

# KY 32 CORRIDOR STUDY

Nicholas County, KY  
Item No. 9-8812

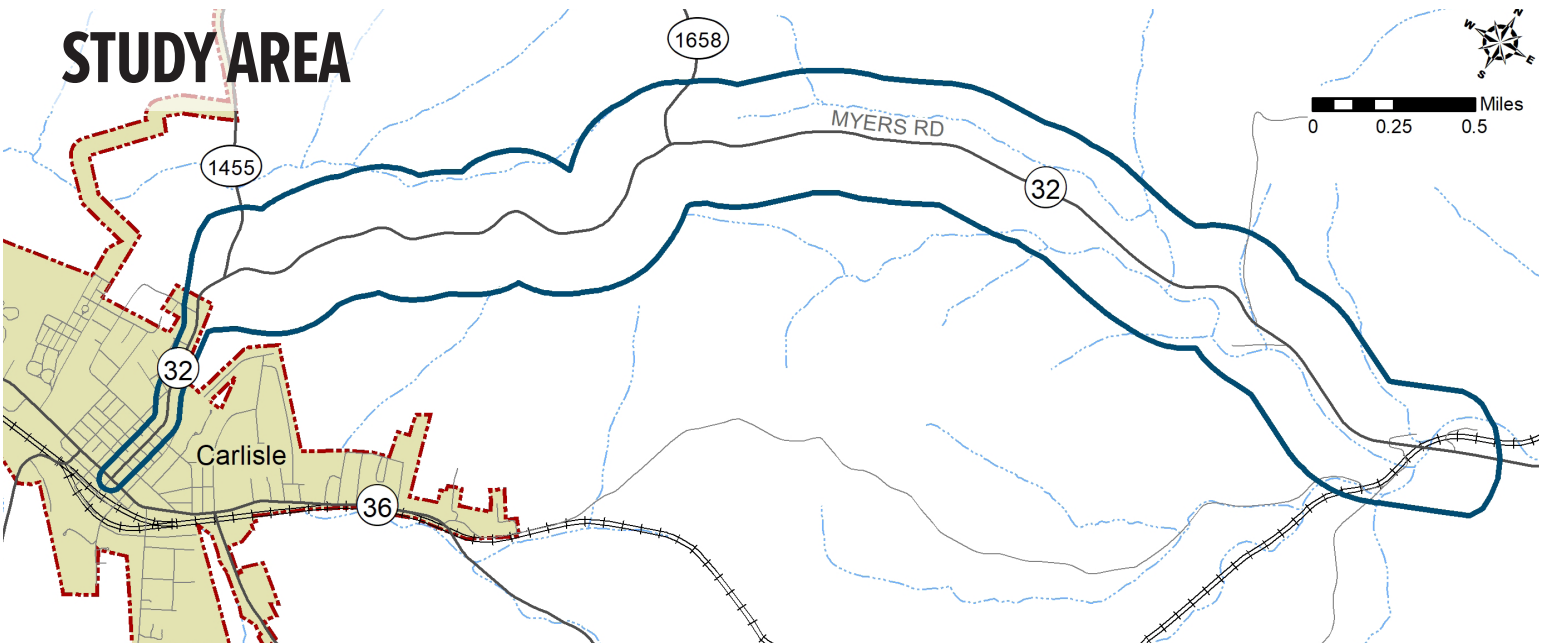
## FINAL REPORT | DECEMBER 2024



PREPARED BY  
**TEAM KENTUCKY**  
TRANSPORTATION CABINET

IN PARTNERSHIP WITH  
**OK**

### STUDY AREA



## Executive Summary

The Kentucky Transportation Cabinet (KYTC) initiated a corridor study of KY 32 (North Broadway/Meyers Road) in Nicholas County to evaluate safety and mobility enhancements for roadway users. The study area (**Figure ES-1**) spans approximately five miles, beginning at the intersection with KY 36 (Main Street) in Carlisle and extending northeast towards Fleming County to the bridge over the TTI Railroad and Scrubgrass Creek.

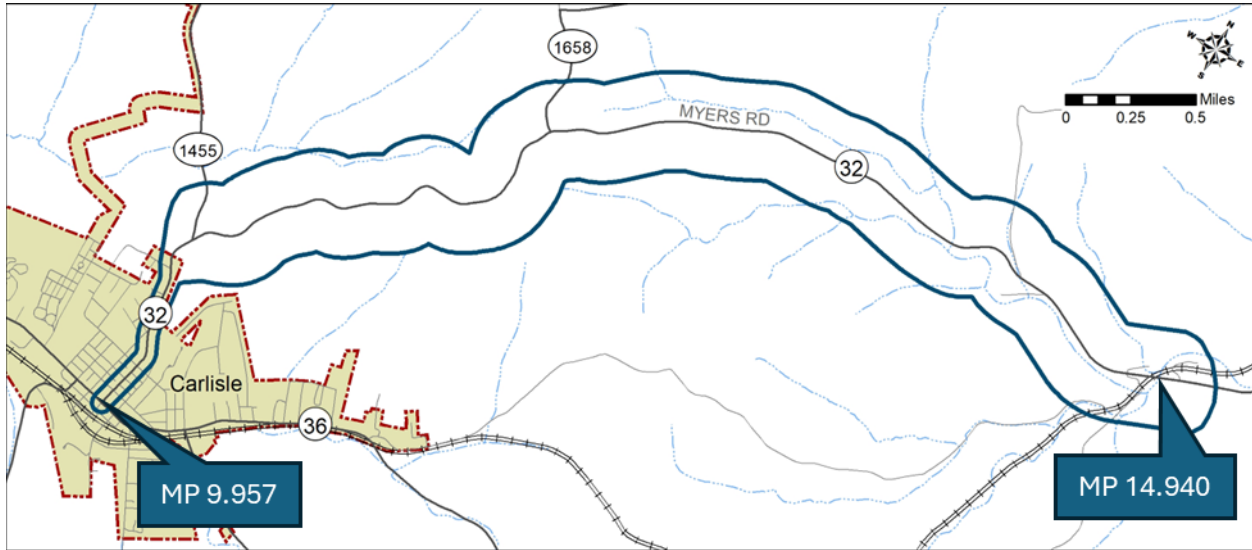


Figure ES-1: KY 32 Study Area

KY 32 is functionally classified as a rural major collector. It is not part of the National Highway System or a federal or state freight route.

Within the city limits, KY 32 has two 13-foot-wide lanes with curb and gutter and on-street parking on both sides of the street through downtown. Beyond, the rural section features two 10-foot-wide driving lanes with 1-foot-wide paved shoulders before widening out approaching the bridge at the northeastern study area limit. Speed limits along KY 32 climb leaving the city: 35 mph in town, 45 mph for 0.8 miles north of KY 1455 (Lake Road), and 55 mph beyond.

Shown in **Figure ES-2**, four KY 32 segments show steeper than recommended vertical grades. There are also 16 sharper-than-recommended horizontal curves, three of which have advisory signage today.

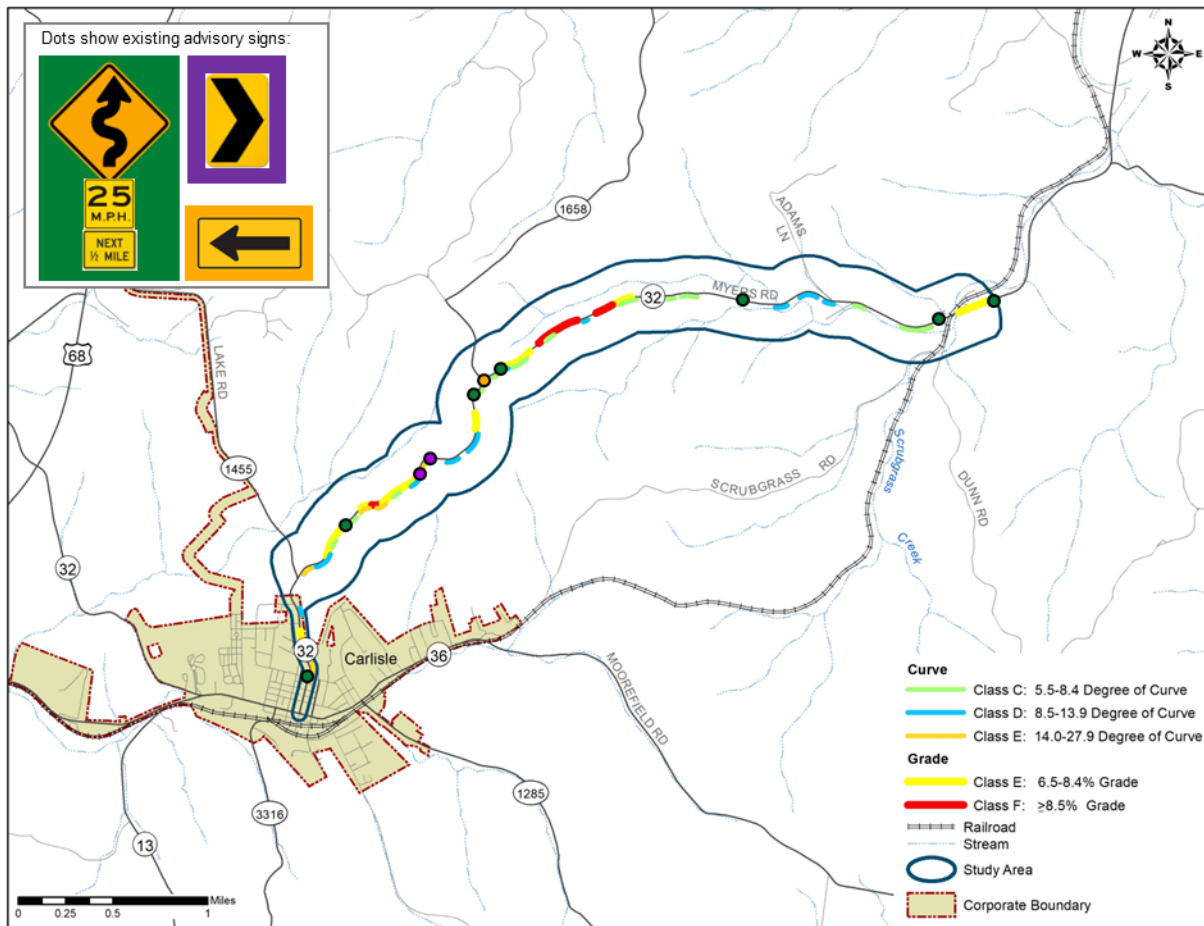


Figure ES-2: Steep Grades and Sharp Curves

## Crash Analyses

To understand reactive safety concerns and systemic risk factors, analysts examined five years of recent crash data. Historical crash data were evaluated to identify KY 32 crash trends. Analyses place heightened focus on more severe crashes, particularly in reducing fatalities and serious injuries.

- A total of 36 crashes were reported during 2018–2022, with locations scattered along the corridor. Of these, 16 occurred within Carlisle (south of Green Valley Road, MP 9.957–10.556) and the remaining 20 were distributed along 4.4 miles of rural route.
- Of the 36 reported crashes, none resulted in fatalities and five (14%) resulted in injuries. Within town, there were two injury collisions; the remainder were property damage only (PDO).
- Considering the entire corridor, the most common crash types were single-vehicle crashes (44%), angle collisions (19%), and same direction sideswipes (11%).

From a systemic perspective, analysts also considered the underlying risks contributing to observed trends. Overall, 31% occurred on wet or icy roads, 28% occurred during nighttime hours, and 33% were classified as roadway departures. The existing conditions analysis found risk factors including tight

horizontal curves, steep grades, and narrow pavement width coupled with steep edge drop-offs. Further, sight distance restrictions due to trees, brush, or hillside slopes inside many horizontal curves also contribute to safety performance.

### Traffic

As of 2023, an estimated 1,100–2,300 vehicles per day (vpd) travel KY 32 through the study area with minimal growth projected through the 2045 analysis year. Turning movement counts were collected during September 2023 at two key intersections. Analysis showed no capacity concerns: today and through 2045, both study intersections operate at LOS A/B during AM and PM peak hours.

While neither Carlisle nor Nicholas County has formal bike/pedestrian plans, Carlisle has a robust sidewalk network. Data shows no cyclists in the area but identifies significant pedestrian movements downtown.

### Meetings

The project team met at three key milestones throughout the study process and engaged with local officials and stakeholders (LO/S) twice.



### Goals & Objectives

Study area needs are driven by safety over mobility and should accommodate all user types. For the developed stretch within the city, this includes a focus on intersections and pedestrian connectivity. For the rural stretch, concepts should address systemic safety risks like narrow typical sections, sharp curves, and pavement deficiencies.

### Build Concepts

Improvement concepts were grouped into four categories:

- **In-town concepts** aim to enhance safety, mobility, and overall usability of the town's transportation network, making it more accessible and efficient for all users. Each is contained within existing pavement, with minimal impacts beyond parking. Much of town lies within a large historic district.
- For the rural section of the study corridor, **Low-Cost concepts** focus on enhancing road safety and visibility through strategic pavement striping, signage, and other measures. Minimal

environmental/community impacts would occur although narrow strips of new right-of-way is required in some cases, and nearby vegetation could represent protected bat habitat.

- **Medium Impact concepts** enhance rural road safety and functionality but require larger investments than the Low-Cost category, including impacts to adjacent properties. Environmental impacts are larger than previous categories, including residential relocations, one stream crossing, potential bat habitat, and utility relocations.
- **Full Reconstruction** to create a consistent 45 mph design speed has the largest footprint and would relocate an estimated 20+ residences along the route, significantly changing the character of the corridor.

**Table ES-1** summarizes prioritization results, incorporating traffic operations, safety considerations, project team input, and other factors. High, medium, and low priorities are assigned relative to other Build concepts within the study area. Other highway corridors throughout the district and state carry higher traffic volumes and demonstrate more severe crash trends than the study section of KY 32, representing more critical needs within the larger transportation system.

Table ES-1: Project Team Recommendations

Concept	DRUC Cost	Priority
<b>IN TOWN</b>		
a. KY 32/KY 26 Pedestrians	\$270k	Low
b. Midblock Crossings	\$80k	Low
c. Define Striping	\$165k	Medium
d. Four-way Stops	\$55k	High/Traffic data needed
<b>LOW-COST</b>		
a. 6" Striping	\$340k	Low/with Resurfacing
b. Curve Signage	\$80k	Medium
c. KY 1455 Striping	\$40k	Medium
d. Additional Guardrail	\$4.6M	Low
f. Henryville Sidewalks	\$1.2M	Medium
<b>MEDIUM IMPACT</b>		
a. Pull-offs	\$780k	Medium
b. Hillsides/Vegetation	\$1.6M	High
b* Adams Ln Hill/Vegetation	\$350k	Medium
c. Stoney Creek Intersection	\$5.0M	Medium
d. Widen/Realign Curves	\$23M	Medium
<b>RECONSTRUCTION</b>		
a. 45 mph design speed	\$61M	Dismiss

While planning-level estimates aim to be conservative, larger projects with longer implementation timelines are likely to see cost escalation. Corridor reconstruction was considered but dismissed due to the excessive costs and significant environmental and property impacts.

Executive Summary.....	ES-1
1 Introduction.....	1
1.1 Study Area Overview.....	2
1.2 Programmed and Planned Projects.....	3
2 Existing Conditions.....	5
2.1 Roadway Systems.....	5
2.2 Roadway Geometry.....	5
2.3 Structures.....	11
2.4 Crash Analyses.....	12
2.5 Traffic Flows and Capacity.....	16
3 Environmental Overview.....	19
3.1 Natural Environment.....	19
3.2 Human Environment.....	23
4 Initial Coordination Efforts.....	28
4.1 First Project Team Meeting.....	28
4.2 First Local Official/Stakeholder Meeting.....	28
5 Concept Development.....	29
5.1 Study Goals & Objectives.....	29
5.2 Initial Concepts Descriptions.....	29
5.3 Second Project Team Meeting.....	32
6 Final Coordination Meetings.....	33
6.1 Second Local Official and Stakeholder Meeting.....	33
6.2 Cost Estimates.....	33
6.3 Environmental Impacts.....	34
6.4 Third Project Team Meeting.....	37
7 Recommendations.....	38
7.1 Project Sheets.....	38
8 Future Cost Escalation.....	53
9 Next Steps.....	54
10 Additional Information.....	54

## Figures

Figure ES-1: KY 32 Study Area.....	ES-1
Figure ES-2: Steep Grades and Sharp Curves.....	ES-2
Figure 1: KY 32 Corridor Study Area.....	1
Figure 2: Corridor Study Process and Corresponding Tasks.....	2
Figure 3: KY 32 in Nicholas County.....	2
Figure 4: Views of Historic Carlisle.....	2
Figure 5: Programmed and Planned Area Projects.....	3
Figure 6: Major Functional Classifications for Roads.....	5
Figure 7: Typical Section in Town.....	6
Figure 8: Typical Section, Rural.....	6
Figure 9: Lane and Shoulder Widths.....	7
Figure 10: Steep Topography beyond Shoulders.....	7
Figure 11: Existing Sidewalk Network.....	8
Figure 12: Representative Pedestrian Mobility Issues.....	8
Figure 13: Grades Steeper than HDM Recommendations.....	10
Figure 14: Curves Sharper than HDM Recommendations.....	11
Figure 15: Structures Located in Study Area.....	12
Figure 16: Crash Locations, Severity, and Type.....	13
Figure 17: Crashes by Severity.....	14
Figure 18: Crashes by Type.....	15
Figure 19: 2023 Existing Traffic.....	16
Figure 20: 2045 No-Build Traffic.....	17
Figure 21: What is Level of Service?.....	18
Figure 22: Environmental Overview Map.....	20
Figure 23: Farmland Soil Classifications.....	22
Figure 24: Potentially Significant Historic Resources.....	25
Figure 25: Census Geographies.....	26
Figure 26: Grade/Stairs at KY 32/Chestnut St.....	30
Figure 27: KY 1455 Striping.....	30
Figure 28: Optical Speed Bars.....	31
Figure 29: KY 32/KY 1658 Reconstruction.....	31
Figure 30: Seven Curve Realignment Sites.....	32
Figure 31: Typical Project Development Process.....	53

## Tables

Table ES-1: Project Team Recommendations .....	ES-4
Table 1: CHAF Projects Near Study Area .....	4
Table 2: Vertical Grade Classes.....	10
Table 3: Horizontal Curve Classes.....	11
Table 4: Listed, Proposed, and Candidate Species .....	21
Table 5: Socioeconomic Metrics for Study Area Block Groups.....	26
Table 6: Initial Improvement Concept Groupings .....	29
Table 7: Cost Estimates by Phase (2023 Dollars) .....	34
Table 8: Costs/Impacts for Curve Realignment.....	37
Table 9: Project Team Recommendations .....	38

## Appendices

- A. Crash Records, 2018-2022
- B. Traffic Forecast Report
- C. Geotechnical
- D. Cultural Historic Overview
- E. Socioeconomic Report
- F. Meeting Summaries
- G. Cost Estimates



## Acronyms

ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
BGADD	Bluegrass Area Development District
CHAF	Continuous Highway Analysis Framework
DHV	Design Hourly Volumes
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
HDM	Highway Design Manual
HIS	Highway Information System
KDOW	Kentucky Division of Water
KYTC	Kentucky Transportation Cabinet
LEP	Limited English Proficiency
LO/S	Local Officials/Stakeholders
LOS	Level of Service
LOSS	Level of Service of Safety
LWCF	Land and Water Conservation Fund
MP	milepoint
MSAT	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NBI	National Bridge Inventory
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
PDO	Property Damage Only
SHIFT	Strategic Highway Investment Formula for Tomorrow
SHPO	State Historic Preservation Office
STIP	Statewide Transportation Improvement Program
TED	Transportation Enterprise Database
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
UST	Underground Storage Tank
v/c	volume-to-capacity
vpd	vehicles per day

## 1 Introduction

The Kentucky Transportation Cabinet (KYTC) initiated a corridor study of KY 32 (North Broadway/Meyers Road) in Nicholas County, Kentucky, to evaluate safety and mobility enhancements for all roadway users. The study area spans approximately five miles, beginning at the intersection with KY 36 (Main Street) in Carlisle at KY 32 milepoint (MP) 9.957 and extending northeast towards Fleming County to the bridge over TTI Railroad and Scrubgrass Creek (MP 14.940). KY 32 is a narrow, two-lane highway generally running along the ridge top north and east of the city, which has a population around 2,000 persons.

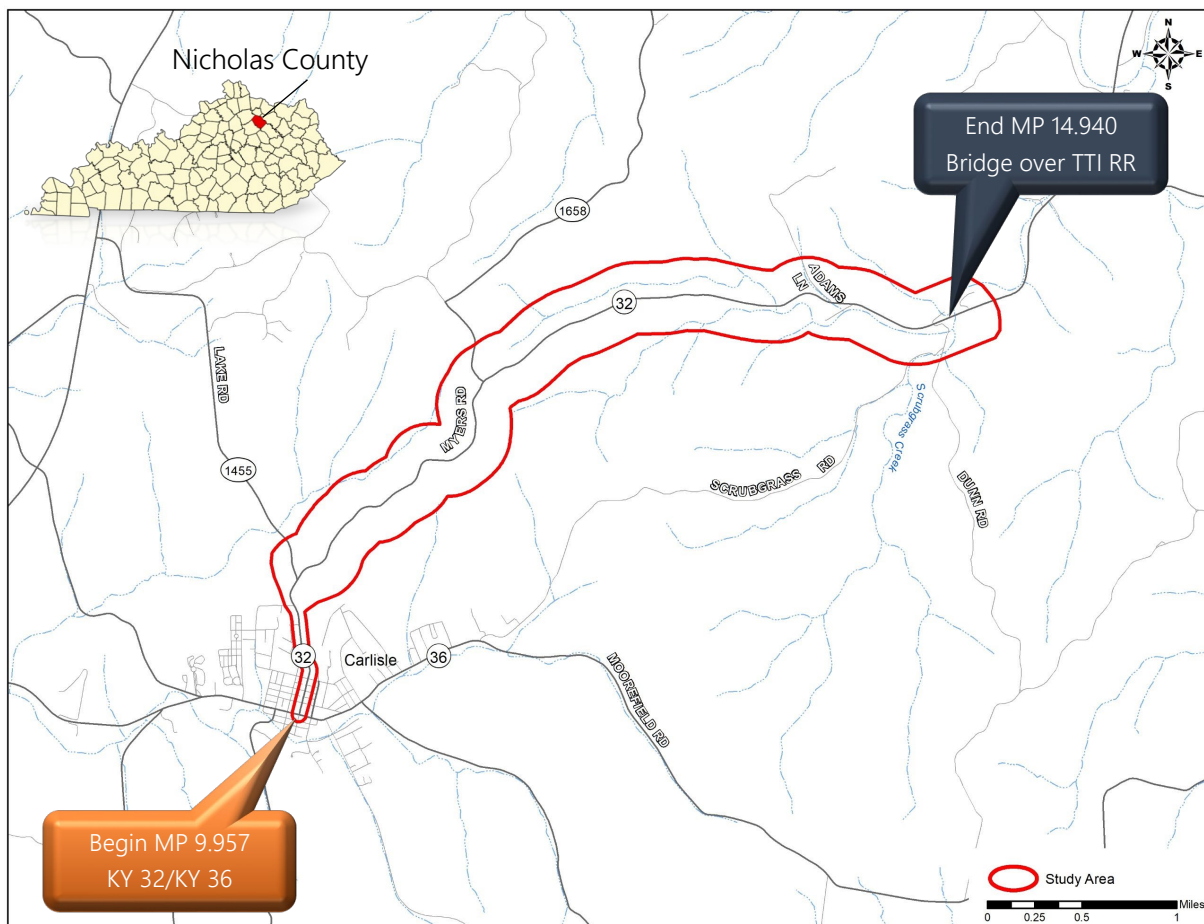


Figure 1: KY 32 Corridor Study Area

The study analyzes existing conditions and future traffic demands to identify options for addressing geometric deficiencies and improving safety. Additional tasks include defining the study goals and objectives, considering the surrounding environmental context, providing cost estimates for improvement options, engaging with local stakeholders, and delivering a technical report. **Figure 2** illustrates the study process.



Figure 2: Corridor Study Process and Corresponding Tasks

### 1.1 Study Area Overview

Nicholas County is located on the northeastern edge of the Inner Bluegrass region of Kentucky and is one of 15 counties within the Bluegrass Area Development District (BGADD). Nicholas County has a picturesque, rural character with rolling countryside typical of the Bluegrass region.



Figure 3: KY 32 in Nicholas County

At the southwest end of the study area, Carlisle is a small city with a rich historic heritage.

Founded in 1816, it serves as the county seat of Nicholas County and is home to the Carlisle Historic District, which features numerous well-preserved 19th- and early 20th-century buildings (Figure 4). Carlisle bills itself “the little town with the big heart.” A notable landmark is the Nicholas County Courthouse, built in 1893, which remains the governmental hub of the county.



Figure 4: Views of Historic Carlisle

## 1.2 Programmed and Planned Projects

Every two years, Kentucky's state legislature establishes the transportation budget through its biennial highway plan. Kentucky's *FY 2024–FY2030 Enacted Highway Plan*<sup>1</sup> was reviewed for nearby programmed projects. Planned projects near the study area were also identified from KYTC's Continuous Highway Analysis Framework (CHAF) database. The CHAF database serves as the initial phase for the biennial SHIFT<sup>2</sup> process, evolving into the two-year budget cycle outlined in the Highway Plan. Active CHAF concepts and Highway Plan projects near the study area are shown in **Figure 5** and described below.

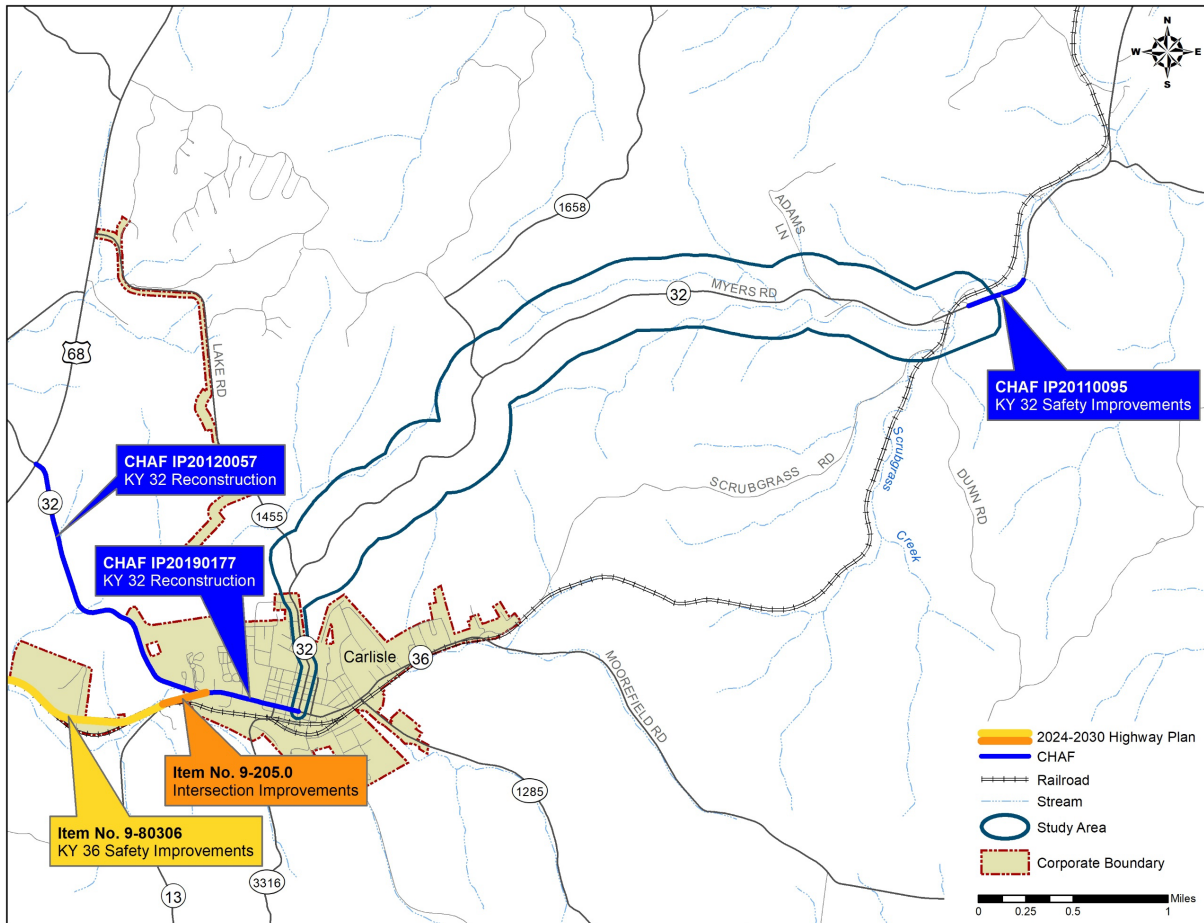


Figure 5: Programmed and Planned Area Projects

<sup>1</sup> Online at <https://transportation.ky.gov/Program-Management/Pages/default.aspx>

<sup>2</sup> SHIFT, or the Strategic Highway Investment Formula for Tomorrow, is a data-driven project scoring process to compare and prioritize statewide capital improvement projects to make better use of limited transportation funds in the Commonwealth's biennial budget.

- Item No. 9-205 reconstructs the signalized KY 32/KY 36 intersection near Nicholas County High School as a roundabout. Designs are completed; the Highway Plan includes state funding for right-of-way in 2024, utilities in 2025, and construction in 2026–2027.
- Item No. 9-80306 reconstructs KY 36 between US 68 and KY 13 with state funding for design programmed in 2025, right-of-way and utility funding in 2026, and construction funding in 2029.

Table 1: CHAF Projects Near Study Area

CHAF	Route	Limits	Description	Cost*
IP20110095	KY 32	From Scrubgrass Creek Bridge (MP 15.406) to Fleming Creek Bridge (MP 18.128)	Improve safety and geometry; includes KY 57 intersection and bridge replacement	\$24.9M
IP20120057	KY 32	From US 68 (MP 7.744) to KY 36 (MP 9.423)	Major Reconstruction	\$15.6M
IP20190177	KY 32	From KY 36 (MP 9.410) to KY 36 (MP 9.960)	Major Reconstruction	\$4.9M

\* Some CHAF estimates are several years old and may not fully account for recent inflation trends

## 2 Existing Conditions

The following sections provide an overview of existing transportation conditions in the study area. Data gathered from KYTC’s Highway Information System (HIS) database, KYTC’s Transportation Enterprise Database (TED), the National Bridge Inventory (NBI), traffic counts, and field reviews were used to inform discussions.

### 2.1 Roadway Systems

Functional classification is a systematic grouping of streets and highways according to the character of travel service and type of access to adjacent land use. This classification system recognizes that travel occurs within a hierarchical roadway system, progressing from lower classifications (short, locally oriented trips) to higher classifications (longer-distance travel at higher speeds). Traditionally, a roadway’s classification is further designated as urban or rural based upon whether it is within the Adjusted Urban Area boundaries from the Federal Highway Administration (FHWA).

More recently, design policies acknowledge a broader spectrum of land use contexts: rural, rural town, suburban, urban, and urban core. **Figure 6** defines major functional classifications.

KY 32 is functionally classified as a rural major collector. It is not part of the National Highway System or a federal or state freight route.

It is listed in the State Secondary System as a regionally significant route of shorter distance providing mobility and access to adjacent land, generally serving smaller cities and county seats.

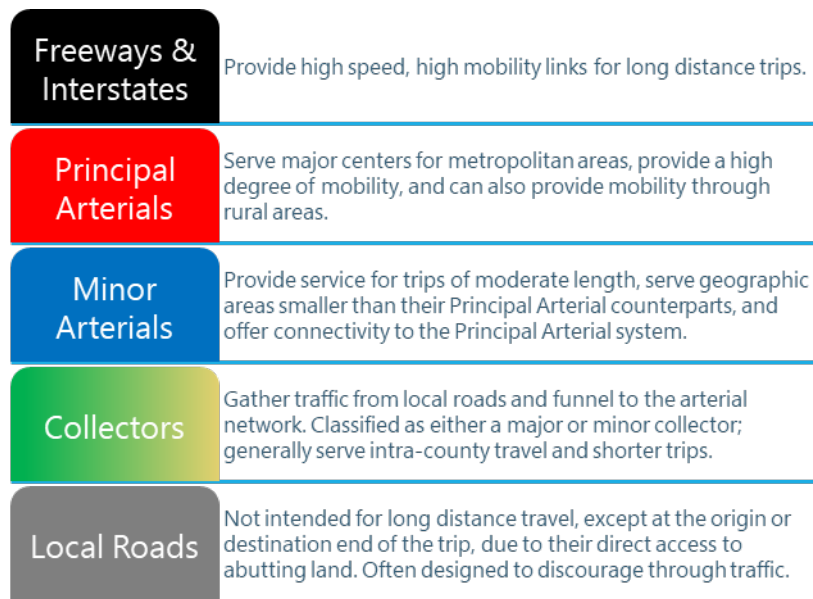


Figure 6: Major Functional Classifications for Roads

### 2.2 Roadway Geometry

KYTC’s HIS database was queried for geometric characteristics such as speed limits, driving lanes, shoulders, vertical grades, and horizontal curves along the study corridor. A comparison with KYTC’s *Highway Design Manual* (HDM)<sup>3</sup> measures conditions against current practice guidelines.

<sup>3</sup> Online at <https://transportation.ky.gov/Highway-Design/Pages/default.aspx>

**Speed Limit:** Posted speed limits along KY 32 drop approaching the city:

- 35 mph in town, MP 9.957 to MP 10.910
- 45 mph north of KY 1455 (Lake Road), MP 10.910 to MP 11.520
- 55 mph beyond, MP 11.520 to MP 14.940

**Typical Section:** Within the city limits, KY 32 has two 13-foot-wide lanes with curb and gutter and on-street parking on both sides of the street downtown. Beyond, the rural section features two 10-foot-wide driving lanes with 1-foot-wide paved shoulders before widening out approaching the bridge at the northeastern study area limit. **Figure 7** and **Figure 8** show representative views, with widths mapped in **Figure 9**.

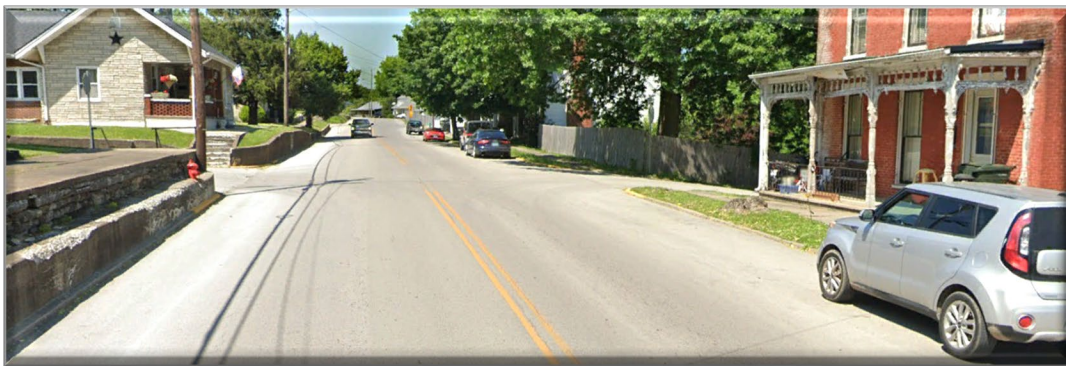


Figure 7: Typical Section in Town

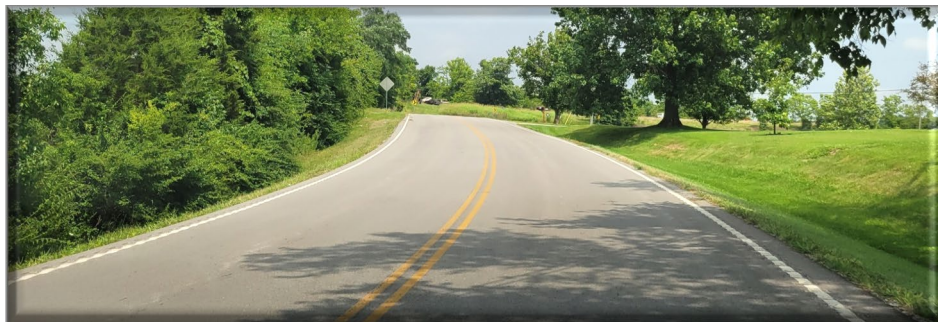


Figure 8: Typical Section, Rural

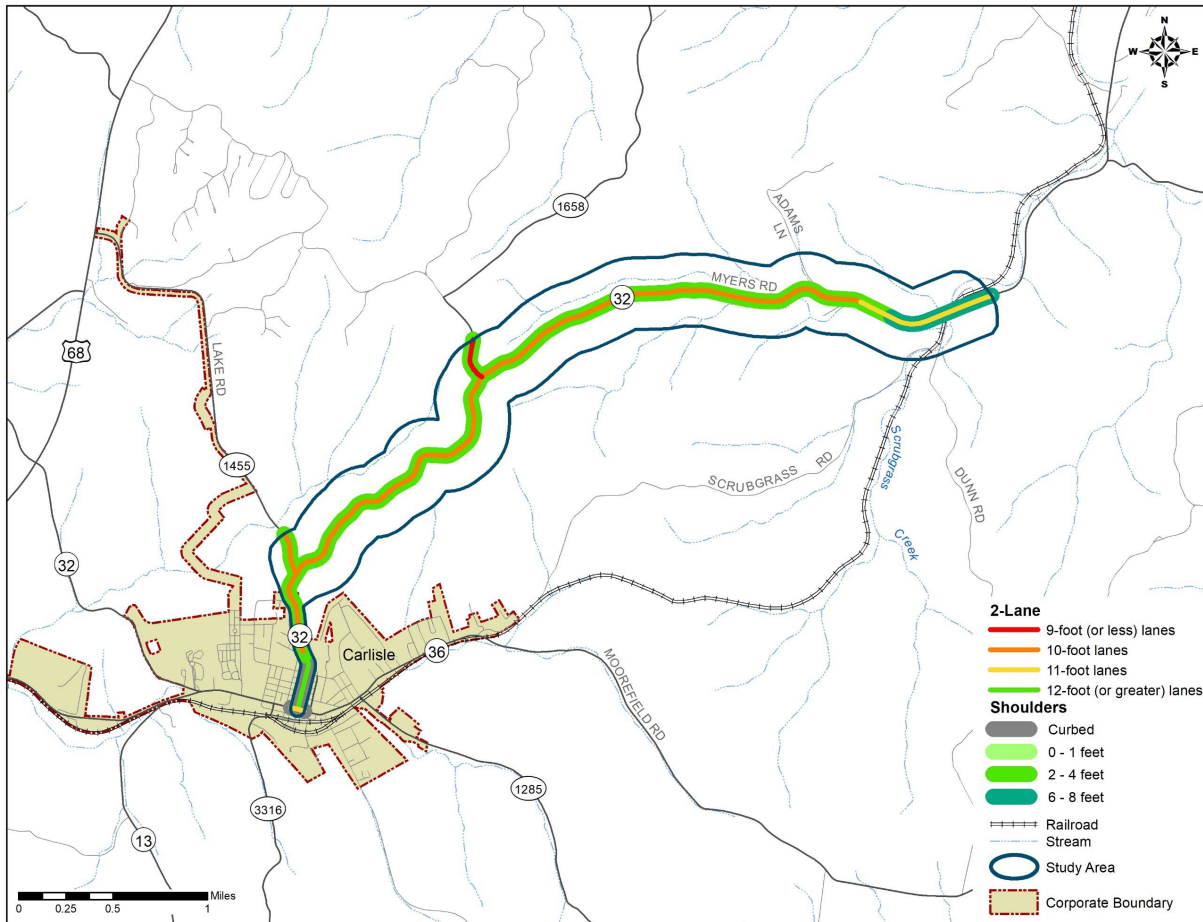


Figure 9: Lane and Shoulder Widths

Field visits identified several areas along the route with steep terrain beyond the shoulder, some with rocky outcrops that limit visibility and others with steep drop-offs that lead to pavement deterioration and may warrant guardrail. Representative locations are shown in **Figure 10**.



Figure 10: Steep Topography beyond Shoulders

For rural collector roads, HDM recommends 11-foot-wide driving lanes and 4- to 6-foot-wide usable shoulders for design speeds over 35 mph.



**Bicycle and Pedestrian Facilities:** While neither Carlisle nor Nicholas County has formal bike/pedestrian plans, Carlisle has a robust sidewalk network (Figure 11).

- Sidewalks exist on both sides of KY 32 from KY 36 to East North Street.
- Following an 800-foot gap, sidewalks resume on the north/west side of KY 32 at North Locust Street and extend to Green Valley Road.
- The sidewalks' width, condition, and compliance with the *Americans with Disabilities Act* (ADA) vary.
- No dedicated bike facilities exist on the corridor.

Third-party StreetLight™ data shows no cyclists in the area but identifies significant pedestrian movements in town with negligible activity beyond the downtown area.

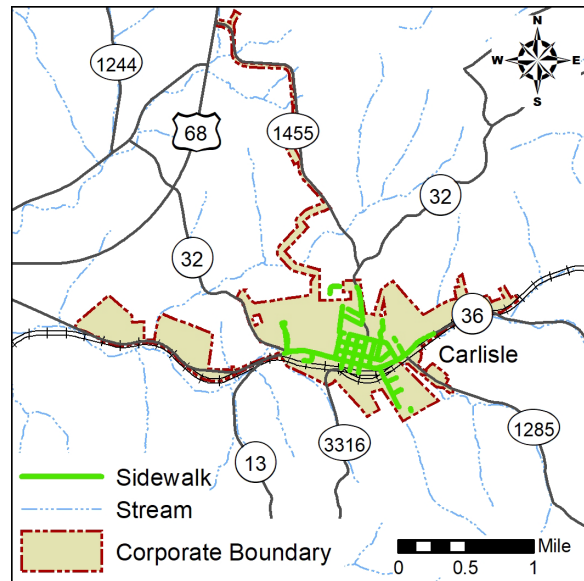


Figure 11: Existing Sidewalk Network

Within Carlisle city limits, KY 32 presents mobility challenges for non-motorized users, including narrow walkways, on-street parking, and grade-separated sidewalks. Other obstacles (e.g., parked cars, signs/poles, and steep grades on cross-streets) limit visibility for motorists.

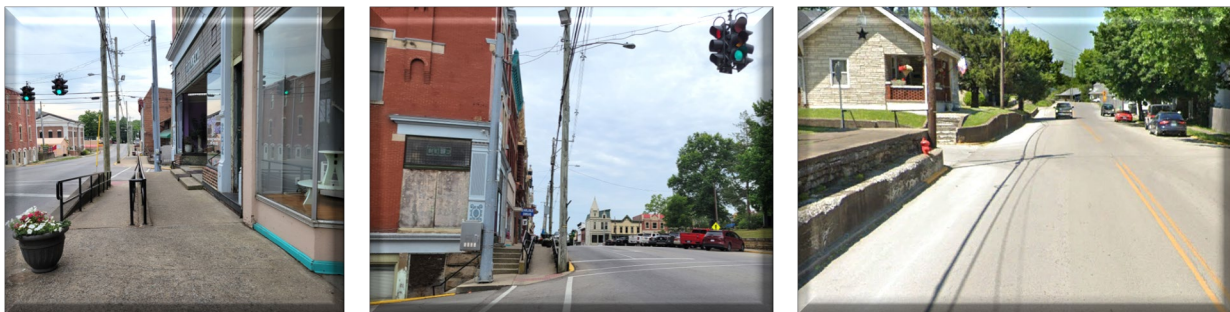


Figure 12: Representative Pedestrian Mobility Issues

Consideration of the needs of all modal users is critical throughout the planning and project development process. KYTC adopted a *Complete Streets Policy*<sup>4</sup> in September 2022, committing to partnering with other agencies to:

- Identify opportunities to promote and provide safe, convenient access and travel for all users of the transportation network while reducing crash rates and the severity of crashes.
- Improve mobility and accessibility for all individuals.
- Support mode shift to non-motorized transportation.
- Ensure early coordination to identify potential actions/strategies.

## What are COMPLETE STREETS?

A **Complete Street** is a street, road, or highway that is safe and accommodating for all expected users. Complete Street design varies based on land use, corridor characteristics, and user types.

Complete Streets are for every community from small towns to dense urban centers.

Using the **Safe Systems Approach**, Complete Streets provide transportation choices for pedestrians, bicyclists, transit users, motor vehicle drivers, freight carriers, and others within the context of the surrounding area.



<sup>4</sup> Online at <https://transportation.ky.gov/BikeWalk/Pages/Complete-Streets.aspx>

**Vertical Grades:** HIS data highlight substandard grades (i.e., steep hills) along the study route. Vertical grades are classified from Class A (flattest) to F (steepest), as outlined in **Table 2**. HDM recommends a maximum grade of 8% for rural collector roads in rolling terrain with a 45-mph design speed or 7% at 55 mph (Class E or better).

**Figure 13** shows four KY 32 segments are steeper than recommended grades, with three falling within the Class F designation.

Table 2: Vertical Grade Classes

Class	Description (percent)
A	0.0-0.4
B	0.5-2.4
C	2.5-4.4
D	4.5-6.4
E	6.5-8.4
F	8.5+

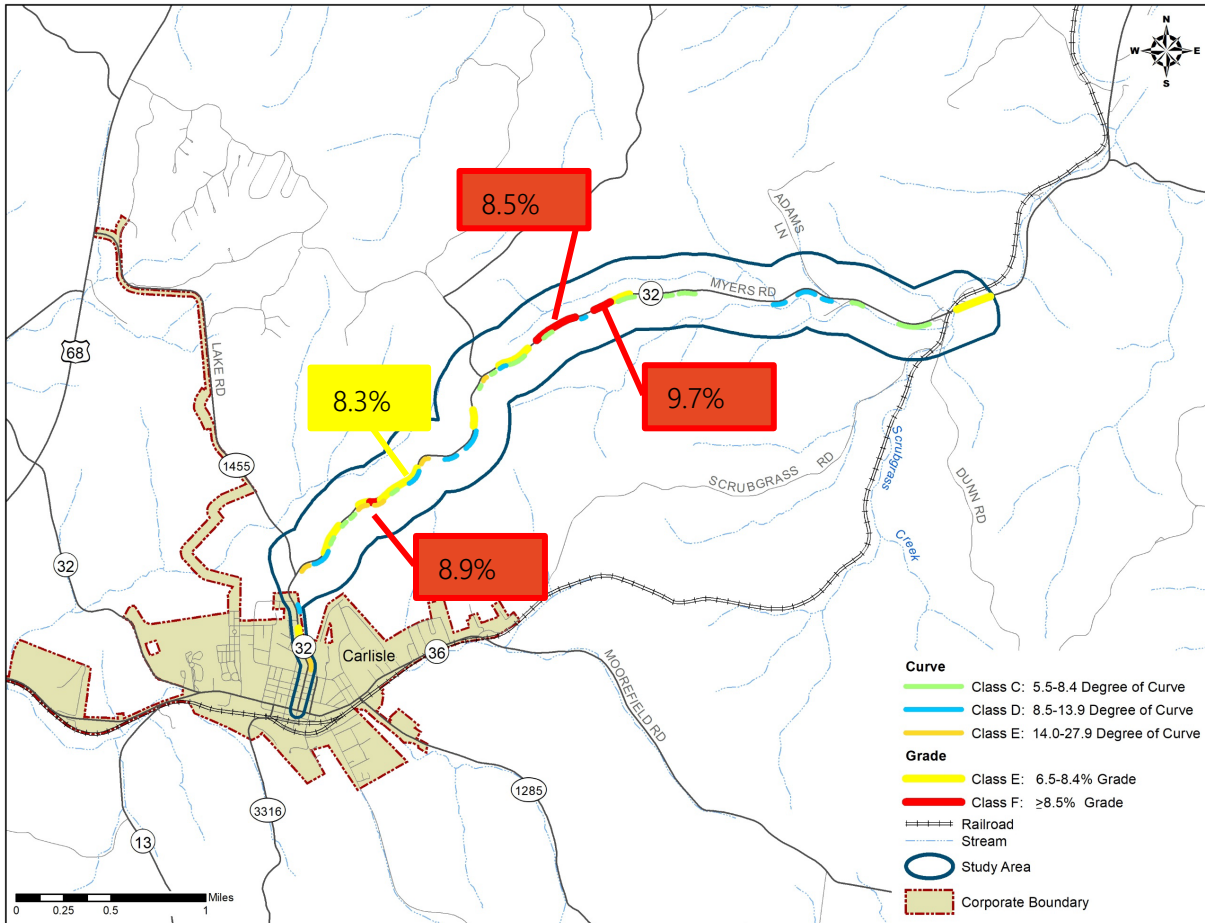


Figure 13: Grades Steeper than HDM Recommendations

**Horizontal Curves:** Horizontal curves are also categorized from Class A (most sweeping) to Class F (sharpest), as indicated in **Table 3**. Design guidelines vary based on area type (rural or urban), design speed, and superelevation. Generally, for a 55-mph design speed, recommended minimum radius falls into Class C or better. At 45 mph, recommended minimum radius is Class D or better.

Table 3: Horizontal Curve Classes

Code	Degrees	Radius (ft)
A	0.0-3.4	≥1,680
B	3.5-5.4	1,640-1,060
C	5.5-8.4	1,040-680
D	8.5-13.9	670-410
E	14.0-27.9	410-205
F	28.0+	≤205

**Figure 14** shows ten Class D and six Class E horizontal curves alongside advisory curve warning signs.

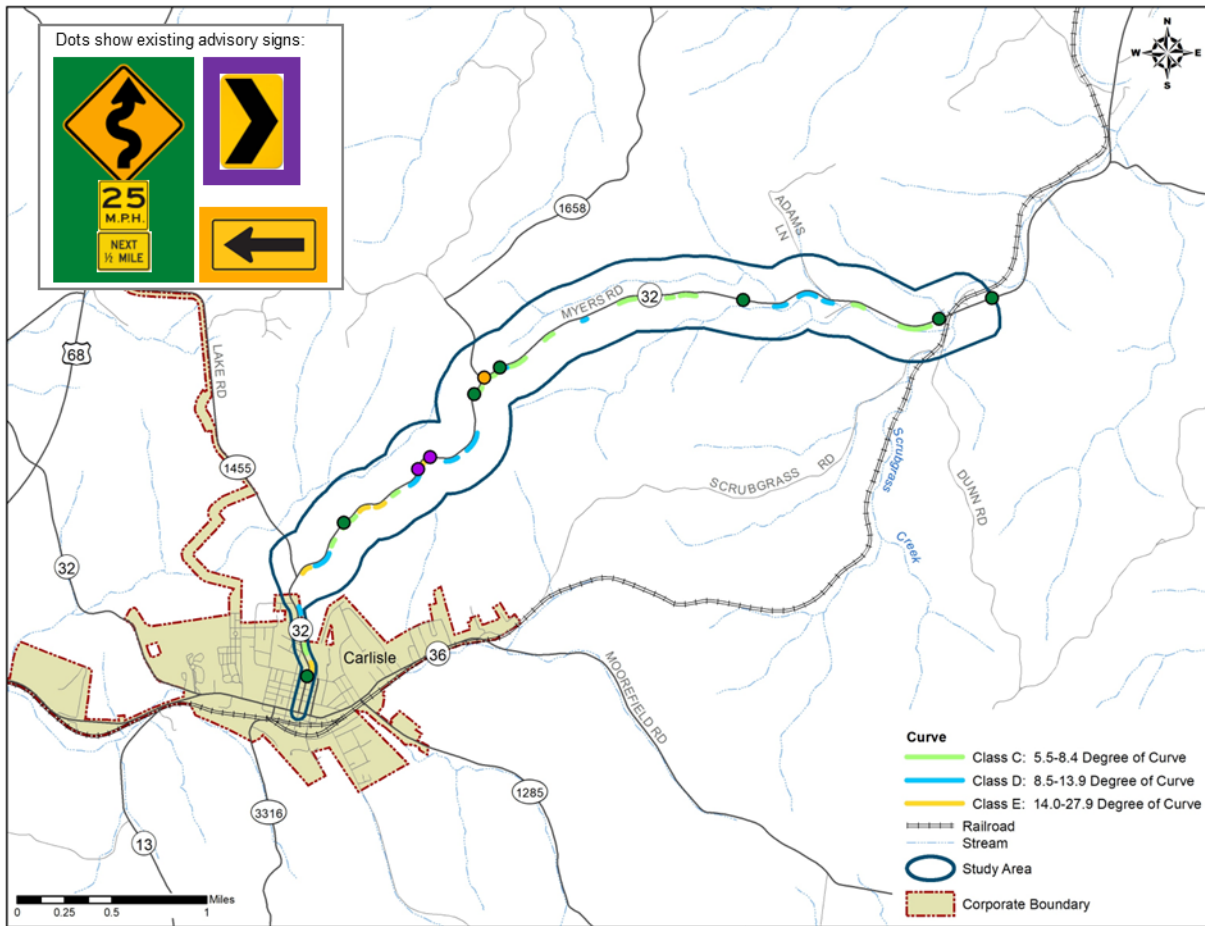


Figure 14: Curves Sharper than HDM Recommendations

### 2.3 Structures

KYTC’s Bridge Data Miner shows two KY 32 structures within the study area limits. Locations are illustrated in **Figure 15**, with details summarized below.

- Culvert over Scrubgrass Creek (091B00009N): Located 3.5 miles northeast of KY 1455 (Lake Road), this culvert was built in 1930 and spans a branch of Scrubgrass Creek. The 2024 inspection shows the 21-foot-long concrete culvert to be in Fair condition.
- Bridge over TTI Railroad and Scrubgrass Creek (091B00067N): About 2.7 miles north of KY 1658 (Stoney Creek Road), this bridge was constructed in 2015 and spans both the railroad and Scrubgrass Creek. The 2024 KYTC inspection determined the 374-foot-long, four-span structure to be in Good condition. On the structure, KY 32 has two 11-foot-wide lanes with 5-foot-wide paved shoulders.

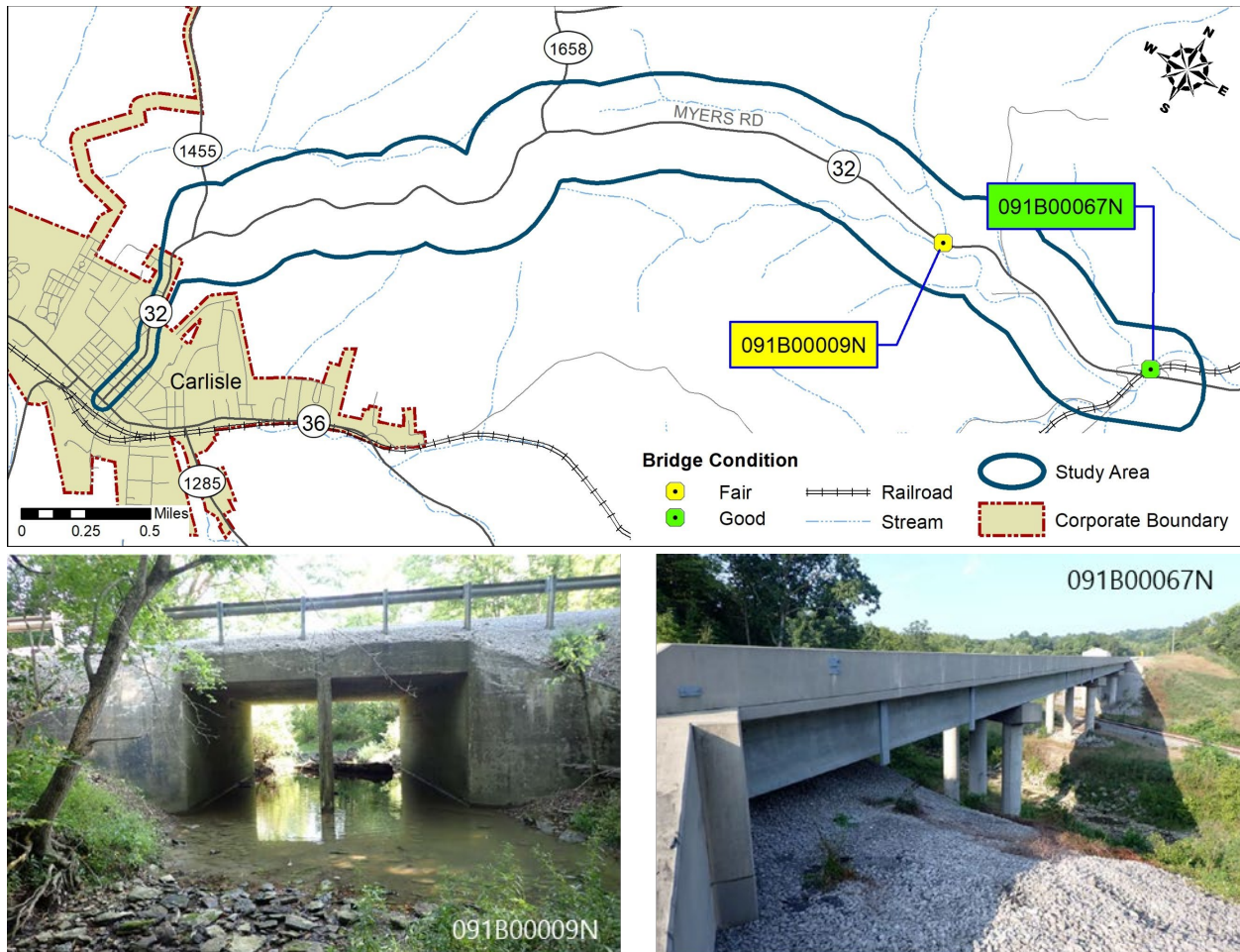


Figure 15: Structures Located in Study Area

## 2.4 Crash Analyses

Throughout the analysis, safety is viewed through both *reactive* and *systemic* lenses:

*A **Reactive** perspective focuses on historic crash clusters at specific locations that suggest underlying safety issues, reacting to observed geographic trends.*

*A **Systemic** perspective takes a broader view of underlying risk factors, looking system-wide to target key crash types (e.g., pedestrian strikes after dark or sharp curves with 55+ mph speed limits) even at locations that may not demonstrate recent crash clusters.*

To understand reactive safety concerns and systemic risk factors, analysts examined five years of recent crash data. Historical crash data were evaluated for a five-year period (January 2018 through December 2022) to identify KY 32 crash trends. Summary records are in **Appendix A**. **Figure 16** presents crash locations, severity, and type.

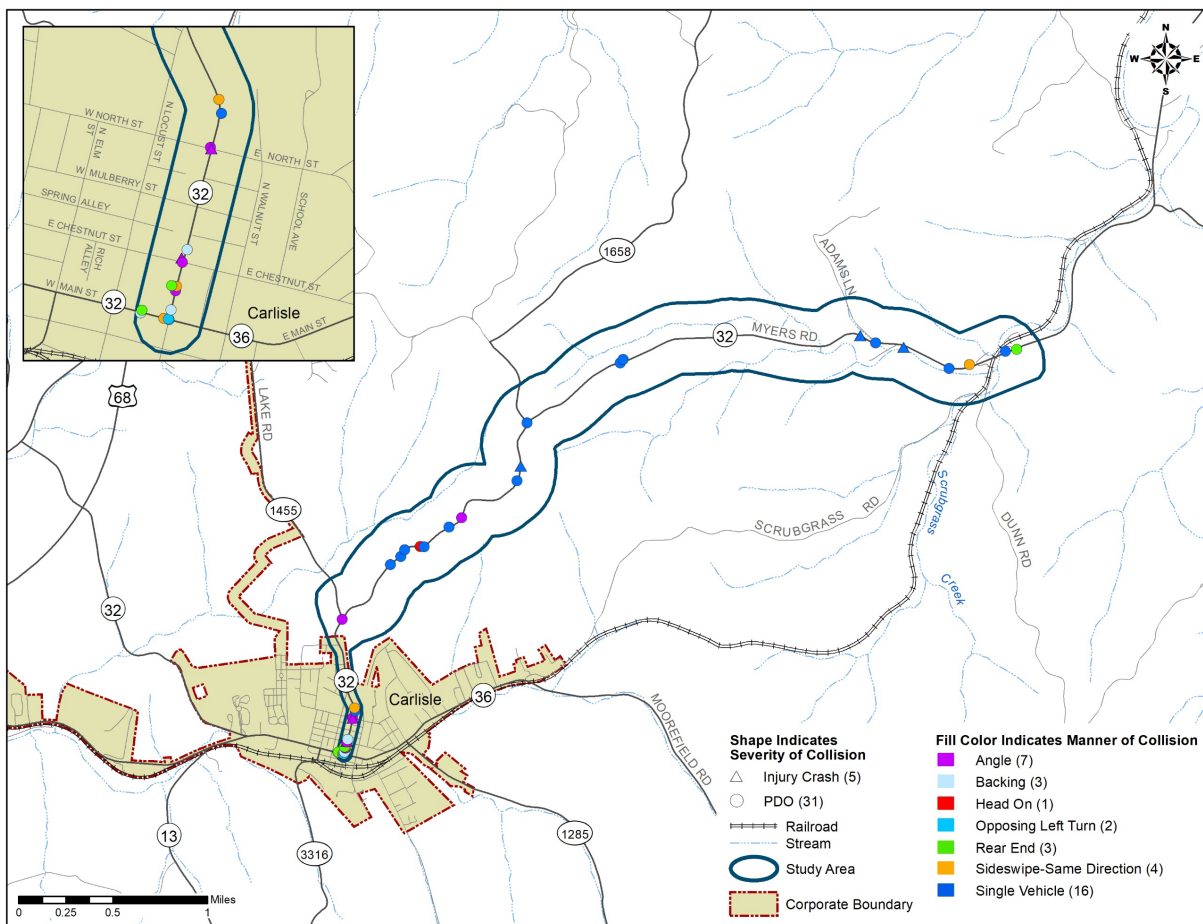


Figure 16: Crash Locations, Severity, and Type



Consistent with the federal Safe Systems Approach, analyses place greater focus on higher severity crashes, particularly in reducing fatalities and serious injuries. States most commonly use the “KABC0” severity scale, developed by the National Safety Council to measure the observed injury severity for any person at the scene of a crash. The KABC0 scale codes each crash as Fatal (K), Suspected Serious Injury (A), Suspected Minor Injury (B), Possible Injury (C), and No Apparent Injury (O)—resulting in property damage only (PDO).

### Reactive Approach to Safety

A total of 36 crashes were reported during 2018–2022, with locations scattered along the corridor. No pedestrian or bicycle collisions were reported. Of these, 16 occurred within town (south of Green Valley Road, MP 9.957–10.556) and the remaining 20 were distributed along 4.4 miles of rural route.

It should be noted the study corridor was resurfaced in 2021; crash rates since that time have been lower but may return to former levels as the new pavement and striping ages.

**By Severity.** Of the 36 reported crashes, none were fatalities; five (14%) involved injuries (A, B, C); and the remaining 86% were PDO collisions. The distribution by severity is summarized in **Figure 17**.

Within town, there were two injury collisions; the remainder were PDO.

**By Manner of Collision:** Considering the entire corridor, single-vehicle crashes were the most common crash type, representing 44% of all reported crashes. Shown in **Figure 18**, other common crash types were angle collisions (19%) and same direction sideswipes (11%).

Looking only at crashes in town, the most common crash types—angle and left turn collisions—accounted for seven incidents or 44% of in-town reports.

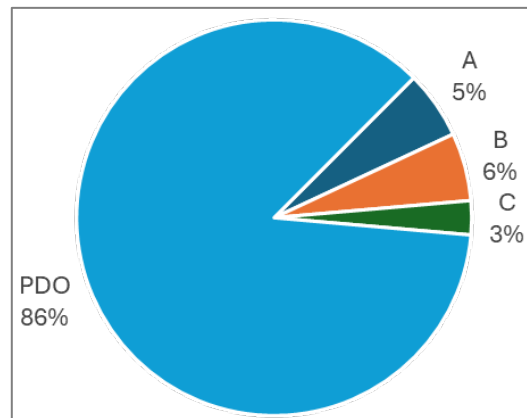


Figure 17: Crashes by Severity

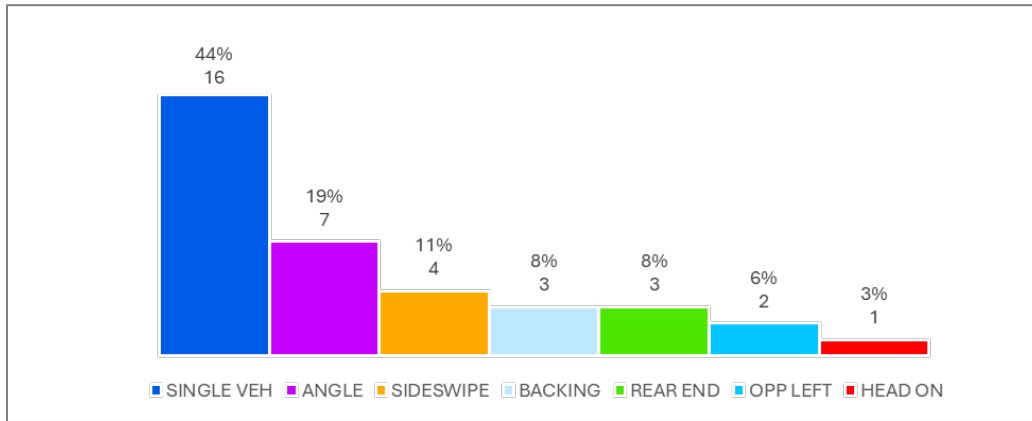


Figure 18: Crashes by Type

Typical KYTC planning studies also address Level of Service of Safety (LOSS), a mathematical formula to compare recent crash rates to expected occurrences based on traffic volumes and roadway characteristics. Due to an inconsistent reporting convention using derived MP in the database, LOSS calculations are not included in this study.

### Systemic Approach to Safety

Beyond looking at five years of crash records, analysts also considered the underlying risks contributing to observed trends.

During 2020–2021, KYTC undertook a district-wide assessment of roadway departure crashes to evaluate systemic risks and identify low-cost countermeasures. The study section of KY 32 was not identified as a priority improvement corridor but does satisfy the top risk factors that correlate with severe (K or A) roadway departure crashes: rural two-lane major collector routes with a 55-mph posted speed limit and narrow lane widths.

**Roadway departure** is a crash that occurs after a vehicle crosses the center line or leaves the traveled way. These can result in some of the most severe crash outcomes.

Review of the 36 reported crashes discussed above revealed the following crash trends along the corridor:

- 31% of crashes occurred on wet or icy roads.
- 28% of crashes occurred during nighttime hours. Streetlights are mounted on select electrical poles in town, but the rural remainder of the corridor is unlit.
- 33% were classified as roadway departures, with two-thirds occurring in curves. Roadway departure crashes tend to be more severe than other crash types and are one of the emphasis areas in KYTC’s *Strategic Highway Safety Plan*.<sup>5</sup>

<sup>5</sup> Online at <https://transportation.ky.gov/HighwaySafety/Pages/default.aspx>



- 39% of crashes were attributed to distracted driving.

The existing conditions analysis found risk factors including tight horizontal curves, steep grades, and narrow pavement width coupled with steep edge drop-offs. Further, sight distance restrictions due to trees, brush, or hillside slopes inside many horizontal curves also contribute to safety performance.

## 2.5 Traffic Flows and Capacity

KYTC provided 2023 and forecasted 2045 traffic data detailed in the *Traffic Forecast Technical Report* in **Appendix B**. Analysts reviewed historical traffic volume data, including truck percentages, and both hourly and directional distributions. Turning movement counts were collected during September 2023 at two key intersections. Segment and intersection traffic volume data are illustrated in **Figure 19** and **Figure 20** for the 2023 Existing and 2045 No-Build scenarios, respectively. Average Daily Traffic (ADT), Design Hourly Volumes (DHV), and truck percentages are shown for segments; AM and PM peak hours are shown at intersections with PM in parentheses.

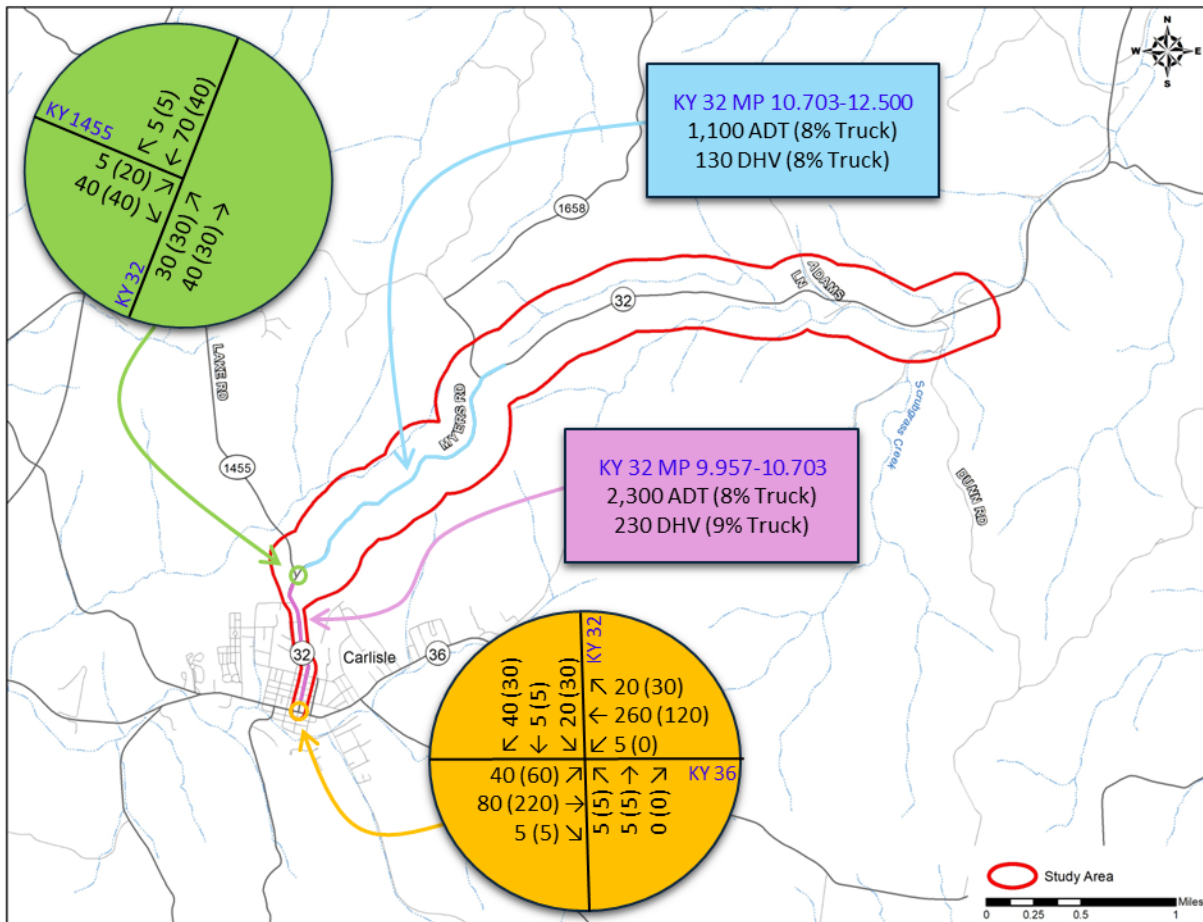


Figure 19: 2023 Existing Traffic

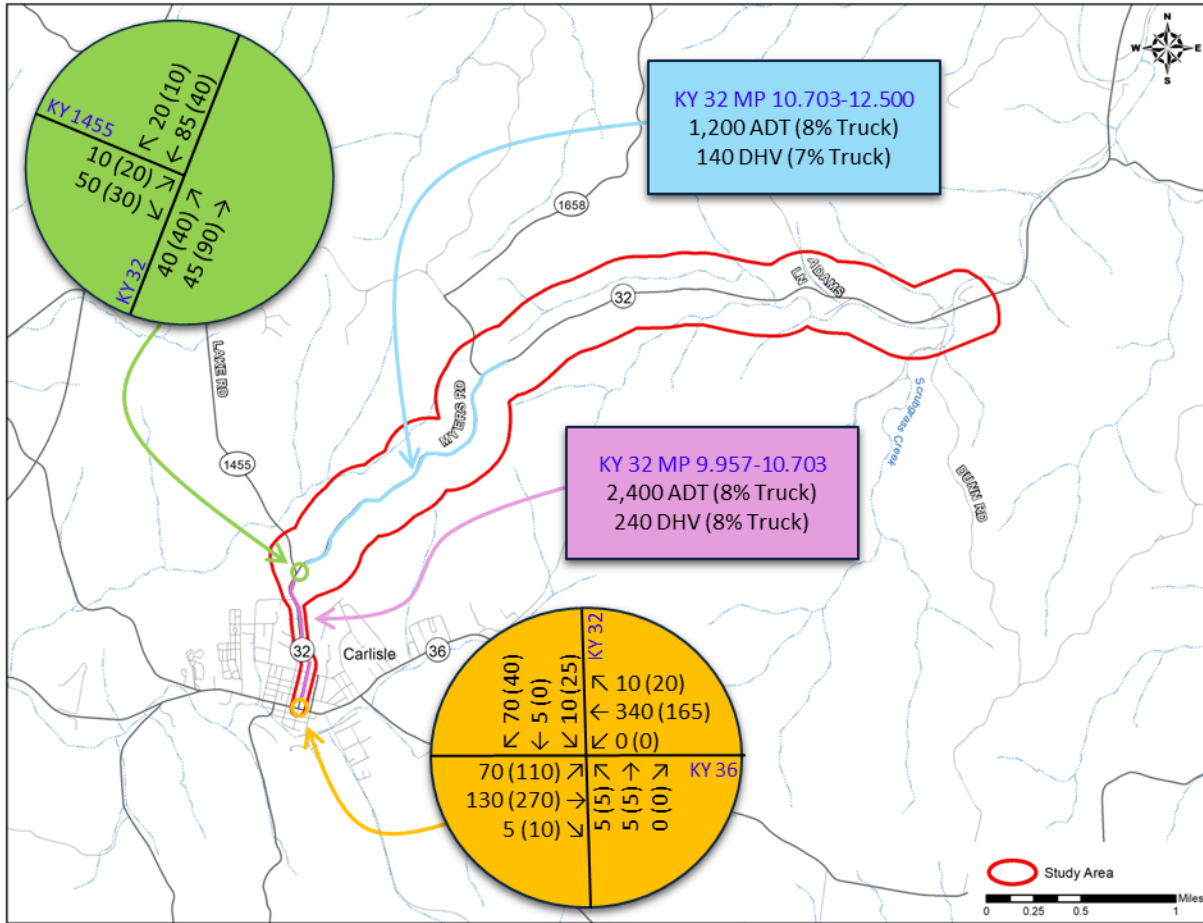


Figure 20: 2045 No-Build Traffic

### Traffic Operational Analyses

Two highway performance indicators, Level of Service (LOS) and volume-to-capacity (v/c) ratios, were calculated to assess traffic operations along the corridor. Computations were performed in accordance with current *Highway Capacity Manual* (HCM) procedures.

**Level of Service:** LOS serves as a qualitative measure to describe traffic conditions based on several metrics, including speed, travel time, freedom to maneuver, traffic interruptions, and overall comfort and convenience. As pictured in **Figure 21**, LOS A indicates free-flow conditions, high freedom to maneuver, and little or no delay. LOS F represents oversaturated traffic conditions beyond capacity, characterized by low travel speeds, limited freedom to maneuver, and lengthy delays.

LOS is measured for highway segments and for non-free-flow turn movements at intersections. Generally, LOS D is considered acceptable for urban areas and LOS C for rural areas.

**Volume-to-Capacity Ratio:** The v/c ratio compares a facility's traffic volume to its theoretical capacity over a specific duration, typically one hour. A v/c ratio exceeding 1.0 suggests the route has surpassed its capacity, potentially justifying the need for additional lanes.

Analysis showed no capacity concerns: today and through the 2045 analysis horizon, both study intersections operate at LOS A/B during AM and PM peak hours.







LEVEL OF SERVICE		DESCRIPTION
A		<ul style="list-style-type: none"> <li>Average Travel Speed.</li> <li>Free traffic flow with few restrictions on maneuverability or speed.</li> </ul> <p><b>NO DELAYS</b></p>
B		<ul style="list-style-type: none"> <li>Stable traffic flow.</li> <li>Speed becoming slightly restricted.</li> <li>Low restriction on maneuverability.</li> </ul> <p><b>NO DELAYS</b></p>
C		<ul style="list-style-type: none"> <li>Stable traffic flow, but less freedom to select speed, change lanes or pass.</li> </ul> <p><b>MINIMAL DELAYS</b></p>
D		<ul style="list-style-type: none"> <li>Traffic flow becoming unstable.</li> <li>Speeds subject to sudden change.</li> <li>Passing is difficult.</li> </ul> <p><b>MODERATE DELAYS</b></p>
E		<ul style="list-style-type: none"> <li>Unstable traffic flow.</li> <li>Speeds change quickly and maneuverability is low.</li> </ul> <p><b>MAJOR DELAYS</b></p>
F		<ul style="list-style-type: none"> <li>Heavily congested traffic.</li> <li>Demand exceeds capacity and speeds vary greatly.</li> </ul> <p><b>MAJOR DELAYS</b></p>

Figure 21: What is Level of Service?

### 3 Environmental Overview

The purpose of this environmental overview is not to quantify environmental impacts, but instead to identify potential environmental issues and risks to consider during the 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 may be required.

If there is a federal nexus (e.g., federal funds, lands, permits, etc.) on a future project, then the procedures established in 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 weighed to reach a decision that is in the best overall public interest.

Figure 22 provides a visual summary of environmental resources near the study corridor.

#### 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 most notable water resource is Scrubgrass Creek, which drains to the Licking River via Cassidy Creek just northeast of the study area. Unnamed tributaries on both sides of KY 32 feed into Scrubgrass Creek, following the rolling topography. North of KY 1658 (Stoney Creek Road), the study area lies within the Carlisle Water Department's source water protection area.

The National Wetlands Inventory records seven scattered wetlands, all of which are freshwater farm ponds, within the study area limits.

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

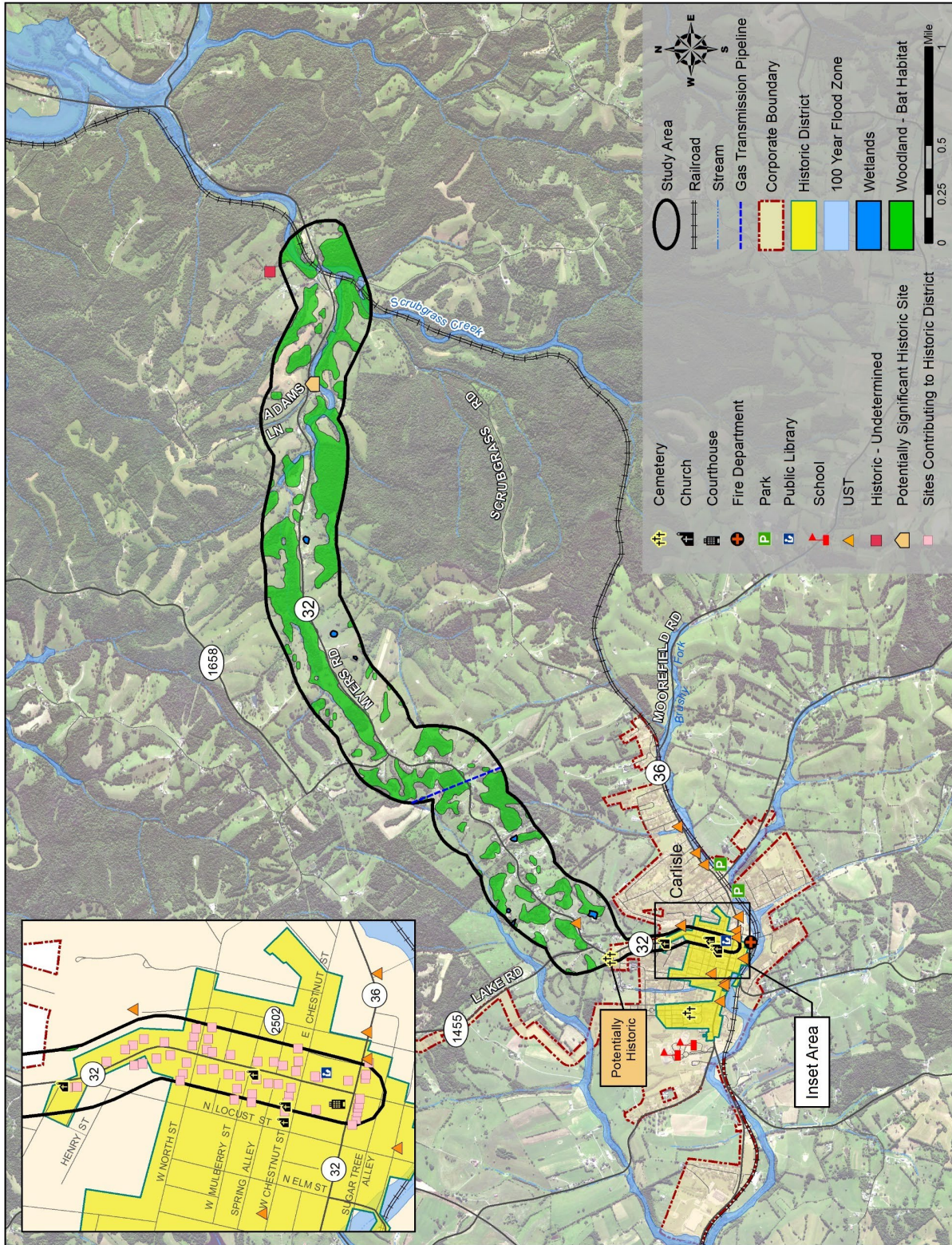


Figure 22: Environmental Overview Map

## Protected Species

The US Fish and Wildlife Service (USFWS) database lists federally protected species as endangered or threatened under the *Endangered Species Act*. Four listed bats, eight mussels, one insect, and one plant species potentially inhabit the study area. There is no critical habitat along the study corridor. **Table 4** lists current and potential threatened and endangered species in the area.

Table 4: Listed, Proposed, and Candidate Species

Group	Name	Scientific Name	Status
Mammals	Gray bat	<i>Myotis grisescens</i>	Endangered
	Indiana bat	<i>Myotis sodalis</i>	Endangered
	Northern long-eared bat	<i>Myotis septentrionalis</i>	Endangered
	Tricolored bat	<i>Perimyotis subflavus</i>	Proposed Endangered
Mussels	Northern riffleshell	<i>Epioblasma rangiana</i>	Endangered
	Longsolid	<i>Fusconaia subrotunda</i>	Threatened
	Clubshell	<i>Pleurobema clava</i>	Endangered
	Fanshell	<i>Cyprogenia stegaria</i>	Endangered
	Pink mucket	<i>Lampsilis abrupta</i>	Endangered
	Round hickorynut	<i>Obovaria subrotunda</i>	Threatened
	Snuffbox	<i>Epioblasma triquetra</i>	Endangered
	Salamander mussel	<i>Simpsonaias ambigua</i>	Proposed Endangered
Insect	Monarch butterfly	<i>Danaus plexippus</i>	Candidate
Plant	Short's goldenrod	<i>Solidago shortii</i>	Endangered

A habitat assessment may be needed in the early stages of project development for future project(s) to assess potential project impacts 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. KYTC maintains a *Programmatic Conservation Memorandum of Agreement for Forest Dwelling Bats* to streamline measures to minimize impacts for Indiana and northern long-eared bats. 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 Soil Classifications

Natural Resource Conservation Service (NRCS) classifies farmlands based on soil type. As shown in **Figure 23**, 7% of study area soils qualify as farmlands of statewide importance, with another 1–7% classified as prime farmlands. No 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 is required.

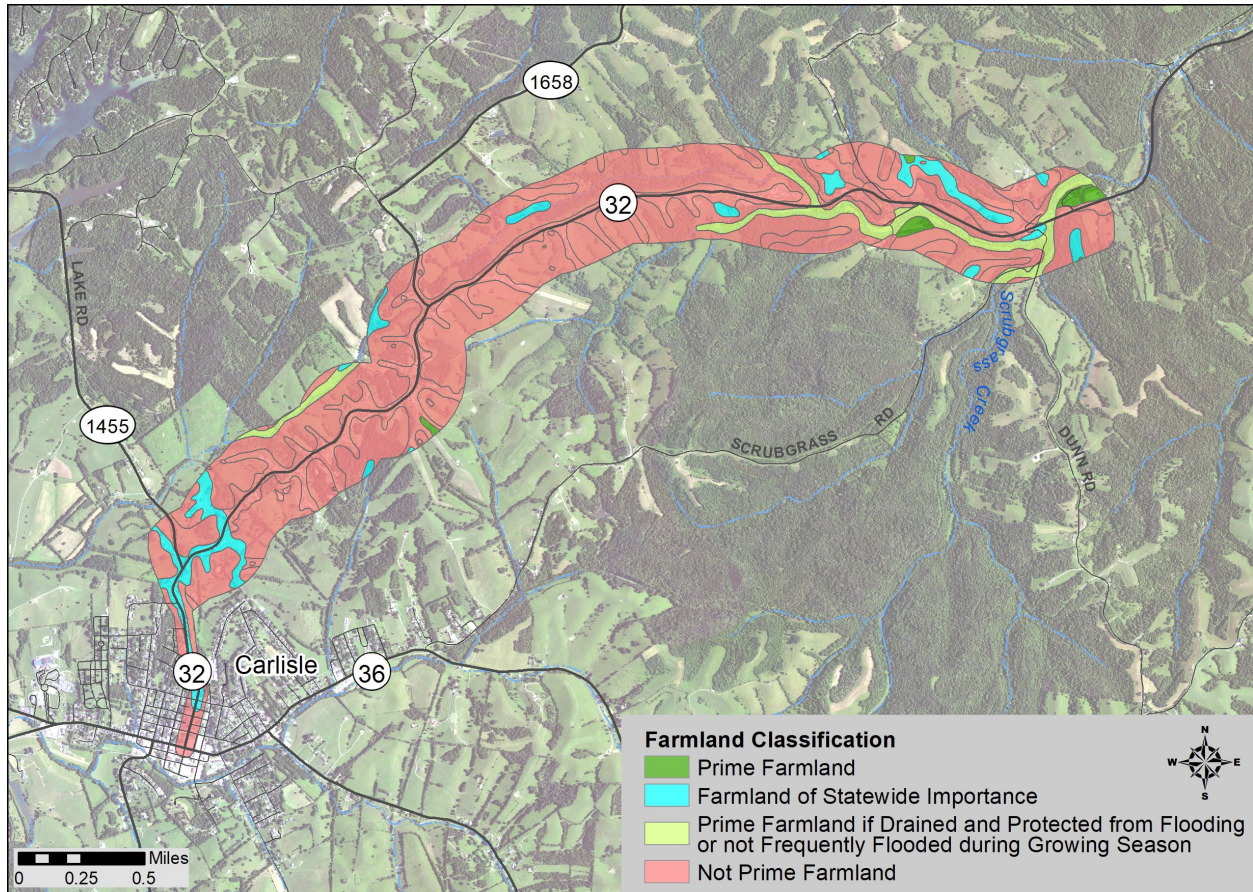


Figure 23: Farmland Soil Classifications

## Geotechnical Considerations

KYTC provided a *Geotechnical Overview Report* to identify anticipated bedrock, soil, and geomorphic features along the alignment, emphasizing geotechnical factors that could affect future projects. Study findings are summarized here, with a full report in **Appendix C**.

The study corridor features interbedded limestone, shale, and siltstone. Residual soils derive from weathering of limestone, dolomitic limestone, and shale, displaying diverse characteristics such as flaggy silty clay prone to erosion on moderate slopes, rocky terrain, and silt loams susceptible to flooding on gentler slopes. Recent reports describe soils as medium stiff clay with rock fragments.

Located in the Outer Bluegrass Physiographic Region, the project area is predisposed to karst features, notably in the western section near a mapped high karst area. Common springs between limestone and shale beds are observable during heavy rainfall. Any discovered sinkholes or springs require documentation. Landslides in 2019 affecting specific roadway segments were attributed to groundwater movement, poor rock mass quality, steep slopes, and construction practices. Geologic mapping shows a west-southwest dip of underlying bedrock without significant faults or structural features.

Geotechnical considerations for the project include varying slope designs based on bedrock durability and soil conditions to mitigate instability, erosion, and construction challenges. Management of water wells, springs, and potential karst features is crucial for environmental preservation and structural integrity. Detailed geotechnical assessments will inform specific requirements for embankments, cut slopes, and structural elements should a project advance. Geotechnical drilling will be essential for assessing cut/fill areas and structures, with attention to existing pavement structure for widening projects. Chemical modification of soils may not be possible, necessitating granular subgrade use, and sampling of foundation soils is crucial for embankment scenarios.

### Hazardous Materials

Windshield surveys paired with review of online databases monitored by the US Environmental Protection Agency (USEPA) identified minimal hazardous materials concerns within the study area. Downtown Carlisle is home to a few gas stations and other commercial businesses with underground storage tanks (USTs) but none immediately adjacent to the study corridor. Records indicate most have been closed.

US EPA records also show a UST along KY 32 north of its KY 1455 intersection. Field observations noted an aboveground storage tank and informal dump site south of a diner (181 Myers Road) that could pose a concern.

Due to the age of structures and prevalence of agricultural land uses, aboveground storage tanks, improperly stored pesticides/herbicides, informal waste disposal sites, and structures containing asbestos could be encountered should build concepts require additional right-of-way.

### Air Quality Considerations

USEPA monitors National Ambient Air Quality Standards (NAAQs) for six criteria pollutants: ozone, lead, nitrogen dioxide, sulfur dioxide, carbon monoxide, and particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>). The region is currently in attainment for all criteria pollutants monitored by the USEPA.

To prove air quality conformity, federally funded transportation projects recommended for further development should be modeled and included in KYTC's statewide transportation improvement program (STIP) to ensure conformity requirements are satisfied.

Future federal projects may need to address potential Mobile Source Air Toxics (MSAT) impacts based on the project type. FHWA has developed a tiered approach for three categories to analyze MSATs in NEPA documents, depending on specific project circumstances. The three tiers 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 one of the lower two categories.

## 3.2 Human Environment

The human environment includes people and the resources they define: land use, community features, cultural historic resources, etc. Each could potentially be affected by future projects. The following sections



identify these resources for consideration during any future project development phases. **Figure 22** shows corresponding locations.

## Land Use and Community Resources

Beginning at the southwest edge of the study area, land use in downtown Carlisle is a mix of civic and commercial uses, with the densest development along KY 36 (Main Street) and the first block of KY 32. The courthouse square is bound by Main, Broadway, Chestnut, and Locust streets, immediately west of the KY 32 corridor. The county's new judicial center and a public library front the corridor to the east. North of Chestnut Street, adjacent land uses are more residential with a few churches interspersed. Development densities decrease north of North Street, as the area transitions to a more rural residential and agricultural setting for the remainder of the route. A large cemetery is west of KY 32, located between Green Valley Road and KY 1455 (Lake Road).

City services are based at the county courthouse or City Hall, located just to the north. Public schools in the county are located on the west side of downtown, north of the other KY 32/KY 36 intersection. The nearest medical facilities are found in Cynthiana and Paris.

## Historic Resources

Section 106 of the *National Historic Preservation Act* requires federal agencies to consider impacts to historic properties when making project decisions, in coordination with the State Historic Preservation Office (SHPO).

A *Cultural Historic Overview* (**Appendix D**) was completed for the study area to identify properties listed or eligible for listing on the National Register of Historic Places (NRHP). A records review found 75 previously surveyed resources within or adjacent to the study area, including the NRHP-listed Carlisle Historic District that includes 350+ buildings. Listed in 1989, the Historic District demonstrates a period of significance of 1816 to 1939 associated with its community planning and development, commerce, transportation, and government/politics. Review of portions of the district within the 9-8812 study area revealed eight resources on the nomination form have since been demolished and one has been altered to the extent it is likely no longer a contributing element. The district boundary is shown in yellow in **Figure 22**.

Field work during October 2023 identified two potentially significant resources (**Figure 24**) not originally included in the NRHP nomination form for the district:

- NI 16 on Bretz Lane appears to be a log house built in two sections and subsequently covered with siding but that merits further examination.
- Henryville African American Cemetery, located west of KY 32 between Green Valley Road and KY 1455 (Lake Road). The cemetery contains 639 burials with the earliest legible marker dating to 1885.



Figure 24: Potentially Significant Historic Resources

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

### Section 4(f)

Section 4(f) of the *Department of Transportation Act* is a substantive law that applies to federally funded projects using land from publicly owned public parks, recreation areas, and wildlife or waterfowl refuges; and publicly or privately owned historic sites eligible for or listed on the NRHP. Section 4(f) requires that transportation projects avoid use of such protected properties unless no feasible and prudent alternative exists and project planning minimizes harm to Section 4(f) sites.

Section 4(f) protected properties within the study area include any historic resources that may meet NRHP criteria. No parks or wildlife/waterfowl refuges are found within the study area.

### Section 6(f)

The *Land and Water Conservation Fund (LWCF) Act* was established to safeguard natural areas, water resources, and cultural heritage, and to provide recreation opportunities. The fund helps strengthen communities, preserve history, and protect the national endowment of lands and waters. The LWCF provides federal grants to acquire land for outdoor recreation, protect important natural areas, and develop or renovate outdoor recreation facilities (e.g., campgrounds, picnic areas, swimming facilities, etc.). Section 6(f) of the LWCF Act addresses protection from permanent conversion of outdoor recreation property acquired or developed using LWCF funds. Impacts must be addressed when projects result in permanent conversion of grant-assisted facilities. No Section 6(f) investments lie along the study corridor.

### Socioeconomic Profile

BGADD completed a socioeconomic study for the corridor (**Appendix E**) to highlight potential areas statistically likely to contain elevated concentrations of minority, elderly, low-income, limited English proficiency (LEP), and/or disabled populations. The study area covers portions of five US Census block

groups in two Census tracts, shown in **Figure 25**. Statistics are summarized in **Table 5**, reported from 2022 American Community Survey five-year estimates. Concentrations for the encompassing county serve as the reference threshold, highlighting any block group populations exceeding this level.

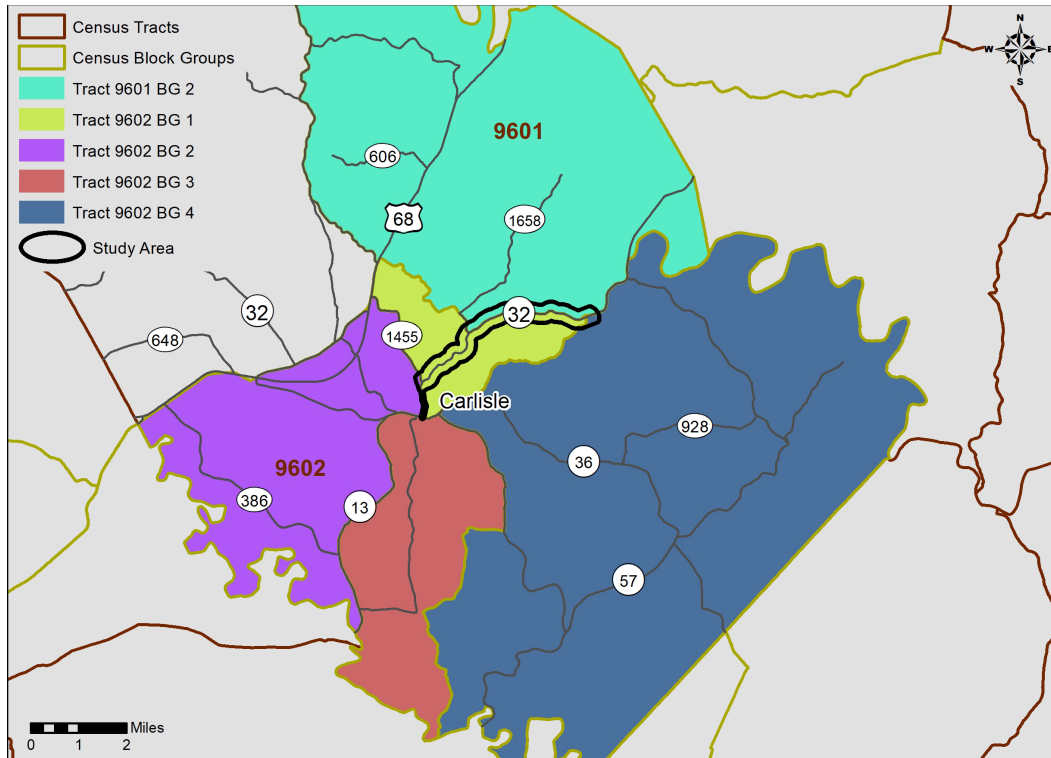


Figure 25: Census Geographies

Table 5: Socioeconomic Metrics for Study Area Block Groups

Geography	Population	Minority	Low-Income	Age 65+	Disabled	LEP
US	331,097,593	41.1%	12.5%	16.5%	15.4%	8.2%
Kentucky	4,502,935	16.8%	16.1%	16.8%	21.1%	2.4%
Nicholas Co.	<b>7,613</b>	<b>4.2%</b>	<b>16.2%</b>	<b>16.9%</b>	<b>24.3%</b>	<b>1.1%</b>
CT9601 BG2	1,189	3.4%	9.0%	9.5%	23.5%	0.0%
CT9602 BG1	1,046	2.7%	<b>25.9%</b>	<b>17.3%</b>	<b>29.6%</b>	0.0%
CT9602 BG2	1,291	<b>9.8%</b>	11.6%	<b>29.2%</b>	<b>26.5%</b>	0.0%
CT9602 BG3	1,038	1.6%	8.7%	11.0%	17.4%	0.0%
CT9602 BG4	2,192	<b>4.8%</b>	<b>17.4%</b>	13.8%	20.3%	<b>3.6%</b>

As shown, three of five block groups exceed the county threshold in one or more demographic categories.

- Tract 9602 Block Group 1 covers the bulk of the study area, with elevated concentrations of low-income, age 65+, and disabled populations.
- Tract 9602 Block Group 2, covering the west side of KY 32 south of KY 1455, exhibits elevated concentrations of minority, age 65+, and disabled populations.

- Tract 9602 Block Group 4, covering a small portion near the northeastern study area limits, has higher concentrations of minority, low-income, and LEP populations.

It should be noted that block groups encompass much larger areas than the study area limits with most of their population beyond the narrow study area limits.

### Noise Considerations

Federally funded transportation projects typically require consideration of noise impacts. Noise sensitive receptors include residential areas, parks, cemeteries, hospitals, churches, schools, etc. Commercial properties with exterior uses can also be considered noise sensitive. Specific traffic noise impact analyses may be needed as part of future project development activities if projects are shown to add capacity or shift traffic closer to sensitive receptors.

As the corridor has access by permit with cross-streets and driveways providing access to adjacent low density land uses, it is unlikely that noise mitigation measures would be recommended even if noise increases were predicted.

## 4 Initial Coordination Efforts

The project team, consisting of representatives from KYTC Central Office, KYTC District 9, BGADD, and the consultant, coordinated key tasks and engaged with local officials and stakeholders (LO/S) to explore existing conditions and discuss transportation needs. Meeting summaries are arranged chronologically in **Appendix F**.

### 4.1 First Project Team Meeting

The project team met November 20, 2023, in Flemingsburg to review existing conditions data and prepare for the first LO/S coordination meeting. The team assessed area planned projects, past studies, and current conditions (including roadway geometry, traffic flow, crash trends, and environmental resources) as detailed in **Chapters 2 and 3**.

### 4.2 First Local Official/Stakeholder Meeting

On February 13, 2024, the project team met with LO/S to present an overview of existing roadway conditions and to gather local insights on transportation needs in the study area.

Key discussion topics covered were:

- Two planned developments—a nursing home (80-90 jobs) and a slaughterhouse (40-50 jobs)—should be included in future year traffic forecasts. Additionally, a potential Nicholas/Bourbon industrial park along Carpenter Pike and the future widening of US 68 may create more economic opportunities for the area.
- The corridor lacks safe pull-off areas for activities like using cell phones or allowing slower-moving farm equipment to let cars pass.
- The curve at KY 1658 (Stoney Creek Road) is a safety concern. Heavy rain events cause nearby water lines to slip as topsoil slides off the underlying clay.

## 5 Concept Development

Based on the data collection results described in previous sections, analysts explored study goals then defined potential improvement concepts to address identified needs.

### 5.1 Study Goals & Objectives

A review of existing conditions paired with LO/S coordination helped define the main goal and secondary objectives driving this planning effort.

Study area needs are driven by safety over mobility and should accommodate all user types. For the developed stretch within the city, this includes a focus on intersections and pedestrian connectivity. For the rural stretch, Build concepts should address systemic safety risks like narrow typical sections, sharp curves, and pavement deficiencies.

### 5.2 Initial Concepts Descriptions

Improvement concepts were grouped into four categories, summarized in **Table 6** followed by descriptions of each.

Table 6: Initial Improvement Concept Groupings

In Town	Low-Cost
<ul style="list-style-type: none"> <li>a. KY 32/KY 36 Pedestrians</li> <li>b. Midblock Crosswalks</li> <li>c. Define Striping</li> </ul>	<ul style="list-style-type: none"> <li>a. 6-inch Thermo Striping</li> <li>b. Chevrons for Curves</li> <li>c. KY 32/KY 1455 Striping</li> <li>d. Add Guardrail</li> <li>e. Optical Speed Bars</li> </ul>
Medium Impact	Reconstruction
<ul style="list-style-type: none"> <li>a. Pull-offs</li> <li>b. Systemic Visibility Inside Curves</li> <li>c. KY 32/KY 1658 (Stoney Creek Road)</li> <li>d. Widen/Realign Curves</li> </ul>	<ul style="list-style-type: none"> <li>a. 45 mph Reconstruction</li> </ul>

### In-Town Concepts

In-town concepts aim to enhance safety, mobility, and overall usability of the town's transportation network, making it more accessible and efficient for all users.

- a. **KY 32/KY 36 Pedestrian Enhancements:** Improve accessibility and safety for all road users at the KY 32/KY 36 intersection. This includes curb extensions to shorten crossing distances, high-visibility crosswalks, and parking restrictions to enhance sightlines and reduce potential conflicts between pedestrians and vehicles.

- b. **Mid-Block Crosswalks:** Construct midblock crossings to the east and north of the courthouse. The Chestnut Street crossing links the county courthouse to city services and churches, avoiding a significant grade differential (**Figure 26**) that limit ADA compliance at the KY 32 intersection. The link east across KY 32 connects the courthouse and judicial center.



Figure 26: Grade/Stairs at  
KY 32/Chestnut St

- c. **Define Striping:** Add 6-inch striping for edge lines and centerlines to define driving lanes through town, including stop bars at cross-streets. Parking spaces nearest intersections should be eliminated with cross-hatching to discourage use and improve visibility.

### Low-Cost Improvements

For the rural section of the study corridor, these low-cost concepts focus on enhancing road safety and visibility through strategic pavement striping, signage, and speed reduction measures.

- a. **6-Inch Thermo Striping:** Improve travel-lane visibility on rural two-lane highways by installing wider edge lines using 6-inch thermoplastic striping. This is a Proven Safety Countermeasure,<sup>6</sup> which can lead to a 37% reduction in fatal and injury crashes by enhancing lane visibility, especially in low light conditions.
- b. **Chevrons for Curves:** Install chevrons and additional signage at class D and E horizontal curves. FHWA research shows this countermeasure can reduce fatal and injury crashes by 16% overall and by 25% during nighttime conditions.



Figure 27: KY 1455 Striping

- c. **KY 32/KY 1455 (Lake Road) Striping:** Restripe skew approach (**Figure 27**) to improve safety and traffic flow, making it easier and safer for vehicles to navigate.

- d. **Add Guardrail:** Widen shoulders and install new guardrail in areas with 2:1 or steeper slopes. Planning-level investigations suggest this would include approximately 3,400 feet broken into 26 linear sections.

- e. **Optical Speed Bars:** Reduce vehicle speeds approaching the diner (MP 10.8) with optical speed bars, which are

<sup>6</sup> Online at <https://highways.dot.gov/safety/proven-safety-countermeasures>

transverse stripes spaced at gradually decreasing intervals, creating an optical illusion of increasing speed to prompt drivers to slow down. **Figure 28** shows an example of this countermeasure.



Figure 28: Optical Speed Bars

### Medium Impact Concepts

For the rural section of the study corridor, these mid-size improvement concepts enhance road safety and functionality but require larger investments than the Low-Cost category, including impacts to adjacent properties.

- a. **Pull-offs:** Provide paved area for low-speed vehicles to pull off the roadway. Requested by LO/S, these pull-offs provide a refuge for motorists to use cell phones safely and enable slower moving farm equipment to let faster vehicles pass. Two representative locations were considered: one per direction near the corridor midpoint, sited in a tangent stretch to promote visibility.
- b. **Systemic Visibility Inside Curves:** Improve visibility and safety at horizontal curves by trimming vegetation, flattening outcrops, and widening shoulders. As FHWA Proven Countermeasures,<sup>6</sup> these improvements can reduce curve crashes by 35% to 66%.

- c. **KY 32/KY 1658 (Stoney Creek Road) Intersection:** Improve visibility and safety by reconstructing the intersection and adjacent curves. The planning-level concept (**Figure 29**) assumes a wider typical section: 11-foot-wide driving lanes and 4-foot-wide paved shoulders to increase recovery areas and usable shoulders. One nearby home would be relocated.



Figure 29: KY 32/KY 1658 Reconstruction

- d. **Widen and Realign Curves:** Of the 31 Class C, D, and E curves along the route, seven improvement sections were considered for realignment (**Figure 30**). Planning-level concepts assume a wider typical section: 11-foot-wide driving lanes and 4-foot-wide paved shoulders; each would result in at least one relocation. Realigning curves can reduce crashes within the specific curve but can also encourage faster travel speeds that could prove problematic if downstream curves are not likewise addressed.



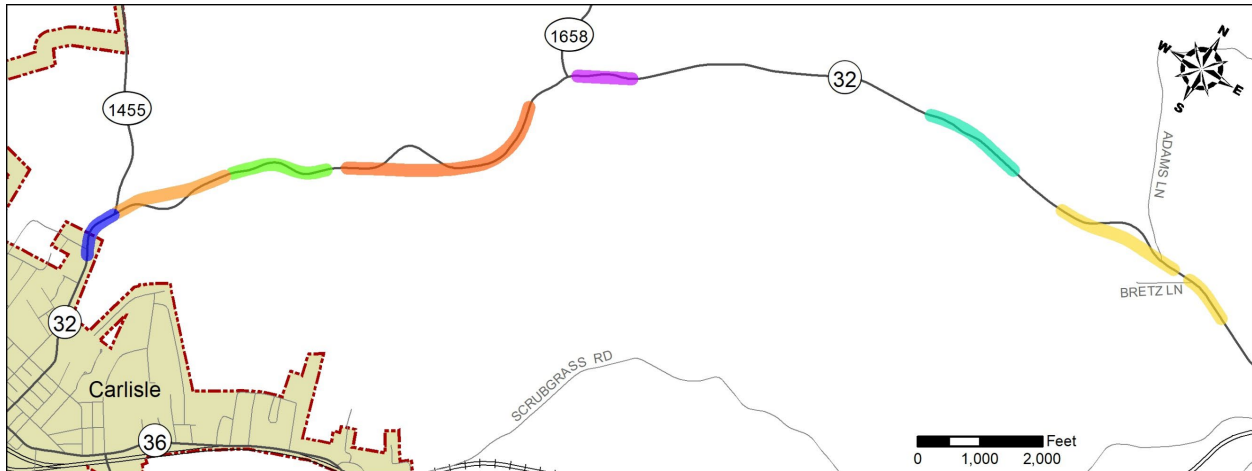


Figure 30: Seven Curve Realignment Sites

### Corridor Reconstruction

As a comparison point, costs and impacts to upgrade the entire rural corridor to a consistent 45 mph design speed were developed, providing 11-foot-wide driving lanes and 4-foot-wide paved shoulders throughout the corridor. Construction costs and impacts to adjacent properties are considerably higher than with Build concepts presented above.

### 5.3 Second Project Team Meeting

The project team met again May 17, 2024, in Flemingsburg to discuss the initial Build concepts.

Key discussion topics included:

- Even with curb extensions, downtown turning radii should accommodate truck traffic.
- Addressing curve sections may increase travel speeds and change driver expectations. The corridor is consistently curvy today, but larger new alignment sections add conflict points at oxbows.
- From KY 1658 (Stoney Creek Road), stopping sight distance meets 55 mph turning right (towards Carlisle) and 45 mph turning left (away from town). Stoney Creek Road carries 218 vpd as of its 2022 count.
- Team members expressed concerns that optical speed bars may be unfamiliar to motorists and could cause confusion. Additionally, according to the FHWA's Speed Management Manual for Local Rural Road Owners, optical speed bars typically reduce speeds by only 2 mph on average and should be used sparingly to preserve their effectiveness. The team agreed to dismiss this measure from further consideration.
- Costs and impacts for the 45-mph reconstruction would be significant but the concept should be carried forward as a comparison point through the planning study, even if not recommended.

## 6 Final Coordination Meetings

After developing initial improvement concepts discussed in **Section 5.2**, the project team engaged with local leaders to gather feedback on proposed Build concepts. This outreach was crucial for understanding community perspectives and refining concepts to better address local priorities and challenges.

### 6.1 Second Local Official and Stakeholder Meeting

The project team presented proposed improvement concepts to LO/S on July 9, 2024, at the Nicholas County Courthouse in Carlisle. As a result of these discussions, three additional concepts were added to the Build list for prioritization.

Category	Description
In Town D	Replacing both signals south of the courthouse with all-way stops to help slow traffic through downtown. At KY 32/KY 36, all movements operate at LOS A/B during both peak hours; however, detailed traffic data is not available at the KY 36/Locust Street intersection as it lies beyond the study corridor.
Low-Cost F	Existing pavement near Henryville is several inches higher than the adjacent sidewalk, creating drainage issues. The Build concept reconstructs approximately 1,600 feet of sidewalk and restores curb/gutter to operable condition.
Med Impact B*	Trim trees and cut back steep sideslopes to improve visibility near Adams Lane. This location is one of the systemic measures in Medium Impact Concept B originally but was broken out as a standalone improvement due to LO/S interest.

Other key discussions items during the meeting included:

- The city is looking to replace some waterlines through downtown; any future sidewalk projects should be coordinated to minimize rework.
- Adding signage along the corridor complicates right-of-way mowing.

Consensus among attendees found realigning the intersection/curves at KY 1658 (Stoney Creek Road) is the top priority. Visibility at Adams Lane, restriping KY 1455 (Lake Road), and the northernmost two curve realignments are also priorities of the options discussed.

### 6.2 Cost Estimates

Planning-level designs for the Build corridors were used to estimate preliminary quantities for high-cost construction items such as earthwork and pavement. Construction costs were calculated using average unit bid prices from Bid Express for projects in Nicholas and surrounding counties since January 2021. Parametric factors were applied to account for other costs related to drainage, traffic control, mobilization, and miscellaneous items. A 30% contingency was also added to the overall construction costs. KYTC District 9 provided right-of-way and utility cost estimates, based on conceptual disturbance

limits, aerial imagery, approximate property line locations, and utility records. Estimates reflect 2023 dollars with details included in **Appendix G**.

**Table 7** summarizes planning-level cost estimates by project phase (design, right-of-way acquisition, utility relocations, and construction).

Table 7: Cost Estimates by Phase (2023 Dollars)

Concept	Phase and Total Costs				
	D	R	U	C	TOTAL
<b>IN TOWN</b>					
a. KY 32/KY 36 Pedestrians	\$30k	-	-	\$240k	\$270k
b. Midblock Crosswalks	\$20k	-	-	\$60K	\$80K
c. Define Striping	\$15k	-	-	\$150k	\$165k
d. Four-way Stops	\$5k	-	-	\$50k	\$55k
<b>LOW-COST</b>	<b>D</b>	<b>R</b>	<b>U</b>	<b>C</b>	<b>TOTAL</b>
a. 6" Striping	\$30k	-	-	\$310k	\$340k
b. Curve Signage	\$10k	-	-	\$70k	\$80k
c. KY 1455 Striping	\$10k	-	-	\$30k	\$40k
d. Additional Guardrail	\$400k	\$100k	\$50k	\$4.0M	\$4.6M
f. Henryville Sidewalks	\$100k	\$100k	\$150k	\$900k	\$1.3M
<b>MEDIUM IMPACT</b>	<b>D</b>	<b>R</b>	<b>U</b>	<b>C</b>	<b>TOTAL</b>
a. Pull-offs	\$100k	\$60k	\$120k	\$500k	\$780k
b. Hillsides/Vegetation	\$100k	\$250k	\$200k	\$1.0M	\$1.6M
b* Hillside/Vegetation at Adams Ln	\$25k	\$50k	\$75k	\$200k	\$350k
c. Stoney Creek Intersection	\$400k	\$350k	\$650k	\$3.6M	\$5.0M
d. Widen/Realign Curves	\$2.0M	\$2.0M	\$1.0M	\$18M	\$23.0M
<b>CORRIDOR RECONSTRUCTION</b>	<b>D</b>	<b>R</b>	<b>U</b>	<b>C</b>	<b>TOTAL</b>
a. 45 mph design speed	\$4.5M	\$6.0M	\$4.5M	\$46.0M	\$61.0M

## Potential Funding Streams

Traditionally, most funds for highway projects statewide are allocated within the biennial Highway Plan, competing against other projects through the SHIFT process. Beyond SHIFT, a range of other federal grants and other funding streams align with specific project types and could represent other mechanisms to advance smaller projects. A brief discussion follows, with notes on projects sheets in **Section 7.1** to suggest which Build Concepts could align with which programs.

### Within SHIFT/Highway Plan

- The federal Surface Transportation Block Grant (**STBG**) program provides flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway; bridge and tunnel projects on any public road; pedestrian and bicycle

infrastructure; and transit capital projects, including intercity bus terminals. The annual budget is around \$250 million.

- State Priority Projects (SPP) funds target high priority construction projects based on prioritized needs. The annual budget varies but can be over \$1 billion.

#### State-Managed Funds Beyond SHIFT/Highway Plan

- The federal Highway Safety Improvement Program (HSIP) targets strategic, data-driven safety applications with over \$50 million for Kentucky annually. Generally, HSIP funding is allocated to state departments of transportation with a 10% local match. However, under 23 USC 120(c)(1), federal funds up to 100% can be used for certain HSIP projects including retroreflective signing, pavement marking, and more. Funding is overseen by the KYTC Division of Traffic Operations, with an Investment Plan establishing funding allocations for intersections, roadway departure corridors, and vulnerable roadway users.
- The federal Transportation Alternatives Program (TAP) is available for non-motorized transportation projects like sidewalks, trails, bike lanes, etc. Traditionally, there is a 20% local match although the GRANT Program of 2024<sup>7</sup> provides competitive funding to offset the local match. TAP is managed through the KYTC Office of Local Programs with applications collected each Spring.
- Limited FE01 maintenance funds are allocated to each District to address low-cost repairs like striping or roadside clearing. A similar FE02 budget covers bridge maintenance needs.
- Limited FE04 funds are available to the Division of Traffic Operations to improve signal systems, lighting, and similar operational measures.
- Pavement overlays and striping projects can be funded through FD05 funds, overseen through the Division of Maintenance.
- The Department of Rural and Municipal Aid oversees a small FD39 budget that focuses on local needs, covering a broad range of maintenance and improvement projects to address hazards, enhance safety, or promote economic development. The annual budget is around \$10 million.

#### Other Federal Grant Opportunities

The *Infrastructure Investment and Jobs Act* (IIJA), also known as the *Bipartisan Infrastructure Law*<sup>8</sup>, provides federal highway programs more than \$350 billion over a five-year period (fiscal years 2022–2026). Most of this funding is distributed to states based on formulas spelled out in legacy programs such as the Federal-aid Highway Program and HSIP. However, funds may also be provided through competitive grant programs. The [Grants.gov](https://www.grants.gov) website provides a one-stop shop for information on available grant programs across multiple agencies, including a feature to search by keyword.

---

<sup>7</sup> Online at <https://ced.ky.gov/grant>

<sup>8</sup> Online at <https://www.fhwa.dot.gov/bipartisan-infrastructure-law/funding.cfm>

For example, the Safe Streets for All (**SS4A**) program is open to MPOs, local, and Tribal governments to develop or implement projects from a Comprehensive Safety Action Plan. The program is funded with about \$1 billion per year nationally with a 20% local match component. However, a project must be from the local/regional Action Plan to be eligible for SS4A implementation funding. The next cycle of applications is anticipated to open in March 2025.

Rebuilding American Infrastructure with Sustainability and Equity (**RAISE**) grants support multi-modal, multi-jurisdictional projects with a significant national, regional, or local impact that are difficult to support through traditional programs. Applications require a solid benefit-cost analysis to compete; awards start at \$1 million for rural areas.

### 6.3 Environmental Impacts

In addition to monetary costs, effects on the human and natural environment were also considered during Build options evaluation.

Each of the four In Town Build concepts are contained within existing pavement, resulting in minimal impacts. Three of the four would result in fewer parking spaces along KY 32 or KY 36, each taking 3-6 spots to improve pedestrian safety.

Three of the five Low-Cost Build concepts result in minimal impacts.

- Low-Cost D (Adding guardrail) will require narrow strips of new right-of-way to accommodate shoulder widening. As most buildings are well set back from the roadway, this should have few impacts to adjacent property owners, depending on final disturb limits. Nearby vegetation could represent bat habitat.
- Low-Cost F (Henryville sidewalks) lies at the northern limits of the Historic District, requiring consultation with SHPO if federal funds are used. Utility poles along the existing sidewalk and houses with shallow front yards may require special attention during construction to minimize impacts.

Larger in scale, concepts in the Medium Impact category result in greater potential impacts.

- Medium Impact A (Pull-offs) locations were selected near the corridor midpoint within tangent stretches. Terrain at locations selected will influence disturb limits and resulting impacts. Assumed locations for planning-level concepts will require additional right-of-way and may impact scattered trees (potential bat habitat). The northbound location includes a water line crossing.
- Medium Impact B (Systemic Tree/Slope Clearing) will impact potential bat habitat. Some locations where sideslopes are flattened will include new right-of-way acquisitions or easements.
- Medium Impact C (KY 32/KY 1658 Intersection) will require new right-of-way acquisition and relocates one residential property.

- Costs and impacts for the seven curve realignments (Medium Impact D) are summarized by location in **Table 8**. Colored dots in the first column correspond to shaded limits in **Figure 30** (page 32), arranged from southwest to northeast along the corridor.

Table 8: Costs/Impacts for Curve Realignments

Location	Approx MP	DRUC Cost	Relocations	Crashes
• by Green Valley	10.5-10.7	\$1.3M	2 residences	0
• by Lake Rd	10.7-11.1	\$6.2M	1-2 residences	0
• Curves 8-10	11.1-11.4	\$2.3M	1 residence	5
• Curves 12-15	11.5-12.1	\$6.0M	4 residences	4
• by Stoney Creek	12.3-12.5	\$1.9M	1 barn	0
• Curves 25-26	13.4-13.7	\$2.4M	1 residence + 1 barn	0
• by Adams Ln	13.9-14.6	\$3.6M	1 residence	4

The potentially historic “NI 16” log home is located adjacent to the Adams Lane curve realignment but is beyond the disturb limits of the planning-level concept. The realignment will impact the culvert (091B00009N) carrying KY 32 over a branch of Scrubgrass Creek.

The full corridor reconstruction has the largest footprint and would relocate an estimated 20+ residences along the route, significantly changing the character of the corridor. Earthwork quantities include 480,000 cubic yards of cut and 660,000 cubic yards of fill, disturbing the environmental and community features associated with this area—bat habitat, utility lines, a cemetery, etc.

## 6.4 Third Project Team Meeting

The project team met August 27, 2024, to review study findings and reach consensus on priorities

Key discussions related to improvement concepts consisted of the following points:

- Temporary striping and bollards could be used for pedestrian improvements at KY 32/KY 36 instead of a more permanent solution; however, interim measures are unlikely to meet ADA requirements.
- Henryville sidewalk repairs could be a candidate for a city or county project, possibly eligible for Transportation Alternatives Program (TAP) funding.
- Realigning curves would be less effective if done piecemeal, as individual curves are closely spaced and should be addressed together. District staff favored combining the curve realignments into a single project, adjusting limits as needed as funding becomes available.
- Costs and impacts associated with the 45-mph reconstruction would be significant. This concept is not recommended to advance.

## 7 Recommendations

This KY 32 Corridor Study resulted in a range of conceptual improvements recommended for future implementation. Study area needs are driven by safety over mobility and should accommodate all user types. **Table 9** summarizes prioritization results, incorporating traffic operations, safety considerations, project team input, and other factors. High, medium, and low priorities are assigned relative to other Build concepts within the study area. Other highway corridors throughout the district and state carry higher traffic volumes and demonstrate more severe crash trends than the study section of KY 32, representing more critical needs within the larger transportation system.

Table 9: Project Team Recommendations

Concept	DRUC Cost	Priority
<b>IN TOWN</b>		
a. KY 32/KY 26 Pedestrians	\$270k	Low
b. Midblock Crossings	\$80k	Low
c. Define Striping	\$165k	Medium
d. Four-way Stops	\$55k	High/Traffic data needed
<b>LOW-COST</b>		
a. 6" Striping	\$340k	Low/with Resurfacing
b. Curve Signage	\$80k	Medium
c. KY 1455 Striping	\$40k	Medium
d. Additional Guardrail	\$4.6M	Low
f. Henryville Sidewalks	\$1.2M	Medium
<b>MEDIUM IMPACT</b>		
a. Pull-offs	\$780k	Medium
b. Hillsides/Vegetation	\$1.6M	High
b* Adams Ln Hill/Vegetation	\$350k	Medium
c. Stoney Creek Intersection	\$5.0M	Medium
d. Widen/Realign Curves	\$23M	Medium
<b>RECONSTRUCTION</b>		
a. 45 mph design speed	\$61M	Dismiss

The corridor reconstruction concept using a 45-mph design speed template was considered but dismissed due to the excessive costs and significant environmental and property impacts.


### 7.1 Project Sheets

This section contains project sheets for each recommended concept.


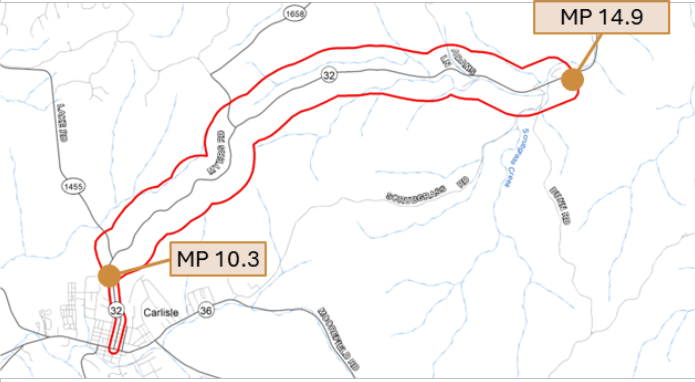
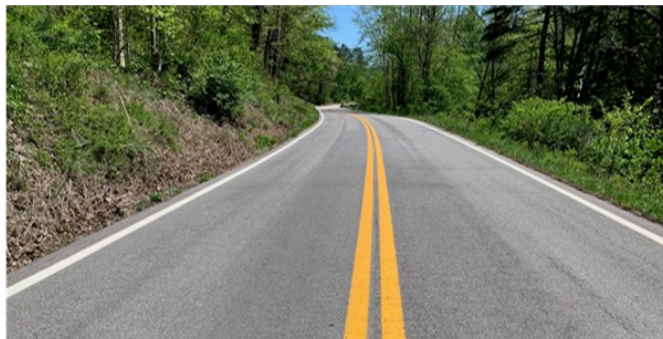
Nicholas 9-8812		KY 32/36 Pedestrian Improvements (KY 32 MP 9.957/KY 36 MP 4.118)		IN TOWN <b>a</b>	
<b>IMPROVEMENT DESCRIPTION:</b>				<b>Low Priority</b>	
Improve pedestrian connectivity at the KY 32/KY36 intersection <ul style="list-style-type: none"> <li>• Curb extensions to shorten crossing distance and improve pedestrian visibility</li> <li>• High-vis crosswalk markings to alert drivers and protect pedestrians</li> <li>• Parking restrictions near intersection to improve sight lines between pedestrians and drivers</li> </ul>				PHASE	(2023 \$'s)
				D	\$ 30 k
				R	\$ 0
				U	\$ 0
				C	\$ 240 k
				<b>TOTAL</b>	<b>\$ 270 k</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>					
2024 Traffic:	KY 32 carries 2,300 vehicles per day (vpd) in town. KY 32/KY 36 intersection operates at LOS A/B in peak hours.				
2045 No-Build Traffic:	KY 32 carries 2,400 vpd in town, with KY 32/KY 36 intersection operating at LOS A/B in peak hours.				
2018-2022 Crashes:	4 PDO collisions occurred within 100 feet of the intersection. No bike/ped crashes were reported.				
<b>WORK TYPE:</b>	Bike/Ped				
				Railroad	
				R/W Required	
				Shared Use Path	
				Bike Facility	
				Ped Facility	Improve Sidewalk Add Curbs
				Increased Connectivity	
				Socioeconomic Impacts	Disabled
					Elderly
					Non-Drivers
					Community Cohesion
Environmental Impacts					
Affected Utilities					
<b>Notes:</b> <ul style="list-style-type: none"> <li>• Estimate includes milling and resurfacing intersection and 6-inch thermoplastic striping.</li> <li>• Expected to lose approximately 6 parking spaces for visibility.</li> <li>• Consider local TAP grant.</li> </ul>					


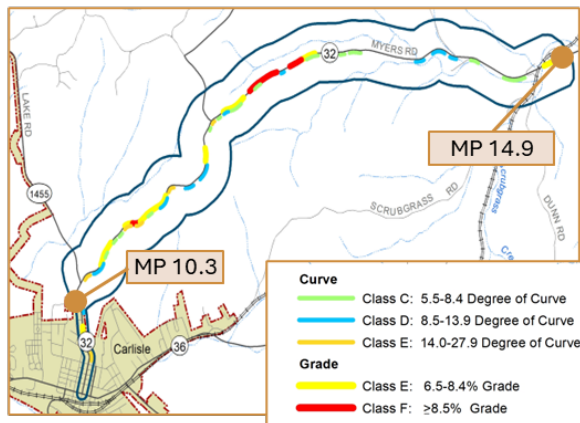




Nicholas 9-8812		Pedestrian Mid-Block Crosswalks (KY 32 MP 9.957-10.023)		IN TOWN <b>b</b>	
<b>IMPROVEMENT DESCRIPTION:</b>				<b>Low Priority</b>	
<ul style="list-style-type: none"> <li>Add north mid-block crossing linking the courthouse and Chestnut Street to improve connectivity by avoiding significant grade differentials at the corner of Chestnut St and KY 32</li> <li>Add east mid-block crossing linking the courthouse to the library and judicial center</li> </ul>				PHASE	(2023 \$'s)
				D	\$ 20 k
				R	\$ 0
				U	\$ 0
				C	\$ 60 k
<b>TOTAL</b>				<b>\$ 80 k</b>	
<b>TRAFFIC OPERATIONS AND SAFETY:</b>					
2024 Traffic:	KY 32 carries 2,300 vehicles per day (vpd) in town. KY 32/KY 36 intersection operates at LOS A/B in peak hours.				
2045 No-Build Traffic:	KY 32 carries 2,400 vpd in town, with KY 32/KY 36 intersection operating at LOS A/B in peak hours.				
2018-2022 Crashes:	4 PDO collisions occurred on KY 32 between Main and Chestnut Streets. No ped/bike crashes were reported.				
<b>WORK TYPE:</b>	Bike/Ped				
<p><b>Carlisle: Courthouse Square</b></p> <ul style="list-style-type: none"> <li>Mid-block crosswalk and bulb-outs between Courthouse and City Hall</li> <li>Lose 2-3 parking spaces on both sides of the street</li> <li>Grade Differential</li> <li>Mid-block crosswalk and bulb-outs between Courthouse and Library/Judicial Center</li> <li>Lose 2-3 parking spaces on courthouse side</li> </ul>				Railroad	
				R/W Required	
				Shared Use Path	
				Bike Facility	
				Ped Facility	Mid-block Crosswalk Add Curbs
				Increased Connectivity	
				Socioeconomic Impacts	Disabled
					Elderly
					Non-Drivers
					Community Cohesion
Environmental Impacts					
Affected Utilities					
<b>Notes:</b> <ul style="list-style-type: none"> <li>Milling and resurfacing not included in estimate.</li> <li>Expected to lose 6-9 total parking spaces for visibility.</li> <li>Consider local TAP grant.</li> </ul>					

Nicholas 9-8812		Define Striping Through Town (Chestnut Street to near N. Locust Street, KY 32 MP 10.023-10.25)		IN TOWN <b>C</b>	
<b>IMPROVEMENT DESCRIPTION:</b>			<b>Medium Priority</b>		PHASE (2023 \$'s)
Improve safety by installing clear road markings, including: <ul style="list-style-type: none"> <li>• 6-inch edge line and centerline striping</li> <li>• Cross-street stop bars and centerlines</li> <li>• Eliminate parking spaces near intersections to improve sight lines</li> </ul>			D		\$ 15 k
			R		\$ 0
			U		\$ 0
			C		\$ 150 k
			<b>TOTAL</b>		<b>\$ 165 k</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>					
2024 Traffic:		KY 32 carries 2,300 vehicles per day (vpd) in town with no capacity concerns			
2045 No-Build Traffic:		KY 32 carries 2,400 vpd in town, with no capacity concerns			
2018-2022 Crashes:		12 crashes consisting of 10 PDO and 2 Injury collisions occurred within the concept limits.			
<b>WORK TYPE:</b>		Safety			
<div style="display: flex; justify-content: space-between; padding: 10px;"> <div style="text-align: center;">Chestnut Street MP 10.023</div> <div style="text-align: center;">Mulberry Street MP 10.086</div> <div style="text-align: center;">North Street MP 10.153</div> <div style="text-align: center;">Near N. Locust MP 10.25</div> </div> 					
Railroad		Environmental Impacts			
R/W Required					
Shared Use Path					
Bike Facility					
Ped Facility		Affected Utilities			
Increased Connectivity					
Socioeconomic Impacts					
<b>Notes:</b> <ul style="list-style-type: none"> <li>• Estimate includes milling and resurfacing and 6-inch thermoplastic striping</li> <li>• Expected to lose 5-7 total parking spaces for visibility</li> <li>• Consider funding with FE01 or FD05 if paired with next resurfacing</li> </ul>					




Nicholas 9-8812		KY 32/KY 36 Four-Way Stop (KY 32 MP 9.957/KY 36 MP 4.118)		IN TOWN <b>d</b>		
IMPROVEMENT DESCRIPTION:			High Priority		PHASE	(2023 \$'s)
Convert signalized intersection to 4-way stop					D	\$ 5 k
					R	\$ 0
					U	\$ 0
					C	\$ 50 k
					<b>TOTAL</b>	<b>\$ 55 k</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>						
2024 Traffic:		Turn movement shown below; KY 32/KY 36 intersection operates at LOS A/B in peak hours.				
2045 No-Build Traffic:		KY 32 is predicted to have minimal growth, with no capacity concerns.				
2018-2022 Crashes:		4 PDO collisions occurred within 100 feet of the intersection.				
<b>WORK TYPE:</b>		Spot Improvement				
				Railroad		
				R/W Required		
				Shared Use Path		
				Bike Facility		
				Ped Facility		
				Increased Connectivity		
				Socioeconomic Impacts		
				Environmental Impacts		
				Affected Utilities		
				<b>Notes:</b> <ul style="list-style-type: none"> <li>Milling and resurfacing not included in estimate.</li> <li>Signal at KY 32/Locust Street (one block west) also proposed to convert to all-way stop but beyond study limits; additional traffic data needed to assess feasibility.</li> <li>Consider funding with FE01 or FE04.</li> </ul>		

Nicholas 9-8812		6-inch Striping (KY 32 MP 10.3-14.9)		LOW-COST <b>a</b>		
<b>IMPROVEMENT DESCRIPTION:</b>			<b>Low Priority (With Next Resurfacing)</b>		<b>PHASE</b>	
Improve travel lane visibility by installing 4.6 miles of 6-inch edge and centerlines along corridor.					(2023 \$'s)	
					D	\$ 30 k
					R	\$ 0
					U	\$ 0
					C	\$ 310 k
			<b>TOTAL</b>	<b>\$ 340 k</b>		
<b>TRAFFIC OPERATIONS AND SAFETY:</b>						
2024 Traffic:	KY 32 carries 1,100 vehicles per day (vpd) on rural segment with no capacity concerns.					
2045 No-Build Traffic:	KY 32 carries 1,200 vpd with no capacity concerns.					
2018-2022 Crashes:	A total of 16 crashes in rural improvement limits, including no fatal and 4 injury collisions. 31% occurred on wet pavement, 38% at nighttime, and 56% are classified as roadway departures.					
<b>WORK TYPE:</b>	Safety					
 <p><b>Safety Benefits:</b></p> <p>Wider edge lines can reduce crashes up to:</p> <p><b>37%</b> for non-intersection, fatal and injury crashes on rural, two-lane roads.<sup>2</sup></p> <p><b>22%</b> for fatal and injury crashes on rural freeways.<sup>3</sup></p> <p><b>Benefit-Cost Ratio</b></p> <p><b>25:1</b> for fatal and serious injury crashes on two-lane rural roads.<sup>4</sup></p>					Railroad	
					R/W Required	
					Shared Use Path	
					Bike Facility	
					Ped Facility	
					Increased Connectivity	
					Socioeconomic Impacts	
					Environmental Impacts	
					Affected Utilities	
<b>Notes:</b> <ul style="list-style-type: none"> <li>Resurfacing not included in estimate.</li> <li>Consider funding with HSIP, FE01, or FD05 if paired with next resurfacing.</li> </ul>						


Nicholas 9-8812		Curve Signage (KY 32 MP 10.3-14.9)		LOW-COST <b>b</b>		
<b>IMPROVEMENT DESCRIPTION:</b>			<b>Medium Priority</b>		<b>PHASE</b>	
Install chevrons and other advanced warning signs as necessary at class C,D, and E horizontal curves					D	
					R	
					U	
					C	
					<b>TOTAL</b>	<b>\$ 80 k</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>						
2024 Traffic:	KY 32 carries 1,100 vehicles per day (vpd) on rural segment with no capacity concerns.					
2045 No-Build Traffic:	KY 32 carries 1,200 vpd with no capacity concerns					
2018-2022 Crashes:	A total of 16 crashes in rural improvement limits, including no fatal and 4 injury collisions. 31% occurred on wet pavement, 38% at nighttime, and 56% are classified as roadway departures.					
<b>WORK TYPE:</b>	Safety					
 <p><b>Safety Benefits:</b></p> <p><b>Chevron Signs</b> 25% reduction in night-time crashes<sup>1</sup></p> <p>16% reduction in non-intersection fatal and injury crashes<sup>2</sup></p> <p><b>Oversized Chevron Signs</b> 15% reduction in fatal and injury crashes.<sup>3</sup></p> <p><b>Sequential Dynamic Chevrons</b> 60% reduction in fatal and injury crashes<sup>3</sup></p>			 <p><b>Curve</b></p> <ul style="list-style-type: none"> <li>Class C: 5.5-8.4 Degree of Curve</li> <li>Class D: 8.5-13.9 Degree of Curve</li> <li>Class E: 14.0-27.9 Degree of Curve</li> </ul> <p><b>Grade</b></p> <ul style="list-style-type: none"> <li>Class E: 6.5-8.4% Grade</li> <li>Class F: ≥8.5% Grade</li> </ul>		Railroad	
					R/W Required	
			Shared Use Path			
			Bike Facility			
			Ped Facility			
			Increased Connectivity			
			Socioeconomic Impacts			
			Environmental Impacts			
			Affected Utilities			
			 <p>Place chevron series in all Class C,D,E curves.</p>		 <p>Combination of Curve Advisory and hidden driveway signs as needed.</p>	
<b>Notes:</b> <ul style="list-style-type: none"> <li>Consider funding with HSIP, FE01, or FD05 if paired with next resurfacing.</li> </ul>						

Nicholas 9-8812		KY 1455 (Lake Road) Realignment (KY 32 MP 10.703)		LOW-COST <b>C</b>		
<b>IMPROVEMENT DESCRIPTION:</b>			<b>Medium Priority</b>		<b>PHASE</b>	<b>(2023 \$'s)</b>
Realign the KY 1455 (Lake Road) intersection to 90 degrees using existing pavement and striping to improve sight distance, making it easier for drivers to see/navigate.			D		\$ 10 k	
			R		\$ 0	
			U		\$ 0	
			C		\$ 30 k	
			<b>TOTAL</b>		<b>\$ 40 k</b>	
<b>TRAFFIC OPERATIONS AND SAFETY:</b>						
2024 Traffic:	Turn movement shown below; KY 32/KY 1455 intersection operates at LOS A/B in peak hours.					
2045 No-Build Traffic:	KY 32 is predicted to have minimal growth, with no capacity concerns.					
2018-2022 Crashes:	1 PDO Angle collision occurred at this intersection.					
<b>WORK TYPE:</b> Spot Improvement						
				Railroad		
				R/W Required		
				Shared Use Path		
				Bike Facility		
				Ped Facility		
				Increased Connectivity		
				Socioeconomic Impacts		
				Environmental Impacts		
				Affected Utilities		
				<b>Notes:</b> <ul style="list-style-type: none"> <li>Resurfacing included in estimate.</li> <li>Consider funding with FE01 or FD05 if paired with next resurfacing.</li> </ul>		

Nicholas 9-8812		Additional Guardrail (KY 32 MP 10.3-14.9)		LOW COST <b>d</b>	
<b>IMPROVEMENT DESCRIPTION:</b>				<b>Low Priority</b>	<b>PHASE</b> (2023 \$'s)
Widen shoulders and install new guardrail in approximately 26 areas with 2:1 or steeper slopes. Widen with T-Rail and cribbing to keep guardrail face off roadway edge. Install reflective guardrail delineators for increased nighttime visibility.				D	\$ 0.4 M
				R	\$ 0.1 M
				U	\$ 0.1 M
				C	\$ 4.0 M
				<b>TOTAL</b>	<b>\$ 4.6 M</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>					
2024 Traffic:		KY 32 carries 1,100 vehicles per day (vpd) on rural segment with no capacity concerns.			
2045 No-Build Traffic:		KY 32 carries 1,200 vpd with no capacity concerns.			
2018-2022 Crashes:		A total of 16 crashes in rural improvement limits, including no fatal and 4 injury collisions. 31% occurred on wet pavement, 38% at nighttime, and 56% are classified as roadway departures.			
<b>WORK TYPE:</b>		Minor Widening			
Railroad		Environmental Impacts	Endangered Species – Tree Cutting		
R/W Required	Strip Taking				
Shared Use Path					
Bike Facility		Affected Utilities	Water		
Ped Facility			Power		
Increased Connectivity			Gas		
Socioeconomic Impacts					
Notes:					
<ul style="list-style-type: none"> <li>Consider funding with FE01 or traditional Highway Plan funding.</li> </ul>					

Nicholas 9-8812		Henryville Sidewalks and Drainage (N. Locust Street to Green Valley Road; KY 32 MP 10.3-10.6)		LOW-COST <b>f</b>	
<b>IMPROVEMENT DESCRIPTION:</b>			<b>Medium Priority</b>		<b>PHASE</b> (2023 \$'s)
Remove and reconstruct existing sidewalk and drainage system; KY 32 pavement is several inches above existing sidewalk, creating drainage issues during rain events.			D		\$ 0.1 M
			R		\$ 0.1 M
			U		\$ 0.2 M
			C		\$ 0.9 M
			<b>TOTAL</b>		<b>\$ 1.3 M</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>					
2024 Traffic:	KY 32 carries 2,300 vehicles per day (vpd) in town with no capacity concerns				
2045 No-Build Traffic:	KY 32 carries 2,400 vpd in town, with no capacity concerns				
2018-2022 Crashes:	No reported crashes occurred within the concept limits.				
<b>WORK TYPE:</b>	Bike/Ped Improvement				
  	Railroad				
	R/W Required	Strip Taking			
	Shared Use Path				
	Bike Facility				
	Ped Facility	New Sidewalk			
		New Drainage			
	Increased Connectivity				
	Socioeconomic Impacts				
	Environmental Impacts	Potential Historic Area			
Affected Utilities	Water				
	Sewer				
	Power				
<b>Notes:</b> <ul style="list-style-type: none"> <li>Resurfacing not included in estimate.</li> <li>Consider funding with FE01, FD05 (if paired with next resurfacing), or local TAP grant.</li> </ul>					



Nicholas 9-8812		NB & SB Pull-off (Locations to be determined in field)		MEDIUM IMPACT <b>a</b>		
<b>IMPROVEMENT DESCRIPTION:</b>				<b>Medium Priority</b>	<b>PHASE</b>	<b>(2023 \$'s)</b>
Provide northbound and southbound safe areas for vehicles to pull off the roadway in each direction.					D	\$ 100 k
					R	\$ 60 k
					U	\$ 120
					C	\$ 500 k
					<b>TOTAL</b>	<b>\$ 780 k</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>						
2024 Traffic:		KY 32 carries 1,100 vehicles per day (vpd) on rural segment.				
2045 No-Build Traffic:		KY 32 is predicted to have minimal growth, carrying 1,200vpd.				
2018-2022 Crashes:		A total of 36 crashes scattered along the corridor including no fatal and 5 injury collisions. 31% occurred on wet pavement, 28% at nighttime, and 33% are classified as roadway departures.				
<b>WORK TYPE:</b>		Minor Widening/Safety				
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid red; border-radius: 15px; padding: 5px; text-align: center;"> <p>One per direction, in tangents, midway through corridor</p> </div> <div style="border: 1px solid gray; border-radius: 50%; padding: 10px; text-align: center;"> <p>16 ft wide x 150 ft long + 150 ft tapers</p> </div> </div> 						
Railroad		Environmental Impacts	Endangered Species – Tree Cutting			
R/W Required	Strip Taking					
Shared Use Path						
Bike Facility		Affected Utilities	Water			
Ped Facility			Power			
Increased Connectivity						
Socioeconomic Impacts						
<b>Notes:</b> <ul style="list-style-type: none"> <li>Consider funding with FE01 or FD39.</li> </ul>						

Nicholas 9-8812		Systemic Tree/Hillside Trimming (KY 32 MP 10.3-14.9)		MEDIUM IMPACT <b>b</b>		
<b>IMPROVEMENT DESCRIPTION:</b>				<b>High Priority</b>	<b>PHASE</b>	<b>(2023 \$'s)</b>
Improve visibility and safety at horizontal curves with vegetation management, tree removal, inside curve shoulder widening, and side slope flattening.					D	\$ 0.1 M
					R	\$ 0.25 M
					U	\$ 0.2 M
					C	\$ 1.0 M
					<b>TOTAL</b>	<b>\$ 1.6 M</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>						
2024 Traffic:		KY 32 carries 1,100 vehicles per day (vpd) on rural segment with no capacity concerns.				
2045 No-Build Traffic:		KY 32 carries 1,200 vpd with no capacity concerns.				
2018-2022 Crashes:		A total of 16 crashes in rural improvement limits, including no fatal and 4 injury collisions. 31% occurred on wet pavement, 38% at nighttime, and 56% are classified as roadway departures.				
<b>WORK TYPE:</b>		Spot Improvements				
Railroad		Environmental Impacts	Endangered Species – Tree Cutting			
R/W Required	Strip Taking					
Shared Use Path						
Bike Facility		Affected Utilities	Water			
Ped Facility			Power			
Increased Connectivity			Gas			
Socioeconomic Impacts						
<b>Notes:</b> <ul style="list-style-type: none"> <li>Consider funding with HSIP, FE01, or FD05 if paired with next resurfacing.</li> </ul>						

Nicholas 9-8812		Adams Lane Visibility (KY 32 MP 14.294)		MEDIUM IMPACT <b>b*</b>	
IMPROVEMENT DESCRIPTION:			Medium Priority		PHASE (2023 \$'s)
Improve visibility for drivers entering KY 32 from Adams Lane by removing trees to west and cutting back slope to east			D		\$ 25 k
			R		\$ 50 k
			U		\$ 75 k
			C		\$ 200 k
			<b>TOTAL</b>		<b>\$ 350 k</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>					
2024 Traffic:		KY 32 carries 1,100 vehicles per day (vpd) on rural segment with no capacity concerns.			
2045 No-Build Traffic:		KY 32 is predicted to have minimal growth, carrying 1,200vpd with no capacity concerns.			
2018-2022 Crashes:		Three crashes within 500 feet on intersection, including one injury collision. All were single vehicle crashes; two were roadway departures.			
<b>WORK TYPE:</b>		Spot Improvement			
Railroad		Environmental Impacts	Endangered Species – Tree Cutting		
R/W Required	Strip Taking				
Shared Use Path					
Bike Facility		Affected Utilities	Water		
Ped Facility			Power		
Increased Connectivity					
Socioeconomic Impacts					
Notes:					
<ul style="list-style-type: none"> <li>Consider funding with FE01, or FD05 if paired with next resurfacing.</li> </ul>					

Nicholas 9-8812		KY 1658 (Stoney Creek Rd) Intersection (KY 32 MP 12.291/KY 1658 MP 0.000)		MEDIUM IMPACT <b>C</b>	
IMPROVEMENT DESCRIPTION:			Medium Priority		PHASE (2023 \$'s)
Reconstruct intersection to improve visibility and functionality by: <ul style="list-style-type: none"> <li>Replacing curves with a tangent section (11 ft-wide lanes and 4 ft-wide paved shoulders)</li> <li>Reconstructing KY 1658 to form a 90-degree angle with KY 32</li> </ul>			D		\$ 0.4 M
			R		\$ 0.35 M
			U		\$ 0.65 M
			C		\$ 3.6 M
			<b>TOTAL</b>		<b>\$ 5.0 M</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>					
2024 Traffic:		KY 32 carries 1,100 vehicles per day (vpd) on rural segment with no capacity concerns.			
2045 No-Build Traffic:		KY 32 is predicted to have minimal growth, carrying 1,200 vpd with no capacity concerns.			
2018-2022 Crashes:		1 crash occurred at this intersection: a PDO roadway departure in snowy conditions.			
<b>WORK TYPE:</b>		Spot Improvement			
Railroad		Environmental Impacts	Endangered Species – Tree Cutting		
R/W Required	New R/W and 1 Relocation				
Shared Use Path					
Bike Facility		Affected Utilities	Water		
Ped Facility			Power		
Increased Connectivity			Gas		
Socioeconomic Impacts					
<b>Notes:</b> <ul style="list-style-type: none"> <li>There is a local concern about existing water lines east of Stoney Creek Road.</li> <li>Consider traditional Highway Plan funding.</li> </ul>					

Nicholas 9-8812		Widen/Realign Curves		MEDIUM IMPACT <b>d</b>	
<b>IMPROVEMENT DESCRIPTION:</b>			<b>Medium Priority</b>		PHASE (2023 \$'s)
Improve horizontal curves that do not satisfy current Highway Design Manual guidelines, including a wider typical section (11-ft lanes + 4-ft paved shoulders). Reconstructions should be completed as a package set rather than piecemeal, varying limits based on available funding.			D		\$ 2.0 M
			R		\$ 2.0 M
			U		\$ 1.0 M
			C		\$ 18.0 M
			<b>TOTAL</b>		<b>\$ 23.0 M</b>
<b>TRAFFIC OPERATIONS AND SAFETY:</b>					
2024 Traffic:		KY 32 carries 1,100 vehicles per day (vpd) on rural segments.			
2045 No-Build Traffic:		KY 32 is predicted to have minimal growth, carrying 1,200vpd.			
2018-2022 Crashes:		A total of 36 crashes scattered along the corridor including no fatal and 5 injury collisions. 31% occurred on wet pavement, 28% at nighttime, and 33% are classified as roadway departures.			
<b>WORK TYPE:</b>		Reconstruction			
Railroad		Environmental Impacts	Endangered Species – Tree Cutting		
R/W Required	New R/W and Relocations		Potential Historic Areas		
Shared Use Path			Stream Crossing		
Bike Facility		Affected Utilities	Water		
Ped Facility			Power		
Increased Connectivity			Gas		
Socioeconomic Impacts					
Notes:					
<ul style="list-style-type: none"> <li>Consider traditional Highway Plan funding</li> </ul>					

## 8 Future Cost Escalation

The traditional project development process, illustrated in **Figure 31**, involves several phases before construction can begin. It starts with project-level planning, followed by design, right-of-way/utility, construction and ultimately maintenance phases. Each phase can potentially take a year or more to complete depending on the project's size and complexity. Unique risk factors emerge at each stage, which can extend timelines. Challenges such as public opposition, environmental investigations, geotechnical issues, and redesigns or alternative approaches due to unforeseen conditions can delay progress. Added risks include legal complications related to property acquisition, long lead times for specialty materials, unexpectedly high construction bids, and change orders, all of which may require reevaluating earlier decisions.

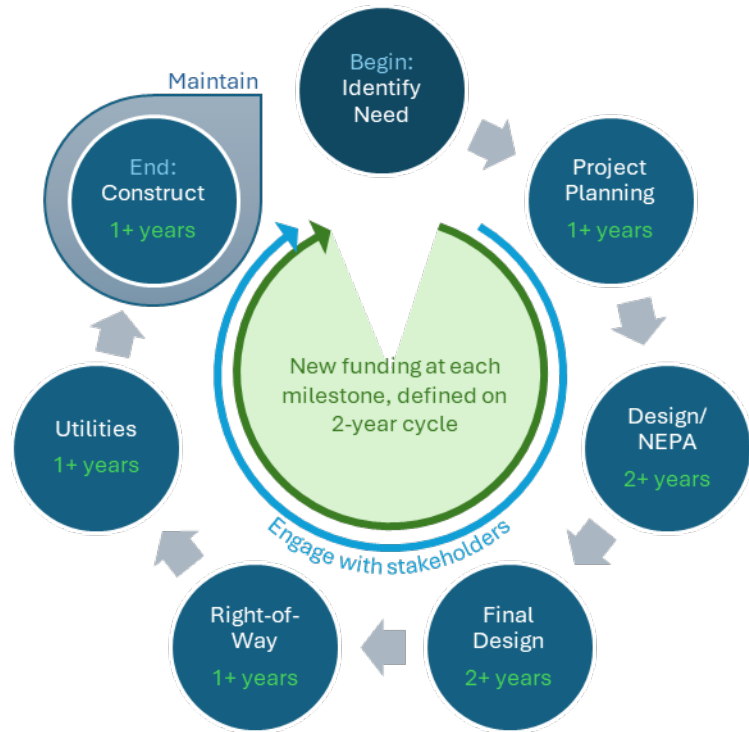


Figure 31: Typical Project Development Process

Each phase also needs added funding, typically identified through the biennial Highway Plan. For large-scale projects, securing sufficient funding often requires competing across multiple budgetary cycles at the state level. As projects advance, uncertainty and risk continue, and the time value of money becomes a critical factor in long-term estimates.

FHWA's National Highway Construction Cost Index<sup>9</sup> tracks constant-dollar expenditures across various highway construction categories. As of 2023, construction costs have tripled compared to 2003 baselines, with a 50% increase since 2021.

While planning-level estimates aim to be conservative, larger projects with extended implementation timelines are likely to face significant cost increases.

<sup>9</sup> Online at <https://www.fhwa.dot.gov/policy/otps/nhcci/>

## 9 Next Steps

No funding to date has been assigned to advance improvement concepts beyond this initial planning phase. Some improvements are low-cost actions requiring little advance preparation and could be implemented relatively quickly by KYTC maintenance forces. Others are higher-cost projects that must compete for funding and progress through the project development process: preliminary design/environmental, final design, right-of-way acquisition, utility relocation, then construction.

For those competing for traditional Highway Plan funds, CHAF forms should be created or modified so potential projects can compete for future funding in the next SHIFT cycle.

Limited public involvement has occurred to date; engaging with key stakeholders and affected property owners will be important during the design process.

## 10 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