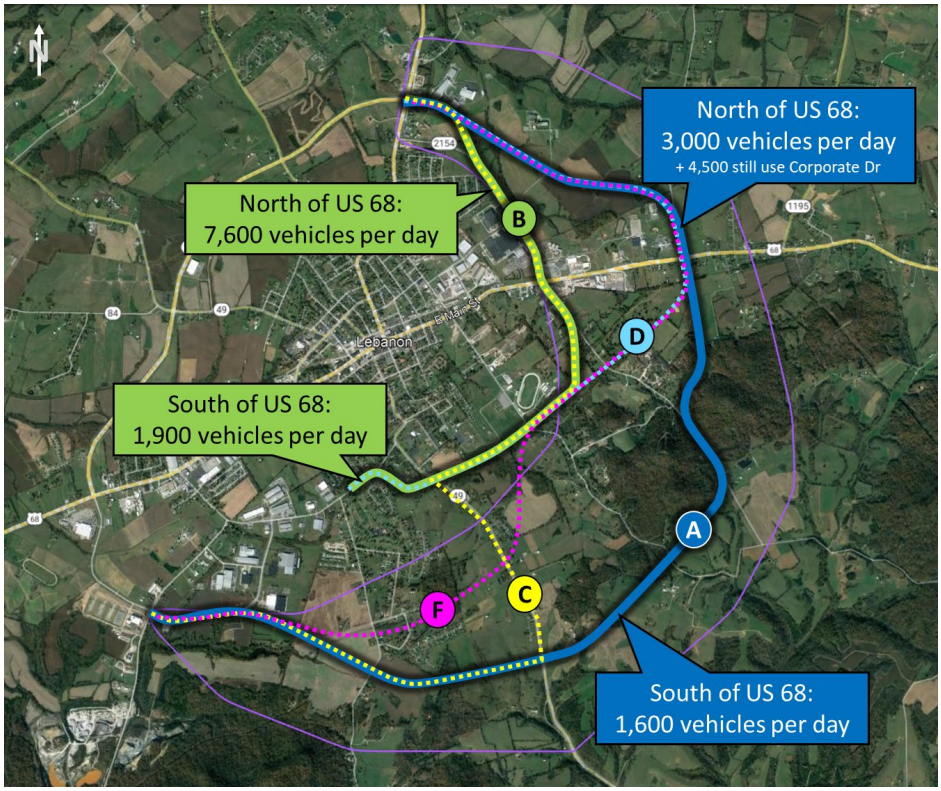


Figure 25: 2045 Build Traffic Comparison

Table 6 provides more detailed outputs for each concept considered. As shown below, an inner connector improves traffic moving through town while an outer connector benefits traffic near the schools and cooperage east of town.

Table 6: Comparison of 2045 Build ADTs

	NO-BUILD	CONCEPT A	CONCEPT B	CONCEPT C	CONCEPT D	CONCEPT F
New Connector: south of US 68	N/A	1,600	1,900	1,600	2,800	1,600
New Connector: north of US 68	N/A	3,000 +4,500 Corporate	7,600	7,600	3,100 +4000 Corporate	3,000 +4500 Corporate
US 68 Main St. (in town)	11,600	10,700	10,600	10,700	10,200	10,700
US 68 East Main St. (east of Corporate Dr.)	10,900	8,900	11,200	8,900	7,900	8,900

Travel Time. Another metric to evaluate Build traffic examines travel time between proposed routes. While this is highly speculative at the concept phase, generalizations about corridor lengths, intersection types, and design speeds provide a relative comparison between scenarios.

For the travel time analysis, the two sets of endpoints shown on **Figure 7** (page 11) were used, applying estimated travel speeds and delay penalties at stop-controlled intersection movements for each Build scenario. **Figure 26** summarizes the findings for the two origin/destination pairs: the southern industrial park to KY 55/KY 2154 north of town (black path) and the southern neighborhoods to the school campus (white path). **Table 7** compares travel lengths and estimated travel times for each.

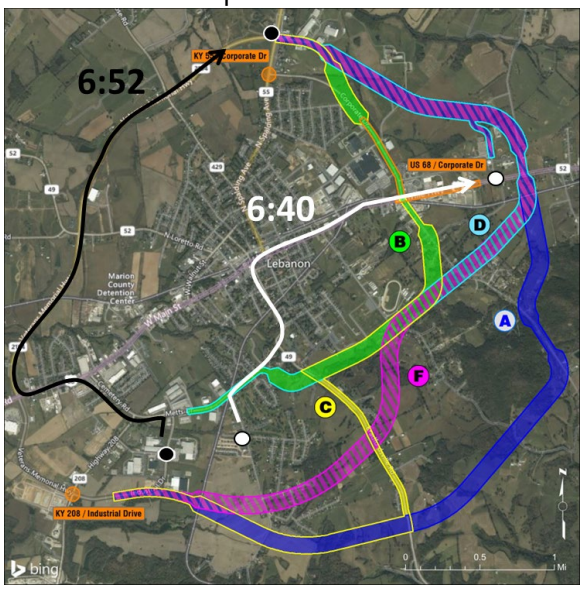


Figure 26: Origin/Destination Pairs

As shown, the existing KY 2154 (Veterans Memorial Highway) bypass provides the fastest link between the southern industrial park and KY 55 north of town. The inner concepts show potential travel time savings for the schools, in addition to providing an alternate route beyond US 68.

Table 7: Comparison of Build Travel Times

Route	South Industrial Park to KY 55/Bypass		Southern Neighborhoods to Schools	
	Length (mi)	Time (min)	Length (mi)	Time (min)
Existing	4.7	6.9	3.2	6.7
Concept A	6.9	9.2	4.9	7.1
Concept B	4.5	7.7	3.3	6.2
Concept C	6.4	9.7	5.3	7.9
Concept D	5.5	8.5	2.9	5.9
Concept F	6.1	8.5	3.7	6.4

7.4.2 Cost Estimates

Planning-level concepts were used to estimate preliminary quantities of high-cost construction items including earthwork, pavement, and structures. Construction costs were tabulated using KYTC average unit bid prices with costs presented in 2021 dollars. Each includes an additional 25% for contingencies. Construction cost estimates are presented in **Table 8**.

Table 8: Planning-Level Construction Cost Estimates

Build Concept	Length	Construction Cost
Concept A	7.1 mi	$27.1 million
Concept B	3.4 mi	$13.3 million
Concept C	3.3 mi	$14.3 million
Concept D	4.7 mi	$17.1 million
Concept F	5.3 mi	$14.4 million

Right-of-way and utility costs have not been quantified due to the width of the conceptual corridor bands. As roughly six new highways could fit side-by-side within the 600-foot corridor bands, there is inherent uncertainty in quantifying impacts. Generally, Concept A will have the fewest property impacts as it passes through the least densely developed areas. Alternatively, Concepts B and F pass through more established residential areas, resulting in the most property impacts. Overall, inner concepts would have higher per-acre acquisition costs, but outer concepts have larger acquisition footprints.

7.4.3 Comparison of Impacts

As noted, portions of some Build concepts considered extend beyond the study area. While less information is available for these areas, known community and environmental constraints are illustrated in **Figure 27** alongside the Build concepts. Most impacts discussed below occur south

of US 68: the new alignment sections proposed between US 68 and KY 55 pass primarily through undeveloped fields proposed for future economic development opportunities.

Impacts discussed below are based on the current corridor widths shown—which are approximately six times wider than would be required for the final right-of-way for a two-lane highway.

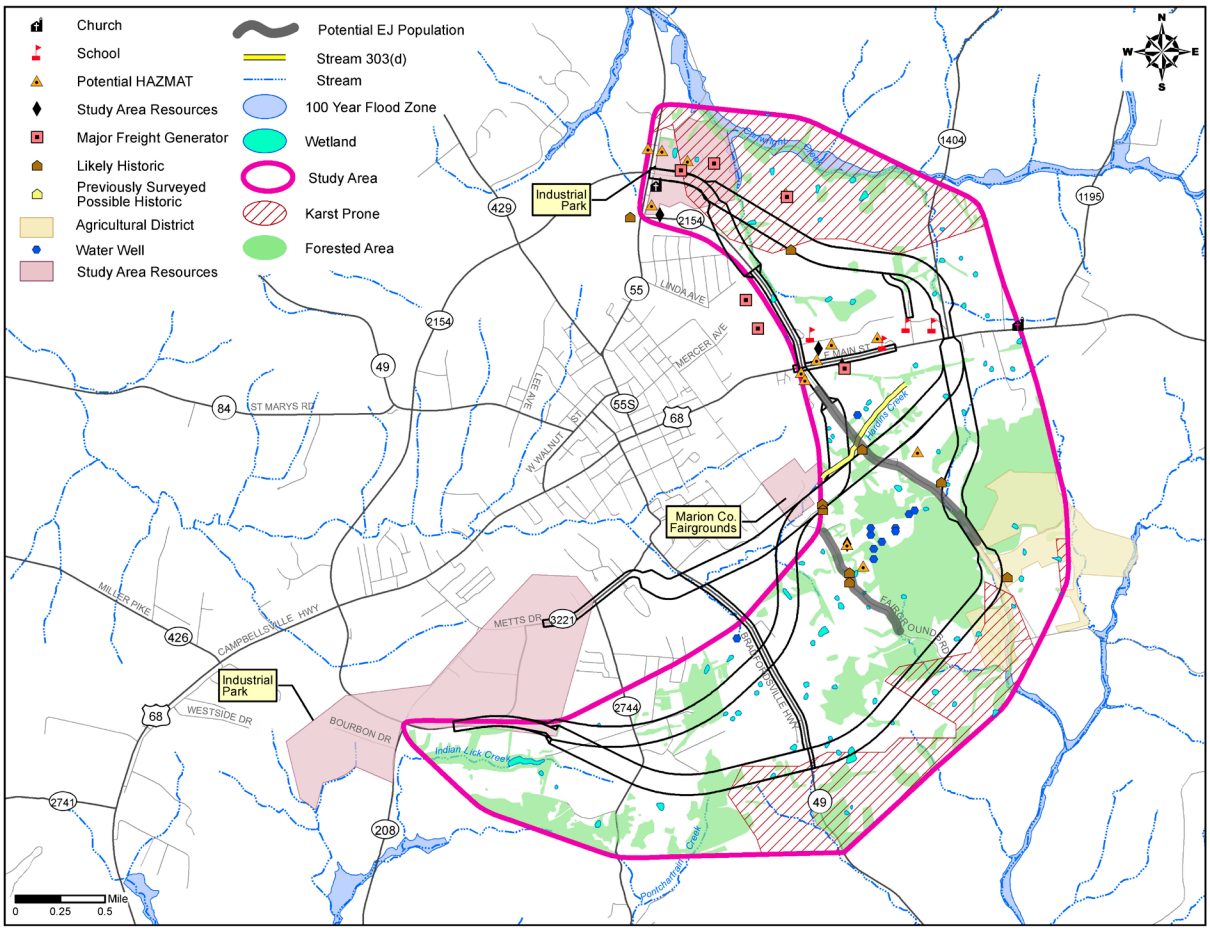


Figure 27: Build Concepts and Environmental Red Flags

Concept A could impact up to 82 acres of forest (which serves as potential habitat for threatened/endangered bat species) and 4.1 acres of wetland plus requires three stream crossings. It infringes on areas that are prone to karst features. Both agricultural districts near the eastern study area limit are likely to be impacted; 37% of the 7.1-mile corridor is designated as prime or statewide important farmland soils. Three likely historic resources abut the corridor, requiring additional evaluations to determine effects. Impacts to low-income populations along Sulphur Springs Road are also a concern. One or more residential relocations are likely to be required to create a four-way intersection at US 68/KY 1404 (Barbers Mill Road).

Concept B could impact up to 8 acres of forest, 1.5 acres of wetland, and requires three stream crossings. It infringes on an area prone to karst features near the northern terminus. About 19% of the 3.4-mile-long corridor is designated as prime or statewide important farmland soils.

As areas closer to town are more developed, impacts to residential areas are more likely:

- Widening along Country Club Drive will lead to more right-of-way impacts than widening through more rural areas—including likely residential relocations to accommodate the transition to new alignment. Houses are setback at least 40 feet from the existing highway through this stretch.
- Introducing a new intersection at KY 49 will require the relocation of one or more homes.
- Improvements at/near Sulphur Springs Road will require the relocation of one or more homes, many of which represent potential low-income populations.

It should be noted that the southern portion of Concept B lies beyond the study area limits. This portion of the route was not included in the KHC records check for previously surveyed historic resources.

The section immediately east of Fairgrounds Road (**Figure 28**) will likely incur property impacts because of the density of resources nearby. The fairgrounds border the northern edge of the corridor—protected under Section 4(f) as a public recreational resource. The county has plans to expand its existing RV lot to provide more parking spaces on the south/east side of the fairgrounds' access driveway. Hardins Creek crosses the corridor in this stretch. Hood Lane serves several modest residences that could represent low-income populations, with several of its structures also noted as a potential NRHP group. All the proposed build concepts except Concept A share a footprint through this section, resulting in the same likely impacts. Both the fairgrounds and potential NRHP properties represent Section 4(f) resources, protected from transportation use if an avoidance option exists.

Figure 28: Constraints near Fairgrounds Road/Hood Lane

Concept C could impact up to 25 acres of forest, 2 acres of wetland, and requires two stream crossings. It infringes on areas prone to karst features. About 28% of the 3.3-mile corridor is designated as prime or statewide important farmland soils. Any widening along KY 49 will lead to more right-of-way impacts than in rural areas, although houses are not as densely spaced as along corridors closer to town. Introducing a new intersection at KY 49 will relocate one or more homes; the same Concept B constraints shown in **Figure 28** and discussed along Sulphur Springs Road are also associated with this concept.

Concept D could impact up to 30 acres of forest, 1.3 acres of wetland, and requires two stream crossings. It infringes on an area prone to karst features near the northern terminus. About 25% of the 4.7-mile corridor is designated as prime or statewide important farmland soils. Concept D shares many of the same potential residential impacts as Concept B: Country Club Drive, KY 49, and Fairgrounds Road/Hood Lane. While it minimizes residential impacts along Sulphur Springs Road, Concept D abuts the recycling center, which has the potential to contain contaminated soils. One or more residential relocations are likely to be required to create a four-way intersection at US 68/KY 1404 (Barbers Mill Road). Beyond Hood Lane, the only potentially historic resource noted is along Teledyne Road in the northeast section.

Concept F could impact up to 55 acres of forest, 2.3 acres of wetland, and requires up to three stream crossings. It infringes on an area prone to karst features near the northern terminus. About 36% of the 5.3-mile corridor is designated as prime or statewide important farmland soils. Impacts

to residential areas will occur where the corridor touches existing roadways—Old Hickory Drive, January Woods Loop, KY 49, Fairgrounds Road/Hood Lane, and US 68/KY 1404 (Barbers Mill Road). The concept also abuts the recycling center, with the potential to encounter contaminated soils. Beyond Hood Lane, the only potentially historic resource noted is along Teledyne Road in the northeast section.

7.5 Coordination with Item No. 4-80152

Kentucky's *2022-2028 Enacted Highway Plan* includes federal funding for right-of-way, utilities, and construction within the biennium for Item No. 4-80152. Design work to improve the US 68/KY 2154 (Corporate Drive) intersection is expected to begin as soon as recommendations for the larger corridor are determined. The project is assumed to widen the southbound KY 2154 and westbound US 68 approaches corresponding to the orange limits shown in **Figure 24**.

Two configurations were analyzed for capacity based on 2045 traffic volumes. A conventional signalized intersection with dedicated left-turn lanes on each approach and permitted left-turn signal phasing results in LOS B–C operations during both peak hours. A single lane roundabout results in less delay and fewer stops, operating at LOS B in both peak hours. Roundabouts also provide substantial crash savings compared to signalized intersections. Each will be evaluated further during future design phases.

8.0 FINAL COORDINATION MEETINGS

Following concept development efforts described in **Chapter 7.0**, the project team engaged with the community to present and discuss options. As part of this effort, the study website[9] was updated to include interactive mapping displaying the proposed Build concepts, as well as an overview of costs, traffic impacts, and environmental mapping. Meeting summaries for each coordination point are in **Appendix H**, arranged chronologically.

8.1 Local Official and Stakeholder Meeting No. 2

A second meeting with local officials and stakeholders was April 12, 2022, at City Hall in Lebanon. Following a review of the three separate projects (Item Nos. 4-80152, 4-80153, and 4-80259) covered by the study and existing transportation conditions around town, the project team presented Build Concepts A through F. Key discussion points are summarized below.

- An outer connector (e.g., Concept A or F) would open more area for future development. Concept A, which is longer than the existing Veterans Memorial bypass, may be too removed from activity centers to draw much traffic and has the highest construction costs. Extending utilities that far would also be a challenge.
- Traffic on US 68 near the schools is already busy; adding more congestion is a concern. The outer connectors provide a link between the proposed bypass and school campus; final design efforts would include additional coordination to determine the best connection and circulation patterns.
- Concept F, nearer to town than A, would likely have fewer costs/impacts to extend utility infrastructure to serve the corridor.
- Inner concepts B, C, and D are likely to face pushback from the community regarding neighborhood impacts. Some stakeholders are concerned that the city will outgrow an inner connector, much like Bardstown experienced.
- The proposed intersection between the new bypass and KY 49 may be a good opportunity for a roundabout.
- A new waterline is being installed for the development alongside the municipal park and fairgrounds.

The project team also encouraged attendees to help promote the public meeting April 28 and updated study website.

[9] Online at EastLeb.com

8.2 Second Public Meeting

Alongside the updated website, the project team hosted an in-person public meeting at the Centre Square Gym near downtown Lebanon on April 28, 2022. The meeting was set up with stations depicting the purpose and need, build concepts, and impacts to traffic and the environment. Opportunities to provide feedback were incorporated throughout: with markers to add notes to exhibits. A survey was also provided. The project website contained the same information and survey questions for individuals who did not attend the in-person event. The meeting was promoted via newspaper ads, social media posts, roadside message boards, and a direct mailing postcard to postal routes within the study area. In total, 41 community members attended the meeting in addition to the project team.

A total of 89 responses were collected during the comment period; 73 individuals submitted survey responses online and an additional 16 survey responses were provided at the in-person public meeting. Key findings are summarized below:

- Most responders (65%) indicated that a new East Lebanon connector was not needed.
- By section, the northeast connector between KY 55 and US 68 was rated the most important. The southern piece—between KY 208 and KY 49, corresponding to Item No. 4-80153—was the lowest priority of the three.
- As shown in **Figure 29**, Concept B was preferred over the other Build options.

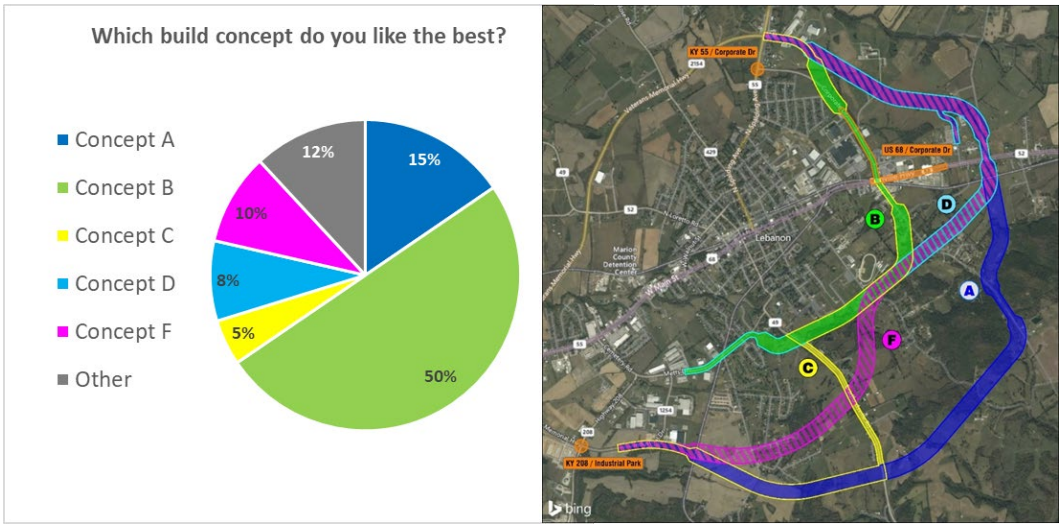


Figure 29: Survey Results: Which build concept do you like best?

The main reasons cited for preferring Concept B included: it is the most economical, spans the shortest distance, makes the most use of the existing road network, and is least disruptive to farmland. It should be noted that a portion of Concept B falls beyond the

study area limits, which could have influenced the engagement of people living along this stretch. Postcards advertising the public meetings and website focused on mailing routes within the study area; additionally, residents in these areas may not have followed the study closely, assuming they would not be directly affected.

- As shown in **Figure 30**, Concept A was ranked the least preferred of the build options with 59% of responses. Concept B was ranked as second least preferred. Themes for disliking Concept A included disruption to farmlands and its high cost.

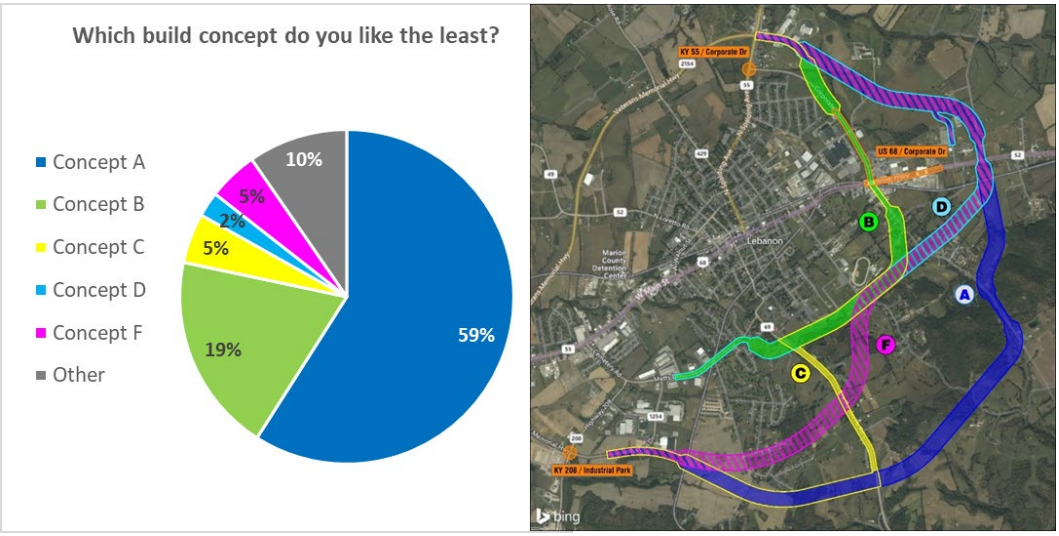


Figure 30: Survey Results: Which build concept do you like least?

- Most responders (79%) thought intersection improvements at US 68/KY 2154 (Corporate Drive) are needed.

- The final survey question provided an open-ended comment box to share any additional comments with the project team. Major themes emerged from the comments: most responders welcomed intersection improvements but were uninterested in pursuing a bypass due to the cost and disruptive nature of construction. In addition, improving the existing highway network and correcting GPS truck routing were believed to be sufficient to improve traffic flow through Lebanon.

8.3 Project Team Meeting No. 3

The project team held a third meeting on June 13, 2022, to review the improvement concepts, discuss costs/impacts, and concur on priorities. Input from both rounds of public surveys and both local officials/stakeholders meetings were considered as well.

KYTC District 4 staff met informally with a few local officials the previous week and provided an update on that coordination. Local officials in attendance agreed the northeast section (between

KY 55 and US 68) is the highest priority to advance. There was less consensus about the sections south of US 68: generally, Concept B was not preferred but many felt Concept A was too far outside town to address traffic concerns.

9.0 RECOMMENDATIONS AND NEXT STEPS

In light of the study goals, anticipated costs, benefits to traffic, impacts to the human and natural environment, community input, and project team discussions, the northeast connector between KY 55 and US 68 (Item No. 4-80259) is recommended to advance for additional project development.

Capacity improvements at the US 68/KY 2154 (Corporate Drive) intersection (Item No. 4-80152) are recommended to advance for additional project development, coordinated with the upcoming US 68 structure project connecting the cooperage properties on either side of US 68, and with the future northeast connector project.

Ongoing efforts to reroute the federal truck route designation to the existing KY 2154 bypass west of town should continue.

South of US 68, the No-Build concept is recommended at this time. Once the future northeast connector is constructed and truck routing adjusted, the need for a southern bypass extension may be reconsidered.

The recommendation from the VE study to reconfigure the US 68/KY 2154 intersection to make the north-west movement predominant is beyond the scope of this study but was noted as a viable improvement for future consideration.

9.1 Northeast Connector Concept

During future design efforts, a preferred alignment for the outer northeast connector concept will be refined. Appropriate design speeds, typical sections, and configurations for the connections to KY 55, KY 2154 (Corporate Drive), Knight's Way/Patriot Drive, and US 68 will be determined during the future phase of work. At the planning level, a two-lane rural typical section is assumed, with 12-foot-wide lanes, 10-foot-wide paved shoulders, a 55-mph design speed, and partial access control. Curb/gutter sections may be appropriate approaching US 68 and KY 55 to reduce impacts to adjacent properties.

Construction costs for this section are estimated at $4.2 million in 2021 dollars, including $150,000 for stream impacts and a 25% factor for contingencies. Year 2045 traffic projections show an estimated 3,000 vpd using the new link and reducing the traffic along KY 2154 (Corporate Drive).

Presented in **Figure 31**, there are red flag environmental resources near this corridor concept to consider in future design phases:

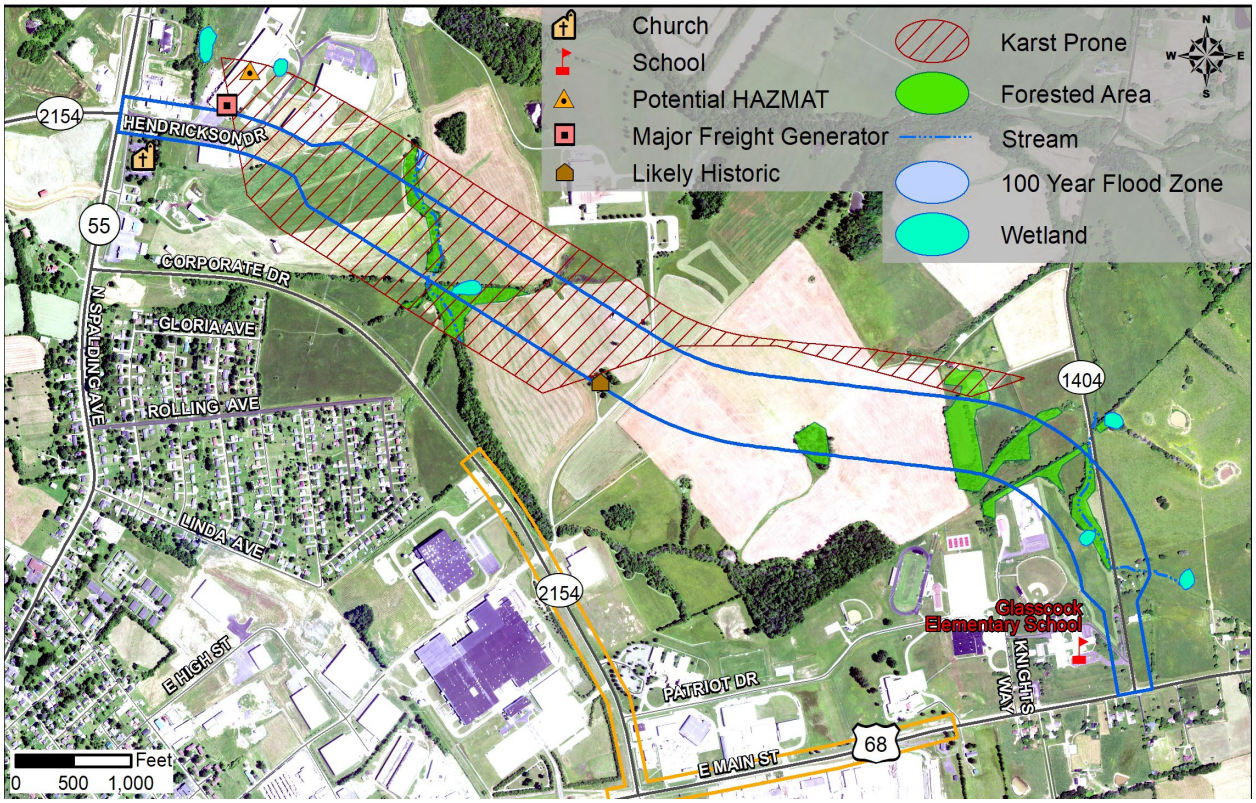


Figure 31: Recommended Northeast Connector with Environmental Red Flags

- Two unnamed tributaries to Cartwright Creek intersect the northeast corridor band: one just east of the industrial park and the other along KY 1404 (Barbers Mill Road). Each is lined with trees, representing potential habitat for protected bat species.
- This corridor concept passes through an area designated as prone to karst features.
- A band of New Albany Shale runs along US 68, stretching north 750–2,400 feet into the northeast corridor band. This geologic unit is susceptible to pyrite oxidation, which can lead to serious geotechnical and environmental concerns. Further coordination with KYTC Geotechnical Branch will be needed.
- The county's school bus maintenance garage is at the northern end of Knights Way.
- One house along Teledyne Road (**Figure 32**) has been identified as potentially eligible for the NRHP. Detailed survey and coordination with KHC will be required for this and any other structures over 50 years in age.

Figure 32: Potentially NRHP-eligible Resource on Teledyne Road

9.2 Project Sheets

Individual information sheets for the improvement concepts recommended for further development are presented in this section.

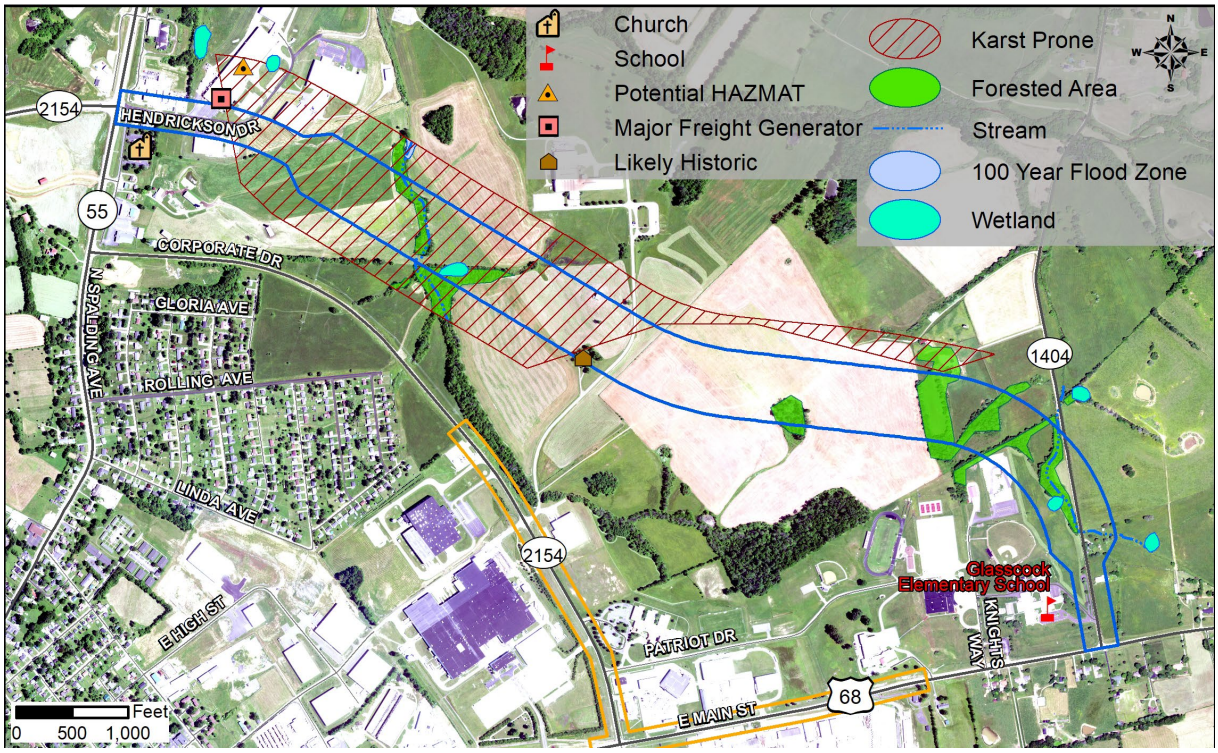
Northeast Connector		Item No. 4-80259
Lebanon, Marion County	New Alignment: KY 55 to US 68	
IMPROVEMENT DESCRIPTION: New two-lane, partial controlled access connector northeast of Lebanon	Phase Estimate	(2021 dollars)
	Design:	$1,000,000
	Right-of-Way:	$3,400,000
	Utilities:	$1,000,000
	Construction:	$7,400,000
	Total Cost:	**$11,100,000**

IDENTIFIED NEEDS:

2021 Traffic:	6,400-10,000 vpd on KY 55; 7,200 vpd on US 68; peak-hour segment LOS B/C
2045 Traffic:	7,400-11,500 vpd on KY 55; 8,300 vpd on US 68; peak-hour segment LOS B/C
2015-2020 Crashes:	62 crashes (5 injury) on KY 2154 (Corporate Dr.) with 56% rear ends

POTENTIAL ENVIRONMENTAL RED FLAGS: Bat habitat, historic, streams, karst

PROJECT LOCATION:



US 68/KY 2154 (Corporate Drive) Intersection		Item No. 4-80152
Lebanon, Marion County	US 68 MP 12.322 | KY 2154 MP 0.000	
IMPROVEMENT DESCRIPTION: Reconstruct intersection to improve capacity • Conventional signal with turn lanes or roundabout proposed for future evaluation • Widening for southbound and westbound approaches	Phase Estimate	(2021 dollars)
	Design:	$400,000
	Right-of-Way:	$1,200,000
	Utilities:	$1,800,000
	Construction:	$2,600,000
	Total Cost:	**$6,000,000**

IDENTIFIED NEEDS:

2021 Traffic:	5,200 vpd on KY 2154; 7,200 vpd on US 68; peak-hour segment LOS C
2045 Traffic:	6,000 vpd on KY 2154; 8,300 vpd on US 68; peak-hour segment LOS C
2015-2020 Crashes:	34 crashes (4 injury) within 500 ft on southbound and westbound legs; 53% rear ends

POTENTIAL ENVIRONMENTAL RED FLAGS: N/A

PROJECT LOCATION:

US 68/KY 2154 (Veterans Memorial Hwy) Intersection

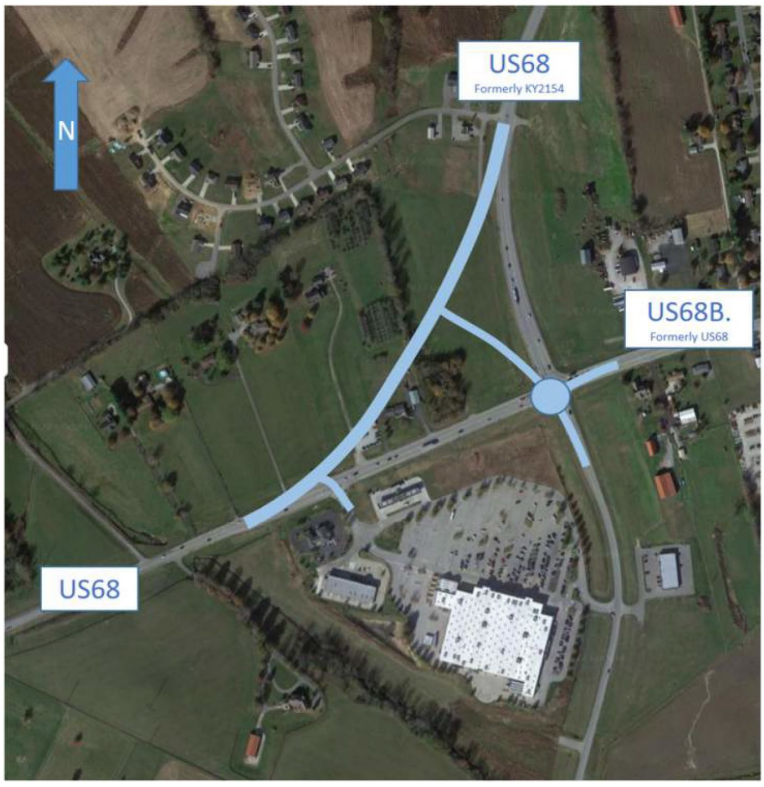
Lebanon, Marion County	US 68 MP 9.364 | KY 2154 MP 4.601	
IMPROVEMENT DESCRIPTION:	Phase Estimate	(2021 dollars)
Realign intersection to make eastbound/southbound legs primary thru movements, consistent with proposed federal truck routing	Design:	TBD
	Right-of-Way:	$500,000
	Utilities:	TBD
*NOT EVALUATED IN PLANNING PROCESS	Construction:	$1,700,000
	Total Cost: (by others)	**TBD**

IDENTIFIED NEEDS:

2021 Traffic:	6,600-8,000 vpd on KY 2154; 12,100 vpd on US 68
2045 Traffic:	7,500-9,100 vpd on KY 2154; 13,800 vpd on US 68
2015-2020 Crashes:	62 crashes (5 injury) on Corporate Dr. with 56% rear ends

POTENTIAL ENVIRONMENTAL RED FLAGS: TBD; beyond study limits

PROJECT LOCATION:



10.0 ADDITIONAL INFORMATION

Written requests for additional information should be sent to:

KYTC Division of Planning
ATTN: Director
200 Mero Street
Frankfort, KY 40622
Phone: 502.564.7183