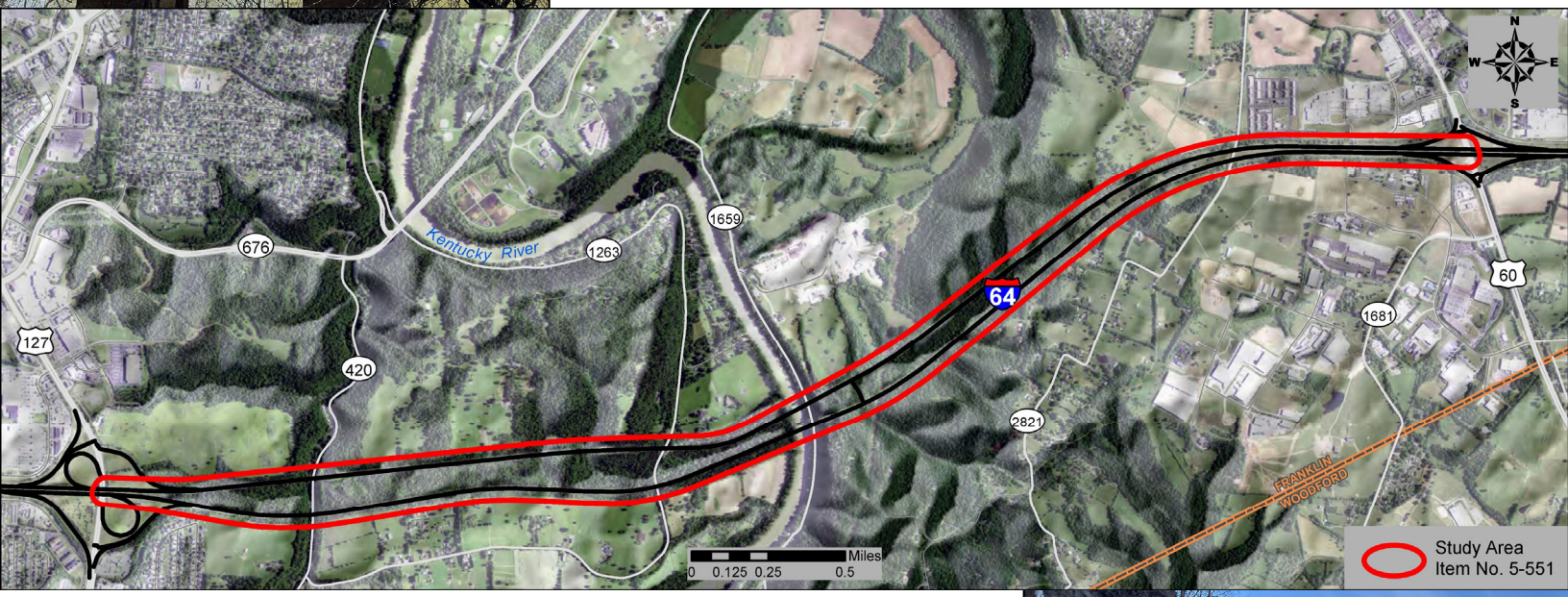
I-64 Widening Study

Franklin County, KY

Item 5-551

October 2023 | Final Report



Prepared by:

In partnership with:

ABSTRACT

During the mid-1990s, design efforts under Item No. 5-56 were completed to widen I-64 to six lanes between the Frankfort exits: at US 127 (milepoint [MP] 53.110) and at US 60 (MP 57.960). This Item No. 5-551 study represents a fresh look at the previous effort, intended to explore additional build concepts, incorporate current design standards, technologies, and best practices, and update cost estimates to current year dollars.

The purpose of the 5-551 project is to improve safety and mobility along I-64 in Franklin County, between the US 127 and US 60 interchanges. Projected future traffic volumes will approach the capacity of the four-lane facility. Steep grades surrounding the Kentucky River create long climbing sections that introduce variable travel speeds, especially for large trucks. Existing rock cuts are subject to erosion with fallen rocks restricting clear zones and requiring routine maintenance. Elevated crash trends characterize the facility: 358 crashes during 2018-2022 on mainline I-64 and 85 on ramps with the majority single vehicle crashes (45%) and rear ends (33%).

Seven build concepts were developed, summarized in **Table ES-1**, including three Common Median (CM) options and variations on the four 1997 designs from Item 5-56. Construction cost estimates in 2023 dollars are presented assuming asphalt pavement. No new right-of-way and minimal utility impacts are anticipated.

Table ES-1: Summary of Build Concepts

	Median Type	EB Max Grade	Truck Climbing Lane (TCL)	Cost Est. (2023 $)
CM	Barrier	3.00%	None	$177 M
CM_TCL	Barrier	3.00%	EB & WB	$182 M
CM_4%	Barrier	4.00%	EB & WB	$175 M
1997	Bifurcated	3.52%	EB	$151 M
1997_3.52_noTCL	Bifurcated	3.52%	None	$151 M
1997_3.52_2-TCL	Bifurcated	3.52%	EB & WB	$152 M
1997_3.78	Bifurcated	3.78%	EB	$152 M
1997_3.78_noTCL	Bifurcated	3.78%	None	$151 M
1997_3.78_2TCL	Bifurcated	3.78%	EB & WB	$154 M

Alternative procurement options should be considered to encourage innovation and reduce construction costs/schedule. Further environmental investigations and coordination with FHWA will be needed if a build option advances for implementation, including consideration of any potential design exceptions.

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1.0 INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) initiated a planning study in late 2022 (Item No. 5-551) to examine the Interstate 64 (I-64) corridor in Franklin County.

During the mid-1990s, design efforts under Item No. 5-56 were completed to widen I-64 to six lanes between the Frankfort exits: at US 127 (milepoint [MP] 53.110) and at US 60 (MP 57.960).

This study represents a fresh look at the previous effort, intended to explore additional build concepts, incorporate current design standards, technologies, and best practices, and update cost estimates to current year dollars.

Figure 1 shows the project location; **Figure 2** provides a view of the study area limits.

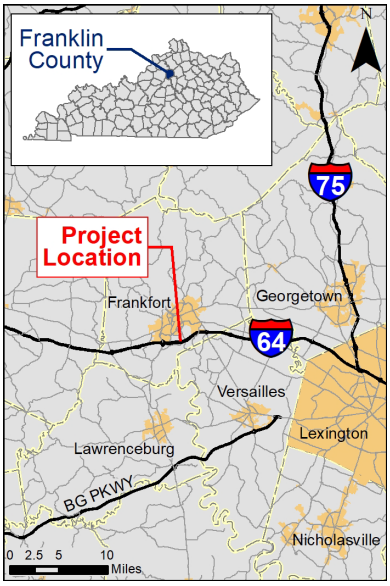

Figure 1: Vicinity Map

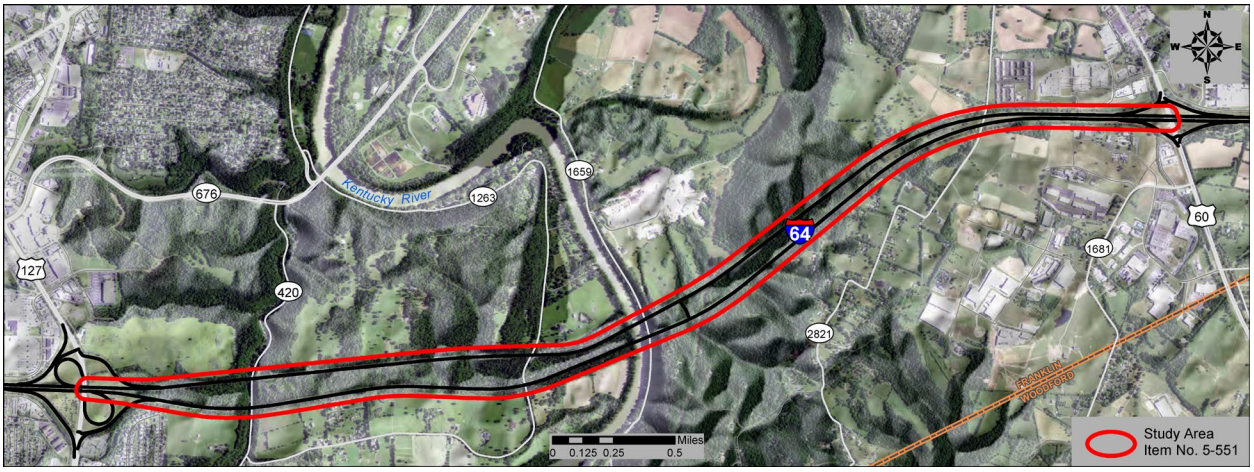

Figure 2: Study Area Limits

1.1 Other Nearby Projects

One of the initial steps in the planning process was to understand what committed projects near the study area are ongoing, influencing the "existing" conditions. Several projects in *Kentucky's 2022 –2028 Enacted Highway Plan*[1] abut or overlap the limits of this planning study, summarized in **Table 1**.

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

Table 1: Highway Plan Projects Abutting Item No. 5-551

Item	Route	MP	Description	Phase	Funding	FY
5-551	I-64	53.1-57.8	Improve safety, truck mobility, and reduce congestion along I-64 from directly east of US 127 to US 60 south of Frankfort	D R U C	$1.5M $750k $300k $80M	22 23 23 27+
5-577	I-64	-	Planning study to evaluate the potential for dedicated automated or connected vehicle lanes between Lexington and Louisville	P	$750k	24
5-80201	US 127	4.4-6.1	Improve safety and reduce congestion on US 127 in Frankfort from I-64 to US 60	P D R U C	$470k $2.0M $5.5M $3.4M $13.1M	24 25 25 26 27
5-80212	US 127	4.4-5.2	Provide a new roadway from the I-64 WB off-ramp at US 127 to KY 676 to reduce congestion, improve safety, and enhance mobility	P D R U D	$200k $1.3M $1.1M $710k $16.6M	23 23 24 24 25
5-10042	I-64	55.4-55.5	Bridge project: I-64 WB at KY River	D C	$700k $7.0M	24 24
5-10043	I-64	55.4-55.5	Bridge project: I-64 EB at KY River	D C	$700k $7.0M	24 24
5-22030	I-64	46.3-53.1	Address pavement condition	D C	$2.0M $20.4M	27 27
5-22031	I-64	53.1-57.8	Address pavement condition	D C	$1.4M $14.0M	25 25
5-22032	I-64	57.8-59.4	Address pavement condition	D C	$972k $9.7M	28 28

Recent planning and design efforts on Item 5-80212 identified a series of improvements along US 127 and the I-64/US 127 interchange ramps as a preferred solution. Item 5-586 is a local project anticipated to be let with Item 5-80212 to improve mobility on adjoining cross-streets and frontage roads.

Items 5-10042 and 5-10043 represent critical repairs to the structures carrying I-64 over the Kentucky River but would not increase capacity. These repairs were let to construction on August 24, 2023.

Looking at I-64 specifically, a series of separate projects include improvements along sections of the corridor to provide a continuous six-lane section from the I-264 (Watterson Expressway) in Jefferson County to Frankfort. Details are summarized in **Table 2**.

Table 2: Projects to Six-Lane I-64

County	BMP	EMP	Description	Phase	Funding	FY
Jefferson Shelby	12.233 I-265 23.974 County Line	23.974 County Line 32.300 KY 55	Existing 6 Lane Section	-	-	-
Shelby	32.300 KY 55	35.900 East of KY 53	Item 5-65.4[1] Widening	C	$80M	23-26
Shelby	35.900 East of KY 53	38.200 KY 1790	Item 5-475[1] Widening	-	-	-
Shelby	38.200 KY 1790	43.330 KY 395	Existing 6 Lane Section	-	-	-
Shelby Franklin	43.330 KY 395 46.303 County Line	46.303 County Line 47.700 KY 151	Item 5-2035.4 Widening[2]	D R U C	$1M $250k $250k $30M	22 24 24 28
Franklin	47.759 KY 151	53.110 US 127	Item 5-2305.7 Widening	-	-	-
Franklin	53.110 US 127	57.860 US 60	Item 5-551 Widening **CURRENT STUDY**	D R U C	$1.5M $750k $300k $80M	22 23 23 27-28

Notes: [1]Item No. 5-475 included alongside Item No. 5-65.4 funding in Highway Plan as both projects are anticipated to let to construction together. [2]Construction ongoing to widen bridges as part of Item No. 5-2035.8.

In addition, the I-64 corridor was assessed as Corridor 21 in KYTC's Statewide Corridor Plan.[2] The corridor received a high mobility score (27.9 out of 30 possible points), a moderate accessibility score (22.2/30), and a high safety score (26/40)—making it the highest scoring of all Tier 1 corridors. Tier 1 corridors had the greatest needs to better connect Kentucky's regions and improve safety, mobility, and accessibility. The highest scoring interstate corridors have recent, current, or planned projects to improve safety. However, interstates and parkways were set aside for consideration as part of the future *Statewide Interstate and Parkway Plan*, which has not been published at the time of this report.

1.2 Item 5-56 Design Concepts

The 4.8-mile section of I-64 between the two Frankfort exits was designed to be widened from four lanes to six lanes with final plans completed in 1997 with an approved Design Executive Summary (DES, included as **Appendix A**) and environmental document. These plans, prepared

[2] Online at https://transportation.ky.gov/LinkingKentucky/Pages/Home.aspx

under the metric system, are old enough that some design guidelines, environmental methodologies, and construction practices have changed.

The 1997 DES examined four basic build concepts alongside the No-Build option:

- Alternate 1 provided a six-lane section with a uniform median barrier plus an eastbound truck climbing lane from the river crossing. The vertical alignment was similar to existing and all structures were assumed to be replaced.
- Alternate 1A was similar to Alternate 1 but with a 60-foot depressed median instead.
- Alternate 2 reused the existing alignments to add an extra inside travel lane and fall benches. Existing bridges could be widened or replaced.

A **Fall Bench** is a flat space to safely catch and collect fallen debris.

- Alternate 3 combined elements from Alternates 1 and 2: the existing westbound alignment (with an extra inside lane and fall bench) and a new, flatter eastbound alignment to improve the grade from the river.

The proposed typical section (**Figure 3**) includes three 12-foot travel lanes per direction, 12-foot shoulders, 18-foot ditches, and an 18-foot fall bench.

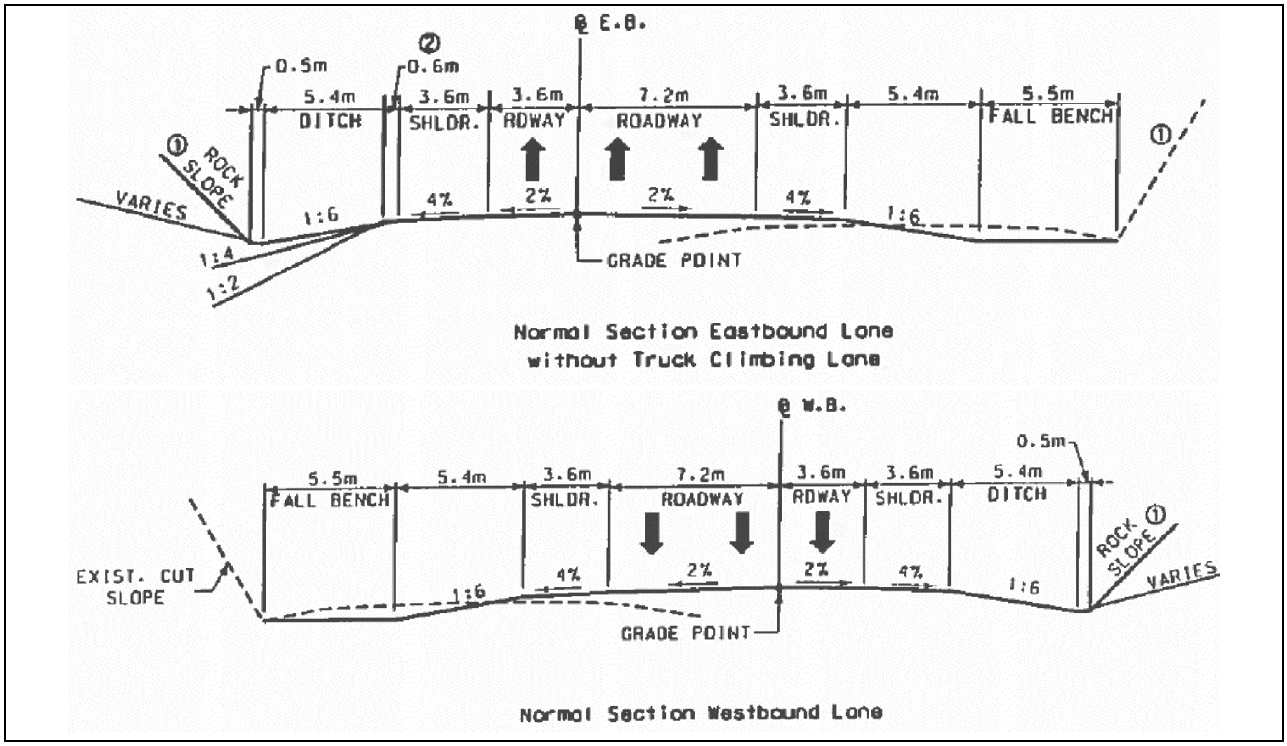

Figure 3: Item 5-56 Proposed Typical Section

A hybrid concept was identified as preferred: "reconstructing the roadways to provide a third lane on the inside of the existing roadways in both eastbound and westbound directions and the addition of an eastbound truck climbing lane up the hill from the Kentucky River." The eastbound grade would be flattened from 3.78% to 3.52%. Offsets to incorporate an 18-foot fall bench without impacting outside rock cuts make widening of the existing structures impractical. There are also concerns about the age and remaining lifespan of existing structures—particularly for the KY River crossing—which are recommended to be replaced.

Maintenance of traffic during construction first builds part-width westbound lanes while traffic remains on existing roadways. Next, eastbound traffic shifts to barrier-separated westbound lanes with crossovers at either end while the eastbound roadway is reconstructed. Two lanes of traffic per direction are maintained for the duration of construction, excluding brief (e.g., 20-minute) delays for blasting.

At the time, construction costs were estimated at $51 million.

A 1997 Value Engineering (VE) study was also completed on Alternate 2, reexamining the preferred alternate in the DES to reduce costs and improve quality. Considered options include:

- Rehabilitating the existing river bridges.
- Rehabilitating the existing roadway (minor widening).
- Building a new three lane bridge adjacent to the existing bridge, incorporating the old girders and/or piers.
- Using a barrier to reduce the 30-foot clear zone to a 12-foot shoulder.
- Improving detour routes: I-64 would be maintained with one lane of traffic per direction throughout construction, with additional traffic shifting to KY 676.
- Pursuing Alternate 4, which reuses existing river bridges and two-lane roadways, substituting a barrier for the clear zone to minimize earthwork and horizontal shifts.

2.0 EXISTING CONDITIONS

As part of the Interstate system, I-64 offers a high degree of mobility and is included as part of numerous state and federal systems:

- National Highway System (NHS), which includes roadways important to the nation's economy, defense, and mobility.

- Strategic Highway Network (STRAHNET), which includes roads deemed necessary for emergency mobilization and peacetime movements to support US military operations.
- National Highway Freight Network (NHFN)/federally designated truck route, which includes the most critical roadways for the US freight transportation system.
- State Primary Highway, a system including Kentucky's interstates, parkways, and other long-distance, high volume intrastate routes of statewide significance.
- KY Highway Freight Network, which represents Kentucky's critical freight corridors.

Design standards for the interstate system are defined in two key publications from the American Association of State Highway and Transportation Officials (AASHTO): *A Policy on Design Standards—Interstate System* (2016) and *A Policy on Geometric Design of Highways and Streets* (2018), commonly called the "Green Book." KYTC's *Highway Design Manual*[3] also provides design information and guidance to uniformly apply laws, regulations, policies, and procedures to Kentucky highways.

Appendix B contains an oversized map of key existing conditions, discussed in the following subsections.

2.1 Typical Section

Through the 4.8-mile study area, I-64 has two 12-foot travel lanes per direction, 10-foot paved outside shoulders, 3-foot paved inside shoulders, and a varying width median as much of the length has a bifurcated section. The posted speed limit is 70 mph. It is a fully controlled access facility, bounded by service interchanges at both ends of the study area: a partial cloverleaf at US 127 (Exit 53) and a diamond at US 60 (Exit 58). Beyond interchange areas, the corridor is not lighted.

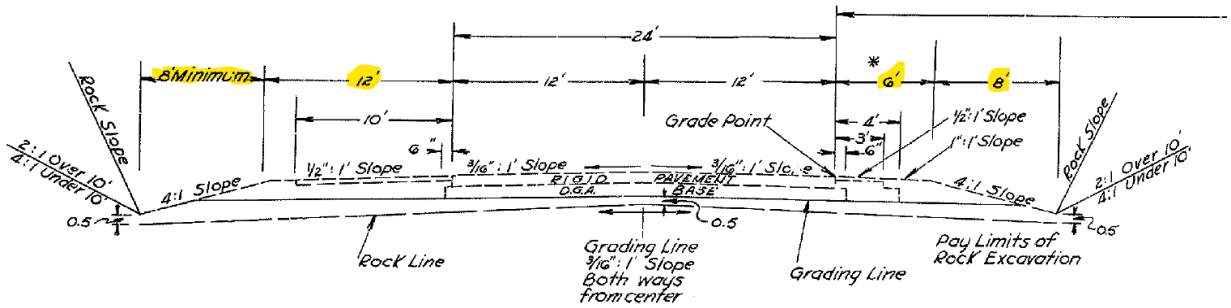

Figure 4: Existing Typical Section (Westbound Direction)

[3] Online at https://transportation.ky.gov/Organizational-Resources/Policy%20Manuals%20Library/Highway%20Design.pdf

Approaching interchanges at both ends of the study corridor, I-64 lanes share a common 60-foot depressed median. From MP 57.2 to the Woodford County line, I-64 has a cable barrier in the median. However, the majority of I-64 within the study limits is characterized by rugged terrain, with steep rock cuts lining the bifurcated section (**Figure 5**). Rock cuts were not pre-split during initial construction, leading to jagged eroded edges today and falling rocks that represent a recurring maintenance and safety concern.

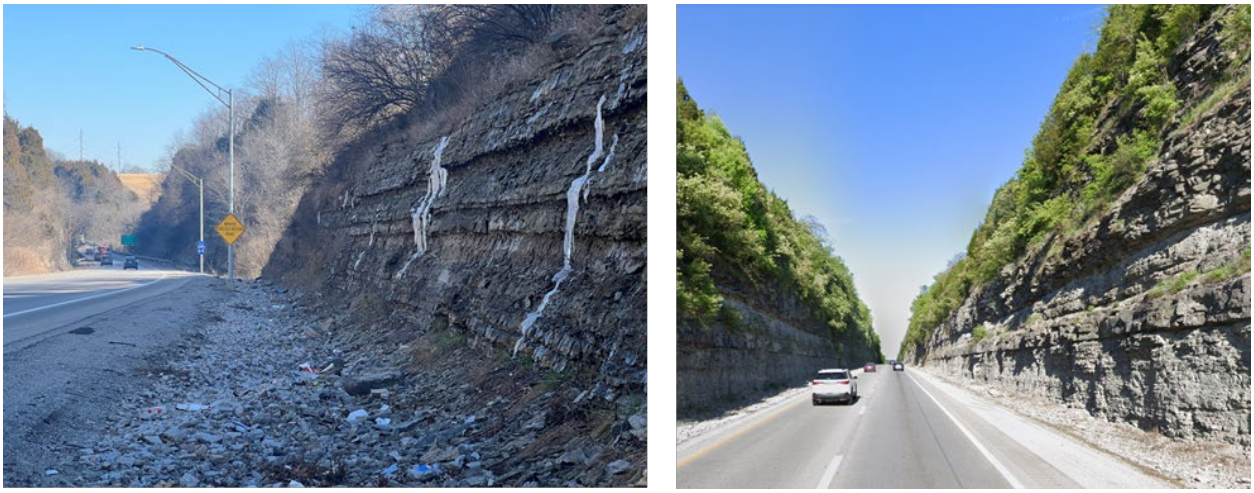

Figure 5: Representative Rock Cuts, Eastbound (left) and Westbound (right)

Combined shoulder and ditch widths do not provide adequate clear zone widths to meet current standards. The suggested clear zone distance for a 70-mph facility with 4:1 side slopes is 38-46 feet. The provided clear zone in areas of rock cuts is 20 feet on the outside and 14 feet to the inside. In those areas there is also fallen rock and debris from the weathered cuts that results in even less recovery area available for errant vehicles.

2.2 Horizontal and Vertical Alignment

As shown in **Appendix B**, maximum grades within the study area are 4.0%, associated with downgrades approaching the river in each direction of travel. There are also lengthy climbing upgrades after crossing the river: 3.0% westbound and 3.8% eastbound.

AASHTO standards call for a maximum vertical grade of 4.0% for rural areas through rolling terrain with a 70-mph design speed. A maximum superelevation rate of 8.0% for horizontal curves is considered appropriate for freeways where snow and ice conditions are common, and congestion is not prevalent. Thus, the minimum recommended radius for horizontal curves with an 8.0% maximum superelevation rate and a 70-mph design speed is 1,810 feet.

All horizontal curve radii meet and exceed the minimum radius for 70-mph design speed and maximum 8.0% superelevation.

2.3 Bridges

The National Bridge Inventory (NBI) condition rating is determined by the lowest rating for the deck, superstructure, substructure, or culvert. A bridge is considered structurally deficient if any bridge component (deck, superstructure, substructure, or culvert) is in poor condition, warranting monitoring or repairs.

There are ten bridges within the study corridor. Bridge inventory data are in **Table 3** and locations are shown in **Appendix B**. Funding for repairs on the Kentucky River bridges is included in the current Highway Plan.

Table 3: Structures Inventory

Bridge ID	Route	MP	Crosses Over	Length	Condition
037B00096N	US 127	4.46	I-64	277 ft	Fair
037B00051R	I-64 EB	53.82	KY 420, Cedar Run Creek	410 ft	Fair
037B00051L	I-64 WB	53.82	KY 420, Cedar Run Creek	526 ft	Fair
037B00058R	I-64 EB	54.95	KY 1263	119 ft	Fair
037B00058L	I-64 WB	55.01	KY 1263	53 ft	Fair
037B00052R	I-64 EB	55.46	KY River, KY 1659	774 ft	Poor
037B00052L	I-64 WB	55.47	KY River, KY 1659	774 ft	Poor
037B00029N	KY 2821	1.92	I-64	347 ft	Fair
037B00053R	I-64 EB	57.91	US 60	300 ft	Fair
037B00053L	I-64 WB	57.90	US 60	300 ft	Fair

The KY 2821 (Hanley Lane) overpass provides a minimum 15.75 feet of vertical clearance along I-64—compared to 16 feet minimum recommended in AASHTO's guidance.

Figure 6: KY 2821 Overpass seen from Westbound I-64

In addition to bridges, ten large culverts facilitate drainage along the study portion of I-64 with locations presented in **Appendix B** mapping. Some of these are "step down" culverts where the concrete thickness varies over its length, discussed further in **Section 5.2.6**.

2.4 Existing and Projected Traffic

Available existing traffic volumes for study area roadways, including truck percentages, hourly factors, and peak hour directional distributions were reviewed. A 2022 count showed 48,200 vehicles per day (vpd) traveling I-64 between Frankfort exits, with 18% of this volume representing truck traffic. As shown in **Figure 7**, the interstate has shown steady growth over the past two decades, excluding a sharp decline during 2020.

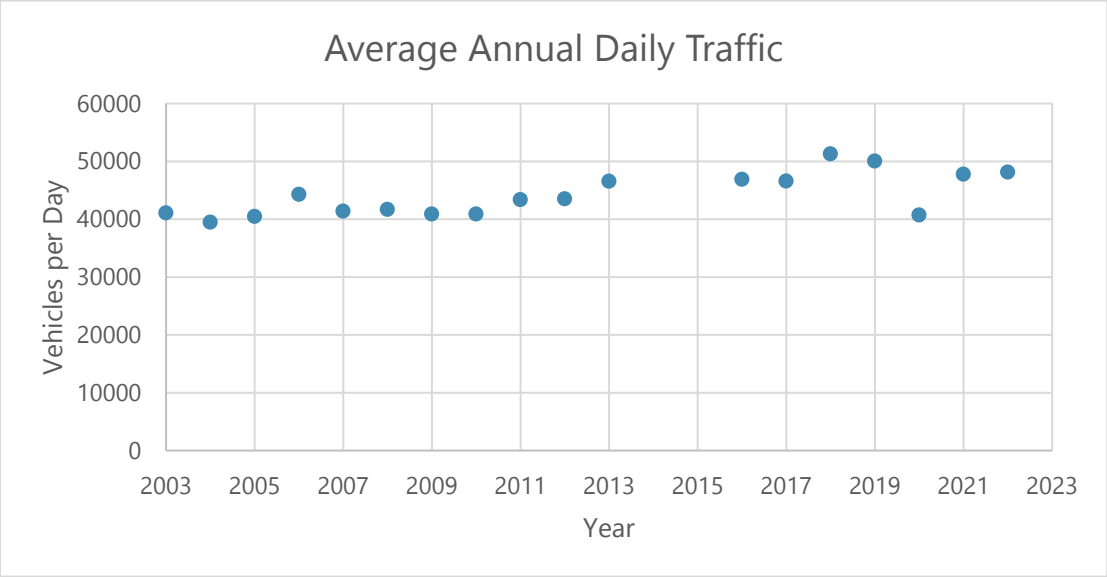

Figure 7: Historic KYTC Traffic Counts along Study Area

The Kentucky statewide travel demand model (KYTSM version 7) provided the baseline to derive future year forecasts. Based on projected increases in population and employment rates, I-64 is estimated to carry 63,400 vpd with 27% trucks by 2045.

2.5 Crash History

Historical crash data from KYTC's Transportation Enterprise Database (TED) warehouse were evaluated for a five-year period (January 2018 through December 2022). Crash location, severity, and manner of collision are shown in **Figure 8**. During this timeframe, 443 crashes occurred throughout the study area: 358 along I-64 mainline and the remainder associated with ramps. A table of corresponding crash data is in **Appendix C**.

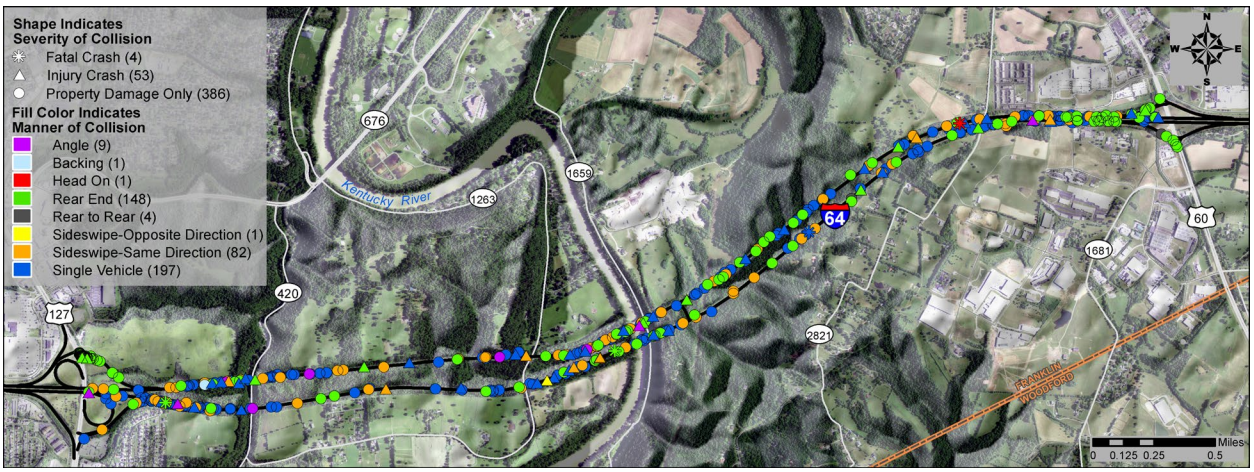

Figure 8: Crashes by Severity and Manner of Collision

Figure 9 shows a simplified heat map view of the same data; as shown, crashes are fairly evenly distributed over the study length, with the highest geographic concentration at the westbound off-ramp to northbound US 127—proposed for reconstruction as part of Item 5-80212.

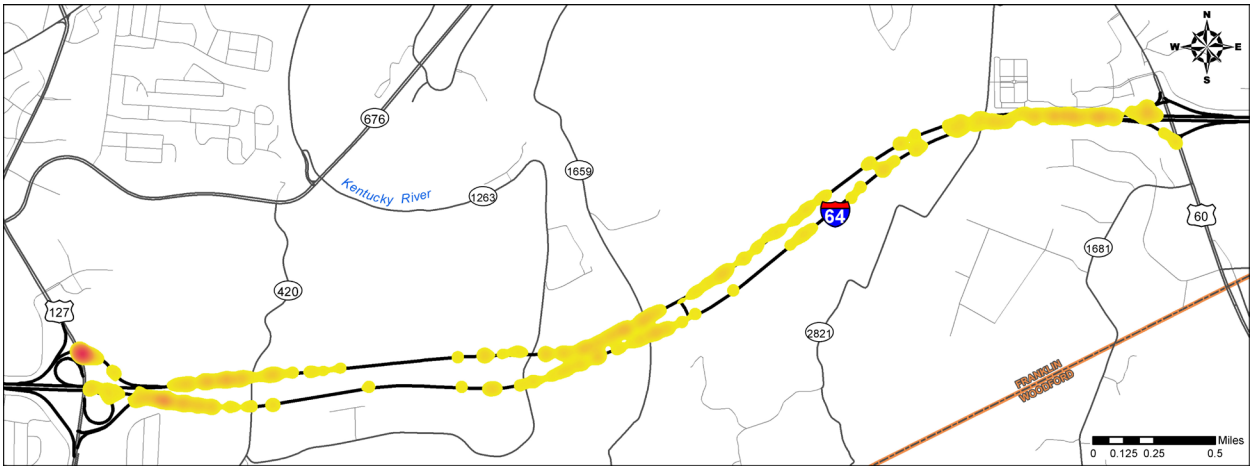

Figure 9: Heat Map of 2018-2022 Crash Distribution

Severity. By severity, there were four fatal crashes (noted as stars in **Figure 8**), 53 injury crashes, with the remainder representing property damage only (PDO) crashes. Injury crashes can be further subdivided by severity: 7 serious "A" injury crashes, 22 minor "B" injury crashes, and 23 possible "C" injury crashes.

Fatalities during the analysis period include:

- August 2019 near MP 53.5, distracted eastbound driver collides with queue from downstream construction zone.

- May 2021 near MP 55.3, high speed, impaired driver impacts guardrail along eastbound I-64.
- September 2019 near MP 56.3, eastbound motorcyclist loses control.
- February 2019 near MP 57.0, head-on collision in westbound lanes with one vehicle heading the wrong way.

Each of the four fatalities represents a roadway departure, one of the emphasis areas in KYTC's 2020 *Strategic Highway Safety Plan*.[4] Nearly half of all reported study area crashes (48%) are roadway departures, which tend to be more severe than other crash types.

Manner of Collision. The manner of collision breakdown is shown in **Figure 10**. The majority are single vehicle crashes, followed by rear ends, then same direction sideswipes. Other notable trends from the data: 33% occurred in wet weather, 31% represent nighttime crashes, and 13% involved a commercial vehicle.

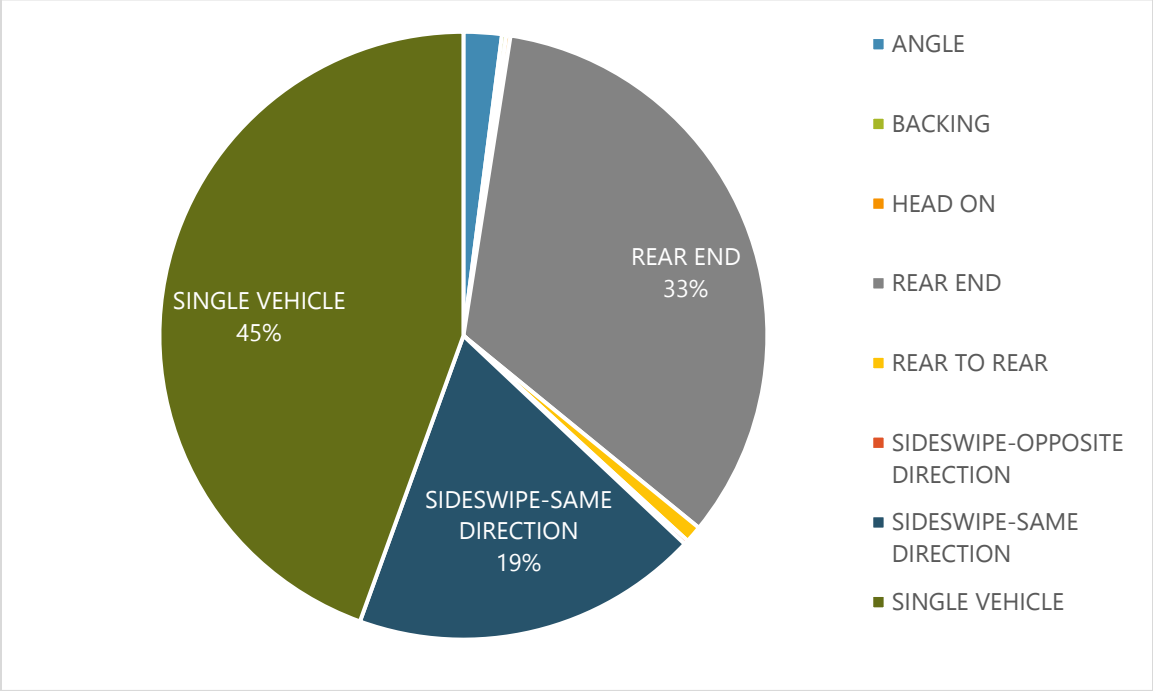

Figure 10: 2018-2022 Crashes by Type

[4] Online at https://transportation.ky.gov/HighwaySafety/Pages/default.aspx

2.5.1 Level of Service of Safety

Level of Service of Safety (LOSS) is a refined statistical methodology in the *Highway Safety Manual* and is used to evaluate safety needs. It replaces the former critical rate factor analyses. LOSS categories 1 and 2 represent sites with fewer than anticipated crashes, while categories 3 and 4 represent sites with more than anticipated crashes. Because LOSS 4 sites experience such elevated crash rates, there is a higher probability that safety countermeasures at these locations will result in larger improvements.

The entire 4.8-mile study section represents a LOSS 4, considering all manners of collision and only severe "KAB" reports. Limiting calculations to consider only roadway departure crashes (all severities), the study section demonstrates a LOSS 3.

3.0 PURPOSE AND NEED

The purpose of the 5-551 project is to improve safety and mobility along I-64 in Franklin County, between the US 127 and US 60 interchanges—exits 53 and 58 serving the city of Frankfort. Supporting data-driven needs include:

- Projected future traffic volumes are approaching the capacity of the four-lane facility. I-64 is estimated to carry 63,400 vpd by 2045 with 27% trucks—resulting in volume-to-capacity (v/c) ratios over 0.9 in both travel directions with a four-lane freeway.
- Steep grades surrounding the Kentucky River create long climbing sections that introduce variable travel speeds, especially for large trucks. Both eastbound (3.78% climb over 8,100 feet) and westbound (3.00% climb over 4,600 feet) exceed the critical length and reduce truck travel speeds by 10 MPH or more.
- Due to geotechnical considerations and initial construction techniques, existing rock cuts are subject to erosion with fallen rocks restricting clear zones and requiring routine maintenance. Reduced clear zones negatively influence safety exposure.
- Elevated crash trends characterize the facility. Along mainline I-64 within the study area, 358 crashes were reported during 2018-2022, including four fatalities. Nearly half (48%) are roadway departures, which tend to be more severe than other crash types, influenced by the reduced clear zones lining the route.

4.0 ENVIRONMENTAL OVERVIEW

An environmental overview was prepared to identify resources for consideration during the development of build concepts. Shown in **Figure 11**, resources were identified from available literature, database review, and site visits.

The purpose of this overview was not to quantify potential environmental impacts, but instead to identify potential environmental issues 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.

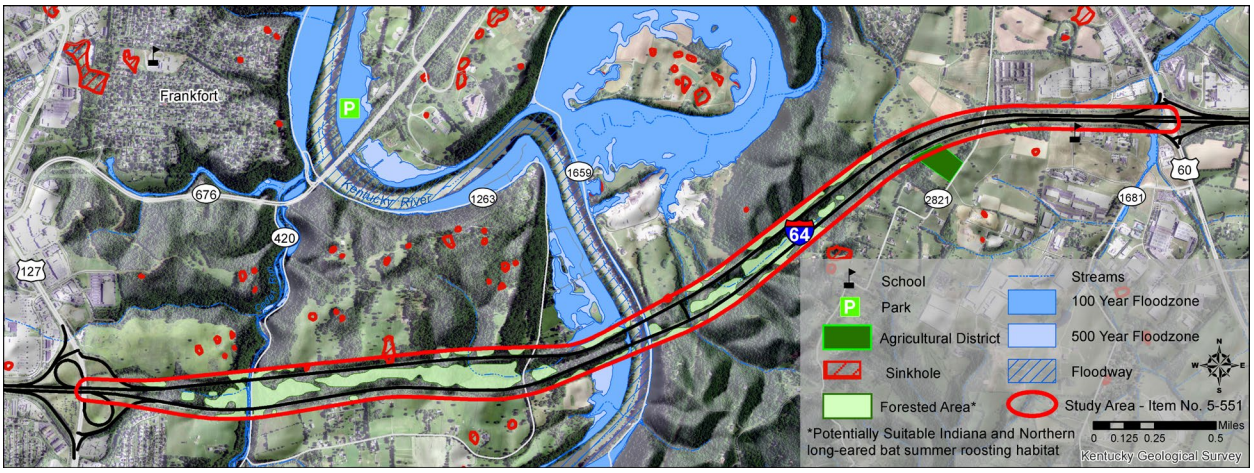

Figure 11: Environmental Overview

With the rugged terrain and limited highway access within the study area, there are relatively few environmentally sensitive resources to note.

Water Resources. There are several water resources in the study area: the Kentucky River, Cedar Run Creek, Slickway Branch, and several unnamed tributaries. The river provides drinking water for the city, with a Source Water Assessment and Protection Plan (SWAPP) to maintain water quality and protect public health. Large floodplains follow the river, covering low-lying adjacent farmlands. Impacts to streams and wetlands require permit coordination with the US Army Corps of Engineers, US Coast Guard, and/or KY Division of Water, depending on the scale of the water resource and potential disturbance.

Listed Species. The US Fish and Wildlife Service (USFWS) maintains a database of federally protected species—listed as endangered or threatened under the *Endangered Species Act.* Several listed species have the potential to occur within the study area. Additionally, the monarch

butterfly is under consideration for official listing. Listing statuses for all potential species are shown in **Table 4**. There is no designated critical habitat within the study area.

Table 4: Listed Threatened and Endangered Species

Group	Name	Scientific Name	Status
Mammals	Gray Bat	*Myotis grisescens*	Endangered
Mammals	Indiana Bat	*Myotis sodalis*	Endangered
Mammals	Northern Long-eared Bat	*Myotis septentrionalis*	Threatened
Clams	Clubshell	*Pleurobema clava*	Endangered
Clams	Fanshell	*Cyprogenia stegaria*	Endangered
Clams	Longsolid	*Fusconaia subrotunda*	Threatened
Clams	Rabbitsfoot	*Quadrula cylindrica cylindrica*	Threatened
Plants	Braun's Rock-cress	*Arabis perstellata*	Endangered
Plants	Short's Bladderpod	*Physaria globose*	Endangered
Insect	Monarch Butterfly	*Danaus plexippus*	Candidate

A habitat assessment may be needed in the early stages of project development for future project(s) to assess potential project impact to threatened and endangered species. Projects that occur within an area of known bat habitat would 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 may be necessary to determine the need for future project-specific surveys.

Geology. Rock within the project area consists of interbedded limestone (65% to 85%) and shale (15% to 35%). The limestone is light gray to gray, fine to medium crystalline grained, thin bedded, bioclastic, fossiliferous with shale stringers and partings. This material is highly susceptible to eroding and thus the existing rock cuts have become a maintenance and safety concern. Therefore, any new rock cuts are recommended to be pre-split and have intermediate benches to improve physical stability. Underlying bedrock in the area is shown in **Figure 12**.

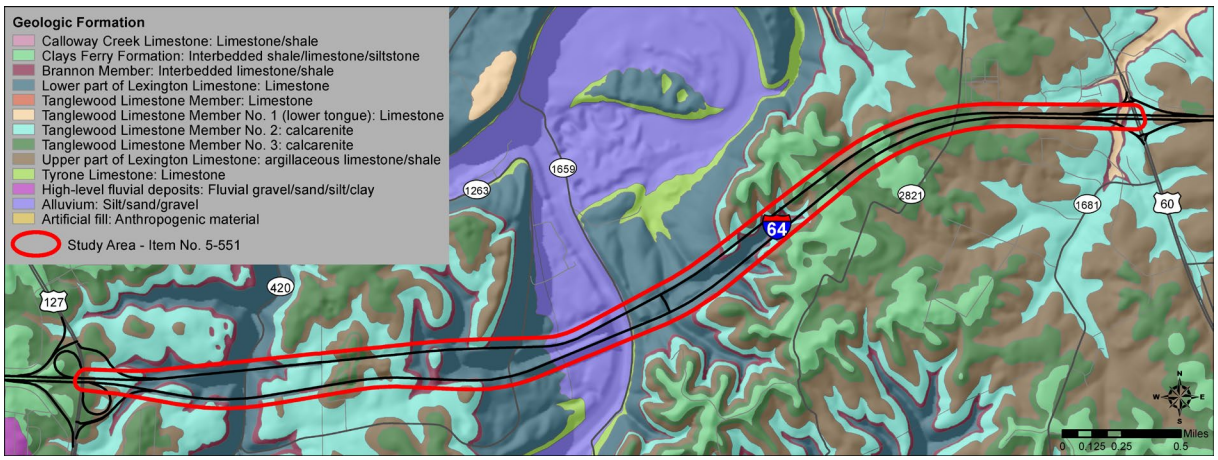

Figure 12: Geological Formations underlying Study Area

Landslides have been noted in the vicinity, particularly along KY 1659 near the eastbound I-64 alignment, which was closed to thru traffic at the time of this study.

Because the bedrock underlying most of the study area has an intense karst potential (**Figure 13**), well developed underground drainage systems including caves, sinkholes, and/or springs can be expected. Two known sinkholes abut the westbound alignment, shown as red outlines in **Figure 11**.

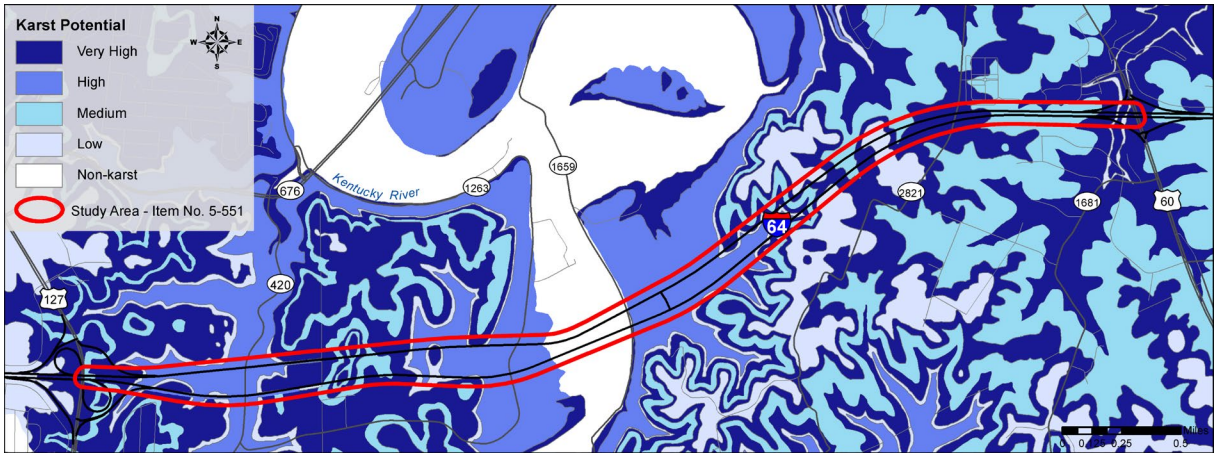

Figure 13: Karst Potential

Historic Resources. A *Cultural Historic Overview* (**Appendix E**) was completed to identify properties within the study area that are listed or eligible for listing on the National Register of Historic Places (NRHP). A Kentucky Heritage Council (KHC) records review identified one previously recorded resource within or adjacent to the study area, which has since been demolished. A windshield survey was also completed to identify potentially significant properties that would require additional research to formally evaluate their eligibility for listing in the NRHP.

One barn, one partially obscured outbuilding, and ten bridges were noted but none are recommended as potential historic concerns.

Field surveys and coordination with the KHC for both aboveground and archaeological resources would be required for future project development phases.

Farmlands. There is one agricultural district overlapping the study area, shown as dark green in **Figure 11**. However, the district lies beyond existing I-64 right-of-way.

Noise Considerations. There are noise sensitive receptors in the vicinity of potential future improvements. Noise sensitive receptors include all outdoor areas of frequent human use such as residential areas, parks, cemeteries, hospitals, churches, schools, and some commercial properties with exterior use. Notably, multi-family residential areas near either interchange are located in close proximity to the interstate: Riverford Crossing off US 60/Jett Boulevard and 300 units at the proposed Paddocks development off US 127/ Westridge Drive. Federally funded projects that add capacity or shift traffic closer to sensitive receptors require consideration of traffic noise impacts.

Figure 14: Riverford Crossing Apartments

5.0 INITIAL COORDINATION EFFORTS

Two project team coordination meetings occurred early in the study process. Summaries of all meetings are arranged chronologically in **Appendix D**.

5.1 Kickoff Meeting with Structures and Geotech Branches

Subject matter experts from KYTC's Structures and Geotechnical Branches met with core project team members on February 8, 2023, to discuss engineering concerns prior to the larger design charette. Key issues, discussed further in **Section 5.2**, included pre-splitting cuts, benching and earthwork recommendations, truck climbing lanes, existing right-of-way as a constraint, step-down culverts, single versus dual structures to cross the river, and maintenance of traffic.

5.2 Design Charette

On February 27, 2023, the project team met to discuss engineering considerations and brainstorm build concepts for further development. Input was gathered from the project team during two initial meetings, discussing critical sections and design constraints to guide the development of a range of reasonable build concepts. From these two meetings, assumptions for design were established, summarized below. These assumptions were derived from a combination of input from the project team, current design standards/practices, and a review of the existing design plans which were finalized in 1997. Additional information is presented in minutes from the design charette in **Appendix D**.

5.2.1 Constraints

Two overarching assumptions applied to all build concepts:

- Two lanes of traffic per direction should be available to maintain traffic flow throughout construction.
- No additional right-of-way should be required to construct the widened roadway. This means that all widening will be to the inside and that outside slopes remain undisturbed.

With no new right-of-way, few to no utility impacts are expected.

5.2.2 Rock Cuts

Per the Geotechnical Branch's recommendation, any new rock cuts should be pre-split with cut slopes between 1:4 (H:V) and 1:2 (H:V) and with an intermediate bench 20 feet wide. Any undisturbed existing cuts should include an 18-foot-wide fall bench to collect falling debris that continues to erode from the existing rock cuts.

5.2.3 Truck Climbing Lanes

Truck climbing lanes (TCL) were included in the eastbound upgrade from the Kentucky River with the 1997 design. Current warrants for truck climbing lanes per the AASHTO Green Book were assessed based on geometry and traffic volumes.

The Green Book bases the need for a TCL on critical length of grade and level of service (LOS). As shown in **Table 5**, both eastbound and westbound directions have lengths of grade that exceed the critical length and reduce travel speeds by 10 MPH or more. The effect of that speed reduction on LOS determines the need to consider a TCL—i.e., when the LOS is D or worse.

Table 5: Critical Lengths of Grade for Design

	Existing Grade	Length of Grade	Critical Length of Grade (10 MPH reduction)	Critical Length of Grade (15 MPH reduction)
Eastbound	3.78%	8,129 ft	1,330 ft	2,000 ft
Westbound	3.00%	4,600 ft	1,740 ft	2,700 ft

Source: AASHTO GB Figure 3-21

Table 6 summarizes the effect of grades and lane configurations on predicted 2045 traffic, reporting LOS, v/c, average travel speed, and densities for each scenario. The proposed widening (2 to 3 lanes) provides a greater operational benefit than adding a TCL (3 to 4 lanes) or reducing the eastbound grade. Therefore, KYTC opted to analyze build concepts with and without TCL's.

Table 6: LOS by Grade and Lanes

	2 Lane	3 Lane	4 Lane (TCL)
Eastbound 3.78% Grade (Existing)	LOS E 0.97 v/c 55.8 mph average 41.5 pc/mi/ln	LOS C 0.64 v/c 71.9 mph 21.5 pc/mi/ln	LOS B 0.48 v/c 75.1 mph 15.4 pc/mi/ln
Eastbound 3.52% Grade (1997 proposed)	N/A	LOS C 0.64 v/c 72.1 mph 21.2 pc/mi/ln	LOS B 0.48 v/c 75.1 mph 15.3 pc/mi/ln
Westbound 3.0% Grade (Existing)	LOS E 0.93 v/c 58.1 mph average 38.5 pc/mi/ln	LOS C 0.62 v/c 72.5 mph 20.6 pc/mi/ln	LOS B 0.47 v/c 75.2 mph 14.9 pc/mi/ln

5.2.4 Bridges

There are seven bridges between interchanges, all constructed in the 1960's, and all assumed to be full replacements. A minimum width of 10 feet is recommended between the construction of new bridges and existing bridges carrying traffic. Otherwise, bridge construction should be phased, increasing structure costs by approximately 30%.

5.2.5 Pavement

The 1997 design assumed concrete; however, since the 1990's asphalt is more common due to its lower initial cost. For cost estimating purposes, the following pavement section was assumed:

- 2 inches CL4 Asphalt Surface 0.38A PG 76-22
- 3.5 inches CL4 Asphalt Base 1.0D PG 76-22
- 6.5 inches CL4 Asphalt Base 1.0D PG 64-22 (2 lifts)
- 6 inches Crushed Stone Base
- 2 feet Rock Roadbed

Concrete pavement costs were also included as an alternative, assuming 13 inches of depth.

5.2.6 Step Down Culverts

There are 6 "step down" culverts within the study area. Within large embankment sections, step down culverts (**Figure 15**) have a varying slab thickness with narrower slab depths towards the outside of the embankment where loads are less.

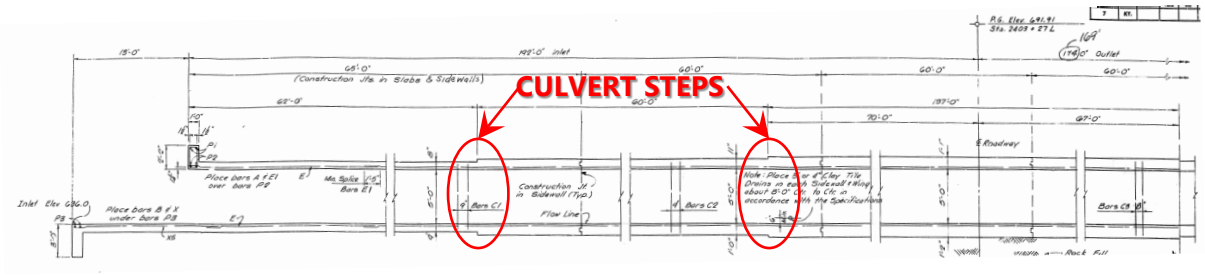

Figure 15: Example profile of a stepdown culvert

However, when roadways are widened across step down culverts, more fill is placed on top of the narrower step down portions which may not support the weight of the proposed fill from the widened roadway. To mitigate this, lightweight fill (e.g., cellular concrete fill or Expanded Polystyrene "EPS" geofoam blocks) could be used to add fill depth without increasing loads above the step-down portions of the culvert.

As the quantity of lightweight fill cannot be quantified based on the current level of design, the step down portions of existing culverts were assumed to be excavated, removed, and replaced for cost estimates.

6.0 BUILD CONCEPTS

Improvement concepts were developed from the design assumptions described above. Concepts were organized into three concept categories: Common Median, Original 1997, and Modified 1997 Concepts. Large-format drawings of each can be found in **Appendix F**.

6.1 Common Median Concept

A common median (CM) section was explored for its potential to reduce the amount of roadside grading, especially in areas of tall rock cuts. It also allows the existing lanes/bridges to maintain traffic flow during construction. Three concepts were developed in the common median category.

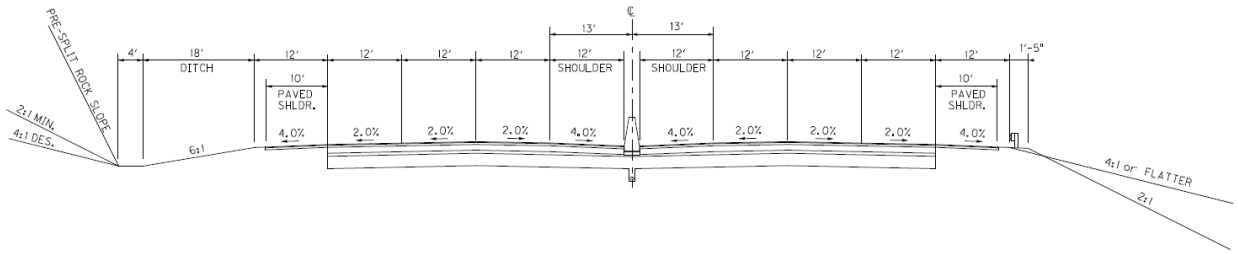

Figure 16: Proposed Common Median Typical Section

Each CM variation results in about 2.3 million cubic yards of excavation, 5,000 to 10,000 adjusted mitigation unit (AMU) of stream impacts, replacement of seven bridges, and replacement/extension of six step down culverts.

The CM variations on new alignment offer flexibility to construct the Kentucky River bridge and haul earthwork along the construction corridor, shortening haul distances. The new alignment also moves blasting further away from existing traffic lanes, minimizing disruptions to traffic operations during construction.

6.1.1 CM: Common median new alignment

This concept placed new horizontal and vertical alignments in the bifurcated median area. A maximum grade of 3.0% was utilized for traffic operations purposes. While many alignments were initially considered for this concept, the optimal horizontal alignment followed the westbound lanes more closely since that direction has less sinuosity to it than the eastbound lanes. It assumes a six-lane section throughout with no additional TCL.

The critical section to developing the vertical alignment was at the fill section west of the Kentucky River (approximate MP 55.3). The vertical grade can only be raised so high before the fill slopes of the proposed roadway encroached upon the existing fill slopes and/or travel lanes. Thus, raising

the overall height of the Kentucky River bridge was limited by the height of fill placed over this critical section.

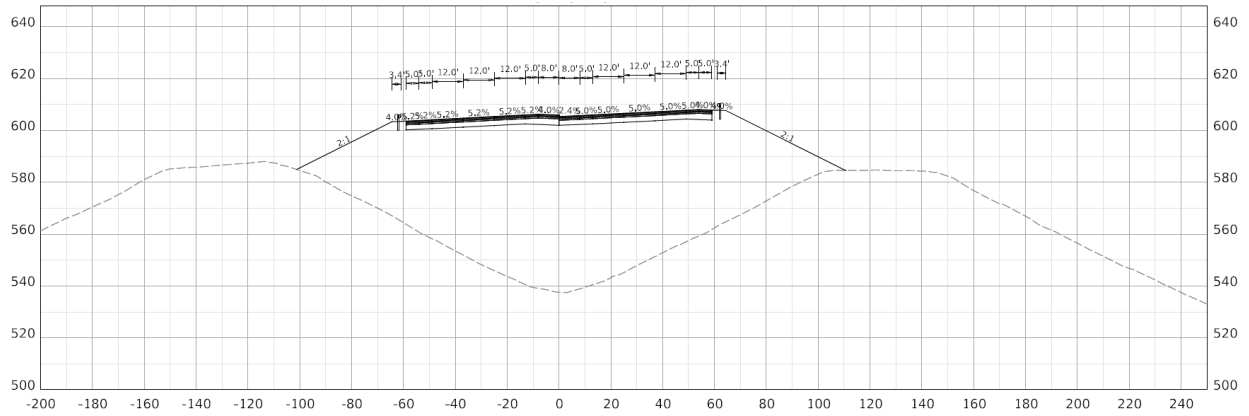

Figure 17: Critical Section for CM Concepts

6.1.2 CM_TCL: Common median new alignment with TCLs

This concept utilizes the same horizontal and vertical alignment from the common median concept described above and includes truck climbing lanes in both the eastbound and westbound upgrades from the Kentucky River.

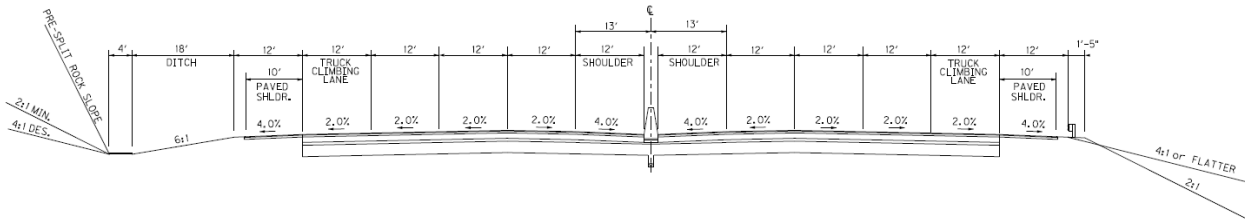

Figure 18: Typical Section for CM_TCL Concept

6.1.3 CM_4%: Common median from existing WB alignment – 4% grade

The third variation uses the same typical section but follows the existing westbound alignment, widening to provide eastbound lanes adjacent. Since the existing westbound alignment has a 4% downgrade to the Kentucky River, the maximum vertical upgrade eastbound is 4%. Therefore, truck climbing lanes were included in both the eastbound and westbound upgrades from the Kentucky River.

Since the typical section abuts existing rock cuts, an 18-foot fall bench was introduced to catch rock that erodes and falls from the existing cuts. The horizontal alignment was shifted towards the median to allow space for the placement of the fall bench along existing rock cuts.

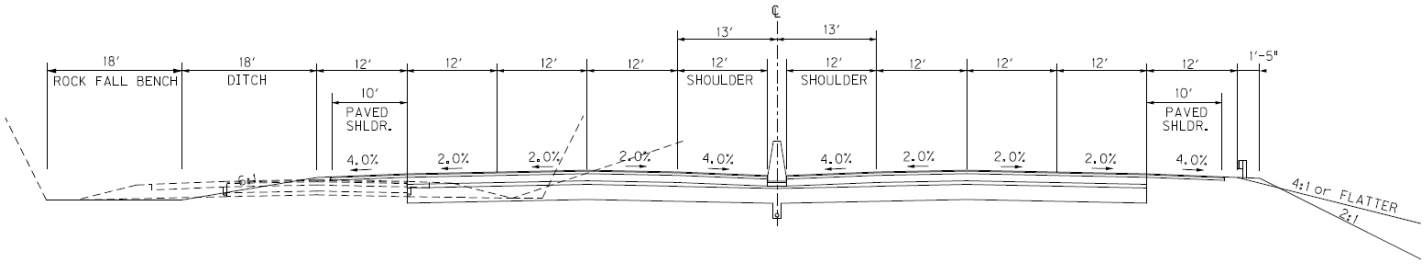

Figure 19: Typical Section for CM_4% Concept

6.2 Original 1997 Concept

From Item 5-56 final inspection plans, designs from 1997 show a bifurcated widening that closely follows the existing horizontal and vertical geometry but flattens the eastbound upgrade from the Kentucky River from 3.78% to 3.52%. An eastbound TCL is included. An 18-foot fall bench is also provided from the face of existing rock cuts.

In addition to the 1997 concept, two variants of this concept were also examined, varying which TCL were included. The "1997" concept includes only the eastbound TCL. The "1997_3.52_noTCL" includes no TCL. The "1997_3.52_2-TCL" includes both eastbound and westbound TCL for upgrades from the river.

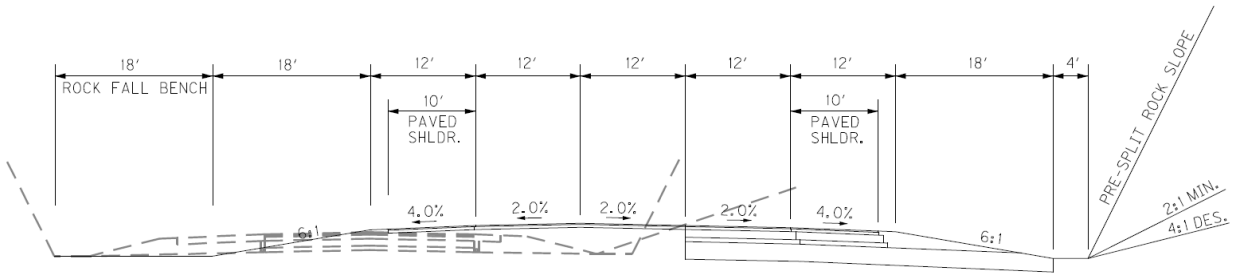

Figure 20: Typical Section for 1997 concepts (westbound)

The 1997 proposed maintenance of traffic plan widened the westbound lanes, then shifted the eastbound traffic to the westbound lanes, enabling the eastbound alignment to be constructed and the grade to be adjusted. The last phase shifted eastbound traffic back onto the newly constructed eastbound lanes.

Hauling heavy rock over existing bridges—particularly the Kentucky River bridges—will be expensive. The haul weight will likely be limited over the structurally deficient structures thereby reducing the weight capacity of the haul trucks and creating more trips/increased costs.

Each 1997_3.52 variation results in 2.2 million cubic yards of excavation, 7,000 AMU of stream impacts, replacement of seven bridges, and replacement/extension of six step down culverts.

6.3 Modified 1997 Concept

The Modified 1997 concepts utilize the same typical sections and horizontal geometry as the 1997 concepts above; however, the vertical grade is adjusted to keep the 3.78% upgrade from the Kentucky River. Overall, three concepts were produced in the modified 1997 Concept: the "1997_3.78" concept includes only the eastbound TCL. The "1997_3.78_noTCL" includes no TCL. The "1997_3.78_2-TCL" includes both eastbound and westbound TCL for upgrades from the river.

The maintenance of traffic strategy would be the same as the original 1997 concept. However, keeping the 3.78% grade creates more earthwork imbalance on either side of the Kentucky River. This translates to more materials to be hauled across existing bridges, with smaller loads per truck and higher earthwork costs overall.

Each 1997_3.78 variation results in 2.2 million cubic yards of excavation, 7,000 AMU of stream impacts, replacement of seven bridges, and replacement/extension of six step down culverts.

For easy reference, **Table 7** provides a side-by-side comparison of naming conventions and key features of the seven Build concepts.

Table 7: Build Concept Naming Conventions

	Median Type	EB Max Grade	EB TCL	WB TCL
CM	Barrier	3.00%	No	No
CM_TCL	Barrier	3.00%	Yes	Yes
CM_4%	Barrier	4.00%	Yes	Yes
1997	Bifurcated	3.52%	Yes	No
1997_3.52_noTCL	Bifurcated	3.52%	No	No
1997_3.52_2-TCL	Bifurcated	3.52%	Yes	Yes
1997_3.78	Bifurcated	3.78%	Yes	No
1997_3.78_noTCL	Bifurcated	3.78%	No	No
1997_3.78_2TCL	Bifurcated	3.78%	Yes	Yes

7.0 CONCLUSIONS

Following the concept development activities and coordination with the project team, detailed costs were developed for each scenario. Potential impacts to the surrounding environment are also important considerations in the decision-making process.

7.1 Final Coordination Meeting

The project team held a third meeting May 22, 2023, to review the build concepts and discuss costs/impacts. Cost impacts versus benefits for benching cuts, adding truck climbing lanes, and using asphalt versus concrete pavement were discussed. An additional build concept was suggested—pairing the existing westbound alignment with a common median section to evaluate potential earthwork versus pavement savings: CM_4% discussed above.

7.2 Cost Estimates

Planning-level design concepts were used to estimate preliminary quantities of high-cost construction items including earthwork, pavement, and structures. Unit price assumptions for key items are summarized in **Table 8** for reference. Additional factors for miscellaneous items (30%) and contingencies (20%) were applied as well.

Table 8: Unit Cost Assumptions

Item	Price
Excavation	$6/cubic yard
Full Depth Pavement	$76/square yard
Overlay	$33/square yard
Median Barrier	$320/linear foot
Step Down Culvert Work	$2,600/linear foot
Bridges	$250-$350/square foot
Stream Impacts	$518 AMU

Planning-level cost estimates by build concept are presented in **Table 9** with costs shown in 2023 dollars. Additional details and cost breakdowns for each build concept are available in **Appendix G**.

Table 9: Planning-Level Cost Estimates by Concept

Build Concept	Asphalt	Concrete
1997	$ 151 M	$ 173 M
1997_3.52_noTCL	$ 151 M	$ 175 M
1997_3.52_2-TCL	$ 152 M	$ 175 M
1997_3.78	$ 152 M	$ 174 M
1997_ 3.78_noTCL	$ 151 M	$ 173 M
1997 _3.78_2-TCL	$ 154 M	$ 177 M
CM_4%	$ 175 M	$ 198 M
CM	$ 177 M	$ 198 M
CM_TCL	$ 182 M	$ 204 M

As shown, the Common Median concepts have higher construction costs, driven by added pavement width for inside shoulders and the median barrier. Earthwork savings are minimal with a marginally narrower grading width but do not outweigh added costs for paving and barrier.

7.3 Benefit/Cost Comparison

Potential benefits to mobility and safety were quantified across the range of build concepts to assess whether impacts to the traveling public outweigh increased construction costs.

Travel Time. As discussed in **Section 5.2.3**, most operational benefits are derived from the overall widening with less impact associated with flattening grades and adding TCL. Capacity analyses projected minimal changes in travel time between scenarios—within 6 seconds during the 2045 AM or PM peak hour. At 6 seconds per trip, factoring the savings up to account for every vehicle traveling through the study area every day over the design life of the widening project adds up to $1.7 million.

$$6\ seconds\ \times \frac{1\ hour}{3600\ seconds} \times \frac{3{,}300\ vehicles}{peak\ hour} \times \frac{\$25}{hour}\ = \$137.50\ savings\ per\ peak\ hour$$

$$\$137.50\ \times \frac{10\ peak\ hours}{week} \times \frac{52\ weeks}{year} = \$71{,}500\ savings\ per\ year$$

$$\$71{,}500\ annual\ savings\ \times 25\ year\ analysis\ period\ = \$1.7\ million\ in\ undiscounted\ benefits$$

Crash Reductions. Crash modification factors (CMF) represent crash reductions between build concepts based on extensive research. While differences between build concepts are relatively minor, several CMF are relevant to adjust existing crash rates to proposed future conditions:

Table 10: Relevant Crash Modification Factors

CMF Name	Factor	Applies to	Source
8336: Six-lane rural freeway	0.74	All types, Fatal & Inj.	CMF Clearinghouse[5]
10074: Add TCL	0.57	All types & severities	CMF Clearinghouse
Eq. 18-26: Widen inside shoulder	Equation	All types & severities	Highway Safety Manual
Eq. 18-38: Widen clear zone	Equation	Single veh. crashes; Fatal & Injury	Highway Safety Manual

Limited research on the influence of grade on freeway safety characteristics has been completed to date. While grade is one of the distinguishing features between Build concepts, the range of concepts considered varies by less than 0.5%—a relatively minor component when compared to other elements influencing safety.

Applying relevant factors from **Table 10** to 2018-2022 mainline crash rates determines predicted crash reductions. As a baseline, the No-Build scenario includes 0.8 fatality crashes, 9 injury crashes,

[5] Online at https://www.cmfclearinghouse.org/

and 56.4 PDO crashes per year within the study limits. Monetizing these reductions results in the projected annual crash savings summarized in **Table 11**. Comprehensive crash costs come from the 2021 *Kentucky Traffic Collision Facts*.[6] For example, the Common Median concept results in an estimated 10.8 fewer crashes per year, resulting in a crash savings of just over $6 million compared to the No-Build. The highest crash savings are associated with the Common Median concept with TCL in both directions (CM_TCL).

Table 11: Projected Annual Crash Reductions and Costs between Scenarios

Build Concept	Reduction in			Cost Savings
	Fatal Crashes	Injury Crashes	PDO Crashes	
CM	0.35 EB	2.22 EB + 2.58 WB	2.58 EB + 3.06 WB	$6.07 M
CM_TCL	0.52 EB	2.57 EB + 2.93 WB	5.59 EB + 3.83 WB	$8.26 M
CM_4%	0.50 EB	2.17 EB + 2.61 WB	5.59 EB + 3.83 WB	$7.79 M
1997	0.41 EB	2.35 EB + 2.26 WB	5.33 EB + 3.06 WB	$6.70 M
1997_3.52_noTCL	0.33 EB	2.00 EB + 2.26 WB	2.58 EB + 3.06 WB	$5.45 M
1997_3.52_2-TCL	0.41 EB	2.35 EB + 2.44 WB	5.33 EB + 3.92 WB	$6.80 M
1997_3.78	0.41 EB	2.35 EB + 2.26 WB	5.33 EB + 3.06 WB	$6.70 M
1997_3.78_noTCL	0.33 EB	2.00 EB + 2.26 WB	2.58 EB + 3.06 WB	$5.45 M
1997_3.78_2-TCL	0.41 EB	2.35 EB + 2.44 WB	5.33 EB + 3.92 WB	$6.80 M

Accruing those crash reduction benefits over a 25-year analysis period adds up, equating to $136-$206 million in undiscounted benefits. This demonstrates that the safety benefits associated with the TCL ($1.35-$2.19 million per year) outweighs cost increases associated with constructing TCL ($1-$3 million).

7.4 Environmental Considerations

Alongside costs, impacts to the human and natural environment are another consideration when evaluating between Build concepts. As topography and access limit development for much of the study area, minimal impacts are anticipated. Based on the range of build concepts considered, the level of environmental investigations required to satisfy the National Environmental Policy Act (NEPA) will be the same for each. A categorical exclusion is expected but should be confirmed with FHWA at an initial scope verification meeting.

- Field surveys for threatened and endangered species will likely be needed, including coordination with USFWS. Braun's rock-cress is known to occur in rocky limestone outcrops near the Kentucky River, especially within northern Franklin County. Short's bladderpod also grows on rocky limestone outcrops or in bedrock with shallow, well-

[6] Online at https://uknowledge.uky.edu/ktc_researchreports/1760/

drained soils. Both plant species flower during April/May, restricting the timeline to complete field surveys.

- While no new right-of-way acquisition is required, the extent of earthwork is likely to affect previously undisturbed areas and require additional archaeological investigations. Investigations for aboveground historic resources will also be required, though no red flag concerns were noted in the initial windshield survey. Both investigations will require consultation with KHC.

- Noise modeling consistent with the latest KYTC policy will be necessary to determine the potential for impacts and whether abatement measures are reasonable and feasible. Higher density multi-family developments near either interchange may satisfy the cost-effectiveness threshold to warrant barriers.

- Stream impacts are anticipated and will require an individual permit. Due to the length of anticipated stream impacts, costs associated with paying in-lieu fees were included in the planning-level estimate. However, as the design progresses, on-site mitigation or the use of mitigation banks may be explored as options to reduce mitigation costs.

- The Statewide Transportation Improvement Program (STIP)[7] should be updated to reflect future project development phases.

7.5 Procurement Options

The 5-551 widening project has unique challenges with major cost components spread across major categories—i.e., grade and drain (with substantial rock excavation near the existing roadways), pavement widening and reconstruction, and construction of several structures including a new Kentucky River crossing. Though the team explored varying strategies for construction, individual contractors may approach this project very differently. Depending on their strengths and preferences, individual contractors may decide to satisfy the project purpose and need from a different angle than proposed by this study. As a result, this project may be a strong candidate for an Alternative Delivery method.

The following paragraphs summarize alternative delivery methods currently being utilized in Kentucky and their potential applicability to this project. The project team believes that, as this project moves forward, alternative delivery methods should be considered to allow KYTC to meet the project's Purpose and Need in the most efficient manner possible.

[7] Online at https://transportation.ky.gov/Program-Management/Pages/default.aspx

7.5.1 Design-Build

Until recently, the primary alternative delivery method to the traditional Design-Bid-Build approach utilized in Kentucky was Design-Build. According to FHWA's Center for Accelerating Innovation:[8]

> State DOTs have found that they can accelerate project delivery, lower project costs, and improve project quality with an alternative project delivery method: Design-Build (D-B). In the D-B process, a State DOT identifies what it wants constructed, accepts proposals, and selects a D-B team to assume the risk and responsibility for the design and construction phases. With D-B, DOTs generally have the option of selecting a D-B team based on a best-value basis—allowing DOTs to consider other factors beyond lowest price.
>
> **DESIGN-BUILD BENEFITS AT-A-GLANCE**
>
> - ☑ Project cost savings
> - ☑ Schedule reduction
> - ☑ Reduced litigation associated with project delivery
> - ☑ Risks and costs associated to design errors and omissions transferred from owner to the D-B team
>
> The D-B method accelerates project delivery, or shortens the project duration, in several ways. The contractor has flexibility in selecting the design, materials, and construction methods based on the available equipment, workforce, and resources. The contractor also works closely with the designer, sharing his or her expertise, to reduce the risk of design errors and the need for redesigns, which can add to project costs and project delays. Allowing the contractor to tailor the project design and apply appropriate innovations provides flexibility for the contractor to manage and compensate for cost increases in one area through efficiencies in another. This does not include changes to environmental commitments, but control of the means and methods.

7.5.2 Progressive Contracting Methods

KYTC is also actively developing projects that will be delivered using progressive contracting methods. The key feature of these methods is that the construction price is not established until after the selection of the contractor. This allows for multiple benefits including better risk mitigation and greater price certainty. Other benefits include:

[8] Online at https://www.fhwa.dot.gov/innovation/everydaycounts/edc-2/designbuild.cfm#:~:text=In%20conventional%20highway%20construction%20projects,bid%E2%80%94to%20complete%20the%20construction

Less investment in proposal process

Compensates for pre-construction work

Greater collaboration

Opportunity for innovation

Better risk management

Progressive Design-Build (PDB).[9] PDB uses a qualifications-based or best value selection, followed by a process whereby the owner then "progresses" towards a design and contract price with the team. The design-builder is retained by the owner early in the life of the project—in some cases, before the design has been developed at all. The design-builder is generally selected on qualifications so the project cost and schedule is not established as part of the selection process.

PROGRESSIVE DESIGN-BUILD is an excellent option when the owner wants to use D-B but remain actively involved in design decisions.

In PDB, the design-builder delivers the project in two distinct phases with Phase One including budget-level design development, preconstruction services and the negotiation of a firm contract price and Phase Two including final design, construction, and commissioning.

As part of Phase One or Preconstruction Services, the design-builder collaborates with the owner to create or confirm the project's basis of design and programming requirements then advances that design. Design and other project decisions are based on cost, schedule, quality, operability, life cycle and other considerations, with the design-builder providing ongoing, transparent cost estimates to ensure that the owner's budgetary requirements are satisfied. Then, the design-builder will provide a formal commercial proposal (including the overall contract price) for Phase Two services. The proposal is often established when the design is approximately 40% to 60% complete, but can occur anytime (including as late as 90% to 100% design completion), depending on the amount of control the owner desires to maintain over the design definition.

Phase Two Services or Final Design and Construction Services begin once the owner and design-builder agree upon commercial terms. The design-builder will complete the design and construction of the facility in accordance with those commercial terms along with any testing, commissioning, and other services that have been agreed upon.

[9] Online at https://dbia.org/wp-content/uploads/2018/05/Primer-Progressive-Design-Build.pdf

If, for any reason, the parties cannot reach agreement on the Phase Two commercial terms, then the owner may consider an "off-ramp" option — where it can use the design and move forward with the project through another contract strategy.

Construction Manager/General Contractor (CM/GC). The CM/GC or "Construction Manager at-Risk" project delivery method allows an owner to engage a construction manager during the design process to provide constructability input. The Construction Manager is generally selected based on qualifications, experience, or a best-value basis. During the design phase, the construction manager provides input regarding scheduling, pricing, phasing, and other input that helps the owner design a more constructible project. At 60% to 90% design completion, the owner and the construction manager negotiate a "guaranteed maximum price" for the construction of the project based on the defined scope and schedule. If this price is acceptable to both parties, they execute a contract for construction services, and the construction manager becomes the general contractor.

CM/GC offers the potential for lower project costs primarily because risks are identified early in project development before construction; it encourages the owner and contractor to form a more effective management team to look at all options to reduce time and cost. The combined knowledge of the owner, designer, and contractor fosters a partnership that can result in improved project designs, greater cost certainty, and optimized construction schedules.

8.0 ADDITIONAL INFORMATION

Written requests for additional information should be sent to:

KYTC Division of Planning
ATTN: Director
200 Mero Street, 4th Floor West
Frankfort, KY 40622
Phone: 502.564.7183