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Executive Summary

The Kentucky Transportation Cabinet (KYTC) initiated a planning study in August 2017 to identify and evaluate improvements to safety, access, drainage, freight movement, and mobility for all travel modes on KY 1065 (Outer Loop) from KY 907 (3rd Street Road) to KY 1020 (National Turnpike) in Louisville, Jefferson County, Kentucky. This study serves as the first step toward identifying, documenting, and recommending appropriate transportation investment into the Outer Loop corridor.

This planning study was initiated after ranking in the top 10 out of 42 potential planning study candidates across the state for prioritization by KYTC based upon numerous factors such as safety, congestion, roadway characteristics, etc. Furthermore, in early 2017 KYTC's Highway Safety Improvement Program (HSIP) Intersection Emphasis Preliminary Report (SYP #5-9010.00) prioritized 37 intersection improvements located in KYTC District 5. The Outer Loop corridor contained priorities 6, 7, 32, and 33. Lastly, the Kentuckiana Regional Planning and Development Agency Metropolitan Planning Organization (KIPDA MPO) identified the Outer Loop intersections with New Cut Road and National Turnpike as the top and ninth highest crash intersections, respectively, (2009-2011) in the KIPDA KY region.

Study Area

The study area (**Figure ES 1**) begins at 3rd Street Road (MP 0.000) and extends east for 2.514 miles to National Turnpike (MP 2.514). There are three major intersections along the corridor: 3rd Street Road, New Cut Road, and National Turnpike, with the study area widening slightly at these intersections.

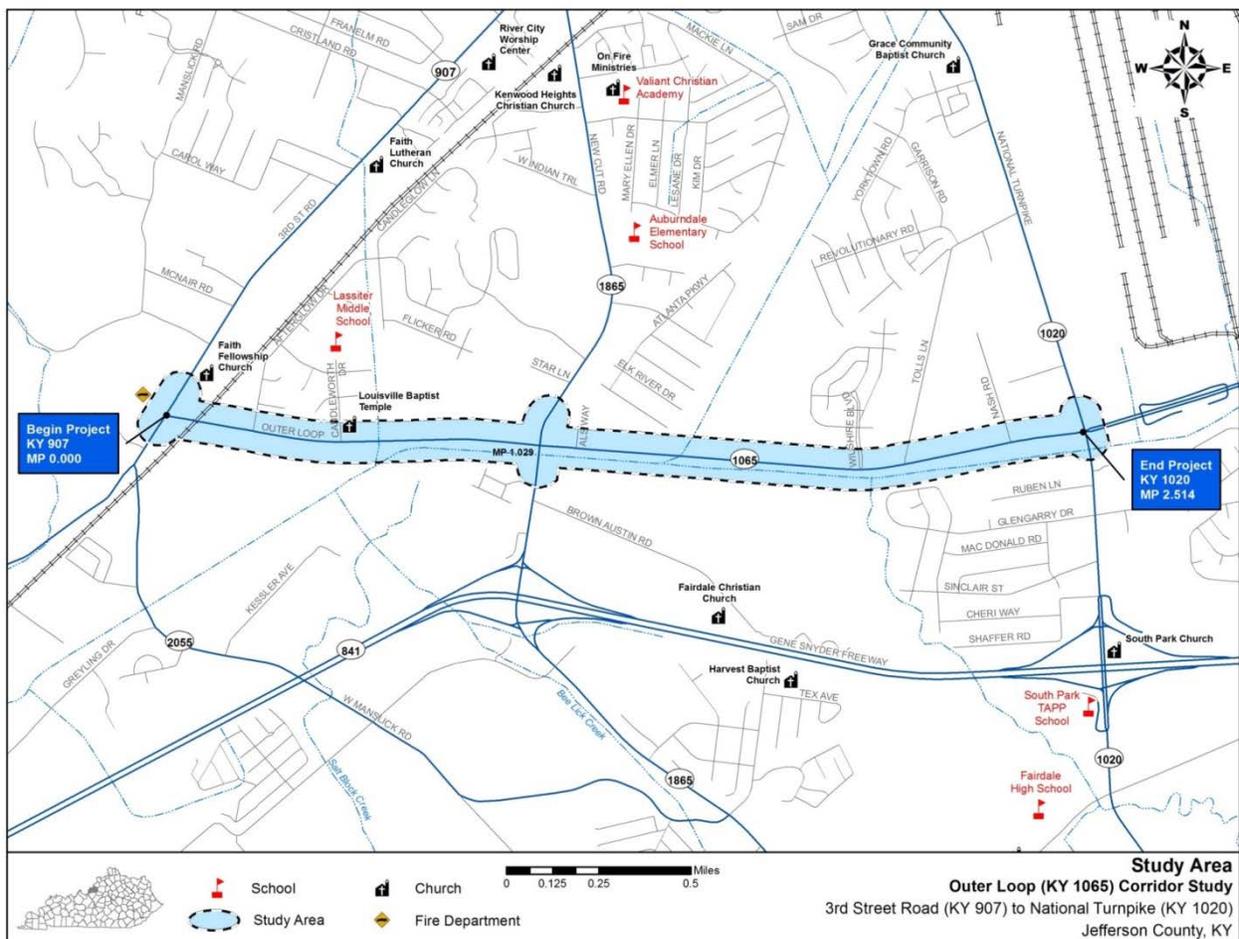


Figure ES 1: Study Area

Purpose and Need

The purpose of this project is to improve safety, targeting two major intersections (New Cut Road and National Turnpike); and improve mobility for travelers.

Safety is the primary concern along the corridor. As mentioned previously, the New Cut Road and National Turnpike intersections are identified as numbers one and nine, respectively, on the region's 2011 *Top 40 High Crash Intersections* list supplied by the KIPDA MPO. Records show 283 reported crashes along Outer Loop during 2014–2016. This number included three fatal and 51 injury collisions. Five high crash spots were identified on Outer Loop. Current crash trends mirror KIPDA's earlier findings with high crash spots at New Cut Road and National Turnpike. Business entrances and exits too close to the major intersections contribute to angle crashes as motorists must negotiate through traffic in as many as three lanes when turning left. Additional high crash spots occur at 3rd Street Road and the signalized Walmart entrance.

Mobility is another concern along Outer Loop. Annual average daily traffic (AADT) ranges from 14,000 vehicles per day (vpd) at the western end of the study area to 17,600 vpd near the eastern end. Four percent of those volumes are trucks. Travel times along the corridor range from 5 minutes in morning hours to nearly 9 minutes in evening hours. Average travel speeds along the corridor range from 17 to 30 mph during peak periods, well below the posted 45 and 55 mph speed limits. Motorists often drive into opposing travel lanes to avoid long queues and access the short left turn lanes at National Turnpike, and are also often seen using the shoulders to pass stopped, left-turning vehicles.

Outer Loop traffic volumes are not forecasted to grow; however, existing volumes on New Cut Road and National Turnpike are expected to increase from 22,000 to 28,000 vpd and from 25,000 to 34,000 vpd, respectively, by 2035. These increased volumes will contribute to intersection congestion, resulting in Level of Service (LOS¹) E on Outer Loop in 2035.

In addition to the needs above, **Goals** for the project include:

- Improve drainage, as much of the corridor lies within the 100-year floodplain; the road is often closed due to flooding following heavy rain events.
- Improve pedestrian safety through improved sidewalk condition and connectivity.

Environmental Overview, Geotechnical Review, and Resource Agency Input

An Environmental Overview was performed including a review of Historic and Archaeological Resources by Brockington and Associates, Aquatic/Terrestrial Resources by Redwing, and a Socioeconomic Study by KIPDA. Additionally, a preliminary geotechnical overview report was prepared by American Engineers, Inc. and reviewed by the KYTC Division of Structural Design, Geotechnical Branch. Lastly, several selected state and federal resource agencies were contacted to derive their input for the corridor study.

¹ A qualitative measure used to evaluate roadway or intersection congestion. LOS range from LOS "A" (free flow, no delays–best conditions) to LOS "F" (considerable delays–worst conditions). LOS D (minimal delays) or better is desirable in urban areas.

Existing Conditions

Outer Loop is a state-maintained route providing both local and regional traffic with access to work, school, shopping, and regional state routes as well as destinations beyond. It is classified as an Urban Minor Arterial. The study area consists of mainly residential and commercial development. However, the region just east of the study area is mostly comprised of industrial development surrounding the Louisville International Airport, including the Renaissance South Business Park located to the south of Outer Loop and nearer to Interstate 65.

Within the study area, Outer Loop is similar to a rural two-lane roadway with drainage handled by roadside ditches. The grass ditches drain the majority of Outer Loop to the Northern and Southern ditches, Wilson and Big Bee Lick creeks. There are a few small sections of urban curb and gutter. **Table ES 1** summarizes the existing geometric characteristics of Outer Loop. Much of the Outer Loop corridor lies within the floodplain, with documented flooding occurring in the past. An at-grade railroad crossing exists near 3rd Street Road. Sidewalks are sporadic along the corridor and no dedicated bicycle facilities exist. Transit service along Outer Loop is minimal, only served from New Cut Road and looping around the Walmart parking lot.

Table ES 1: Outer Loop Roadway Geometrics

Outer Loop	
2017 ADT	13,500–17,600 vpd
Terrain	Flat
Number of Lanes	MP 0.000–2.352: 2 Lanes MP 2.352–2.514: 3 Lanes (two lanes eastbound) MP 0.703-0.950: 3 Lanes with Two-Way Left Turn Lanes (TWLTL)
Lane Width	11–12 feet
Shoulder Width	MP 0.000–0.481: 10 feet (1–3 feet paved) MP 0.481–1.121: 10 feet (1 foot paved, south); 2 feet curbed (north) MP 1.121–2.250: 10 feet (2 feet paved) MP 2.250–2.514: 11 feet (11 feet paved)
Speed Limit	45–55 MPH
Access Points	22 between 3 rd Street Road and New Cut Road 15 between New Cut Road and National Turnpike
Horizontal Alignment	All meet current guidelines
Vertical Alignment Deficiencies	2 curves approaching 3 rd Street Road do not meet stopping sight distance 1 curve on SB 3 rd Street Road does not meet minimum sight distance 8% grade at CSX railroad crossing exceeds maximum grade

Kentucky State Police traffic collision data was collected and analyzed for the three-year period between January 1, 2014, and December 31, 2016. Five high crash 0.1-mile spots (**Figure ES 2**) were identified with critical crash rate factors (CCRF²) greater than 1.0.

²**CCRF**: one measure of the safety of a road, expressed as a ratio of the crash rate at the location compared to the critical crash rate for roadways of the same functional classification throughout the state. A CCRF of 1.0 or greater indicates crashes may be occurring due to circumstances beyond random occurrence.

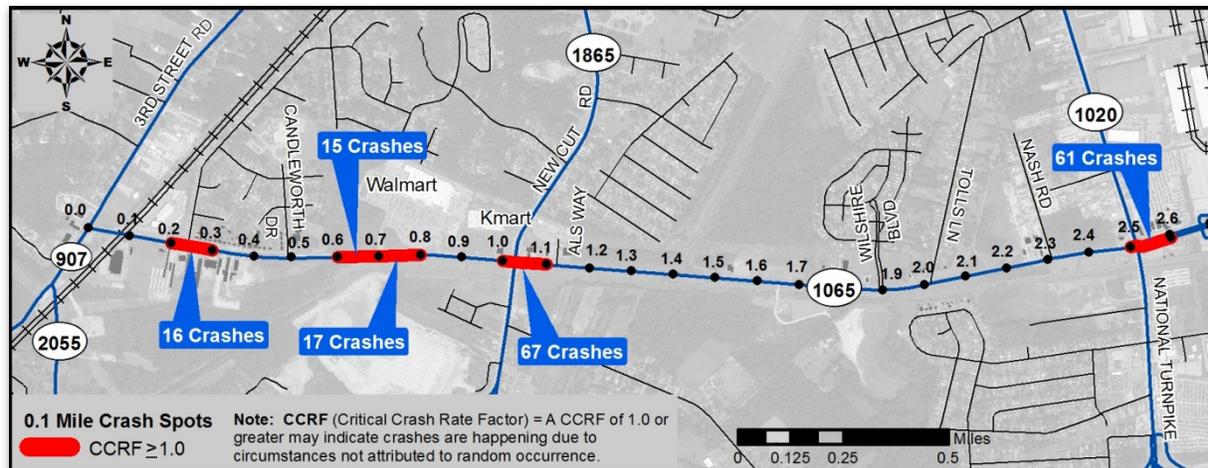


Figure ES 2: Outer Loop 0.1-Mile High Crash Spots

Traffic Analysis

Qk4 coordinated with KIPDA on travel demand modeling and traffic analysis for this study. Traffic volumes and turning movement data was collected. Traffic operations were evaluated based upon several performance measures such as traffic volumes, volume to capacity (v/c) ratios, percent time spent following (PTSF), average travel speeds (ATS), Level of Service (LOS), queue lengths, and travel times. Data was collected and existing traffic operations were analyzed for the 2017 base year. These existing conditions were then compared with a forecasted year of 2035.

The 2035 No Build traffic volumes were calculated using KIPDA's 2007 Regional Travel Demand Model (RTDM), adjusted for expected growth and more recent traffic counts. Using 2035 design year growth and supported by further information, it was concluded that future traffic operations will show minimal-to-no change from existing 2017 operations. All capacity analyses used current Highway Capacity Software (HCS).

Build alternative traffic analyses began by assessing potential effects of a conceptual interchange on Outer Loop traffic. The new interchange would connect to Outer Loop via Air Commerce Drive. Traffic analyses performed including the interchange showed a maximum 400 vehicles per day (vpd) diverted from Outer Loop, resulting in minimal traffic effects. The project team decided to move forward with Outer Loop Build traffic analyses using the worst-case traffic scenario—without a new interchange.

Public Involvement

The project team consisted of representatives from the KYTC Central and District 5 offices, the KIPDA MPO, and the consultant. Over the course of the study three project team meetings, one preliminary alternative meeting, two local officials/stakeholders meetings, and two public meetings were held.

The project team met with local officials/stakeholders and members of the public for the first time in December 2017 to provide study information, present existing conditions, verify current issues, and identify issues of specific concern. The top three improvement focus areas from 303 completed surveys were congestion/delay (93%), safety (80%) and drainage (66%).



Figure ES 3: Alternative 2: 3-5-4-5 Configuration (Recommended)

A range of improvement concepts were developed based on existing conditions analysis, and input received both from the project team and public involvement activities. As indicated in the Purpose and Need Statement, safety and mobility are the primary concerns on Outer Loop. The project team also decided that rehabilitation of existing sidewalks to meet current ADA standards and new pedestrian facilities to improve connectivity should be included in the alternatives. However, dedicated bicycle facilities would not be included because of the low compatibility for bicycling on Outer Loop and proximity of the Louisville Loop south of the corridor.

Following alternatives/improvements development, the project team met with local officials/stakeholders and members of the public for the final time in May 2018 to present long- and short-term improvements and solicit input. Alternatives 1 and 2 were presented in two constructible segments -- western (3rd Street Road to New Cut Road) and eastern (New Cut Road to National Turnpike). Surveys were once again utilized in the prioritization process. The majority of the 316 respondents supported Outer Loop improvements (94%), and preferred Alternative 2 for western (60%) and eastern (76%) segments. The public prioritized short-term intersection improvements as (1) New Cut Road, (2) National Turnpike, and (3) 3rd Street Road. Respondents supported all four spot improvements, chose east segment construction (67%) as higher priority over west, thought the roadway should be raised above floodplain elevation (89%), and desired continuous sidewalks along Outer Loop (82%).

Alternatives/Improvements Development

In addition to the No Build³ option, this study examined two types of improvement concepts: (1) Long-term improvements and (2) Short-term improvements.

³ **No Build/Do Nothing:** The No Build/Do Nothing alternative serves as a baseline for comparison of other alternatives. This alternative indicates existing conditions would remain without new construction improvements and only future maintenance would take place.



Figure ES 4: Alternative 1: 3-2-3 Configuration

Long-term improvements consist of Alternatives 1 (Figure ES 3) and 2 (Figure ES 4). Both widen Outer Loop along the corridor, differentiating in lane numbers. Alternative 1 includes two and three-lane typical sections and Alternative 2 includes three, four, and five-lane sections.

Short-term improvements include relatively low-cost, stand-alone projects to address existing safety issues in a timely manner including spot improvements and intersection improvements.

Short-term spot improvements are shown in Table ES 2.

Table ES 2: Short-Term Spot Improvements

	Improvement	Included in
A	Construct two westbound through lanes through the National Turnpike intersection to reduce motorists' confusion.	Long-term Build Alternative 2
B	Deepen ditch at Tolls Lane.	Long-term Build Alternatives 1 and 2
C	Construct TWLTL and/or right turn lanes for Wilshire Boulevard, Tolls Lane, and Nash Road.	Long-term Build Alternatives 1 and 2
D	Construct a right turn lane at Candleworth Drive.	Long-term Build Alternatives 1 and 2

Table ES 3 summarizes brief descriptions, milepoints and phased and total costs for the recommended long-term Alternative 2 and high priority short-term spot improvements.

Table ES 3: Long-term and High Priority Spot Improvement Costs

Alternatives	Design	Right of Way	Utilities	Construction	Total
Alt 2 - Segment 1 – (3 rd Street Road to New Cut Road)	\$500,000	\$1,600,000	\$3,600,000	\$4,700,000	\$10,400,000
Alt 2 - Segment 2 – (New Cut Road to National Turnpike)	\$1,000,000	\$2,600,000	\$3,600,000	\$10,500,000	\$17,700,000
Right Turn Lane at Wilshire Boulevard	\$5,000	-	\$100,000	\$50,000	\$155,000
Right Turn Lane at Candleworth Drive	\$15,000	-	\$60,000	\$150,000	\$225,000
New Sidewalks for Connectivity	\$50,000	\$250,000	\$75,000	\$830,000	\$1,205,000

Three major intersections (3rd Street Road, New Cut Road, and National Turnpike) were identified for potential improvements and are shown on the following pages with high priority improvement costs shown (3rd Street Road, **Figure ES 5** and **Table ES 4**; New Cut Road, **Figure ES 6** and **Table ES 5**; and National Turnpike, **Figure ES 7** and **Table ES 6**).



Figure ES 5: 3rd Street Road Intersection Improvements

Table ES 4: 3rd Street Road High Priority Improvement Costs

ID	Survey Score	Design	Right of Way	Utilities	Construction	Total
a	4.03	\$15,000	-	-	\$150,000	\$165,000
c	4.35	\$11,500	\$60,000	-	\$115,000	\$185,500
d	4.81	-	-	-	\$5,000	\$5,000
e	5.33	\$6,000	\$10,000	\$60,000	\$60,000	\$136,000
h	5.39	\$3,000	\$15,000	-	\$30,000	\$48,000



Figure ES 6: New Cut Road Intersection Improvements

Table ES 5: New Cut Road High Priority Improvement Costs

ID	Survey Score	Design	Right of Way	Utilities	Construction	Total
a	3.78	\$6,200	-	-	\$62,000	\$68,200
d	3.51	\$7,000	\$250,000	-	\$70,000	\$327,000
e	4.66	-	-	-	\$1,000	\$1,000

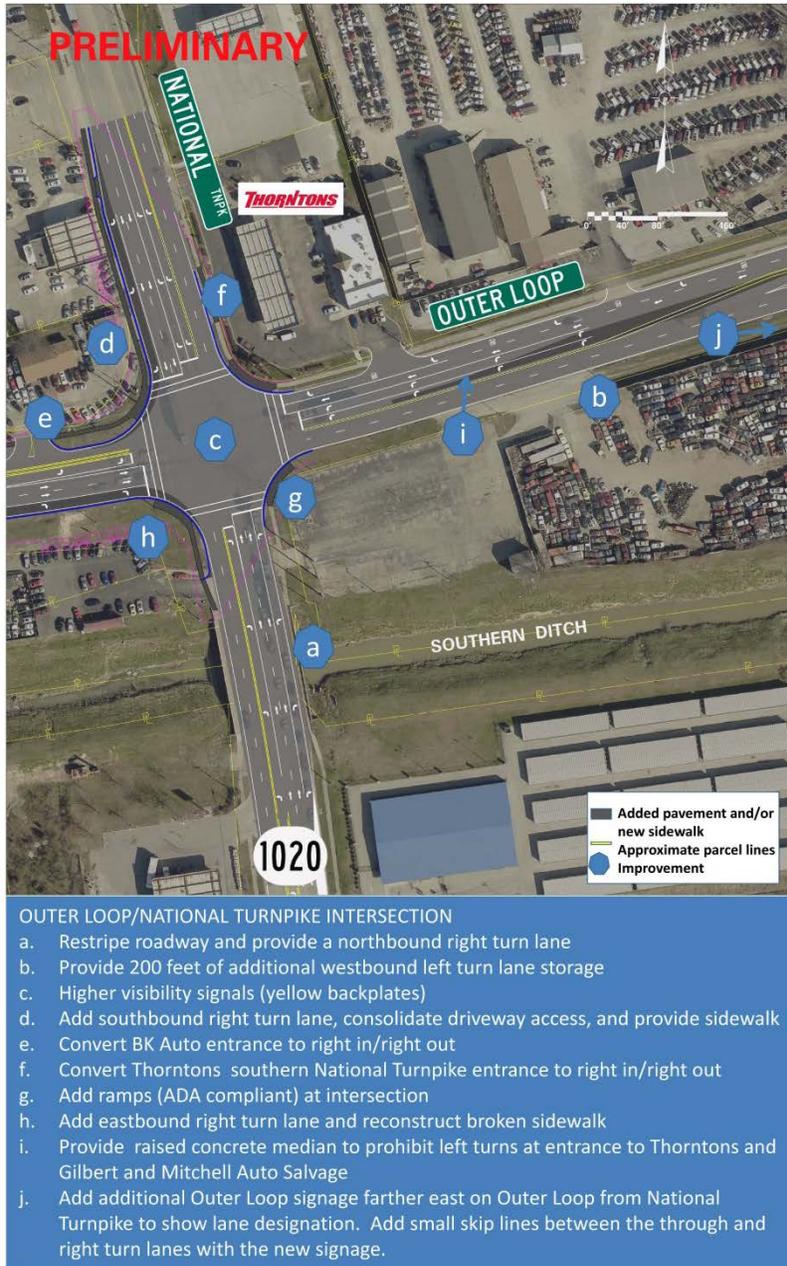


Figure ES 7: National Turnpike Intersection Improvements

Table ES 6: National Turnpike High Priority Improvement Costs

ID	Survey Score	Design	Right of Way	Utilities	Construction	Total
a	6.87	\$3,000	-	\$50,000	\$30,000	\$83,000
b	7.41	\$34,000	-	\$125,000	\$340,000	\$499,000
c	4.88	-	-	-	\$2,000	\$2,000
f	4.16	-	\$25,000	-	\$2,000	\$27,000
g	3.76	\$14,000	\$15,000	-	\$140,000	\$169,000
i	4.22	\$10,000	-	-	\$100,000	\$110,000
j	N/A	-	-	-	\$2,000	\$2,000

Conclusions and Recommendations

The project team considered the No Build option, as well as each long- and short-term improvement alternative. Recommendations were made for the Outer Loop Corridor Study based on existing conditions, crash history, projected traffic operations, public input, project costs, and ability to meet the project's purpose and need.

The project team recommended Long-term Alternative 2 over Alternative 1. Alternative 2 is anticipated to operate three times better than Alternative 1 in terms of corridor travel times, improves LOS to B from just west of Candleworth Drive to National Turnpike, and has a benefit-cost ratio (BCR)⁴ greater than 1.0.

The four spot improvements and the 34 Outer Loop short-term intersection improvements for 3rd Street Road, New Cut Road, and National Turnpike were prioritized as high, medium, or low. Two of the four spot improvements were prioritized as high along with sidewalks along the corridor. Additionally, of the 34 short-term improvements, five on 3rd Street Road, three on New Cut Road, and seven on National Turnpike were assigned high priority. Cost estimates were prepared for each improvement concept given a high priority based on average KYTC District 5 unit costs and costs for bridges and contingencies. KYTC District 5 provided high-level cost estimates for right-of-way and utility phases.

Next Steps

Currently no funding for the projects suggested in this corridor study exist in the enacted *Kentucky's FY 2018 - FY 2024 Highway Plan* beyond those allocated to complete this study. The recommended long-term corridor improvement(s) should be reflected in KIPDA's long range plan and evaluated against other projects for inclusion in KYTC's next Six Year Highway Plan. Likewise, the suitable high priority short-term improvements should also be evaluated against other projects for inclusion in KYTC's next Six Year Highway Plan. Lastly, implementation of the appropriate high priority short-term improvements should be pursued through other funding sources such as pavement rehabilitation projects, highway safety improvement projects, etc.

⁴ **Benefit cost ratio:** (BCR) is an indicator used in cost-benefit analysis, to show the relationship between the costs and benefits of a proposed project, in monetary or qualitative terms. A BCR greater than 1.0 suggests the project's benefits outweigh its cost.

1.0 INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) initiated a planning study in August 2017 to identify methods to improve safety, access, drainage, freight movement, and mobility for all travel modes on KY 1065 (Outer Loop) from KY 907 (3rd Street Road) east to KY 1020 (National Turnpike) in Louisville, Jefferson County, Kentucky. **Figure 1.1** and **Figure 1.2** show the Outer Loop study area context in Jefferson County.

Federal State Planning and Research (SPR) monies funded the Outer Loop Corridor Study to quantify needs and identify issues for programming potential improvements. Future project phases are not yet funded. This study serves as the first step toward identifying and recommending appropriate investment into the Outer Loop corridor.

Both the Kentuckiana Regional Planning and Development Agency's⁵ (KIPDA) 2016 High Crash Intersection Report and the KYTC's 2017 Highway Safety Improvement Program (HSIP) Intersection Emphasis Preliminary Report (SYP #5-9010.00) identified Outer Loop intersections New Cut Road and National Turnpike as high-crash locations. The KYTC Project Identification Form (PIF) (**Appendix A**) states the preliminary purpose as: "Improve safety, access, and mobility for all modes along Outer Loop from 3rd Street Road to National Turnpike." KIPDA's Metropolitan Transportation Plan (MTP) Project 435 identifies the study purpose as: "Widen KY 1065 (Outer Loop) from two to five lanes (four through lanes with a center left turn lane)." The KYTC's PIF and KIPDA's MTP estimated 2017 total project costs as \$26,470,000 and \$29,604,885, respectively.

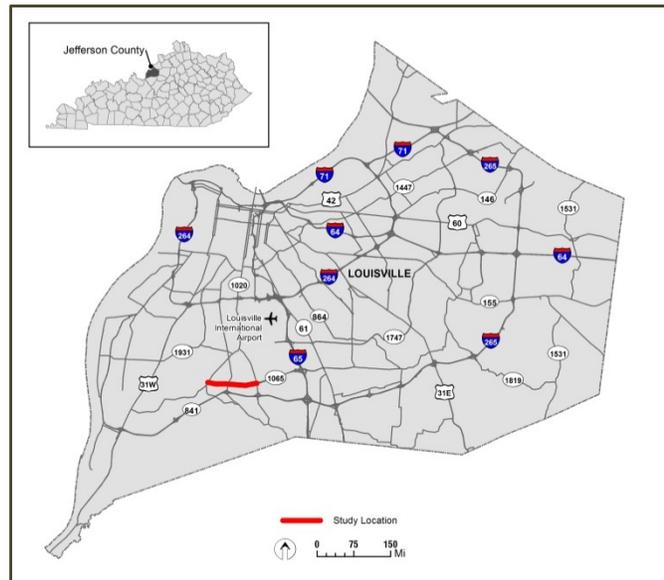


Figure 1.1: Outer Loop in Jefferson County

The project team, composed of the KYTC Central and District Five Offices, KIPDA, and consultant Qk4, Inc., studied existing conditions; developed a draft Purpose and Need (P&N) Statement; engaged the public, local officials, and other stakeholders; completed traffic analyses; examined drainage; studied alternatives; and made recommendations to be carried forward for further project development phases.

1.1 Study Area

The study area (**Figure 1.2**) begins at 3rd Street Road (MP 0.000) and extends east approximately 2.5 miles to National Turnpike (MP 2.514). There are three major intersections along the corridor: 3rd Street Road, New Cut Road, and National Turnpike, with the study area widening slightly at these intersections.

⁵ KIPDA is the regional planning organization composed of an association of local governments in a nine-county region of southern Indiana and north central Kentucky that includes Jefferson County. KIPDA is Louisville's Metropolitan Planning Organization (MPO).

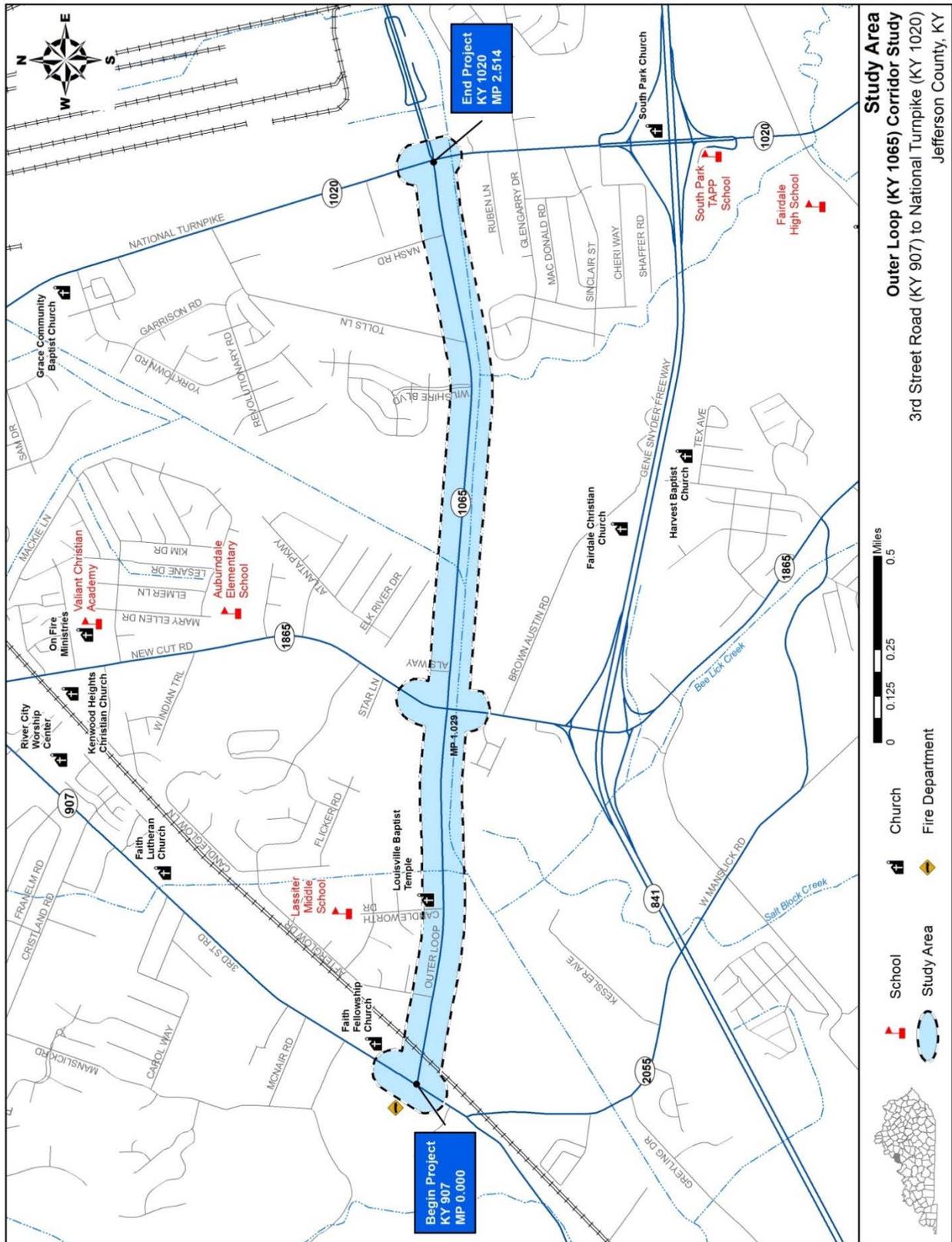


Figure 1.2: Study Area

1.2 Project History

In 1999, the KYTC submitted the Outer Loop Study for inclusion in KIPDA's MTP as a mechanism to address local concerns and identify existing roadway deficiencies. At the onset of this study the Outer Loop corridor was described and modeled for five-lane widening from 3rd Street Road to National Turnpike. However, no specific design concept, five-lane or otherwise, was committed to construction. Appropriate concepts and the draft project P&N Statement would be determined in the Planning and Design phases, but no funding was identified to begin the project.

Initial cost estimates were based on the extreme-case "Five-Lane Widening" concept. The KYTC recognized the need for a planning study prior to design to understand corridor needs, coordinate community vision, establish widely accepted concepts, and provide more accurate cost estimates. Improvement concepts ranging from "No Build/Do Nothing" to "Five-Lane Widening" would be analyzed.

During development of *Kentucky's FY 2018—FY 2024 Highway Plan*, KYTC District 5 ranked the Outer Loop corridor improvement project 39th out of 40 high priority projects in Jefferson County (187 total projects). North and east of this corridor are extensive intermodal freight facilities including CSX-Louisville railroad yard, Ford's Louisville Outer Loop Assembly Plant, UPS WorldPort, Standiford Field Louisville International Airport (SDF) expansion area, Louisville Renaissance Corporation Zone, and a potential new interchange proposed by SDF on KY 841 (Gene Snyder Freeway) between I-65 and National Turnpike. North of the Gene Snyder Freeway and east of New Cut Road a large warehouse development is under construction. KIPDA described the Outer Loop as the only "good" east-west route to Dixie Highway and a candidate for transit.

1.3 Prior Studies

Several completed studies of Outer Loop were identified and deemed applicable to today's study. The studies are summarized below.

- Using 2009–2011 crash history, KIPDA identified Outer Loop intersections with New Cut Road and National Turnpike as numbers one and nine, respectively, on the region's list of *Top 40 High Crash Intersections* in Bullitt, Jefferson, and Oldham counties.
- The 2008 *3rd Street Road/St. Andrews Church Road Area Transportation Study* recommended access management improvements at 3rd Street Road, westbound and eastbound turn lanes at New Cut Road, and Outer Loop widened to three lanes.
- The 2013 *New Cut Road/Taylor Boulevard Corridor Study* offered a vision for New Cut Road that would provide two 10-foot lanes in each direction between Palatka Road and Gene Snyder Freeway, a five-foot bicycle lane in each direction, treed lawns, and five-foot sidewalks on both sides of the road. Access management, bus shelters, streetscape amenities, and landscaping were also recommended.
- The KYTC's 2017 *Highway Safety Improvement Program (HSIP)* preliminary priority list recommended west- and eastbound turn lanes at New Cut Road (Priorities 33 and 6), signal timing adjustments, and access management (Priorities 7 and 32).
- Louisville International Airport's 2010 *Airport Layout Plan* includes a new Gene Snyder Freeway interchange south of Outer Loop between I-65 and National Turnpike.

Details of each recommended improvement are in **Appendix A**.

2.0 OTHER PLANNED TRANSPORTATION PROJECTS

The following sections address the KYTC Highway Plan and PIF, KIPDA TIP and MTP, and Louisville Metro projects located in the study area vicinity. Potential impacts to Outer Loop are noted.

2.1 KYTC 2016–2022 Highway Plan Projects

Highway plan projects near Outer Loop in Jefferson County are illustrated in **Figure 2.1**. Two projects—sidewalk construction Item No. 5-3505.00, and bridge replacement Item No. 5-1061.00—are not anticipated to change traffic patterns in the study area. During the course of this study, *Kentucky’s FY 2018 – FY 2024 Highway Plan* was enacted, and included Item No. 5-1061.00 with construction scheduled in Fiscal Year 2018.

2.2 KIPDA Transportation Improvement (TIP) and MTP Projects

Eleven projects (two of which are addressed in Section 2.1) near the Outer Loop Corridor Study (KIPDA ID 435) project area are in KIPDA’s Transportation Improvement Program (TIP) and MTP. Seven of these projects are not anticipated to change traffic patterns along the study area. The following five projects (not anticipated to change traffic patterns) are considered “committed” and expected to be implemented by design year 2035. They are shown in **Figure 2.1** with estimated completion dates listed below:

- KIPDA ID 1650—Louisville Metro project estimated open-to-traffic date in 2020.
- KIPDA ID 2036—KYTC project. Letting scheduled for February 2018.
- KIPDA ID 2281—Completed KYTC project.
- KIPDA ID 2473—Louisville Metro project that uses Safe Routes to School funding, estimated open-to-traffic date in 2023.
- KIPDA ID 2473—KYTC is working to secure funding to repair this section of roadway.

2.3 Additional Considerations along Outer Loop

Two developments on or near Outer Loop (**Figure 2.2**) are of particular interest for this study:

1. Louisville Renaissance South Business Park east of National Turnpike near Airport Road. The 750-acre park is home to UPS. The park also includes 230 acres with 11 million square feet of warehousing and light manufacturing potential.
2. Two new warehouses in the southwest quadrant of Outer Loop and New Cut Road just north of Gene Snyder Freeway. These businesses can only access Outer Loop via New Cut Road, as direct access will not be provided.

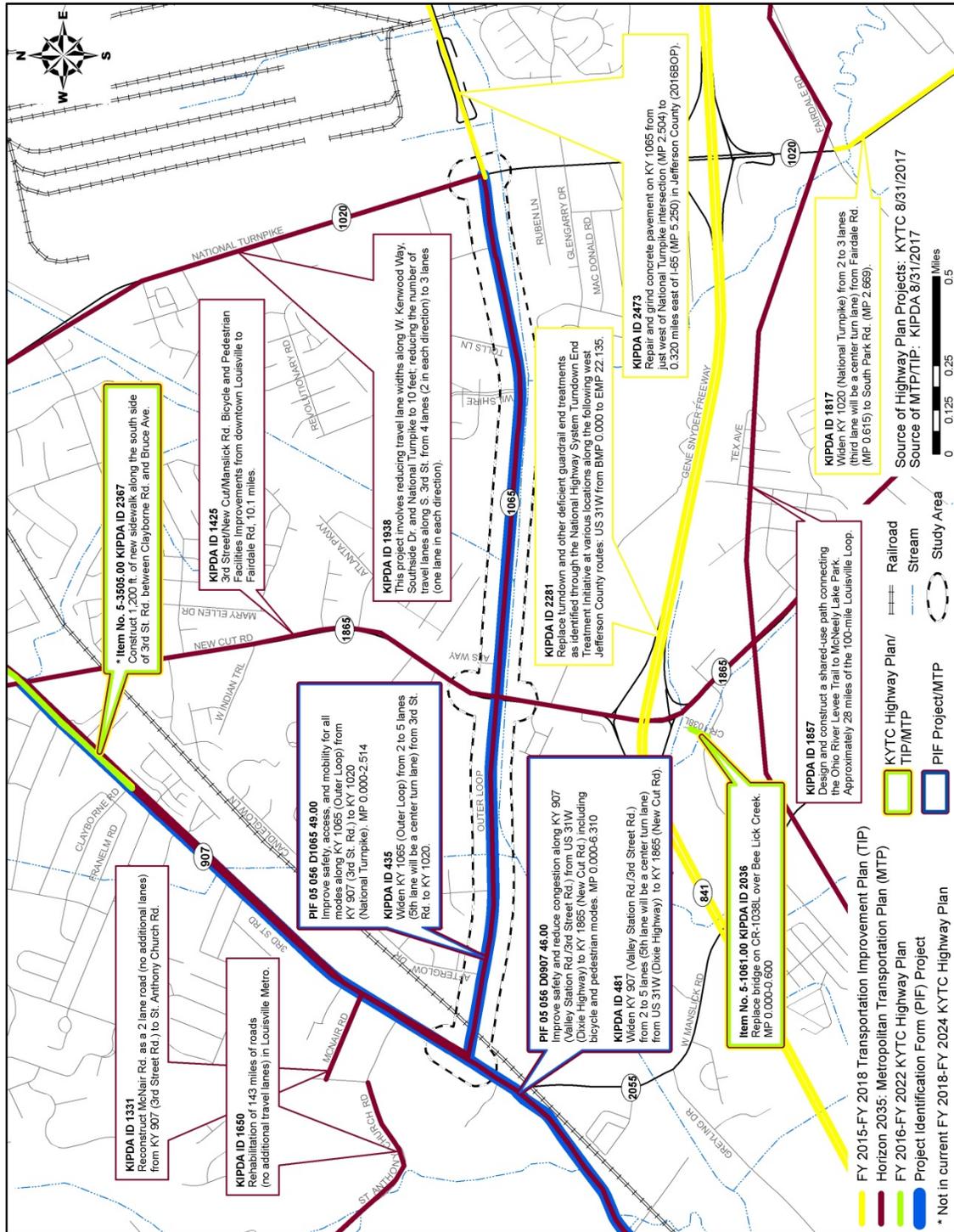


Figure 2.1: KYTC Highway Plan, PIF, TIP and MTP Projects



Figure 2.2: Two Developments along Outer Loop

3.0 EXISTING CONDITIONS

Outer Loop roadway characteristics are identified in the following sections. Information on highway systems, geometric characteristics, structures, traffic conditions, crash history and other applicable features are summarized from the KYTC Highway Information System (HIS) database, existing plans, and field reviews.

3.1 Highway Systems

Outer Loop and intersecting route information was obtained from the KYTC HIS database. See **Table 3.1** for details.

Table 3.1: Highway Systems—Outer Loop

Route	State System	Functional Classification	National Highway System	Kentucky Freight Highway System	Truck Weight Class
Outer Loop (KY 1065)	State Secondary	Urban Minor Arterial	No	Yes - Tier 3	AAA - 80,000 pounds
3rd Street Road (KY 907)	State Secondary	Urban Minor Arterial	No	Yes - Tier 3	AAA - 80,000 pounds
New Cut Road (KY 1865)	State Primary	Urban Principal Arterial	Yes	Yes - Tier 3	AAA - 80,000 pounds
National Turnpike (KY 1020)	State Primary	Urban Minor Arterial	No	Yes - Tier 3	AAA - 80,000 pounds

Outer Loop is not part of National Truck Network, Forest Highway, Scenic Byway, or Extended Weight systems

Intersecting routes: 3rd Street Road has two lanes, and is functionally classified as a minor arterial with 11-foot lanes and three-foot shoulders. New Cut Road is a four-lane, principal arterial and National Turnpike, a four-lane minor arterial, both having 12-foot lanes with curb and gutter.

3.2 Roadway Geometrics

Outer Loop roadway geometrics were compared to common geometric practices for Urban Arterial Roads⁶. Roadway characteristic data discussed in this section are taken from the KYTC HIS database or existing highway plans. **Table 3.2** summarizes geometric characteristics of Outer Loop including terrain, number of lanes, lane width, shoulder width, posted speed limit, and horizontal and vertical alignments.

Existing driving lane widths from 11 to 12 feet meet common geometric practices for urban arterial roads. Beginning at 3rd Street Road, Outer Loop has two lanes for approximately 2.35 miles, changing to three lanes (two eastbound) for 0.20 mile approaching National Turnpike. Posted speed limits are 45 mph between 3rd Street Road (MP 0.000) and New Cut Road, transitioning to 55 mph east of New Cut Road (MP 1.100). Outer Loop is also three lanes (two driving lanes with a two-way-left-turn-lane (TWLTL)) from east of Candleworth Drive to Als Way.

⁶ 2017 KYTC Highway Design Manual, Exhibit 700-03.

Combination shoulders are ten feet wide (one to three feet paved) from 3rd Street Road to east of Tolls Lane, with two exceptions: (1) two-foot-wide curb and gutter on the north side from Candleworth Drive to Als Way; and (2) 11-foot-wide eastbound shoulders at Candleworth Drive, Wilshire Boulevard, and Tolls Lane. Through motorists routinely pass left turning vehicles by using the shoulder at these locations. Eastbound and westbound paved shoulders widen to 11 feet from Nash Road to National Turnpike.

Table 3.2: Outer Loop Geometrics

Outer Loop	
2017 ADT	13,500–17,600 vpd
Terrain	Flat
Number of Lanes	MP 0.000–2.352: 2 Lanes MP 2.352–2.514: 3 Lanes (two lanes eastbound) MP 0.703–0.950: 3 Lanes with TWLTL
Lane Width	11–12 feet
Shoulder Width	MP 0.000–0.481: 10 feet (1–3 feet paved) MP 0.481–1.121: 10 feet (1 foot paved, south); 2 feet curbed (north) MP 1.121–2.250: 10 feet (2 feet paved) MP 2.250–2.514: 11 feet (11 feet paved)
Speed Limit	45–55 MPH
Access Points	22 between 3 rd Street Road and New Cut Road 15 between New Cut Road and National Turnpike
Horizontal Alignment	All meet current guidelines
Vertical Alignment Deficiencies	2 curves approaching 3 rd Street Road do not meet stopping sight distance 1 curve on SB 3 rd Street Road does not meet minimum sight distance 8% grade at CSX railroad crossing exceeds maximum grade

Arterial roadways, such as Outer Loop are generally intended to provide high levels of mobility, i.e., the capability of traveling from one place to another; and lower levels of access to adjacent land uses. According to the Transportation Research Board, the Highway Safety Manual, and the Geometric Design Manual for Highways and Streets, adding access points along an arterial increases the number of crashes. Twenty-two access points exist between 3rd Street Road and New Cut Road and fifteen from New Cut Road east to National Turnpike. The three main intersections—3rd Street Road, New Cut Road, and National Turnpike—have multiple access points within functional intersection areas. Vehicle conflict points occur when motorists enter and exit entrances and cross opposing traffic lanes (**Figure 3.1**).

Traffic signals control 3rd Street Road, Walmart/New Cut Market Center, New Cut Road, and National Turnpike intersections. No other stop-controls exist along the corridor.

“As-built” plans for Outer Loop, 3rd Street Road, New Cut Road, and National Turnpike were compared to 45 and 55 mph geometric guidelines. Notable findings are listed below.

- Horizontal curves meet minimum radii.



Figure 3.1: Outer Loop/National Turnpike Intersection Looking East

- A short 8% grade on Outer Loop between 3rd Street Road and the CSX railroad crossing exceeds the 6% recommended maximum grade (**Figure 3.2**).
- Three vertical curves do not meet either recommended stopping or headlight sight distance: two curves on Outer Loop approaching 3rd Street Road and one curve on 3rd Street Road southbound approaching Outer Loop (**Figure 3.3**).



Figure 3.2: Outer Loop Approaching 3rd Street Road



Figure 3.3: View of Vertical Curve North of 3rd Street Road Intersection

3.3 Outer Loop Corridor Issues

The following paragraphs highlight some issues affecting the Outer Loop corridor beginning at 3rd Street Road east to just beyond National Turnpike.

3.3.1 Outer Loop and 3rd Street Road (MP 0.000)

Congestion along 3rd Street Road affects motorists turning to and from Outer Loop in AM peak hours. Northbound backup on 3rd Street Road impedes motorists from entering the right turn lane to Outer Loop. School buses loading/unloading students at Johnson's 2 Quality Child Care create queues north through the 3rd Street Road intersection (**Figure 3.4**) due to the proximity of their entrance to the intersection.



Figure 3.4: Northbound Backup and Queues created by School Bus at 3rd Street Road

CSX Transportation operates an at-grade railroad crossing that intersects Outer Loop less than 400 feet east of 3rd Street Road (**Figure 3.5**). Given its proximity to the intersection, traffic operations are routinely affected. The U.S. Department of Transportation Federal Railroad Administration's Crossing Inventory Form shows trains averaging 30 mph cross Outer Loop twice daily; once each in 6 AM to 6 PM and 6 PM to 6 AM time spans. CSX trains at the Outer Loop railroad crossing can cause extensive delay on all three legs of the Outer Loop/3rd Street Road intersection (**Figure 3.6**).



Figure 3.5: CSX Proximity to 3rd Street Road



Figure 3.6: Traffic Backup due to Trains

3.3.2 Outer Loop Drainage west of New Cut Road (MP 0.481-MP 1.029)

Site visits were conducted to determine and verify existing drainage conditions. Grass ditches drain the majority of Outer Loop to the Northern and Southern ditches, Wilson and Big Bee Lick creeks. A concrete ditch located just west of Nash Road routes water under Outer Loop to the Southern Ditch.

Ponding water was a drainage issue discovered during site visits. Ponding occurs throughout the corridor, but particularly along curb and gutter sections west of New Cut Road where the road grade is flat. Slotted drains are used along the curb line between inlets from Candleworth Drive to the Walmart east entrance to help take water off the roadway. Partially clogged drains at times prevent these drains from working to their full capacity. **Figure 3.7** shows a drain on the northern side of westbound Outer Loop near the Walmart signalized west entrance. Stormwater runoff routinely overwhelms the drain, causing water to pond across the right turn lane.



Figure 3.7: Water Ponding in Right Turn Lane at Walmart

3.3.3 Outer Loop Approaching New Cut Road (MP 1.029)

Drivers traveling through or making right turns at New Cut Road experience long queues on a daily basis in both directions during peak hours, as shown in **Figure 3.8** and **Figure 3.9**. A single through–right turn combination lane and a single left turn lane are present today on Outer Loop. Peak hour eastbound queues frequently extend beyond the Walmart signalized west entrance while westbound traffic backs up beyond Als Way to the Outer Loop Bridge. Eastbound vehicles bound for New Cut Road frequently use the Walmart and Old Kmart (now Peddlers Mall) parking lots to bypass the traffic signal. The KYTC is adding right turn lanes for both east and westbound on Outer Loop to reduce delay at New Cut Road.

Motorists heading northbound on New Cut Road experience delay at the signal on Outer Loop at New Cut Road as seen in **Figure 3.10**. Currently, northbound New Cut Road currently has two through lanes, and single dedicated left and right turn lanes.



Figure 3.8: Eastbound Outer Loop Backup Approaching New Cut Road



Figure 3.9: Westbound Outer Loop Backup Approaching New Cut Road



Figure 3.10: Northbound New Cut Road Backup at Outer Loop

3.3.4 Outer Loop Drainage east of New Cut Road (MP 1.074)

Two flood prone locations were identified along Outer Loop. The first problem area is east of New Cut Road where archived plans show a 48-inch cross drain under Outer Loop at MP 1.074 with a ditch draining to the pipe. A retention area was originally constructed upstream for backwater relief during heavy rain events. Commercial developments including Circle K service station and Wendy's restaurant near the intersection (**Figure 3.11**) have replaced the original retention area, and the Louisville/Jefferson County Information Consortium (LOJIC) data show a storm sewer system connected to the original 48-inch cross drain. These factors are likely contributors to roadway flooding. In addition, the Flood Insurance Rate Map (FIRM) depicts this area in the 100-year floodplain⁷, possibly resulting from Pond Creek⁸ backwater inundating the area during high flow times. The New Cut Road Bridge near Outer Loop has been raised above floodplain elevations.

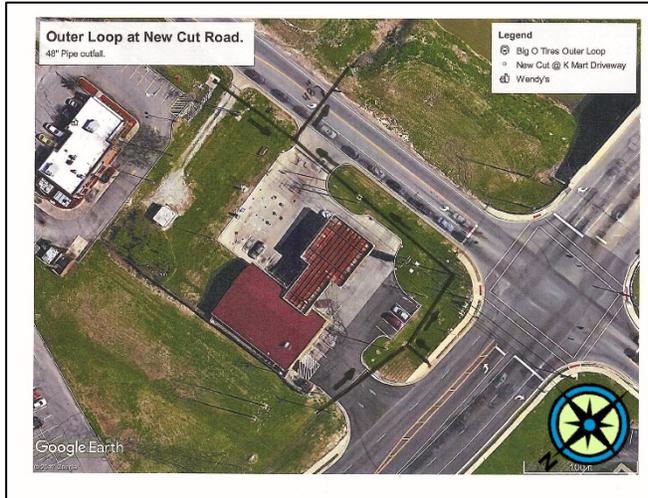


Figure 3.11: Outer Loop near New Cut Road

3.3.5 Outer Loop Drainage east of Tolls Lane (MP 2.014)

The second problem area identified through public involvement is near Tolls Lane at MP 2.014. Excessive silt in an existing pipe under the Tolls Lane approach decreases the pipe's capacity to handle high water events. The clogged pipe coupled with shallow Outer Loop roadside ditches may be contributing to flooding in the area (**Figure 3.12**). The nearest drainage structure under Outer Loop is located at MP 2.154. The five- by four-foot concrete box culvert is approximately 740 feet east of Tolls Lane—a distance too far for flooding relief.



Figure 3.12: Tolls Lane Clogged Pipe (Left) and Shallow Ditch (Right)

⁷ Areas subject to inundation by the one-percent-annual-chance flood event.

⁸ Southern Ditch is one of several channelized ditches constructed to drain the formerly swampy Pond Creek watershed. West of the project corridor, water in Southern Ditch flows directly into the unchannelized creek and follows a circuitous course before emptying into the Ohio River.

The area around Tolls Lane lies within the 100-year floodplain and the Southern Ditch is also a likely contributor to flooding issues (**Figure 3.13**).



Figure 3.13: Outer Loop 100-Year Floodplain Areas

3.3.6 Near Wilshire Boulevard (MP 1.895) and Tolls Lane (MP 2.014)

Left turn lanes do not exist at Wilshire Boulevard and Tolls Lane. Identified by the public and confirmed in the field, eastbound motorists use a wide paved shoulder to pass slower vehicles (**Figure 3.14**) or vehicles waiting to make a left turn at Wilshire Boulevard and Tolls Lane (**Figure 3.15**), thereby creating potential safety issues.



Figure 3.14: Outer Loop Motorist Passing Left Turning Vehicle on Wide Shoulder near Wilshire Boulevard



Figure 3.15: Closer Loop at Wide Shoulder Used for Passing

3.3.7 Outer Loop at National Turnpike (MP 2.514)

Outer Loop drivers approaching National Turnpike encounter long delays and queues due to congestion, a lane drop, and driver confusion. A lane drop occurs for westbound vehicles at National Turnpike as two driving lanes approach the intersection: only the inside lane goes through while the outside lane becomes a right turn only lane. Backup of traffic in the single through lane extends beyond the dual left turn lanes in the PM peak hour. As a result, many westbound motorists create safety hazards when driving on the median and in the eastbound travel lanes to reach the dual left turn lanes (**Figure 3.16**).



Figure 3.16: Outer Loop Looking East at National Turnpike

3.4 Bicycle Accommodations

Outer Loop is not classified as a bicycle route according to Louisville Metro’s Comprehensive Plan Cornerstone 2020 “Core Graphic 13, Bikeways” (**Appendix B**), nor does the Louisville Metro Latent Demand Model identify a need for future bicycle facilities in the study area. However, the plan lists 3rd Street Road as a medium volume, shared-use roadway and New Cut Road and National Turnpike as high volume, shared roadways.

A KYTC review of bicycle/pedestrian accommodations (**Appendix C**) indicated a need for sidewalk and pedestrian elements, but not bicycle facilities on Outer Loop. Using the Bicycle Comfort Index (BCI) average rating, Outer Loop was rated “D” on a grading scale from “A” to “E,” an indication of “moderately low” bicycling compatibility with vehicular traffic.

Connectivity to the Outer Loop corridor exists only through bicyclists negotiating with vehicular traffic on other existing roads (**Figure 3.17**). Beyond year 2035, bicycle lanes in each direction are envisioned along New Cut Road and National Turnpike.



Figure 3.17: Bicyclist on Outer Loop

3.5 Pedestrian Accommodations

3.5.1 Sidewalks

Pedestrian facilities in the western section of the corridor consist of sidewalks along the north side of Outer Loop between the CSX railroad tracks (MP 0.070) and New Cut Road (MP 1.04, **Figure 3.18**), and along National Turnpike extending east; however, no sidewalks exist between New Cut Road and National Turnpike (MP 2.514) to provide connectivity along Outer Loop or from 3rd Street Road to the CSX railroad tracks.

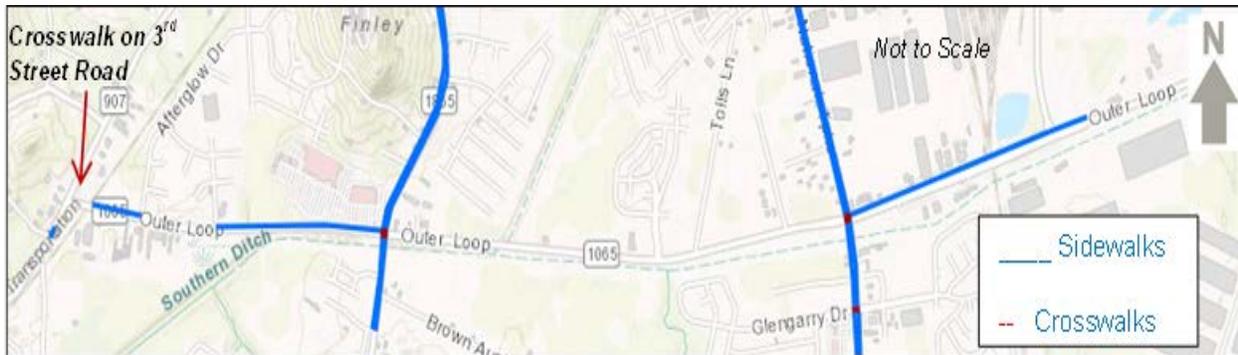


Figure 3.18: Pedestrian Facilities along Outer Loop

A review of existing sidewalks along Outer Loop found mixed states of condition and compliance with current American with Disabilities Act (ADA) design standards. Sidewalk segments are listed below.

- **3rd Street Road to CSX railroad tracks:** No sidewalks are present.
- **CSX railroad tracks to Afterglow Drive:** Four-foot-wide sidewalks are in good condition but do not meet the Metro Louisville's ADA's five-foot minimum passing width requirement.
- **Afterglow Drive to Candleworth Drive:** Sidewalks are not located along Outer Loop, but are adjacent to a parallel residential frontage road. This segment is in disrepair and pedestrian use is restricted due to cars parked on the sidewalk (**Figure 3.19**).
- **Candleworth Drive to New Cut Road:** Sidewalks are parallel to Outer Loop and in good condition; however, at four feet wide, they do not meet the ADA's minimum passing width requirement.
- **New Cut Road to National Turnpike:** No sidewalks are present.
- **National Turnpike extending east:** This area is outside the study area; however, sidewalks are in good condition and meet the ADA's minimum passing width requirement.



Figure 3.19: Sidewalk between Afterglow and Candleworth Drives

3.5.2 Intersections

Pedestrian accommodations were evaluated at three major intersections for ADA compliance, safety, and sidewalk connectivity. Major intersections include 3rd Street Road, New Cut Road, and National Turnpike. Based on the KYTC and Metro Louisville standard drawings, all three intersections have non-ADA compliant elements including, but not limited to, lack of detectable warnings, five-foot-square landing areas, reachable pedestrian buttons, and five-foot sidewalk widths. Corresponding intersection figures show results of the high-level assessment. Each figure also depicts geometric findings related to the intersection. Specific issues are discussed below.

- **3rd Street Road Intersection (Figure 3.20 and Figure 3.21)**

- A diagonal signal configuration exists, leaving a commercial entrance without signal control.
- No detectable warnings are located at the southern 3rd Street Road crosswalk.
- 3rd Street Road crosswalk is non-ADA compliant. No receiving or landing areas are present nor does it connect to any sidewalks. Obstacles including signal poles, a fire hydrant, an electric pole, and a concrete curb are located at crosswalk ends.



Figure 3.20: 3rd Street Road Intersection

- Pedestrian signal heads are present; however, pedestrian control buttons are located on utility poles in grassy areas without ADA accessible ramps, which makes them unreachable by wheelchair users.
 - Bus traffic creates safety and congestion issues while serving a nearby day care center located just south of Outer Loop. Buses for Johnson's 2 Quality Child Care stop to load and unload students directly in the southbound 3rd Street Road driving lane. Traffic queues formed behind buses block the intersection, resulting in long traffic queues for westbound drivers on Outer Loop.
- **New Cut Road Intersection (Figure 3.22)**
 - Four-foot-wide sidewalks on north side of Outer Loop do not meet the ADA's minimum passing width requirement.
 - Curb ramp landings in southern quadrants do not meet the ADA's five-foot-square minimum area requirement.
 - Pedestrian signal controls in southern quadrants are placed on signal poles located behind guardrail, making the controls unreachable for wheelchair users.
 - Outer Loop sidewalk connectivity ends just east of New Cut Road.
 - **National Turnpike Intersection (Figure 3.23)**
 - Curb ramps in all four quadrants lack detectable warnings.
 - Sidewalk in the northwest quadrant ends at a utility pole.
 - Sidewalk ramp in the northeast quadrant does not align with crosswalk.
 - Three of four quadrants have pedestrian signal controls located on poles in grassy areas unreachable by wheelchair users.

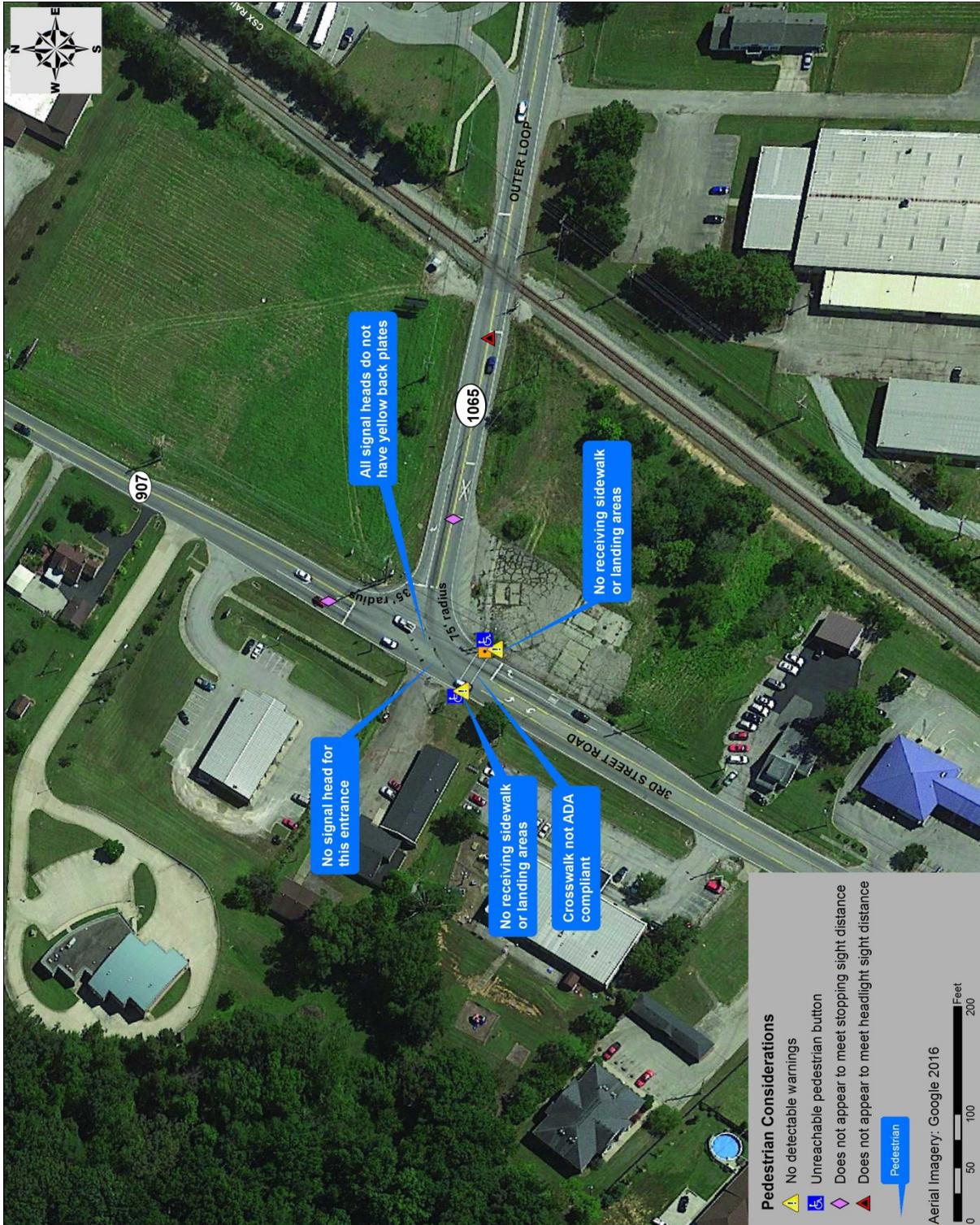


Figure 3.21: Outer Loop/3rd Street Road Intersection Pedestrian Accommodations and Signal Analysis



Figure 3.22: Outer Loop/New Cut Road Pedestrian Accommodations and Signal Analysis

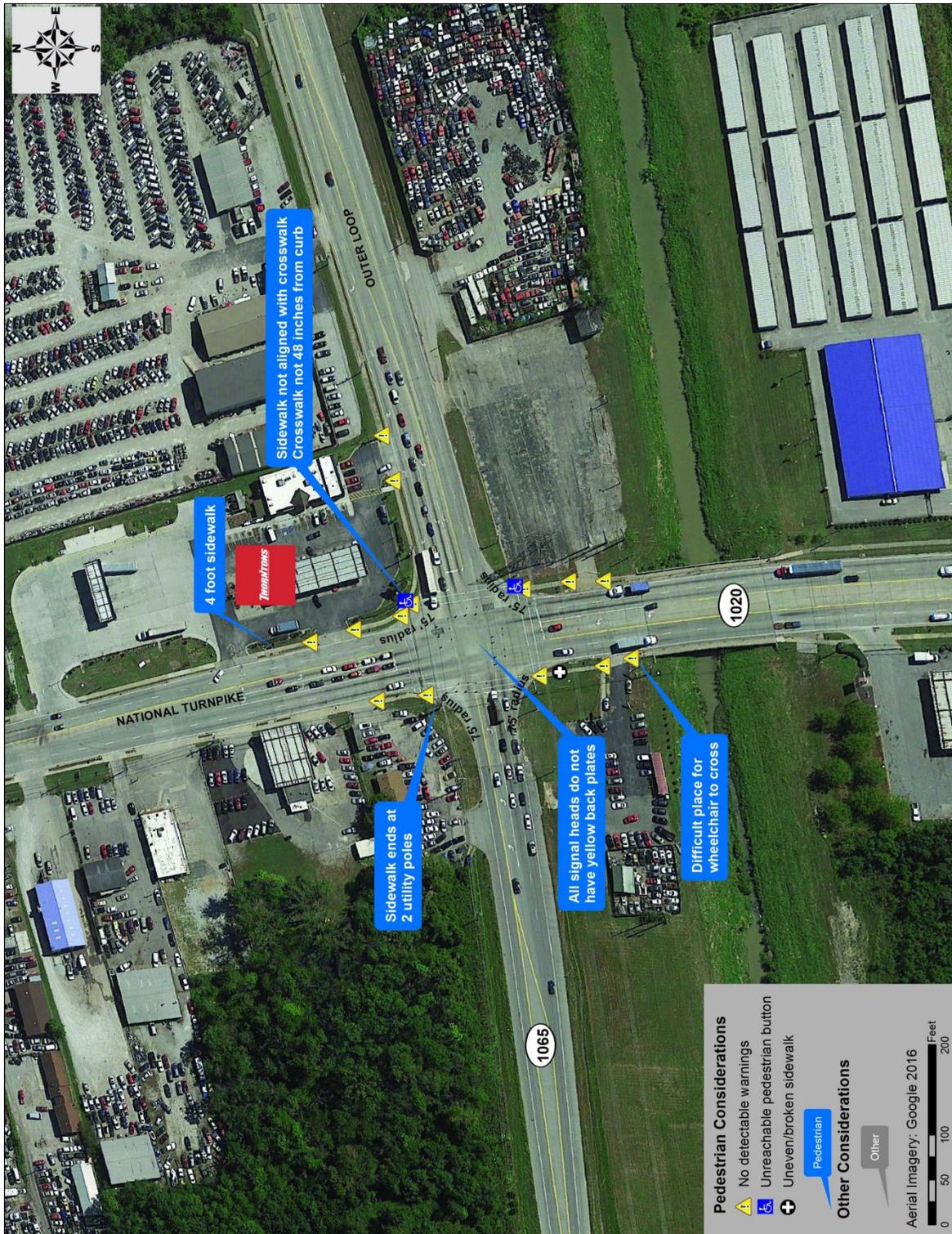


Figure 3.23: Outer Loop/National Turnpike Pedestrian Accommodations and Signal Analysis

3.6 Freight

Outer Loop, 3rd Street Road, New Cut Road, and National Turnpike are listed as Tier 3 roads on the Kentucky Freight Network. KIPDA has identified high density freight access on National Turnpike and regions north and east of the study area. Thirty-five freight generators are within the Traffic Analysis District (TAD), 23 of which are situated in two clusters as shown in red on **Figure 3.24**. Generators include CSX, Louisville International Airport, Ford Motor Assembly Plant, and UPS World Port. Most of these facilities utilize National Turnpike, Outer Loop east of National Turnpike, and the interstate system to travel to and from their destinations. According to recent traffic counts, truck traffic on Outer Loop in the study area is 4% of the annual daily traffic.

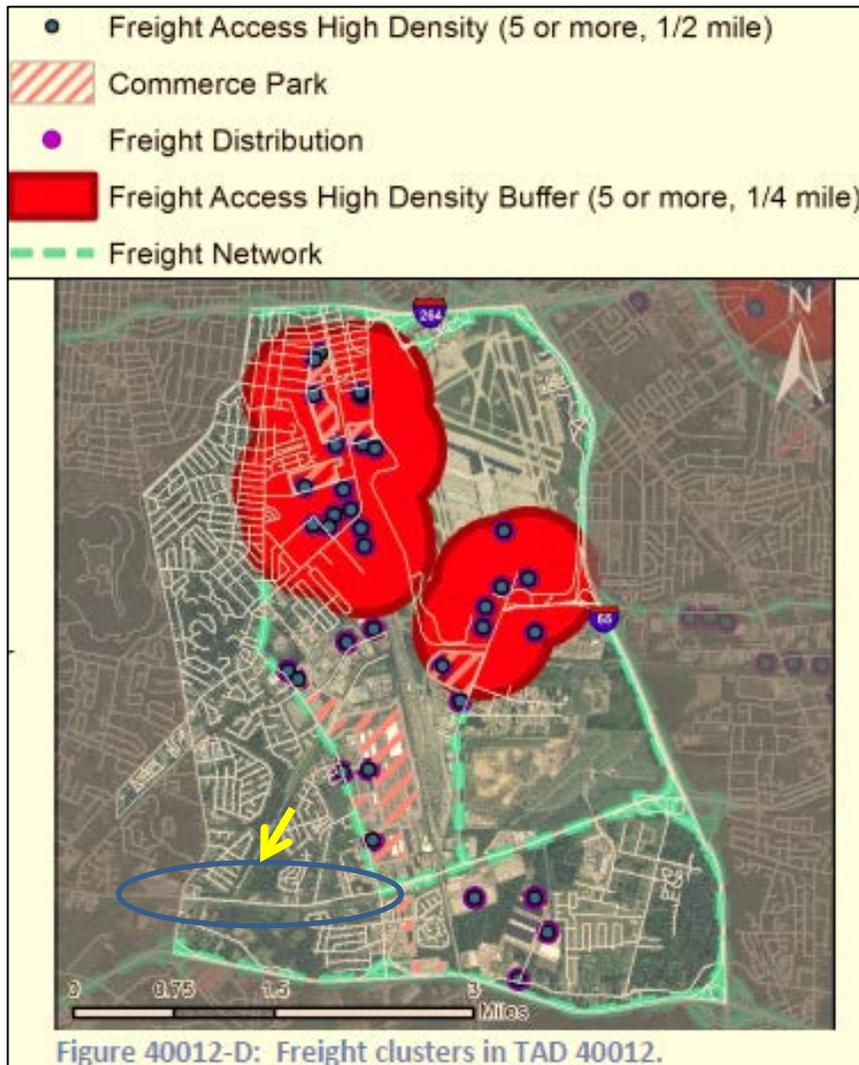


Figure 3.24: Freight Clusters in TAD 40012

Source: KIPDA

3.7 Transit

The Transit Authority of River City (TARC) provides public transportation in the Greater Louisville area with bus routes in Jefferson, Bullitt, and Oldham counties in Kentucky and Clark and Floyd counties in Indiana. All TARC buses accommodate wheelchairs and are equipped with bike racks. North/South TARC transit routes are present on New Cut Road, including a loop utilizing 1,800 feet of Outer Loop around the Walmart parking lot to the west, and National Turnpike; however, no through east-west transit routes exist along Outer Loop (**Figure 3.25**). In 2018, TARC applied for federal Congestion Mitigation and Air Quality (CMAQ) funding for a route along Outer Loop. The application included eight peak morning and eight peak afternoon weekday trips along the corridor from Iroquois Park to Renaissance Business Center; and Commerce Crossings via National Turnpike, Outer Loop, and Preston Highway. Thus far no funding has been secured.

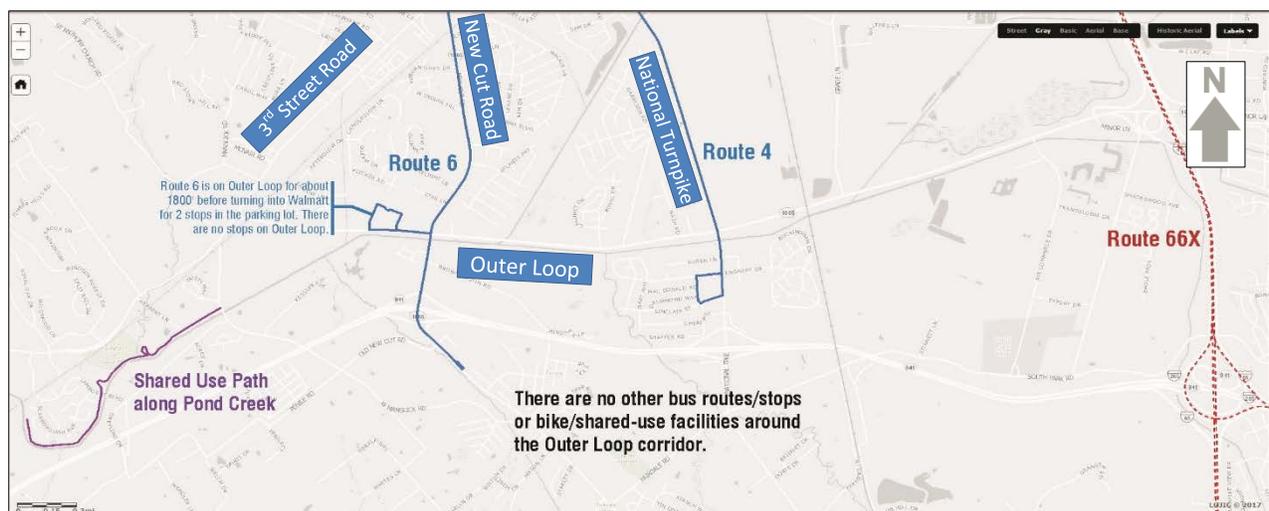


Figure 3.25: Transit (TARC) Routes

Source: LOJIC Online Map

3.8 Existing Bridges

Figure 3.26 shows locations of three bridges in the study corridor: New Cut Road over Southern Ditch, 0.1 mile south of Outer Loop (056B00482N); mainline Outer Loop over Northern Ditch (056B00094N); and National Turnpike over Southern Ditch, 200 feet south of Outer Loop (056B00418N). In accordance with federal standards, bridges are inspected every two years to evaluate their conditions and other elements. All bridges in the study area were last inspected in 2018. Terms and definitions related to bridge inspection ratings are discussed below.

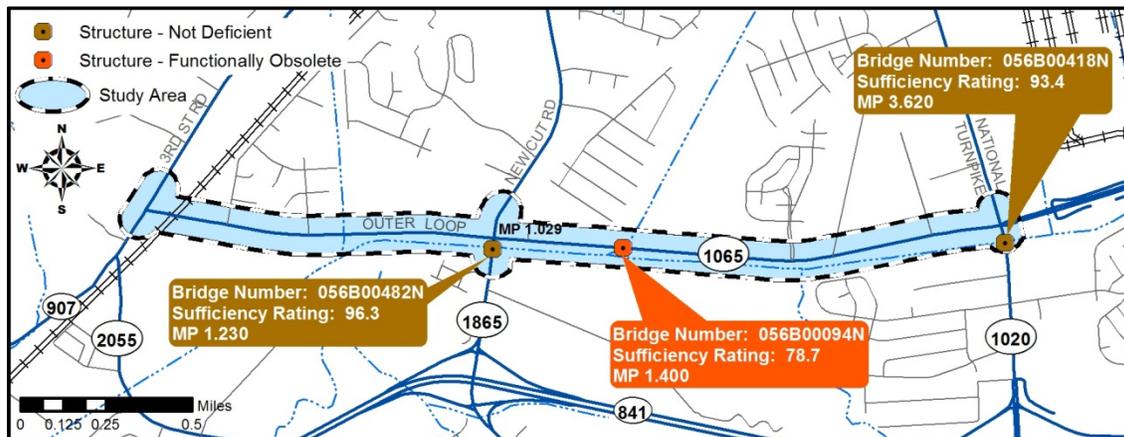


Figure 3.26: Bridge Locations in Study Area

- **Functionally Obsolete:** A bridge that is functionally obsolete is not necessarily unsafe. This category indicates the bridge has older design features not built to today's standards. A functionally obsolete bridge is likely not wide enough or tall enough to accommodate current vehicle sizes, weights, and traffic volumes.
- **Not Deficient:** A bridge that is neither structurally deficient nor functionally obsolete.
- **Structurally Deficient:** A bridge that is structurally deficient is not necessarily unsafe. This category indicates the bridge has elements that need to be repaired and/or monitored. A structurally deficient bridge should be maintained, inspected, and monitored on a regular basis.
- **Sufficiency Rating:** Developed by the Federal Highway Administration (FHWA), the Sufficiency Rating is calculated from a complex formula using 18 data items from the Structural Inventory and Appraisal (SI&A). A number (or rating) is generated from 0 to 100 to indicate the bridge's structural and functional condition.

Bridges considered structurally deficient or functionally obsolete and having a sufficiency rating of less than 50.0 are eligible for funding to replace or rehabilitate. Those with a sufficiency rating of 80.0 or less are considered for funding to rehabilitate. None of the structures in the project area qualify for replacement or rehabilitation funding. The Outer Loop Bridge over Northern Ditch was reconstructed in 2011, but is listed as functionally obsolete (**Table 3.3⁹**). The bridge has a 2018 sufficiency rating of 78.7 and can be considered for additional rehabilitation funding in the future.

⁹ Bridge Inspection Report and KYTC Division of Maintenance

Table 3.3: Existing Structures Inventory

Bridge No.	056B00482N	056B00094N	056B00418N
Route	New Cut Road (KY 1865)	Outer Loop (KY 1065)	National Turnpike (KY 1020)
MP	1.230	1.400	3.620
Features Intersected	Southern Ditch	Northern Ditch	Southern Ditch
Location	0.1 mile south of south of Outer Loop (KY1065)	0.3 mile east of New Cut Road	200 feet south of Outer Loop (KY 1065)
Year Built	2003	1954 (2011 Reconstructed)	1989
Description	3-Span prestressed concrete continuous Stringer/Multi-beam or Girder	5-Span concrete Tee Beam	3-Span prestressed concrete continuous Box Beam or Girders – Single or Spread
Length (ft.)	173.0	215.0	133.0
Width (ft. Curb To Curb)	83.00	27.17	76.83
Sufficiency Rating	96.3	78.7	93.4
Last Inspection Date	3/5/2018	3/5/18	3/5/2018
Approach Roadway (ft.)	83.00	29.86	74.00
Skew (degrees)	5	45	0
Horizontal Clearance (ft.)	83.00	27.17	76.83
Structurally Deficient	No	No	No
Functionally Obsolete	No	Yes	No
Inventory Rating	50.8 Tons	44.0 Tons	48.0 Tons
Operating Rating	84.7 Tons	66.0 Tons	80.0 Tons
Posting	A: Open No Restriction	A: Open No Restriction	A: Open No Restriction
Structural Evaluation			
Deck	7	7	6
Superstructure	7	6	7
Substructure	7	6	6
Channel	7: Minor Damage	6	7
Culvert	N	N	N
Waterway	9	8	8
Condition*	Good	Fair	Fair
* Condition Descriptions Good = All Deck, Super & Substructure or Culvert ratings ≥ 7 Fair = If any Deck, Super, Substructure or Culvert ratings < 7 but > 4 Poor = If any Deck, Super, Substructure or Culvert ratings ≤ 4			

3.9 Known Utilities

Existing utilities will have notable impacts to reconstruction efforts pursued along Outer Loop. Considerable involvement with utility companies providing services in the area will be necessary. Major overhead and underground utility facilities are present on both sides of the highway along the corridor's length, including overhead electric, phone, gas, fiber optic, and underground gas, water, and sewer facilities (**Figure 3.27**).

The KYTC requested location information from surrounding utilities. Utility companies with facilities potentially impacted by future construction activities include:

- AT&T Telecommunications
- Century Link/Level 3 Telecommunications
- Louisville Gas & Electric (LG&E)
- Louisville Water Company (LWC)
- Marathon Gas
- Louisville-Jefferson County Metropolitan Sewer District (MSD)
- Spectrum (internet/cable tv/phone)
- Windstream Communications (internet/cable tv/phone)



Figure 3.27: Overhead Utilities along Outer Loop

3.10 Crash History

In 2015, KIPDA identified Outer Loop intersections with New Cut Road and National Turnpike as numbers one and nine, respectively, on the region's list of 2009–2011 *Top 40 High Crash Intersections* in Bullitt, Jefferson, and Oldham counties.

Kentucky State Police traffic collision data were collected and analyzed for the three-year period between January 1, 2014, and December 31, 2016 (**Appendix D**). During the review period, 283 crashes were reported on Outer Loop between 3rd Street Road and National Turnpike. None of the 283 crashes involved a pedestrian, bicycle, or train.

3.10.1 Crashes by Type

Crashes by type—fatality, injury, and property damage only (PDO)—are shown on **Figure 3.28**. During the three-year period, 51 injury and 229 PDO crashes were reported. Three fatal crashes occurred on Outer Loop: two near 3rd Street Road (MP 0.057 and 0.201) and one near Als Way (MP 1.136). **Figure 3.29** shows Outer Loop crash locations by type along the corridor. Crashes occurring approximately 500 feet north and south of intersecting routes are included in crash totals. The following describes each fatal crash.



Figure 3.28: Outer Loop Crashes by Type

Crashes occurring approximately 500 feet north and south of intersecting routes are included in crash totals. The following describes each fatal crash.

- 1) **Outer Loop MP 0.057 at 3rd Street Road:** This collision involved three vehicles; two of which were stopped on Outer Loop to make a left turn onto

3rd Street Road. An erratic driver came from behind, ran off the roadway and then back on, swerving before rear ending a stopped vehicle, forcing a crash chain reaction. One of the stopped vehicles crossed the opposing lane and came to rest in the ditch south of Outer Loop. The erratic driver spun around before coming to rest. According to KSP crash report, the erratic driver behavior resulted in the driver's fatality. The crash occurred in daylight AM peak hour on dry pavement.

- 2) **Outer Loop MP 0.201 east of Afterglow Drive:** A speeding driver lost control of the vehicle, struck several roadside objects, and rolled before coming to rest against a building, resulting in the driver's fatality. A passenger was injured in the single vehicle crash occurring in dark conditions on dry pavement.
- 3) **Outer Loop MP 1.136 near Als Way:** A westbound driver struck an eastbound vehicle nearly head-on, resulting in the driver's fatality. Three passengers in the eastbound vehicle were injured in the two-vehicle crash occurring in daylight hours on dry pavement.



Figure 3.29: Outer Loop Crash Types, Including Major Intersections

3.10.2 Crashes by Manner of Collision

A breakdown of corridor crashes by manner of collision is shown on **Figure 3.30**. Rear-end (49%) and angle (26%) collisions accounted for 75% of all crashes on Outer Loop. **Figure 3.31** shows crash locations, including crashes at intersecting routes, by manner of collision.

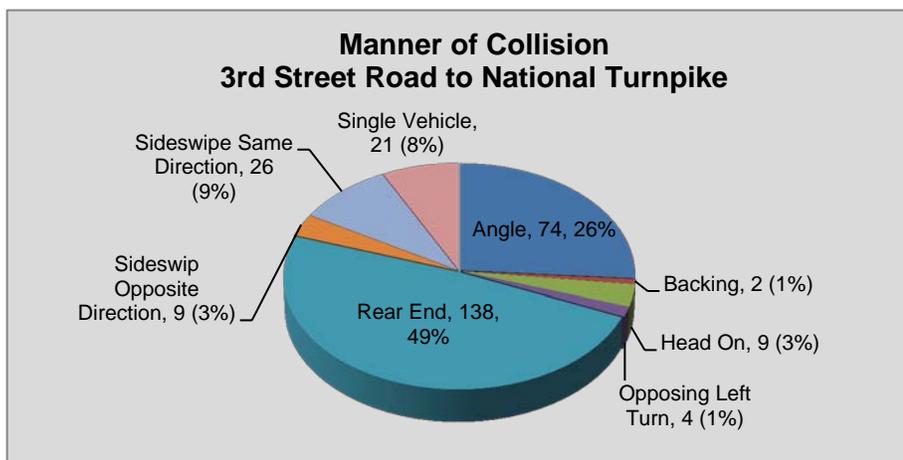


Figure 3.30: Outer Loop Crashes by Manner of Collision

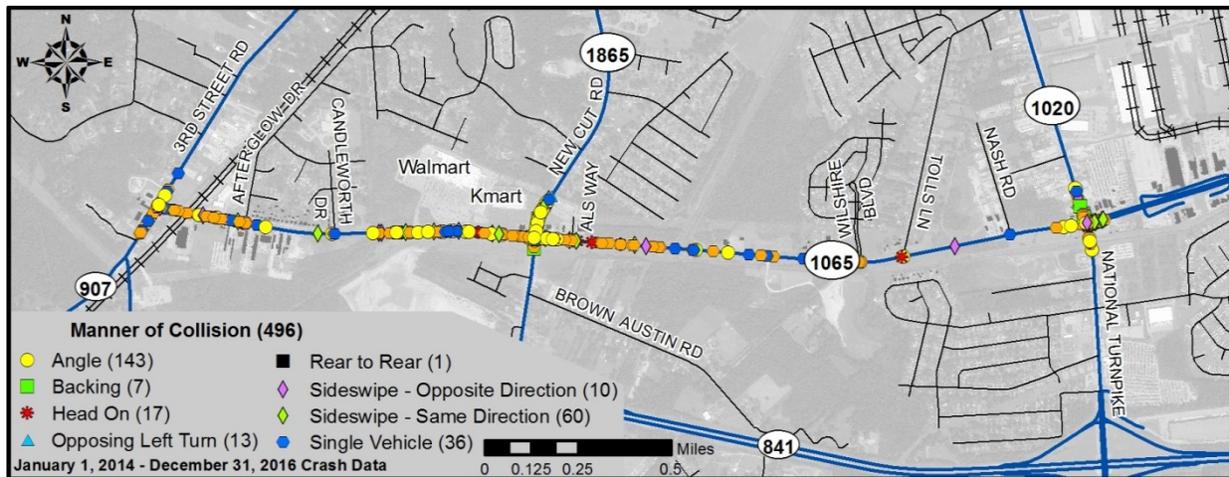


Figure 3.31: Outer Loop Crash Locations by Manner of Collision

3.10.3 Bus or Truck Crashes

Due to proximity of the Lassiter Middle School, Miller Transportation, and truck traffic, the KYTC requested crashes by vehicle type. Of the 283 total crashes on Outer Loop, 12 involved buses or trucks. **Figure 3.32** shows these crash locations.



Figure 3.32: Crashes by Vehicle Type other than Passenger Vehicles

3.10.4 Railroad Crashes

A total of four crashes with trains were reported, with one each in 1985, 1989, 1993, and 2003; however, none occurred during the crash history timeframe. A recent crash occurred June 29, 2017, during dark conditions, by a motorist traveling 20 MPH. The driver drove around the safety gate; no injuries were reported.

3.10.5 Intersection Crashes

Crashes at three major intersections were identified and analyzed. Rear-end and angle crashes continued to be predominant collisions, likely resulting from stop and go vehicle movements influenced by closely spaced driveways along Outer Loop and intersecting routes. **Figure 3.33** illustrates the manner of collisions at 3rd Street Road, New Cut Road, and National Turnpike intersections. Specific intersection issues related to 0.1-mile high crash spots and closely spaced driveways are discussed in Section 3.11.

- **3rd Street Road intersection:** Rear end (31) and angle (6) crashes accounted for 37 of 51 collisions.
- **New Cut Road intersection:** Rear end (72) and angle (74) crashes accounted for 146 of 207 collisions.
- **National Turnpike intersection:** Rear end (63) and angle (43) crashes accounted for 106 of 152 collisions.

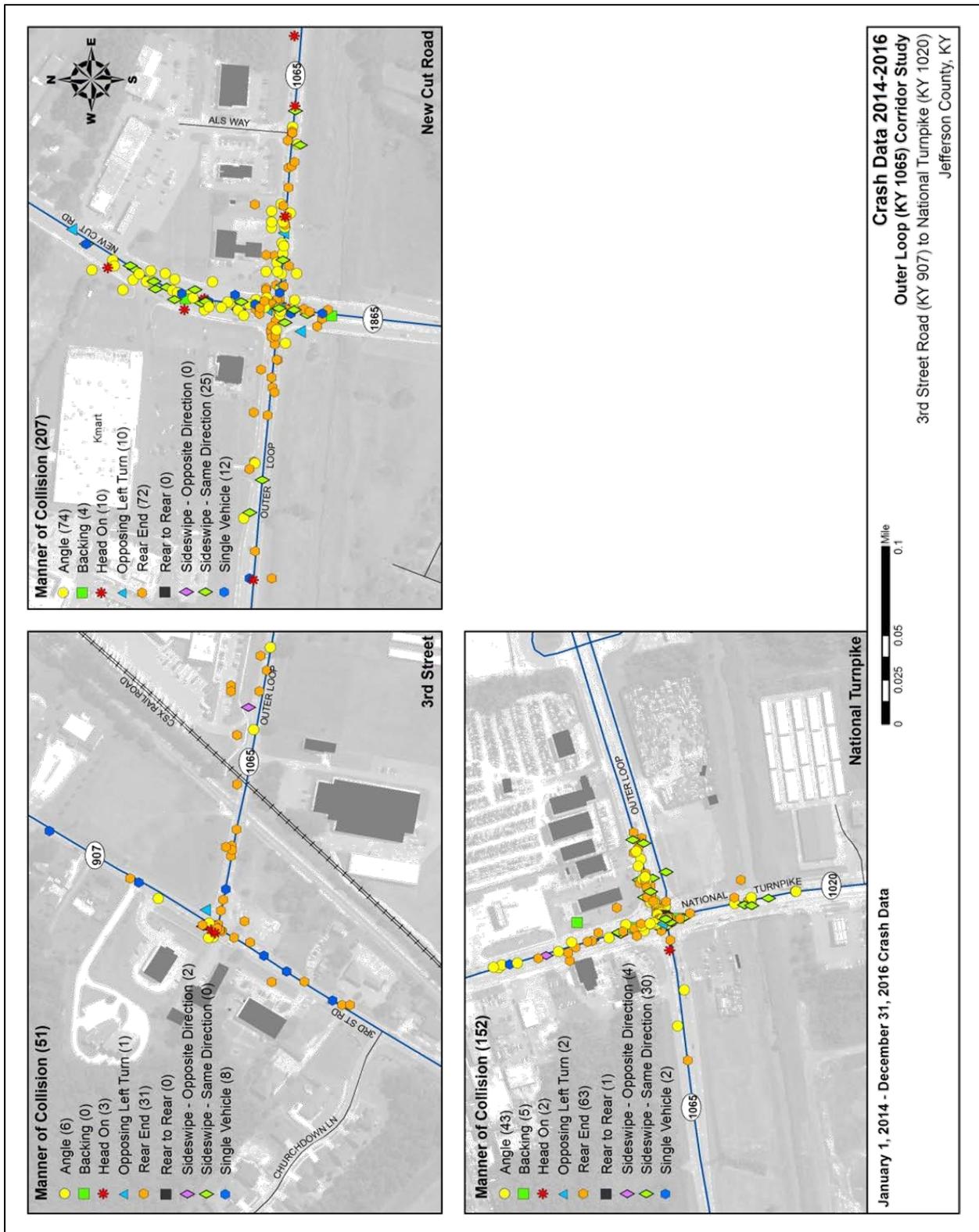


Figure 3.33: Intersection Crashes by Manner of Collision

3.10.6 High Crash Segments

The KYTC uses a systematic procedure to identify locations having high crash rates. The actual number of crashes, as obtained from the KYOPS database, occurring within a roadway segment is used to calculate the Actual Crash Rate using the number of crashes, roadway length, Annual Average Daily Traffic (AADT), and the number of years for which crash data is being examined. Using an analysis procedure from the Kentucky Transportation Center and referenced in *The Analysis of Traffic Crash Data in Kentucky (2012-2016)*, Actual Crash Rates are compared to the Critical Crash Rate for similar types of Kentucky roadways.

Two high crash segments along the corridor are identified in **Figure 3.34**. More than 65% (182) of 283 crashes on Outer Loop occurred along the segment from 3rd Street Road (MP 0.000) to New Cut Road (MP 1.029). Of the 182 crashes, 147 were PDO, 32 were injury, and three were fatalities. The additional 60 crashes located east of National Turnpike define the second high crash segment along the corridor.

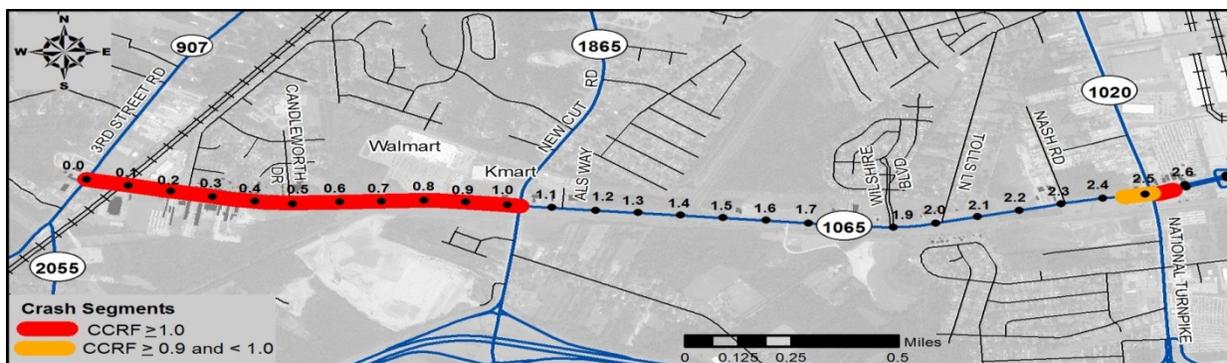


Figure 3.34: Outer Loop High Crash Segments

3.10.7 0.1-Mile High Crash Spots

Five high crash 0.1-mile spots (**Figure 3.35**) were identified with critical crash rate factors (CCRF¹⁰) greater than 1.0 and listed in **Table 3.4**.

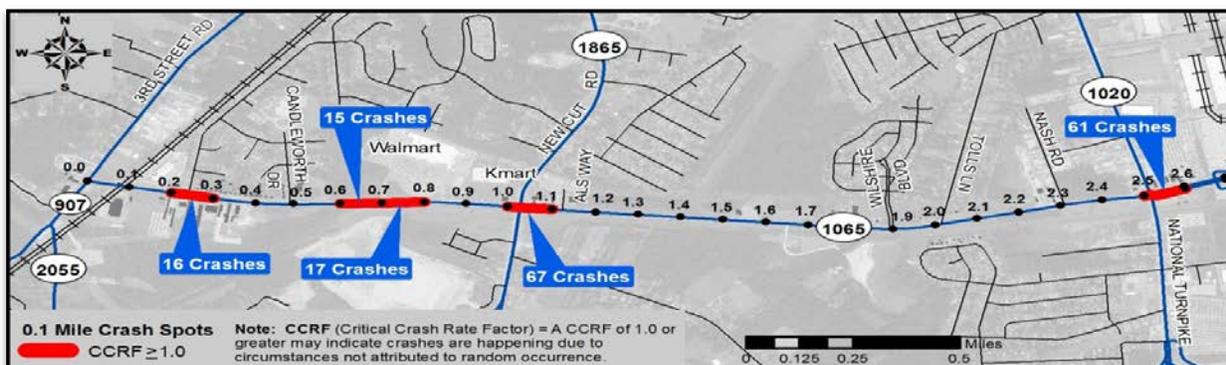


Figure 3.35: Outer Loop 0.1-Mile High Crash Spots

¹⁰ The Critical Crash Rate is the rate which is greater statistically 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). Thus, a CCRF greater than 1.0 indicates crashes may be occurring more often than can be attributed to random occurrence. This procedure is used as a screening technique indicating locations where further analysis may be needed. It is not a definitive statement or a measurement of a crash problem.

Table 3.4: 0.1-Mile Outer Loop High Crash Spot Locations and Officer Comment Summary

Begin MP	End MP	Fatal	Injury	PDO	Total	Critical Crash Rate Factor	Summary
0.2 West of Afterglow Drive	0.3 East of Afterglow Drive	1	5	10	16	1.14	9 of 13 rear ends (8 at Afterglow Dr.) 3 Ran off road (1 fatality) 3 Failure to yield to r/w 1 Collision due to emergency vehicle
0.6 Walmart West Entrance	0.7	0	2	13	15	1.07	6 rear ends including 18 units 1 Failure to yield from Walmart 3 Left turns in front of 2 Sideswipe
0.7	0.8 Walmart East Entrance	0	4	13	17	1.21	5 Left from Walmart 7 Rear End 1 Left from Kmart 1 Ran off Road on cell phone 1 Deer
1.0 West of New Cut Road	1.1 East of New Cut Road	0	11	56	67	4.68	26 Rear Ends 6 Turns out of Circle K 5 Left turns from gas station (1 Shell) 5 Failure to yield green/flashing yellow 5 Ran Red light 3 Left turns from Business 4 Left turns from Private Drive 3 Left turns (1 waived out)
2.5 West of National Turnpike	2.6 East of National Turnpike	0	5	56	61	1.92	26 rear end 11 switching lanes 8 Thorntons gas station turning left Other - used center median to pass and reach left turn lane.

As shown in the summary column of **Table 3.4**, left turn crashes played major roles in four of five identified high crash locations, and rear end crashes were factors in all five. Access points located too close to New Cut Road and National Turnpike intersections contributed to crashes involving motorists turning left into and out of businesses, private drives, and Thorntons and Circle K gas stations.

3.11 Access Management

Access management is the act of controlling location, spacing, design, and operation of driveways, median openings, interchanges and street connections¹¹. Its purpose is to balance mobility and access. Studies show that implementing access management can provide three major benefits: increased roadway capacity, reduced crashes, and shortened travel time for motorists. Thirty-seven access points are located along Outer Loop from 3rd Street Road to National Turnpike, many concentrated at major intersections. When vehicles make turns at driveways, conflicts such as crossing, merging, diverging, etc., often lead to increased crashes. High access density, particularly at intersections, is expected to produce left turn and rear end collisions. This can be seen at major intersections along Outer Loop. It is important to provide adequate distance between intersection corners and first access points to effectively separate conflict points and reduce crashes and long vehicle delays. The following summarizes existing access issues along the corridor:

- 3rd Street Road has one business directly across from Outer Loop without a signal overhead within the intersection proper. In addition, a vacant lot currently for sale has four entrances, two on Outer Loop and two on 3rd Street Road which are less than 100 feet from the intersection and within the influence area.
- Outer Loop from MP 0.180 and MP 0.380 has 12 entrances within 1,050 feet (**Figure 3.36**). However, crash history did not yield a high crash spot at this location.

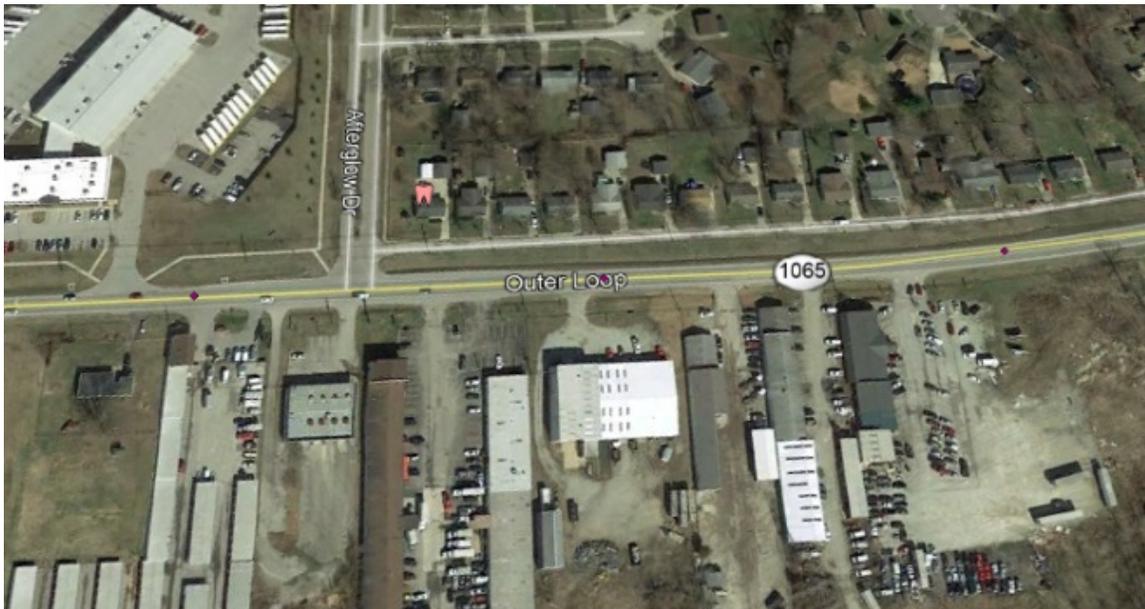


Figure 3.36: Outer Loop Between MPs 0.180 and 0.380

¹¹ Transportation Research Board (TRB) 2014 Access Management Manual and the FHWA.

- Circle K located in the northeast corner of the Outer Loop/New Cut Road intersection has two entrances less than 100 feet to the intersection proper, one on New Cut Road and the other on Outer Loop (**Figure 3.37**). Circle K entrance is an Outer Loop high crash location as shown in **Table 3.4**.
- North of Outer Loop on New Cut Road, the Old Kmart entrance is not aligned with the shopping center across the road at MP 1.330, which adds to the conflict points. Southbound motorists also use the Old Kmart entrance as a “cut through” to westbound Outer Loop. (**Figure 3.37, blue circle**)
- Every quadrant of the Outer Loop/National Turnpike intersection has at least one entrance within the influence area of the intersection (**Figure 3.37**). The Thorntons in the northeast corner is a high crash spot identified in Table 3.4.



Figure 3.37: Outer Loop Intersections with New Cut Road (left) and National Turnpike Intersection (right)

4.0 TRAFFIC ANALYSIS – EXISTING (2017) AND NO BUILD (2035)

Qk4, Inc. (Qk4) coordinated with KIPDA on travel demand modeling and traffic analysis for this study. The June 2017 *Traffic Forecast and Model Amendment Study (Appendix E)* prepared by Qk4 contains traffic volumes, forecasts, and existing and future traffic operations analyses. VISSIM software was used to develop microscopic, multi-modal traffic simulation models.

4.1 2017 Turn Movements

Miovision technologies, data collection through video and mobile devices, captured 24-hour multi-modal turning movement counts (TMCs) at five intersections (**Figure 4.1**), and travel time speed data as motorists traveled through the corridor. The AM and PM peak hours were found to occur at 7:00–8:00 AM and 5:00–6:00 PM. Directional counts were used to establish 2017 AADT volumes ranging between 13,500–17,600 vehicles per day (vpd) from 3rd Street Road to New Cut Road; 14,000–14,800 vpd from New Cut Road to National Turnpike, and 28,300–29,000 vpd from National Turnpike eastward. Truck percentages range from 4.0% (540 to 700 trucks) west of National Turnpike to 8.0% (2,270 to 2,320 trucks) east of National Turnpike. Though outside the study area, turning movements were captured at the Outer Loop/Air Commerce Drive intersection. The information was used to determine potential impacts of substantial growth in the area and a proposed Gene Snyder Freeway interchange near Air Commerce Drive on Outer Loop traffic. The information also verified acceptable operations of westbound dual left turn lanes on Outer Loop at Air Commerce Drive. Microsimulation models used in this study included Outer Loop from 3rd Street Road to Grade Lane.



Figure 4.1: Five Intersections with Turning Movement Counts

4.2 Traffic Operations Performance Measures

Traffic conditions for two-lane roadways are typically described using traffic volumes, volume to capacity (v/c) ratios, percent time spent following (PTSF), average travel speeds (ATS), Level of Service (LOS), queue lengths, and travel times.

V/c ratios compare traffic volume (v) to a roadway's theoretical capacity (c). In urban areas, v/c ratios less than 0.85 generally indicate available capacity, insignificant queue lengths, and minimal delays. V/c ratios greater than 1.0 indicate congestion, excessive delay, and significant queuing. Level of Service (LOS) is a qualitative measure used to evaluate roadway or intersection congestion (**Figure 4.2**). LOS D or better is generally considered acceptable in urban areas.

Outer Loop was analyzed as a Class I highway using 2010 Highway Capacity Manual (HCM) classifications and methodology. Class I highways function as primary connectors of major traffic generators where motorists expect to travel at high speeds and serve as daily commuter routes. LOS criteria for Class I two-lane highways are measured by ATS and PTSF. All capacity analyses used current Highway Capacity Software (HCS).

LEVEL OF SERVICE	INTERSECTION		ROADWAY	
	<ul style="list-style-type: none"> Highly stable with little or no congestion. <p>Delay: <10 seconds/vehicle</p>			<ul style="list-style-type: none"> Free traffic flow with few restrictions on maneuverability or speed. Highest Quality of Service <p>NO DELAYS</p>
	<ul style="list-style-type: none"> Stable, free-flow condition with little congestion. <p>Delay: 10 to 20 seconds/vehicle</p>			<ul style="list-style-type: none"> Stable traffic flow. Speed becoming slightly restricted. Low restriction on maneuverability. <p>NO DELAYS</p>
	<ul style="list-style-type: none"> Moderate congestion. <p>DELAY: 20 to 35 seconds/vehicle</p>			<ul style="list-style-type: none"> Stable traffic flow, but less freedom to select speed. <p>MINIMAL DELAYS</p>
	<ul style="list-style-type: none"> Approaching unstable condition with increasing congestion. <p>DELAY: 35 to 55 seconds/vehicle</p>			<ul style="list-style-type: none"> Traffic flow becoming unstable. Speeds subject to sudden change. <p>MINIMAL DELAYS</p>
	<ul style="list-style-type: none"> Unstable, congested condition. <p>DELAY: 55 to 80 seconds/vehicle</p>			<ul style="list-style-type: none"> Unstable traffic flow. Speeds change quickly and maneuverability is low. <p>SIGNIFICANT DELAYS</p>
	<ul style="list-style-type: none"> Stop and go. <p>DELAY: >80 seconds/vehicle</p>			<ul style="list-style-type: none"> Heavily congested traffic. Demand exceeds capacity and speeds are drastically reduced. <p>CONSIDERABLE DELAYS</p>

Figure 4.2: Level of Service Illustrated

4.3 2017 Existing Traffic Operations

Figure 4.4 (p.37), summarizes 2017 AM and PM peak hour traffic conditions along the corridor (LOS, turn movements, ADT, percent trucks).

4.3.1 2017 Outer Loop Mainline Analysis

Current year 2017 mainline traffic analysis (**Table 4.1**) suggests Outer Loop peak hour operations from 3rd Street Road to New Cut Road average LOS E: improving to LOS D from New Cut Road to National Turnpike in AM and worsening to a consistent LOS E in PM. ATS range from 30.5 to 34.9 MPH in the 45 MPH speed zone and from 42.5 to 46.9 mph in the 55 mph zone. Drivers experience 74.9% to 88.5% time spent following other vehicles. However, using the two-lane and multi-lane highway modules in the Highway Capacity Software, no Outer Loop segment has a v/c ratio higher than 0.61¹². Outside the study area, the existing four-lane segment east of National Turnpike to Grade Lane operates at an acceptable LOS B with a 50 mph ATS, v/c ratios of 0.30 to 0.47, and low traffic density ranging from 11.4 to 17.7.

Table 4.1: 2017 Existing Mainline Traffic Analysis

Segment Description		2017 EXISTING			
		3rd Street Road to Walmart Signalized West Entrance	Walmart Signalized West Entrance to New Cut Road	New Cut Road to National Turnpike	National Turnpike to Grade Lane
LOS	AM	E	E	D	B
	PM	E	E	E	B
PTSF/ Density	AM	81.2	80.8	74.9	11.4
	PM	85.8	86	88.5	17.7
ATS (mph)	AM	32.2	34.9	37.1	-
	PM	30.5	33.7	32.7	-
v/c ratio	AM	0.47	0.45	0.34	0.3
	PM	0.55	0.57	0.61	0.47
AADT (vpd)		14,800	14,000-17,600	14,800	29,000
Speed Limit (mph)		45		55	
Number of Lanes		2			4

LOS = Level of Service

ATS = Average Travel Speed

PTSF = Percent Time Spent Following

v/c ratio - volume to capacity ratio

ADT = Average Daily Traffic (vehicles per day)

Density = Multilane Highways—passenger cars per mile per lane

4.3.2 2017 Travel Times

Travel times, intersection queue lengths, and average travel speeds on Outer Loop were determined using Miovision data gathering technology and verified with field inspections. Notably, few trips were made through the entire corridor from 3rd Street Road to National Turnpike; most exited Outer Loop on an intersecting roadway. Peak hour travel times were determined to be between five and six minutes in both directions during AM, lengthening to between seven and nine minutes in PM, at four intersections (**Figure 4.3**). Cumulative peak hour travel times and number of trips used to calculate the travel times are shown in **Table 4.2**.

¹² The existing signals are spaced too far apart to analyze Outer Loop as an arterial street; therefore, the ratio does not take into account the available green time at major intersections New Cut Road and National Turnpike. Due to the limitations of HCS, a VISSIM traffic simulation was used to analyze the corridor and to obtain comparable travel times.

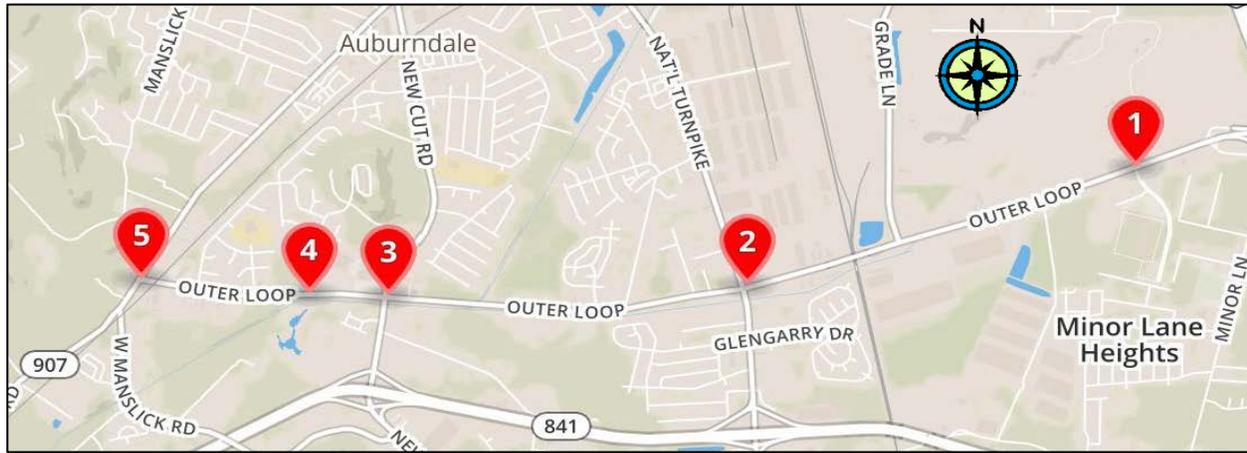


Figure 4.3: Intersections with Peak Hour Travel Times

Table 4.2: AM and PM Peak Travel Times

AM Peak Hour 7-8 PM Peak Hour 5-6		Cumulative Peak Hour Travel Time in minutes:seconds (Cumulative Number of Trips)			
Point	Intersection	AM		PM	
		EB	WB	EB	WB
5	3rd Street Road	0:00 (0)	5:01 (105)	0:00 (0)	7:20 (246)
4	Walmart Signalized West Entrance	0:57 (35)	3:32 (69)	1:41 (87)	5:10 (168)
3	New Cut Road	2:48 (96)	2:37 (29)	5:16 (155)	3:59 (103)
2	National Turnpike	5:25 (134)	0:00 (0)	8:46 (206)	0:00 (0)

Point 1 in Figure 4.3 was not included in the above travel times because it is outside the study area.

4.3.3 2017 Existing Intersection Traffic Operations

A driver’s experience crossing an intersection is quantified by a number of performance measures used in capacity analysis, including LOS and travel delay. Delay, a measure of excess time to travel through an intersection, directly affects the driver’s experience.

Year 2017 traffic analysis on Outer Loop (Table 4.3 and Figure 4.4) shows acceptable AM peak traffic operations at seven of eight intersections. National Turnpike operates at LOS E. Conditions worsen in PM peak hours, with two Outer Loop intersections (New Cut Road and National Turnpike) and the New Cut Road/Old Kmart Entrance operating at LOS E or F. Of particular concern is the travel delay (92 seconds per vehicle [sec/veh]) at National Turnpike. From field observations, the westbound approaches to New Cut Road and National Turnpike back up 1,650 and 2,190 feet, respectively, in the PM peak hour.

Table 4.3: Intersection Traffic Analysis

Intersection	Delay (sec/veh)		LOS	
	AM	PM	AM	PM
3rd Street Road	18.0	27.0	B	C
Walmart Signalized West Entrance	7.1	13.8	A	B
Walmart East Entrance	14.8	30.0	SB - B	SB - D
New Cut Road/Old Kmart Entrance	23.5	46.3	EB - C	EB - E
New Cut Road	46.9	65.4	D	E
National Turnpike	55.1	91.9	E	F
Grade Lane	5.3	12.4	A	B
Air Commerce Drive	34.9	22.3	C	C

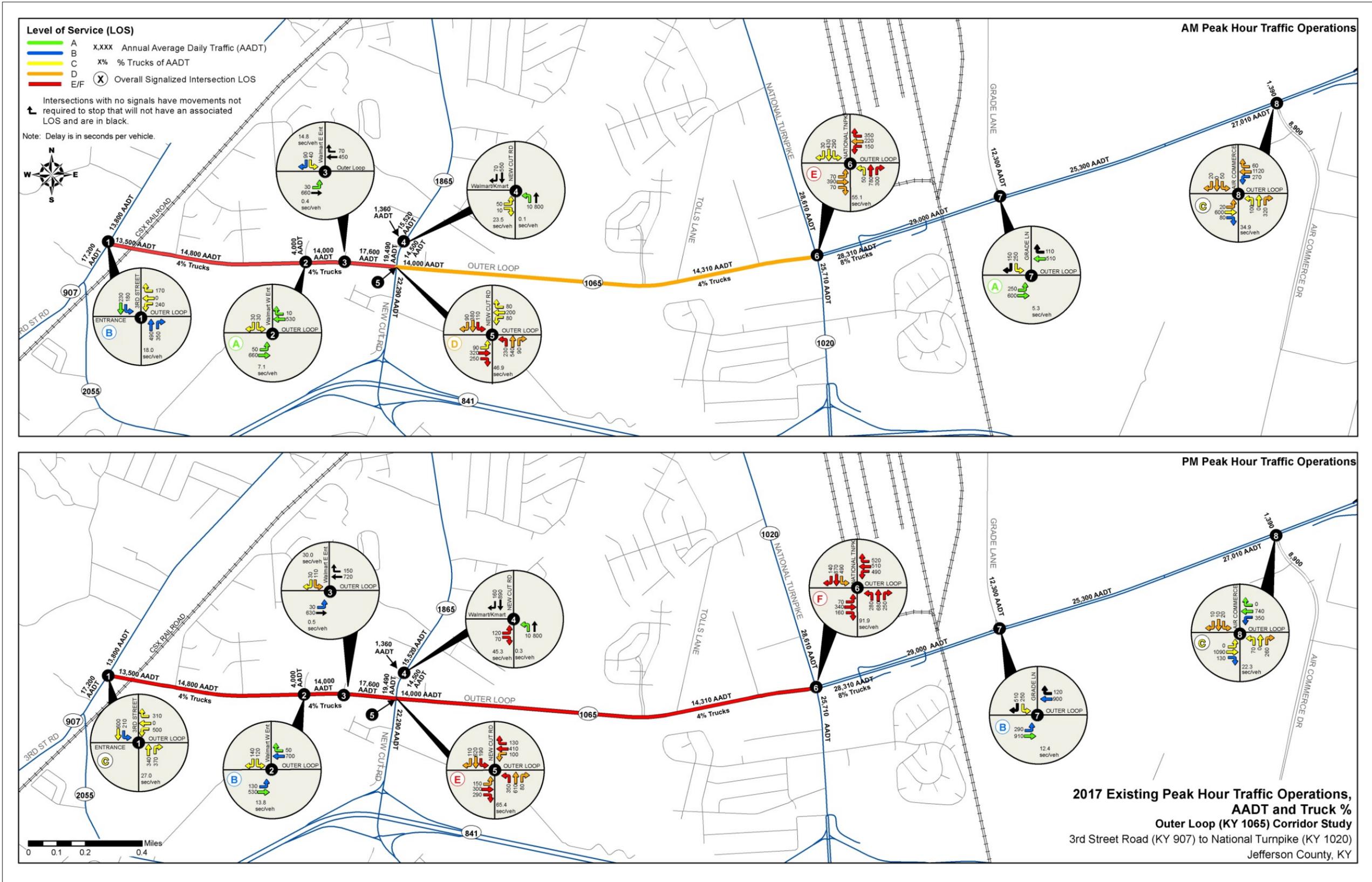


Figure 4.4: 2017 Existing Peak Hour Traffic Operations

4.4 2035 No Build Traffic Operations

Design year 2035 No Build traffic conditions are graphically shown on **Figure 4.5** and compared to 2017 operations in **Table 4.4**. The 2035 No Build traffic volumes were calculated using KIPDA’s 2007 Regional Travel Demand Model (RTDM), adjusted for expected growth and more recent traffic counts. Using 2035 design year growth and supported by information in the following traffic sections, it was concluded that future traffic operations will show minimal-to-no change from existing 2017 operations.

4.4.1 2035 Design Year Growth

Negligible residential population change is forecasted in KIPDA’s 2007 RTDM; however, study area workforce populations are forecasted to grow by 5,000 workers between years 2007 and 2035. This calculation is supported by warehouse expansions totaling 3,000,000 square feet since 2016 in the Renaissance Zone.

New warehouses near the intersection of Outer Loop and New Cut Road will not be expected to substantially increase future traffic on Outer Loop since the only access to the warehouses is restricted to New Cut Road due to the presence of Southern Ditch. No access will be provided via Outer Loop. Furthermore, four conservation sites in the study area cannot be developed and are assumed to generate no additional traffic.

Historical traffic counts and travel demand forecasts included in the 2007 RTDM indicate flat to negative growth in the corridor. Design year 2035 analysis shows approximately 5% more trips generated than in 2017. The project team met with the Louisville International Airport Authority (LIA) and Louisville Metro Planning (LMP) staff to validate expected growth assumptions.

4.4.2 2035 No Build Mainline Traffic Operations

Table 4.4 summarizes mainline capacity analyses and shows minimal-to-no change between 2017 and 2035 traffic operations.

Table 4.4: 2017 Existing and 2035 No Build Mainline Operations

Segment Description		3rd Street Road to Walmart Signalized West Entrance		Walmart Signalized West Entrance to New Cut Road		New Cut Road to National Turnpike		National Turnpike to Grade Lane	
		2017 EX	2035 NB	2017 EX	2035 NB	2017 EX	2035 NB	2017 EX	2035 NB
LOS	AM	E	E	E	E	D	D	B	B
	PM	E	E	E	E	E	E	B	B
PTSF/ Density	AM	81.2	81.9	80.8	80.8	74.9	74.9	11.4	11.4
	PM	85.8	85.8	86	86	88.5	88.5	17.7	17.7
ATS (mph)	AM	32.2	31.6	34.9	34.9	37.1	46.9	-	-
	PM	30.5	30.5	33.7	33.7	32.7	42.5	-	-
v/c ratio	AM	0.47	0.47	0.45	0.45	0.34	0.34	0.3	0.29
	PM	0.55	0.55	0.57	0.57	0.61	0.61	0.47	0.45
AADT (vpd)		14,800	15,500	14,000 - 17,600	17,200	14,800	14,800	29,000	31,000
Speed Limit (mph)		45				55			
Number of Lanes		2				4			

LOS = Level of Service

PTSF = Percent Time Spent Following

ADT = Average Daily Traffic (vehicles per day)

ATS = Average Travel Speed

v/c ratio = volume to capacity ratio

Density = Multilane Highways—passenger cars per mile per lane

NB = No Build

EX = Existing

4.4.3 2035 No Build Intersection Operations

Eight intersections were analyzed for 2035 design year traffic operations, two of which (Grade Lane and Air Commerce Drive) are east of the study area. **Table 4.5** compares existing 2017 to design year 2035 traffic conditions for each intersection

Given future traffic projections, Outer Loop intersections 1, 2, 7, and 8, as defined by **Figure 4.5**, are expected to maintain acceptable LOS ranging from B to D in peak hours, with one exception: Air Commerce Drive is predicted to worsen to LOS E in AM peak hours.

Future problems are expected to occur with intersections 3, 4, and 6. Traffic operations worsen to LOS E or F in 2035 with significant increases in driver delay at these intersections.

Table 4.5: 2017 Existing and 2035 No Build Intersection Traffic Operations

Intersection		3rd Street Road (1)		Walmart Signalized West Entrance (2)		Walmart East Entrance (3)		New Cut/Kmart (4)	
Year		2017	2035 NB	2017	2035 NB	2017	2035 NB	2017	2035 NB
Delay	AM	18.0	18.1	7.1	10.9	14.8	24.5	23.5	41.0
	PM	27.0	28.0	13.8	15.9	30.0	194.7	45.3	805.4
LOS	AM	B	B	A	B	SB-B	SB-C	EB-C	EB-E
	PM	C	C	B	B	SB-D	SB-F	EB-E	EB-F

Intersection		New Cut Road ¹³ (5)		National Turnpike (6)		Grade Lane (7)		Air Commerce Drive (8)	
Year		2017	2035 NB	2017	2035 NB	2017	2035 NB	2017	2035 NB
Delay	AM	46.9	32.8	55.1	90.9	5.0	7.9	34.9	61.2
	PM	65.4	52.6	91.9	154.1	12.4	33.4	22.3	25.7
LOS	AM	D	C	E	F	A	A	C	E
	PM	E	D	F	F	B	C	C	C

NB = No Build

SB = southbound

EB = eastbound

Traffic operations for Outer Loop intersections with Grade Lane and Air Commerce Drive were analyzed mainly for freight movement into the corridor and traffic simulation purposes. These intersections are located outside of the study area; therefore, they were not analyzed for improvements.

¹³ New Cut Road intersection shows improvement over the existing Level of Service because the KYTC will have constructed right turn lanes and retimed the existing signal.

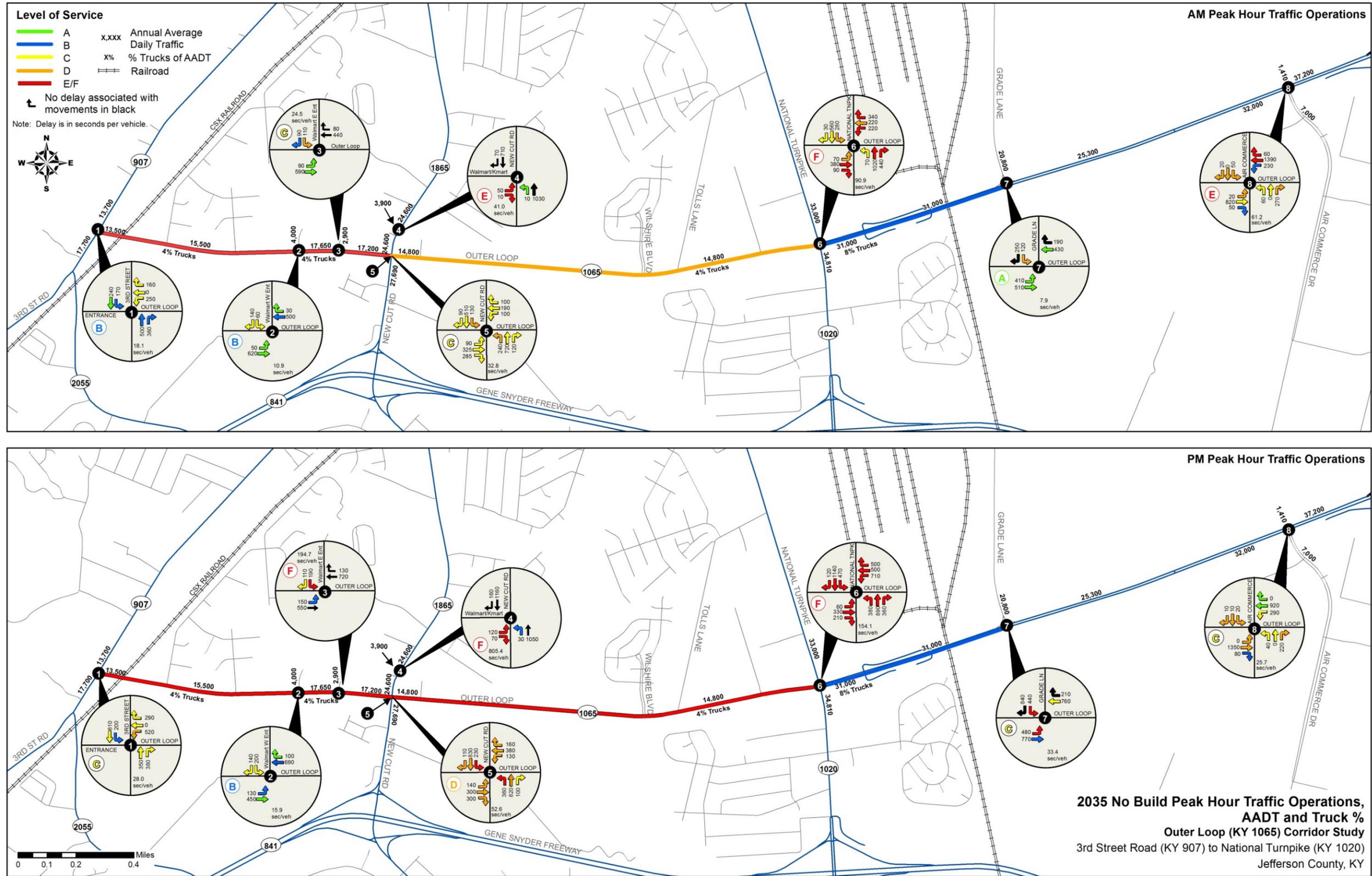


Figure 4.5: 2035 No Build Peak Hour Traffic Operations

5.0 ENVIRONMENTAL OVERVIEW

An abbreviated environmental overview was conducted to identify human and natural environmental resources in the study area. These resources were identified through literature searches, field reviews, and resource agency coordination. If projects advanced from this study receive federal funds, National Environmental Policy Act (NEPA) documentation will be required to address resources, impacts, and mitigation commitments.

The overview study area encompasses a 600-foot-wide corridor following Outer Loop between 3rd Street Road and National Turnpike, a distance of 2.514 miles. The corridor is moderately developed with commercial and industrial intermixed with residential and conservation/mitigation uses. Channelized ditches parallel the roadway to the south. Ecological, historic, and archaeological overviews are in **Appendix F**.

5.1 Natural Environment

Streams, wetlands, floodplains, geological features, and threatened and endangered species comprise the natural resources summarized in the following sections.

5.1.1 Ecological Resources

A review of available mapping and field reconnaissance identified potential ecological resources. Those resources are listed in **Table 5.1** and illustrated on **Figure 5.1**. Streams include Northern and Southern ditches and Wilson Creek, located primarily south of the existing roadway. Four unnamed intermittent streams and seven wetlands were also identified.

Table 5.1: Ecological Resources

Resource	Quantity	Unit
Potential wetlands	18	acres
Potential streams*	12,980	linear feet of perennial and intermittent streams
Federal Emergency Management Agency (FEMA) floodplain	100	acres
Indiana bat (<i>Myotis sodalis</i>) and northern long-eared bat (<i>Myotis septentrionalis</i>) summer habitat	33	acres

* Louisville/Jefferson County Information Consortium (LOJIC) mapping identifies Northern Ditch, Southern Ditch, and Wilson Creek as protected waterways.

5.1.2 100 Year Floodplain

As shown in the top half of **Figure 5.1**, according to Flood Insurance Rate Maps (FIRM), existing plans and an Outer Loop generated profile, over 1.6 miles of Outer Loop appears within the 100-year floodplain and are prone to flooding. Based on drainage analysis and more detailed design beyond the scope of this study, any improvements may necessitate elevating the roadway out of the 100-year floodplain. In subsequent phases, the 100-year floodplain may be impacted; therefore, floodplain mitigation may be required for fill placed within the local 100-year floodplain at a 1.5:1 ratio. Credits can be purchased from the Water Resources, LLC, basin.

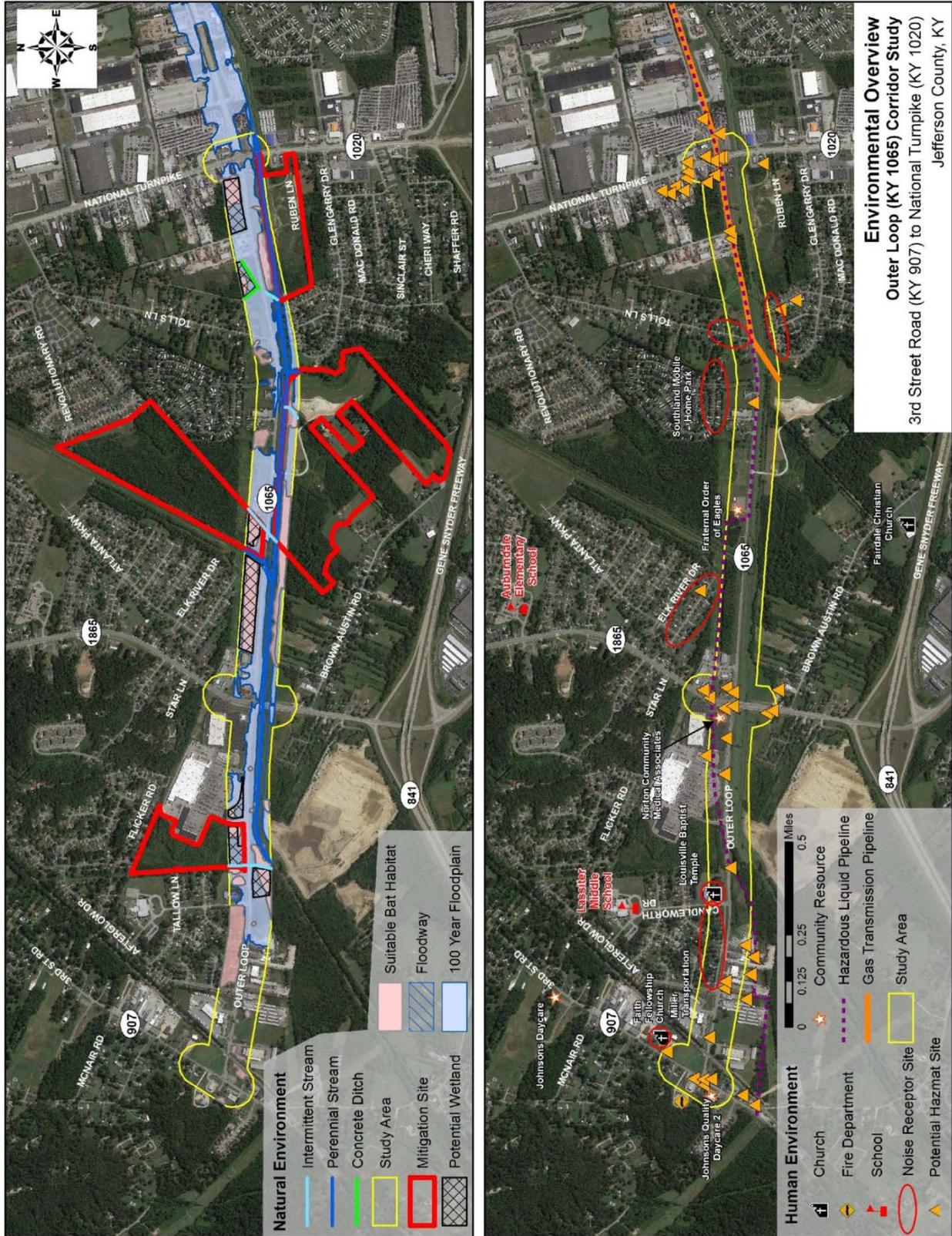


Figure 5.1: Environmental Overview

5.1.3 Threatened and Endangered Species

In addition to a windshield survey, federally listed species occurrence databases maintained by the U.S. Fish and Wildlife Service (USFWS), the Kentucky Department of Fish and Wildlife Resources (KDFWR), and the Kentucky State Nature Preserves Commission (KSNPC) were reviewed. Data requests were submitted to the KSNPC and the KDFWR. USFWS's Information for Planning and Conservation (IPaC) website was used to obtain an official list of species.

Federally listed species of primary concern for this project are the Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) because potential summer habitat for both species is present in the study area (**Table 5.2**). A third protected bat species, as well as several protected mussels, plants, birds, and an insect, are also known to occur in Jefferson County; however, suitable habitat is not present in the project area.

Mature wooded areas potentially providing suitable summer habitat for roosting, foraging, and commuting for Indiana and northern long-eared bats were documented through review of the National Land Cover Database and aerial photographs. Suitable habitat in the project vicinity totals 33.0 acres. The project is located at the northern edge of Known Summer 1¹⁴ habitat for northern long-eared bats. Review of mine maps, topographic quadrangle maps, and geological maps did not identify any underground or surface mines in the vicinity. The entire study corridor is classified as non-karst.

Table 5.2: Federally Listed Species of Primary Concern

Species	Common Name	Status	Habitat Present	Listing Agency
Mammals				
<i>Myotis sodalis</i>	Indiana bat	Endangered	Yes	USFWS
<i>Myotis septentrionalis</i>	northern long-eared bat	Threatened*	Yes	USFWS, KDFWR

*Threatened, with 4(d) rule, which allows USFWS to focus on protections necessary/advisable to conserve species listed as "threatened."

5.1.4 Prime Farmland

According to the U.S. Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS) web soil survey, most of the study area (**Figure 5.2**) is composed of urban land not suitable for agricultural use. A small area along Wilson Creek qualifies as prime farmland if irrigated.

¹⁴ Source: USA Topographic Map - Louisville East, Louisville West, And Valley Station Quadrangles; USFWS Kentucky Field Office - Indiana and Northern Long-eared Bat Habitat (2016).



Figure 5.2: Prime Farmland per USDA—NRCS Classification

5.1.5 Geotechnical Overview

The Geotechnical Overview in **Appendix G** contains results of site and mapping reconnaissance in the project area. The report describes site conditions and near-surface geology, and also details potential design recommendations.

The study area is in Kentucky's Outer Bluegrass Physiographic Region, with topography characterized by broad, gently sloping ridgetops, moderately sloping to steep side slopes, and moderately wide to narrow floodplains. Topographic mapping shows relief ranging from 455 feet in the east to approximately 480 feet near the 3rd Street Road intersection. Soils that underlie the study area are anticipated to consist largely of clayey silts with excessive moisture content.

A means of soil stabilization, such as granular embankment or chemical stabilization, will likely be required to provide a suitable platform for additional fill placement and to support new construction. Manipulation and drying of subgrade soils will likely be required during construction to provide adequate compaction.

5.2 Human Environment

The human environment is often defined as the “built” environment or can be described as what we live in, around and have built. Built environment resources are discussed in the following sections.

5.2.1 Land Use

The study corridor is located in a developed area of Jefferson County dominated by roads, utility easements, and major drainage ditches. Residential and commercial developments with maintained lawns and wooded areas are prevalent. A CSX rail line crosses Outer Loop near the project's western terminus. **Figure 5.3** shows representative views along the corridor. Zoning in **Figure 5.4** includes Residential Single Family (R4 and R5), Industrial (M2), and Commercial (C1 and C2). Outer Loop provides access to Lassiter Middle School, which is located north of the corridor along Candleworth Drive and serves 900 students.

A permit was filed in August 2017 to construct a 5,500-square-foot, mixed-use development on the south side of Outer Loop between 3rd Street Road and Afterglow Drive.



Figure 5.3: Representative Views along Outer Loop

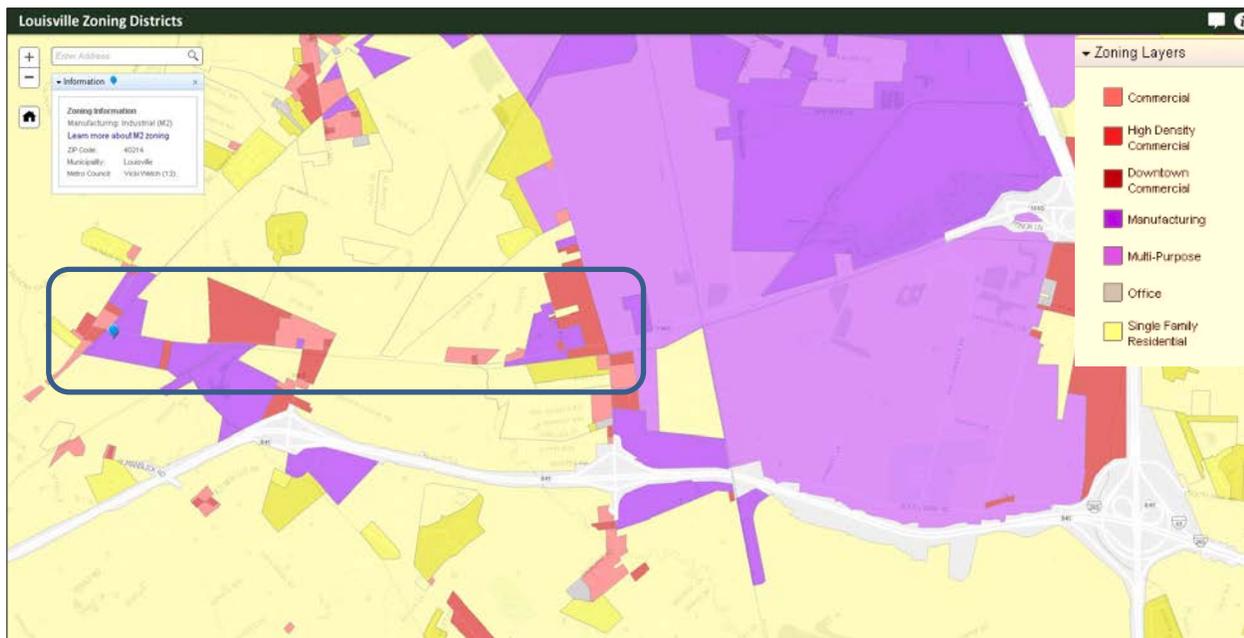


Figure 5.4: Louisville Zoning Districts

Source: LOJIC

As shown in Section 2.3, east of the study corridor, the Louisville Renaissance Zone Corporation is developing a large area promoting airport-compatible redevelopment. The development includes the 750-acre Renaissance South Business Park accessed from Outer Loop at Air Commerce Drive and Minors Lane. North and west of Gene Snyder Freeway and New Cut Road, new warehouses are being constructed.

5.2.2 Socioeconomic Review

The *Outer Loop/KY 1065 Socioeconomic Study (Appendix H)* was prepared by KIPDA. The report relies on the U.S. Census Bureau's 2011–2015 American Community Survey (ACS) for demographic data about the statistical areas intersecting and surrounding the study area (**Figure 5.5**) which include:

- Census Tract 91.05, Block Group (BG) 2
- Census Tract 91.06, BG 1
- Census Tract 120.02, BG 1, 2, and 3
- Census Tract 122.02, BG 4 and 5

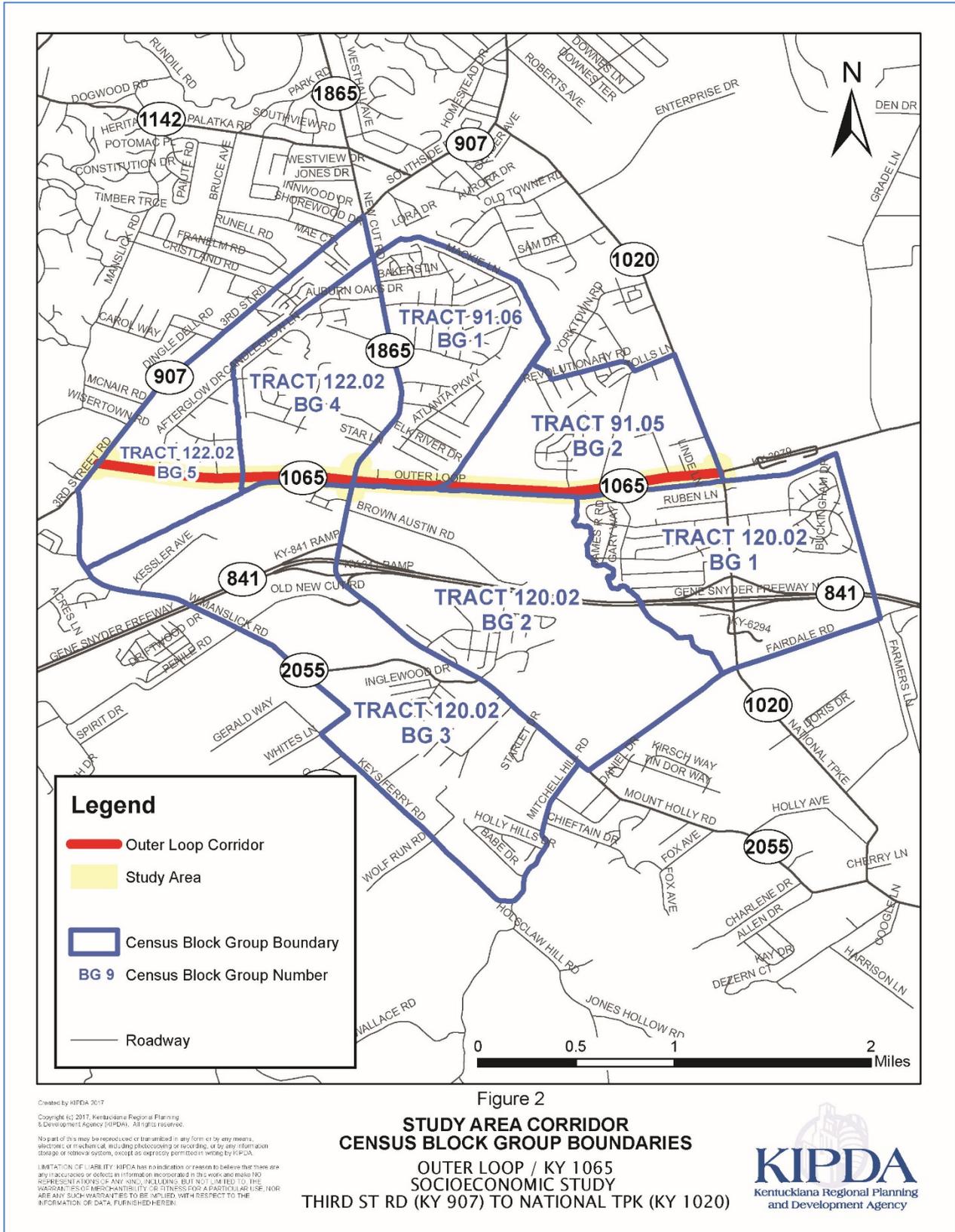


Figure 5.5: Census Data Statistical Areas

The report includes documentation of potential environmental justice populations—racial minorities and persons below poverty level.

Statistics are provided for minority, elderly, poverty status, disabled, and limited English proficiency (LEP) populations. The data are intended to identify populations that may have specific concerns/needs and require additional analysis if projects are advanced to future phases.

Three block groups have concentrations of **minority populations** exceeding the countywide average (30.5%): Tract 120.02 BG 1 (36.7%) south of Outer Loop at the eastern end of the project, Tract 122.02 BG 4 (48.7%) north of Outer Loop between Candleworth Lane and New Cut Road, and Tract 122.02 BG 5 (39.4%) at the western end of the project. These three block groups contain areas of higher density residential land use, with a large apartment complex, townhomes, and a mobile home park.

Two block groups have a concentration of persons **below poverty level** greater than the countywide average (16.4%): Tract 91.05 BG 2 (27.8%) and Tract 120.02 BG 1 (35.1%). These are located at the eastern end of the project, north and south of Outer Loop. These two areas contain Southland Mobile Home Park and Barrington Park Mobile Home Park, respectively.

The **65 years and over population** ranges by block groups from 6.8% to 15.1%, which are generally consistent with national, statewide, and countywide averages (14%). No concentrations were noted in the analysis.

Three block groups have a concentration of **persons with disabilities** greater than averages statewide (20.7%) or countywide (17.3%): Tract 91.05 BG 2 (22.9%), Tract 120.02 BG 3 (28.3%), and Tract 122.02 BG 4 (21.9%). Due to its elongated shape, the majority of residents in Tract 120.02 BG 3 are located well away from the study corridor.

Two block groups have a concentration of **zero vehicle households** greater than the countywide average (10.1%): Tract 91.05 BG 2 (14.1%) and Tract 122.02 BG 5 (23.4%).

One block group has a concentration of **persons with LEP** substantially above the countywide average (3.7%): Tract 120.02 BG 1 (23.8%). Other block groups range from 0% to 7.5%, generally comparable to national, state, and county averages.

Table 5.3 provides a summary of population and potential socioeconomic concerns for each census area. During future phases of project development, a more detailed analysis may be required for NEPA documentation, per Environmental Justice Executive Order 12898, to assess potential for adverse and disproportionate impacts to low-income and minority (i.e., environmental justice) populations.

Table 5.3: Potential Socioeconomic Concerns Based on Census Data

Census Areas	Population	Minority	Low Income	Age 65 and Older	Disability	Zero vehicle Household	Limited English
Tract 91.05 BG 2	1,600		X		X	X	
Tract 91.06 BG 1	3,263						
Tract 120.02 BG 1	2,548	X	X				X
Tract 120.02 BG 2	1,600						
Tract 120.02 BG 3	1,833				X		
Tract 122.02 BG 4	1,251	X			X		
Tract 122.02 BG 5	1,682	X				X	

5.2.3 Noise

The FHWA’s Noise Abatement Criteria (NAC) were used to identify potential noise sensitive land uses within the study area. A field review of the corridor and a review of available aerial mapping were conducted to identify noise sensitive areas that may be impacted by traffic noise associated with the proposed improvements. Typical noise sensitive receptors include residences, parks, schools, hospitals, and churches.

Based on the field review and a review of available mapping, the following noise sensitive areas were identified:

- Faith Fellowship Church
- Single-family residences adjacent to Outer Loop located in the Candleworth Drive/Afterglow Drive neighborhoods
- Louisville Baptist Temple
- Single-family residences along Appomattox Road on the north side of Outer Loop, east of New Cut Road (KY 1865)
- Southland Mobile Home Park on the north side of Outer Loop along Calumet Drive
- Single-family residences along Tolls Lane on the north side of Outer Loop
- Single-family residences along Fergusson Fife Avenue in Glengarry subdivision south of Outer Loop

Numerous cross streets and driveway openings along the corridor limit opportunities to provide noise mitigation measures in the form of noise walls. If a project is advanced from this study and receives federal funds, additional noise impact analysis may be required.

5.2.4 Air Quality

Based on the most current National Ambient Air Quality Standards (NAAQS), Jefferson County is considered a marginal nonattainment area (2015) for 8-hour Ozone (O₃). Jefferson County is in attainment for the following air quality pollutants: nitrogen dioxide (NO₂), sulfur dioxide (SO₂), lead (Pb), particulate matter PM₁₀ and Carbon Monoxide (CO). For particulate matter PM_{2.5}, Jefferson County is classified as a moderate maintenance area (1997).

The purpose of the study is to identify methods to improve safety, access, and mobility for all modes of travel on Outer Loop from 3rd Street Road to National Turnpike. Based on Kentucky carbon monoxide (CO) screening criteria, projects resulting from this study will not require a CO project-level analysis and is not expected to result in a projected violation of the 1-hour or 8-hour CO standard. As this project is not expected to have a meaningful impact on traffic volumes or vehicle mix, it is considered to be “Exempt or No Potential for Meaningful Mobile Source Air Toxics (MSAT) Effects.”

5.2.5 Hazardous Materials

Review of potential hazardous materials sites is based on the Environmental Data Resources, Inc. (EDR) DataMap Area Overview map and a limited field reconnaissance to identify additional potential sites of concern. An electronic review of applicable environmental database searches of 55 federal records, 10 state and local records, five tribal records, and two EDR proprietary records was conducted. A database search reported by EDR identified 74 potential hazardous waste sites in the study area. **Appendix I** lists these sites with the EDR map and report.

5.2.6 Historic Architectural Resources (Section 106)

Outer Loop was constructed in the mid-1950s: development was generally limited to its western terminus at 3rd Street Road and other primary intersections eastward toward the Louisville airport. Subdivisions in the vicinity include Confederate Acres (built circa 1970) to the north and Glengarry (built circa early 1960s) to the south.

A review of Kentucky Heritage Council (KHC) files identified two previously recorded historic architectural resources in the study area, both of which have since been demolished. Field surveys in August 2017 identified 15 previously unrecorded resources over 50 years old: 11 individual houses, two commercial buildings, Glengarry subdivision, and a 1940s metal truss bridge over Southern Ditch. None are recommended as eligible for the National Register of Historic Places (NRHP) due to a general lack of distinctive character-defining features and, in some cases, subsequent modifications to original structures.

NRHP eligibility assessments are based on a reconnaissance-level effort to ascertain integrity; therefore, they should be considered preliminary pending a formal, more intensive survey under Section 106 of the National Historic Preservation Act if a build alternative is advanced for construction. The overview report documenting research and reconnaissance conducted for this study is in **Appendix F**.

5.2.7 Archaeological Resources

An archaeological overview was completed to identify sites listed in or eligible for listing in the NRHP. No fieldwork was undertaken; however, background research was conducted using historic maps, USDA soil data, and Office of State Archaeology (OSA) GIS data/site files. Archaeological data obtained from the OSA identified one previously recorded archaeological site in the study area: the remains of a historic residence dating from the 1870s to the 1960s when the former residence was demolished. Six previous archaeological studies occurred wholly or partially in the study area but no other sites have been identified.

Given its low-lying, swampy nature, there is a low likelihood of encountering archaeological resources pre-dating 1840. Likewise, historic maps and data suggest limited historic development until the late twentieth century; modern development has negatively impacted soils, further reducing the probability for intact deposits. No further archaeological investigations are recommended.

5.2.8 Land and Water Conservation Fund (LWCF)—Section 6(f)

Parks using LWCF grants are afforded certain protections. A list of LWCF grants in Jefferson County is in **Appendix F**. Between records search and field reconnaissance, no Section 6(f) sites were identified in the corridor.

5.2.9 Public Parks

No public parks exist in the study area. The Fraternal Order of Eagles (F.O.E. Derby City) has a property with a picnic shelter at 201 Outer Loop.

5.2.10 Agricultural Districts and Conservation Easements

The Kentucky Division of Conservation administers the Agricultural District Program, goals of which are to protect Kentucky's best agricultural land for food and fiber production, and to prevent its conversion to nonagricultural usage. No agricultural districts exist in the study area. Land enrolled in the program cannot be annexed or condemned without mitigation, is taxed at the agricultural rate, and is eligible for deferred assessment costs when water lines are extended.

Kentucky's Farmland Preservation Program authorizes the purchase of agricultural conservation easements through the Purchase of Agricultural Conservation Easements (PACE) program to ensure lands currently in agricultural use will remain available for agriculture and not be converted to other uses. The Kentucky Department of Agriculture data located no PACE Program properties in or near the study area.

Four conservation areas have been identified within the study area (**Figure 5.1**):

- Water Resources, LLC Wetland and Stormwater Compensation Basin site
- Waste Management Wetland Mitigation sites (two properties)
- Walmart Wetland Mitigation site

6.0 INITIAL MEETINGS AND PUBLIC INVOLVEMENT

The project team held three project team meetings, two meetings with Local Officials/Stakeholders (LO/S), and two public meetings to coordinate key issues, gather input, and verify current issues and needs. This section describes initial project team meetings and public involvement that occurred as a result of these efforts. Project team members included the KYTC Central Office and District 5 staff from numerous fields, representatives from KIPDA, and the consultant team. Project team, LO/S, and public meeting minutes are in **Appendix J**.

6.1 First Project Team Meeting

The first project team meeting was held October 12, 2017, at KYTC District 5 in Louisville. The meeting objective was to discuss existing roadway, traffic, and environmental conditions; socioeconomic conditions provided by KIPDA; and future growth in the area. In addition, the draft P&N Statement was presented and revised, and plans were made for the first LO/S and public meetings.

Key discussions and decisions included:

- Right turn lane implementation at New Cut Road through the Highway Safety Improvement Program (HSIP).
- Rapidly expanding warehouses and logistic-based business developments in the area.
- Relevance of completed Outer Loop studies to the current corridor study.
- Inclusion of traffic growth east of National Turnpike, adjacent to the study area, in traffic forecasts.
- Upcoming discussion between the project team and the Transit Authority of River City (TARC) about a planned east-west transit route.
- Potential environmental justice (EJ) concerns.
- Addition of “Improve freight movement” to project goals.

6.2 First Local Officials/Stakeholders Meeting

The first LO/S meeting was held December 5, 2017, at Lassiter Middle School. The project team met with public officials and representatives of local businesses, schools, and nearby subdivision residents. The meeting objective was to review existing roadway, traffic, and environmental conditions; present and discuss the project’s P&N Statement; and gather input and feedback from the group.

Comments and concerns communicated by the LO/S included:

- Rapid Industrial Park and warehouse expansion at New Cut Road.
- Speeding on Outer Loop.
- Lack of TARC service for Industrial Park and Outer Loop.
- Pedestrian and bicycle safety.
- Eastbound motorists passing slower vehicles using the wide shoulder at Wilshire Boulevard.
- Motorists encountering oncoming vehicles that are passing slower vehicles.

- Traffic problems at the 3rd Street Road intersection, including crashes at the traffic signal and concerns/delays due to school buses stopping in the driving lane while loading and unloading students at Johnson's 2 Quality Child Care.
- Need for turn lanes at several locations along the corridor.

The LO/S were asked to complete a project survey.

6.3 First Public Meeting

Following the first LO/S meeting, an informal open house public meeting was held at Lassiter Elementary School to gather information on existing conditions and verify current issues and needs.

Approximately 60 members of the public attended and were provided a handout with the project area map, the project's purpose, location of the online survey, existing conditions, and contact information. In lieu of a formal presentation, project team members were available to answer questions as the public viewed project exhibits placed around the room. Exhibits included a simulation video of existing traffic conditions, and exhibit boards illustrating environmental resources, existing traffic operations, and crash data. No exhibits of alternatives were presented.

Each attendee was given the opportunity to complete a survey either online via iPads or using paper. The project link was also provided to those unable to attend. The survey was advertised in the Courier Journal newspaper and by Courier Journal digital display with posts linking to the KYTC's website; through Twitter; on the KYTC's Facebook and Facebook boosted advertisements, resulting in 303 completed surveys revealed 61% of respondents do not live along the corridor and 51% travel Outer Loop multiple times per day. Top items identified needing improvement were congestion/delay (93%), safety (80%) and drainage (66%).

A summary of all survey results are in **Appendix K**.

7.0 PROJECT PURPOSE AND NEED

The purpose of the Outer Loop Corridor Study (from 3rd Street Road to National Turnpike in Jefferson County) is to identify methods to improve safety, targeting two major intersections (New Cut Road and National Turnpike); and improve mobility for travelers.

7.1 Safety Need

- KIPDA identified Outer Loop intersections with New Cut Road and National Turnpike as numbers one and nine, respectively, on the region's 2011 *Top 40 High Crash Intersections* list.
- Records show 283 reported crashes along Outer Loop during 2014–2016, with five high crash spots. Current crash trends mirror KIPDA's earlier findings with concerns at the intersections with New Cut Road and National Turnpike. Additional high crash spots occur at intersections with 3rd Street Road and the signalized Walmart entrance.
- Business entrances and exits too close to the major intersections cause angle crashes as motorists attempt left turns and cross up to three lanes at New Cut Road and National Turnpike.
- Current congestion causes motorists to: (1) drive in the opposing lane to reach the short left turn lane pocket at National Turnpike, and (2) use the shoulder as a passing lane when vehicles in front stop for an opportunity to make a left turn.

7.2 Mobility Need

- New Cut Road and National Turnpike intersections operate at levels of service¹⁵ (LOS) E and F in the current year (2017).
- Measured average peak hour travel time for the corridor is between 5:01 (AM) and 8:46 (PM) (minutes: seconds), equating to 17–30 mph vehicle speeds in posted 45–55 mph speed zones.
- Vehicles traveling westbound in PM hours back up approximately 2,200 and 1,700 feet at National Turnpike and New Cut Road intersections, respectively.
- Implementing the KYTC's 2017 Highway Safety Improvement Program's (HSIP) recommendations—adding westbound and eastbound turn lanes at New Cut Road to improve congestion and safety, adjusting signal timing, and implementing access management on Outer Loop—is predicted to improve traffic operations at New Cut Road, but will result in LOS F at National Turnpike in 2035.”
- Outer Loop traffic volumes are not forecasted to grow, but New Cut Road and National Turnpike volumes would increase from 22,000 to 28,000 vpd and from 25,000 to 34,000 vpd, respectively, by 2035. Increased volumes would contribute to intersection congestion, resulting in LOS E on Outer Loop in 2035.

7.3 Project Goals to consider when seeking to address purpose and need

- Improve drainage and prevent road closures during flooding events by raising the corridor above 100-year floodplain elevation.
- Improve sidewalk conditions and connectivity to increase pedestrian safety.

¹⁵ A qualitative measure used to evaluate roadway or intersection congestion LOS range from LOS “A” (free flow, no delays—best conditions) to LOS “F” (considerable delays—worst conditions). LOS “D” (minimal delays) or better is acceptable in urban areas.

8.0 ALTERNATIVES/IMPROVEMENTS DEVELOPMENT

A range of concepts was developed based on existing conditions analysis and input received from the project team and public involvement activities. As stated in the P&N Statement, safety and mobility are the primary concerns on Outer Loop. In addition to the No Build¹⁶ option, this study examined two types of improvement concepts: (1) Long-term improvements, and (2) Short-term improvements. Both types are discussed in the following sections.

8.1 Preliminary Meeting – Alternatives/Improvements Discussion

During the initial alternative development process, a No Build alternative along with the following three long-term alternatives were considered by the project team:

1. Continuous three-lane with two-way-left-turn-lane (TWLTL)
2. Four-lane with median
3. Five-lane with TWLTL

Stakeholder information obtained through public involvement activities coupled with subsequent corridor research appeared to invalidate the original three alternative options. Project team members met on February 23, 2018, to identify revised long-term and short-term improvements for development (**Appendix J**). Two hybrid alternatives were identified in lieu of the three original, long-term alternatives.

Additional issues impacting the change to the original three alternatives include:

- Four environmental mitigation sites in the corridor prohibit future development.
- Future growth south of the corridor at New Cut Road would be severed by the Southern Ditch and have no access to Outer Loop.
- Future jobs/households within the study corridor would have minimal effect on No Build 2035 traffic volumes, increasing, at most, 400 vehicles per day.

Bicycle accommodations were considered during project team discussions, but were not included in the alternatives for two reasons: (1) low compatibility for bicycling on Outer Loop, and (2) proximity of the Louisville Loop south of the corridor.

8.2 Typical Sections

Right-of-way maximization, utility impacts, and future traffic projections were considered to determine appropriate typical sections for each alternative. The project team decided on 11-foot travel lanes and shoulders varying from four feet paved with two feet unpaved to two feet with curb and gutter. These lane and shoulder widths were used for disturb limits and earthwork. Typical sections are illustrated with the alternatives' discussion.

8.3 Long Term Mainline Build Alternatives

Each alternative begins at 3rd Street Road, MP 0.000, extending east through New Cut Road to just east of National Turnpike, MP 2.600. Design challenges that could escalate project costs

¹⁶ **No Build/Do Nothing:** The No Build/Do Nothing alternative serves as a baseline for comparison of other alternatives. This alternative indicates existing conditions would remain without new construction improvements and only future maintenance would take place.

include a plethora of utilities, restricting improvements to 100 foot width to stay within state-owned right-of-way, bridges and entrances/driveways too close to intersections, Northern and Southern ditches' proximity to the route, access management, and geotechnical considerations.

8.3.1 Alternative 1: 3-2-3 Configuration

Alternative 1 (**Figure 8.1**) widens Outer Loop to three-lanes—two lanes plus a center TWLTL—from 3rd Street Road (MP 0.000) to the existing three-lane section east of Candleworth Drive (MP 0.587). The existing three lanes continue east to Als Way (MP 1.139). The 0.517-mile section from Als Way across Outer Loop Bridge to east of F.O.E Derby City (MP 1.657) remains two lanes due to limited access points and no expected future development. Outer Loop widens to three lanes again east of F.O.E Derby City to National Turnpike (MP 2.445). Typical sections are shown in **Figure 8.2**, and **Figure 8.3** provides more Alternative 1 detail.

Alternative 1 includes the following other proposed improvements:

- Drainage improvements
- Continuous sidewalk and intersection (including a CSX railroad crossing) improvements for pedestrians
- Right turn lanes at Candleworth Drive (Lassiter Middle School), Wilshire Boulevard (Southland Mobile Home Park), and Tolls Lane
- Northbound right turn lane extension on 3rd Street Road at Outer Loop
- Extension of westbound dual left turn lanes on Outer Loop at National Turnpike
- Southbound right turn lane on National Turnpike at Outer Loop
- Northbound right turn lane on National Turnpike at Outer Loop
- Access management strategies near New Cut Road and National Turnpike intersections
- Option to raise Outer Loop above floodplain elevation



Figure 8.1: Alternative 1: 3-2-3 Configuration

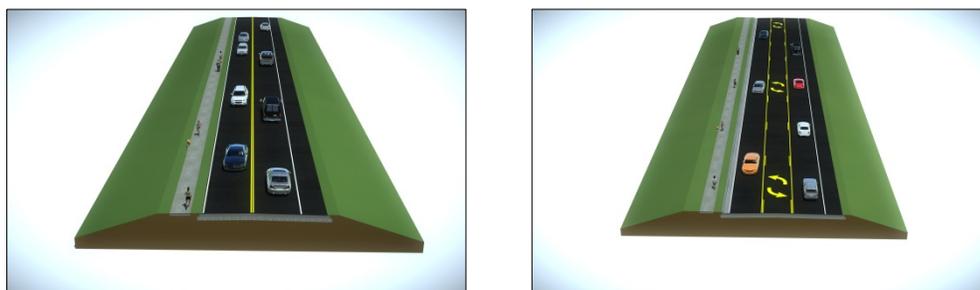


Figure 8.2: Alternative 1 Typical Sections



Figure 8.3: Alternative 1—Configuration 3-2-3 in Greater Detail

8.3.2 Alternative 2: 3-5-4-5 Configuration

Alternative 2 (Figure 8.4) widens Outer Loop to three lanes—two lanes plus a center TWLTL—from 3rd Street Road (MP 0.000) to Candleworth Drive (MP 0.481). A five-lane typical section—four lanes plus a center TWLTL—begins at Candleworth Drive and continues to Als Way (MP 1.151). The TWLTL is replaced with a median creating a four-lane typical section from Als Way across the Outer Loop Bridge to east of F.O.E. Derby City (MP 1.521), then transitioning again to the five-lane typical section east to National Turnpike (MP 2.436). Typical sections are shown in **Figure 8.5**, and Alternative 2 is shown in more detail in **Figure 8.6**.

Alternative 2 includes the following other proposed improvements:

- Drainage improvements
- Continuous sidewalk and intersection (including a CSX railroad crossing) improvements for pedestrians
- Right turn lanes at Candleworth Drive (Lassiter Middle School), Wilshire Boulevard (Southland Mobile Home Park), and Tolls Lane
- Northbound right turn lane extension on 3rd Street Road at Outer Loop
- Extension of westbound dual left turn lanes on Outer Loop at National Turnpike
- Southbound right turn lane on National Turnpike at Outer Loop
- Second through lane on Outer Loop in both directions at New Cut Road and eastbound at National Turnpike
- Outer Loop and National Turnpike bridges widening
- Northbound right turn lane on National Turnpike at Outer Loop
- Dual left turn lanes from New Cut Road and National Turnpike at Outer Loop
- Access management near New Cut Road and National Turnpike intersections
- Option to raise Outer Loop above floodplain elevation



Figure 8.4: Alternative 2—Configuration 3-5-4-5



Figure 8.5: Alternative 2 Typical Sections

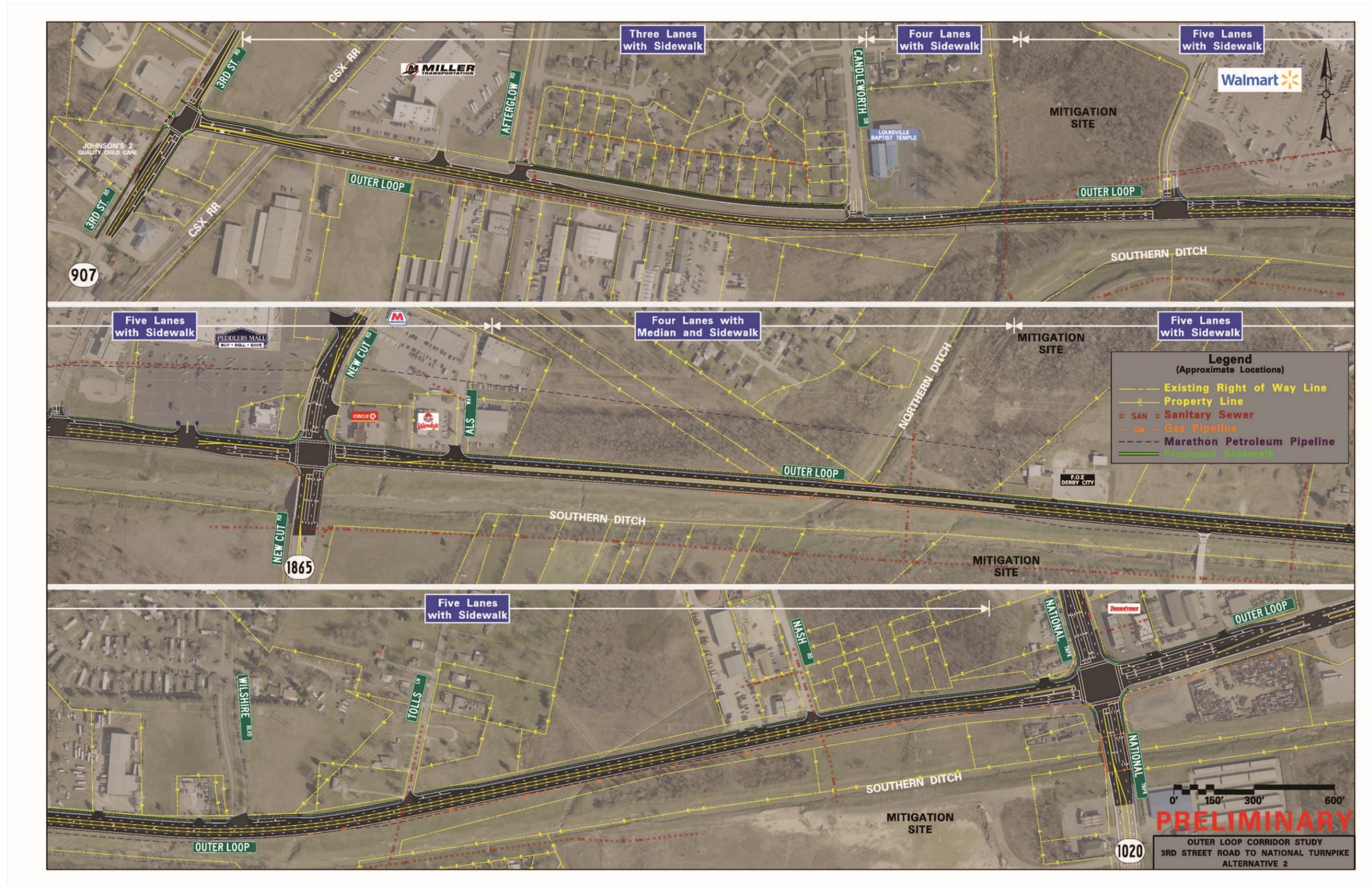


Figure 8.6: Alternative 2—3-5-4-5 in Greater Detail

8.4 Short Term Improvements

Short-term improvements include relatively low-cost, stand-alone projects to address existing safety issues in a timely manner. Three major intersections and four spot improvement locations were identified for potential improvements based on local input, field inspections, and historical crash data. Each improvement is incorporated into long-term Build Alternative 1.

8.4.1 Intersection Improvements

Short-term, stand-alone improvement options were developed for 3rd Street Road (**Figure 8.7**), New Cut Road (**Figure 8.8**), and National Turnpike (**Figure 8.9**) intersections. Improvements included widening turning radii, lengthening turn lanes, constructing new sidewalks, reconstructing existing pedestrian facilities to current ADA standards, and widening pavement. Each figure below includes details specific to each intersection.



OUTER LOOP/3rd STREET ROAD INTERSECTION IMPROVEMENTS

- a. Add signal head for west approach (Pronto Auto Parts driveway)
- b. New east and west sidewalks (ADA compliant) along 3rd Street Road from approximately Churchdown Lane to Outer Loop
- c. New ramps and crosswalks (ADA compliant) at the intersection
- d. Higher visibility signals (yellow backplates) and southbound flashing yellow arrow for left turns
- e. Add southbound bus pull off in front of Johnson’s 2 Quality Child Care
- f. Provide 150 feet of additional northbound right turn lane storage
- g. Add signal ahead sign
- h. Widen Outer Loop westbound right turn radius to northbound 3rd Street Road

Figure 8.7: Option A—3rd Street Road Intersection Improvements



OUTER LOOP/NEW CUT ROAD INTERSECTION

- a. New ramps (ADA compliant) at intersection
- b. New sidewalk (ADA compliant) on north side between New Cut Road and Als Way
- c. Relocate Old Kmart entrance and extend sidewalk
- d. Add concrete median to prohibit left turns at both Circle K entrances
- e. Restripe for 200 additional feet of westbound left turn lane storage
- f. Add advance signal warning for southbound New Cut Road

Figure 8.8: Option B—New Cut Road Intersection Improvements



OUTER LOOP/NATIONAL TURNPIKE INTERSECTION

- a. Restripe roadway and provide a northbound right turn lane
- b. Provide 200 feet of additional westbound left turn lane storage
- c. Higher visibility signals (yellow backplates)
- d. Add southbound right turn lane, consolidate driveway access, and provide sidewalk
- e. Convert BK Auto entrance to right in/right out
- f. Convert Thorntons southern National Turnpike entrance to right in/right out
- g. Add ramps (ADA compliant) at intersection
- h. Add eastbound right turn lane and reconstruct broken sidewalk
- i. Provide raised concrete median to prohibit left turns at entrance to Thorntons and Gilbert and Mitchell Auto Salvage
- j. Add additional Outer Loop signage farther east on Outer Loop from National Turnpike to show lane designation. Add small skip lines between the through and right turn lanes with the new signage.

Figure 8.9: Option C—National Turnpike Intersection Improvements

8.4.2 Other Short-Term Spot Improvements

In addition to intersection improvements, short-term “spot” improvements were identified in four locations on Outer Loop. As shown on **Figure 8.10**. From west to east, Identified spot improvements will:

- A. Construct two westbound through lanes after the National Turnpike intersection to reduce motorists’ confusion (included in long-term Alternative).
- B. Deepen the ditch at Tolls Lane (included in long-term Alternatives 1 and 2).
- C. Construct TWLTL and/or westbound right turn lanes for Wilshire Boulevard, Tolls Lane, and Nash Road (included in long-term Alternatives 1 and 2).
- D. Construct a westbound right turn lane at Candleworth Drive (included in long-term Alternatives 1 and 2).



Figure 8.10: Other Spot Improvements in Corridor

8.5 Cost Estimates

Bentley MicroStation and Inroads software was developed to create conceptual design models of long-term Alternatives 1 and 2. A five-foot digital elevation model, derived from LiDAR collected as part of Kentucky’s Aerial Photography and Elevation Data, was used as existing terrain. Conceptual design models were used to estimate quantities of high-cost construction items including earthwork, pavement, and structures. Construction costs were tabulated using the KYTC District 5 average unit bid prices. The KYTC District 5 assisted with 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 Jefferson County Property Valuation Administrator (PVA) data, and utility plans provided by the KYTC through the utility companies. Any Impacts to the 100 year floodplain were not included in cost estimates. Drainage analysis would be performed in future project phases.

8.6 Benefit Cost Analysis and Evaluation Matrix

Using a 20-year horizon, a Benefit/Cost Analysis (BCA) was conducted for Alternatives 1 and 2, and the intersection improvements at 3rd Street Road, New Cut Road, and National Turnpike short-term. The benefits were derived from the following:

- Three-year crash history
- Existing and future ADT volumes
- Peak hour travel time savings derived from 2035 peak hour traffic simulations for Alternatives 1 and 2
- 2035 intersection peak hour delay savings
- Traffic and crash growth rate of 1.074%.

The 2018 phase improvement costs were used for the BCA “costs” (denominator).

Appropriate crash reduction factors¹⁷ were applied to the proposed improvements, using the *2016 Kentucky Collision Facts Comprehensive Costs*¹⁸, and value of travel time savings and vehicle operating costs.¹⁹

Present value of all present and future costs and benefits was determined using a 7% discount rate. Discount rates are typically applied based on government borrowing interest rates, including an inflation component. BCA results for all improvement options were greater than 1.0, indicating benefits of the project are expected to outweigh the costs in a 20-year horizon.

Based on BCA results, projects were prioritized in the third Project Team Meeting and subdivided into smaller projects. **Table 8.1** and **Table 8.2** summarize key elements of the long-term alternatives, short-term intersection improvements and short-term spot improvements.

Table 8.1: Benefit-Cost Analysis

Alternative/ Option	Description	Estimated Total Benefits (\$)	Estimated Total Costs (\$)	BCA
Alternative 1	Widen existing 2-lane to 3-lane (w/ TWLTL) MP 0.0 to MP 0.587 and MP 1.657 to MP 2.445. Improve various intersections throughout study corridor.	46,220,000	14,400,000	3.2
Alternative 2	Widen existing 2-lane to 3-lane (w/ TWLTL) MP 0.000 to MP 0.600. Widen existing 3-lane to 5-lane (w/ TWLTL) MP 0.600 to MP 1.151. Widen existing 2-lane to 4-lane (w/median) MP 1.151 to MP 1.521 Widen existing 2-lane to 5-lane (w/TWLTL) MP 1.521 to MP 2.436. Improve various intersections throughout study corridor.	41,600,000	28,100,000	1.5
Intersection Only				
Option A	Improvements to 3rd Street Road Intersection	4,200,000	1,513,000	2.8
Option B*	Improvements to New Cut Road Intersection.	2,500,000	1,323,000	1.9
Option C	Improvements to National Turnpike Intersection	14,710,000	1,160,000	12.7
<i>*The presented BCA results include right turn lanes at New Cut Road in the No Build alternative</i>				

¹⁷ Crash Modification Clearinghouse

¹⁸ 2016 KY Traffic Collision Facts Report

¹⁹ 2017 USDOT BCA Guidance

Table 8.2: Phased Cost Estimates and Evaluation Matrix

Improvement Category	Alternative/Option	Cost Estimates					Savings Over the No Build Alternative		Simulated Peak Hour Travel Times		Benefit / Cost	Public Involvement	
		Design	Right of Way	Utilities	Construction	Total	AM Alternative 1 (sec./veh.)	PM Alternative 2 (sec./veh.)	Daily Peak Hour Eastbound Travel Time (sec./veh.)	Daily Peak Hour Westbound Travel Time (sec./veh.)	BCA 7% Discount Rate	Additional Survey Results	Public Involvement
Long-term	No Build	\$ -	\$ -	\$ -	\$ -	\$ -	0	0	352	707			94% believe Outer Loop should be improved.
	Alternative 1	\$ 700,000	\$ 2,700,000	\$ 4,200,000	\$ 6,800,000	\$ 14,400,000	19	111	333	596	3.2		Preferred 40% 3rd Street Road to New Cut Road: New Cut Road to National Turnpike: Preferred 14%
	Alternative 1 - Raised Out of Floodplain	\$ 700,000	\$ 4,100,000	\$ 4,200,000	\$ 10,200,000	\$ 19,200,000	19	111	333	596			89% stated road should be raised above floodplain.
	Alternative 2	\$ 1,500,000	\$ 4,200,000	\$ 7,200,000	\$ 15,200,000	\$ 28,100,000	16	350	336	357	1.5		Preferred 60% 3rd Street Road to New Cut Road: New Cut Road to National Turnpike: Preferred 76%
	Alternative 2 - Raised Out of Floodplain	\$ 1,500,000	\$ 6,300,000	\$ 7,200,000	\$ 21,800,000	\$ 36,800,000	16	350	336	357			89% thought Outer Loop should be raised above the floodplain. New Cut Road to National Turnpike: Preferred 76%
Intersection Spot Improvement Options	Option A - 3rd Street Intersection	\$ 70,000	\$ 292,500	\$ 500,000	\$ 650,000	\$ 1,513,000					2.8	Number 3 Intersection Option	(1) Widen Outer Loop westbound right turn radius to northbound 3rd Street Road; (2) Add southbound bus pull off in front of Johnson's 2 Quality Child Care and Provide 150 feet of additional northbound right turn lane storage
	Option B - New Cut Road Intersection*	\$ 70,000	\$ 102,500	\$ 500,000	\$ 650,000	\$ 1,323,000					1.9	Number 1 Intersection Option	(1) Provide 200 additional feet of westbound left turn lane storage; (2) New ramps (ADA compliant) at the intersection; (3) Relocate Old Kmart entrance and extend sidewalk.
	Option C - National Turnpike Intersection	\$ 50,000	\$ 170,000	\$ 500,000	\$ 440,000	\$ 1,160,000					12.7	Number 2 Intersection Option	(1) Provide 200 feet of additional westbound left turn lane storage; (2) Restripe roadway and provide a northbound right turn lane; (3) Add southbound right turn lane, consolidate driveway access, and provide sidewalk.
Other Short-term Spot Improvements from Survey No. 2	Carry two westbound through lane east of the National Turnpike Intersection (a.)**	\$ -	\$ -	\$ 882,000	\$ 1,000,000	\$ 1,882,000							1st Preferred Other Short-term Spot Improvements - 1.76 Weighted Average
	Deepen Ditch at Tolls Lane (b.)	\$ -	\$ 25,000	\$ 150,000	\$ 40,000	\$ 215,000							2nd preferred Other Short-term Spot Improvements - 1.61 Weighted Average
	Wilshire Blvd, Tolls Lane, Nash Road TWLTL (c.)	\$ 160,000	\$ 65,000	\$ 65,000	\$ 1,520,000	\$ 1,810,000							3rd preferred Other Short-term Spot Improvements - 1.58 Weighted Average
	Right Turn Lane Wilshire Boulevard (c.)	\$ -	\$ -	\$ 100,000	\$ 50,000	\$ 150,000							3rd preferred Other Short-term Spot Improvements - 1.58 Weighted Average
	Right Turn Lane at Candleworth Drive (d.)	\$ -	\$ -	\$ 60,000	\$ 150,000	\$ 210,000							2nd preferred Other Short-term Spot Improvements - 1.61 Weighted Average
Potential Short-term Spot Improvements Extracted from Intersection Options A, B and C	Bus pull off in front of Johnson's 2 Quality Child Care on southbound 3rd Street Road (Option A [e.])	\$ -	\$ 10,000	\$ 60,000	\$ 60,000	\$ 130,000							Tied for 1st for 3rd Street Road Intersection
	Access Control at Ncw Cut Road (Option B [d.])	\$ -	\$ -	\$ -	\$ 70,000	\$ 70,000							Ranked fourth for New Cut Road Intersection
	Access Control at National Turnpike (Option C [i.])	\$ -	\$ 25,000	\$ -	\$ 100,000	\$ 125,000							Ranked sixth for National Turnpike Intersection
	Restripe roadway and provide a northbound right turn Lane at National Turnpike (Option C [a.])	\$ -	\$ -	\$ 50,000	\$ 30,000	\$ 80,000							Ranked second for National Turnpike Intersection
	Provide 200 feet of additional westbound left turn lane storage at National Turnpike (Option C [b.])	\$ -	\$ -	\$ 125,000	\$ 340,000	\$ 465,000							Ranked first for National Turnpike Intersection
	Widen Outer Loop westbound right turn radius to northbound 3rd Street Road (Option A [h.])	\$ -	\$ 15,000	\$ -	\$ 30,000	\$ 45,000							Tied for first for 3rd Street Road Intersection
	Sidewalks	\$ 50,000	\$ 250,000	\$ 75,000	\$ 830,000	\$ 1,205,000							82% preferred a sidewalk along Outer Loop

*The presented BCA results include right turn lanes at New Cut Road in the No Build Alternative.

**Due to cost and ease of implementation, this improvement was revised at Project Team Meeting No. 3 to Add additional westbound right-turn only signage east of National Turnpike and add skip lines between through and right turn only lanes in Project Team Meeting No. 3.

9.0 2035 BUILD TRAFFIC OPERATIONS

Build alternative traffic analyses began by assessing potential effects of a conceptual interchange on Outer Loop traffic. The Louisville International Airport Authority (SDF), in partnership with Louisville Metro, is seeking funding to finance a new I-265 (Gene Snyder Freeway) interchange with KY 841. The new interchange would connect to Outer Loop via Air Commerce Drive (**Figure 9.1 blue circle**). Traffic analyses performed including the interchange showed a maximum 400 vehicles per day (vpd) diverted from Outer Loop, resulting in minimal traffic effects. The project team decided to move forward with Outer Loop Build traffic analyses using the worst-case traffic scenario—without a new interchange.

Using a list of committed projects, KIPDA modeled estimated 2035 traffic diverted to the Outer Loop Corridor for varying lane configurations from which ADTs and peak hour traffic volumes were developed for long-term build alternatives. Diverted traffic is expected to be between 2,600 and 3,100 vpd for three lanes and between 5,000 and 11,100 vpd for four or five lanes.

9.1 Mainline Traffic Analysis—No Build versus Build Alternatives

Using the HCS, future mainline traffic analysis of each Build alternative is compared to the 2035 No Build traffic operations in **Table 9.1** and data are shown graphically in **Figure 9.2** and **Figure 9.3**. Year 2035 ADT is expected to range from 13,500 to 17,200 vpd in the study corridor for both alternatives. Results are discussed in the following sections.

9.1.1 Mainline Alternative 1 versus No Build

Traffic operation analysis comparing the 2035 No Build/Do Nothing to 2035 Build Alternative 1 showed very little change in the two scenarios for mainline Outer Loop. Both are predicted to operate at LOS E in peak AM and PM hours from 3rd Street Road to National Turnpike, and LOS C from National Turnpike to Grade Lane. Volume-to-capacity (v/c) ratios in Alternative 1 have minor increases across the board, but remain below the 0.85 threshold for urban roadways.

9.1.2 Mainline Alternative 2 versus No Build

Traffic operation analyses comparing the 2035 No Build/Do Nothing Alternative with 2035 Build Alternative 2 revealed little change in the two scenarios from 3rd Street Road to the Walmart signalized west entrance, both showing LOS E in AM and PM peak hours. Operational improvements are evident across the rest of the corridor. Walmart signalized west entrance to New Cut Road improves from LOS E to B and from LOS D or E to LOS A or B from New Cut Road to National Turnpike. National Turnpike to Grade Lane will continue operating at an acceptable LOS B and LOS C.

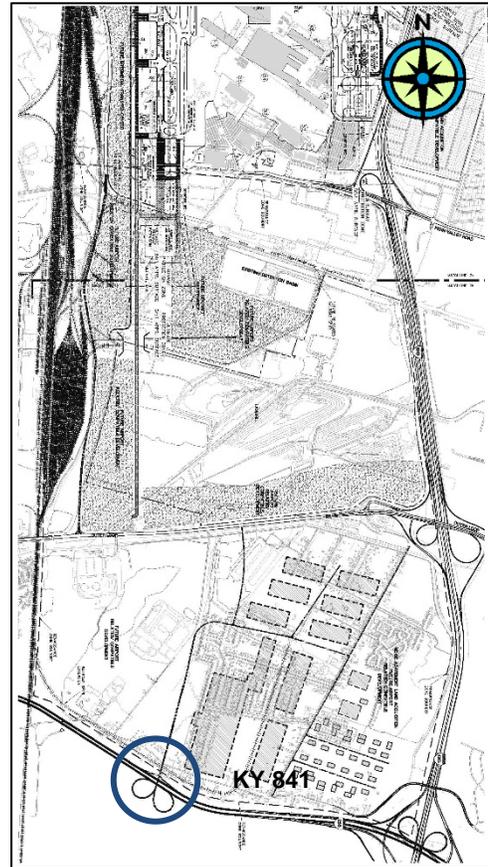


Figure 9.1: LIA Master Plan—New Interchange

All 2035 v/c ratios remain below 0.85, but show a slight increase from 3rd Street Road to Walmart signalized west entrance and from National Turnpike to Grade Lane due to diverted traffic from other routes projected to result from Alternatives 1 and 2.

Table 9.1: 2035 Mainline Capacity Analyses—No Build, Alternative 1, and Alternative 2

Segment Description		3rd Street Road to Walmart Signalized West Entrance			Walmart Signalized West Entrance to New Cut Road			New Cut Road to National Turnpike			National Turnpike to Grade Lane		
		2035			2035			2035			2035		
		NB	Alt 1	Alt2	NB	Alt 1	Alt2	NB	Alt 1	Alt2	NB	Alt 1	Alt2
LOS	AM	E	E	E	E	E	B	D	D	A	B	B	B
	PM	E	E	E	E	E	B	E	E	B	B	C	C
PTSF/ Density*	AM	81.90	82.20	82.20	80.80	84.00	9.00*	74.90	79.90	8.70*	11.40*	13.20*	13.40*
	PM	85.80	89.50	89.50	86.00	89.40	16.30*	88.50	91.80	16.10*	17.70*	20.40*	20.40*
ATS (mph)	AM	31.60	30.80	28.70	34.90	33.90	N/A	46.90	45.50	N/A	N/A	N/A	N/A
	PM	30.50	28.70	28.70	33.70	31.80	N/A	42.50	39.70	N/A	N/A	N/A	N/A
v/c ratio	AM	0.47	0.49	0.48	0.45	0.50	0.23	0.34	0.42	0.22	0.29	0.33	0.34
	PM	0.55	0.67	0.73	0.57	0.66	0.41	0.61	0.76	0.41	0.45	0.52	0.52
AADT (vpd)		15,000	18,000	25,000	17,200	20,200	28,210	14,800	17,100	22,510	31,000	31,800	32,710
Speed Limit (mph)		45						55					

LOS = Level of Service PTSF = Percent (%) Time Spent Following Alt 1 = 3-2-3 Configuration NA = Not Applicable
 NB = No Build v/c ratio = volume to capacity ratio Alt 2 = 3-5-4-5 Configuration
 ATS = Average Travel Speed ADT = Average Daily Traffic *Density = passenger cars per mile per lane

9.2 2035 Intersection Traffic Analyses: No Build versus Build Alternatives

Future intersection traffic analysis of each build alternative is compared to the 2035 No Build traffic operations in **Table 9.2**, and data are shown graphically in **Figure 9.2** and **Figure 9.3**. 2035 ADT is expected to range from 13,500 to 17,200 vpd in the study corridor for both alternatives. Results are discussed below.

9.2.1 Intersections Alternative 1 versus No Build

Build Alternative 1 analyses show most intersection operations in design year 2035 worsen one level of service or remain at LOS F. Alternative 1 is not predicted to provide operational improvement at four of six intersections. Exceptions occur at the New Cut Road/Old Kmart intersection with LOS improving from E to C, and at National Turnpike with LOS improving from F to D. Both improvements occur during AM peak hours. Though intersection delay improves at New Cut/Kmart and National Turnpike, both still operate at LOS F in PM peak hours.

9.2.2 Intersections Alternative 2 versus No Build

Build Alternative 2 analyses show most intersection operations in design year 2035 maintain or improve. Notable exceptions occur at 3rd Street Road, with delay and LOS worsening in AM and PM peak hours; and a rise in delay at Walmart east unsignalized entrance in PM peak hours due to modeled AADT increases between 7,000 and 8,000 vpd. The east Walmart unsignalized entrance is not the primary entrance: a signalized entrance is available to motorists.

Table 9.2: 2035 Intersection No Build/Alternative 1/Alternative 2 Capacity Analyses

Intersection		3rd Street Road			Walmart Signalized West Entrance			Walmart East Entrance		
		2035			2035			2035		
		NB	Alt 1	Alt 2	NB	Alt 1	Alt 2	NB	Alt 1	Alt 2
AM	Delay	18.1	20.4	24.6	10.9	11.6	9.3	24.5	30.3	12.2
	Peak LOS	B	C	C	B	B	A	SB-C	SB-D	SB-C
PM	Delay*	28.0	37.7	62.1	15.9	24.2	14.9	194.7	364.6	752.5*
	Peak LOS	C	D	E	B	C	B	SB-F	SB-F	SB-F

		New Cut/Kmart			New Cut Road			National Turnpike		
		2035			2035			2035		
		NB	Alt 1	Alt 2	NB	Alt 1	Alt 2	NB	Alt 1	Alt 2
AM	Delay	41.0	21.3	40.4	32.8	33.1	32	90.9	49.1	47.7
	Peak LOS	EB-E	C	EB-E	C	C	C	F	D	D
PM	Delay*	805.4	410.5	484.3	52.6	57.7	44.5	154.1	122	87.1
	Peak LOS	EB-F	EB-F	EB-F	D	E	D	F	F	F

*During peak hours, motorists will experience delays at unsignalized intersections and may have to divert to a traffic signal to exit onto a main roadway.

LOS = Level of Service
 NB = No Build

Alt 1 = 3-2-3 Configuration
 Alt 2 = 3-5-4-5 Configuration

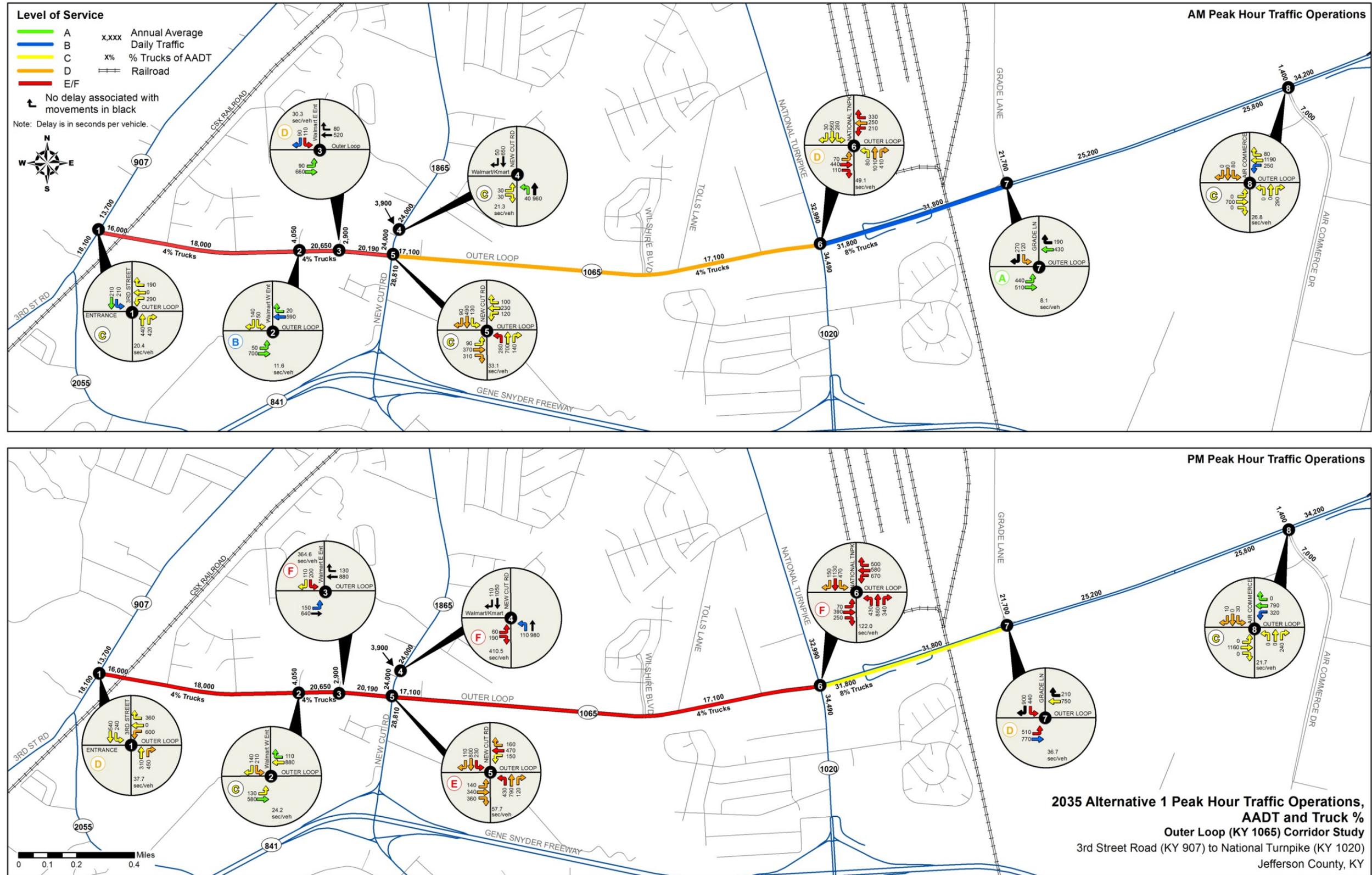


Figure 9.2: 2035 Build Alternative 1 Peak Hour Traffic Operations

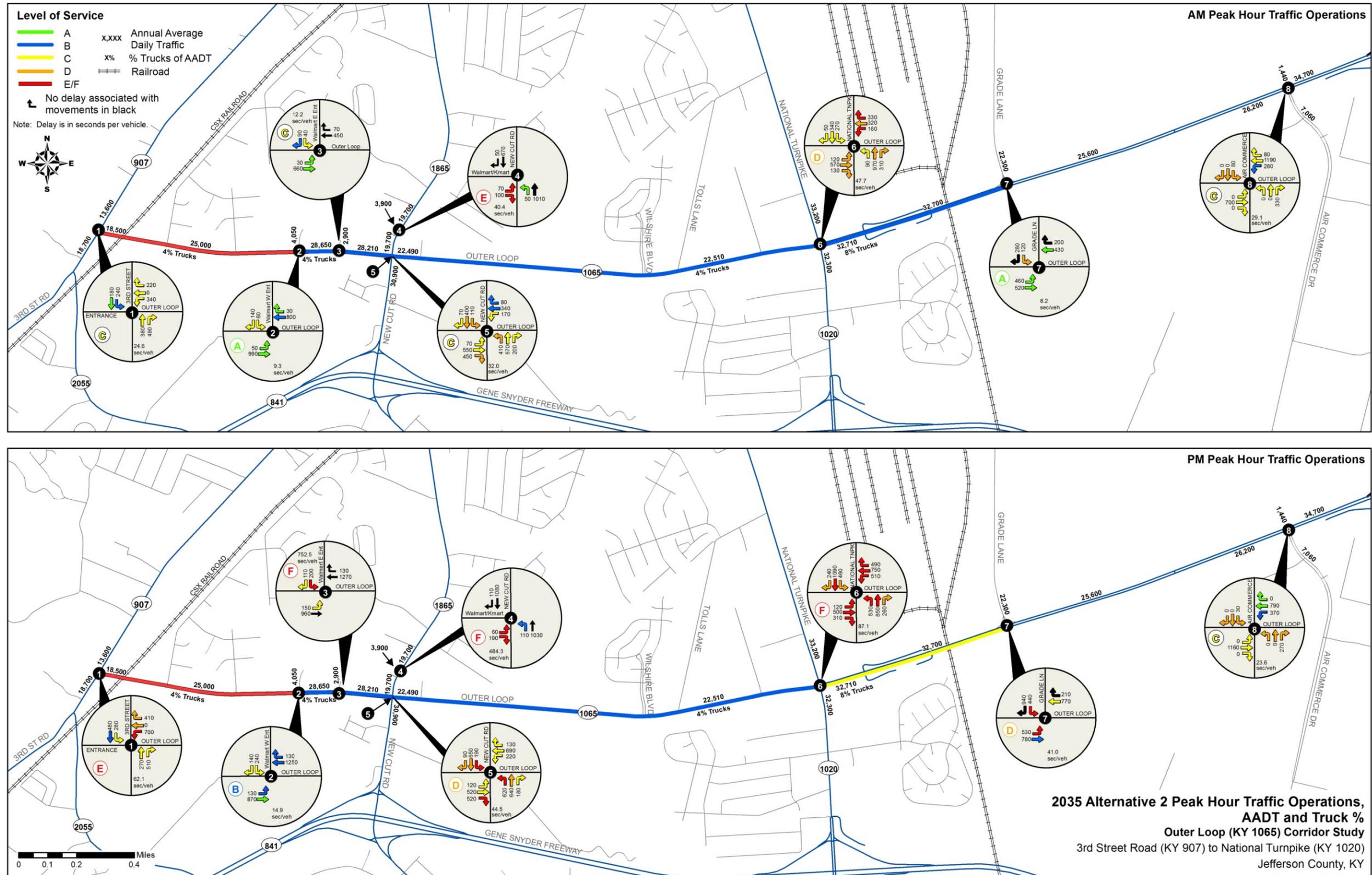


Figure 9.3: 2035 Build Alternative 2 Peak Hour Traffic Operations

9.3 2035 Intersection Traffic Operations—Short-Term Alternatives

The project team focused on improving the Outer Loop/National Turnpike intersection because of the poor traffic operations and field-measured queues forecasted at that intersection, and the public’s support for improvements there; and because the Outer Loop/New Cut Road intersection already has as a planned HSIP improvement the addition of right turn lanes.

For short-term alternatives, 2035 traffic was assessed to determine expected intersection delay resulting from individual project implementation. Analyses results (**Table 9.3**) show the northbound and eastbound right turn lanes should reduce 2035 delay by half and improve to LOS D when compared to the No Build Alternative. If the westbound left turn lanes are lengthened, queues/backups are expected to also reduce by half. The bottom row provides an estimate of delay if all short-term alternatives at National Turnpike are constructed together.

Table 9.3: Short-Term Alternatives National Turnpike Intersection Traffic Operations Summary

Outer Loop National Turnpike Short-Term Alternatives	AM		PM	
	Overall Intersection Delay (seconds/vehicle)	LOS	LOS	Overall Intersection Delay (seconds/vehicle)
No Build	90.9	F	F	154.1
Southbound Right Turn Lane	90.8	F	F	143.2
Northbound Right Turn Lane	48.3	D	F	122.5
Westbound Left Turn Lanes Lengthened*	90.9	F Changes Westbound Left Queue Storage ratio from 0.52 to 0.22	F	154.1 Changes Westbound Left Queue Storage ratio from 2.82 to 1.13
Westbound Through Lanes Carried Westbound Through Intersection	87.5	F	F	142.1
Eastbound Right Turn Lane	46.8	D	F	115.3
All of the Above (except No Build)	46.2	D	F	115.4

Green Lettering indicates this movement improved over the No Build Alternative.

10.0 SECOND ROUND OF MEETINGS AND PUBLIC INVOLVEMENT

All project team, LO/S, and public meeting minutes are in **Appendix J**.

10.1 Second Project Team Meeting

The second project team meeting was held April 11, 2018. New improvement concepts (**Alternatives 1 and 2** discussed in **Section 8.0**) were introduced to the team.

Year 2035 traffic operations were presented and discussed. Minimal difference (400 vpd) was found in 2035 future traffic growth/diversion analyses of the “with and without a new KY 841 interchange” scenarios. The traffic analysis presented used the worst case—without the new interchange. Additionally, the No Build traffic analyses include future right turn lanes at New Cut Road under design and to be constructed as part of the HSIP.

The team reviewed LO/S and public input from the first meetings and survey responses received. Top concerns relayed by the first survey were Congestion/Delay (93%), Safety (80%), Drainage (66%), and Pedestrian Accommodations (75%).

10.2 Second Local Officials/Stakeholders Meeting

The second LO/S meeting was held May 17, 2018, at Lassiter Middle School. The project team met with public officials and representatives of local businesses, schools, and nearby subdivision residents. The meeting objective was to solicit feedback on long- and short-term improvement alternatives, review the first survey results, and answer questions posed by the group. The project team gave a brief overview of information to be presented at the public meeting later the same evening.

10.3 Second Public Meeting

After meeting with key stakeholders and local officials, the project team held the second public meeting at Lassiter Middle School on May 17, 2018. The purpose of the meeting was to present information about the study and improvement alternatives, and to solicit input from the public in a similar manner to the first meeting.

Forty-nine members of the public and 11 project team members attended. Attendees were provided a study area map, descriptions of long- and short-term improvements and asked to complete a survey to help the project team understand local priorities. Each attendee was given the opportunity to complete a survey either online via iPads or using paper. The project link was also provided to those unable to attend. The survey was advertised in the Courier Journal newspaper and by Courier Journal digital display with posts linking to the KYTC’s website; through Twitter; on the KYTC’s Facebook and Facebook boosted advertisements, resulting in 316 completed surveys.

In addition, respondents were asked to indicate improvement preferences for two Outer Loop segments from 3rd Street Road to New Cut Road (western) and New Cut Road to National Turnpike (eastern). Overall, the majority of respondents (94%) supported Outer Loop improvements, and preferred Alternative 2 for western (60%) and eastern (76%) segments. The public prioritized short-term intersection improvements as (1) New Cut Road, (2) National Turnpike, and (3) 3rd Street Road:

Respondents supported all four spot improvements, chose east segment construction (67%) as higher priority over west, thought the roadway should be raised above floodplain elevation (89%), and wanted sidewalks along Outer Loop (82%).

Complete survey results are shown in **Appendix K**.

10.4 Resource Agency Coordination

Resource agency coordination was conducted to help identify potential environmental resources, development plans, future permits needed, or other potential issues. The KYTC Division of Planning mailed applicable resource agencies a packet of project-related information including purpose and need, existing conditions, an environmental overview, crash data, alternatives, and No Build and Build traffic data and maps. Resource agencies were provided a link to view potential improvement alternatives. Responses are summarized in **Table 10.1** and provided in **Appendix L**.

Table 10.1: Resource Agency Comments Summary

Representing	Resource Agency Comments
US Environmental Protection Agency (EPA)	<ul style="list-style-type: none"> • Main preliminary environmental concerns for this project are water quality and stormwater management. • EPA’s Geographical Information System’s “NEPAssist” data shows two impaired streams/rivers-two unnamed rivers that are perpendicular to the project area and feed Southern Ditch, which is parallel to the project area. • Once the draft of NEPA the document is completed, provide EPA with two hard copies and/or electronic link to the document. • Recommends the following be considered in preparation for the environmental document and project construction: <ul style="list-style-type: none"> ○ Explain how adequate sediment and erosion control measures will be used to prevent discharge of pollutants into the water body. ○ Reduce the impact of pollution runoff from construction activities. ○ Use best management practices to control erosion, sediment release, and stormwater surface runoff to minimize adverse impacts on water resources. ○ Stabilize soils to reduce the effects of erosion, sedimentation, and runoff to maintain or improve water quality. ○ Identify and quantify incremental and cumulative impacts on water quality as a result of the past, present, and reasonably foreseeable actions, including the proposed project and other land use actions. ○ Drainage design should be a major part of planning for the project and stormwater from new impervious surfaces should be treated (e.g., grassed detention basins) prior to discharge to streams to help minimize water quality impacts.
US Army Corps of Engineers (USACE)	<ul style="list-style-type: none"> • USACE was concerned their database is dated and may not identify old mitigation sites that didn’t require permits (old preservation sites). Several old mitigation projects were the KYTC’s sites and USACE suggests contacting the KYTC to check their records within the study area. USACE provided an excel table of mitigation sites, but none are located within the study area. • Later coordination response from USACE (July 24, 2018) stated a Department of Army (DA) Permit may be required. The mapping shows proposed work in or near “waters of the US.” Waters include several unnamed ephemeral, intermittent, or perennial tributaries to Southern Ditch, Pond Creek, and the Ohio River. If the project would necessitate the discharge of dredged or fill material into any “waters of the US,” then a DA permit application and additional project design detail should be submitted for review.

Representing	Resource Agency Comments
KY Airport Zoning Commission (KAZC)	<ul style="list-style-type: none"> Any permanent or temporary structures greater than 607 feet above mean sea level require a permit from the KAZC.
KY State Police	<ul style="list-style-type: none"> Noted a large number of collisions were rear-end and usually occurred near an intersection. Many of these collisions are attributed to congestion and driver inattention. Attached a KYOPS Map in response.
KY Energy And Environment Cabinet Department for Environmental Protection: <u>KY Department of Fish and Wildlife (KDFWR)</u>	<ul style="list-style-type: none"> The Indiana bat, gray bat, interior least tern, piping plover, and northern long-eared bat are known to occur within 10 miles of the project area. The state-listed crayfish and Kirtland's snake are known to occur within one mile of the project area. To minimize impacts to the surrounding species, the KDFWR recommends avoiding and/or minimizing impacts to wetlands. No caves, critical habitats, trout streams/fish spawning areas, or any other unique natural areas are known to occur within close proximity to the project site. If tree clearing will be required for the project, contact the U.S. Fish and Wildlife Service Kentucky Field Office. Tree clearing may require payment into the Imperiled Bat Mitigation Fund. KDFWR recommends: Channel changes located within the project area should incorporate natural stream channel design; if culverts are used, the culvert should be designed to allow the passage of aquatic organisms; culverts should be designed so that degradation upstream and downstream of the culvert does not occur; development/excavation during low flow period to minimize disturbances; proper placement of erosion control structures below highly disturbed areas to minimize entry of silt into area streams; replanting of disturbed areas after construction, including stream banks, with native vegetation for soil stabilization and enhancement of fish and wildlife populations; return all disturbed instream habitat to a stable condition upon completion of construction in the area; preservation of any tree canopy overhanging any streams within the project area.
KY Division for Air Quality	<ul style="list-style-type: none"> Kentucky Division for Air Quality Regulations 401 KAR 63:010 Fugitive Emissions and 401 KAR 63:005 must be adhered to for this project. The Division has the following suggestions on how this project can help stay in compliance with the NAAQS: utilize alternatively fueled equipment; utilize other emission controls that are applicable to your equipment; reduce idling time on equipment.
KY Department of Education (KDE)	<ul style="list-style-type: none"> No impacts under the direct control of KDE in terms of school facilities or school bus routes. Recommended Jefferson County School District be contacted directly for feedback. They will have a better knowledge of how this project could impact schools in the affected area.
KY Division of Water (KDOW)	<ul style="list-style-type: none"> Best management practices should be utilized to reduce runoff from construction activities into nearby surface waters. An Individual Water Quality Certification may be required. "Stream Construction Permit for Construction in or Along a Stream" will not be required. No formal approval is required for Water Withdrawal Permitting or Water Management Planning. No permits, certifications, or formal approvals needed for the description of work from the Groundwater Section of the Watershed Management Branch. It is recommended the site be made aware of 401 KAR 5:037 requirements and the need to develop a Groundwater Protection Plan (GPP) for the protection of groundwater resources within that area during both construction and in operation if necessary. Project must obtain all necessary permit approvals from KDOW before implementing construction.

Representing	Resource Agency Comments
KY Division of Waste Management	<ul style="list-style-type: none"> A number of active underground storage tanks exist in the project area and sites where underground storage tanks have been removed. List of sites included. All solid waste generated by this project must be disposed at a permitted facility. If asbestos, lead paint, and/or other contaminants are encountered during this project, they must be properly addressed.
KY Geological Survey	<ul style="list-style-type: none"> There should be no karst or sinkhole related issues in this part of Louisville-Jefferson County. This project is outside the area of the Ohio River alluvial aquifer, and groundwater-related issues are not expected to be of great concern. However, excavation activities in the area may encounter a perched groundwater table on the unconsolidated surficial sediments, and the possibility of some localized groundwater drainage from fractured bedrock units should also be anticipated. KGS can provide information about depth to water from archives if desired. It seems unlikely excavation activities will extend deep enough to breach into the Sellersburg-Jeffersonville Limestones, but crude oil occurs in vugs and fractures in these near-surface bedrock units. Refer to Taylor and Hostettler, 2002 (US Geological Survey, Water Resources Investigation Report 02-4123). The western end of the project is underlain by a mosaic of terrace deposits, loess, and bedrock outcrops (New Albany black shale, New Providence clay shale); each of these has its own unique geotechnical challenges, so careful geotechnical data collection should precede any construction in this area. KGS surficial geologic mapping shows most of the rest of the project area is underlain by an estimated 20 feet of Pleistocene lacustrine deposits; these will typically be fine grained, can be poorly drained, and can present geotechnical design and performance challenges.
Kentucky Speleological Survey (KSS)	<ul style="list-style-type: none"> Identified the Falls City Quarry Cave. This cave is approximately 3.5 miles east of the eastern study area boundary.
Metropolitan Sewer District (MSD)	<p>No significant concerns, but a few comments on their mapping of the corridor:</p> <ul style="list-style-type: none"> Water Resources, LLC, stormwater basin is located on the south side of southern ditch and west of National Turnpike. MSD 72-inch diameter pipe beneath Outer Loop along the east side of Northern Ditch, which ties into a 10-foot diameter pipe along the south side of Southern Ditch. Walmart Mitigation Site is located along north side of Outer Loop and west of the Walmart building. Western end of the project corridor has a private pump station and a shallow 7-inch sewer line along the south side of Outer Loop and both are within the right-of-way. Floodplain mitigation may be required for fill placed within the local 100-year floodplain at a 1.5:1 ratio. Credits can be purchased from the Water Resources, LLC, basin.
Kentucky State Nature Preserves Commission (KSNPC)	<ul style="list-style-type: none"> Reported 31 occurrence records. Three federally listed species were identified, including the Indiana bat, gray bat, and northern long-eared bat. The exact location of protected species within the KSNPC report may not be released in any document or correspondence.
KY Heritage Council	<ul style="list-style-type: none"> No comments about the specifics of the study, but will need to review the project as additional information becomes available. There is a possibility for the presence of cultural resources within the vicinity of the project area and further consultation will be required.

Color Key: Federal State

Abbreviations: KY = Kentucky USFWS = U.S. Fish and Wildlife Service USDA–NRCS = U.S. Dept. of Agriculture–Natural Resources Conservation Service KDNR = Kentucky Dept. for Natural Resources KSNPC = Kentucky State Nature Preserves Commission

11.0 CONCLUSIONS AND RECOMMENDATIONS

The project team considered the No Build and each long- and short-term improvement alternative developed through the study process. Recommendations were made for the Outer Loop Corridor Study based on existing conditions, crash history, projected traffic operations, public input, project costs, and ability to meet purpose and need.

11.1 Final Project Team Meeting

The final project team meeting was held August 20, 2018, at the KYTC District 5 Office in Louisville, Kentucky. The purpose of the meeting was to prioritize improvement alternatives using LO/S and public input, survey results (**see Section 10.3**) and engineering judgment. Resource agency coordination responses were provided and discussed. A detailed meeting summary is included in **Appendix J**.

11.2 Recommendations

The project team recommended long-term improvement **Alternative 2 (with recommended improvements at each intersection)** over the No Build or Alternative 1. Although Alternative 1 appears to have adequate capacity with a maximum v/c ratio of 0.76, heavy traffic volumes and delay at major intersections control the traffic operations of the road. Alternative 2 triples daily PM travel time savings over Alternative 1 (some savings is attributed to traffic diverted from other routes), and improves LOS to B from the transition to five lanes near Candleworth Drive east to National Turnpike. Public survey results showed support for Alternative 2 along both segments of Outer Loop: (1) 3rd Street Road to New Cut Road (60%) and (2) New Cut Road to National Turnpike (76%), and has a calculated benefit-cost ratio greater than 1.0. Traffic diverted from other routes to Outer Loop upon completion of Alternative 2 (between 5,000 and 11,000 vehicles per day) is expected to increase crash potential on the corridor. However, as indicated by the BCA, the congestion savings is expected to outweigh the crash cost increase in the 20-year horizon. Due to increased cost, the project team does not recommend raising Outer Loop out of the floodplain.

11.2.1 Mainline

Table 11.1 and **Table 11.2** summarize key elements of the decision making process for mainline alternatives No Build, Alternative 1, and Alternative 2.

Table 11.1: Key Elements of No Build, Alternatives 1 and 2

Description	3rd Street Road to Walmart Signalized West Entrance			Walmart Signalized West Entrance to New Cut Road			New Cut Road to National Turnpike			National Turnpike to Grade Lane		
	2035			2035			2035			2035		
	NB	Alt 1	Alt 2	NB	Alt 1	Alt 2	NB	Alt 1	Alt 2	NB	Alt 1	Alt 2
AM	E	E	E	E	E	B	D	D	A	B	B	B
PM	E	E	E	E	E	B	E	E	B	B	C	C
AM	81.90	82.20	82.20	80.80	84.00	9.00*	74.90	79.90	8.7*	11.4*	13.2*	13.4*
PM	85.80	89.50	89.50	86.00	89.40	16.30*	88.50	91.80	16.1*	17.7*	20.4*	20.4*
AM	31.60	30.80	28.70	34.90	33.90	-	46.90	45.50	-	-	-	-
PM	30.50	28.70	28.70	33.70	31.80	-	42.50	39.70	-	-	-	-
AM	0.47	0.49	0.48	0.45	0.50	0.23	0.34	0.42	0.22	0.29	0.33	0.34
PM	0.55	0.67	0.73	0.57	0.66	0.41	0.61	0.76	0.41	0.45	0.52	0.52
AADT (vpd)	15,500	18,000	25,000	17,200	20,200	28,210	14,800	17,100	22,510	31,000	31,800	32,710
Three-Year Crash History**	63			69			151					
Speed Limit (mph)	45			55								
Public Sentiment	The majority of respondents (94%) supported Outer Loop improvements, and preferred Alternative 2 from 3 rd Street Road to New Cut Road (60%).						The majority of respondents (94%) supported Outer Loop improvements and preferred Alternative 2 from New Cut Road to National Turnpike (76%).					
AM/PM Simulated Savings Over the No Build Alternative (seconds/vehicle)	ALT 1			19/11								
	ALT 2			16/350								
Benefit Cost Ratio	ALT 1			3.2								
	ALT 2			1.5								

*Density = passenger cars per mile per lane PTSF = Percent Time Spent Following. ** January 1, 2014 through December 31, 2016

Table 11.2: Total Costs and Time Savings of Alternatives 1 and 2

	3rd Street Road to National Turnpike		
	No Build	Alternative 1	Alternative 2
Total Costs (\$ Million)	\$0/regular maintenance	\$14.4	\$28.10
Total Costs Out of Floodplain (\$ Million)	\$0/regular maintenance	\$19.20	\$36.80
BCA	N/A	3.21	1.48
AM Travel Time Savings (seconds/vehicle)	N/A	19	16
PM Travel Time Savings (seconds/vehicle)	N/A	111	350

For programming purposes, Alternative 2 was divided into two segments (**Table 11.3**)—3rd Street Road to New Cut Road and New Cut Road to National Turnpike. The New Cut Road to National Turnpike segment was considered the higher priority based on public input and improvement in delay expected at the National Turnpike intersection.

Table 11.3: Alternative 2 Segments

Recommended Alternative 2	Milepoint Limits	Design	Right of Way	Utilities	Construction	Total
3rd Street Road to New Cut Road	0.000 to 1.029	\$500,000	\$ 1,600,000	\$3,600,000	\$4,700,000	\$10,400,000
New Cut Road to National Turnpike	1.029 to 2.514	\$1,000,000	\$2,600,000	\$3,600,000	\$10,500,000	\$17,700,000

11.2.2 Potential Impacts and Design Considerations

Businesses, potential hazardous materials, shale near 3rd Street Road, 100-year floodplain, threatened and endangered species and wet subgrade are expected project impacts. In addition, widening the Outer Loop Bridge may result in impacts to the conservation easement east of Northern Ditch on the north side of Outer Loop near the existing bridge.

Outer Loop Bridge (056B00094N at MP 1.400) would be widened as part of the Alternative 2 conceptual design. If the bridge is replaced in lieu of widening, additional monies should be added to the total cost.

Northern long-eared and Indiana bats are federally listed and present in the study corridor. Tree clearing may require payment to the Imperiled Bat Conservation Fund.

In subsequent phases, the 100-year floodplain will likely be impacted and floodplain mitigation required. Credits can be purchased from the Water Resources, LLC, basin.

Numerous underground and overhead utilities are in the study area. If abandoned utilities are left in place, the roadway designer should mitigate any related geotechnical issues. Water trapped in and around abandoned utility lines can cause subgrade materials to deteriorate. Active utilities scheduled to remain in place should be considered in the design and construction phases. The designer should provide adequate cover over existing utilities to protect the utility and ensure proper performance of subgrade materials. More details are in **Appendix G**

The KYTC freight coordinator encourages consultation with the CSX regarding coordinated signal timing between the railroad crossing and 3rd Street Road if Alternative 1 or 2 is implemented. The concern is westbound motorists waiting for the 3rd Street Road traffic signal green light queueing at the at-grade crossing. Coordination would help ensure that when the at-grade railroad signal activates, the traffic signal at 3rd Street Road would give priority to the westbound traffic to clear any queue before a train would enter the crossing.

11.2.3 Intersections

Thirty-four Outer Loop intersection improvement options for 3rd Street Road, New Cut Road, and National Turnpike were prioritized high, medium, or low based on projected reduction in delay, public input, ease of construction where appropriate (e.g., restriping versus new construction), cost, sidewalk connectivity, and crash reduction potential. Pedestrian improvements at the intersections were all prioritized as high or medium.

The No Build Alternative includes expected right turn lanes at New Cut Road and retimed signal phases. Traffic signals at New Cut Road and Walmart signalized west entrance should be coordinated by Louisville Metro to improve traffic progression through the corridor.

Table 11.4, **Table 11.5**, and **Table 11.6** contain intersection summaries with higher scores representing more desired improvement options. Minor variations in average survey scores should be considered equal. Survey results are in **Appendix K**. **Table 11.7** summarizes all improvements and phase costs estimates

Table 11.4: 3rd Street Road Intersection Improvement Options

3 rd Street Road ID	Improvement Option	Survey Average Score	Assigned Priority	Reduces Delay	Improves Safety
a	Add signal head for west approach (Pronto Auto Parts driveway)	4.03	High	N	Y
b	New east and west sidewalks (ADA compliant) along 3 rd Street Road from approximately Churchdown Lane to Outer Loop	4.75	Medium	N	Y
c	New Ramps and crosswalks (ADA compliant) at intersection	4.35	High	N	Y
d	Higher visibility signals (yellow backplates) and southbound flashing yellow arrow for left turns	4.81	High	Y	Y
e	Add southbound bus pull off in front of Johnson's 2 Quality Child Care	5.33	High	Y	Y
f	Provide 150 feet of additional northbound right turn-lane storage	5.33	Medium	Y	Y
g	Add advance warning signal southbound 3 rd Street Road	3.26	Low: Recommend signal ahead sign only	N	Y
h	Widen Outer Loop westbound right turn radius to northbound 3 rd Street Road	5.39	High	N	Y

Table 11.5: New Cut Road Intersection Improvement Options

New Cut Road ID	Improvement	Survey Average Score	Priority	Reduces Delay	Improves Safety
a	New Ramps (ADA compliant) at intersection	3.78	High	N	Y
b	New sidewalk (ADA compliant) on north side between New Cut Road and Als Way	3.55	Medium	N	Y
c	Relocate Old Kmart entrance and extend sidewalk	3.58	Low	N	Y
d	Prohibit left turns with raised concrete median at both Circle K entrances	3.51	High	N	Y
e	Restripe for 200 additional feet of westbound left turn lane storage	4.66	High	Y	Y
f	Add advance signal warning for southbound New Cut Road.	2.67	Low	N	Y

Table 11.6 National Turnpike Intersection Improvement Options

National Turnpike ID	Improvement	Survey Average Score	Priority	Reduces Delay	Improves Safety
a	Restripe roadway and provide a northbound right turn lane	6.87	High	Y	Y
b	Provide 200 additional feet per lane of westbound left turn lane storage	7.41	High-To be implemented with pavement rehabilitation project September 2019	Y	Y
c	Higher visibility signals (yellow backplates)	4.88	High	N	Y
d	Add southbound right turn lane, consolidate driveway access and provide sidewalk	6.33	Low	Y	Y
e	Convert BK Auto entrance to right in/right out	4.10	Medium	N	Y
f	Close southern National Turnpike entrance to Thorntons	4.16	High Modified to right in/right out	N	Y
g	Add ramps (ADA compliant) at intersection	3.76	High	N	Y
h	Add eastbound right turn lane and reconstruct broken sidewalk	5.06	Medium	Y	Y
i	Raised concrete median/separation at entrances to Thorntons and Gilbert and Mitchell Auto Salvage	4.22	High	N	Y
Other Short-term Spot Improvements (now j)	Add two through lanes westbound across National Turnpike to reduce driver confusion as to which lane to be in	Ranked highest (1.76) spot	High-Changed to "Add additional Outer Loop signage and skip lines"	N	Y

Table 11.7: Long and Short-Term Alternatives/Improvement Phased Cost Estimate Summary

Improvement Category	Corridor/Intersection	Issues: High Crash Spot(s) Drainage Congestion Safety Access Management	Outer Loop Beg MP	Outer Loop End MP	Crossroad Beg MP	Crossroad End MP	Public Meeting Survey ID	Alternatives	Design	Right of Way	Utilities	Construction	Total
Long-term	Corridor	High Crash Spot Congestion Safety	0.000	0.940	4.551 3rd St Rd	4.910 3rd St Rd	Alternative 2	Segment 1 - (3rd Street Road to New Cut Road)	\$ 500,000	\$ 1,600,000	\$ 3,600,000	\$ 4,700,000	\$10,400,000
		Drainage Access Mangement	0.940	2.670	3.601 (New Cut Rd) 3.571 (Nat. Tpk)	3.771 (New Cut Rd) 3.928 (Nat. Tpk)		Segment 2 - (New Cut Road to National Turnpike)	\$ 1,000,000	\$ 2,600,000	\$ 3,600,000	\$ 10,500,000	\$17,700,000
Intersection Spot Improvement Options	3rd Street Road Intersection	Congestion Safety	0.000	0.140	4.551	4.910	N/A	Option A - 3rd Street Intersection	\$ 70,000	\$ 292,500	\$ 500,000	\$ 650,000	\$ 1,513,000
	New Cut Road Intersection	High Crash Spot Congestion Safety	1.009	1.129	3.601	3.771	N/A	Option B - New Cut Road Intersection	\$ 70,000	\$ 102,500	\$ 500,000	\$ 650,000	\$ 1,322,500
	National Turnpike Intersection	High Crash Spot Congestion Safety Drainage	2.424	2.670	3.561	3.928	N/A	Option C - National Turnpike Intersection	\$ 50,000	\$ 170,000	\$ 500,000	\$ 440,000	\$ 1,160,000
Short-term	3rd Street Road Intersection	Safety	0.000	0.010	4.560	4.670	a	Rebuild Traffic Signal - Add signal head for west approach (Pronto Auto Parts driveway)	\$ 15,000	\$ -	\$ -	\$ 150,000	\$ 165,000
		Safety	0.000	0.020	4.650	4.670	c	New sidewalk, ramps, and crosswalks (ADA compliant) at the intersection	\$ 11,500	\$ 60,000	\$ -	\$ 115,000	\$ 186,500
		Safety Congestion	0.000	0.020	4.650	4.670	d	Higher visibility signals (yellow backplates) and southbound flashing yellow arrow for left turns	\$ -	\$ -	\$ -	\$ 5,000	\$ 5,000
		Safety Congestion	N/A	N/A	4.600	4.630	e	Add southbound bus pull off in front of Johnson's 2 Quality Child Care	\$ 6,000	\$ 10,000	\$ 60,000	\$ 60,000	\$ 136,000
		Safety Congestion	0.000	0.140	4.660	4.662	h	Widen Outer Loop westbound right turn radius to northbound 3rd Street Road	\$ 3,000	\$ 15,000	\$ -	\$ 30,000	\$ 48,000
	New Cut Road Intersection	High Crash Spot Safety	1.009	1.049	1.244	1.284	a	New ramps (ADA compliant) at intersection	\$ 6,200	\$ -	\$ -	\$ 62,000	\$ 68,200
		High Crash Spot Safety Congestion Access Management	1.029	1.089	1.274	1.314	d	Add raised concrete median/separation to prohibit left turns at both Circle K entrances	\$ 7,000	\$ 250,000	\$ -	\$ 70,000	\$ 327,000
		High Crash Spot Congestion	1.089	1.129	N/A	N/A	e	Restripe for 200 additional feet of westbound left turn lane storage	\$ -	\$ -	\$ -	\$ 1,000	\$ 1,000
	National Turnpike Intersection	Congestion	N/A	N/A	3.561	3.661	a	Restripe roadway and provide a northbound right turn lane	\$ 3,000	\$ -	\$ 50,000	\$ 30,000	\$ 83,000
		High Crash Spot Congestion	2.514	2.670	N/A	N/A	b	Provide 200 feet of additional westbound left turn lane storage*	\$ 34,000	\$ -	\$ 125,000	\$ 340,000	\$ 499,000
		High Crash Spot Congestion Safety	2.414	2.614	N/A	N/A	c	Higher visibility signals (yellow backplates)	\$ -	\$ -	\$ -	\$ 2,000	\$ 2,000
		Access Management	N/A	N/A	3.698	3.700	f	Convert National Turnpike entrance to Thorntons to right in/right out	\$ -	\$ 25,000	\$ -	\$ 2,000	\$ 27,000
		High Crash Spot Safety	2.494	2.534	3.631	3.691	g	Add ramps (ADA compliant) at intersection	\$ 14,000	\$ 15,000	\$ -	\$ 140,000	\$ 169,000
		High Crash Spot Access Management Safety	2.514	2.674	N/A	N/A	i	Provide raised concrete median/separation to prohibit left turns at entrances to Thorntons and Gilbert and Mitchell Auto Salvage	\$ 10,000	\$ -	\$ -	\$ 100,000	\$ 110,000
		High Crash Spot Congestion Safety	2.630	2.670	N/A	N/A	j	Add additional right-turn only signage east of National Turnpike and add skip lines between through and right-turn only lanes.**	\$ -	\$ -	\$ -	\$ 2,000	\$ 2,000
Other Spot Improvements	Congestion	1.835	1.895	N/A	N/A	c	Right Turn Lane Wilshire Boulevard	\$ 5,000	\$ -	\$ 100,000	\$ 50,000	\$ 155,000	
	Congestion	0.421	0.481	N/A	N/A	d	Right Turn Lane at Candleworth Drive	\$ 15,000	\$ -	\$ 60,000	\$ 150,000	\$ 225,000	
	Safety	0.000	2.614	N/A	N/A	N/A	Sidewalks	\$ 50,000	\$ 250,000	\$ 75,000	\$ 830,000	\$ 1,205,000	

*Will be implemented as part of pavement rehabilitation project in 2019.

** Due to cost, this short-term improvement was revised from original survey at PTM No. 3.

12.0 NEXT STEPS

The next project phase would be Phase I Design, which includes preliminary engineering and environmental analysis. No phases beyond this planning study are funded in *Kentucky's FY 2018–FY 2024 Highway Plan*.

13.0 CONTACTS/ADDITIONAL INFORMATION

Written requests for additional information regarding the Outer Loop Corridor Study should be sent to:

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