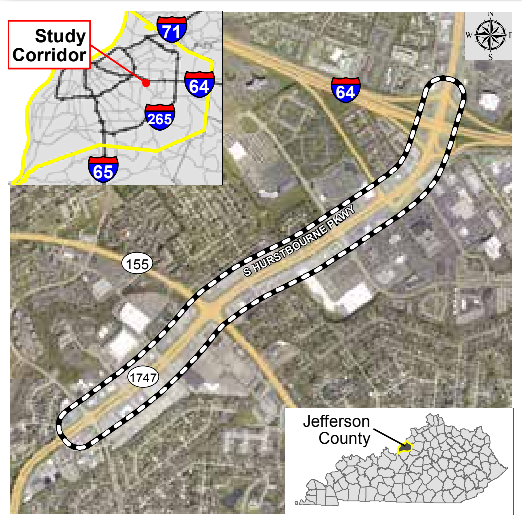
FINAL REPORT
MARCH 2021

KY 1747 HURSTBOURNE PARKWAY IMPROVEMENT STUDY

Jefferson County, KY | Item No. 5-555



PREPARED FOR

KENTUCKY TRANSPORTATION CABINET

IN PARTNERSHIP WITH

QK4
Engineering Planning

EXECUTIVE SUMMARY

The Kentucky Transportation Cabinet (KYTC) initiated a corridor study for KY 1747 (Hurstbourne Parkway) in Jefferson County, stretching from Stony Brook Drive near milepoint (MP) 10.500 to the I-64 westbound ramps near MP 12.000. The study area limits, shown in **Figure ES - 1**, included approximately 250 feet on either side of the existing highway centerline.

The goal of this study was to identify practical, implementable solutions to improve safety, vehicle throughput, and pedestrian connectivity along the congested KY 1747 corridor between Stony Brook Drive and I-64. While each spot improvement has its own Purpose and Need Statement, each focused on one or more of these three goals. In addition, each spot improvement was designed to minimize right-of-way and environmental impacts to the extent practicable.

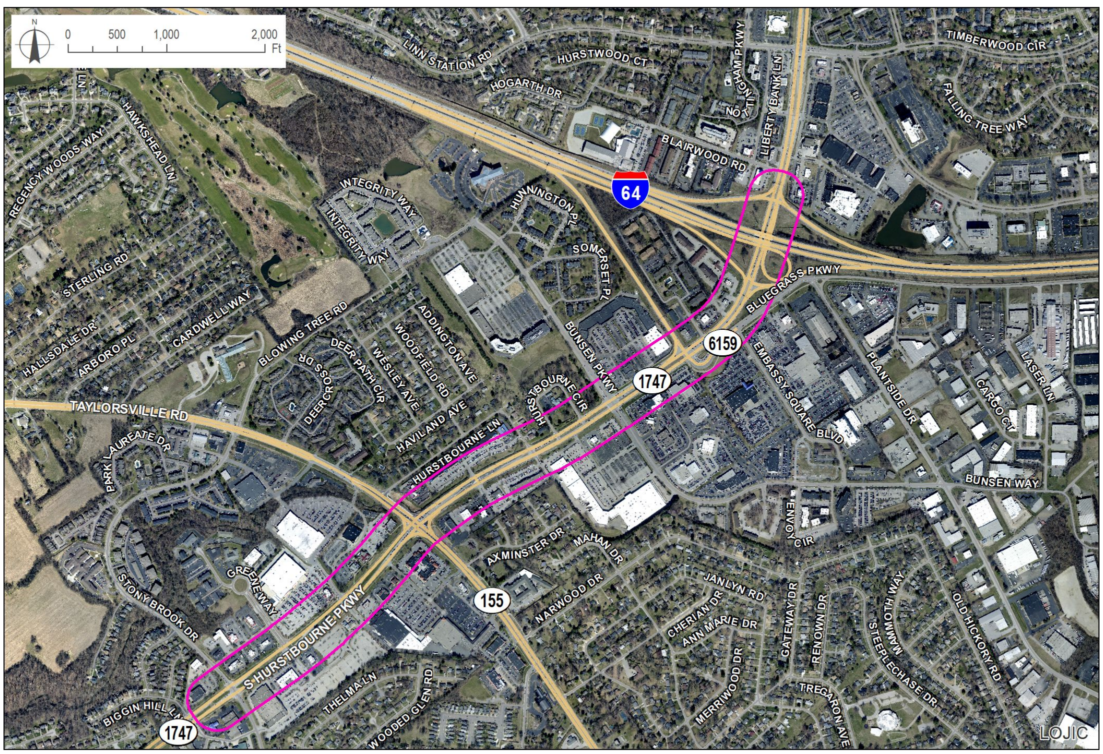


Figure ES - 1: Study Area Map

Study tasks included creating an inventory of existing conditions, defining goals for the study, forecasting existing and future traffic, identifying red flag environmental issues, developing build concepts with construction cost estimates, and documenting the study process and results. Coordination with the project team—KYTC District 5 and Central Office staff, Kentuckiana Regional Planning and Development Agency (KIPDA), and the consultant—occurred throughout the study process. In addition, two local officials/stakeholders' meetings and two rounds of public surveys were conducted to share information and gather community input.

KY 1747 is classified as an urban principal arterial and provides 12-foot lane widths throughout the study area with four travel lanes south of the KY 155 (Taylorsville Road) intersection and six lanes to the north. A grassy median separates travel directions south of the interchange and most of the corridor has curb/gutter for drainage. Between KY 155 and Hurstbourne Circle, large drainage ditches behind curbs carry the South Fork of Beargrass Creek and its tributaries, creating a gap in sidewalk connections for pedestrians. Nine of ten intersections along the study corridor are signalized. Despite a 45-mph posted speed limit, travel speeds during the PM peak average 22 mph southbound and 25 mph northbound.

Traffic Flows

Year 2020 daily traffic volumes (prior to the pandemic) range from 26,900 to 58,800 vehicles with strong directional flows during peak hours. KY 1747 carries 2,200 to 4,600 vehicles during the AM peak hour and 2,700 to 4,800 vehicles during the PM peak hour. To measure performance, a Level of Service (LOS) analysis was performed. LOS rates traffic conditions A (best case, free flow) through F (worst, gridlock) based on speed, density, and driver comfort. Currently, the Hurstbourne Parkway intersections with KY 155, Bunsen Parkway, and Bluegrass Parkway/I-64 eastbound off-ramps (Exit 15A) operate at LOS E or F during peak hours. Most intersections along the study corridor have individual turn movements operating at LOS F.

Defective signal detectors at a series of intersections adjacent to the interchange compromise safety and throughput; Item No. 5-9019 is designed to correct the issue.

KIPDA's current regional travel demand model generated future year forecasts using 2040 as the future analysis year. Because the corridor is already approaching available capacity, model runs showed minor traffic growth. Year 2040 daily traffic volumes range from 32,100 to 62,900 vehicles. This equates to 3,300 to 5,300 vehicles during the AM peak hour and 3,600 to 5,500 vehicles during the PM peak hour.

Forecast volumes were input into a VISSIM microsimulation model to analyze future traffic operations. As the existing system is near capacity, the relatively small increase in No-Build traffic pushes the system over capacity and into gridlock: almost every intersection operates at LOS E or F during the PM peak. With few parallel route options and limited I-64 access points in the vicinity, the study corridor is a critical link in the regional network.

Crash Patterns

From July 2016 through June 2019, 811 crashes were reported within the study area including one fatality (an early morning pedestrian strike near Stony Brook Drive) and 81 injury collisions. Most crashes were rear end collisions (56%)—typical for a congested urban highway—followed by same-direction sideswipes (21%) and angle collisions (18%). Four reported pedestrian strikes (1 fatality and 2 injuries) were distributed along the corridor.

Two methodologies were applied to analyze crash concentrations:

- A Critical Crash Rate Factor (CCRF) greater than 1.0 indicates crashes may be occurring more often than can be attributed to random occurrence. High CCRF spots 0.1-mile long cover over two thirds of the study corridor length—shown in **Figure ES - 2**. The highest CCRF spot is located at the KY 1747 intersection with Bunsen Parkway.
- Excess Expected Crashes (EEC), a newer methodology defined in the *Highway Safety Manual*, represents the number of excess crashes a segment or intersection is experiencing compared to other roadways of its type, adjusting for facility type and statistical corrections. Most of the corridor has a positive EEC—indicating more crashes are occurring than projected. Intersections in the study corridor with the highest EEC are the westbound ramps (215.5), Bunsen Parkway (82.6), and KY 155 (78.8).

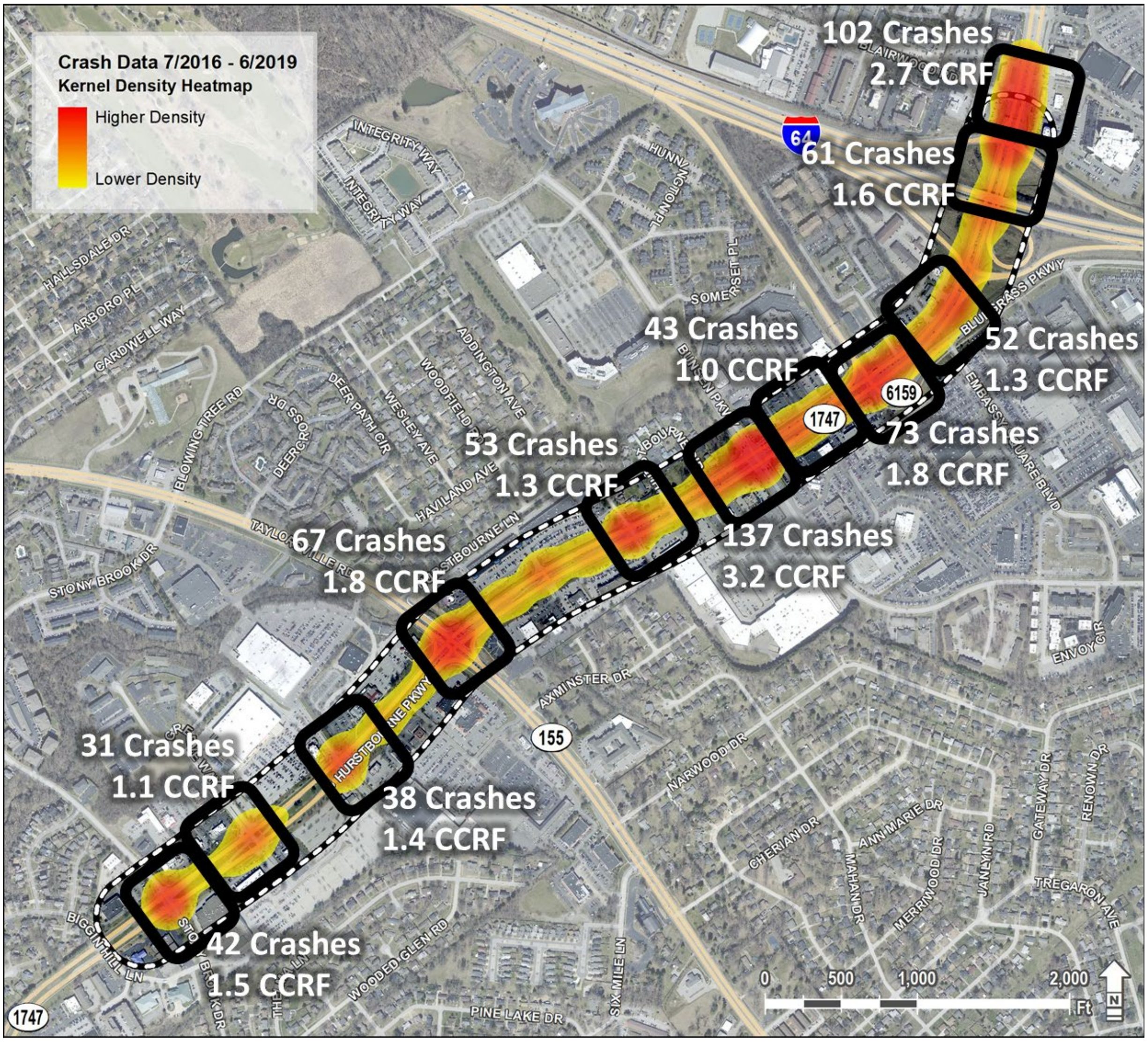


Figure ES - 2: High CCRF Spots by Crash Density

Environmental Overview

As a densely developed urban corridor, there are limited natural environmental elements remaining within the study area: South Fork of Beargrass Creek and two feeder springs. The study area includes narrow strips of the following Jefferson County municipalities: Jeffersontown, Hurstbourne, Hurstbourne Acres, Forest Hills, and Louisville. The entire corridor is zoned commercial/industrial, excluding the pocket of residential area accessed from Hurstbourne Circle. Bluegrass Parkway provides the primary access for Bluegrass Commerce Park in Jeffersontown. Available hazmat monitoring records range from short-term construction permits to commercial automotive properties with underground storage tanks (USTs) lining the route. Noise-sensitive receptors along the study corridor include residential areas and commercial uses with outdoor uses (e.g., sidewalk cafes or outdoor event venues). An assessment of demographic trends identified potential sensitive population concentrations—low-income, minority, elderly, disabled, or limited English proficiency persons—however, properties within the study area limits are almost entirely commercial properties.

Spot Improvements

Potential improvement concepts were developed based on a review of existing traffic and safety needs, field reconnaissance, and community input. These are divided into short-term and mid-term improvements, divided based on the scale of anticipated costs and impacts.

Short-term spot improvements represent small-scale actions within existing right-of-way that can be implemented more quickly than larger projects. Potentially, some could be addressed through maintenance actions, independent of more traditional funding options. Four short-term spot improvements are recommended:

A. Corridor-level Wayfinding/Signage. This concept includes placing "pavement tattoos" near the I-64 interchange and KY 155, restriping the dual left turns onto KY 1747 southbound from the I-64 westbound off-ramp, and updating the "Do Not Block Intersection" box at the southern Hurstbourne Circle intersection. Also included, signage is proposed to shift eastbound Bunsen Parkway traffic to the local access ramp (Exit 15B), providing a longer opportunity for left-turning vehicles to merge across the three southbound travel lanes. The existing versus proposed routing concepts are shown in **Figure ES - 3**.

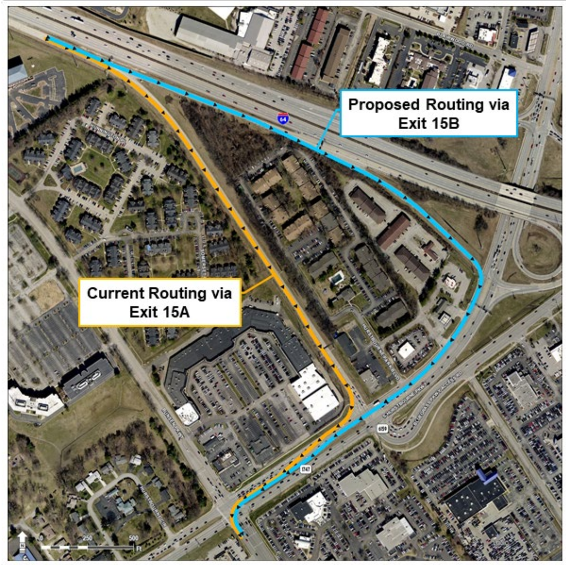


Figure ES - 3: Spot A Routing

B. Signal Optimization. The ongoing 5-9019 project will replace existing puck detectors with loops at signalized intersections from Bunsen Parkway to Linn Station Road, which should noticeably improve corridor throughput. Once hardware is in place Louisville Metro plans to optimize the KY 1747 corridor signals between US 60 and KY 155. This concept (Spot B) extends coordination efforts to the southern three study intersections: Shane Drive, Greene Way, and Stony Brook Drive. At these intersections, permitting off-peak left turns from KY 1747 (with flashing yellow lights) may improve operations.

C. Greene Way Medians. The Greene Way intersection provides raised islands intended to channelize movements to prevent thru movements between cross-streets. This concept (Spot C) proposes to cut back the islands within the intersection to allow thru movements.

D. Sidewalk Maintenance. This spot improvement is a catch-all for maintenance level actions along existing pedestrian facilities lining the corridor: drainage, crosswalks, lighting, Americans with Disabilities Act (ADA) compliance, etc.

The remaining spot improvements are larger in scale and have somewhat longer implementation timelines due to higher costs or greater impacts (e.g., right-of-way acquisition or stream impacts). However, they are intended for implementation within a reasonably foreseeable timeline. Five "mid-term" spot improvements are recommended:

E. Displaced Left Turns. Left turns from northbound KY 1747 onto the I-64 westbound on-ramp represent a high-volume movement. An unscheduled future project (Item No. 5-52) will reconstruct the interchange to convert these turns to a free-flow movement. A less costly alternative, Spot E shifts the left turn movement upstream one intersection to create dual displaced left turn lanes functionally similar to half a diverging diamond interchange (DDI). As shown in **Figure ES - 4**, northbound motorists accessing the westbound I-64 on-ramp will turn left at the eastbound ramps intersection, then continue onto I-64 as a free-flow movement. Beneath the overpasses, a vertical wall replaces the west embankment to accommodate the dual left turn lanes outside the pier. The existing sidewalk shifts inside the pier, separated from southbound traffic by a barrier.

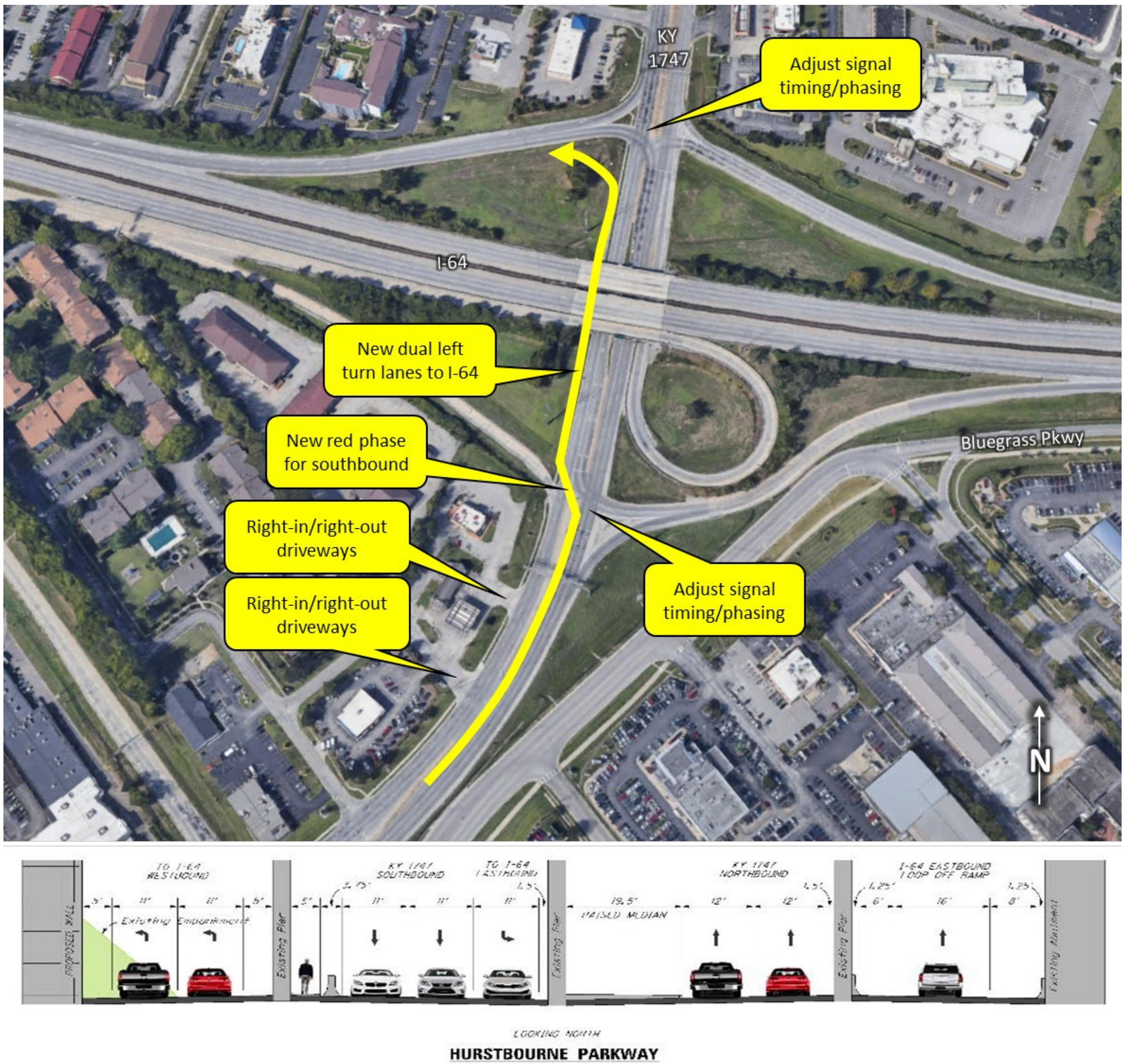


Figure ES - 4: Spot E Northbound Displaced Left to I-64

F/G. Southbound Thru Lane plus Sidewalk. To accommodate heavy, southbound peak hour traffic flows during the PM peak, a fourth southbound lane is proposed within the median south of Hurstbourne Circle to reduce impacts. An extra right turn lane onto Bunsen Parkway is added so four thru lanes continue south, tying to recently constructed improvements approaching KY 155. The northern Hurstbourne Circle intersection is converted to a right-in/right-out configuration to reduce conflict points. In addition, a 5-foot-wide sidewalk is proposed along the west side of KY 1747, between Hurstbourne Circle and KY 155, which will fill the missing gap in pedestrian connectivity.

H. Shared Use Path. A 10-foot-wide shared use path along the east side of KY 1747 is proposed to connect to the existing shared use path along Bluegrass Avenue at its north limit and to the existing sidewalk/crosswalk/bike lane at KY 155 on its south end.

I. Shane Drive Turn Lanes. Spot I proposes to add a southbound right turn lane on Hurstbourne Parkway at Shane Drive. The mainline left turn lanes are proposed to be offset across the median to improve visibility for permitted (flashing yellow) left turns during off-peak periods. A proposed refuge in either median will improve safety for pedestrians and reduces the signal phasing for motorists.

J. Northbound Right Turn Lane onto KY 155. The existing KY 1747 northbound right turn lane onto KY 155 is proposed to be extended back to the right-in/right-out driveway by Starbucks/PNC to increase storage length for right turning vehicles. Northbound thru queues block turning vehicles from accessing the short turn lane today.

Figure ES - 5 and **Figure ES - 6** on the following pages show planning-level concept sketch of Spot E and Spots F, G, and H. Project sheets beginning on Page 60 of this report present each concept in additional detail. Cost estimates are summarized in **Table ES - 1**, including planning-level estimates for design, right-of-way, utility, and construction phases plus a 30% contingency.

Table ES - 1: Planning-Level Cost Estimates (2020 Dollars)

Spot	Total Cost
A – Wayfinding	$90,000
B – Signal Optimization	$50,000
C – Greene Way	$340,000
D – Ped Maintenance	$260,000
E – Displaced Lefts	$5.3 M
F/G – Southbound Thru Lane plus West Sidewalk	$2.3 M to $6.9 M
H – East Shared Use	$3.0 M
I – Shane Drive	$1.3 M
J – Right onto KY 155	$360,000

The proposed improvements were supported by local officials and stakeholders, representing affordable solutions that could be implemented before larger, more expensive solutions like full reconstruction of the I-64 interchange (Item No. 5-52). Affected municipalities identified spots G and H (pedestrian connections) as priorities. Safe turns to/from Hurstbourne Circle were also a concern. Public priorities based on 321 survey responses identified Spot B (signal optimization) as the highest short-term priority; Spot E (displaced lefts at interchange) was the highest mid-term priority, followed closely by Spot F (extra southbound lane).

To the extent practical, improvements are contained within the existing right-of-way to minimize property impacts. Because the corridor is fully developed, few environmental impacts are anticipated. A thorough geotechnical exploration of proposed improvement sites is recommended to identify conditions that may warrant special consideration during design and construction.

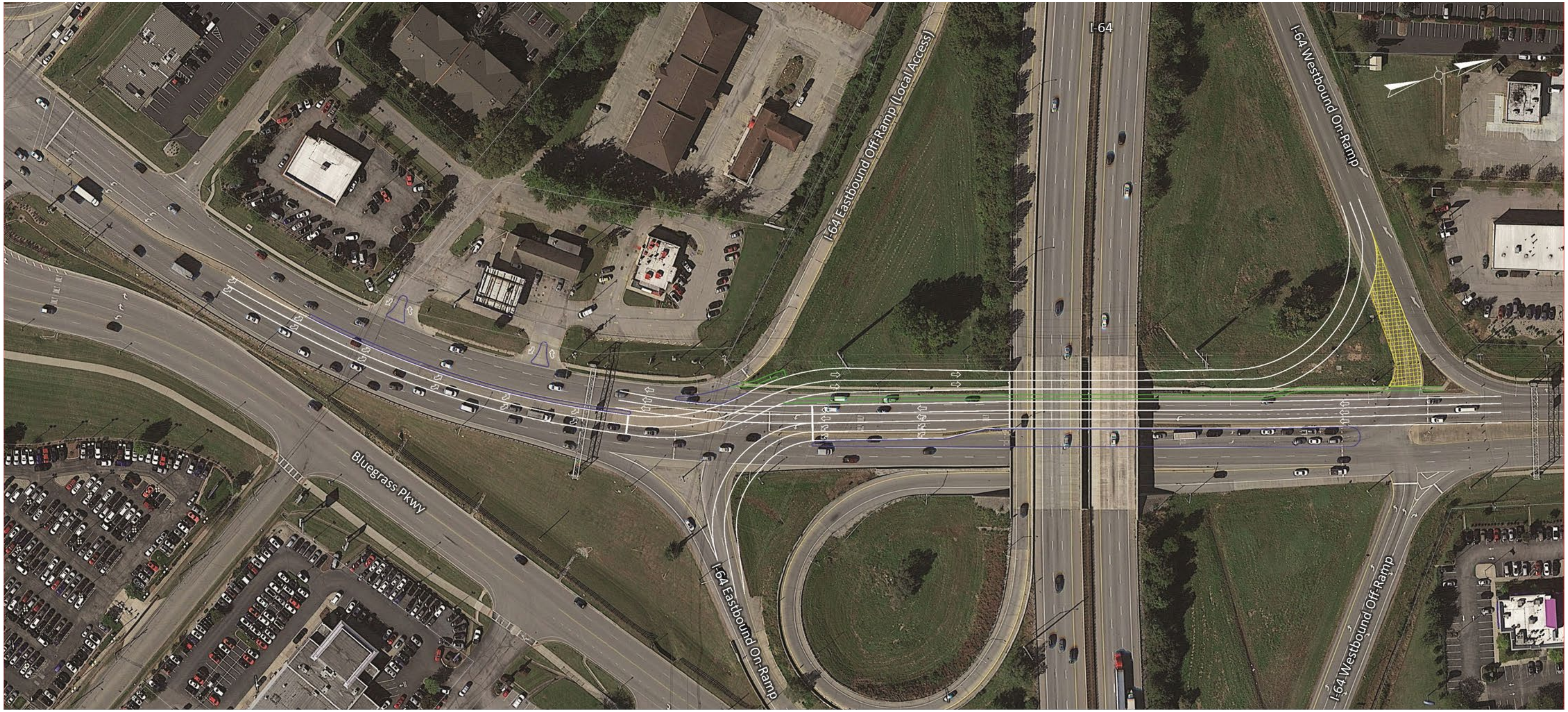


Figure ES - 5: Spot E Concept Sketch of Displaced Lefts

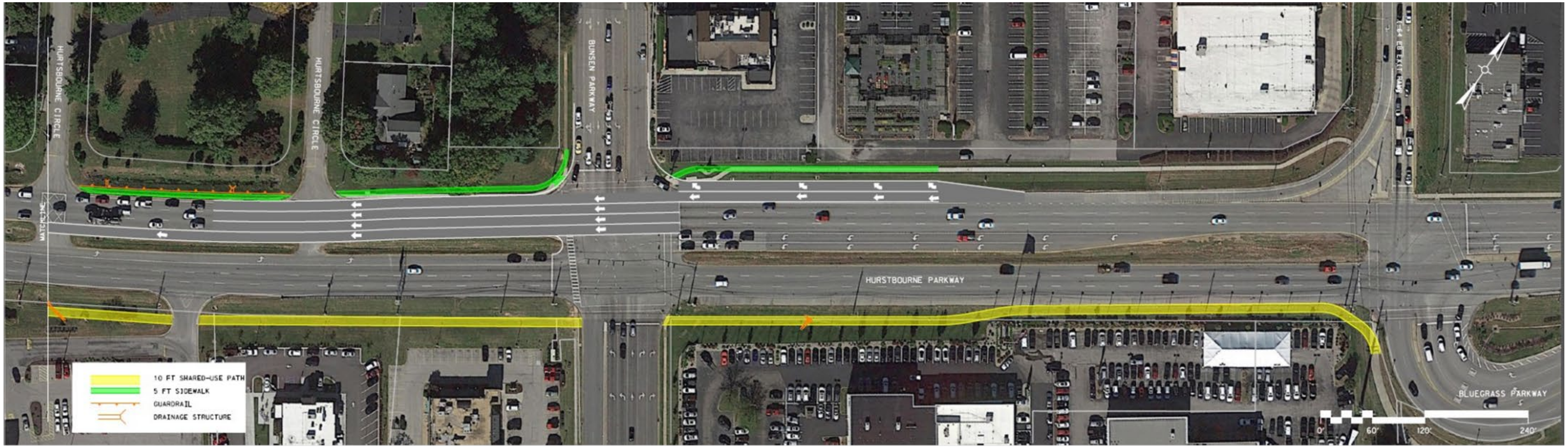


Figure ES - 6: Spots F, G, and H Concept Sketch

Finding an appropriate balance between mobility and access is one of the core challenges facing those planning the corridor's future. Long-term, the ultimate vision for the corridor is estimated to cost $75–136 million for construction alone, excluding design, right-of-way, or utility costs. Impacts to surrounding properties and their access would be substantial. A comprehensive regional planning analysis is recommended to determine whether investing in other cross-I-64 corridors might provide more benefit than direct investment in KY 1747 beyond recommended Spots A—J.

Build Traffic Operations

The future No-Build microsimulation model was adjusted to calculate performance for the larger scale spot improvements discussed above. Travel times along the entire study corridor are summarized in **Table ES - 2** for each peak period, direction, and improvement scenario.

The greatest operational benefits were associated with Spot E (displaced lefts), which improves PM peak LOS at the two signalized ramp termini from LOS F in the No-Build to LOS D in the Build. Queue lengths were examined: introducing a new signal for the southbound thru movement at the eastbound ramps could affect operations within the interchange's area of influence because the movement is free-flow today. The average southbound queue lengths approaching the eastbound ramps are 450 feet. Although this is within the 700-foot available storage capacity, the 800-foot maximum queues exceed this length. During peak periods, westbound right turning traffic from Bluegrass Parkway may struggle to merge across thru lanes to reach the displaced lefts providing access to westbound I-64.

While less dramatic benefits are associated with Spot F (extra southbound thru lane), overall delay at the Bunsen Parkway intersection is reduced by 17 seconds during the PM peak.

Table ES - 2: Comparison of 2040 Corridor Travel Times

Direction	No-Build	Build 1 Spots E & A	Build 2 Spot F	Build 3 Spots C & I
AM Peak				
Northbound	569 sec	523 sec *46 sec savings*	564 sec *5 sec savings*	560 sec *9 sec savings*
Southbound	392 sec	361 sec *31 sec savings*	383 sec *9 sec savings*	387 sec *5 sec savings*
PM Peak				
Northbound	684 sec	659 sec *25 sec savings*	682 sec *2 sec savings*	682 sec *2 sec savings*
Southbound	860 sec	820 sec *40 sec savings*	815 sec *45 sec savings*	855 sec *5 sec savings*

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List of Acronyms

ADT	Average Daily Traffic
BRT	Bus Rapid Transit
CCRF	Critical Crash Rate Factor
CHAF	Continuous Highway Analysis Framework
CMF	Crash modification factor
DDI	Diverging Diamond Interchange
EEC	Exceeds Expected Crashes
FHWA	Federal Highway Administration
GIS	Geographic Information System
HIS	Highway Information System
HSIP	Highway Safety Improvement Program
HSM	Highway Safety Manual
KIPDA	Kentuckiana Regional Planning and Development Agency
KTC	Kentucky Transportation Center
KYTC	Kentucky Transportation Cabinet
LOS	Level of Service
MP	Milepoint
mph	Miles per hour
MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan
NHS	National Highway System
NRHP	National Register of Historic Places
PDO	Property Damage Only
PL&G	Preliminary Line and Grade
PVA	Property Valuation Administrator
SHIFT	Strategic Highway Investment Formula for Tomorrow
SPUI	Single Point Urban Interchange
TARC	Transit Authority of River City
TDM	Transportation Demand Management
TED	Transportation Enterprise Database
TIP	Transportation Improvement Program
TSM	Transportation System Management
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
VHD	Vehicle-hours of delay
vpd	Vehicles per day
vph	Vehicles per hour

1.0 INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) initiated a corridor study for KY 1747 (Hurstbourne Parkway) in Jefferson County, stretching from Stony Brook Drive near milepoint (MP) 10.5 to the I-64 westbound ramps near MP 12.0.

The study examines transportation needs related to safety and congestion, identifying practical short- and mid-term concepts to improve safety, corridor throughput, and pedestrian connectivity. A long-term vision for the corridor is discussed further in **Section 10.0**.

The study area limits, shown in **Figure 1**, include approximately 250 feet on either side of the existing highway centerline. For ease of reference throughout this report, KY 1747 is considered a north/south route and cross-streets are considered east/west movements.

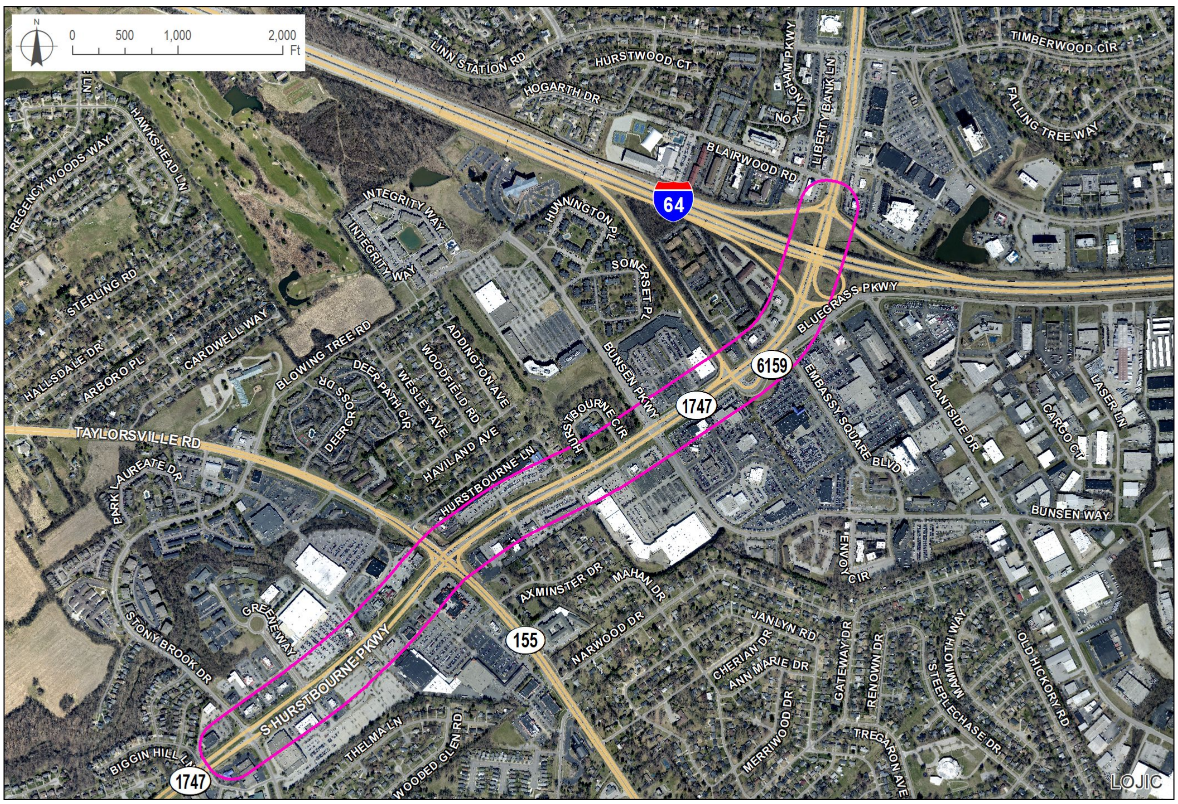

Figure 1: Study Area Map

Study tasks include creating an inventory of existing conditions, defining goals for the study, forecasting existing and future traffic, identifying red flag environmental issues, developing build concepts with construction cost estimates, and documenting the study process and results. The following chapters explore these efforts.

This study was prepared utilizing federal National Highway System funds as programmed in Kentucky's *FY 2018–2024 Highway Plan* and identified as Item No. 5-555.00. Kentucky's *FY 2020–2026 Highway Plan* does not include any additional funding for the project or improvements within its limits.

1.1 Project History

Item No. 5-555.00 was the highest scoring KYTC District 5 project in the 2020 SHIFT[1] process. Recurring peak hour congestion and extremely high crash rates elevate its priority. Existing traffic and safety performance are discussed in **Sections 2.5** and **2.6**.

1.2 Previous Transportation Studies

Past planning studies are listed below.

1) *Hurstbourne Lane/I-64 Subarea Traffic Study* (1985)[2]

In 1985, the Kentuckiana Regional Planning and Development Agency (KIPDA) commissioned a subarea study to assess traffic problems and prioritize improvements along KY 1747 between KY 155 and US 60—the entire length of the highway at that time. KY 1747 carried 25,000 to 46,000 vehicles per day (vpd) at that time. A network of new and improved highway projects was proposed, many of which have since been constructed. Even 35 years ago, widening the KY 1747 corridor to eight lanes was identified as a priority to ease congested traffic operations.

2) *Hurstbourne Parkway Traffic Flow—Congestion Mitigation Study* (1994)[3]

Nearly 10 years later (1994), KYTC assessed the KY 1747 corridor's traffic and safety needs between KY 155 and US 60, identifying a series of short- and long-term projects for implementation. At that time, the corridor carried 25,000 to 75,800 vpd with two to three thru lanes per direction. High traffic volumes contributed to peak hour congestion/delay and elevated crash rates. Recommendations within the 5-555 study area are summarized in **Table 1**; a host of other long-term and off-alignment options were explored but not recommended as part of that study.

Table 1: 1994 Study Recommendations

ID	Description	Status
Ia	Six lane KY 1747, KY 155 to Bunsen Parkway	Completed
Ib	Close KY 1747 median, Bluegrass Parkway to I-64	Not constructed
Ic	Reconstruct loop ramp to add second northbound lane	Not constructed
Id	Three lane southbound KY 1747 through interchange	Dual lefts to eastbound on-ramp were constructed instead
If	Three lane northbound KY 1747, Bluegrass Parkway to eastbound on-ramp	Completed
Ig	Extend Blowing Tree Road to Bunsen Parkway	Constructed but gated
IIa	Northbound KY 1747 flyover ramp to westbound I-64	Not constructed
IIb	Create loop ramp for westbound I-64 to southbound KY 1747	Not constructed
IId	Various side street turn lanes for signal timing	Partially constructed
IIf	Eight lane KY 1747, KY 155 to Timberwood Circle	Not constructed
IIIb	Interchange at KY 1747/KY 155	Not constructed

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[1] SHIFT, or the Strategic Highway Investment Formula for Tomorrow, is a data-driven prioritization process used to develop the biennial Highway Plan. Additional information available online at https://transportation.ky.gov/SHIFT/Pages/default.aspx
[2] Online at https://transportation.ky.gov/Planning/Pages/Planning-Studies-and-Reports.aspx
[3] Online at https://transportation.ky.gov/Planning/Pages/Planning-Studies-and-Reports.aspx

3) Hurstbourne Transportation Study and Small Area Plan (2006)[4]

This Louisville Metro effort was intended "to guide mobility improvements and future growth and development in a manner consistent with a community vision for the area. The Plan contains recommendations for future public and private improvements relating to Land Use, Community Character, and Mobility." The limits of the small area plan (**Figure 2**) lie primarily north of the current study area but overlap the KY 1747 corridor north of KY 155.

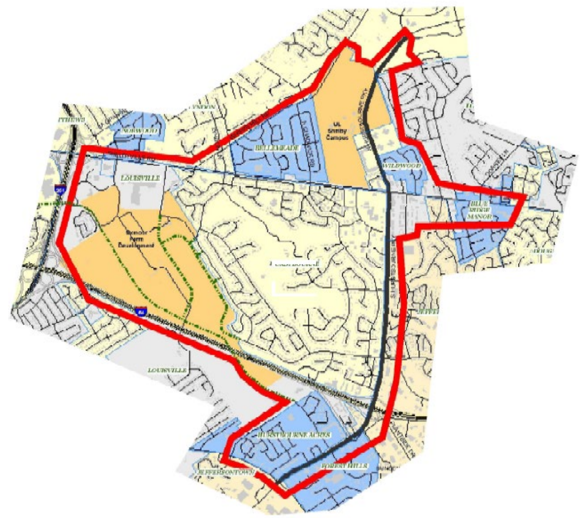

Figure 2: 2006 Study Area

Mobility recommendations overlapping the 5-555 study area include the following:

- Reconstruct the I-64/KY 1747 interchange and widen KY 1747 to the north.
- Improve/extend highway connections nearby: Christian Way, Bunsen Parkway, Blowing Tree Road, and a new I-64 interchange to the west.
- Improve access management, coordinating strategies throughout the area.
- Improve operations through technology: i.e., creating an area-wide Transportation Demand Management (TDM) Program to reduce peak hour trips, developing a Transportation System Management (TSM) Program with coordinated signals, and expanding TRIMARC's coverage to add the corridor.
- Improve transit connections; e.g., implementing a Bus Rapid Transit (BRT) corridor, improving existing facilities, and creating a park and ride lot with a transit center.
- Improve bicycle and pedestrian facilities through Complete Streets philosophy to provide modal choices.

4) Item 5-52, I-64 / Hurstbourne Parkway Interchange Phase I Design

Throughout the early 2000s, KYTC conducted Phase I design efforts to reconstruct the I-64/KY 1747 interchange including traffic simulations and cost estimates for four build alternatives, discussed further in **Section 10.2**. Interim improvements were completed in 2012.

Cost estimates ranged from $25 million to $51 million in 2006 dollars. Three growth rates were applied to account for a range of future development patterns. Level of service (LOS) and delay at 12 intersections were examined. Overall, the 2003 preferred layout (with a northbound-to-westbound flyover, two loop ramps, and supplemental connection to Linn Station Road) provided the best performance and least delay network-wide. During the PM peak, the 2030 No-Build scenario operated at LOS E/F at 7 critical intersections and the 2003 preferred scenario operated at LOS D or better at all critical intersections except Bunsen Parkway.

[4] Online at https://louisville.edu/updc/master-planning/shelby-campus-hurstbourne-transportation-study

The diverging diamond interchange (DDI) performed second best, roughly half the 2003 layout's cost. During the PM peak, the DDI layout Build scenario operated at LOS E/F at one to four critical intersections, depending on the growth rate applied.

5) *Middletown to Simpsonville Needs Analysis* (2019)[5]

In 2019, KYTC conducted a needs analysis to inventory and prioritize improvement concepts throughout portions of Jefferson, Oldham, and Shelby counties. The KY 1747 corridor was one of 16 state-maintained highways inventoried. Five projects along its length were prioritized in the resulting matrix that fed into the sponsorship phase of the 2020 SHIFT process. These are discussed in more detail in the following section.

1.3 Nearby Proposed Transportation Projects

Numerous proposed projects exist within the study vicinity, compiled from the current Highway Plan, KYTC's Continuous Highway Analysis Framework (CHAF) database, and from KIPDA's latest Metropolitan Transportation Plan (MTP), *Connecting Kentuckiana 2040*, and *Transportation Improvement Program* (TIP). Proposed projects are summarized in **Figure 3**.

KYTC-sponsored

- **Item No. 5-344**, also identified as CHAF IP20150293 and KIPDA #359, proposes to widen southbound KY 1747 to three lanes from Linn Station Road to Eden Avenue. While there is no funding in the current *FY 2020–2026 Highway Plan*, KIPDA identifies this as a high priority in its 2040 MTP. The CHAF's estimated cost is $10.5 million for the 1.1-mile widening.
- **CHAF IP20080217**, also identified as KIPDA #386, proposes to widen 3.7 miles of KY 1747 to six lanes from US 31E to KY 155. The CHAF's estimated cost is $33 million. The 2040 MTP's estimated cost is $25 million, identifying the project as a high priority.
- **Item No. 5-52**, also identified as CHAF IP20110082 and KIPDA #181, proposes to reconstruct the I-64/KY 1747 interchange to provide a northbound-to-westbound flyover ramp. The 2040 MTP's estimated cost is $82.6 million.
- **Item No. 5-9019** is a Highway Safety Improvement Program (HSIP) project at the KY 1747 intersection with the westbound I-64 ramps, primarily addressing striping and poorly operating signal detectors at nine intersections from Bunsen Parkway north to Linn Station Road. Once completed, Louisville Metro plans to improve signal coordination between KY 155 and US 60. Construction was awarded in July 2020.

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[5] Online at https://transportation.ky.gov/Planning/Pages/Planning-Studies-and-Reports.aspx

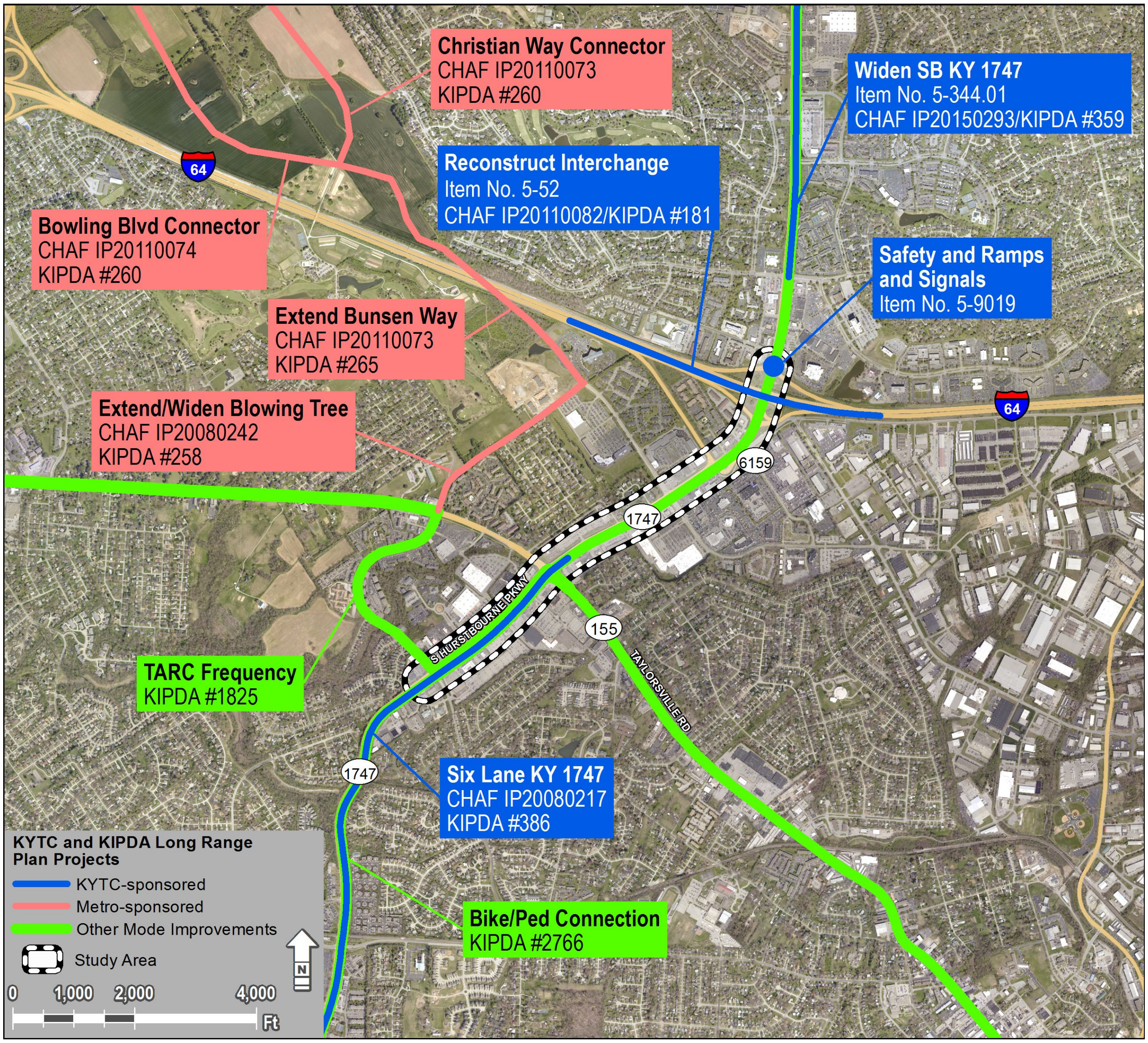


Figure 3: Previous Projects Proposed in Study Vicinity

Louisville Metro-sponsored

- **CHAF IP20110073**, also identified as KIPDA #265 and a portion of KIPDA #260, proposes to create a new five-lane connector between Bunsen Parkway and Christian Way, estimated in the 2040 MTP to cost $32.5 million (#265). The connector would provide an additional north-south connection across I-64.
- **CHAF IP201110074**, also identified as a portion of KIPDA #260, connects from the Bunsen Parkway/Christian Way link identified above (CHAF IP20110073) to Bowling Boulevard, just inside I-264. The 2040 MTP's estimated cost for #260 is $21 million.
- **CHAF IP20080242**, also identified as KIPDA #258, would extend and widen Blowing Tree Boulevard to create a three-lane connection from KY 155 to Bunsen Parkway. Costs are estimated to range from $2.3 to $2.9 million.

Other Mode Improvements

- KIPDA #1825 would increase the frequency of TARC bus routes along high capacity corridors. Existing transit service is discussed in **Section 2.4**.
- KIPDA #2669 would expand fiber communications and upgrades signal controls along high-volume commuter routes throughout Jefferson County.
- KIPDA #2766 would implement the Complete Street philosophy along KY 1747 (Fern Valley Road and Hurstbourne Parkway) to improve bicycle and pedestrian connections. The 2040 MTP's estimated cost is $16.5 million.

2.0 EXISTING CONDITIONS

This section describes existing transportation network conditions within the study area and includes information on roadway systems and geometry, bridges, traffic volumes and operations, and crash history. Data were compiled from the KYTC's Highway Information System (HIS) database, KYTC's Transportation Enterprise Database (TED), bridge inspection reports, traffic counts, aerial photography, and field reviews.

2.1 Roadway Systems and Geometric Characteristics

KYTC's HIS database was queried during December 2019 to obtain roadway systems information and geometric characteristics of study routes. Data assembled from HIS for analyses included:

- Lane, shoulder, and median widths
- Speed limits
- Truck routes
- Functional classifications and other roadway system designations

Lanes

KY 1747 has seven thru lanes north of the I-64 interchange, six thru lanes from the interchange to the KY 155 intersection, and four thru lanes south of KY 155. Lane widths are 12 feet throughout the study area. As illustrated in **Figure 4**, major cross-streets have fewer or narrower lanes.

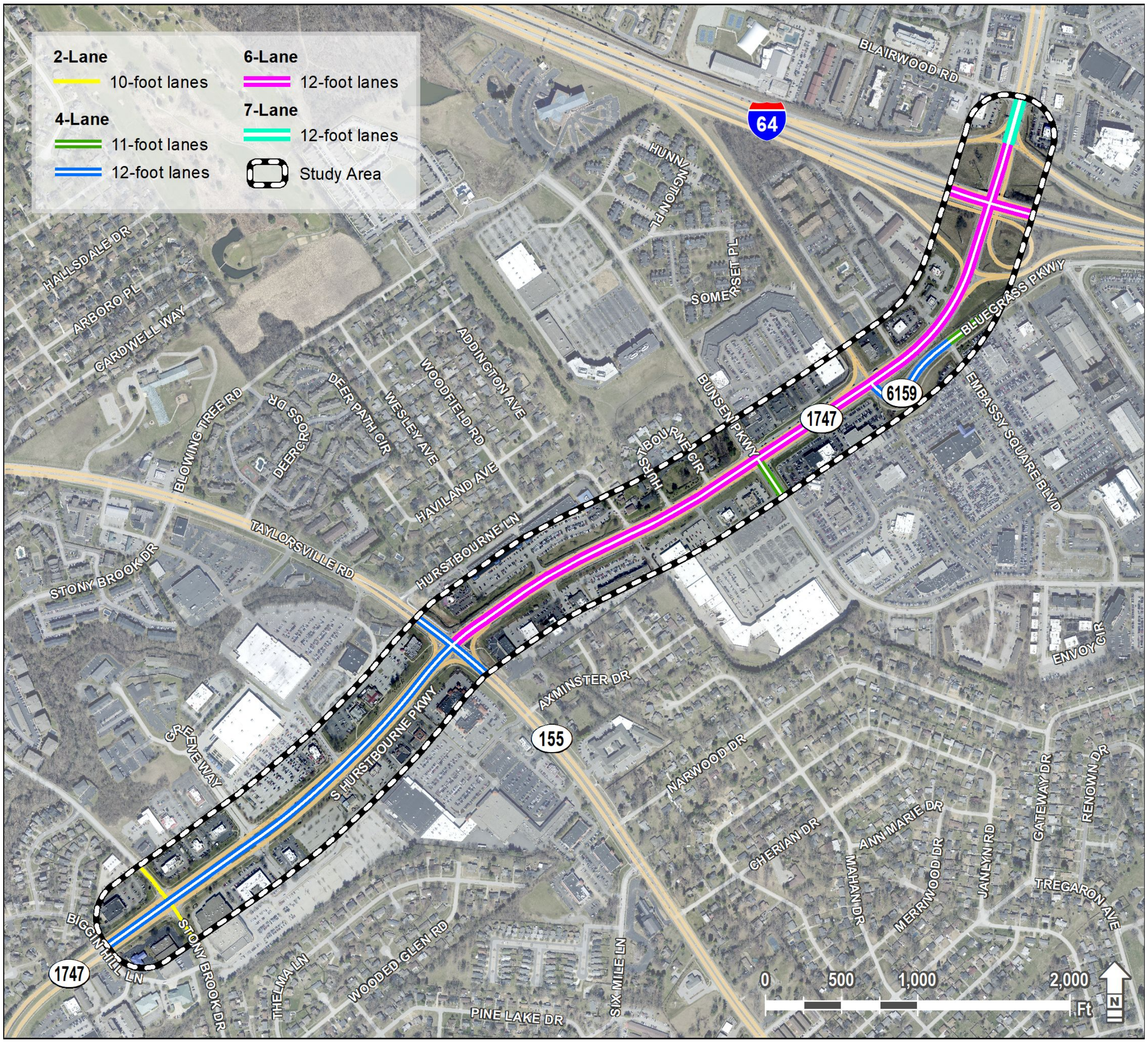


Figure 4: Lane Widths along Study Corridor

Shoulders

Figure 5 presents shoulder widths along the study route and major intersecting cross-streets. Most of the corridor has curb/gutter; however, a few blocks on the east side have paved shoulders. Illustrated in **Figure 6**, some sections have large drainage ditches behind curbs. The ditches carry the South Fork of Beargrass Creek or its tributaries.

Figure 5: Shoulder Widths along Study Corridor

Figure 6: Large Drainage Ditches Paralleling Study Route

Medians

Shown in **Figure 7** on the following page, the entire corridor has a divided cross-section with varying median widths. The median is 36 feet wide from Stony Brook Drive to KY 155, 16 to 20 feet wide from KY 155 to the I-64 interchange, and 26 feet wide continuing north.

Geometric Deficiencies

HIS data were reviewed to identify any substandard grades or curves along the study route and major intersecting cross-streets. At a planning level, KYTC organizes vertical grades into six classes, graded A through F. Similarly, KYTC organizes horizontal curves into six classes, graded A through F.

One Class F curve (28+ degree of curve) is on Bluegrass Parkway just east of the KY 1747 intersection. No other sharp curves or steep grades were noted.

Traffic Control

Within the study area limits, the following intersections are signalized:

- Stony Brook Drive (CS-1006H), MP 10.545
- Greene Way, MP 10.675
- Shane Drive, MP 10.817
- KY 155 Taylorsville Road, MP 11.033
- Hurstbourne Lane, MP 11.291
- Bunsen Parkway (CS-1013H), MP 11.459
- KY 6159 Bluegrass Parkway/I-64 off-ramp, MP 11.634
- I-64 eastbound ramps, MP 11.825
- I-64 westbound ramps, MP 11.990

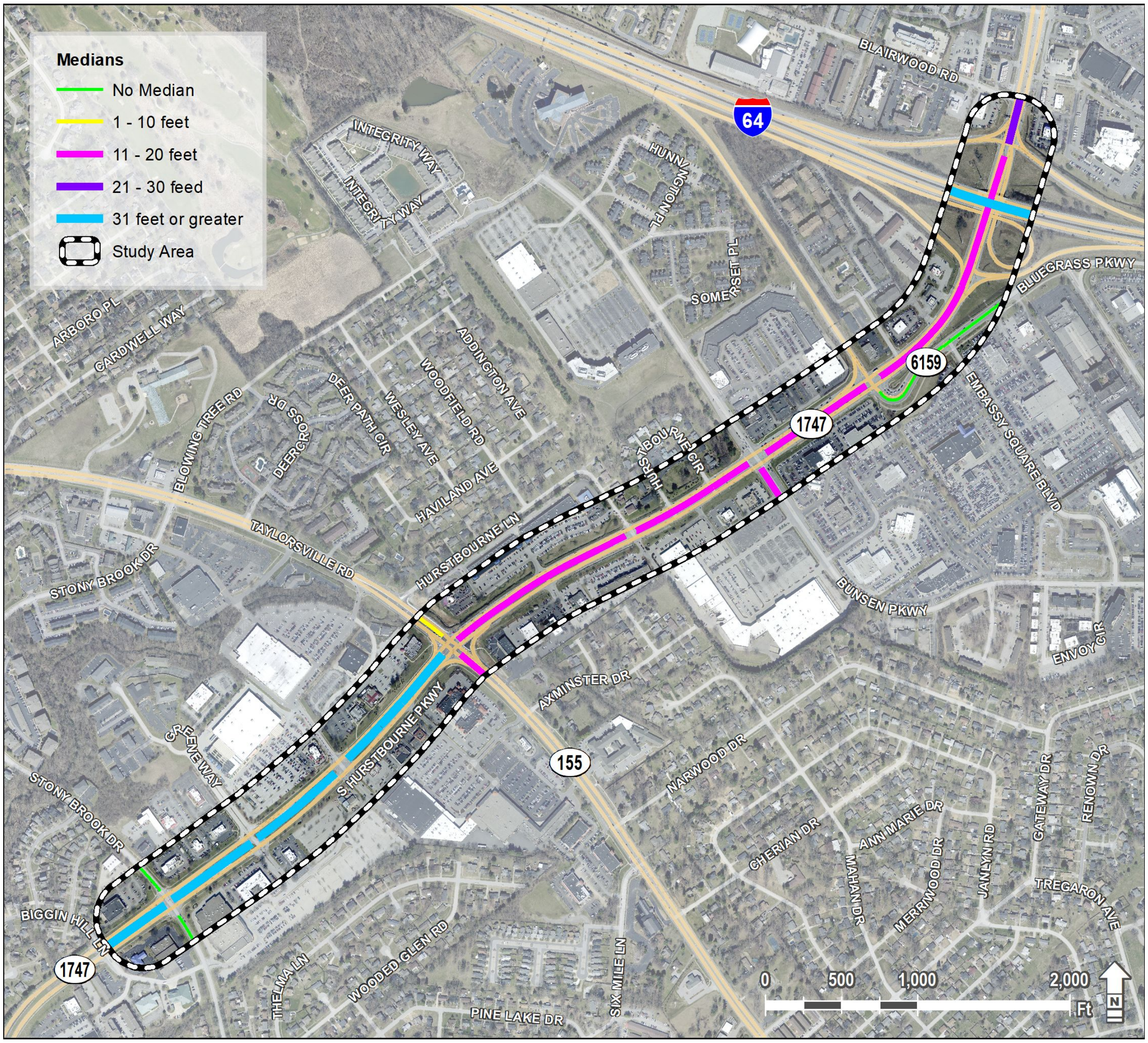


Figure 7: Median Widths along Study Corridor

Speed Limits and Travel Speeds

Identifying posted speed limits can help suggest the character and intended function of highway segments. Shown in **Figure 8**, the speed limit along KY 1747 is 45 mph through the study area. For comparison, **Figure 9** presents average travel times during the PM peak hour (4:00-5:00), which illustrates the effects of congestion on travel times. Travel time party is from HERE Technologies, a third-party vendor, and represents 2015—2017 speed data.

Figure 8: Speed Limit along Study Corridor

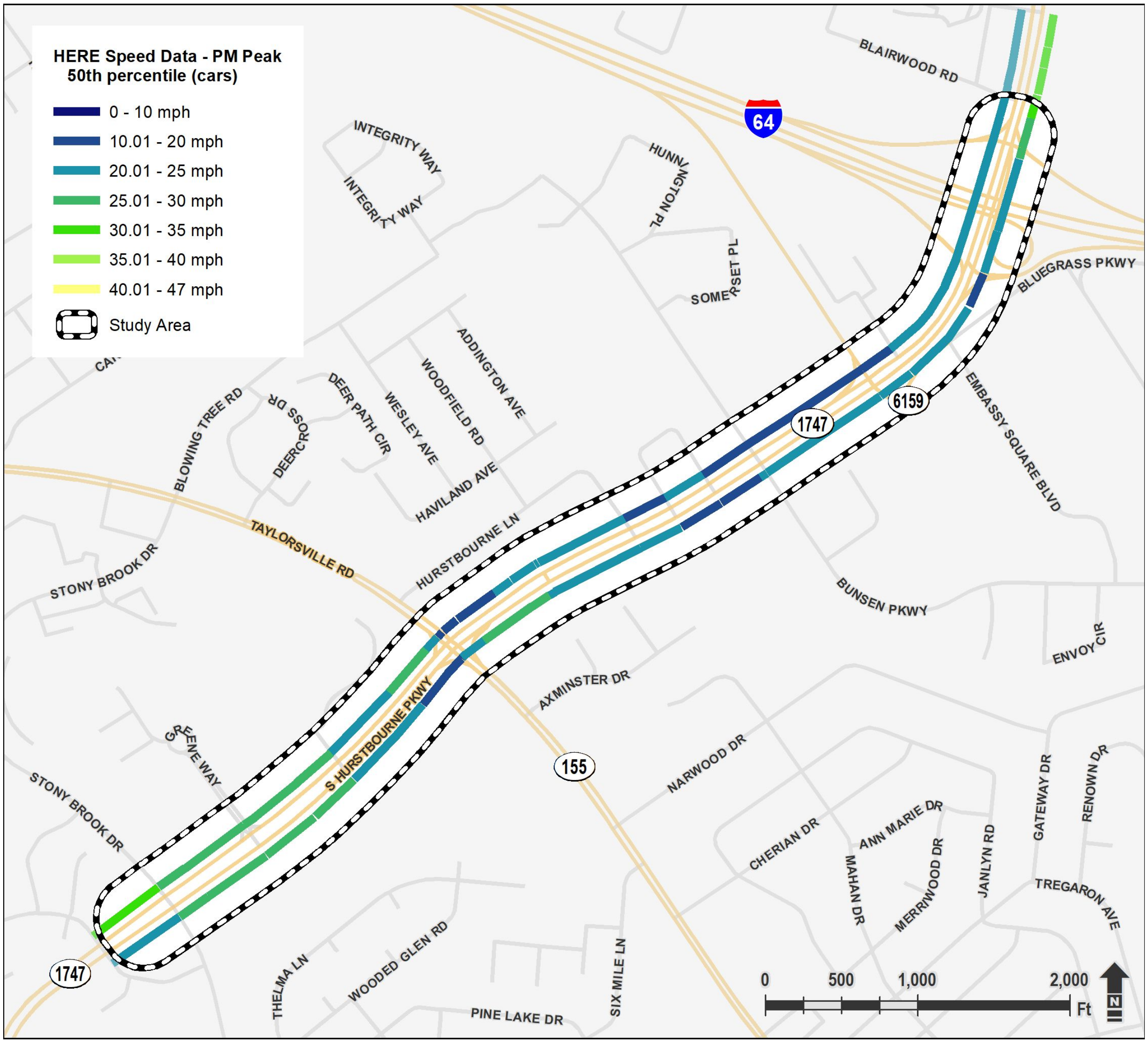


Figure 9: Observed Travel Speed during PM Peak Period

The average travel speed during 4-5 PM is 24.6 mph northbound compared to 22.3 mph southbound. For comparison 7-8 AM speeds are similar: 24.1 mph northbound compared to 27.7 mph southbound. As shown, most of the delays are between the interchange and KY 155, particularly southbound in the afternoon.

Truck Routes

KY 1747 is listed in Kentucky's Highway Freight Network as a Tier 2/3 facility. It is not included on the National Truck Network. The truck weight limit is AAA or 40-ton gross vehicle weight.

Functional Classification

Functional classification is the process of grouping streets and highways according to the character of travel service they provide. This classification system recognizes travel involves movement through a hierarchical system of facilities that progress from lower classifications handling short, local trips to higher classifications serving longer distance travel at a higher level of mobility.

Over the years, functional classification has come to assume additional significance. Functional classification includes expectations about roadway design, such as vehicle speed, capacity, and relationship to land use development. Federal legislation uses functional classification in determining eligibility for funding under the Federal-aid program. Transportation agencies often describe roadway system performance, benchmarks, and goals by functional classification.

The following are short definitions of major functional classes:

- Freeways and Interstates provide high speed, high mobility links for long distance trips.
- Principal Arterials serve major centers of metropolitan areas, provide a high degree of mobility, and can also provide mobility through rural areas.
- Minor Arterials provide service for trips of moderate length, serve geographic areas smaller than their higher arterial counterparts, and offer connectivity to the higher arterial system. The primary difference is usually multiple arterial routes serve a particular urban area, radiating from the urban center to serve the surrounding region. In contrast, an expanse of a rural area of equal size would often be served by a single arterial.
- Collectors gather traffic from local roads and funnel them to the arterial network. Within the context of functional classification, collectors are categorized as either major collectors or minor collectors. In the rural environment, collectors generally serve primarily intra-county travel and shorter trips.
- Local Roads are not intended for use in long distance travel, except at the origin or destination end of the trip, due to their direct access to abutting land. They are often designed to discourage through traffic.

Figure 10 shows the functional classification of roadways within the study area. KY 1747 is classified as an urban principal arterial.

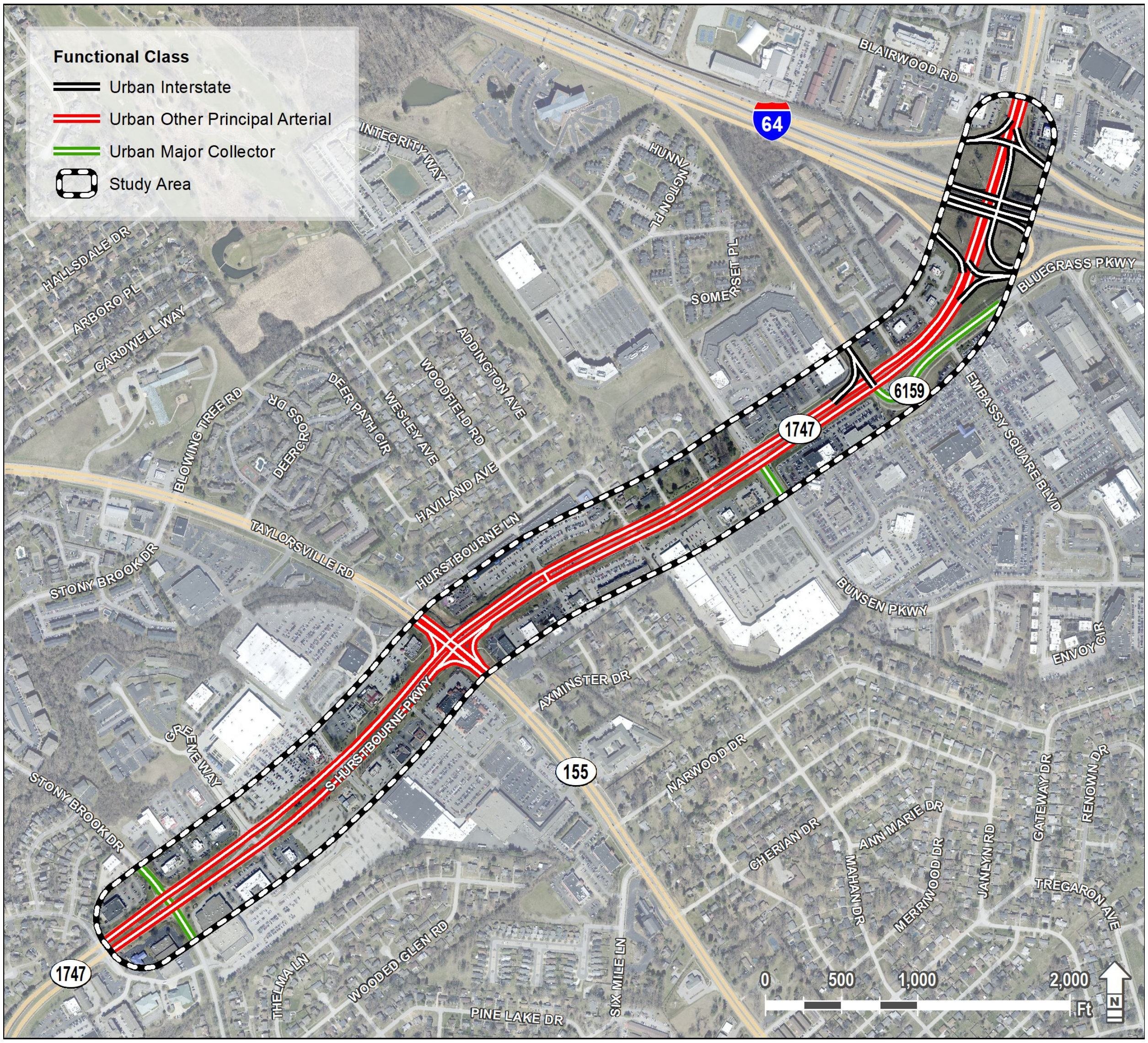


Figure 10: Functional Classification of Study Routes

Highway Systems

The National Highway System (NHS) consists of roadways important to the nation's economy, defense, and mobility. Within the study area, KY 1747 is part of the Enhanced NHS and the State Primary System, which includes interstates, parkways, and other long distance, high volume intrastate routes of statewide significance that generally link major urban areas within the state.

The Federal Highway Administration (FHWA) tracks a series of performance measures statewide, including pavement and bridge conditions for NHS routes, delay, truck travel time reliability, emissions, and more. Any improvements to KY 1747 would have an incremental effect on these metrics.

2.2 Bridges

The only bridges in the study area are the dual structures carrying I-64 over KY 1747 through the interchange. These were constructed in 1964 and reconstructed in 1988. Per April 2019 inspections, both bridges are in fair condition. Each is 192 feet in length with 15+ vertical feet of clearance beneath.

2.3 Bicycle and Pedestrian Accommodations

Pedestrian facilities exist along one or both sides of KY 1747 for parts of the study area length, as shown in **Figure 11**. Crosswalks are provided at most signalized intersections.

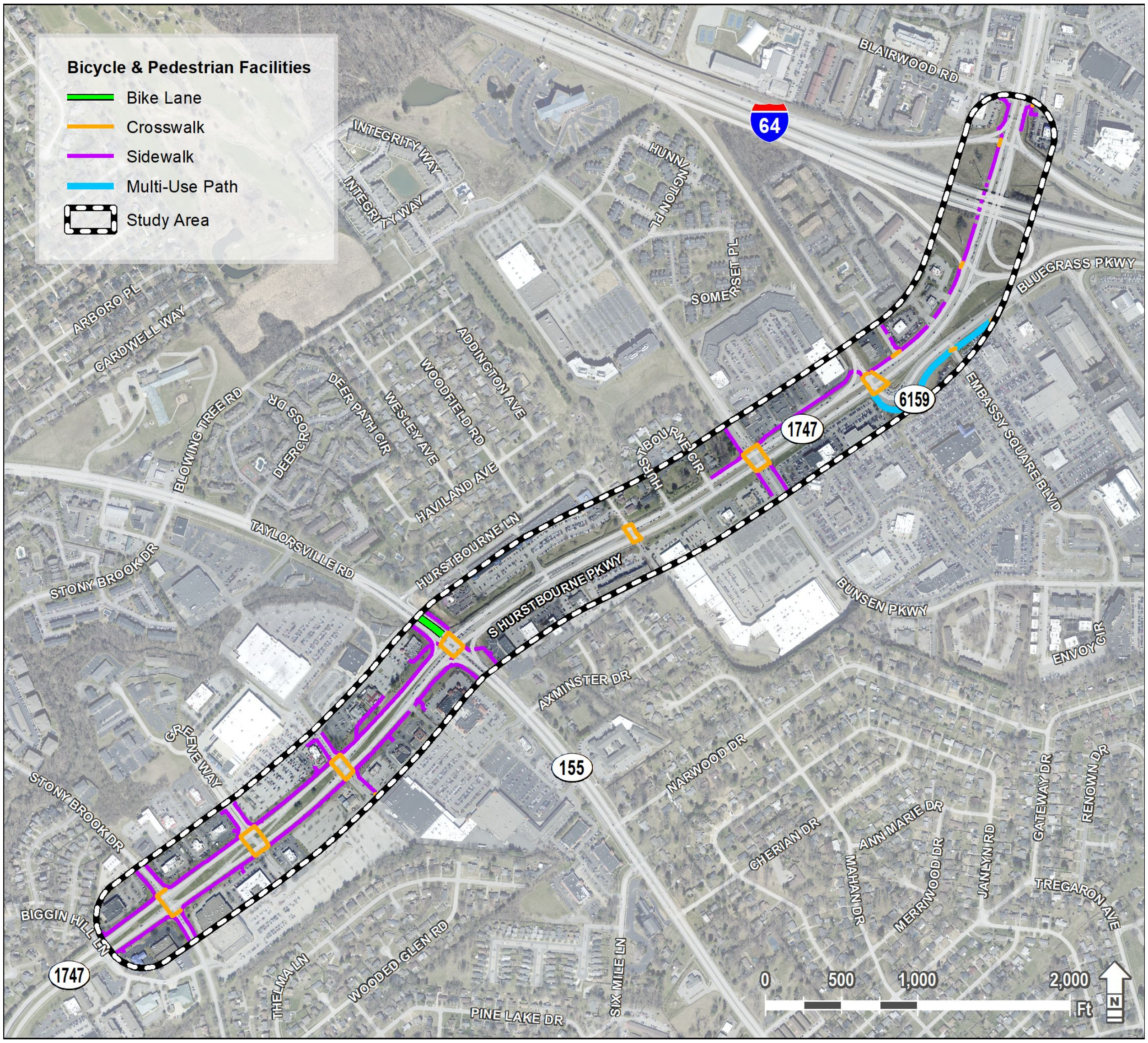


Figure 11: Bicycle/Pedestrian Facilities in Study Area

A gap in sidewalk connectivity extends from KY 155 north to Hurstbourne Circle. This section corresponds to the large roadside ditches but shows evidence of frequent pedestrian use, particularly on the west side of KY 1747 (**Figure 12**). Pedestrians through this section often walk on the narrow grass strip between the guardrail and edge of the southbound right turn lane approaching KY 155.

Figure 12: Roadside Pedestrian Path in Lieu of Sidewalk

Within this section, each approach to the Hurstbourne Lane intersection (signalized intersection just north of KY 155) has a crosswalk with a push-button pedestrian controller; however, no accompanying sidewalk connections are present.

Existing crosswalks and sidewalks along the study corridor are generally compliant with the *Americans with Disabilities Act* (ADA). Crosswalks at signalized intersections provide lighted crossing signals with push buttons to activate. Exceptions (non-compliant areas) are described below and representative examples are shown in **Figure 13**.

- Recurring drainage issues leave low-lying crossings muddy and inaccessible following rain events, particularly in the northeast quadrant of the Shane Drive intersection and at the channelized right turn lane from southbound KY 1747 onto the westbound I-64 on ramp.
- Existing sidewalk connections on the southern/eastern Bunsen Parkway approach are not ADA compliant. In the southern quadrant, the push button for the crosswalk is setback 25 feet from the sidewalk.
- Despite painted crosswalks and a push-button controller, there are no sidewalk connections to the northeastern quadrant at the KY 1747/Bluegrass Parkway intersection. The same situation exists at all four corners of the intersection with Hurstbourne Lane.
- At the channelized right turn lane from southbound KY 1747 onto the westbound I-64 on ramp, the designated crosswalk on the north side has a recurring drainage issue, regularly making the sidewalk impassible. Pedestrians tend to cross the ramp wherever they feel most visible.
- Paint is worn away within many crosswalks, reducing visibility.

Figure 13: Identified Pedestrian Needs Along Study Corridor

The study corridor carries substantial pedestrian traffic each day. **Table 2** summarizes pedestrian traffic observed during November 2019 and January 2020 turning movement counts at key intersections. Cells marked with an asterisk correspond to approaches that do not have a designated crosswalk.

Table 2: 12-Hour Observed Pedestrian Volumes at Key Intersections

Intersection with	KY 1747 Approaches		Cross-Street Approaches	
	South Leg	North Leg	West Leg	East Leg
Stony Brook Drive	3	1*	1	7
Greene Way	3	7	7	15
Shane Drive	3	11	18	25
KY 155 Taylorsville Road	6	0	5	23
Shopping Center	1*	0*	0*	15*
Hurstbourne Lane	7	3	3	8
Bunsen Parkway	13	7	4	4
Bluegrass Parkway/I-64 Off Ramp	6	0	18	1
I-64 Eastbound Ramps	1*	0*	26	0*
I-64 Westbound Ramps	15*	3*	0	0*

Louisville Metro's *Pedestrian Master Plan* (2010)[6] identifies a grand vision "for Louisville to become the safest and most appealing community for pedestrians." In support, the plan identifies numerous goals and objectives for implementation, including providing sidewalks on both sides of all principal arterial roads and at least one side of all other streets in Louisville, where feasible.

Specific to the study area, the plan identifies KY 1747 as a Tier 1-2 facility, indicating the highest priority for implementation based on estimated demand. Potential non-motorized trips are estimated based on characteristics of trip origin/destination pairs, relative proximity, and concentration/dispersion. The plan also identifies future sidewalks filling existing connectivity gaps to KY 155.

Louisville Metro's *Bicycle Master Plan* (2018—2022 Update)[7] identifies goals and priorities for implementing additional bikeways throughout the city. No specific projects are identified for bikeways within this study area.

2.4 Transit

Regional transit operations are managed by the Transit Authority of River City (TARC), which provides a variety of services throughout the greater Louisville area. Services include fixed route buses, a complimentary trolley-style circulator route for downtown attractions, commuter express lines, paratransit for senior and disabled riders, and partnership programs with local non-profits. The fixed route service alone covers over 12.5 million trips annually.

Two routes travel through the study area: Routes 40/40X and Route 75. Route 40 and 40X Express generally run along KY 155 Taylorsville Road, connecting downtown Louisville to southern Jeffersontown. Route 75, the Bluegrass Circulator, connects neighborhoods along Hurstbourne Parkway to major employers in Bluegrass Commerce Park along Bluegrass Parkway. The industrial park houses nearly 850 businesses, representing over 30,000 employees.

There are nine TARC stops along the corridor, shown in **Figure 14**. One bus shelter is within the study area, in the north quadrant of the Greene Way intersection. Four other stops provide

[6] Online at https://louisvilleky.gov/government/bike-louisville/pedestrian-master-plan
[7] Online at https://louisvilleky.gov/government/bike-louisville/2018-2020-bike-master-plan

benches on concrete pads and the remainder are unimproved, marked only with a small roadside sign.

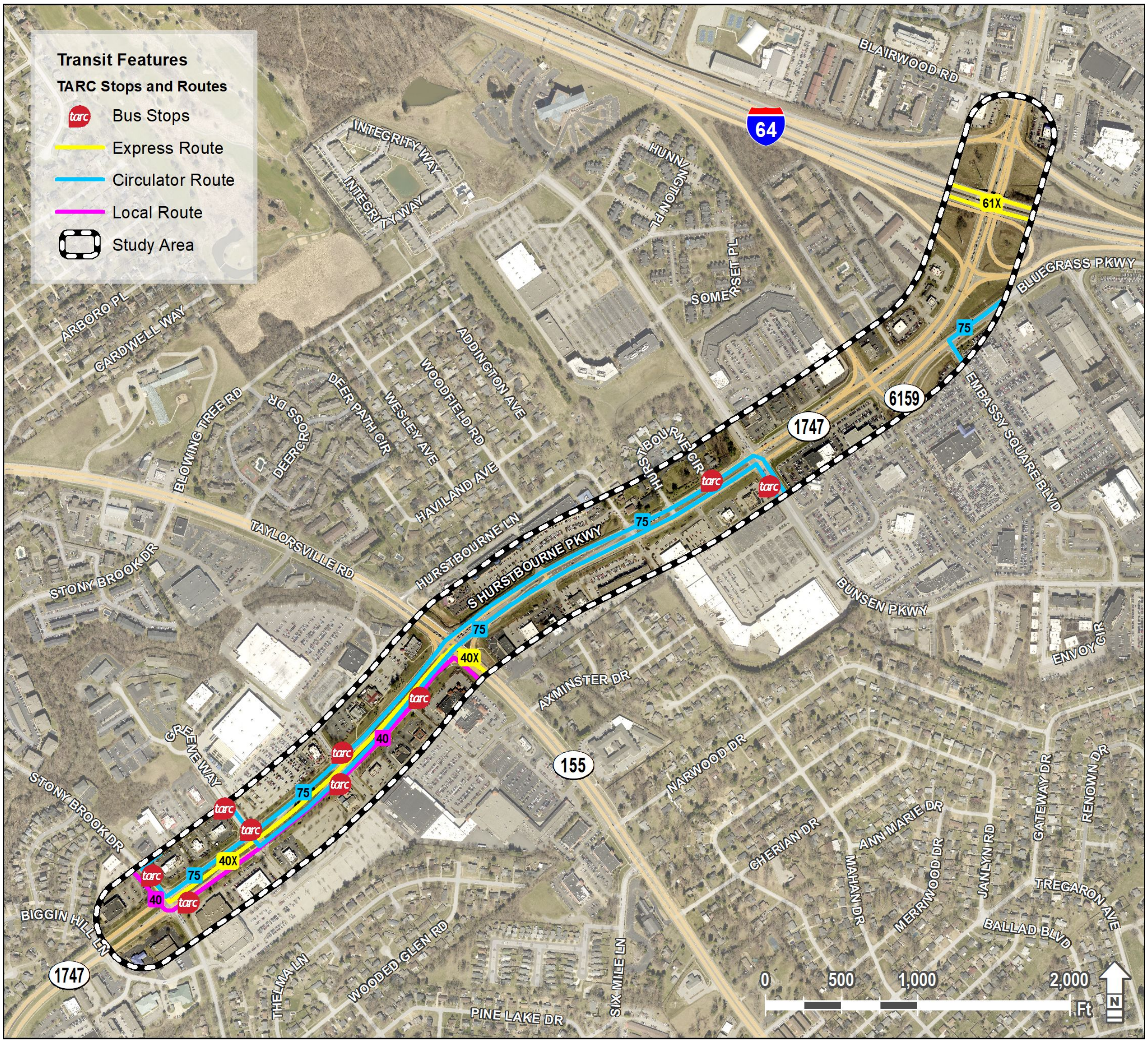


Figure 14: Transit Routes/Stops along Study Corridor

At the time of this study, TARC is in the process of updating its comprehensive operations analysis and long-range plan to define its vision for the future.

2.5 2020 Existing (pre-COVID) Traffic

During November 2019 and January 2020, turning movement counts were collected at seven intersections along the study corridor. These were used to supplement counts collected along the southern portion of the study limits earlier in 2019. Turning movement counts at major intersections were used to define existing traffic including daily, AM, and PM peak hour volumes. Twelve-hour video-based turning movement counts were conducted, classifying vehicles into one of five categories: motorcycles, cars, buses, single unit trucks, and articulated trucks. Any pedestrians and on-road bicyclists were also recorded.

Additional information about this effort is documented in the *Traffic Forecast Report* in **Appendix A**. Count locations are presented in **Figure 15**.

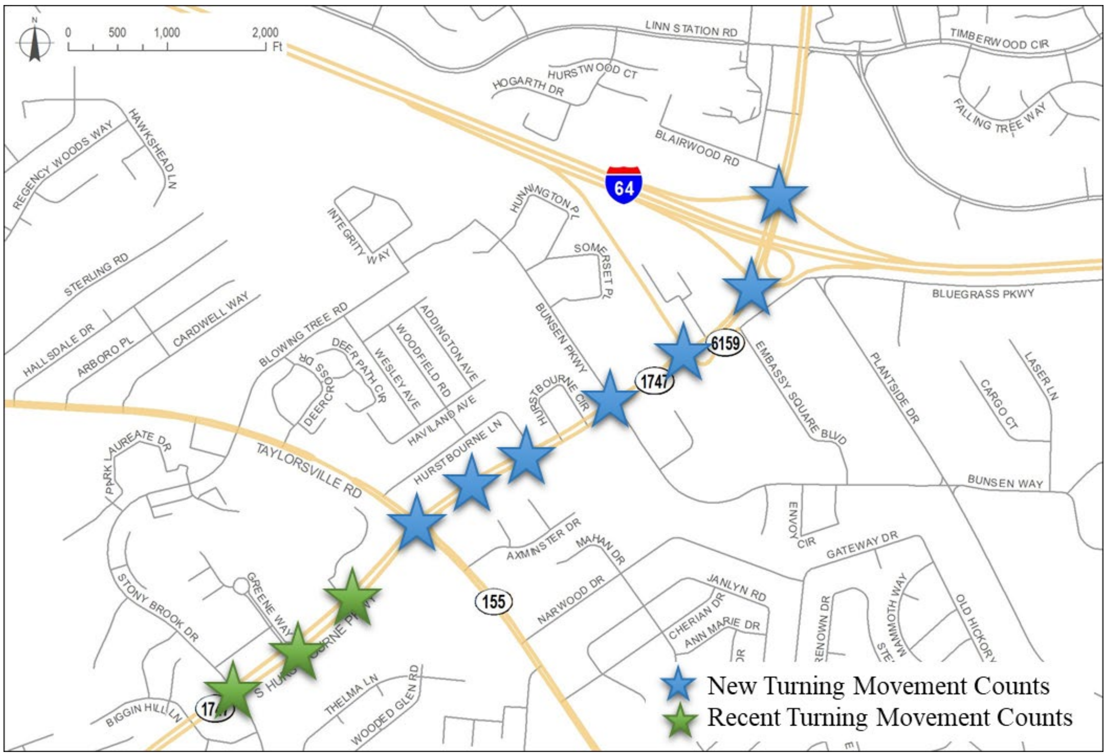


Figure 15: Turning Movement Count Locations

Table 3 summarizes the average daily traffic (ADT) for KY 1747 segments, along with AM and PM peak flows, and truck traffic. Peak hour traffic shows strong directional flows. **Figure 16** depicts the hourly traffic flow along KY 1747 just north of KY 155, which is representative of the larger study corridor trends.

Table 3: Summary of 2020 Existing Traffic

Segment	MP	ADT Volume	AM Peak Volume	PM Peak Volume	Daily Trucks
South of KY 155	10.500 –11.033	26,900 – 33,800	2,200 – 2,300 71% northbound	2,700 – 3,000 57% southbound	520 – 760
KY 155 to Bunsen Parkway	11.033 –11.459	50,700 – 55,800	3,600 – 3,700 59% northbound	4,600 – 4,800 66% southbound	1,000 – 1,200
Bunsen Parkway to South of I-64 Eastbound Ramps	11.459 –11.825	53,100 – 56,400	3,400 – 3,800 55% northbound	4,400 – 4,500 41 – 58% southbound	1,200 – 1,500
Through Interchange	11.825 –11.990	51,500 – 58,800	3,200 – 4,600 67% northbound	4,200 – 4,500 47% southbound	1,200 – 1,500
North of Interchange	11.990+	56,200	2,900 65% northbound	4,200 59% southbound	1,100

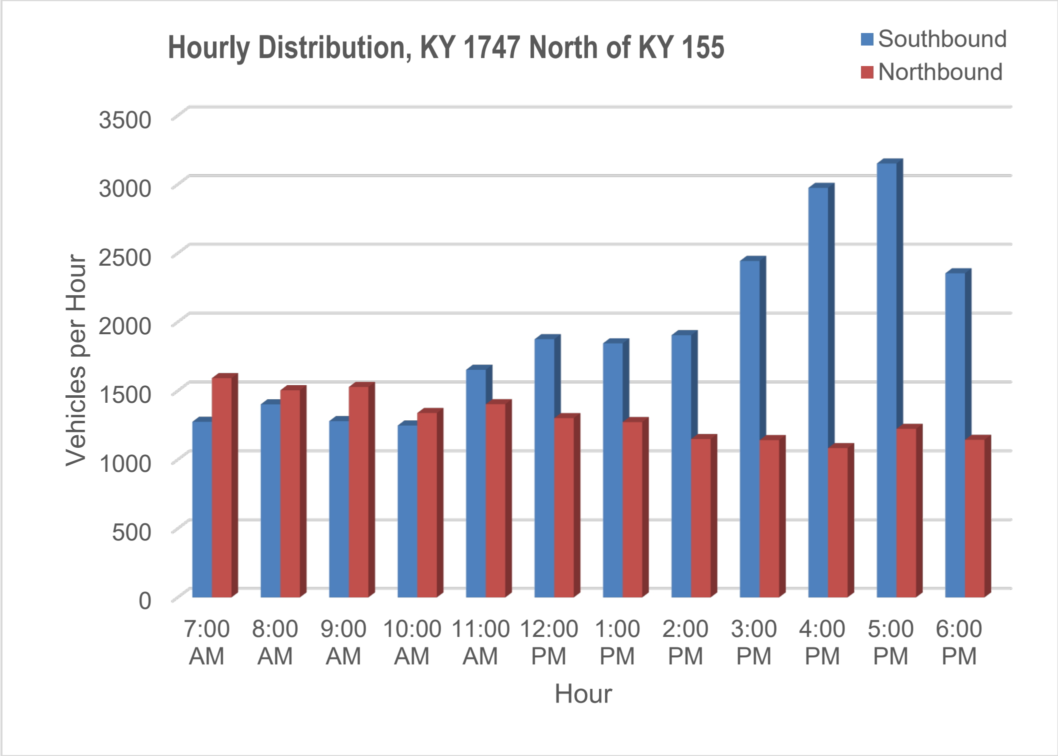


Figure 16: Hourly Volume Distribution by Direction

2.5.1 Historic Traffic Growth Trends

Figure 17 presents growth trends over the past two decades for the four KYTC count stations along KY 1747 near the study area. As shown, corridor growth rates range from negative (e.g., purple and red trendlines decreasing left to right in the chart) to 0.93% per year (i.e., blue trendline slightly increasing left to right in the chart) based on historic count data. Station 056L61 is located about half a mile south of the study area, Stations 056023 and 056A47 are within the study area limits, and Station 056A53 is located immediately north of the study area.

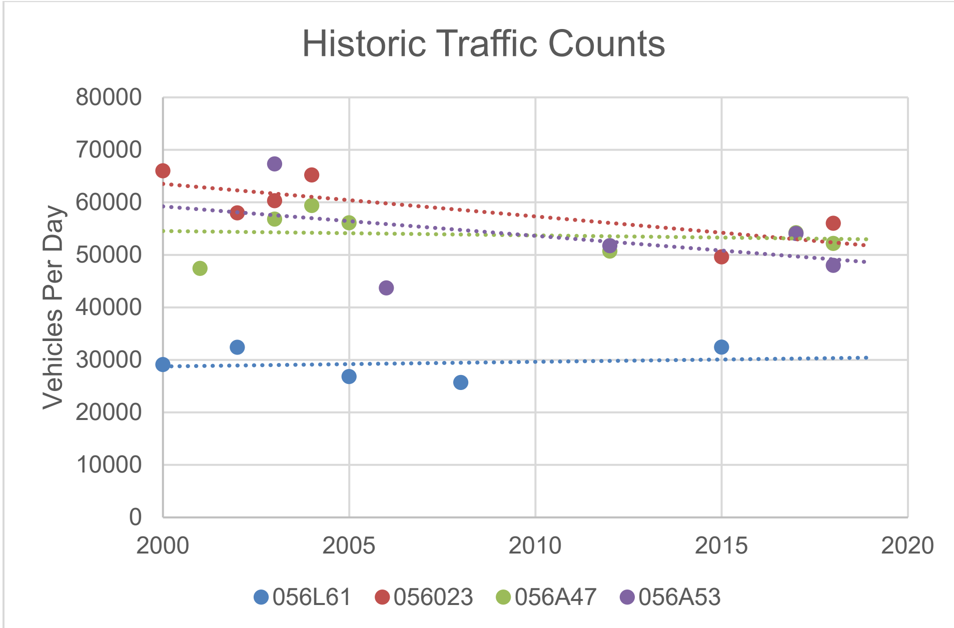


Figure 17: Historic Traffic Counts at Study Area Stations

2.5.2 Existing Traffic Operations

A number of metrics exist to measure traffic operations, such as Level of Service (LOS), delay, and queue lengths at intersections. LOS is a qualitative measure describing traffic conditions based on speed, travel time, freedom to maneuver, traffic interruptions, comfort, and driver convenience. **Figure 18** presents a graphic summary. LOS A is associated with free flow conditions, high freedom to maneuver, and little or no delay. LOS E represents conditions at or near capacity. At LOS F, traffic conditions are oversaturated and beyond capacity, with low travel speeds, little or no freedom to maneuver, and high delays. As a rule of thumb, LOS C or better is desirable in urban areas; however, LOS D is generally acceptable.

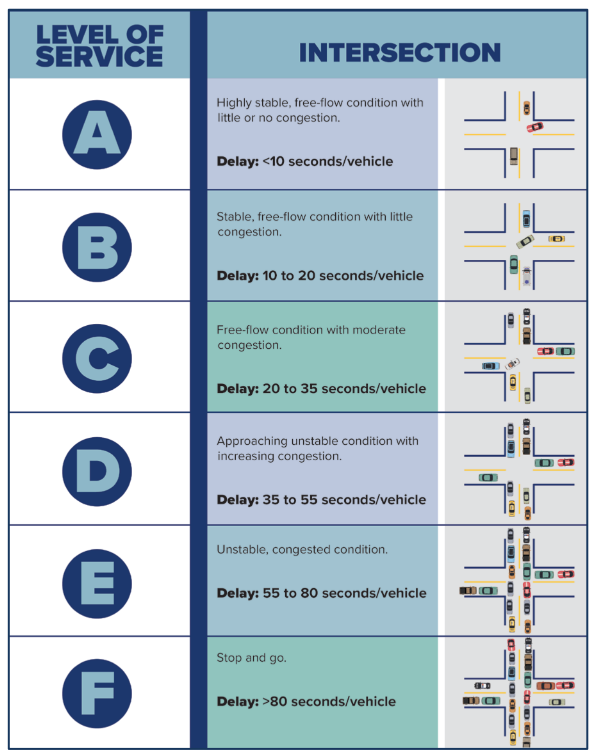


Figure 18: LOS Summary

Microsimulation

For this study, VISSIM microsimulation software was used to model corridor operations. While any model has limitations—particularly in over capacity congested conditions—the model represents the best tool available to approximate current and future traffic scenarios. To calibrate the model, analysts collected information regarding existing traffic conditions: signal timing plans, queue lengths, operating speeds, etc. Additional technical information about the microsimulation modeling tasks is included in **Appendix B**.

In addition to illustrating existing needs within the study area, the microsimulation model forms a baseline to test how proposed infrastructure improvements would affect traffic operations.

Currently, three intersections within the study corridor operate at LOS E or F during peak hours. Most study intersections also have individual turn movements operating at LOS F, as summarized in **Table 4**.

Table 4: 2020 Existing AM and PM Peak Hour Intersection LOS

KY 1747 Intersection	LOS	Delay (sec)	LOS F Movements	LOS	Delay (sec)	LOS F Movements
	AM Peak Hour			PM Peak Hour		
Stony Brook Dr.	C	20	None	D	51	NB and SB KY 1747 lefts EB Stony Brook thru
Greene Way	B	11	NB KY 1747 left	C	20	NB KY 1747 left
Shane Dr.	B	16	None	C	26	None
KY 155	E	64	Left turns from all approaches WB KY 155 thru	E	76	Left turns from all approaches NB KY 1747 thru EB and WB KY 155 thru
Shopping Center	A	3	None	B	12	None
Hurstbourne Ln.	B	17	WB Driveway thru	D	38	SB KY 1747 left EB Hurstbourne Ln left
Bunsen Pkwy.	C	34	Left turns from all approaches EB Bunsen thru and right	F	83	Left turns from all approaches EB Bunsen thru and right
Bluegrass Pkwy.	D	41	SB KY 1747 left EB Off-ramp thru WB Bluegrass left	E	62	SB KY 1747 left and thru EB Off-ramp thru WB Bluegrass left
EB Ramps	B	16	None	C	27	None
WB Ramps	D	39	WB Off-ramp left	D	41	WB Off-ramp left

- The KY 1747 intersection with KY 155 operates at LOS E during both the AM and PM peak hours. The highest volume movement in the AM peak, northbound KY 1747 thru towards I-64 operates at LOS E with average queue lengths over 300 feet. In the PM peak, three movements exhibit maximum queue lengths of 1,000 feet or greater: northbound thru, southbound thru, and southbound left turns. During both peak hours, all left turn movements operate at LOS F.
- The KY 1747 intersection with Bunsen Parkway operates at LOS F during the PM peak hour. All left turn movements are at LOS F and all movements from the eastbound Bunsen Parkway approach are at LOS F. The average queue length for the eastbound right movement is 400 feet. The average queue length for the southbound thru movement is 500 feet, compared to approximately 550 feet between the stop bar and available merge area south of the ramp (**Figure 19**). During busy times, traffic in the far-right southbound lane struggles to merge left, forcing motorists to stop in the driving lane or make a right onto Bunsen Parkway.
- The KY 1747 intersection with Bluegrass Parkway and the eastbound I-64 off-ramp operates at LOS E during the PM peak hour. Four individual turn movements are at LOS F: lefts and thru along southbound KY 1747, thru movements from the off-ramp onto Bluegrass Parkway, and westbound left turns from Bluegrass Parkway. The longest

queues are associated with the southbound KY 1747 thru movement, averaging 450 feet during the PM peak hour, which can block access to/from Hurstbourne Park Boulevard and the car lot/gas station driveway located just south of I-64.

Figure 19: Southbound Merge Area North of Bunsen

Under performing signal detectors at a series of intersections adjacent to the I-64 interchange compromise throughput; improvements proposed as part of the 5-9019 HSIP project should correct the issue and improve mobility.

Microsimulation for this section of KY 1747 estimates the overall corridor travel time at 325 seconds northbound during AM peak hour and 299 seconds southbound. For comparison, PM peak hour travel times run 384 seconds northbound and 499 seconds southbound.

Vehicle-hours of delay (VHD)

As an independent metric for comparison, KYTC provided GIS-based delay data describing congestion in vehicle-hours of delay (VHD), one of the scoring inputs used for the 2020 SHIFT process. This VHD data are built on 2015–2017 speed data and represent excess time spent on a trip during congested periods compared to time required for the same trip in uncongested conditions. VHD represents total delay experienced by all vehicles traveling a highway section during an analysis period, divided into five categories: low, medium low, medium, medium high, and high.

As shown in **Figure 20**, KY 1747 through the study area exhibits medium to medium high delay by segment, representing 1,800 to 8,300 VHD per segments during a typical weekday. Cumulative along the corridor from the Stony Brook Drive intersection through the westbound ramps, delay totals almost 42,000 vehicle-hours.

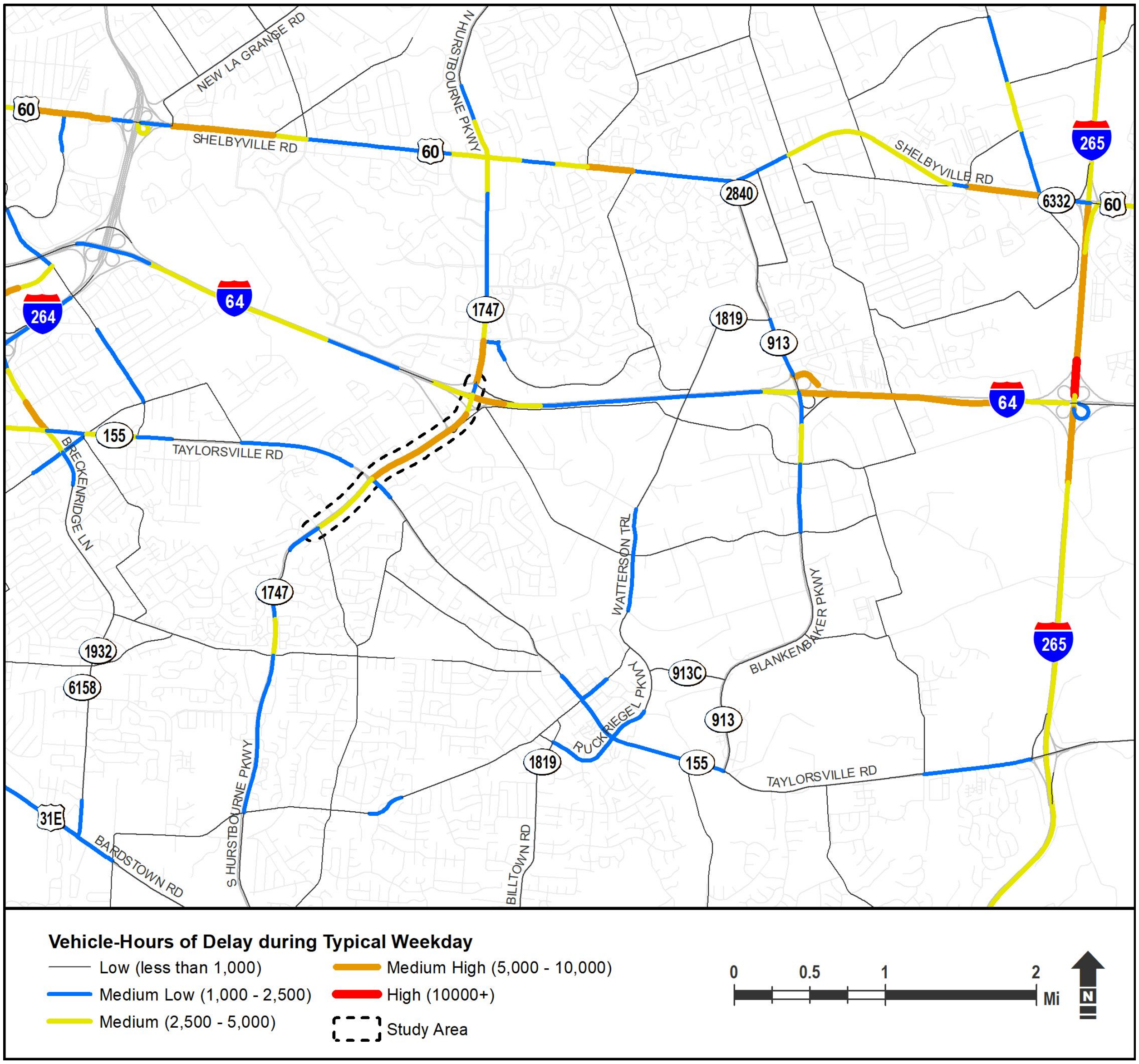


Figure 20: Regional Highway Connections with Typical Weekday Delay

2.6 Crash History

Crash data for the three-year period from July 2016 through June 2019 were plotted along study area roadways, shown in **Figure 21**. During this period, 811 crashes were reported along the study portion of KY 1747. Individual crash records are in **Appendix C** along with larger scale mapping of the study corridor.

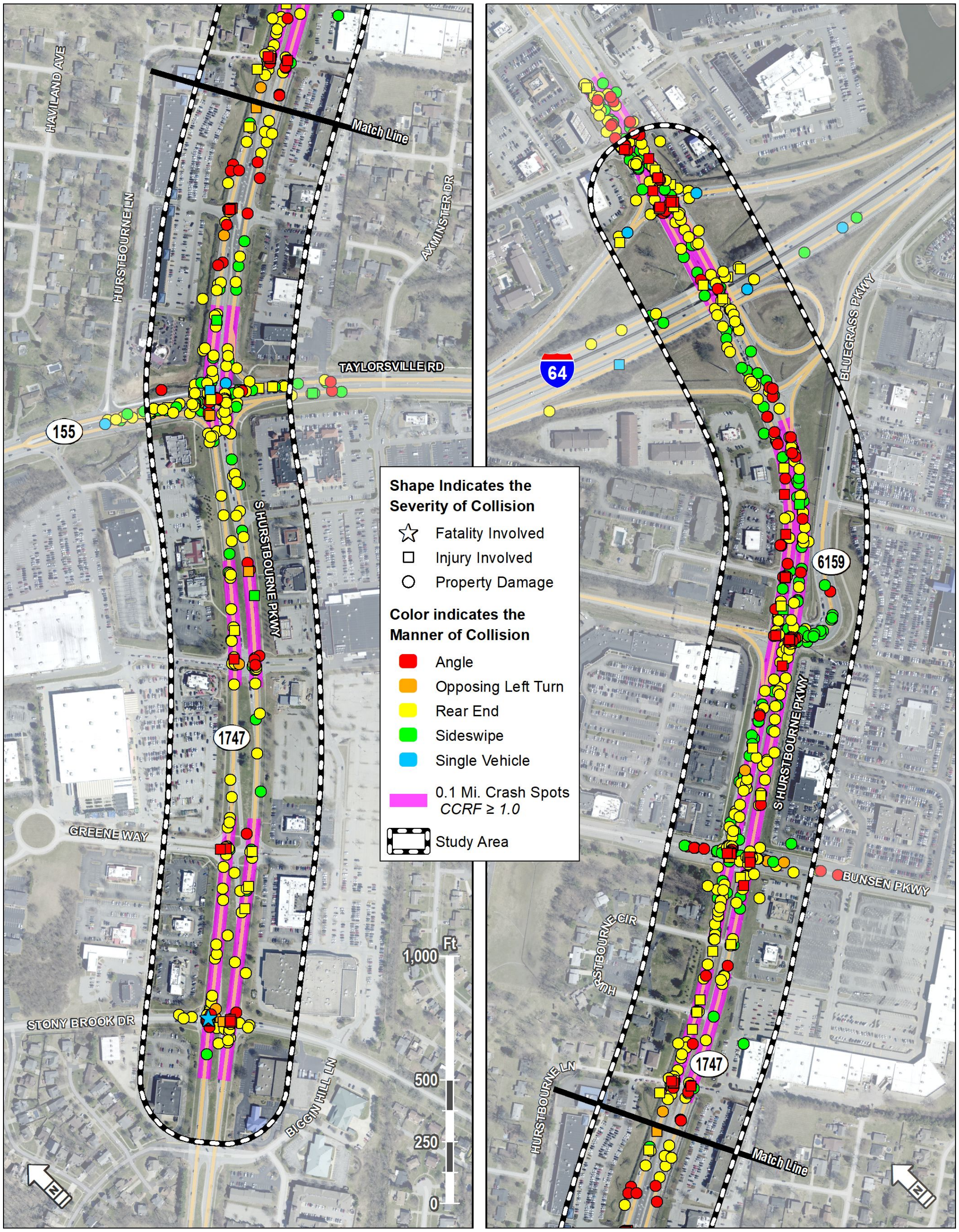


Figure 21: Crashes by Severity and Manner of Collision

By severity, this represents one fatality: an early morning pedestrian strike at the Stony Brook Drive intersection. There were 81 injury collisions, subdivided to represent six incapacitating injury crashes, 28 non-incapacitating injury crashes, and 47 possible injury crashes. Four of the six incapacitating injury collisions represent vehicles running red lights, resulting in angle crashes distributed along the corridor. The remaining 729 crashes represent property damage only (PDO) collisions.

Manner of collision trends are summarized in **Figure 22**. Most crashes were rear end collisions—typical for a congested urban highway—followed by same direction sideswipes and angle collisions.

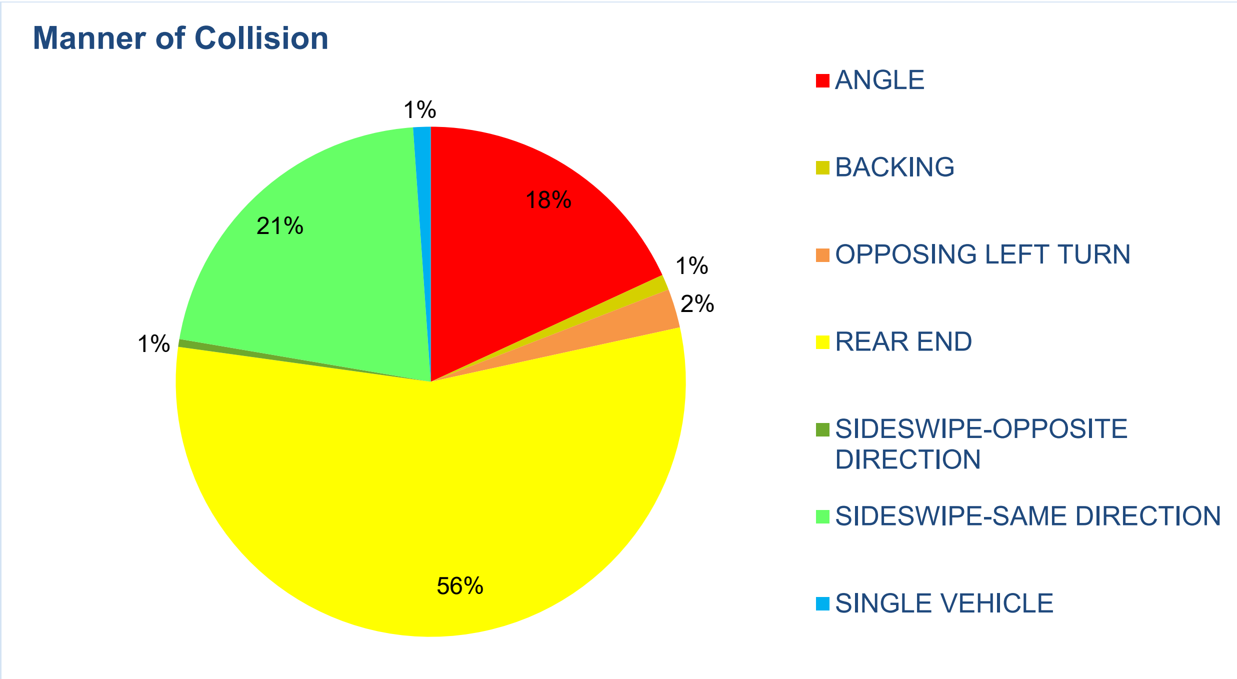


Figure 22: Manner of Collision Distribution for Reported Crashes

Four pedestrian strikes were reported, as shown in **Figure 23**, distributed along the corridor. No bicycle crashes were reported during the analysis period.

Figure 23: Reported Pedestrian Strikes

2.6.1 Critical Crash Rate Factors (CCRF)

KYTC uses a systematic procedure to identify locations having high crash rates. The actual number of crashes, as obtained from KYTC's database, occurring within a roadway segment is used to calculate the Actual Crash Rate using the roadway length, annualized ADT, and the number of years for which crash data are being examined. Using an analysis procedure from the Kentucky Transportation Center (KTC) and referenced in *The Analysis of Traffic Crash Data in Kentucky (2014–2018)*, Actual Crash Rates are compared to the Critical Crash Rate for similar types of Kentucky roadways. The Critical Crash Rate is the rate that is statistically greater than the average crash rate for similar roadways and represents a rate above which crashes may be occurring in a non-random fashion. This ratio of Actual Crash Rate to the Critical Crash Rate is the Critical Crash Rate Factor (CCRF). A CCRF greater than 1.0 indicates crashes may be occurring more often than can be attributed to random occurrence. This procedure is a screening technique indicating locations where further analysis may be needed. It is neither a definitive statement of nor a measurement of a crash problem.

As defined in the KTC methodology report, two analysis types exist: “segments” and “spots.”

- Segments vary in length and are divided along roadways as geometry or traffic volumes change.
- Spots are defined by analyzing 0.1-mile-long sections where crashes are concentrated.

High Crash Segments

The entire corridor represents high CCRF segments, as shown in **Table 5**. The highest CCRF (2.5) is at the northern limits of the study area. As some segment lengths are short, the spot analysis provides a more reliable assessment of crash patterns.

Table 5: CCRF Segment Analysis Results

Location	MP Range	ADT	Crashes (Fatal/Injruy/PDO)	CCRF
Stony Brook Drive to KY 155	10.500 – 11.033	32,411	183 (1/17/165)	1.7
KY 155 to Bluegrass Parkway	11.033 – 11.634	55,993	318 (0/39/279)	1.6
Bluegrass Parkway to I-64 Overpass	11.634 – 11.918	52,179	158 (0/12/146)	1.6
I-64 Overpass to Westbound Ramp	11.918 – 12.100	47,984	152 (0/13/139)	2.5

High Crash Spots

Summarized in **Table 6**, high crash spots cover over two thirds of the study corridor length. High CCRF spots are mapped in pink in **Figure 21** (page 26) and presented by geographic density in **Figure 24**.

Table 6: CCRF Spot Analysis Results

Location	Milepoints	Total Crashes	Fatalities	Injury Crashes	CCRF
Stony Brook Drive	10.50 – 10.60	42	1	7	**1.5**
Greene Way	10.60 – 10.70	31	0	5	**1.1**
Shane Drive	10.80 – 10.90	38	0	4	**1.4**
KY 155 Taylorsville Road	11.00 – 11.10	67	0	4	**1.8**
Hurstbourne Lane	11.28 – 11.38	53	0	9	**1.3**
Bunsen Parkway	11.40 – 11.50	137	0	17	**3.2**
Between Bunsen and Bluegrass Parkways	11.50 – 11.60	43	0	2	**1.0**
Bluegrass Parkway	11.60 – 11.70	73	0	9	**1.8**
I-64 Eastbound Ramps	11.70 – 11.80	52	0	4	**1.3**
I-64 Westbound Ramps	11.90 – 12.00	61	0	8	**1.6**
Blairwood Road	12.00 – 12.10	102	0	6	**2.7**

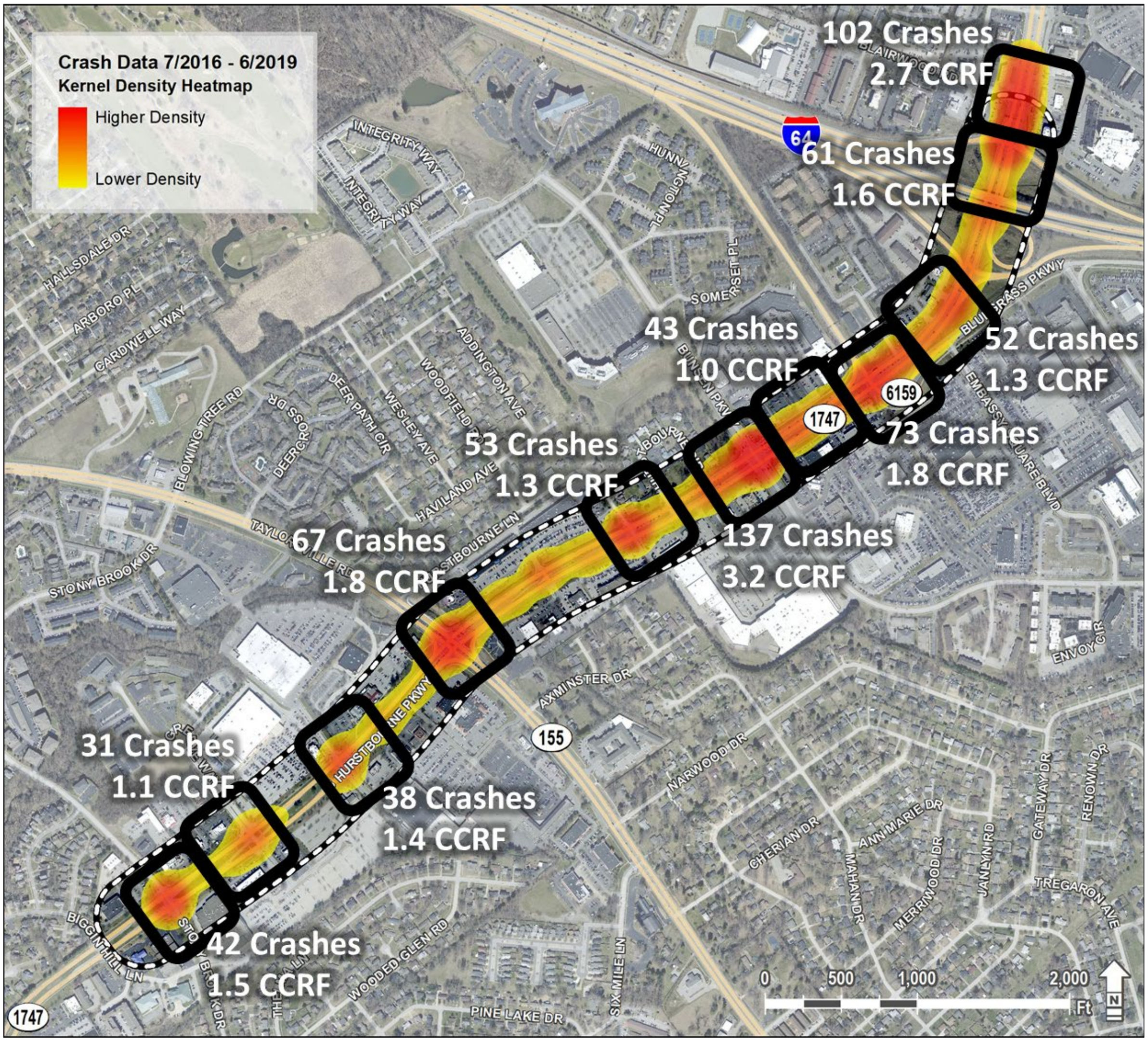


Figure 24: High CCRF Spots by Crash Density

The highest CCRF spot is located at the intersection with Bunsen Parkway. Within this 0.1-mile spot, 137 crashes occurred, 64% of which were rear end collisions and 26% of which occurred when the highway was wet or snowy. Injury collisions include seven angle crashes (running red lights), seven rear ends (four northbound versus three southbound), one vehicle changing lanes without looking, one pedestrian strike, and one collision with a stalled vehicle in the roadway.

The intersection with Blairwood Road, just north of the interchange, is the second highest CCRF spot. Operations at this location are complicated by high traffic volumes and a concentration of commercial driveways. Rear end collisions (47%), same direction sideswipes (28%), or angle crashes (21%) accounted for most of the 102 crashes within this spot.

2.6.2 Excess Expected Crashes (EEC) Comparison

KYTC and the KTC developed a more refined statistical methodology based on the *Highway Safety Manual* (HSM) to rank safety needs of projects included in the 2020 SHIFT process. EEC is based on a crash prediction model estimating the number of crashes expected on an average roadway segment of a given type and length. It represents the number of excess crashes a segment is experiencing compared to other roadways of its type, adjusting for statistical correction. EEC calculations account for higher crash rates at intersections, which the CCRF methodology does not. GIS-based data are measured for both segments and intersections. Legend categories break all data greater than zero into quintiles by segment and intersection, categorizing sites as Low, Medium Low, Medium, Medium High, or High; that is, the lowest 20% of EEC values statewide are Low, the next highest 20% are Medium Low, etc.

Illustrated in **Figure 25**, the majority of the corridor has a positive EEC. Intersections having the highest value in the study corridor are the westbound I-64 ramps (215.5), Bunsen Parkway (82.6), and KY 155 (78.8). The highest segments in the study corridor are north of Bluegrass Parkway (49.6) and between Bunsen and Bluegrass parkways (39.3).

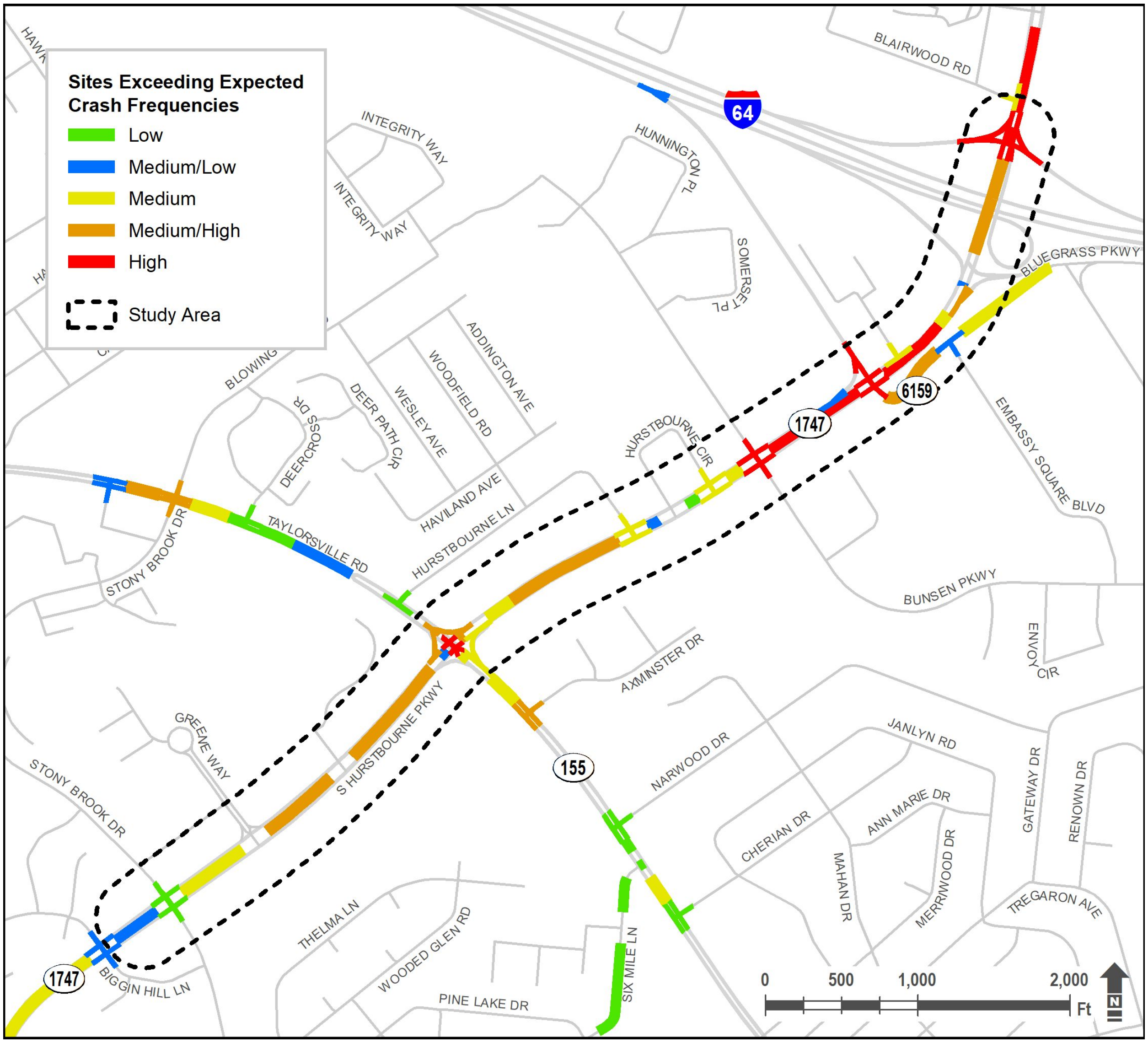


Figure 25: Sites Exceeding Expected Crash Frequencies

3.0 ENVIRONMENTAL OVERVIEW

An environmental overview was conducted to identify resources and potential issues for consideration during the development of build alternatives. Natural and human environmental resources were identified from a literature/database review. Study area environmental resources are shown in **Figure 26** and described in the following sections.

Figure 26: Environmental Overview Map

3.1 Natural Environment

The natural environment typically refers to all living and non-living things found in nature and includes aquatic ecology such as rivers, streams, and wetlands; threatened and endangered species; and farmlands. As a densely developed urban corridor, there are limited natural environmental elements remaining within the study area.

3.1.1 Water Resources

The South Fork of Beargrass Creek crosses the study area near the KY 155 intersection, running in ditches along the north side of KY 1747 up to the Hurstbourne Circle intersections. The creek is classified as a riverine wetland in the National Wetlands Inventory.

Two springs are also within the study area limits: the Zehnderhouse Spring, a gravity spring feeding into the adjacent drainage ditch northeast of the KY 155 intersection; and the Nunnlea Spring, a gravity spring feeding into a tributary of South Fork Beargrass Creek, within Hurstbourne Circle.

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

3.1.2 Listed Species

US Fish and Wildlife Service (USFWS) maintains a database of federally protected species—listed as endangered or threatened under the *Endangered Species Act*. Four listed species, identified in **Table 7,** have the potential to occur within the study area.

Table 7: Protect Species Potentially Within Study Area

Scientific Name	Common Name	Federal Status
Myotis grisescens	gray bat	Endangered
Myotis septentrionalis	northern long-eared bat	Threatened
Myotis sodalis	Indiana bat	Endangered
Trifolium stoloniferum	running buffalo clover	Endangered; proposed for delisting

Gray bats dwell in caves throughout the year, relying on streams and waterbodies to forage at night. Both Indiana and northern long-eared bats live in caves during winter months, roosting in small trees or manmade structures (e.g., barns, bridges, etc.) during summer months. Stream corridors and forested wetlands provide foraging habitat. Per the Kentucky Geological Survey, the entire area has a medium to high potential for karst topography. To streamline the project development process, KYTC often employs programmatic agreements with the USFWS regarding impacts to bat species.

Running buffalo clover is a plant found primarily in shaded woodlots, mowed areas (e.g., lawns, parks, cemeteries), and along streams and trails. No critical habitats for this species exist within the study area.

For 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. Seasonal restrictions on field surveys for running buffalo clover can impact project development timelines if likely habitat exists.

3.1.3 Geology and Soils

The project study area is in the Outer Bluegrass Region, which is characterized by low to moderate relief and thin soil depths over Devonian and Silurian aged bedrock. Surface drainage is directed toward the South Fork of the Beargrass Creek located on the west side of the Hurstbourne Parkway. The study area is underlain by a combination of limestones and dolomites from the Louisville, Sellersburg, and Jeffersonville geologic units—characterized by thin to thick bedded limestones that are suitable for construction purposes. There is a high to medium potential to encounter karst features per Kentucky Geological Survey mapping. No known sinkholes or fault systems have been identified within the study limits. Based on the available resources and the scope of the project, the KYTC Geotechnical Branch does not anticipate any major geotechnical concerns. Additional details are presented in **Appendix D**.

The Natural Resource Conservation Service soil survey classifies all soils within the study area as urban land complexes. None represent prime or statewide important farmland soils. No Kentucky Division of Conservation agricultural districts or other conservation easements have been identified in the vicinity.

3.2 Human Environment

The human environment is often defined as the built environment or as the communities where we live. Such resources that could be impacted by roadway projects are discussed in the following sections.

3.2.1 Land Use

The study area includes narrow strips of the following Jefferson County municipalities: Jeffersontown, Hurstbourne, Hurstbourne Acres, Forest Hills, and Louisville.

The entire corridor is zoned commercial/industrial, excluding the pocket of residential area accessed from Hurstbourne Circle.

3.2.2 Community Features

While no community resources are located within the study area, the roadway network provides access to several key facilities and attractions:

- The Bluegrass Commerce Park along Bluegrass Parkway houses nearly 850 businesses, representing over 30,000 employees.
- Nunnlea, a historic house along Hurstbourne Circle, serves as an event venue with seasonal weddings and craft fairs.
- Jeffersontown Fire Department #3 is located just south of the study area limits, off Biggin Hill Lane.
- Alex Kennedy Elementary is west of the study area along Taylorsville Road.
- Campbellsville University maintains a Louisville campus off Greene Way.
- Stanley B. Welch Park is located at the eastern end of Haviland Avenue, in the green space behind Hurstbourne Circle. The park features playground equipment and picnic tables and hosts annual events for the City of Hurstbourne Acres.
- Des Pres is the only other public park within two miles of the study area. The park features ball fields, picnic shelters, playground equipment, tennis courts, a basketball court, and walking trails. Nearby Oxmoor and Hurstbourne county clubs also offer golf and other recreational activities.
- Plainview post office is northeast of the I-64 interchange.

3.2.3 Historic Resources

While most of the built environment along the corridor is less than 50 years in age, three historic resources remain (see **Figure 27**):

- JF-223, also known as Stony Brook or the James Funk House, was listed on the National Register of Historic Places (NRHP) in 1979 for its architecture, which blends elements of Greek Revival and Italianate styles. The property initially included a mid-19th century farmstead with multiple outbuildings. Today, the 2505 Hurstbourne Gem Lane property covers 1.5 acres and houses an insurance agency.
- JF-224, also known as Nunnlea, Willowbrook, or the Harriet Funk Hite House, is located at 1916 Hurstbourne Circle. The 1.5-acre property was listed on the NRHP in 1979 for its Greek Revival/Italianate architecture and is designated as a Jefferson County Historic Landmark. The Beautification League of Louisville purchased the home in 1962, operating it as a wedding/event venue today.
- JF-225, also known as Cherry Springs or the Peter Funk House, was determined eligible for the NRHP in 1983 but was not formally listed. The double pile Georgian style house has since been absorbed into a modern car lot; however, the stone springhouse remains between KY 1747 and the parking lot. The springhouse is the only historic structure identified within the 500-foot wide study area limits.

Figure 27: Historic Resources

If proposed improvements involve additional right-of-way from within a listed historic site or a site meeting the criteria to qualify for NRHP eligibility, consultation with the Kentucky Heritage Council must occur and Section 4(f) requirements must be considered during future project development phases.

Archaeological Potential

Based on previous disturbances within the corridor, there is low potential to encounter intact archaeological deposits. However, field surveys and/or coordination with the Kentucky Heritage Council will be required if a build solution is selected for implementation.

3.2.4 Socioeconomic Profile

Included as **Appendix E**, an assessment of demographic trends was completed to identify potential sensitive population concentrations. This socioeconomic study reviewed current

US Census estimates[8] to identify geographies where readily identifiable populations of low-income, minority, elderly, disabled, or limited English proficiency persons could be present in the study area and potentially affected by a project.

Each of the five demographic categories examined had at least one statistical geographic area exceeding the county threshold (see **Figure 28** and **Table 8**). However, it should be noted that the properties within the study area limits are almost entirely commercial properties. An assessment of potential effects of the project on environmental justice populations in the study area will be required as part of any future project development phases.

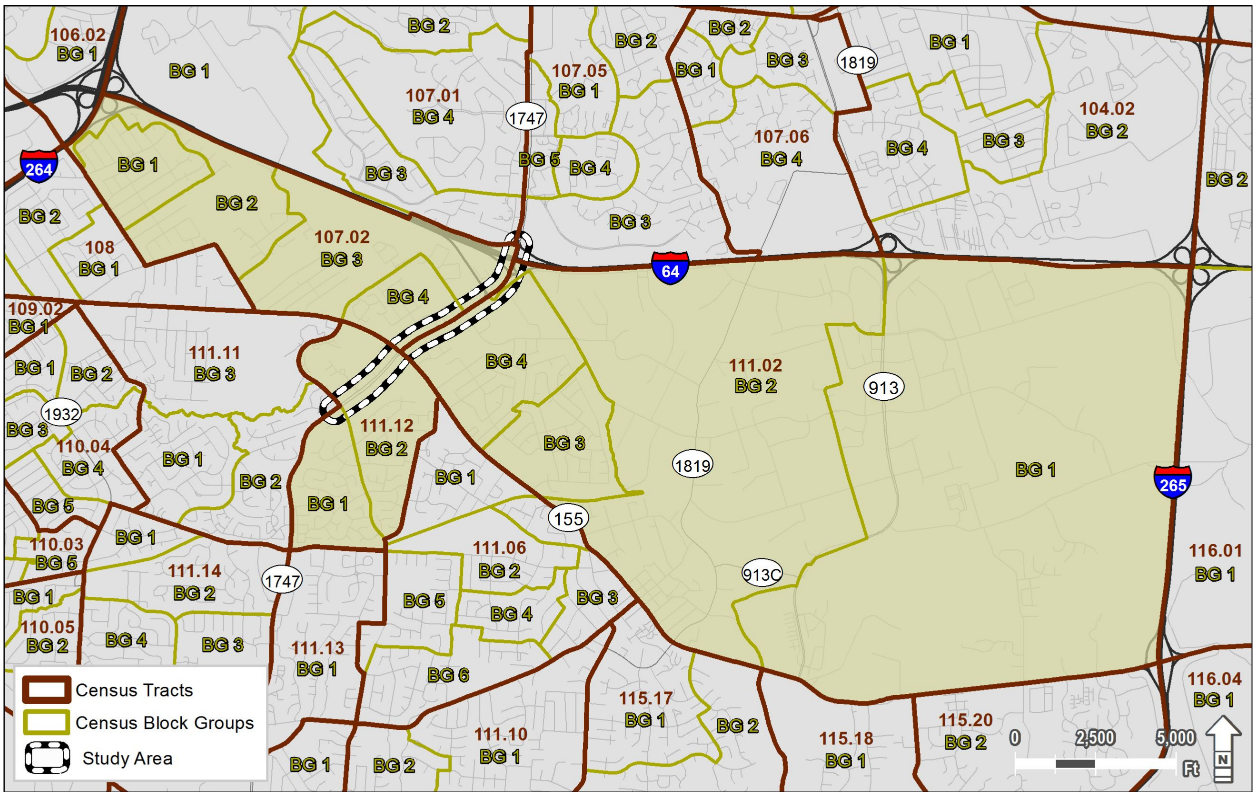


Figure 28: Tracts and Block Groups for Socioeconomic Study

[8] American Community Survey 2014-2018 estimates

Table 8: Socioeconomic Statistics by Block Group

Geography	Minority	Low-Income	Elderly	Disability*	Limited English
Kentucky	13.3%	16.9%	16.4%	15.6%	1.4%
Jefferson County	**28.1%**	**14.8%**	**15.3%**	**12.4%**	**2.6%**
BG 3, Tract 107.02	30.2%	5.4%	9.6%	4.5%	4.5%
BG 4, Tract 107.02	52.6%	3.6%	17.2%	4.5%	2.3%
BG 2, Tract 111.02	38.7%	0.0%	20.7%	8.8%	7.7%
BG 4, Tract 111.02	4.2%	0.7%	22.4%	8.8%	0.0%
BG 2, Tract 111.12	37.4%	21.8%	16.6%	8.5%	0.0%

** Not available at Block Group level. Estimates for encompassing Tracts presented instead.*

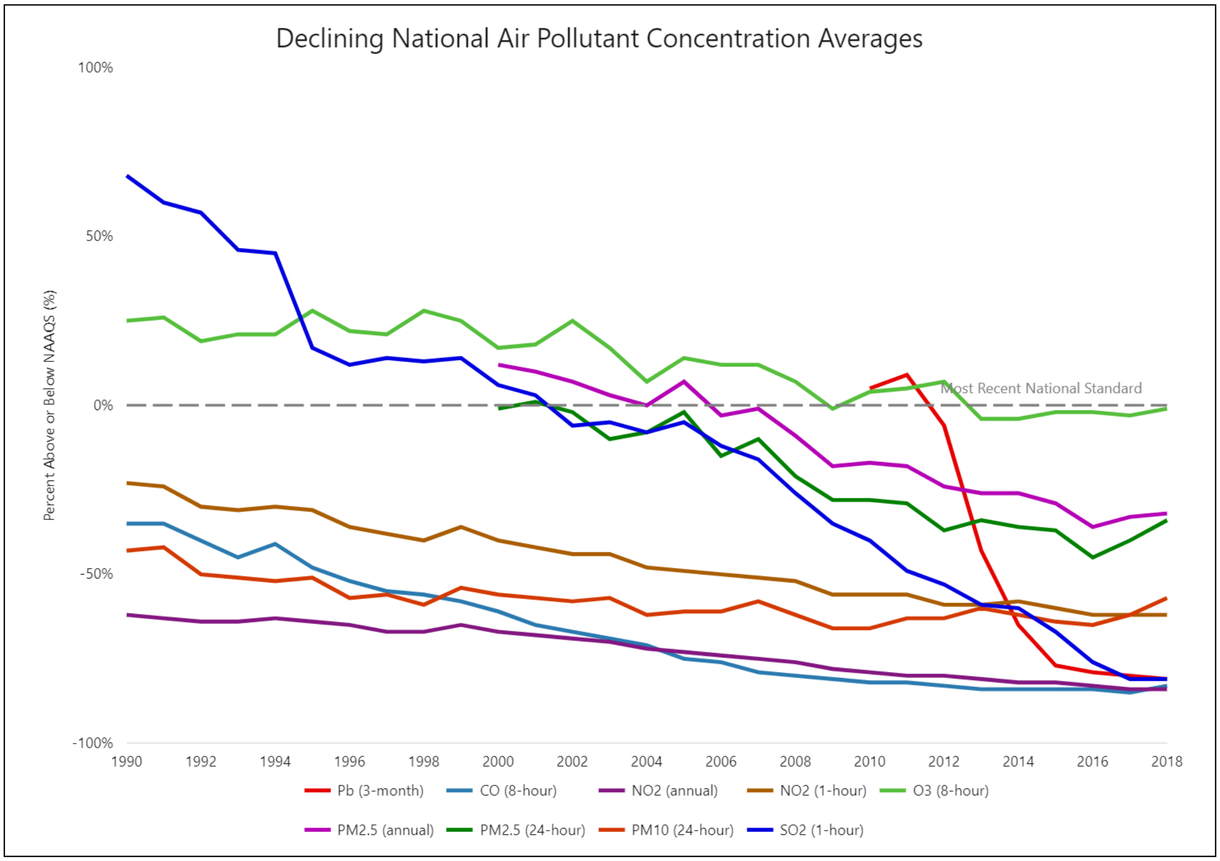
3.2.5 Hazardous Materials Considerations

Readily available records from the US Environmental Protection Agency (USEPA) were compiled to illustrate the range of monitored sites within the study area. Records range from short-term construction permits to commercial automotive properties with underground storage tanks (USTs) lining the route.

3.2.6 Air Quality

Select criteria pollutants are monitored by USEPA: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM), and sulfur dioxide (SO2). The study area is classified as a nonattainment area for ozone per the 8-hour standard. The region is also considered a maintenance area for PM2.5 based on earlier violations that have been addressed. Nationally, air quality has been steadily improving with criteria pollutants declining, as shown in **Figure 29**.

The state and each metropolitan planning organization (MPO) demonstrate air quality compliance for projects through their TIP. KIPDA includes this planning study (Item No. 5-555) in its FY 2020–2025 TIP for Jefferson County. No future phases of any recommended improvements are in the current TIP. Any future project development efforts would have to be amended into the document. Likewise, KYTC lists the study in its FY 2019–2022 Statewide TIP but no future phases are included.



Source: US EPA

Figure 29: National Air Quality Trends

3.2.7 Noise Considerations

Federally funded transportation projects that add capacity or include new alignments require consideration of noise impacts. Noise sensitive receptors along the study corridor include a park, residential areas, and commercial uses with outdoor uses (e.g., sidewalk cafes or outdoor event venues). Specific traffic noise impact analyses may be required as part of future project development activities if projects are identified that add capacity or shift traffic closer to sensitive receptors. However, analyses are unlikely to identify reasonable and feasible mitigation measures due to necessary access for cross-streets and driveways.

4.0 FUTURE NO-BUILD TRAFFIC

Future year forecasts were generated using KIPDA's current regional travel demand model with both 2030 and 2040 horizon years for comparison. The model reflects the current projects included in KIPDA's MTP with the exception of the following:

- Reconstruction of the I-64/KY 1747 interchange (KIPDA ID #181)
- KY 1747 widening efforts north and south of the interchange (ID #359 and #386)
- New alignment connections to the west providing new I-64 and I-264 crossings (ID #258, #260, and #265)

As the corridor is approaching available capacity already, both model runs showed minor traffic growth by 2040, the selected horizon year. Results are summarized in **Table 9**; the *Traffic Forecast Report* is in **Appendix A**.

Table 9: Summary of 2040 No-Build Traffic

Segment	Milepoint	2040 No-Build ADT Volume	AM Peak Volume	PM Peak Volume
South of KY 155	10.500 – 11.033	32,100 – 36,000	3,290 – 3,470 75% northbound	3,550 – 3,710 54% southbound
KY 155 to Bunsen Parkway	11.033 – 11.459	57,900 – 58,900	4,710 – 4,810 64% northbound	5,180 – 5,510 65% southbound
Bunsen Pkwy to south of I-64 Eastbound Ramps	11.459 – 11.825	56,400 – 58,500	4,750 – 5,010 57%—67% northbound	5,110 – 5,160 43%–60% northbound
Through Interchange	11.825 – 11.990	62,900	5,250 70% northbound	5,310 54% northbound
North of Interchange	11.990+	61,600	5,190 67% northbound	4,930 55% southbound

Forecast volumes were built into the microsimulation model to analyze future traffic operations, summarized in **Table 10**. Note, the existing signal timings are assumed, although a city project to implement adaptive control for a portion of the corridor is underway. This provides an unbiased comparison between future scenarios, some of which include additional signal retiming/coordination efforts.

As the existing system is near capacity, the relatively small increase in No-Build traffic pushes the system over capacity with almost every intersection at LOS E or F during the PM peak. Corridor travel times are summarized in **Table 11**, which shows increased delays. The model projects over 14 minutes to travel southbound through the 1.5-mile study length during the PM peak. With few parallel route options and limited I-64 access points in the vicinity, no high capacity diversion routes exist to handle the corridor's anticipated traffic demand.

Table 10: 2040 No-Build AM and PM Peak Hour Intersection LOS and Delay

KY 1747 Intersection	2020 AM Peak LOS | Delay	2040 No-Build AM Peak LOS | Delay	2020 PM Peak LOS | Delay	2040 No-Build PM Peak LOS | Delay
Stony Brook Dr	C | 20 sec	F | 94 sec	D | 51 sec	F | 124 sec
Greene Way	B | 11 sec	E | 63 sec	C | 20 sec	F | 81 sec
Shane Dr	B | 16 sec	D | 50 sec	C | 26 sec	E | 61 sec
KY 155	E | 64 sec	F | 95 sec	E | 76 sec	F | 118 sec
Shopping Center	A | 3 sec	A | 5 sec	B | 12 sec	C | 22 sec
Hurstbourne Ln	B | 17 sec	C | 20 sec	D | 38 sec	E | 54 sec
Bunsen Pkwy	C | 34 sec	D | 54 sec	F | 83 sec	F | 109 sec
Bluegrass Pkwy	D | 41 sec	E | 60 sec	E | 62 sec	F | 123 sec
EB Ramps	B | 16 sec	C | 22 sec	C | 27 sec	F | 83 sec
WB Ramps	D | 39 sec	D | 39 sec	D | 41 sec	F | 100 sec

Table 11: Comparison of Corridor Travel Times in Seconds

Direction	2020 AM Peak	2040 No-Build AM Peak	2020 PM Peak	2040 No-Build PM Peak
Northbound	325 sec	569 sec	384 sec	684 sec
Southbound	299 sec	392 sec	499 sec	860 sec

5.0 INITIAL COORDINATION EFFORTS

Coordination with the project team occurred throughout the study process. The project team consists of KYTC District 5 and Central Office staff, KIPDA representatives, and the consultant. Summaries of project meetings presented chronologically are in **Appendix F**. In light of the 2020 pandemic, most coordination efforts occurred virtually.

5.1 Project Team Meeting No. 1

The first project team meeting was March 16, 2020. The purpose of the meeting was to review the existing conditions analysis, preparing for the upcoming public and local officials' coordination efforts. The existing conditions information (**Chapter 2.0**) was presented, and the following input was received from the team:

- Pedestrian connectivity was discussed. District 5 staff have examined potential sidewalk extensions but are constrained by existing right-of-way limits and deep drainage ditches along the existing roadway. Small-scale safety improvements near the interchange (e.g., additional striping or signage) tends to be short-lived due to high traffic volumes.
- The team agreed to use 2040 as the future analysis year to be consistent with other regional planning efforts.
- Language describing study goals and objectives (**Chapter 6.0**) was refined to ensure turning movements to/from side streets are candidates for improvements, not just mainline thru movements.

Logistics for the upcoming local officials meeting and public survey were also discussed.

5.2 Local Officials Meeting No. 1

The first local officials meeting was March 26, 2020. In addition to project team members, 11 stakeholders joined the web conference, representing Louisville Metro and the municipalities of Hurstbourne, Hurstbourne Acres, Jeffersontown, and Fern Creek. The purpose of the meeting was to review the existing conditions analysis and solicit feedback regarding corridor needs.

Existing conditions information was discussed. Improved pedestrian connectivity is a priority for Louisville Metro including a multi-use path on the east side of the corridor, a sidewalk on the west side, and increased lighting. Other participants, including representatives for Jeffersontown, emphasized the importance of a bike linkage between KY 155 and Bluegrass Parkway.

5.3 Public Survey on Corridor Needs

An online survey, promoted during April 2020, was designed to collect community input regarding existing corridor needs. In total, 207 responses were received, as presented in **Appendix F**. All participants agreed that some level of improvement to the corridor was needed. Shown in **Figure 30**, congestion/delay was the most often cited corridor need, followed by safety, and then closely spaced signals. Respondents were also asked to enter location-specific improvements for consideration through a GIS-based crowdsourcing application. Responses are summarized graphically in **Figure 31** (page 42) and **Figure 32** (page 43). While suggestions covered all ten study intersections, they were geographically concentrated in the northern third of the study area.

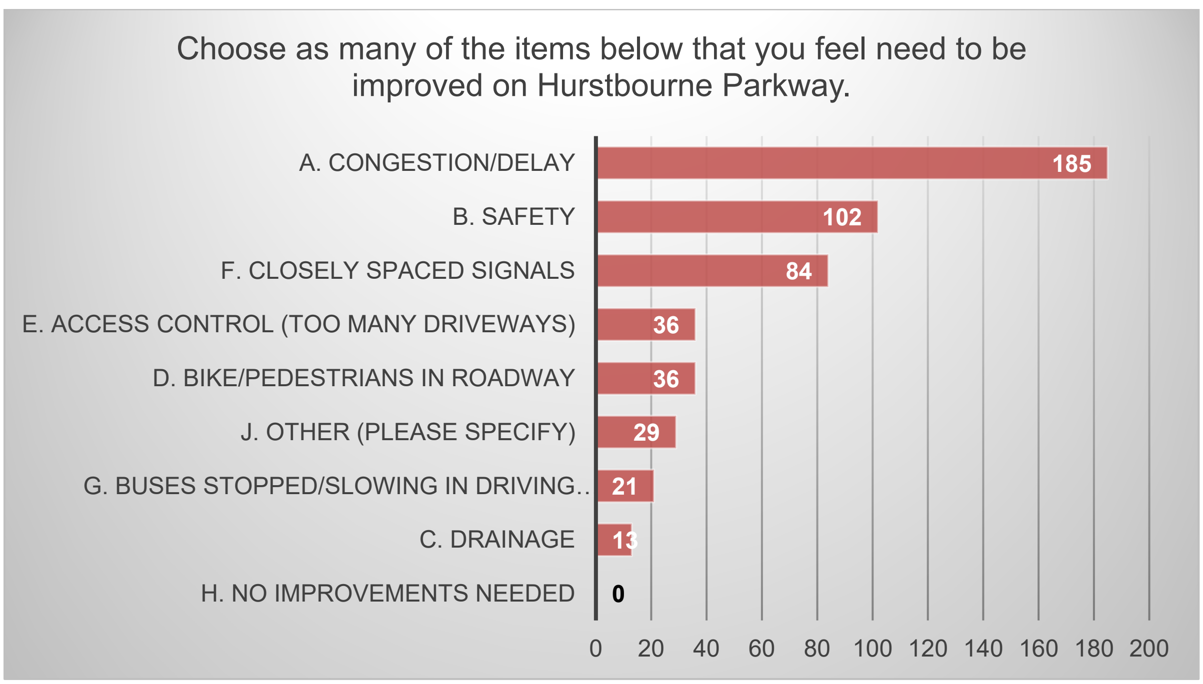


Figure 30: Corridor Needs to Public Survey Responses

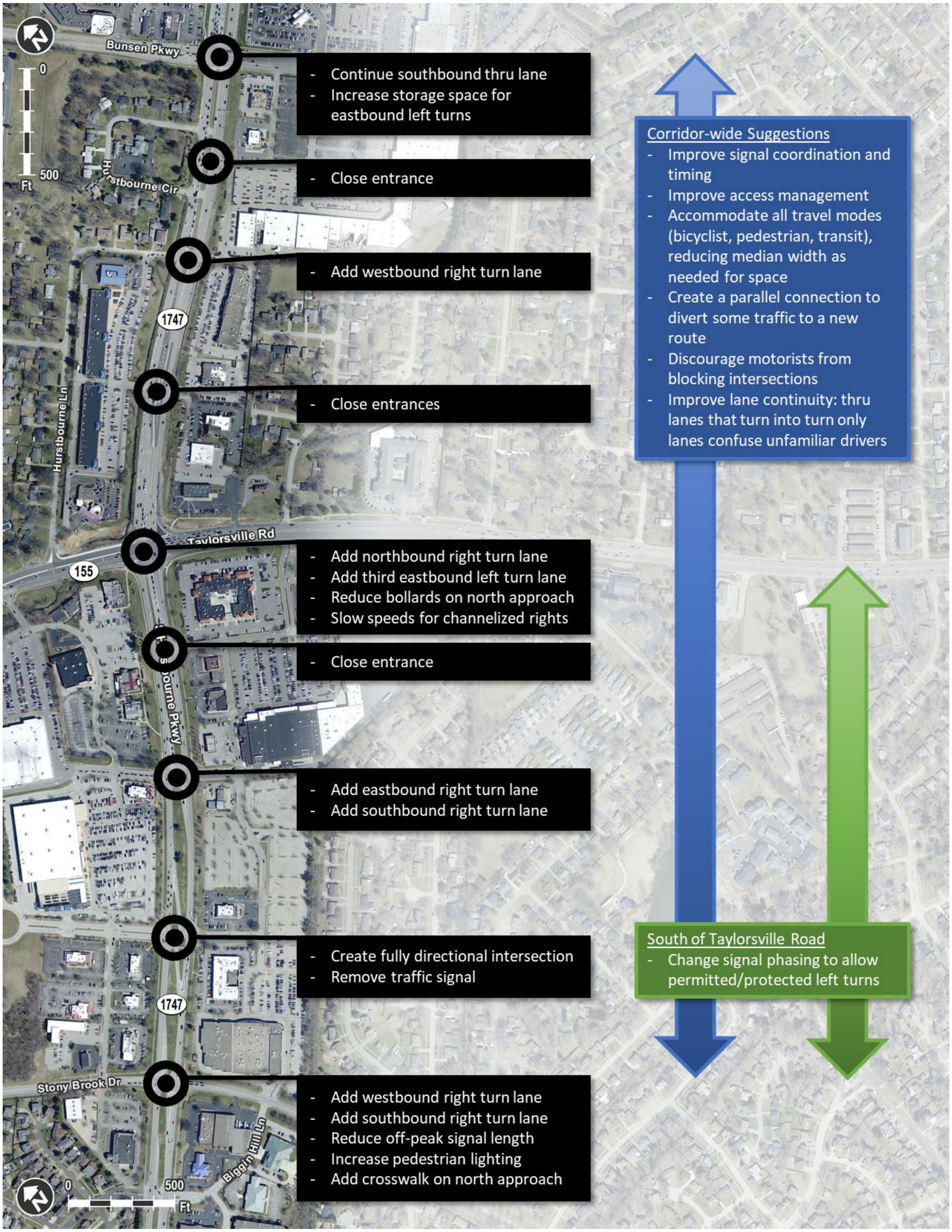


Figure 31: Public Comments on Improvements, South of Bunsen Parkway

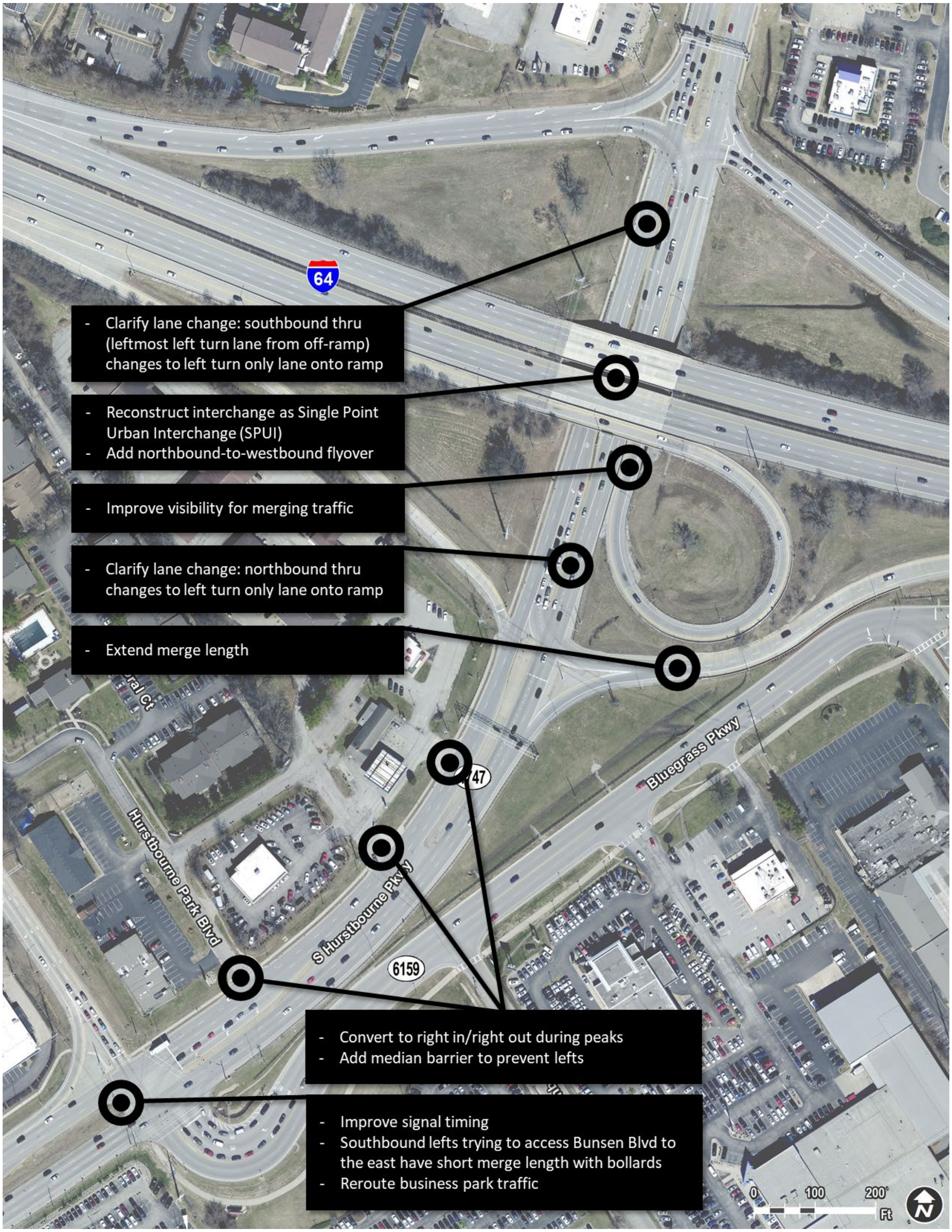


Figure 32: Public Comments on Improvements, I-64 Interchange Area

6.0 STUDY GOALS AND PROJECT PURPOSE

The goal of this study is to identify practical, implementable solutions to improve safety, vehicle throughput, and pedestrian connectivity along the congested KY 1747 corridor between Stony Brook Drive and I-64. While each spot improvement will have its own Purpose and Need Statement, each should focus on one or more of these three goals.

In addition, each spot improvement should be designed to minimize right-of-way and environmental impacts to the extent practicable.

Individual spot improvements are discussed in the following chapter, including a discussion of Purpose and Need for each.

Goals:

1. Improve safety
2. Improve vehicle throughput
3. Improve pedestrian connectivity

Other objectives:

1. Minimize right-of-way impacts
2. Minimize environmental impacts

7.0 INITIAL SPOT IMPROVEMENTS

Improvement concepts were developed based on a review of existing traffic and safety needs, field reconnaissance, and community input. Initial sets of potential improvements were developed and the results evaluated by the project team to identify the most practicable set to advance for further consideration. This chapter describes the development of spot improvements advanced for consideration by the community.

7.1 Initial Concepts

A series of ten potential spot improvements were initially presented to the project team for consideration.

7.1.1 Potential Short-Term Spot Improvements

Short-term spot improvements represent small-scale actions on existing rights-of-way, requiring minimal earthwork, that can be implemented quickly. Some could be addressed through maintenance actions, independent of more traditional funding options. Five short-term spot improvements were initially considered.

Corridor-Level Wayfinding/Signage (Spot A)

In addition to high crash rates and lengthy queues, community input noted the following concerns in the I-64 interchange area:

- Confusion where thru lanes convert to turn-only lanes: the left-most northbound thru lane becomes a left turn lane onto the I-64 westbound on-ramp, the left-most southbound thru lane becomes a left turn lane onto the I-64 eastbound on-ramp, and the right-most southbound thru lane south of the interchange becomes a right turn lane onto Bunsen Parkway.

- Concerns with the right turn movement from the eastbound off-ramp: with the bollards and heavy peak period traffic flows, it is challenging to merge out of the right-turn-only lane onto Bunsen Parkway within the available length (see **Figure 19**).

The improvement concept includes painted "pavement tattoos" depicting interstate shields near the interchange, restriping the "cat tracks" for the dual lefts from the westbound off-ramp, and signage to shift eastbound Bunsen Parkway traffic to the local access ramp (Exit 15B) as highlighted in **Figure 33**.

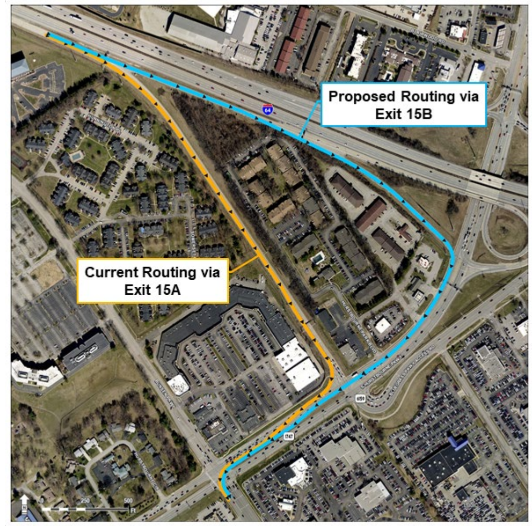


Figure 33: Spot A Routing

Signal Optimization (Spot B)

This spot improvement examines the potential to improve corridor operations by optimizing signal timing and phasing plans. For the three southernmost study intersections (i.e., Stony Brook Drive, Greene Way, and Shane Drive), allowing permitted left turns from KY 1747 on flashing yellow lights may improve off-peak operations. No other infrastructure improvements are assumed to occur in this scenario.

An ongoing HSIP project (Item 5-9019) includes changing existing puck detectors to loops at signalized intersections from Bunsen Parkway to Linn Station, which should make a noticeable improvement. Once hardware is in place Louisville Metro plans to optimize the KY 1747 corridor signals between US 60 and KY 155.

Warrants were evaluated to add protected left turn phases for cross-streets at the southern three study intersections but are not satisfied based on 2020 volumes.

Westbound Right at Hurstbourne Lane

This spot improvement adjusts the westbound approach to create a short right turn bay, separated from westbound thru and left movements. As an adjacent property owner is privately implementing a similar improvement, this spot was eliminated from further consideration.

Greene Way Intersection Reconstruction (Spot C)

Shown in **Figure 34**, the KY 1747 intersection with Greene Way provides numerous raised islands to channelize movements, theoretically preventing thru movements between the cross-streets. Several survey respondents found the layout confusing. The proposed spot improvement cuts back the medians within the intersection to create a more traditional intersection design.

Figure 34: Greene Way Layout (left) and Street View (right)

Miscellaneous Pedestrian Improvements (Spot D)

This spot improvement is a catch-all for maintenance level actions along existing pedestrian facilities lining the corridor: drainage, crosswalks, lighting, ADA compliance, etc.

7.1.2 Potential Mid-Term Spot Improvements

Remaining spot improvements represent larger scale actions with relatively longer timelines for implementation due to higher costs or greater impacts (e.g., right-of-way acquisition or stream impacts), though still developed to be implementable on a reasonably foreseeable timeline. Five mid-term spot improvement were initially considered.

Displaced Left Turns (Spot E)

Left turns from northbound KY 1747 onto the I-64 westbound on-ramp represent a heavy movement: 750 vehicles per hour (vph) during the AM peak hour and 910 vph during the PM peak hour based on 2020 pre-COVID counts. When funding becomes available, Item No. 5-52 will reconstruct the interchange as a DDI or with a flyover ramp to facilitate a free-flow movement.

Less costly concepts were examined to alleviate congestion in the interim. Spot E creates a displaced left, shifting the left turn movement upstream one intersection. Northbound motorists accessing the westbound on-ramp would turn left at the eastbound ramps intersection then continue onto I-64 as a free-flow movement. **Figure 36** (page 48) shows a plan view sketch of the concept. To provide adequate storage for anticipated queues, dual turn lanes are shown with dedicated storage beginning just north of the Bluegrass Parkway intersection. This increases storage space for southbound traffic beneath the bridges but introduces a red phase for southbound traffic, which is uninterrupted today.

Beneath the overpasses, a vertical wall replaces the west embankment to accommodate the dual left turn lanes outside the pier. The existing sidewalk shifts inside the pier, separated from southbound traffic by a barrier. Southbound vehicle lanes shift east slightly, removing the existing curb adjacent to the central pier. Beyond rerouting the northbound left movements, no changes are proposed for the northbound lanes. A typical section view beneath the overpasses is shown in **Figure 35**.

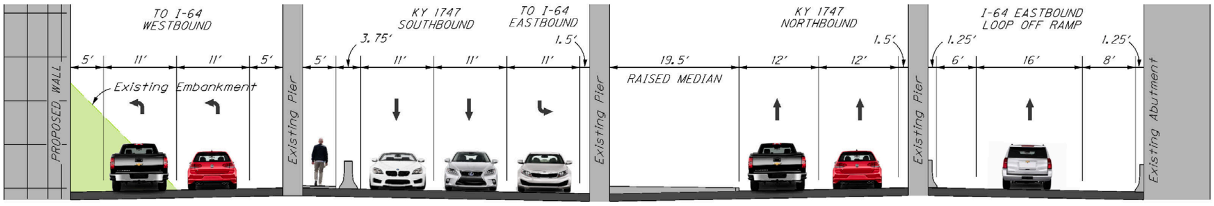


Figure 35: Typical Section Beneath I-64 Overpass (Looking North)

Extra Southbound Thru Lane (Spot F)

To accommodate heavy southbound peak hour traffic flows during the PM peak, a fourth southbound lane is proposed. Most of the widening required is shown in the median to reduce impacts. As shown in **Figure 37** (page 49), the outside southbound lane from the I-64 eastbound off-ramp becomes a thru movement; an extra right turn lane onto Bunsen Parkway is added. Four thru lanes continue south to Hurstbourne Lane, tying to recently constructed improvements on KY 1747 approaching KY 155. The outside lane becomes a right turn only lane onto westbound KY 155 and the inside lane becomes a left turn only lane onto eastbound KY 155. The middle two lanes continue south towards Stony Brook Drive.

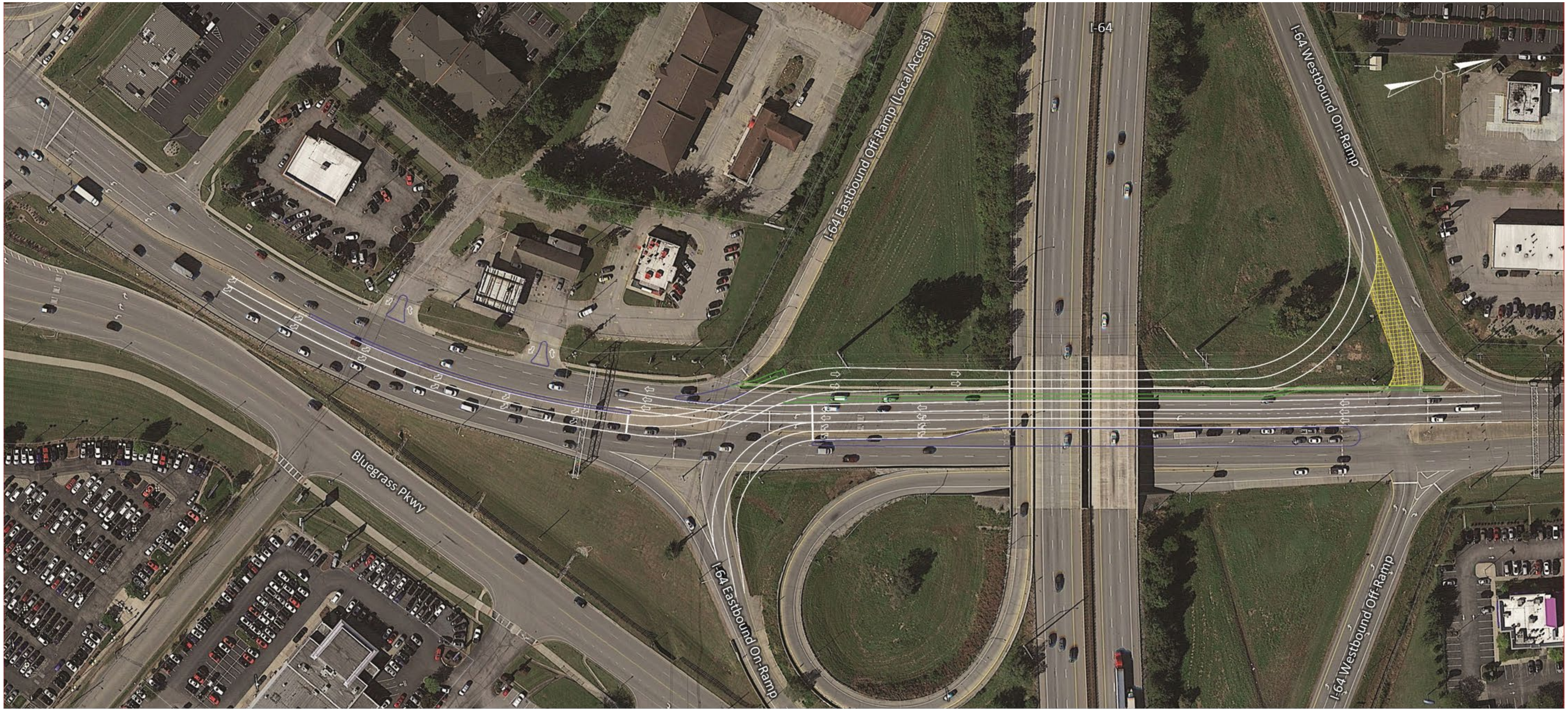


Figure 36: Concept Sketch of Displaced Left Turns

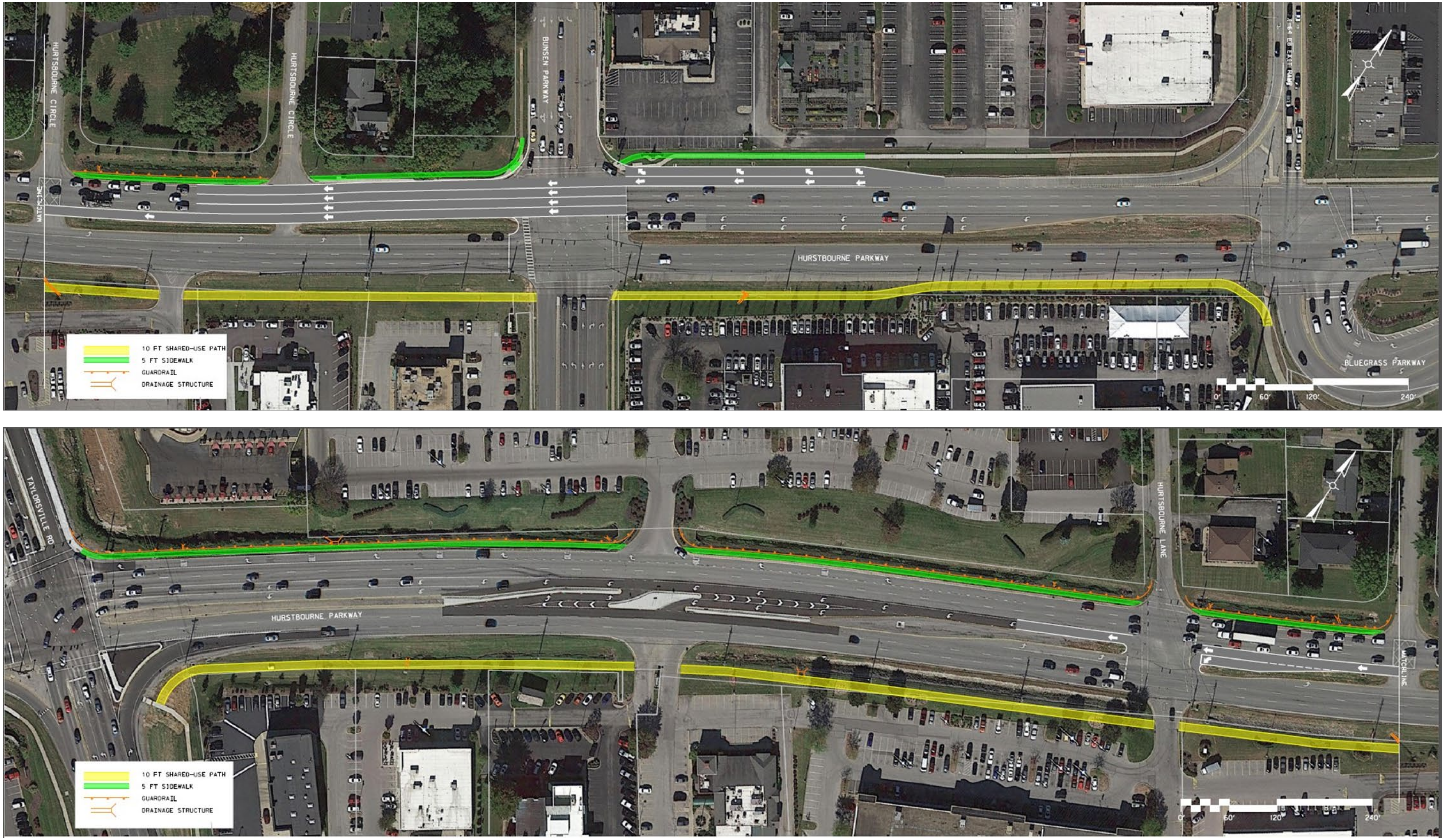


Figure 37: Concept Sketch of Southbound Thru Lane with Pedestrian Facilities

Sidewalk Connection on West Side (Spot G)

This spot improvement adds a 5-foot-wide sidewalk along the west side of KY 1747, between Hurstbourne Circle and KY 155, to eliminate the gap in pedestrian connectivity. One possible layout is shown in green in **Figure 37** above. The ditches through this section carry the South Fork of Beargrass Creek, which would be impacted by proposed sidewalk improvements, as shown. While it would increase property impacts, a meandering path outside the ditch may be feasible to reduce stream impacts.

Shared Use Path Connection on East Side (Spot H)

This spot improvement adds a 10-foot shared use path along the east side of KY 1747. The shared use path is shown in yellow in **Figure 37** above. The representative location was selected to balance property impacts, stream impacts, and earthwork through this section.

The proposed link would connect to the shared use path along Bluegrass Parkway at its north limit and tie to the existing sidewalk/crosswalk at KY 155 on its south end. Currently, a bike path exists along the north edge of KY 155 west of KY 1747 and sidewalk connections exist along both sides of the highway on the south, east, and west approaches.

Shane Drive Intersection Reconstruction (Spot I)

This spot improvement adds a southbound right turn lane on KY 1747 at Shane Drive. The mainline left turn lanes are offset across the median to improve visibility for permitted (flashing yellow) left turns during off-peak periods. A proposed refuge in the adjusted medians improves safety for pedestrians and reduces the signal phasing for motorists. The preliminary concept is shown in **Figure 38**.

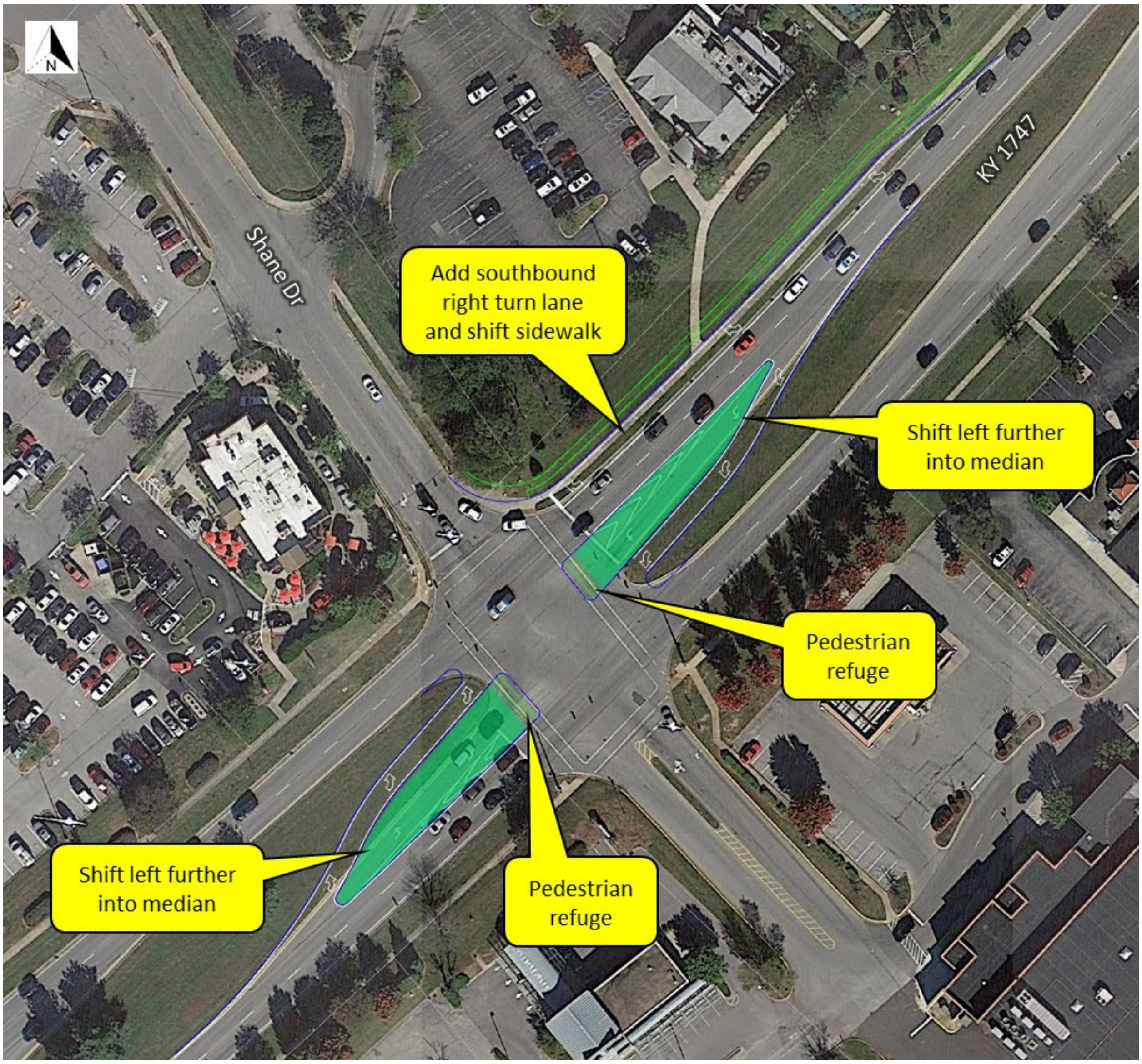


Figure 38: Concept Sketch of Shane Drive Reconstruction

7.2 Project Team Meeting No. 2

A virtual project team meeting was held May 27, 2020, intended to reach a consensus on which spot improvements should be developed further. The team discussed the concepts described above, agreeing on nine to present to the community for feedback. The meeting summary is presented in **Appendix F**.

Spot improvements carried forward included the following:

Short-Term Spots

A. Wayfinding and Signage
B. Signal Optimization
C. Greene Way Intersection
D. Misc. Pedestrian Improvements

Mid-Term Spots

E. Displaced Left Turn Lanes
F. Extra Southbound Thru Lane
G. Sidewalk Link (West Side)
H. Shared Use Path (East Side)
I. Shane Drive Intersection

8.0 ADDITIONAL COORDINATION EFFORTS

Once the initial concepts were defined, the project team reached out to local officials, stakeholders, the public, and resource agencies to solicit feedback. Additional details are provided in **Appendices F** and **G**.

8.1 Local Officials Meeting No. 2

A virtual meeting with local officials and stakeholders was held July 23, 2020 to discuss the proposed improvement concepts. A review of traffic patterns, crash analyses, and April public survey responses provided a context for the proposed improvements. The consultant noted that generally, the proposed improvements were well liked, representing affordable solutions that could be implemented relatively quickly.

Consideration was given to the intersections with Hurstbourne Circle. Left turn movements are challenging today with three southbound lanes to cross. The painted “Do Not Block Intersection” box at the southern intersection is faded. Today, drivers tend to wait to turn left, rather than opting for a right turn then U-turn downstream. Events at the Nunnlea House lead to higher traffic volumes and attract drivers less familiar with the area. Pedestrian safety at the intersections is also a concern.

Attendees were encouraged to complete the public survey and share the link with their organization’s mailing list.

8.2 Public Survey on Prioritization

An online public survey was promoted during July and August 2020 encouraging interested parties to comment on the proposed spot improvements. In lieu of an in-person public meeting, an online StoryMap provided information about the study, existing conditions, and proposed improvements. The survey was promoted via KYTC District 5 social media accounts and through a link posted on the project webpage, linked into KYTC District 5’s homepage. Stakeholders who attended the July 23, 2020 virtual meeting were also asked to help promote the survey through their distribution lists. Analytics show targeted Facebook ads led to over 10,000 impressions (i.e., user views). Throughout the comment period, 321 individuals submitted survey responses.

Respondents were asked to rank the four short-term spot improvements based on importance, where one is the highest priority and four is the lowest. Shown in **Figure 39**, orange bars represent ranked numeric results with the darker bars representing the higher priority. As shown in the chart, Spot B (optimizing traffic signals) received the most #1 rankings, as noted by the largest dark orange bar. The average score represents the mean of numeric results, where the lower number notes the highest priority. Again, Spot B with a 1.38 average ranking is the highest priority of the short-term spot improvements. Conversely, Spot D (maintenance actions along the existing sidewalk network) was the lowest priority of identified short-term spots.

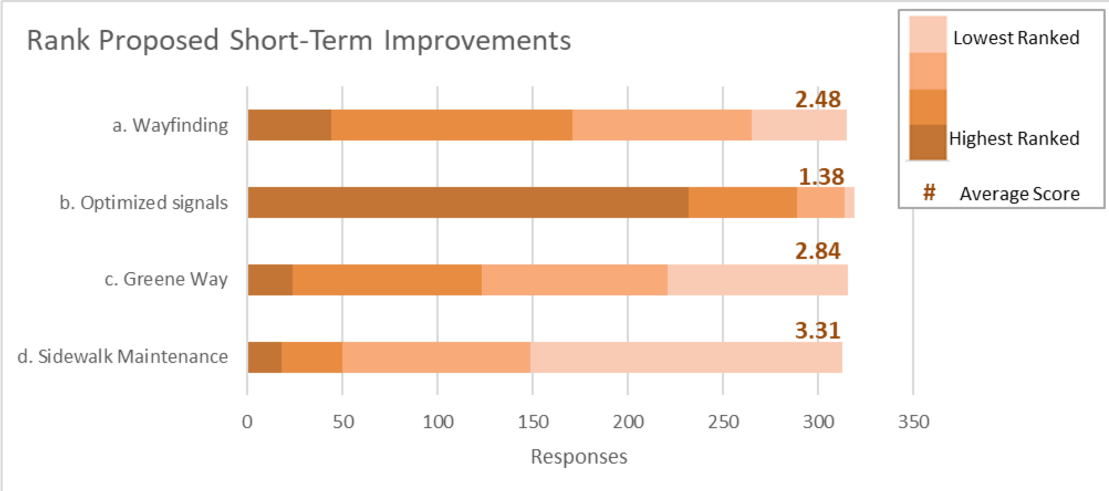


Figure 39: Survey Results of Short-Term Spots Ranking

Respondents were asked to explain why they selected their top short-term priority. The most common response themes favored low-cost, high impact results and the importance of safe modal choices. Many open-ended responses reiterated corridor needs from the initial survey in April: congestion, lengthy delays, and high crash trends along the corridor, particularly associated with signals.

Respondents were also asked to rank the five mid-term spot improvements based on importance, where one is the highest priority and five the lowest. **Figure 40** summarizes the results, following the same format as the previous chart.

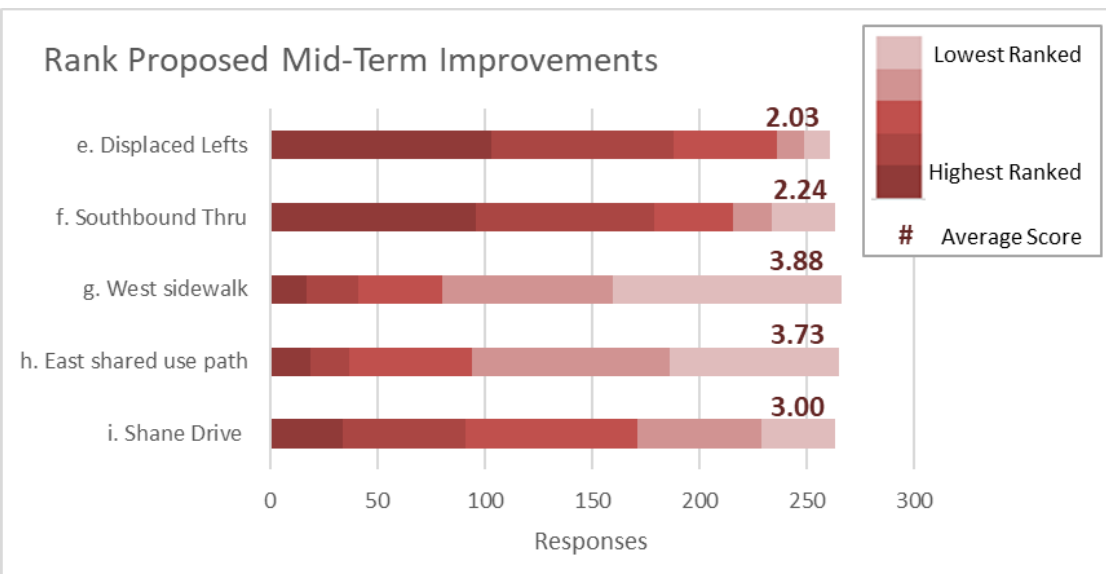


Figure 40: Survey Results of Mid-Term Spots Ranking

As shown, Spot E (displaced lefts at interchange) was the highest priority closely followed by Spot F (extra southbound lane). Spot G (new sidewalk, west side) was the lowest priority. Short-and mid-term spots were rated on different scales so average scores between questions do not directly correlate.

Additional locations suggested for consideration are listed in **Appendix F** and were discussed at the final project team meeting, discussed in **Section 8.4** below.

8.3 Resource Agency Coordination

Resource agency coordination was conducted to help identify potential environmental resources, development plans, or other issues. The KYTC Division of Planning emailed approximately 60 federal, state, and local resource agencies a packet of project-related information including purpose and need, existing traffic and safety information, preliminary build concepts, and an environmental overview exhibit. Responses are summarized in **Table 12** and provided in full in **Appendix G**.

Table 12: Summary of Resource Agency Comments

Resource Agency	Comment(s)
Natural Resources Conservation Service	➢ As the study area is contained in a previously developed urban area, no further coordination on farmland soils is needed.
Kentucky Department of Natural Resources (Reclaimed Mines)	➢ No comments.
Kentucky State Police	➢ No factors would affect state police operations in the area.
Kentucky Department of Fish and Wildlife Resources	➢ No impacts to federally or state-listed protected species or critical habitats are anticipated.
Kentucky Department for Environmental Protection	➢ Construction best management practices should be used to reduce runoff into nearby waters. ➢ KYTC is exempt from Division of Water permitting approval for construction along a stream or in the floodway. A Section 401 water quality certification is required. ➢ The proposed project is not within a designated source water protection area. However, it is in an area with a high karst potential, susceptible to groundwater contamination. A groundwater protection plan is recommended. ➢ A KPDES permit is needed prior to construction, including a stormwater pollution prevention plan and implementation of best management practices. ➢ Five active USTs, five closed USTs, and two superfund sites are noted in the vicinity. An solid waste generated must be disposed of at a permitted facility. ➢ Construction practices to protect air quality are identified including covering open bodied trucks, minimizing open burning, using alternatively fueled equipment, reducing idling time, etc. ➢ The project may impact listed species or natural communities; additional information is available through the Kentucky Biological Assessment Tool online.

8.4 Project Team Meeting No. 3

The third project team meeting was held virtually September 22, 2020. The primary purpose of the meeting was to review study findings to date and identify recommendations. Public and agency comments were reviewed alongside build traffic analyses and preliminary benefit-cost calculations. As a result of the team discussions, initial spot improvements discussed in **Chapter 7.0** were refined as follows:

- Spot A was expanded to add pavement tattoos for southbound KY 1747 approaching KY 155 and repaint the “do not block intersection” striping at the southern Hurstbourne Circle intersection.
- Spot F was expanded to convert the northern Hurstbourne Circle intersection to a right-in/right-out configuration as the additional southbound thru lane is constructed.
- Spots F and G were combined.
- A new Spot J was added, extending the northbound right turn lane onto KY 155 back to the right-in/right-out driveway by Starbucks/PNC. This area frequently sees drivers maneuvering onto the curb to access the channelized right turn onto KY 155. Extending the turn lane back to the entrance will give vehicles better access to turn right. A conceptual sketch is shown in **Figure 41**.

Figure 41: Spot J Northbound Right Turn Lane to KY 155

Priorities for mid-term spot improvements and the long-term vision were also discussed, documented in the following chapters.

9.0 PRIORITIZED RECOMMENDATIONS

This chapter presents the prioritized recommendations of the study's findings—including an assessment of costs, impacts, build traffic operations, and more.

9.1 Potential Impacts

To the extent practical, improvements are contained within the existing right-of-way to minimize property impacts.

As a developed urban corridor, few environmental impacts are anticipated. Spots G and H that add pedestrian facilities along either side of the roadway would lead to stream impacts and incur mitigation fees. No other direct effects to listed species habitats, historic or archaeological resources, community features, or contaminated sites are anticipated. Noise analyses may be necessary during future project development, although mitigation measures are unlikely to be recommended.

Geotechnical drilling will be needed for any roadway cut/fills and the proposed retaining wall associated with Spot E. For widening elements, information on pavement structure should be obtained to assist in pavement design. A chemically modified soil subgrade is the preferred method of stabilization; however, where that is not feasible, a granular subgrade should be anticipated. Sampling of foundation soils should be performed for embankment situations. A thorough geotechnical exploration of proposed improvement sites is recommended to identify conditions that may warrant special consideration during design and construction.

9.1.1 Build Traffic and Operations

Three separate build scenarios were modeled to reflect the incremental traffic impacts associated with individual spot improvements.

- Build Scenario 1 includes the displaced left turn lane (Spot E) and, assuming Bunsen Parkway traffic shifts to the Exit 15B local access ramp (part of Spot A), retiming/optimizing signals at the interchange intersections.
- Build Scenario 2 includes the additional southbound thru lane (Spot F) and retiming/optimizing affected signals.
- Build Scenario 3 includes improvements at Greene Way and Shane Drive intersections (Spots C and I), including signal timing/phasing adjustments at southern three intersections: Stony Brook Drive, Greene Way, and Shane Drive. Reconstruction allows for flashing yellow permitted left turn movements from KY 1747 during non-peak periods, although these non-peak operations are not modeled.

Additional technical information about the modeling efforts are presented in **Appendices A** and **B**. Level of Service (LOS) and delay for each of the build scenarios are presented in **Table 13** and **Table 14**. Bold results indicate which intersections are physically affected by each build scenario. Each scenario reduces delay at key intersections, with the most benefit observed during the PM peak at the interchange.

Table 13: 2040 AM Peak Hour Intersection LOS and Delay

KY 1747 Intersection	No-Build LOS | Delay	Build 1 LOS | Delay	Build 2 LOS | Delay	Build 3 LOS | Delay
Stony Brook Drive	F | 94 sec	F | 92 sec	F | 92 sec	F | 91 sec
Greene Way	E | 63 sec	E | 63 sec	E | 63 sec	**E | 62 sec**
Shane Drive	D | 50 sec	D | 50 sec	D | 50 sec	**D | 49 sec**
KY 155	F | 95 sec	F | 95 sec	F | 94 sec	F | 95 sec
Shopping Center	A | 5 sec	A | 8 sec	**A | 5 sec**	A | 5 sec
Hurstbourne Lane	C | 20 sec	C | 33 sec	**C | 20 sec**	C | 21 sec
Bunsen Parkway	D | 54 sec	F | 88 sec	**D | 50 sec**	E | 56 sec
Bluegrass Parkway	E | 60 sec	E | 64 sec	E | 59 sec	E | 60 sec
EB Ramps	C | 22 sec	**C | 26 sec**	C | 21 sec	C | 21 sec
WB Ramps	D | 39 sec	**C | 25 sec**	D | 39 sec	D | 39 sec

Table 14: 2040 PM Peak Hour Intersection LOS and Delay

KY 1747 Intersection	No-Build LOS | Delay	Build 1 LOS | Delay	Build 2 LOS | Delay	Build 3 LOS | Delay
Stony Brook Drive	F | 124 sec	F | 123 sec	F | 123 sec	F | 118 sec
Greene Way	F | 81 sec	E | 80 sec	F | 82 sec	**E | 78 sec**
Shane Drive	E | 61 sec	E | 61 sec	E | 61 sec	**E | 57 sec**
KY 155	F | 118 sec	F | 114 sec	F | 117 sec	F | 118 sec
Shopping Center	C | 22 sec	C | 22 sec	**C | 22 sec**	C | 22 sec
Hurstbourne Lane	E | 54 sec	E | 54 sec	**E | 54 sec**	E | 54 sec
Bunsen Parkway	F | 109 sec	F | 109 sec	**F | 92 sec**	F | 109 sec
Bluegrass Parkway	F | 123 sec	F | 123 sec	F | 124 sec	F | 123 sec
EB Ramps	F | 83 sec	**D | 49 sec**	E | 83 sec	F | 83 sec
WB Ramps	F | 100 sec	**D | 50 sec**	F | 100 sec	F | 100 sec

Queue lengths between scenarios were compared. Introducing a new signal for the KY 1747 southbound thru movement at the eastbound on-ramps (Build 1) could affect operations within the interchange's area of influence. Off-ramp queues do not substantially increase except for the eastbound local access ramp (Exit 15B) in the AM peak, which is well within the storage capacity of the ramp. The average southbound queue lengths approaching the eastbound ramps are 450 feet, within the 700-foot available storage capacity although the 800-foot max queues exceed this length. Tweaking the city's adaptive signal control system during future project development phases may refine performance.

In the Build Scenario 1, westbound right turning traffic from Bluegrass Parkway may struggle to merge across thru lanes to reach the new displaced lefts to westbound I-64 during busy periods.

Table 15 compares corridor-level travel times between scenarios. The largest benefits are associated with the Build Scenario 1 at the interchange; most of the benefits associated with Build Scenario 3 occur off-peak when permitted left turn movements would be viable.

Table 15: Comparison of Corridor Travel Times in Seconds

Direction	No-Build	Build 1	Build 2	Build 3
AM Peak				
Northbound	569 sec	523 sec *46 sec savings*	564 sec *5 sec savings*	560 sec *9 sec savings*
Southbound	392 sec	361 sec *31 sec savings*	383 sec *9 sec savings*	387 sec *5 sec savings*
PM Peak				
Northbound	684 sec	659 sec *25 sec savings*	682 sec *2 sec savings*	682 sec *2 sec savings*
Southbound	860 sec	820 sec *40 sec savings*	815 sec *45 sec savings*	855 sec *5 sec savings*

9.2 Cost Estimates

Planning-level design concepts were used to estimate preliminary quantities of high-cost construction items including earthwork, pavement, and structures. Construction costs were tabulated using the KYTC District 5 average unit bid prices. KYTC District 5 provided right-of-way and utility cost estimates based on conceptual model disturb limits, aerial imagery, approximate locations of existing right-of-way and property lines generated from property valuation administrator (PVA) data, and utility records. Planning-level cost estimates by phase are presented in **Table 16**. Each construction phase estimate includes an additional 30% for contingencies.

Table 16: Planning-Level Cost Estimates by Phase (2020 Dollars)

Spot	Total Cost	Design	ROW	Utility	Construction
A Wayfinding	$150,000	$ 10,000	-	-	$140,000
B Signal Optimization	$ 50,000	$ 20,000	-	-	$30,000
C Greene Way	$340,000	$ 30,000	-	-	$310,000
D Sidewalk Maintenance	$260,000	$ 20,000	-	-	$240,000
E Displaced Lefts	$5.3 M	$800,000	-	$500,000	$4.0 M
F/G Southbound Thru plus West Sidewalk	$2.3 M $6.9 M	$170,000 $1.0 M	$460,000 -	$80,000 $80,000	$1.6 M $5.3 M
H East Shared Use	$3.0 M	$150,000	$1.3 M	$160,000	$1.4 M
I Shane Drive	$1.3 M	$110,000	-	$80,000	$1.1 M
J Right onto KY 155	$360,000	$20,000	-	$110,000	$230,000

Costs associated with Spot B reflect retiming of the signals at the southern three intersections only; the other signals are assumed to be addressed by Louisville Metro's larger signal optimization project, following implementation of HSIP project 5-9019.

Two approaches were considered for eliminating the gap in sidewalk connectivity on the west side of KY 1747 (Spot F/G). The bottom line the F/G row in **Table 16** (totaling $6.9 million) equates to the green route shown in **Figure 37**, which adjacent to the existing roadway to avoid property impacts. This route increases impacts to the stream, affects cross drains and entrance pipes, and requires a retaining wall near the KY 155 intersection. The top line $2.3 million estimate, which represents a meandering path behind the ditch, requires some right-of-way acquisition but reduces stream impacts and eliminates the pipe/drain/wall elements. A pedestrian bridge over the ditch at KY 155 is assumed but the remainder of the stream is not impacted. Estimated stream mitigation fees are not included in individual phase costs; therefore, the total for Spot F/G is greater than the sum of the individual components.

9.3 Benefit-Cost Analyses

Crash modification factors (CMF) from the CMF Clearinghouse[9] were applied to the three years of crash data discussed in **Section 2.6** to estimate potential safety benefits for each of the proposed spot improvements discussed above. Monetized values of crashes by severity were taken from the 2018 *Kentucky Traffic Collision Facts* report[10] published by the KTC.

Peak hour travel time savings discussed in **Section 9.1.1** were applied for Spots E and F/G where benefits represented a substantial savings versus the No-Build scenario. To create a conservative estimate, all travel time benefits were assumed to occur within the AM and PM peak hour, despite congested operations at other periods during the day. Monetized travel time values were taken from the 2020 *Benefit-Cost Analysis Guidance for Discretionary Grant Programs* published by the US Department of Transportation.

Results in **Table 17** present the estimated benefit-cost ratio for each proposed mid-term spot improvement over a 20-year analysis horizon (2020–2040). A ratio greater than one suggests the discounted present value of the benefits exceeds the discounted present value of the costs, suggesting the project is worthwhile. A 3% discount rate is assumed for the analysis. For short-term concepts, benefits could not be reliably quantified due to the small scale of the proposed improvements, resulting in inflated results—low-cost improvements generally outperform higher cost solutions, resulting in very high benefit-cost ratios.

Table 17: Benefit/Cost Summary

Spot	MP Limits	Total 2017-2019 Crashes	CMF	AM/PM Peak Travel Time Savings (vehicle-hours per day)	Benefit/Cost Ratio
E	11.600 – 12.100	27[2]	0.810[2]	56/53	7.58
F/G	11.033 –11.500	1[1]	0.350[1]	20/46	1.04-2.92
H	11.033 –11.634	2[1]	0.750[1]	-	0.22
I	10.750 –10.900	40	0.860 0.662	-	4.67
J	10.930 – 11.000	12[3]	0.700[3]	-	1.26

Notes: [1] Only applies to pedestrian strikes; [2] Only applies to fatal and injury collisions; [3] Only applies to rear end crashes

9.4 Project Sheets

The following pages contain project sheets for each of the recommended spot improvements.

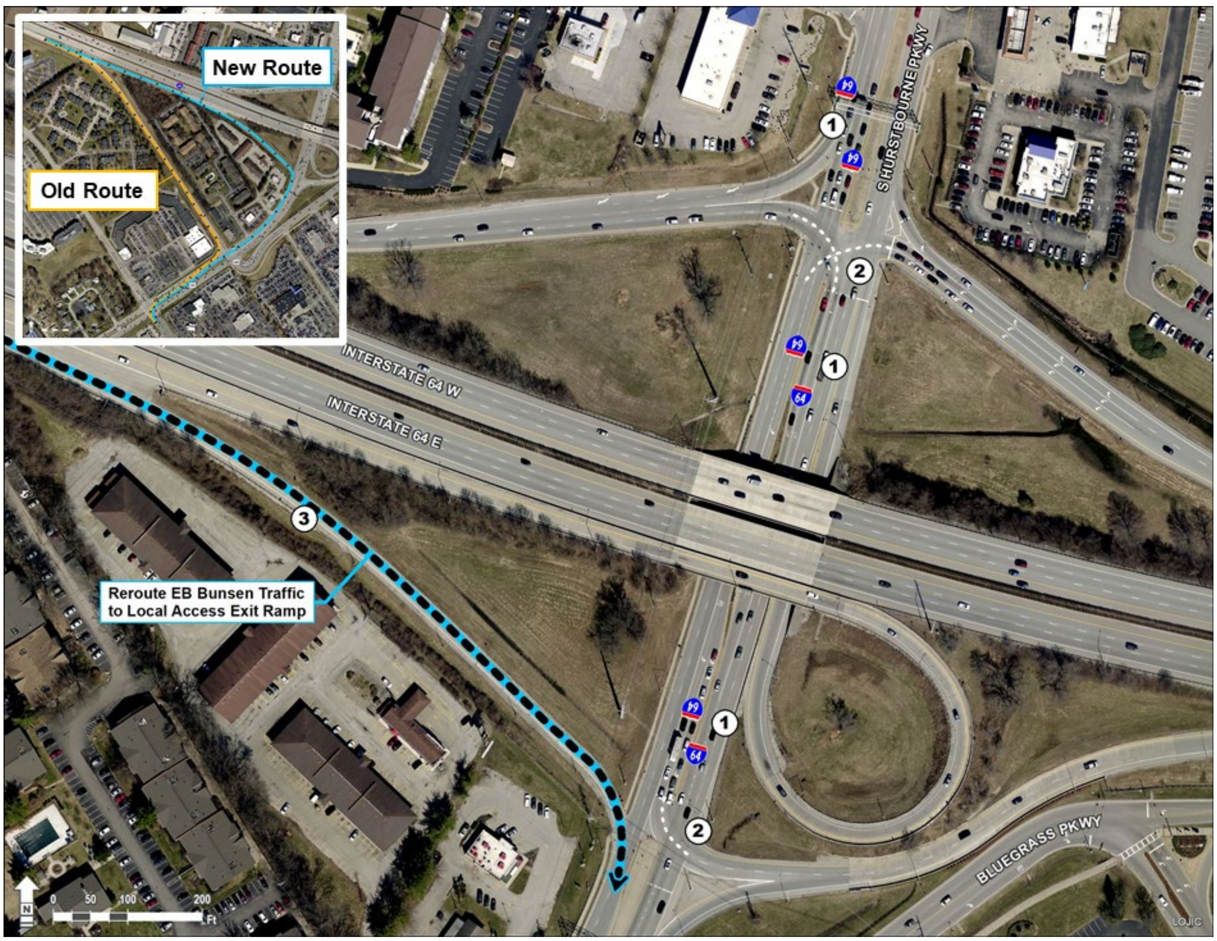
[9] Online at http://www.cmfclearinghouse.org/
[10] Online at https://transportation.ky.gov/HighwaySafety/Documents/2018_KY_Traffic_Collision-Facts.pdf

A	Short-Term Priority	Wayfinding/Signage MP 11.700-12.000

IMPROVEMENT DESCRIPTION:	Phase Estimate	(2020 Dollars)
(1) Pavement tattoos to delineate turn-only lanes to I-64 and KY 155; (2) painted “cat tracks” delineating dual left movements through intersections; (3) signs to reroute eastbound Bunsen Parkway traffic to Exit 15B; (4) repaint “Do Not Block Intersection” box at Hurstbourne Circle	Design:	$10,000
	Right-of-Way:	-
	Utilities:	-
	Construction:	$140,000
IDENTIFIED NEEDS:	**Total Cost:**	**$150,000**

- Confusion for unfamiliar motorists when thru lanes become turn-only onto I-64 ramps or Bunsen Parkway
- Short merge length for southbound traffic from eastbound 15A off-ramp, further restricted by peak queues
- High traffic volumes at interchange, up to 4,600 vehicles during the AM peak hour in 2020
- High crash trends at interchange, including 113 crashes within 0.3 miles, resulting in 1.3 and 1.6 CCRF spots

PROJECT LOCATION MAP: Representative concepts near interchange

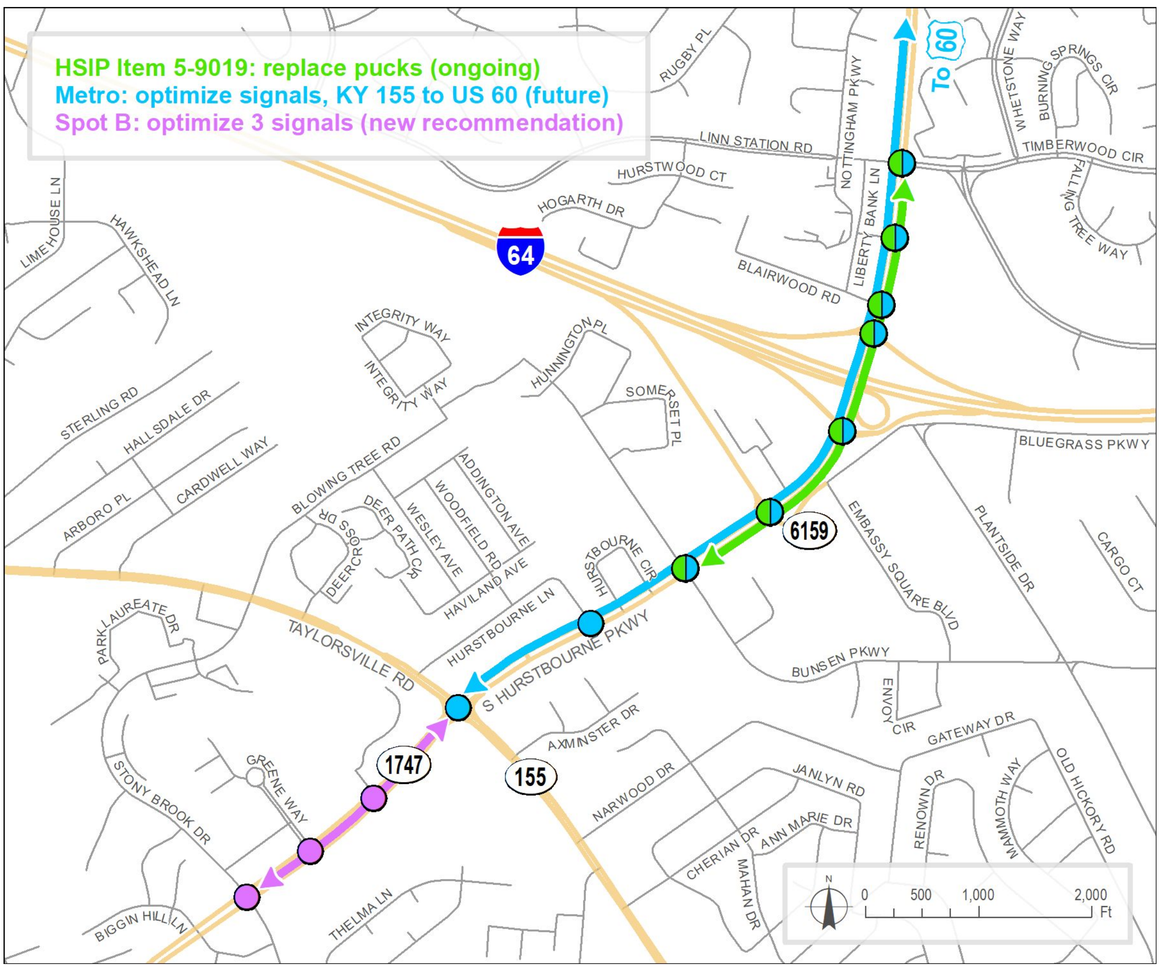


B	Short-Term Priority	Signal Optimization MP 10.400-10.900

IMPROVEMENT DESCRIPTION:	Phase Estimate	(2020 Dollars)
Adjustments to signal timing, phasing, and coordination to optimize throughput south of KY 155 intersection *A separate Louisville Metro project will address KY 1747 signals from KY 155 to US 60*	Design: Right-of-Way: Utilities: Construction:	$20,000 - - $30,000
IDENTIFIED NEEDS:	**Total Cost:**	**$50,000**

- Highest cited public priority of short-term options
- High traffic volumes, up to 3,000 vehicles during the PM peak hour in 2020
- High crash trends, including 112 crashes within 0.5 mile, resulting in high CCRF spots at each intersection

PROJECT LOCATION MAP:

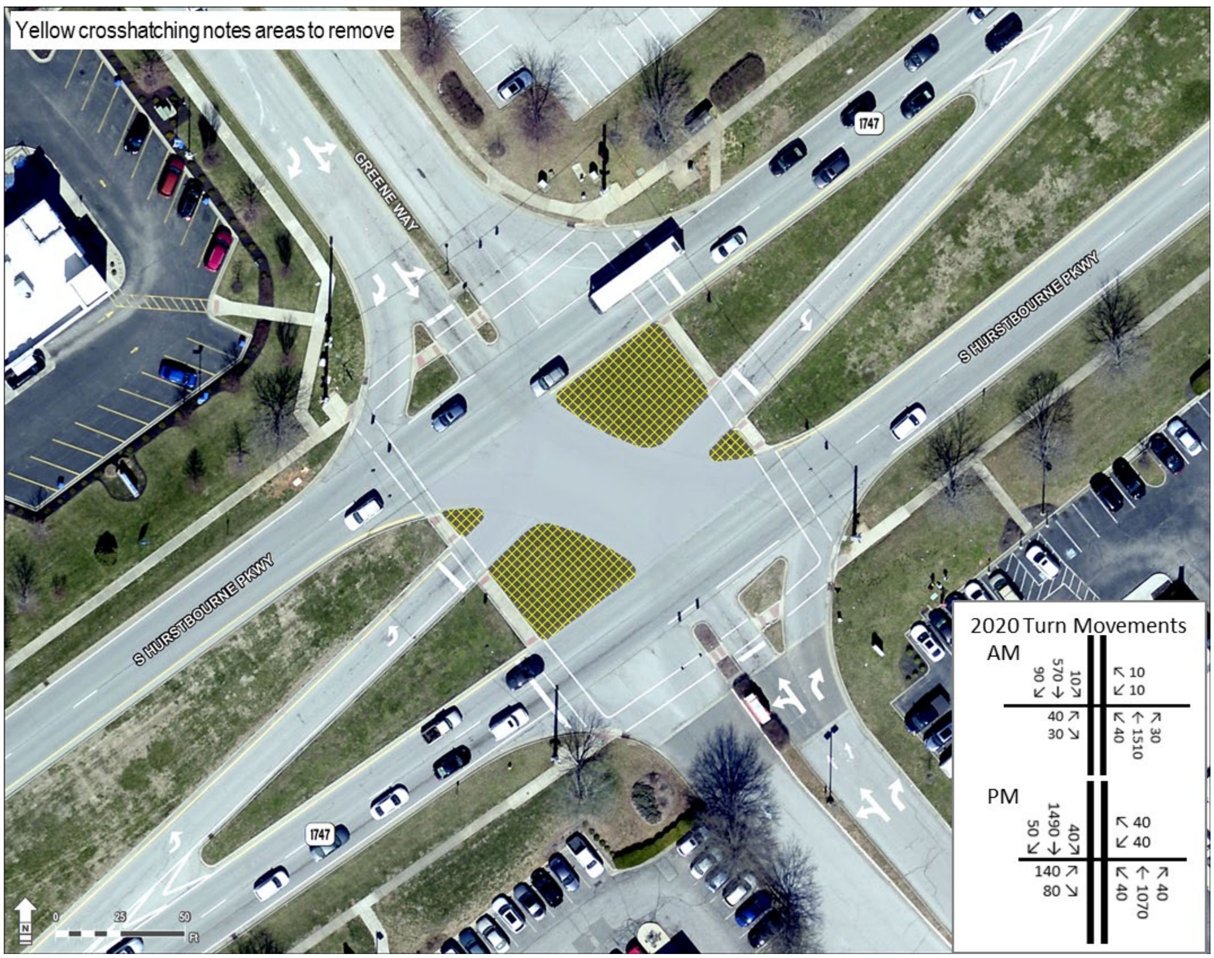


C	Short-Term Priority	Greene Way MP 10.600-10.700

IMPROVEMENT DESCRIPTION:	Phase Estimate	(2020 Dollars)
Removal of raised medians within footprint of intersection, allowing thru movements along cross-street	Design:	$30,000
	Right-of-Way:	-
	Utilities:	-
	Construction:	$310,000
IDENTIFIED NEEDS:	**Total Cost:**	**$340,000**

- Confusion for unfamiliar motorists with atypical intersection layout
- High traffic volumes, noted below
- High crash trends, including 31 crashes within 0.1 mile, resulting in 1.1 CCRF spot

PROJECT LOCATION MAP: Illustrative concept

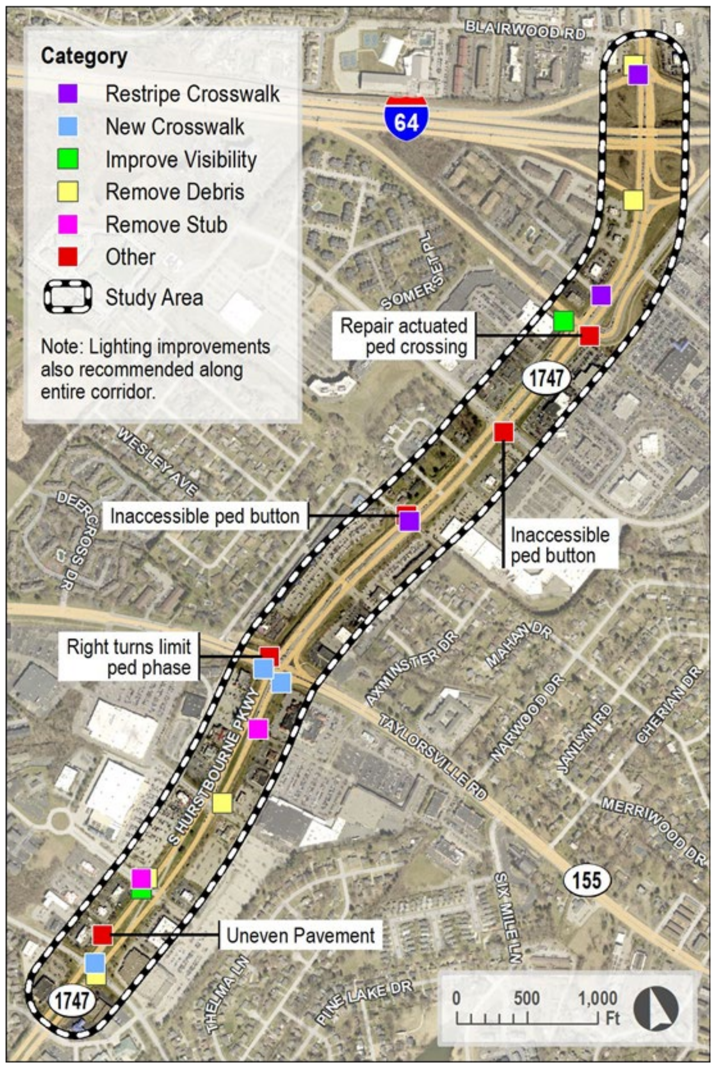


D	Short-Term Priority	Misc. Pedestrian Improvements MP 10.000-12.500

IMPROVEMENT DESCRIPTION:	Phase Estimate	(2020 Dollars)
Maintenance-level actions along the existing sidewalks: improved drainage, restripe crosswalk, pedestrian-level lighting, upgrades for ADA compliance, etc.	Design:	$20,000
	Right-of-Way:	-
	Utilities:	-
	Construction:	$240,000
IDENTIFIED NEEDS:	**Total Cost:**	**$260,000**

- June 2020 inventory of existing sidewalk network identified "quick-fix" maintenance actions to improve user experience and safety
- Four pedestrian strikes along the corridor during 3-year analysis period, including one fatality and two injuries

PROJECT LOCATION MAP:



E	Mid-Term High Priority	Displaced Lefts MP 11.600-12.100

IMPROVEMENT DESCRIPTION:

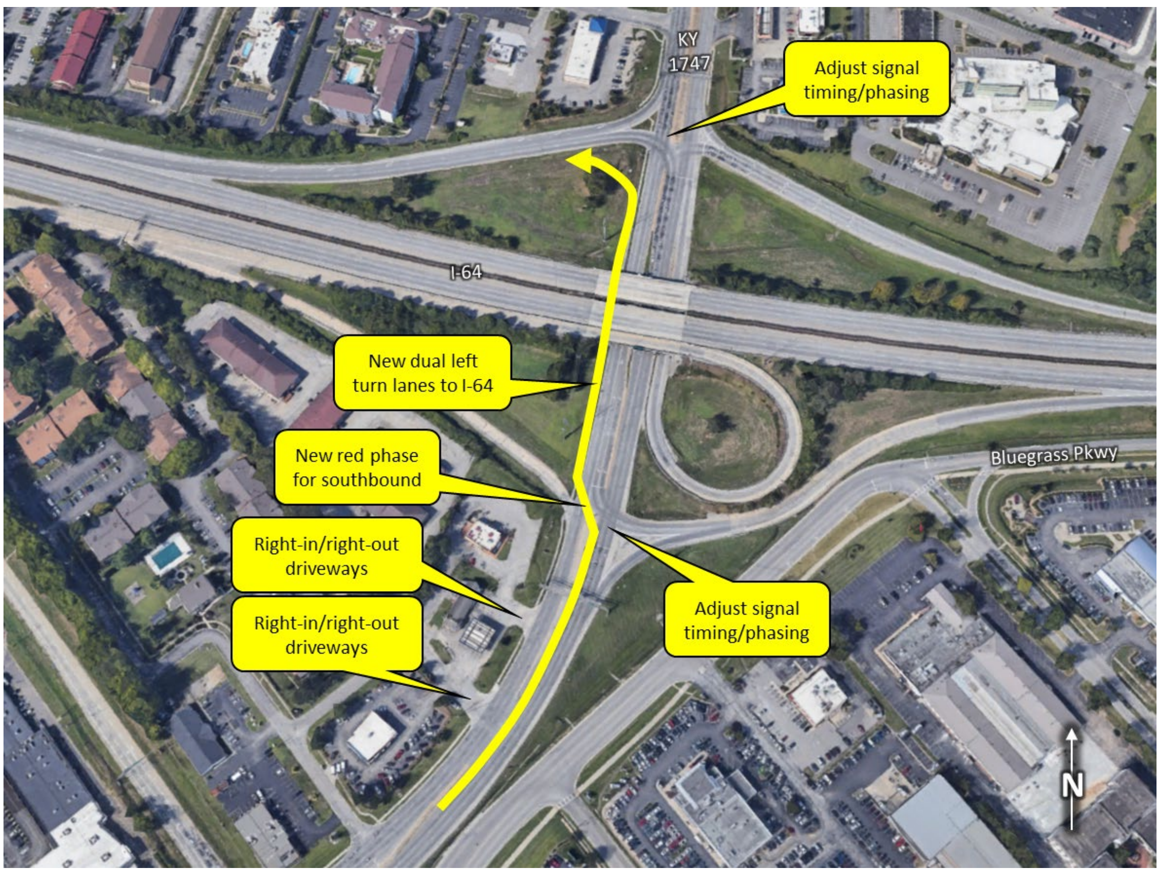
Reconstruction of KY 1747 through the I-64 interchange, shifting the northbound left turn lanes accessing the westbound on-ramp to run west of the southbound thru lanes.

Phase Estimate	(2020 Dollars)
Design:	$800,000
Right-of-Way:	-
Utilities:	$500,000
Construction:	$4,000,000
Total Cost:	**$5,300,000**

IDENTIFIED NEEDS:

- Provides an affordable solution to address existing safety/congestion needs until the full interchange reconstruction (Item No. 5-52) can be funded/constructed
- Highest cited public priority of mid-term options
- High traffic volumes, with 750 (AM)/910 (PM) vehicles in 2020 making the left turn to the on-ramp against 1,500 (AM)/2,130 (PM) southbound thru vehicles opposing
- Increased queue storage space for southbound KY 1747 traffic beneath overpasses
- High crash trends, including 288 crashes within 0.1 mile, resulting in four high CCRF spots (1.3-2.7)

PROJECT LOCATION MAP: Illustrative concept; not to scale



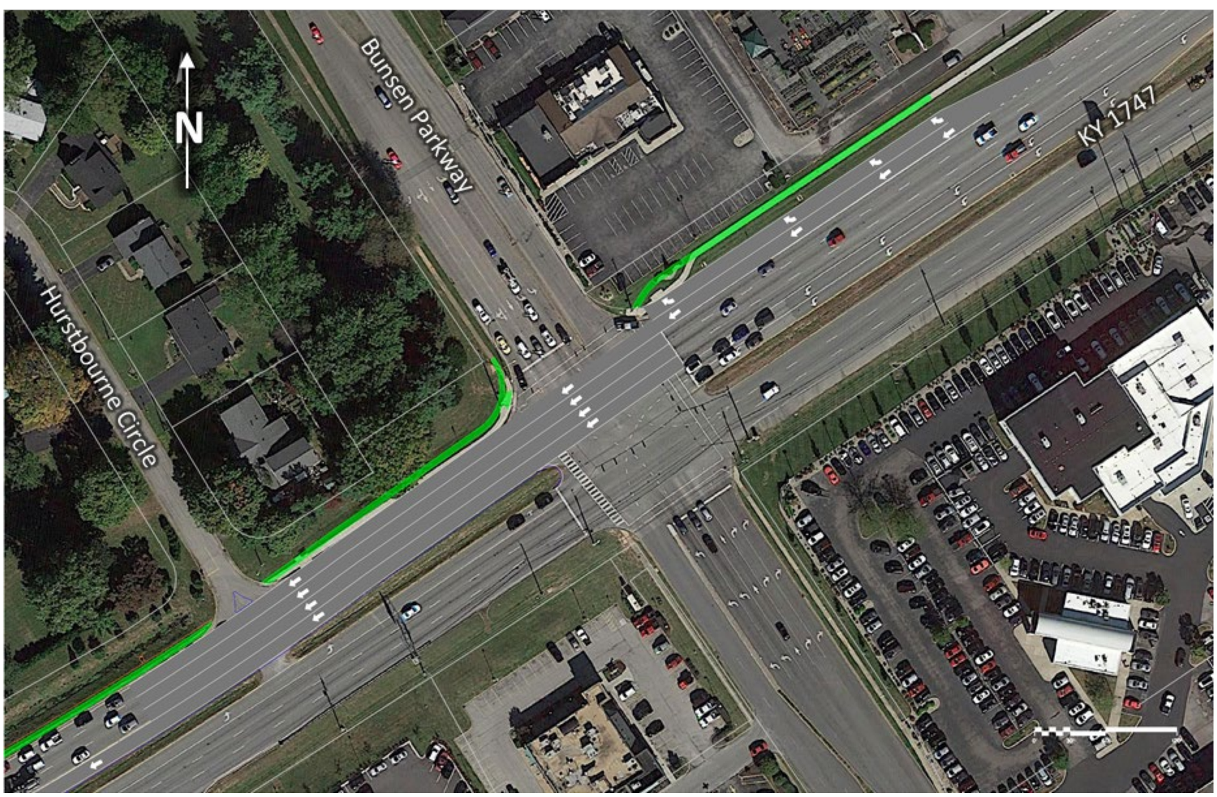
BCA: 7.58 with 3% discount rate, driven by a 19% crash reduction factor and 14,000 annual vehicle-hours of travel time savings during just the PM peak hour

F/G	Mid-Term High Priority	Southbound Thru Lane & Sidewalk MP 11.280-11.500

IMPROVEMENT DESCRIPTION:	Phase Estimate	(2020 Dollars)
Addition of fourth southbound thru lane from Bunsen Parkway to KY 155, widening to the median. Add dedicated southbound right turn lane onto Bunsen Parkway and convert northern Hurstbourne Circle intersection to a right-in/right-out. Repaint ''Do Not Block Intersection" box at southern Hurstbourne Circle intersection. Construct missing sidewalk link (KY 155 to Bunsen Parkway) along west side, shifting to accommodate turn lane.	Design:	$170,000-$1,000,000
	Right-of-Way:	$0-$460,000
	Utilities:	$80,000
	Construction:	$1,600,000-$5,300,000
IDENTIFIED NEEDS:	**Total Cost:**	**$2,300,000-$6,900,000**

- Additional southbound lane represents second highest cited public priority of mid-term options
- High traffic volumes showing strong directional flows, with up to 3,100 vehicles southbound during PM peak hour in 2020
- High crash trends, including 190 crashes within 0.22 miles, resulting in two high CCRF spots (1.3-3.2)
- High pedestrian volumes observed between neighborhoods and commercial areas with gap in connectivity
- Consistent with goals outlined in Louisville Metro's *Pedestrian Master Plan*

PROJECT LOCATION MAP: Representative concept



*Costs reflect range of alignment options for pedestrian path

BCA: 1.04-2.92 with 3% discount rate, driven by 12,000 annual vehicle-hours of travel time savings during just the PM peak hour and 65% reduction in pedestrian collisions

H	Mid-Term Low Priority	Shared Use Path (East) MP 11.033-11.634

IMPROVEMENT DESCRIPTION:

Add a 10-foot-wide shared use path along the east side of KY 1747, connecting the existing shared use path on Bluegrass Parkway and sidewalk and bike lanes on KY 155 (Taylorsville Road).

Phase Estimate	(2020 Dollars)
Design:	$150,000
Right-of-Way:	$1,300,000
Utilities:	$160,000
Construction:	$1,400,000
Total Cost:	**$3,000,000**

IDENTIFIED NEEDS:

- High pedestrian volumes observed between neighborhoods and commercial areas
- Gap in existing connectivity between shared use path along Bluegrass Parkway and striped bike lanes along KY 155 Taylorsville Road
- Consistent with local goals described by elected officials, planners during project meetings

PROJECT LOCATION:

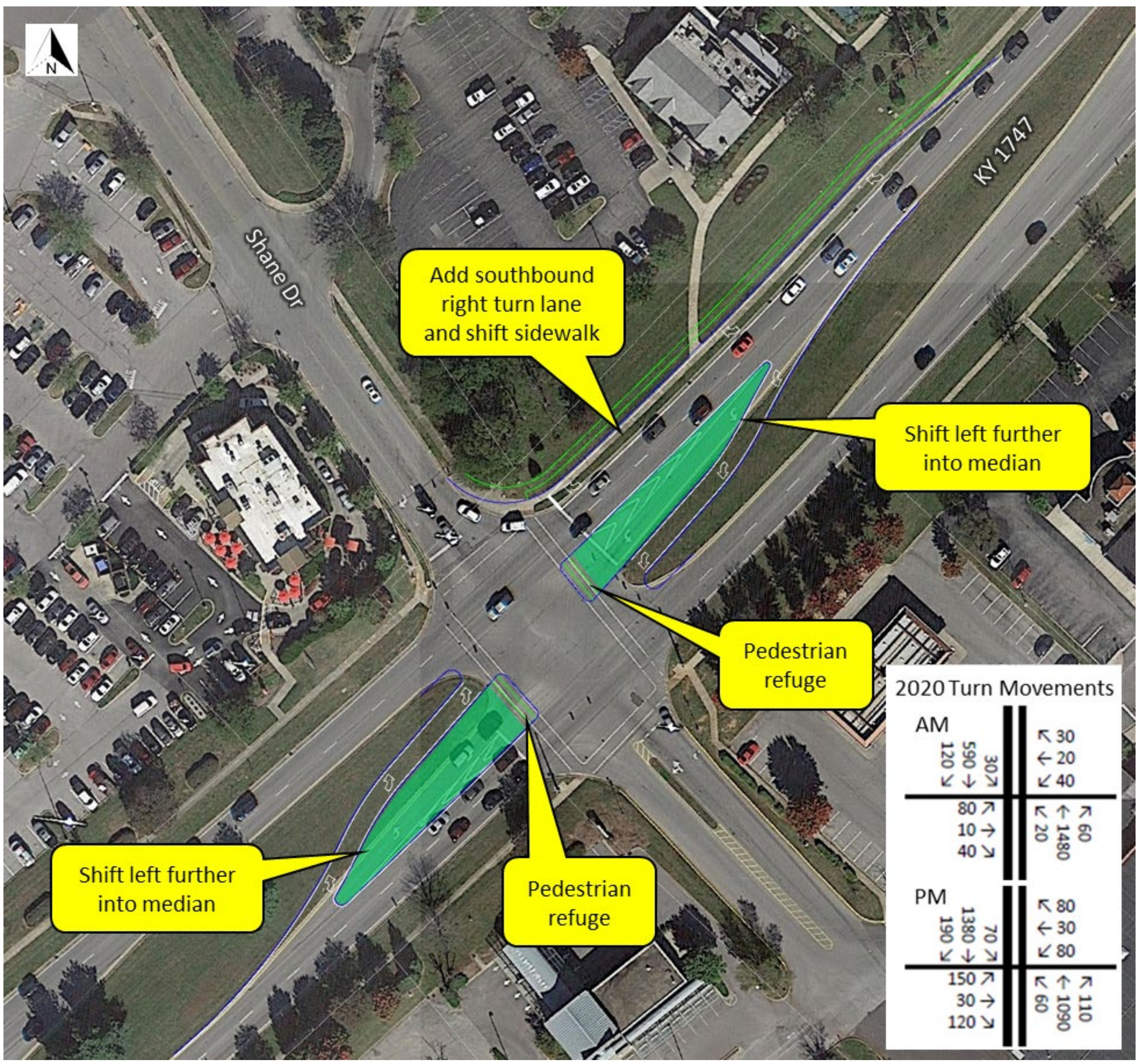
Existing bike/ped links at Bluegrass Parkway (left) and KY 155 to west (below)

BCA: 0.22 with 3% discount rate, driven by a 25% crash reduction factor for pedestrian strikes

I	Mid-Term Medium Priority	KY 1747/Shane Drive Intersection MP 10.750-10.900	
IMPROVEMENT DESCRIPTION:		Phase Estimate	(2020 Dollars)
Add southbound KY 1747 right turn lane onto Shane Drive; shift sidewalk; increase offsets for KY 1747 left turn lanes to allow for off-peak permitted left turn movements; install pedestrian refuges in median		Design:	$110,000
		Right-of-Way:	-
		Utilities:	$80,000
		Construction:	$1,100,000
IDENTIFIED NEEDS:		**Total Cost:**	**$1,300,000**

- High traffic volumes, noted below
- High crash trends, including 40 crashes within 0.15 mile, resulting in 1.4 CCRF spot

PROJECT LOCATION MAP: Illustrative concept; not to scale



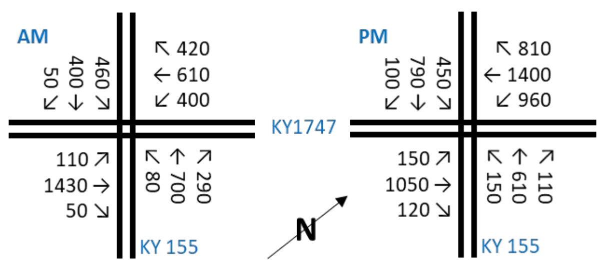
BCA: 4.67 with 3% discount rate, driven by a 43% crash reduction factor

J	Mid-Term Medium Priority	KY 1747/KY 155 Intersection MP 10.930-11.000

IMPROVEMENT DESCRIPTION:	Phase Estimate	(2020 Dollars)
Extend northbound right turn lane along KY 1747 onto KY 155	Design:	$20,000
	Right-of-Way:	-
	Utilities:	$110,000
	Construction:	$230,000
IDENTIFIED NEEDS:	**Total Cost:**	**$360,000**

- High traffic volumes, noted below, result in queues that block the existing channelized turn bay
- High crash trends, including 12 northbound rear end crashes within 0.07 mile

PROJECT LOCATION MAP: Illustrative concept



BCA: 1.26 with 3% discount rate, driven by a 30% crash reduction factor

10.0 Long-Term Vision for the Corridor

A range of technical analyses—both as part of this 5-555 study and previous planning efforts—illustrates the complexity of defining an attainable long-term "fix" for the corridor. A fourth project team meeting was held on November 17, 2020 to discuss these analyses.

The underlying character of the corridor is critical to the discussion. As an urban principal arterial and one of the only north-south connections between I-264 and I-265, motorists rely on KY 1747 to provide a high level of regional mobility. Meanwhile, it also provides access to several large neighborhoods, big box stores, strip malls, and the Bluegrass Commerce Park today—plus critical regional connections to I-64 and KY 155. Finding an appropriate balance of mobility and access is one of the core challenges facing the corridor.

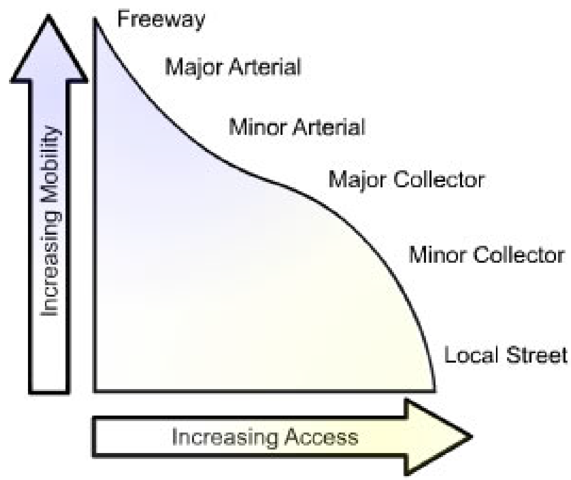


Figure 42: Mobility vs Access

Given Hurstbourne Parkway's large role in the state-maintained highway system, a regional analysis is necessary to accurately define a comprehensive, long-term approach to these interrelated challenges—beyond the purview of the 5-555 study. The smaller-scale, more affordable improvements, which have been developed as part of this study, have the greatest potential to meaningfully improve short-term safety and congestion.

A more comprehensive regional planning analysis is needed to determine if investing in other cross-I-64 corridors might provide more benefit than directly investing in the KY 1747 corridor. The future analysis should provide up-to-date traffic modeling and forecasting, prioritize needs in the area, and evaluate—using benefit/cost analyses, modeling, and other data—whether improving other parallel routes may be more appropriate than making direct, large-scale improvements to KY 1747.

The following subsections discuss a range of potential capacity improvements: widening the corridor and improving major intersections/interchanges.

10.1 Widen KY 1747

Even with additional thru lanes on KY 1747 and signal timing improvements along the study corridor, microsimulation suggests many intersection turning movements remain over capacity, particularly at the Bunsen Parkway and KY 155 intersections. **Figure 43** and **Figure 44** summarize the results of the microsimulation during the AM and PM peak hours. Red numbers represent v/c for individual turn movements operating at LOS F, applying 2040 traffic to the existing (six-lane) geometry. Purple numbers represent v/c for individual turn movements operating at LOS F, applying 2040 traffic to an eight-lane typical section between the Exit 15A off-ramp and Stony Brook Drive, assuming signal timing/coordination is optimized for new geometry.

As shown, numerous turn movements operate at LOS F in either configuration, particularly during the PM peak period. Left turns from eastbound Bunsen Parkway plus left and right turns from southbound KY 1747 to KY 155 are each about 30–40% over capacity in the eight-lane PM peak scenario. However, all KY 1747 thru movements in the widened scenario operate at LOS E or better.

Figure 43: V/C for LOS F Movements, 2040 AM Peak Hour

Figure 44: V/C for LOS F Movements, 2040 PM Peak Hour

The 2019 *Middletown-to-Simpsonville Needs Analysis* study ran dozens of build scenarios using the statewide travel demand model to prioritize improvement concepts throughout portions of Jefferson, Oldham, and Shelby counties. The 5-555 widening was one of the build scenarios tested, assuming an additional travel lane per direction was added between the I-64 interchange and intersection with Stony Brook Drive. Model runs showed 33,000 to 56,000 vehicles per day (vpd) using the corridor in 2018, resulting in a 0.3–0.5 v/c. The 2040 Build scenario showed 34,000–62,000 vpd using the corridor, resulting in a 0.4–0.5 v/c. This suggests that induced demand draws additional trips onto the improved corridor, yielding no v/c improvements despite the added lanes. These represent trips that are using alternative links in the network today, choosing longer routes to reach their destinations to avoid congestion along KY 1747.

Construction costs—excluding design, right-of-way acquisition, and utility relocations—to add an additional lane in each direction from south of the interchange to Stony Brook Drive are estimated at $23–25 million.

10.2 Reconstruct I-64 Interchange

The I-64/KY 1747 interchange is a substantial choke point for the KY 1747 corridor. Reducing delays through the interchange is a key component in reducing congestion and improving travel times along the corridor. However, major improvements to this interchange would be costly and result in sizable impacts to adjacent properties.

A separate preliminary design project, Item No. 5-52, examined a range of configuration options at the interchange to improve operations:

- The preliminary line and grade (PL&G) preferred concept from 2003 included two loop ramps, a flyover for northbound-to-westbound movements, and shortcut connection from Linn Station Road. It also includes frontage connections for the local access ramp (Exit 15B) and northbound toward Linn Station Road plus an extra northbound lane from Bunsen Parkway, common to all four options. Construction costs were estimated at $51 million in 2006 dollars.
- A modified PL&G concept eliminates some of the features above, simplifying it to a northbound-to-westbound flyover with the common frontage connections and widening. Construction costs were estimated at $28 million in 2006 dollars.
- A single point urban interchange (SPUI) brings left turn movements to/from all ramps to a single, signalized intersection below the I-64 overpass. Construction costs were estimated at $26 million in 2006 dollars.
- A diverging diamond interchange (DDI) was also studied. A DDI reverses northbound and southbound KY 1747 between a pair of signalized intersections, running left turns to/from ramps as unopposed movements. Construction costs were estimated at $25 million in 2006 dollars.

Inflating 2006 dollars to current year (2020), estimated construction costs for the range of options above become $39–80 million today. Each of the four options considered improves traffic operations at the interchange compared to the 2030 No-Build scenarios. However, the intersection with Bunsen Parkway operates at LOS E–F in each scenario.

10.3 Improve Traffic Flow at Major Intersections

As discussed in **Section 9.1.1**, traffic at the Bunsen Parkway and KY 155 intersections remains a concern as well, with both intersections operating at LOS F during the PM peak in all 2040 No-Build and Build scenarios.

Analysts applied the “Capacity Analysis for Planning of Junctions” CAP-X tool developed by the Federal Highway Administration (FHWA) to obtain a planning-level v/c for a range of intersection configurations to improve operations. The CAP-X tool examines turning movement volumes to approximate capacity; it does not incorporate site-specific constraints, signal timing/coordination, pedestrian movements or other factors that are important to consider in designing intersections. This analysis represents a high-level overview intended to inform feasibility for future scoping efforts—not to recommend a particular intersection layout for implementation.

10.3.1 KY 1747 at Bunsen Parkway

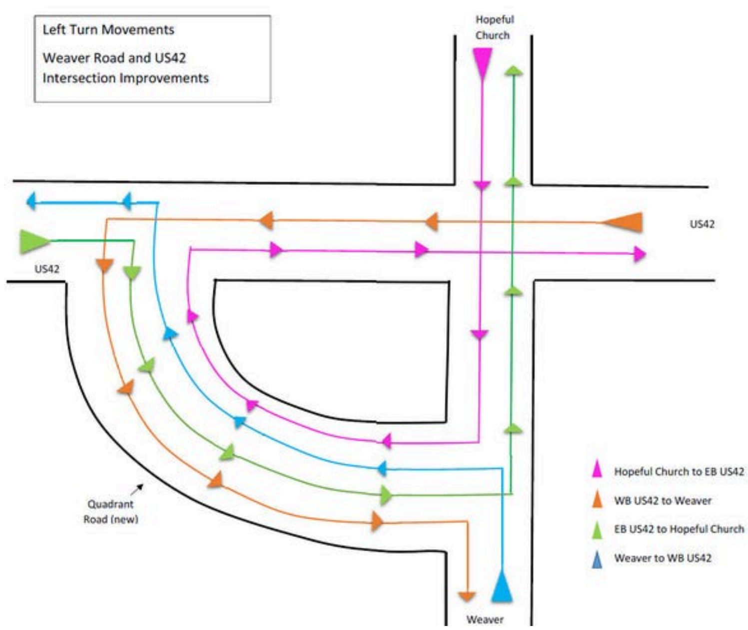
The KY 1747/Bunsen Parkway intersection is about 800 feet south of the Bluegrass Parkway/Exit 15A eastbound off-ramp, leaving little room to alter the north KY 1747 approach without interfering with traffic flows at the interchange. Three quadrants of the KY 1747/Bunsen Parkway intersection contain large commercial developments: strip malls with outlots (north and south) and a car lot (east). The fourth quadrant (west) contains a U-shaped residential street with a historic event space; no other access to this street is provided beyond the dual connections to KY 1747.

Results from the CAP-X tool are summarized in **Table 18**; three at-grade intersection options could provide adequate capacity for anticipated PM peak hour traffic volumes through 2040.

Table 18: CAP-X Intersection Results at Bunsen Parkway

Layout	2020 v/c	2040 v/c
Conventional Intersection	0.8-0.9	0.9-1.0
Quadrant Road (Southeast)	0.8	0.9
Partial Displaced Lefts (along Bunsen)	0.8	0.8
Partial Median U-Turns (along Bunsen)	0.7	0.8

A ***quadrant roadway system*** (**Figure 45**) adds an extra connection in one quadrant to eliminate all left turns at the main intersection, simplifying signal timing/phasing. These trips are routed to the new quadrant roadway link; thru and right turns remain at the main intersection. KYTC District 6 recently constructed a quadrant roadway along US 42 in Florence. Due to substantial right-of-way requirements, the quadrant roadway system is unlikely to be the best fit solution to address KY 1747/Bunsen Parkway congestion.



Source: KYTC District 6 project in Florence, KY

Figure 45: Left Turns in Quadrant Roadway System

A ***partial displaced left turn*** intersection peels left turn movements to the far side of the roadway, allowing them to run concurrent with thru traffic to simplify signal timing/phasing. This is like mid-term Spot E but applied to two approaches—e.g., the eastbound and westbound Bunsen Parkway approaches to the intersection.

Similar Project

The NC 16/Mt Holly-Huntersville Road intersection in Charlotte, North Carolina was reconstructed as a partial displaced left, opening to traffic in 2019. The intersection is about 1,300 feet from the closest ramp of the nearby I-485/NC 16 interchange.

Reconstructing the KY 1747/Bunsen Parkway intersection as a partial displaced left would lead to access impacts for adjacent commercial developments, converting several driveways to right-in/right-out configurations. The shopping center in the north quadrant is especially challenging as it is served by a single access point near where the crossover location would be on the eastbound Bunsen Parkway approach if this configuration were advanced.

A ***partial median U-turn*** intersection eliminates left turns from two approaches, directing left turning traffic downstream to a median U-turn. In this case, lefts from Bunsen Parkway would switch to thru movements, making a U-turn then a right turn to access motorists' intended direction—following the blue arrow in **Figure 46**. Other turn movements follow the same paths as today. Another variation replaces the U-turn bays with roundabouts as an additional traffic calming measure.

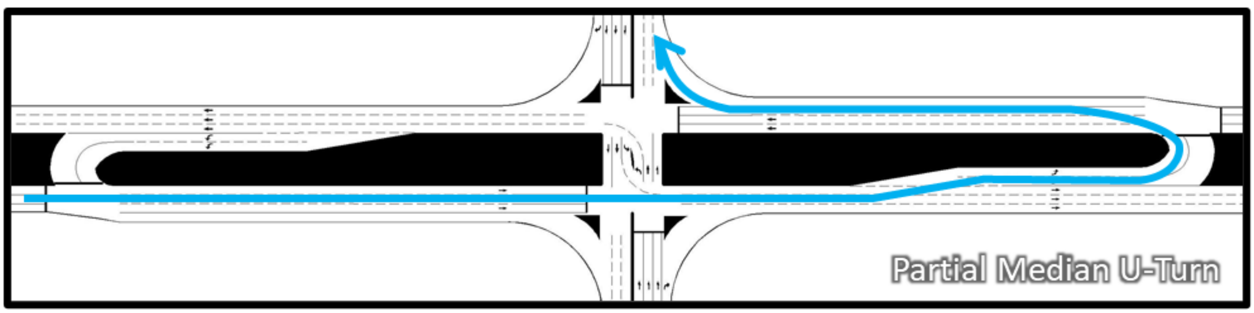


Figure 46: Left Turn from Cross-Street in Partial Median U-Turn Intersection

Construction cost estimates to implement one of these measures at the KY 1747/Bunsen Parkway intersection begin at $5–6 million.

10.3.2 KY 1747 at KY 155

Commercial developments exist in all four quadrants of the KY 1747/KY 155 intersection, with the south fork of Beargrass Creek flowing through the ditch line to the north. The nearest signalized intersection on KY 1747 is about 950 feet south at Shane Drive. The south, east, and west legs include sidewalk connections.

Analysts again applied FHWA's CAP-X tool to obtain a planning-level v/c for a range of innovative intersection configurations to improve operations. Summarized in **Table 19**, three intersection configurations resulted in v/c less than 1.0: a quadrant roadway, partial displaced lefts, or full displaced lefts. A grade-separated interchange also provides adequate capacity.

As at Bunsen Parkway, a ***quadrant roadway system*** would result in substantial right-of-way impacts; impacts to the stream would also increase project costs and complexity.

Table 19: CAP-X Intersection Results at KY 155

Layout	2020 v/c	2040 v/c
INTERSECTION		
Conventional Intersection	1.0	1.2
Quadrant Road (to the North)	0.8	0.9
Partial Displaced Lefts (along KY 1747)	0.8	0.9
Full Displaced Lefts	0.8	0.9
INTERCHANGE (matching existing number of lanes with KY 1747 free flow)		
Diamond	0.8	0.8
Partial Cloverleaf	0.6	0.6
Displaced Left	0.8	0.9
DDI	0.8	1.0
SPUI	0.8	1.0

A ***full displaced left*** intersection differs from a *partial displaced left* intersection as the displaced turn lanes are applied to all four approaches. Reconstruction as a full or partial displaced left would lead to access impacts for adjacent commercial developments, converting several driveways to right-in/right-out configurations. Driveways near the proposed crossover locations would provide an extra challenge; most access points in the vicinity have connectivity to adjacent streets or parking lots but the Cherry Springs apartment complex and Axminster Drive have only single connections, both tying directly to KY 155.

As noted in **Table 19**, grade-separated interchanges provide additional capacity to improve operations. However, construction costs, right-of-way needs, and changes in access for adjacent properties are greater than those associated with at-grade intersections. A grade-separated KY 1747/KY 155 interchange was recommended as early as the 1994 planning study. **Figure 47** illustrates lengths associated with two scenarios: KY 1747 over KY 155 (Orange) and KY 155 over KY 1747 (Red). Preliminary estimates indicate either elevated section would extend approximately 935 feet to provide adequate vertical clearance at the overpass, plus another 1,000 feet beyond to accommodate ramps, tapers, and transitions. Any intersections or driveways within these lengths would be impacted—reducing access to the properties they serve.

Figure 47: Elevated Roadway and Transition Lengths for Interchange

10.4 Costs to "Fix Everything"

Addressing all the corridor's problems using the "fix everything" solution is estimated to require $75–136 million in construction costs—not including design, right-of-way acquisition, or utility relocation costs.

Widen KY 1747	$23–25 million
Reconstruct I-64 Interchange	$39–80 million
Reconstruct Bunsen Parkway Intersection	$5–6 million
Reconstruct KY 155 Intersection	$8–25 million
TOTAL CONSTRUCTION COST	$75–136 million

Alternatively, additional opportunities for regional cross-I-64 mobility have been considered over the years. Preliminary model results from other studies suggest a parallel connection and/or an additional I-64 interchange would be needed to divert a meaningful volume of traffic away from KY 1747.

KIPDA's MTP identifies several such concepts, each with unique costs and associated impacts.

- Christian Way/Bunsen Boulevard connector (KIPDA #260/265), $47 million

- Blowing Tree/Bunsen Parkway connector (#258), $4.5 million
- KY 1918 Watterson Trail widening (Item No. 5-373 and #233), right-of-way acquisition complete with estimated $15 million costs remaining
- Urton Lane extension (#474), $62 million
- Plantside Drive extension (#2608), $24 million
- Rehl Road improvements with I-265 interchange (#1514), $37 million

In the long term, further regional analysis would determine which approaches best balance mobility and access and provide an attainable, long-term "fix" for the corridor.

11.0 NEXT STEPS

Short Term. Recommended short-term projects may be initiated through the district's routine maintenance and traffic programs or become part of systematic specialty programs such as HSIP.

Mid Term. For recommended mid-term spots, individual projects should be added to KYTC's CHAF database to be considered alongside other projects in the next SHIFT prioritization cycle. Once funding is identified, the next phase in the project development process is Phase I Preliminary Design, likely including environmental analyses to be eligible for federal funding. Further funding will be necessary to advance an improvement concept to the design phase. Improvements should be coordinated with KIPDA to incorporate concepts into the MTP and TIP for the MPO, demonstrating air quality compliance. Likewise, KYTC's Statewide TIP should be amended to reflect any future project development phases.

Long Term. A *comprehensive regional planning analysis* is needed to determine whether investing in other cross-I-64 corridors might provide more benefit than directly investing in the KY 1747 corridor. This analysis should provide up-to-date traffic modeling and forecasting, prioritize needs in the area, and evaluate—using benefit/cost analyses, modeling, and other data—whether improving other parallel routes may be more appropriate than making direct, large-scale improvements to KY 1747. In addition to KIPDA concepts listed above, this analysis should evaluate grade-separated interchanges and innovative intersection improvements at the KY 1747 intersections with Bunsen Parkway and KY 155. A study of this magnitude is anticipated to cost $1.25 million.

Coordination with local officials, key stakeholders, and the public will be critical considering the potential for impacts to the already congested corridor.

12.0 ADDITIONAL INFORMATION

Any written requests for additional information regarding the study should be sent to:

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