



Smiths Grove Traffic Operations Study

*Warren County
KYTC Item No. N/A*



TRANSPORTATION
CABINET



FINAL REPORT

Smiths Grove Traffic Operations Study



Kentucky Transportation Cabinet
Central Office, Division of Planning
Highway District 3, Bowling Green

In partnership with:



January 2024



Executive Summary

Smiths Grove Traffic Operations Study

Executive Summary

The Kentucky Transportation Cabinet (KYTC) initiated the Smiths Grove Traffic Operations Study in Warren County to take a comprehensive look at the KY 101 (South Main Street) commercial corridor in Smiths Grove and evaluate the need for improvements.

Existing Conditions

The KY 101 study corridor, shown in **Figure ES-1**, extends approximately 0.25 miles on either side of the interchange with I-65 at Exit 38. Based on the most recent available data, KY 101 carries 4,950 vehicles per day (VPD). Results from the existing traffic analysis show that all study area intersections currently operate at an acceptable level during the AM and PM peak hours.

Safety is the primary concern along KY 101, along with alleviating congestion anticipated from future development. This portion of KY 101 carries a mix of local and regional traffic as it connects Smiths Grove (to the north) and Scottsville approximately 20 miles to the south in Allen County with I-65. It not only serves as a connection for these cities, but also provides access to numerous existing businesses – many of which rely on interstate travel. Angle, backing, rear-end, and sideswipe collisions make up a majority of the crashes along the study area portion of KY 101 - crash types that are typically attributed to issues related to access management.



Commercial Area along KY 101

There are 15 access points on the 0.2-mile section of KY 101 between the I-65 southbound ramps and Wendy's, as shown in **Figure ES-2**. A high number of access points increases the frequency of turning vehicles, which creates more conflict points and compromises safety. It also reduces traffic operations as vehicles are constantly slowing to turn or allow others to turn.

In the five years between 2017 and 2021, there were 57 collisions reported on the study portion of KY 101, one of which resulted in a fatality and ten which resulted in an injury. Further analysis revealed the KY 101 corridor and the four major intersections (I-65 northbound and southbound ramps, Jim Burrell Lane, and Vincent Street) have experienced more crashes than what is expected based on volume and roadway characteristics. KY 101 has a Level of Service of Safety (LOSS) of three, indicating a moderate to high potential for crash reduction.

Without improvement, the frequency of these types of crashes is expected to increase as traffic from future development increases.



Executive Summary
 Smiths Grove Traffic Operations Study

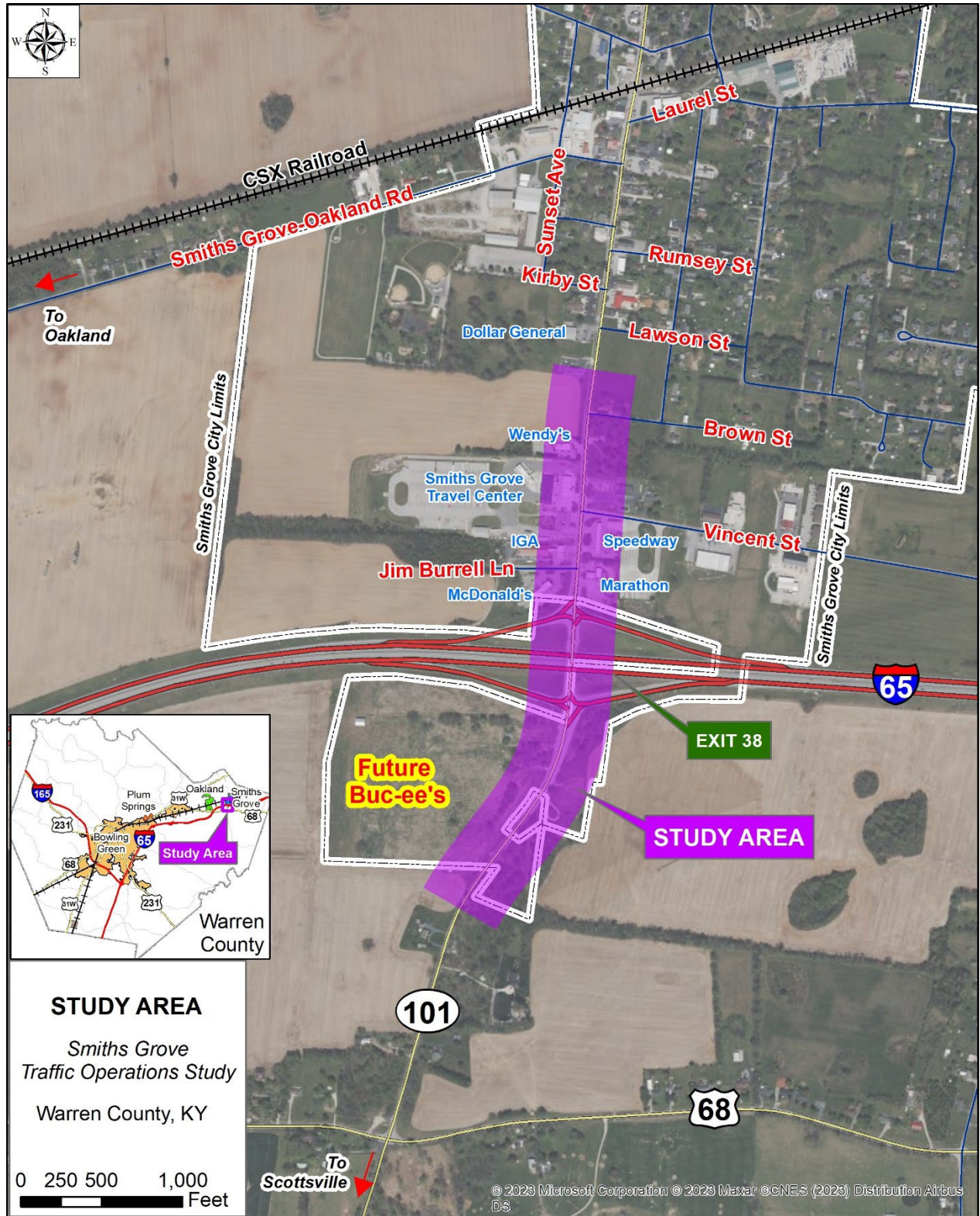


Figure ES-1: KY 101 Study Corridor



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Smiths Grove Traffic Operations Study

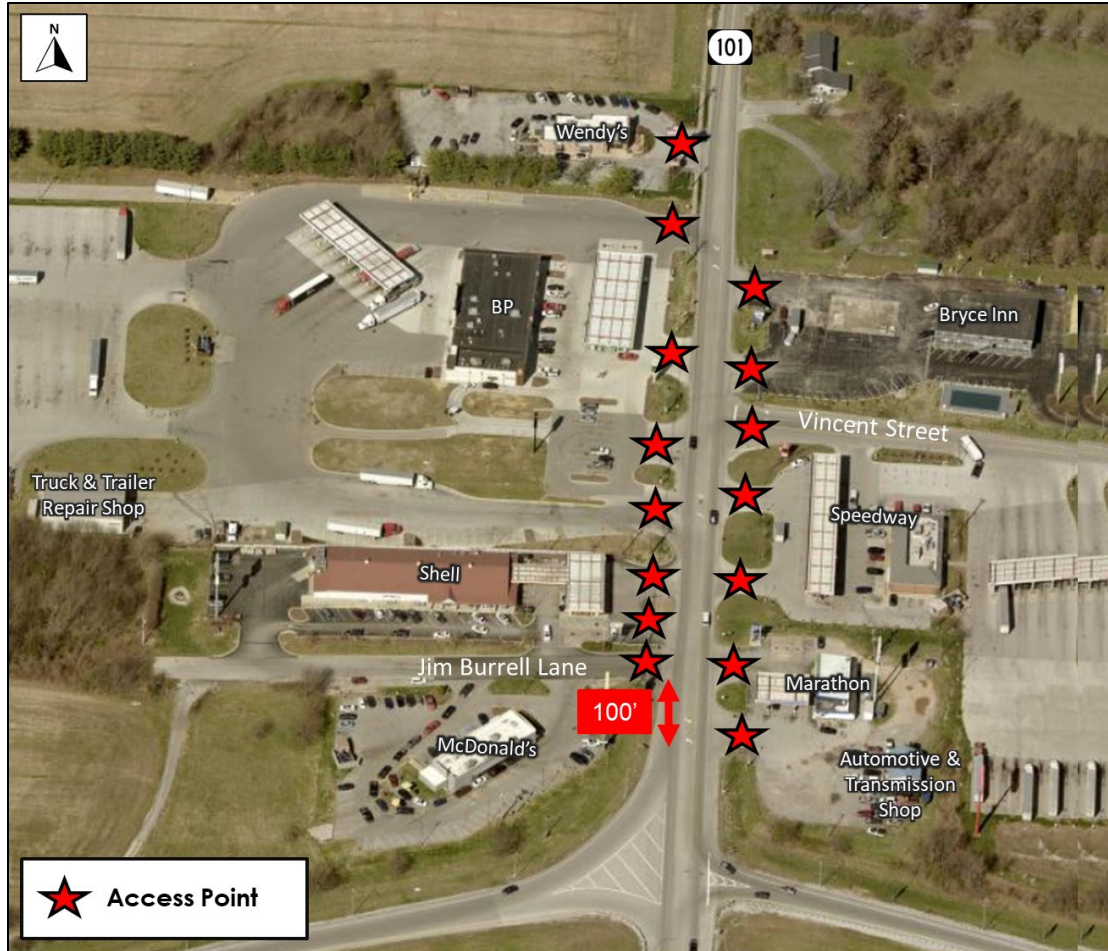


Figure ES-2: Access Points on KY 101

Future Conditions

Construction is currently underway for a Buc-ee's in the southwest quadrant of the interchange. Once it opens, Buc-ee's is anticipated to introduce up to 1,600 trips per hour on KY 101 through and south of the I-65 interchange. As part of the development's approval process, the developer will construct the following roadway improvements to accommodate the additional traffic:

- Install traffic signals on KY 101 at the I-65 northbound and southbound ramps.
- Widen the I-65 ramps to accommodate dedicated left- and right-turn lanes.
- Construct a dual lane roundabout on KY 101 at the main Buc-ee's entrance.
- Construct a second stop-controlled Buc-ee's entrance on KY 101 south of the proposed roundabout.

In addition to the construction of Buc-ee's, there is approximately 150 acres of undeveloped land currently zoned for industrial, business, or residential development north of I-65 within the study influence area. Additionally, rezoning requests have been submitted for 23 acres off Jim Burrell Lane and 17 acres off Vincent Street. Traffic forecasts were developed based on estimates from the Buc-ee's Traffic Impact Study (TIS) and conversations with the Bowling Green-

Executive Summary

Smiths Grove Traffic Operations Study

Warren County Metropolitan Planning Organization (MPO) and show that by 2045, traffic north of I-65 is likely to increase by 90 percent and traffic to the south will increase fivefold (500 percent). Such growth in traffic would adversely affect travel conditions and mobility along the corridor.

Preliminary Improvement Concepts

Preliminary improvement concepts, described below and summarized in **Table ES-1**, were developed to improve congestion and safety by separating driveways so turning and crossing movements occur at fewer locations. Separating driveways and street entrances allows drivers passing through an area to predict where other drivers will turn and cross. Studies consistently show that roadways with good access management have crash rates 40 to 50 percent lower than poorly managed routes.

Concept 1 includes maintaining the Buc-ee's improvements at the I-65 interchange, converting the Jim Burrell Lane intersection to right-in / right-out, consolidating entrances along KY 101 north of I-65, and constructing sidewalks on the west side of KY 101. Backage roads are also recommended to be constructed with private funds as part of future developments.

Concept 2 includes maintaining the Buc-ee's improvements at the I-65 interchange, constructing a raised median on KY 101 north of I-65 to Brown Street, allowing left-turns in at larger intersections, constructing a single-lane roundabout at Brown Street, and constructing a sidewalk along the west side of KY 101.

Concept 3 includes access management improvements on KY 101 along with a dual-lane "dogbone" roundabout at the I-65 interchange and a single-lane roundabout at Brown Street. North of the interchange, this concept includes a non-traversable raised median, with right-in/right-out access provided along the corridor and U-turn opportunities at the new roundabouts.

Concept 4 includes the improvements from Concept 3 but allows left-in access at Shell, Vincent Street, BP, and Wendy's.

Table ES-1: Evaluation Matrix of Preliminary Improvement Concepts

Project Goals	Existing (No Build)	Concept 1	Concept 2	Concept 3	Concept 4
Estimated Total Cost (2023 Dollars)	\$0	\$2,600,000	\$6,000,000	\$10,400,000	\$10,900,000
Benefit-to-Cost Ratio	N/A	0.2	0.1	1.5	1.8
Improves Safety by Reducing Conflict Points	✘	●	●	✓	✓
Improves Congestion by Decreasing Access Density	✘	●	●	✓	✓
Provides Truck Access	●	●	●	✓	✓
Accommodates Future Development	✘	●	✓	✓	✓
Provides Sidewalk	✘	✓	✓	✓	✓
Reduces Right-of-Way Impacts	✓	✓	●	●	●
Reduces Utility Impacts	✓	✓	✓	✓	✓
<p>Key: ✘ Not Addressed ● Somewhat Addressed ✓ Addressed</p>					



Executive Summary

Smiths Grove Traffic Operations Study

Public Outreach

The project team met with local officials and the public at the Smiths Grove Fire Station on July 27, 2023. Surveys were distributed to the 122 attendees to solicit feedback on the need for improvements, transportation issues affecting travel within the study area, and the preliminary improvement concepts. Of the 71 respondents, 94 percent indicated that improvements along KY 101 are needed, with congestion and safety listed as the primary transportation concerns. When asked which preliminary improvement concept they prefer, the leading response was Concept 3 (37 percent) followed by Concept 4 (34 percent).



Public Meeting at the Smiths Grove Fire Station

Study Recommendations

Based on results from the safety analyses, traffic forecasts, benefit-cost analysis, feedback from the Local Officials / Stakeholders, and feedback from the public, it was determined that Concept 3 and Concept 4 best meet the project goals. Three sidewalk options were considered for each of the concepts: Option A includes a sidewalk on the west side of KY 101 from McDonald's to Brown Street, Option B includes a sidewalk on the west side of KY 101 from Buc-ee's to Brown Street, and Option C includes a sidewalk on both sides of the KY 101 from Buc-ee's to Brown Street.



Executive Summary

Smiths Grove Traffic Operations Study

The following options are recommended to move forward for consideration in Phase 1 Design:

- **Concept 3A** (shown in **Figure ES-3**): Sidewalk along the west side of KY 101 beginning at McDonald's and continuing north to the roundabout at Brown Street.
- **Concept 3B** (shown in **Figure ES-4**): Sidewalk along west side of KY 101 beginning at Buc-ee's and continuing north to the roundabout at Brown Street.
- **Concept 3C** (shown in **Figure ES-5**): Sidewalks along both sides of KY 101 beginning at Buc-ee's and continuing north to the roundabout at Brown Street. The I-65 bridge will be widened to accommodate two KY 101 northbound lanes.
- **Concept 4A** (shown in **Figure ES-6**): Sidewalk along west side of KY 101 beginning at McDonald's and continuing north to the roundabout at Brown Street.
- **Concept 4B** (shown in **Figure ES-7**): Sidewalk along west side of KY 101 beginning at Buc-ee's and continuing north to the roundabout at Brown Street.
- **Concept 4C** (shown in **Figure ES-8**): Sidewalks along both sides of KY 101 beginning at Buc-ee's and continuing north to the roundabout at Brown Street. The I-65 bridge is widened to accommodate two KY 101 northbound lanes.

Private developers, local planning staff, and local officials play a role in implementing the backage road recommendations from this study. The location of new backage roadways should be considered as part of rezoning applications, development plan applications, and plats. As the larger area continues to develop over time, these connections will be critical in providing alternative routes which will improve safety and reduce congestion along KY 101.

Table ES-2 presents the cost estimates for each of the improvement concepts.

Table ES-2: Cost Estimates (2023 Dollars)

Concept	Design	Right-of-Way	Utility	Construction	Total
Concept 3A	\$900,000	\$1,500,000	\$2,000,000	\$6,000,000	\$10,400,000
Concept 3B	\$1,000,000	\$1,800,000	\$2,300,000	\$6,800,000	\$11,900,000
Concept 3C	\$1,300,000	\$2,000,000	\$2,500,000	\$8,400,000	\$14,200,000
Concept 4A	\$900,000	\$2,300,000	\$2,000,000	\$5,700,000	\$10,900,000
Concept 4B	\$1,000,000	\$2,500,000	\$2,300,000	\$6,400,000	\$12,200,000
Concept 4C	\$1,200,000	\$2,800,000	\$2,500,000	\$8,000,000	\$14,500,000





Figure ES-3
Improvement Concept 3A



Figure ES-4
Improvement Concept 3B



Figure ES-5
Improvement Concept 3C



Figure ES-6
Improvement Concept 4A



Figure ES-7
Improvement Concept 4B



Figure ES-8
Improvement Concept 4C

Table of Contents

EXECUTIVE SUMMARY	ES-1
1.0 INTRODUCTION	1
1.1 STUDY AREA	1
2.0 EXISTING CONDITIONS	1
2.1 FUNCTIONAL CLASSIFICATION.....	1
2.2 ACCESS MANAGEMENT.....	4
2.3 ROADWAY GEOMETRY.....	5
2.4 SPEED LIMIT.....	5
2.5 EXISTING TRAFFIC ANALYSIS	5
2.6 CRASH HISTORY	9
3.0 ENVIRONMENTAL OVERVIEW	13
3.1 NATURAL ENVIRONMENT.....	13
3.2 HUMAN ENVIRONMENT.....	13
3.3 SOCIOECONOMIC STUDY.....	16
4.0 FUTURE CONDITIONS	17
4.1 POPULATION TRENDS.....	17
4.2 HISTORICAL KYTC TRAFFIC COUNTS	17
4.3 BUC-EE'S TRAFFIC	19
4.4 BOWLING GREEN/WARREN COUNTY TRAVEL DEMAND MODEL.....	19
4.5 DAILY TRAFFIC FORECASTS.....	20
4.6 2032 NO-BUILD MICROSIMULATION MODEL	22
4.7 2032 EXISTING + COMMITTED (E+C) MICROSIMULATION MODEL	22
4.8 SENSITIVITY ANALYSIS	24
5.0 STUDY AREA NEEDS	26
6.0 INITIAL PROJECT TEAM COORDINATION	26
6.1 PROJECT TEAM MEETING NO. 1	26
7.0 IMPROVEMENT CONCEPT DEVELOPMENT	28
7.1 CONCEPT A	28
7.2 CONCEPT B.....	28
7.3 CONCEPT C	29
7.4 CONCEPT D	32
7.5 CONCEPT E	32
7.6 CONCEPT F	33
7.7 CONCEPT G.....	35
8.0 PROJECT TEAM MEETING NO. 2	35



FINAL REPORT

9.0	REFINED IMPROVEMENT CONCEPTS.....	37
9.1	CONCEPT 1	37
9.2	CONCEPT 2	37
9.3	CONCEPT 3	37
9.4	CONCEPT 4	37
10.0	LOCAL OFFICIALS/ STAKEHOLDER AND PUBLIC MEETING.....	38
10.1	LOCAL OFFICIALS / STAKEHOLDER MEETING	38
10.1.1	Local Officials / Stakeholder Survey	38
10.2	PUBLIC MEETING	40
10.2.1	Public Meeting Survey	40
11.0	STUDY RECOMMENDATIONS	41
11.1	BENEFIT-COST ANALYSIS	42
11.2	PROJECT TEAM MEETING NO. 3	42
11.3	NEXT STEPS	50
	CONTACTS/ADDITIONAL INFORMATION.....	50

TABLE OF TABLES

Table ES-1: Benefit-to-Cost Analysis	ES-4
Table ES-2: Improvement Concept Prioritization & Cost Estimates	ES-6
Table 1: Socioeconomic Study	16
Table 2: Population Estimates and Projections	17
Table 3: Buc-ee's Estimated Trip Generation	19
Table 4: 2032 No-Build Traffic Operations	22
Table 5: 2032 E+C microsimulation Model Summary	24
Table 6: ITE Trip Generation Estimates	25
Table 7: Microsimulation Sensitivity Analysis Results	25
Table 8: Benefit-Cost Analysis Summary	42
Table 9: Cost Estimates (2023 Dollars)	43

TABLE OF FIGURES

Figure ES-1: KY 101 Study Corridor	ES-2
Figure ES-2: Access Points on KY 101	ES-3
Figure ES-3: Concept 3A	ES-7
Figure ES-4: Concept 3B	ES-8
Figure ES-5: Concept 3C	ES-9
Figure ES-6: Concept 4A	ES-10
Figure ES-7: Concept 4B	ES-11
Figure ES-8: Concept 4C	ES-12
Figure 1: KYTC District 3 Map	1
Figure 2: Smiths Grove Study Area	2



FINAL REPORT

Figure 3: Functional Classification	3
Figure 4: Access Points on KY 101	4
Figure 5: Commercial Section of KY 101 North of I-65	5
Figure 6: Lane Widths.....	6
Figure 7: Shoulder Widths	7
Figure 8: Average Daily Traffic (ADT).....	8
Figure 9: Crash Severity (2017 – 2021)	10
Figure 10: Crash Type (2017 – 2021)	11
Figure 11: Excess Expected Crashes (EEC)	12
Figure 12: Natural Environment.....	14
Figure 13: Human Environment.....	15
Figure 14: KY 101 Historical Daily Traffic Volumes	18
Figure 15: I-65 Historical Daily Traffic Volumes	18
Figure 16: Potential Study Area Developments.....	20
Figure 17: 2045 Daily Traffic Forecasts	21
Figure 18: Committed Improvements from the Buc-ee's TIS.....	23
Figure 19: Richmond Buc-ee's Traffic Counts	27
Figure 20: Concept A	30
Figure 21: Concept B.....	31
Figure 22: 2032 Simulation Model Results (Concept D)	33
Figure 23: Concept F	34
Figure 24: Concept G.....	36
Figure 25: Local Officials Survey - Ranking Transportation Issues	39
Figure 26: Local Officials Survey - Improvement Concepts	39
Figure 27: Public Survey - Ranking Transportation Issues.....	40
Figure 28: Public Survey - Improvement Concepts.....	41
Figure 29: Concept 3A	44
Figure 30: Concept 3B.....	45
Figure 31: Concept 3C	46
Figure 32: Concept 4A	47
Figure 33: Concept 4B.....	48
Figure 34: Concept 4C	49

APPENDICES

APPENDIX A – TRAFFIC SIMULATION MODEL CALIBRATION MEMORANDUM

APPENDIX B – CRASH HISTORY (2017 – 2019)

APPENDIX C – ENVIRONMENTAL OVERVIEW

APPENDIX D – SOCIOECONOMIC STUDY

APPENDIX E – TRAFFIC FORECASTING TECHNICAL MEMORANDUM

APPENDIX F – MEETING SUMMARIES



1.0 INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) initiated the Smiths Grove Traffic Operations Study in Warren County to examine short- and long-term transportation needs for the KY 101 (South Main Street) commercial corridor in Smiths Grove – approximately 0.25-mile each side of the interchange with I-65 – and evaluate the need for improvements. **Figure 1** presents a map depicting the location of the study area within KYTC District 3.

1.1 STUDY AREA

The KY 101 study corridor extends from milepost 7.6 to milepost 8.2 in Smiths Grove, Kentucky, approximately 0.25-miles on either side of the interchange with I-65 at Exit 38, as shown in **Figure 2**.

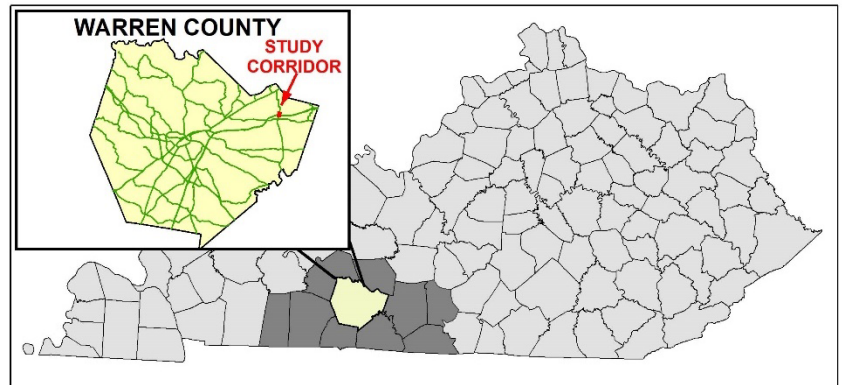


Figure 1: KYTC District 3 Map

This portion of KY 101 carries a mix of local and regional traffic as it connects Smiths Grove (to the north) and Scottsville (to the south) with I-65. It not only serves as a connection for these cities, but also provides access to numerous existing businesses – many of which rely on interstate travel. Within the study area, construction is currently underway for a Buc-ee's south of the I-65 interchange. In addition to the construction of Buc-ee's, additional development is anticipated along Jim Burrell Lane and Vincent Street north of the interchange.

2.0 EXISTING CONDITIONS

Conditions of the existing transportation network were examined and are shown in the following sections. The information compiled includes roadway facilities and geometrics, crash history, and traffic volumes within the study area. Data for this section were collected from KYTC's Highway Information System (HIS) database, KYTC's Traffic Count Reporting System, aerial photography, and field inspection.

2.1 FUNCTIONAL CLASSIFICATION

Functional classification is the result of grouping streets and highways according to the character of travel service they provide. Functional classifications within the study area are shown in **Figure 3**. KY 101 is classified as a rural major collector.

FINAL REPORT

Smiths Grove Traffic Operations Study

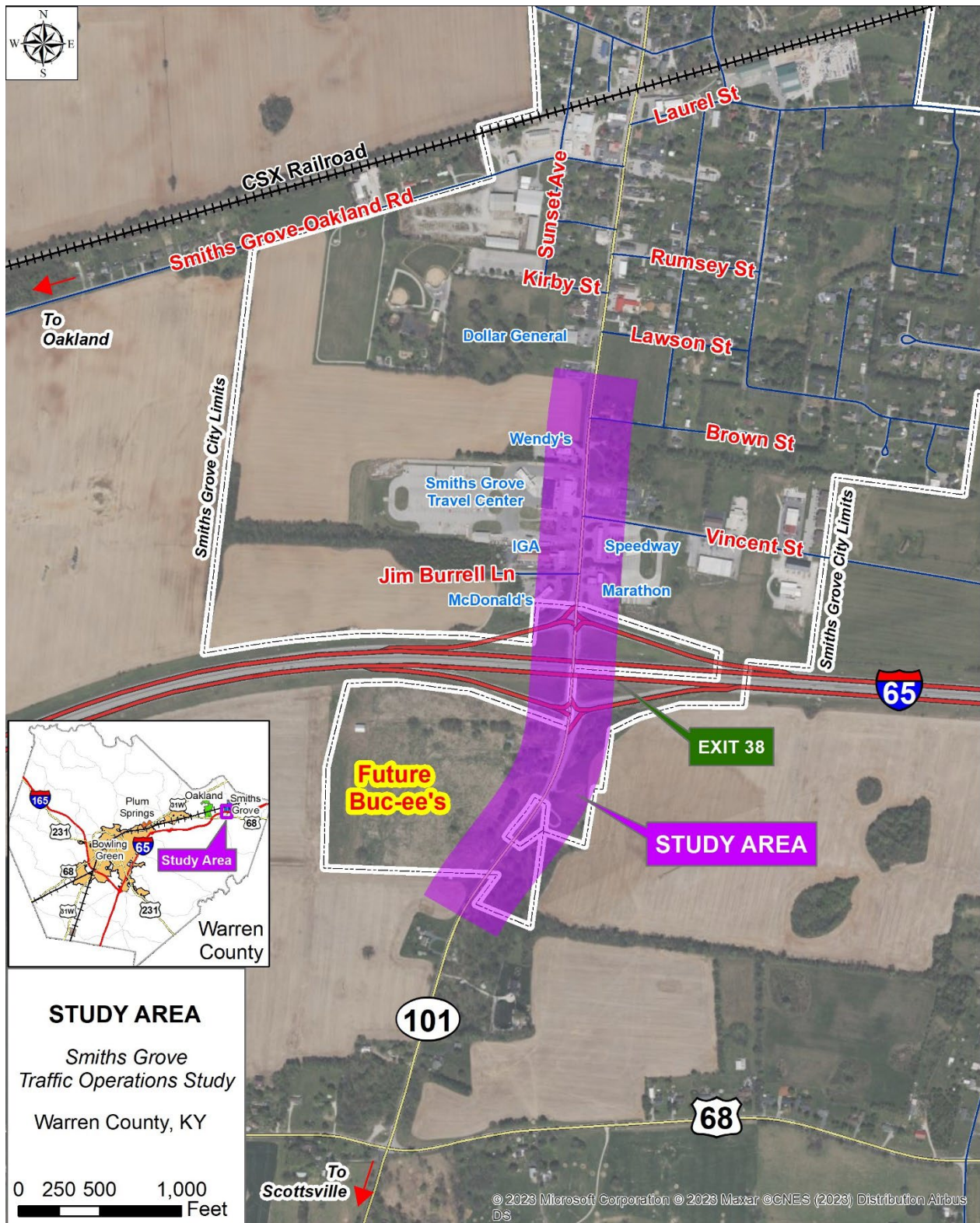


Figure 2: Smiths Grove Study Area



FINAL REPORT

Smiths Grove Traffic Operations Study



Figure 3: Functional Classification



2.2 ACCESS MANAGEMENT

There is currently just over 100 feet between Jim Burrell Lane and the I-65 southbound ramp intersection, as shown in **Figure 4**. The KYTC Highway Design Manual Exhibits 1100-01 and 1100-02 recommends a minimum of 300 feet spacing between interchange ramps and access points on rural roads and a desired distance of 600 feet¹.

Additionally, there are seven access points (equivalent to 35 access points per mile) on the east side of KY 101 on the 0.2-mile section between the I-65 southbound ramps and Wendy's and eight access points (equivalent of 40 access points per mile) to the west. Such a high number of access points increases the frequency of turning vehicles, which creates more potential conflict points and compromises safety. It also contributes to traffic operational concerns as vehicles are constantly slowing to turn.

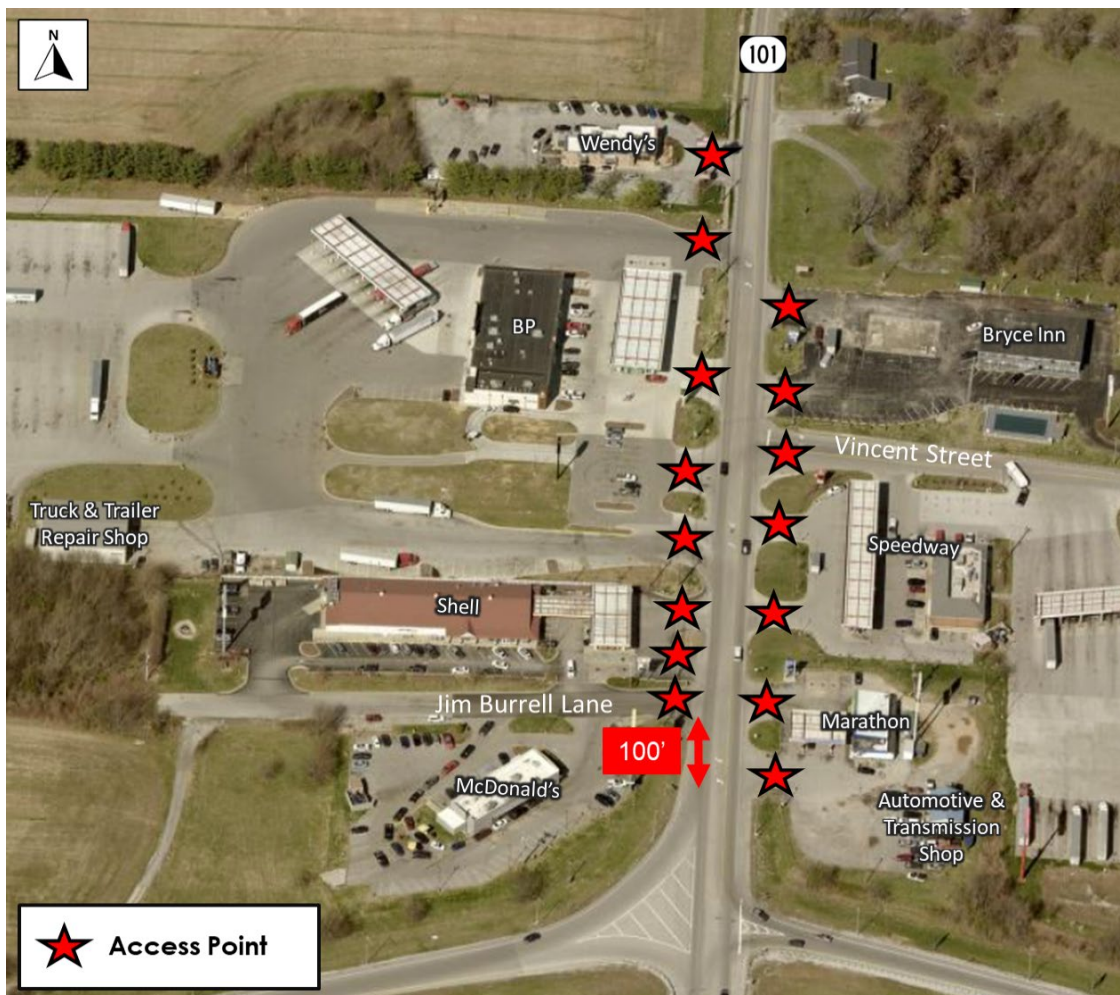


Figure 4: Access Points on KY 101

¹ <https://transportation.ky.gov/Organizational-Resources/Policy%20Manuals%20Library/Highway%20Design.pdf>

FINAL REPORT

Smiths Grove Traffic Operations Study

2.3 ROADWAY GEOMETRY

KYTC's HIS database was used to identify roadway geometry. North of the I-65 interchange KY 101 has 12-foot lanes, a 12-foot center two-way left-turn lane (TWLTL), varying shoulder types, and numerous driveway openings as shown in **Figure 5**. The current number of lanes and recorded lane widths within the study area are shown in **Figure 6**. The shoulder widths for each roadway within the study area are shown in **Figure 7**.

2.4 SPEED LIMIT

KY 101 has a posted speed limit of 35 mph north of the I-65 interchange and 45 mph to the south.

2.5 EXISTING TRAFFIC ANALYSIS

The most current average daily traffic (ADT) volumes from KYTC's traffic count stations are shown on **Figure 8**. Based on the most recent available data, KY 101 carries 4,950 vehicles per day (VPD) with 8.5 percent trucks north of I-65 (2022 count) and 4,950 VPD with 10.2 percent trucks to the south (2018 count). I-65 carries 57,900 VPD with ramp volumes ranging from 2,000 VPD on the northbound exit ramp to 2,900 VPD on the southbound entrance ramp. Note, traffic counts from 2020 and 2021 are not shown because they are not an accurate representation of current traffic patterns due to the COVID shutdowns.

12-hour turning movement counts were collected at the I-65 interchange ramps, Jim Burrell Lane, and Vincent Street in January 2022. These counts, collected between 6 a.m. and 7 p.m., show 7,400 vehicles on KY 101 north of the interchange. This 12-hour volume is significantly higher than the daily KYTC count of 4,950 VPD. The 12-hour turning movement counts also showed around 14 percent trucks on KY 101 north of the interchange, higher than the 8.5 percent estimated at the count station.



Figure 5: Commercial Section of KY 101 North of I-65

FINAL REPORT

Smiths Grove Traffic Operations Study

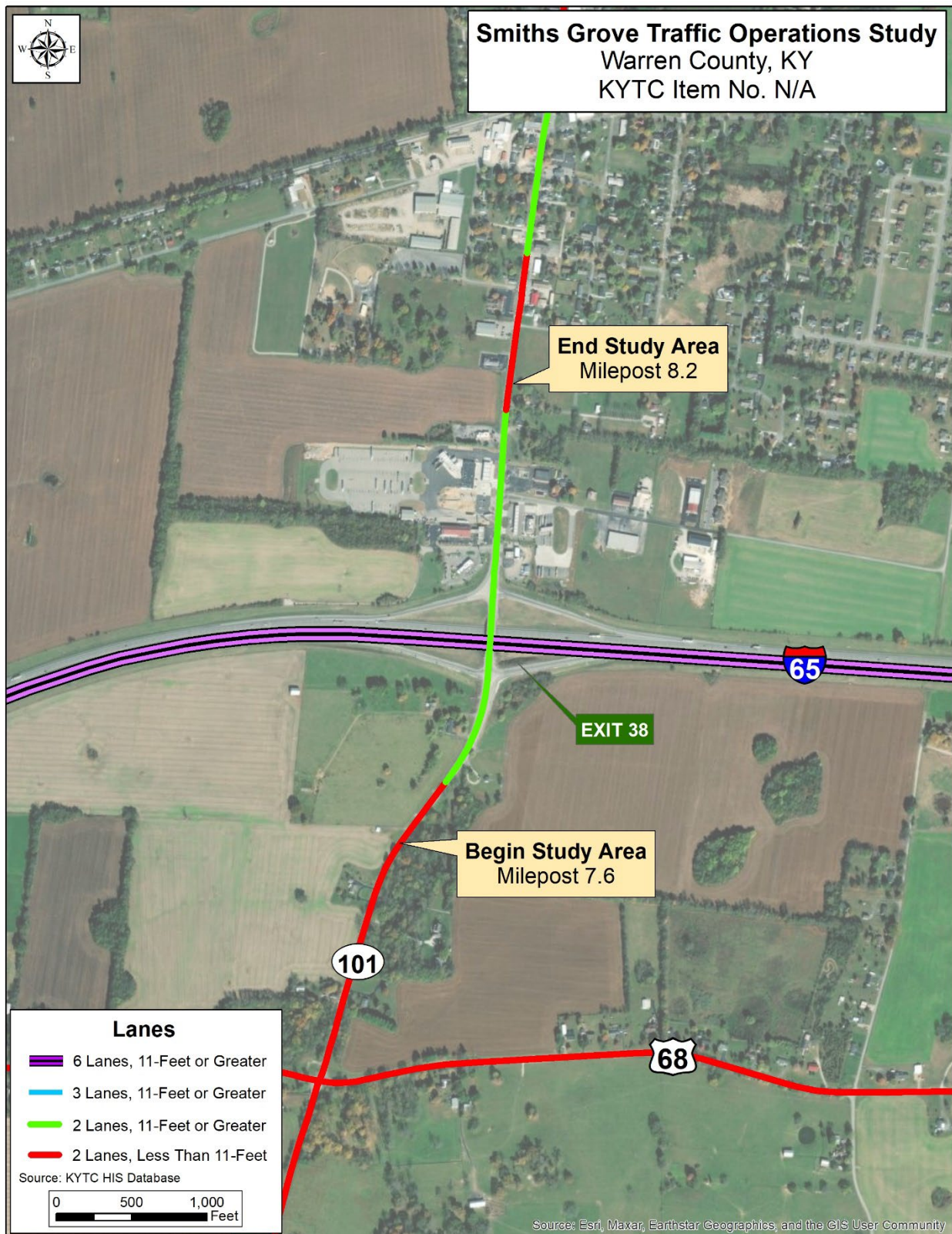


Figure 6: Lane Widths



FINAL REPORT

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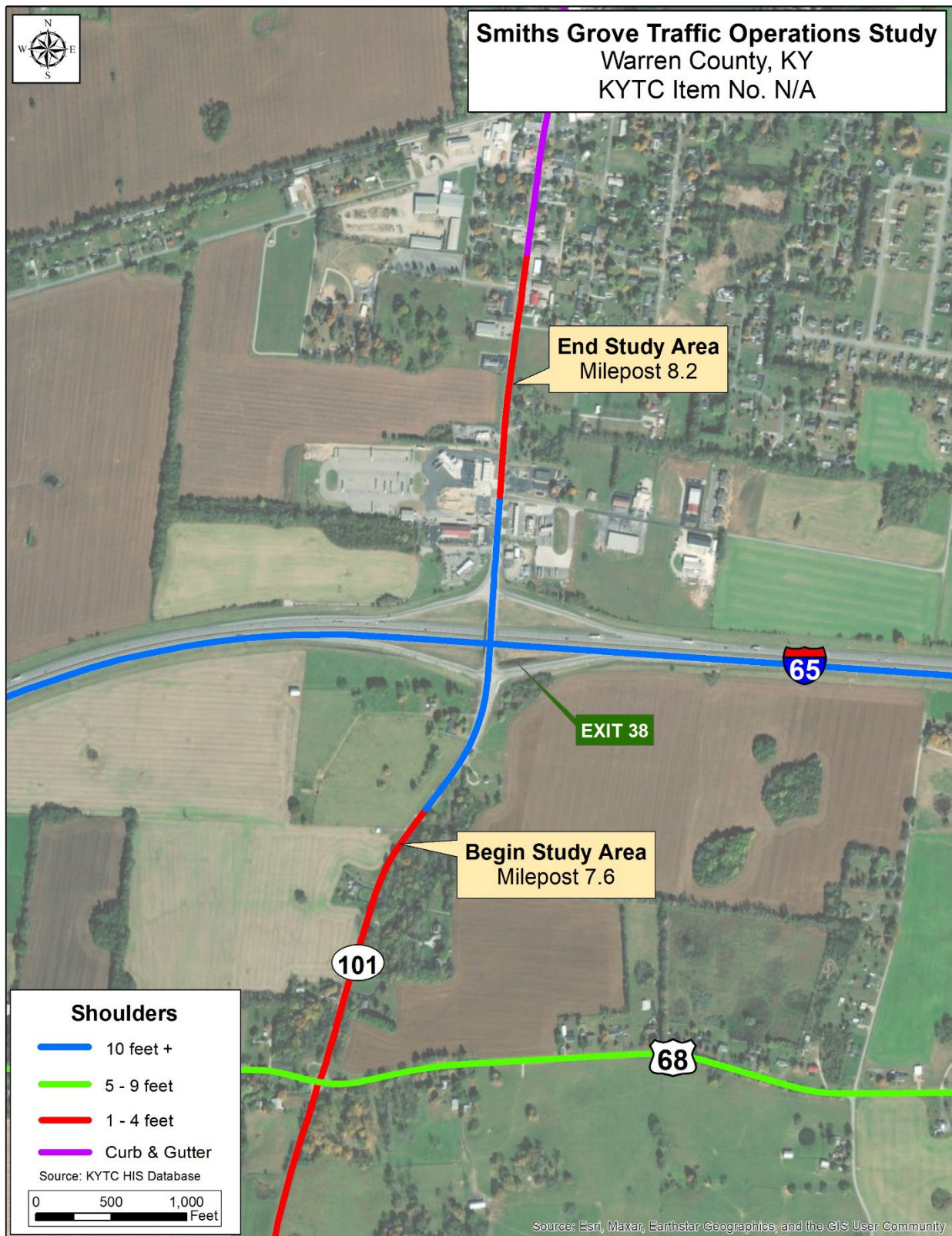


Figure 7: Shoulder Widths



FINAL REPORT

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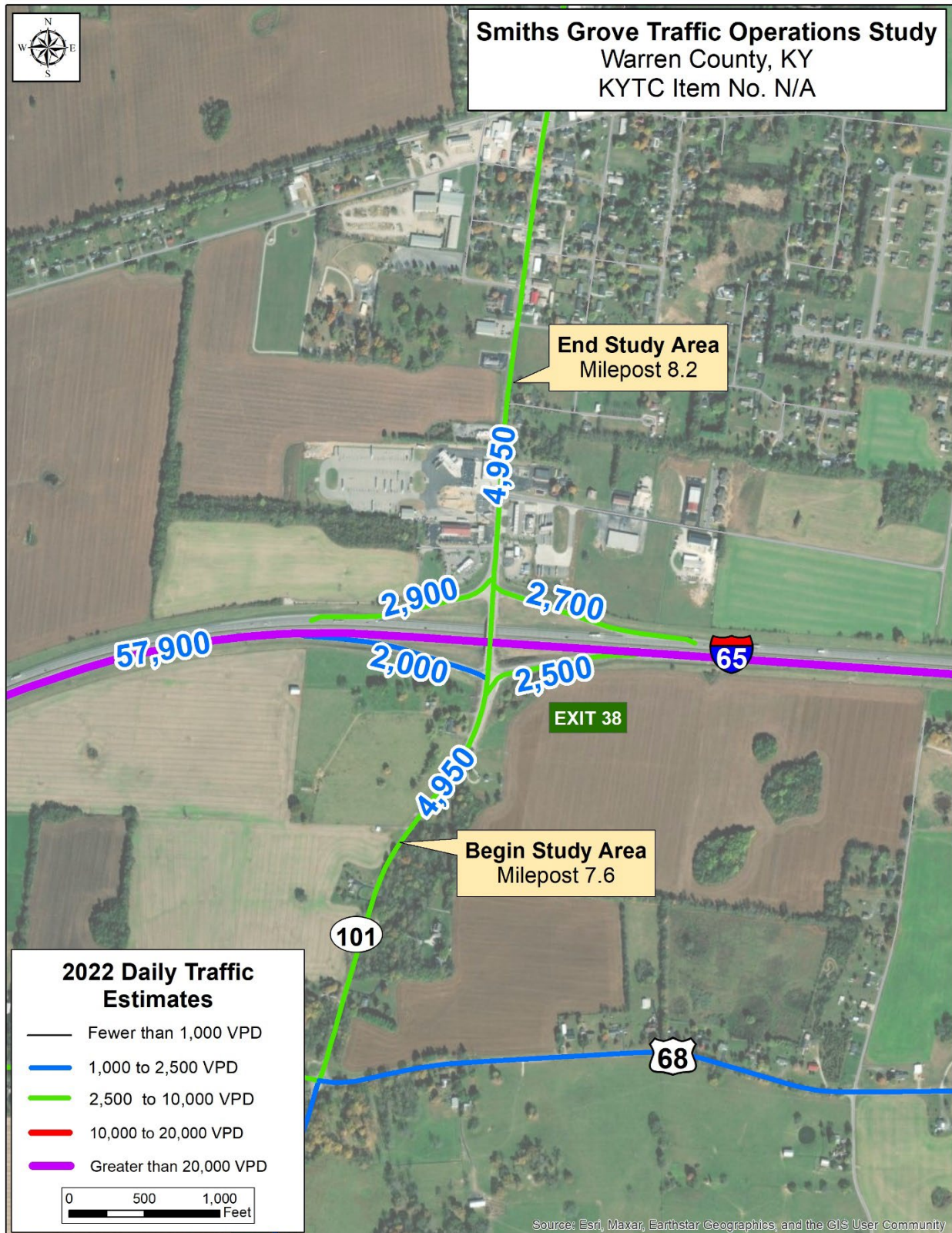


Figure 8: Average Daily Traffic (ADT)



2.6 CRASH HISTORY

Crash data was collected along existing roadways within the study area for the five-year period between January 1, 2017, and December 31, 2021. Over the five years, there were 57 collisions on KY 101 between mile point 7.6 and mile point 8.2. The crash records are included in **Appendix B**.

Of the 57 crashes, one resulted in a fatality (2 percent), 10 resulted in an injury (17 percent), 46 resulted in property damage only (81 percent). The fatal collision was an opposing left-turn at night at the northbound ramp terminal intersection. **Figure 9** presents a map of the crash severities for all crashes in and around the study portion of KY 101. Crashes that occurred on mainline I-75, the ramps, and KY 101 outside of the study limits were not included in the analysis.

Angle collisions (37 percent) make up a majority of the crashes along the study area portion of KY 101 – a crash type that is typically located at intersections and can be attributed to issues related to access. **Figure 10** presents the crash types for crashes in and around the study area.

The Crash Data Analysis Tool (CDAT) was used to perform an Excess Expected Crashes (EEC) analysis. EEC is a measure of the crash frequency at a given site compared to what is expected based on current conditions (geometrics, traffic, etc.). A positive EEC indicates more crashes are predicted than expected. Results from the analysis showed the study portion of KY 101 has an EEC of 0.5 crashes per year and a level of service of safety (LOSS) of 3, indicating that has a moderate potential for crash reduction. Additionally, four of the study area intersections have positive EECs as shown in **Figure 11**.



FINAL REPORT

Smiths Grove Traffic Operations Study

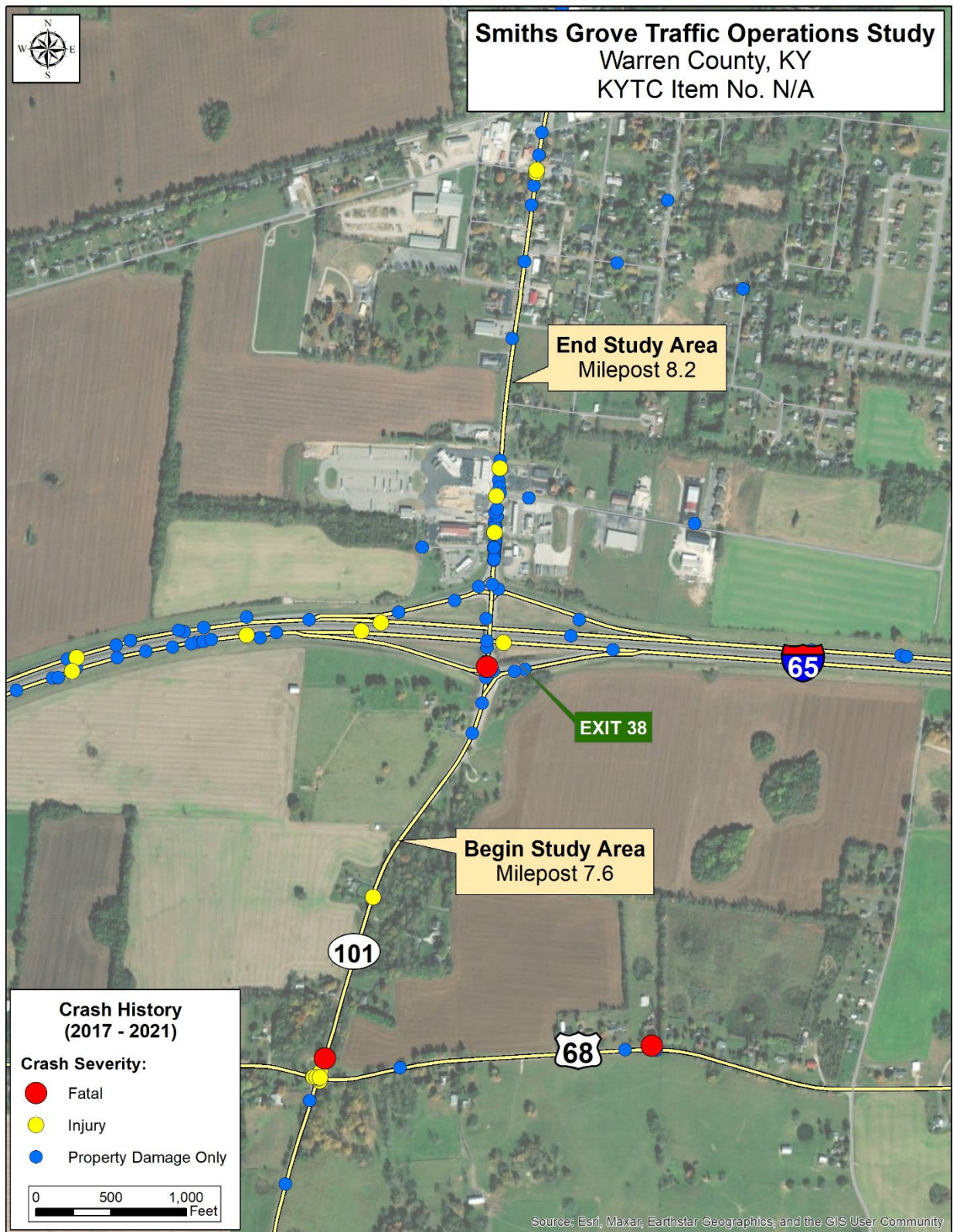


Figure 9: Crash Severity (2017 – 2021)



FINAL REPORT

Smiths Grove Traffic Operations Study

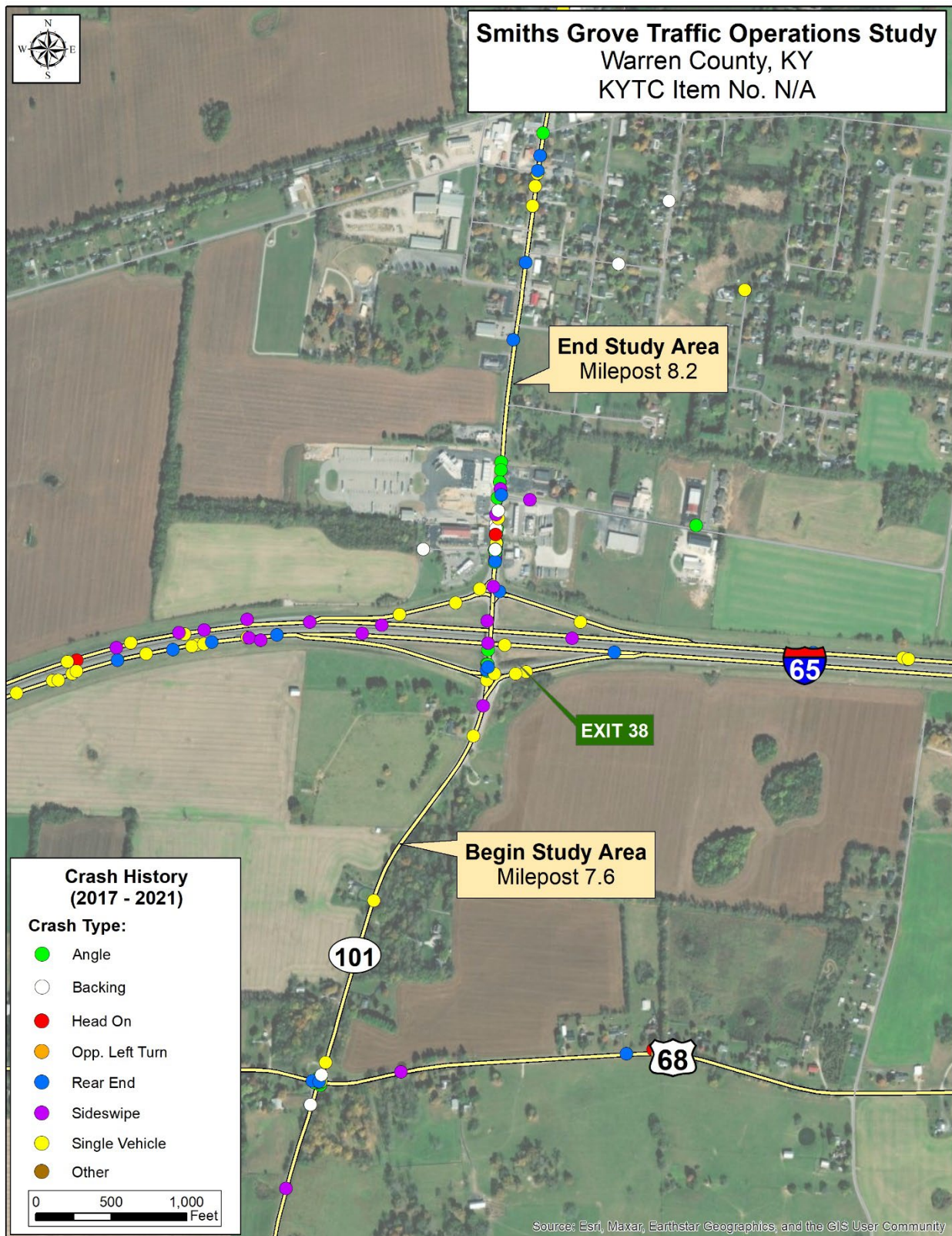


Figure 10: Crash Type (2017 – 2021)



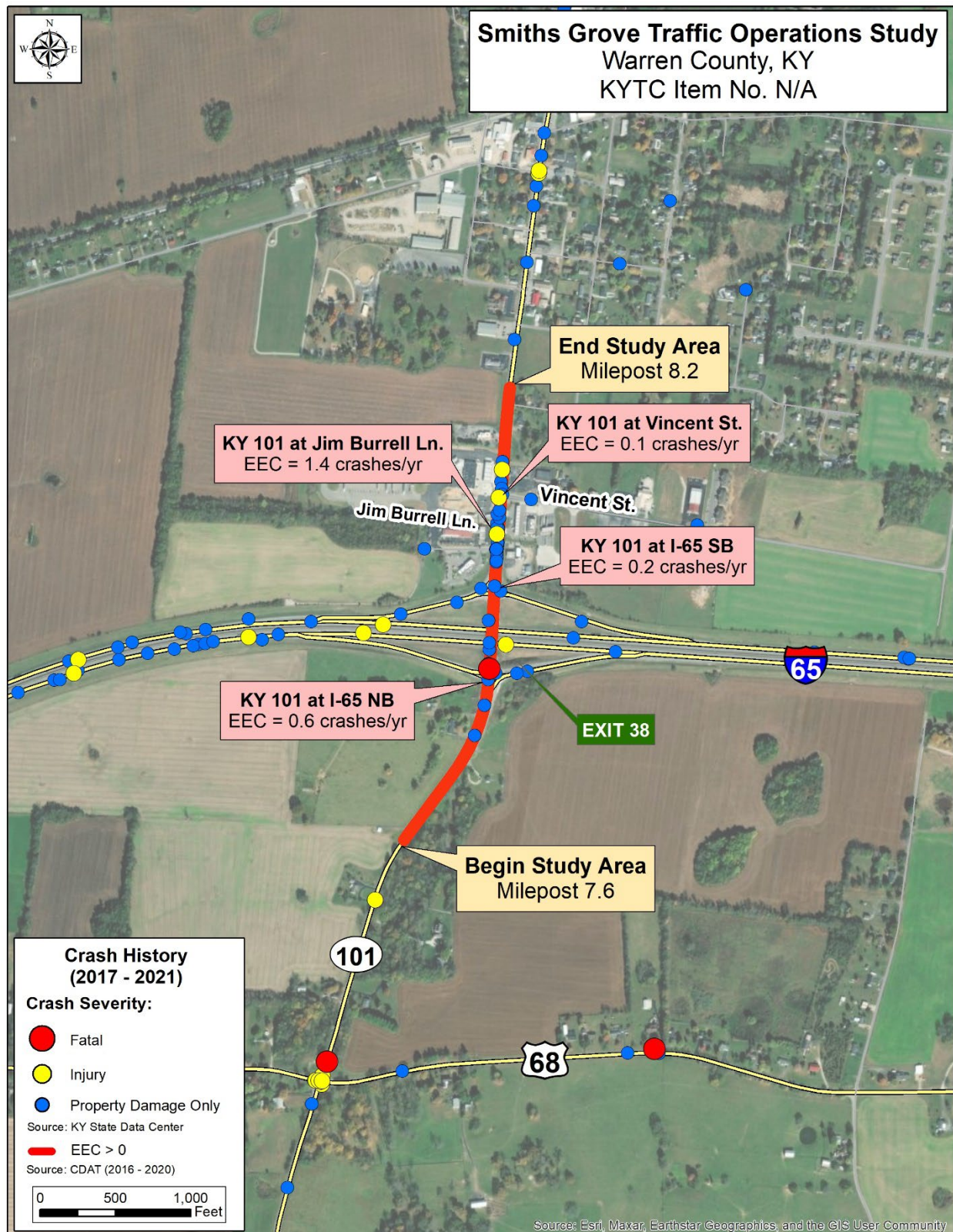


Figure 11: Excess Expected Crashes (EEC)



3.0 ENVIRONMENTAL OVERVIEW

An Environmental Overview (EO) was prepared to identify known natural and human features which occur within the study area. These features should be considered during the development and advancement of conceptual alternatives along with avoidance or minimization of impacts to the environment. The complete document is included in **Appendix C**.

3.1 NATURAL ENVIRONMENT

There are six National Wetland Inventory (NWI) features mapped within the influence area, as shown in **Figure 12**. All six are classified as Fresh Water Emergent (PEM) wetlands totaling 1.9 acres. Additionally, seven state water wells are found within the study area, four are listed as monitoring wells and three domestic use wells. There is one federal well identified within the study area.

The study area is underlain with bedrock with a high potential for karst development. There are four caves within the study area, all of which are protected by WKU.

According to U.S. Fish and Wildlife Service's Information for Planning and Consultation (IPaC) there are five federally listed endangered species, two federally listed threatened species and one federally listed candidate. All have the potential to occur within the study area.

Approximately 70 percent of the soil in the study area is considered Prime Farmland and an additional 17 percent is considered Farmland of Statewide Importance, which means that the land economically produces high yields of crops when treated and managed according to acceptable farming methods.

3.2 HUMAN ENVIRONMENT

An overview of the human environment in and around the study area is shown in **Figure 13**. Based on the review of National Register of Historic Places (NRHP) there are two registered historic districts and registered buildings located within the study area, most of which are in the northern portion of the study area. Community resources and sensitive noise receptors in the study area include single family residential neighborhoods and houses, five houses of worship, one school, and one park. Potential hazardous materials concerns, including underground storage tanks, exist throughout the study area.



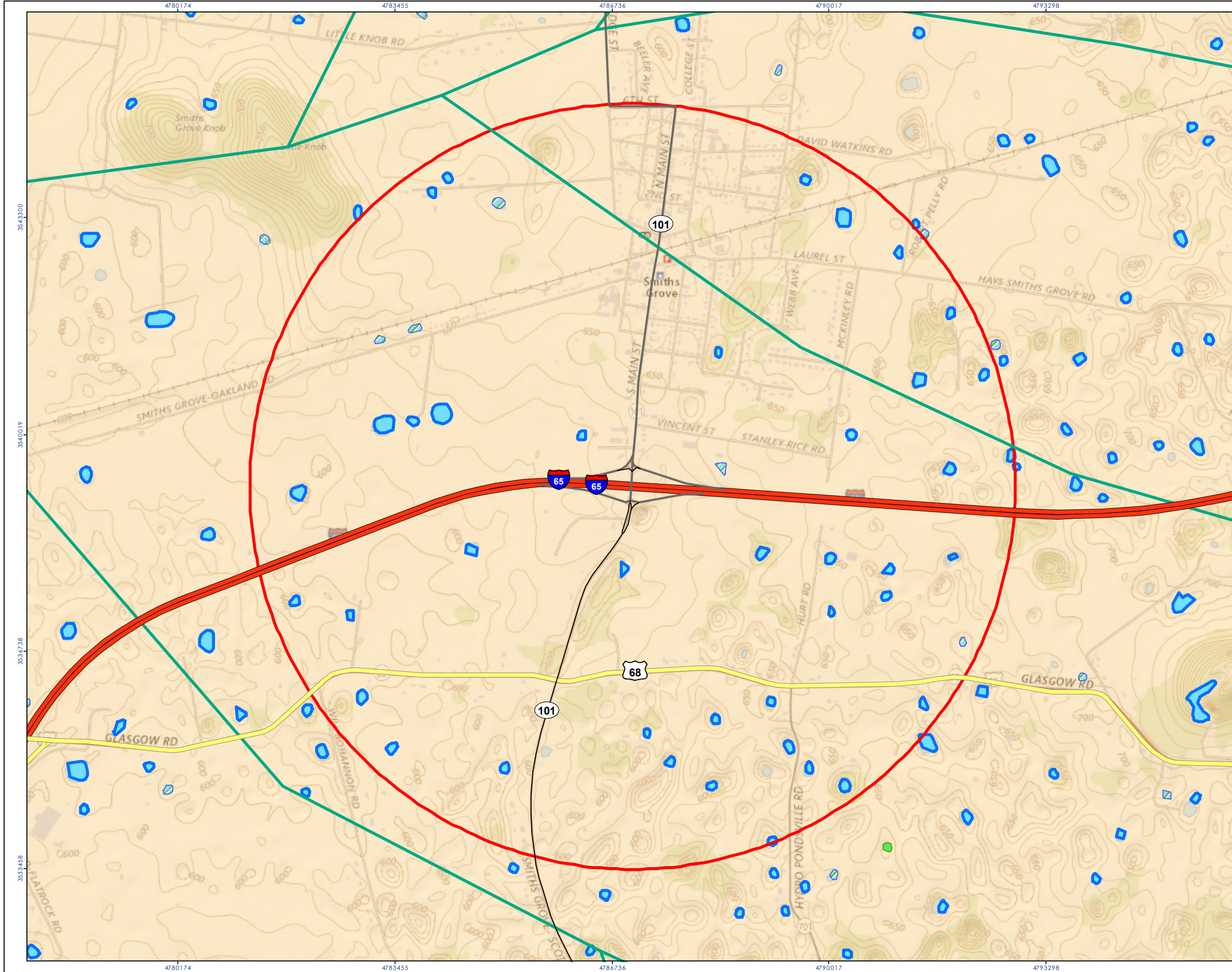


Figure No.

12

Title

Water Resources

Client/Project
 Kentucky Transportation Cabinet
 Smiths Grove Study
 Environmental Overview

178567021 REVA

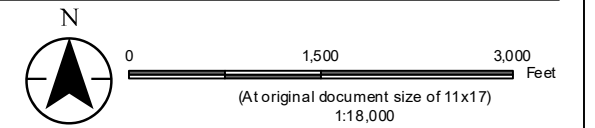
Project Location

Warren County, Kentucky

Prepared by SK on 2022-02-15

TR by CK on 2022-02-16

R Review by JW on 2019-02-17



- Influence Area
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Area of Minimal Flood Hazard (Zone X)
- NHD Flowline - Underground Conduit



Notes

1. Coordinate System: NAD 1983 StatePlane Kentucky FIPS 1600 Feet
2. Data Sources: KYTC, USA Major Roads, NWI, NHD, FEMA NFHL, EDR
3. Background: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed October



C:\Users\skelley\OneDrive - Stantec\Documents\11 - Projects\178567021 - KY 32 Megapark\Smiths_Grove\gismxd\Figure_3_Soils.mxd Revised: 2022-02-15 By: skelley



Figure No.

13

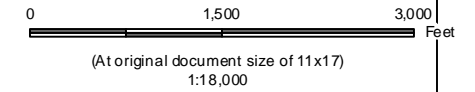
Title

Human Environment

Client/Project: Kentucky Transportation Cabinet
 Smiths Grove Study
 Environmental Overview

Project Location: Warren County, Kentucky

Prepared by SK on 2022-02-15
 TR by CK on 2022-02-16
 R Review by JW on 2019-02-17



- Influence Area
- Historic District
- Freeway or Other Major Road
- Other Major Road
- Secondary Road
- Local Connecting Road
- + Church
- + School
- NRHP Building
- EDR Sites



Notes

1. Coordinate System: NAD 1983 StatePlane Kentucky FIPS 1600 Feet
2. Data Sources: KYTC, NRHP, USA Roads, Google Earth, PADUS
3. Background: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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3.3 SOCIOECONOMIC STUDY

The Barren River Area Development District (BRADD) conducted a socioeconomic study for the study area. A complete copy of the report is found in **Appendix D**. The information in this report outlines 2016-2020 American Community Survey (ACS) statistics in and near the study area using tables, charts, and maps. The data presented in this document is intended to highlight areas of concern that will require additional analysis should any project be advanced to future phases. Statistics are provided for minority, elderly, poverty status, limited English proficiency (LEP), and disabled populations for the nation, state, region, county, and census block groups located within the study area, shown in **Table 1**.

Table 1: Socioeconomic Study

Category	United States	Warren County	Study Area
Percent of Minority Population	39.90%	22.24%	11.04%
Percent Below the Poverty Line	12.80%	16.37%	3.90%
Percent of Adults over 65	16.00%	12.81%	12.74%
Percent of Adults with a Disability	15.30%	21.40%	13.17%
Percent with Limited English Proficiency	8.30%	6.00%	0.13%

This information is intended to aid in making informed and prudent transportation decisions, especially regarding the requirements of *Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Poverty status, Populations* (signed February 11, 1994). The analysis uses the socioeconomic percentages by population for Warren County as the reference threshold for identifying target populations. The study area includes Census Tract 116 Block Group 2 which has a lower percentage of minorities, low-income, elderly, disabled, and limited English proficiency population levels than Warren County.

During future phases of project development, a more detailed and robust analysis would be required for the National Environmental Policy Act (NEPA) documentation when assessing the potential for adverse and disproportionate impacts to those with disabilities, poverty status, and minority populations.



4.0 FUTURE CONDITIONS

To determine the need for potential transportation improvements, it is necessary to estimate future conditions. This chapter summarizes the anticipated future conditions within the study area. The complete Model Update and Traffic Forecasting Memorandum can be found in **Appendix E**.

4.1 POPULATION TRENDS

Population data were obtained from the Kentucky State Data Center (KSDC) at the University of Louisville which is Kentucky’s official clearinghouse for Census data. Population estimates and projections for the state of Kentucky, Warren County, and Bowling Green are summarized in **Table 2**. Over the past 20 years, Warren County and the City of Bowling Green have grown faster than the state average, at just under 2 percent per year. Warren County is expected to continue to grow at a rate of 1.6 percent per year over the next 20 years.

Table 2: Population Estimates and Projections
(Source: Kentucky State Data Center, 2022)

Area	Census Estimates			Annual Growth	2040 Projection	Annual Growth
	2000	2010	2020	2000 - 2020		2020 - 2040
Kentucky	4,041,769	4,339,367	4,505,836	0.54%	4,886,381	0.41%
Warren County	92,522	113,792	133,207	1.84%	183,705	1.62%
Bowling Green	49,296	58,067	72,294	1.93%	N/A	

4.2 HISTORICAL KYTC TRAFFIC COUNTS

Historical data from KYTC count stations were used to analyze traffic trends for the KY 101 corridor and I-65. Average daily traffic (ADT) volumes and annual growth rates for both facilities are summarized in **Figure 14** and **Figure 15**. While counts can fluctuate significantly from year to year for many reasons, historical data can still provide an opportunity to identify growth trends. Daily traffic on KY 101 has steadily increased over the past 15 years, with traffic south of the I-65 interchange growing at a significant rate of 2.4 percent per year. Daily traffic on I-65 has also steadily increased between 1.9 and 2.4 percent per year, bolstered by the Kentucky Transpark and the new I-65 interchange at KY 3145 (Exit 30).



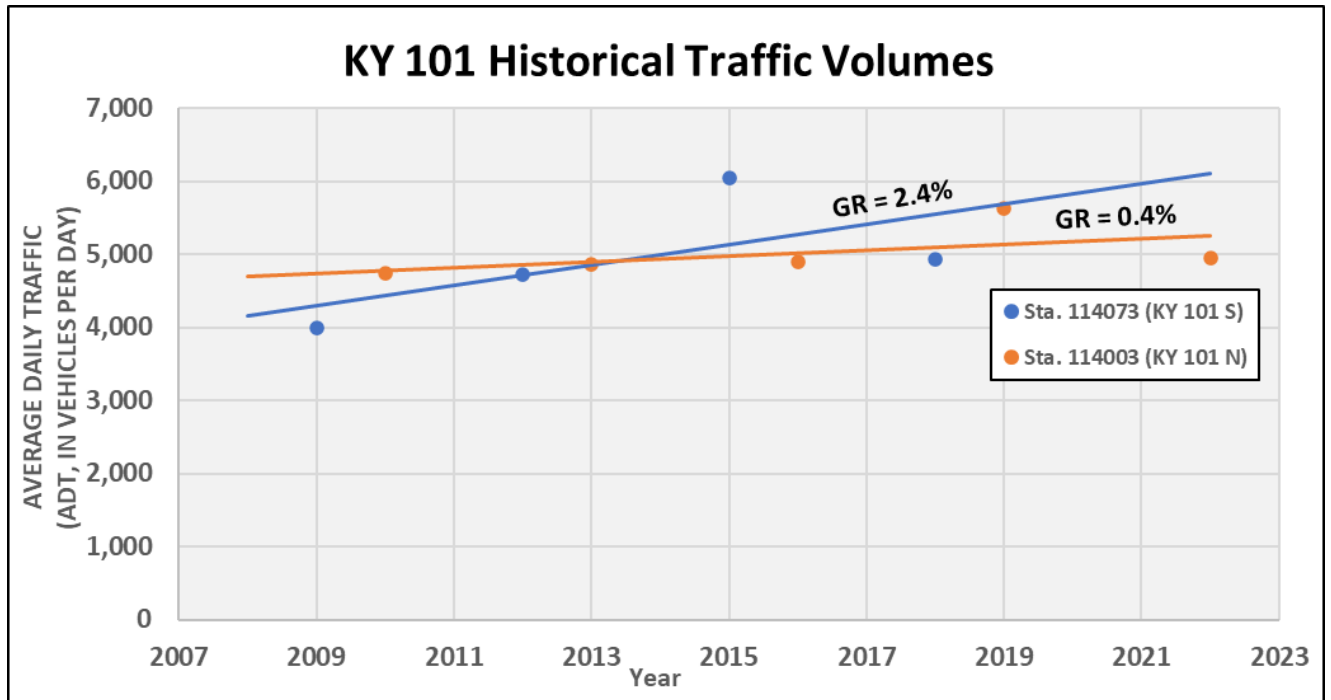


Figure 14: KY 101 Historical Daily Traffic Volumes

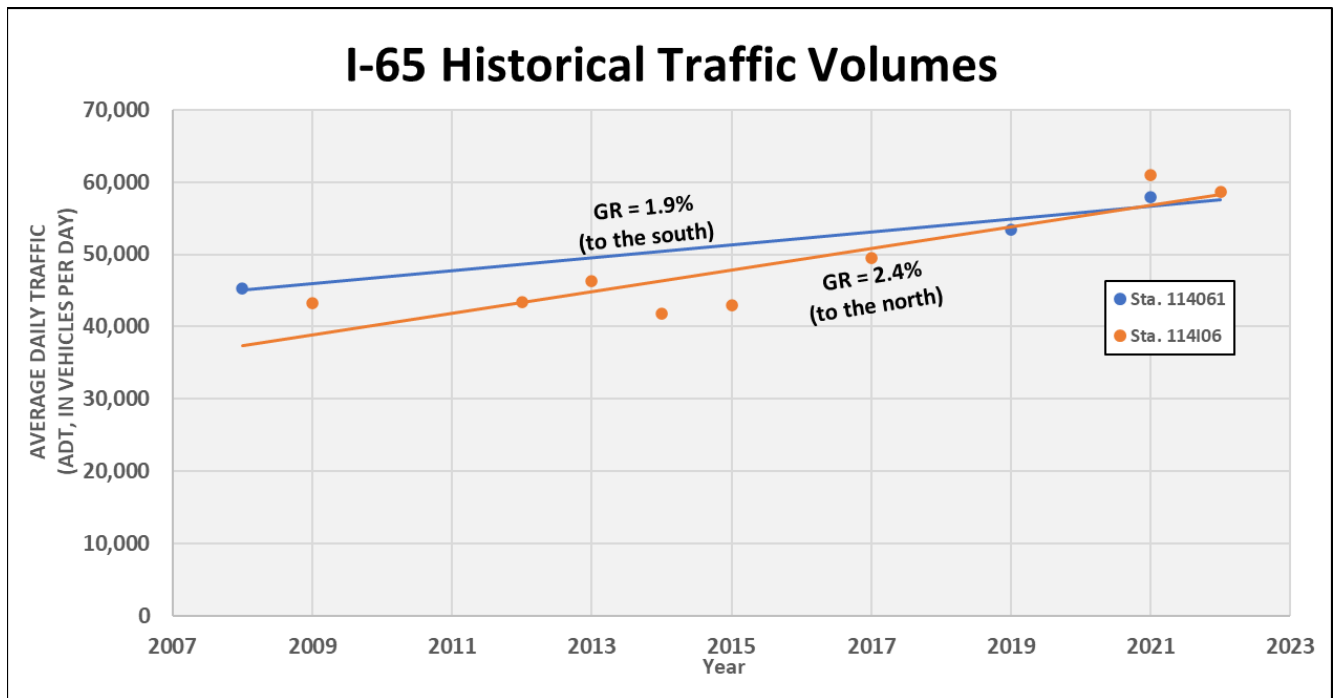


Figure 15: I-65 Historical Daily Traffic Volumes



4.3 BUC-EE'S TRAFFIC

A Buc-ee's fueling station and general store is planned to open in the southwest quadrant of the I-65 interchange with KY 101 in 2024. There are expected to be 120 fueling stations and a 53,000 square-foot store. A traffic impact study (TIS) for Buc-ee's was approved by KYTC in September 2022 and summarizes the traffic expected to be generated by the development and the roadway improvements needed to facilitate the additional traffic. The TIS included traffic analyses for weekday morning, weekday midday, weekday afternoon, and Saturday midday peak hours. **Table 3** presents the peak hour trip generation estimates from the TIS. Intercept trips are trips that will stop at the development while in route to another destination. New trips are trips that otherwise wouldn't have traveled study area roadways.

Table 3: Buc-ee's Estimated Trip Generation

Peak Hour	Total Trips		Intercept Rates	Intercept Trips		New Trips	
	In	Out		In	Out	In	Out
Weekday Morning Peak Hour	427	403	69%	295	278	132	125
Weekday Midday Peak Hour	535	549	61%	326	335	209	214
Weekday Afternoon Peak Hour	584	594	66%	385	392	199	202
Saturday Midday Peak Hour	788	835	49%	386	409	402	426

During the period between opening day of the proposed development and the 10-year design period, traffic along KY 101 were assumed to grow at a rate of 1 percent per year. During this same period, traffic conditions on the I-65 ramps were assumed to grow at a rate of 3.5 percent per year. The TIS states that these growth rates were developed using historical traffic data from KYTC.

4.4 BOWLING GREEN/WARREN COUNTY TRAVEL DEMAND MODEL

The Bowling Green/Warren County Travel Demand Model was updated and used as a tool to develop background growth rates. Base and future socioeconomic data in the model, including employment and population, were updated to include anticipated employment growth in the Smiths Grove area. In addition to the construction of Buc-ee's, there are three large, underdeveloped tracts near the KY 101 interchange that are anticipated to develop over the next 20 years. The locations of these potential developments are displayed in **Figure 16**.

1. Northwest of I-65 interchange off Jim Burrell Lane – Currently zoned Highway Business
2. Northeast of I-65 interchange of Vincent Street – Currently zoned Highway Business
3. Southeast of I-65 interchange across from Buc-ee's – Currently zoned Agriculture



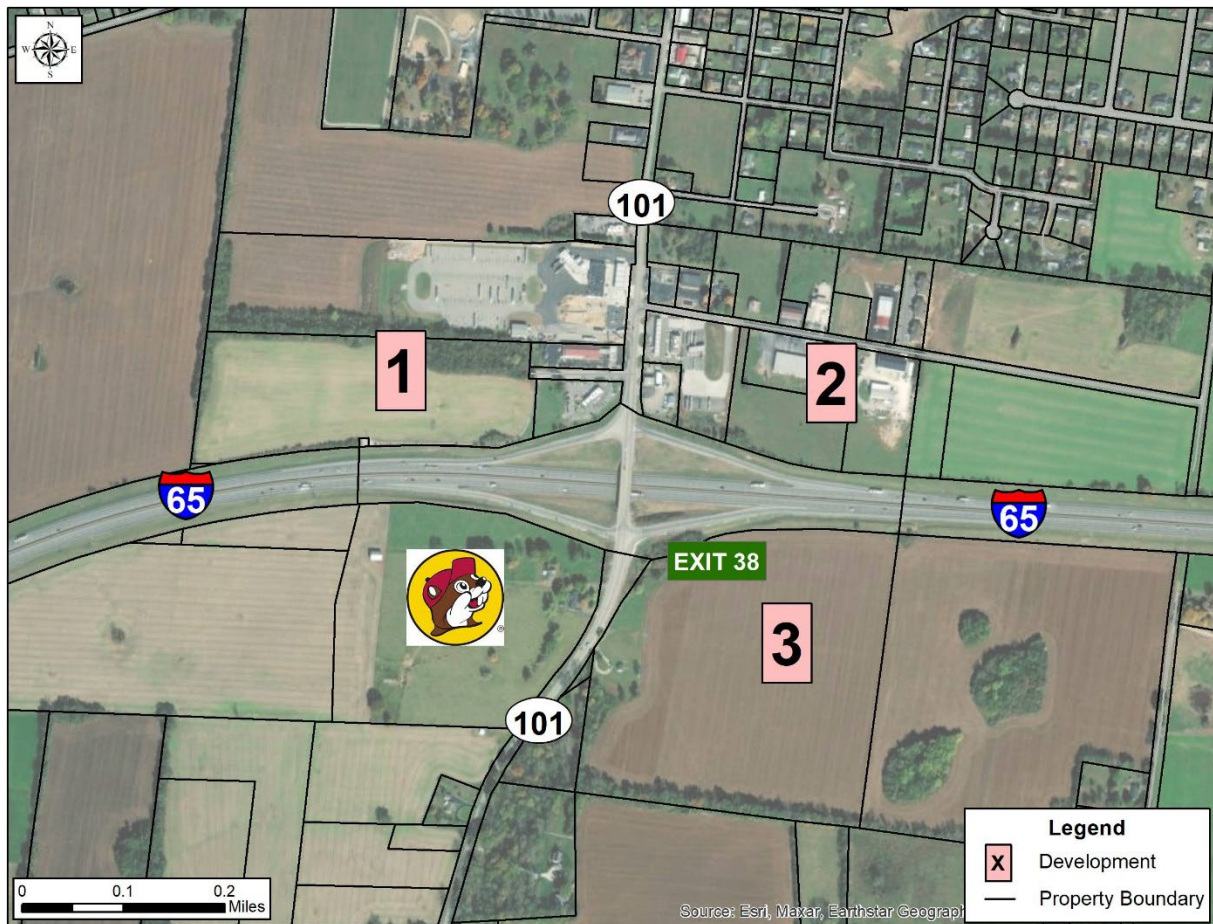


Figure 16: Potential Study Area Developments

Based on discussions with the Warren County Metropolitan Planning Organization (MPO), location number one has had a proposal involving around 400 apartment units and a hotel, location number two has had two applications for re-zoning to multi-family housing, and location number three is currently zoned for agriculture, but could develop after Buc-ee's is constructed. The updated 2018 Base and 2045 Future scenarios were run, with annual growth rates on KY 101 ranging from 0.9 to 1.5 percent per year.

4.5 DAILY TRAFFIC FORECASTS

Based on historical traffic trends, regional population trends, expected developments, results from the updated Bowling Green/Warren County Regional Travel Demand Model, the Buc-ee's TIS, and results from the KYSTM, an **annual growth rate of 1.5 percent per year** was used to forecast background traffic. This growth rate was applied to existing daily traffic volumes on study area routes and then Buc-ee's trips were added and distributed based on recommendations from the TIS, resulting in 2045 daily traffic forecasts, as shown in **Figure 17**. KY 101 is expected to carry over 28,000 VPD south of the I-65 interchange in 2045 and 9,300 VPD north of the interchange.

FINAL REPORT

Smiths Grove Traffic Operations Study



Figure 17: 2045 Daily Traffic Forecasts



4.6 2032 NO-BUILD MICROSIMULATION MODEL

A 10-year Horizon 2032 No-Build simulation model was developed by applying the 1.5 percent per year growth rate to the Existing 2022 trip matrices and adding the expected Buc-ee's traffic. This scenario was developed to understand the impacts of Buc-ee's traffic without the recommended improvements from the TIS. Results from the model are shown in **Table 4**. Traffic is unable to reach KY 101 from the unsignalized ramps and queues onto mainline I-65 during both the AM and PM peak hours. The ramp approaches are expected to operate at LOS F during both peak hours if no improvements are made.

Table 4: 2032 No-Build Traffic Operations

Intersection	Approach	AM Peak		PM Peak		Saturday Peak	
		LOS	Delay	LOS	Delay	LOS	Delay
KY 101 at I-65 SB Ramps	I-65 Off Ramp	F	**	F	**	F	**
	NB KY 101	A	0.0	A	0.0	A	1.3
	SB KY 101	A	1.4	A	1.3	A	0.1
	Overall	F	58.6	F	82.8	F	**
KY 101 at I-65 NB Ramps	I-65 Off Ramp	C	15.7	F	**	F	**
	NB KY 101	A	0.0	A	0.0	A	0.4
	SB KY 101	A	0.0	A	0.0	A	1.5
	Overall	A	6.5	E	46.5	E	70.9

**Indicates more than 100 seconds of delay per vehicle (sec/veh)

4.7 2032 EXISTING + COMMITTED (E+C) MICROSIMULATION MODEL

The Buc-ee's TIS recommended the following roadway improvements to manage the expected increase in traffic (as shown in **Figure 18**):

KY 101 at Southbound I-65 Ramps

- Construct approximately 300' left- and right-turn lanes on the southbound off ramp.
- Construct an additional southbound through lane on KY 101.
- Install a traffic signal.

KY 101 at Northbound I-65 Ramps

- Construct approximately 240' left- and right-turn lanes on the northbound off ramp.
- Construct an additional northbound through lane on KY 101.
- Install a traffic signal.



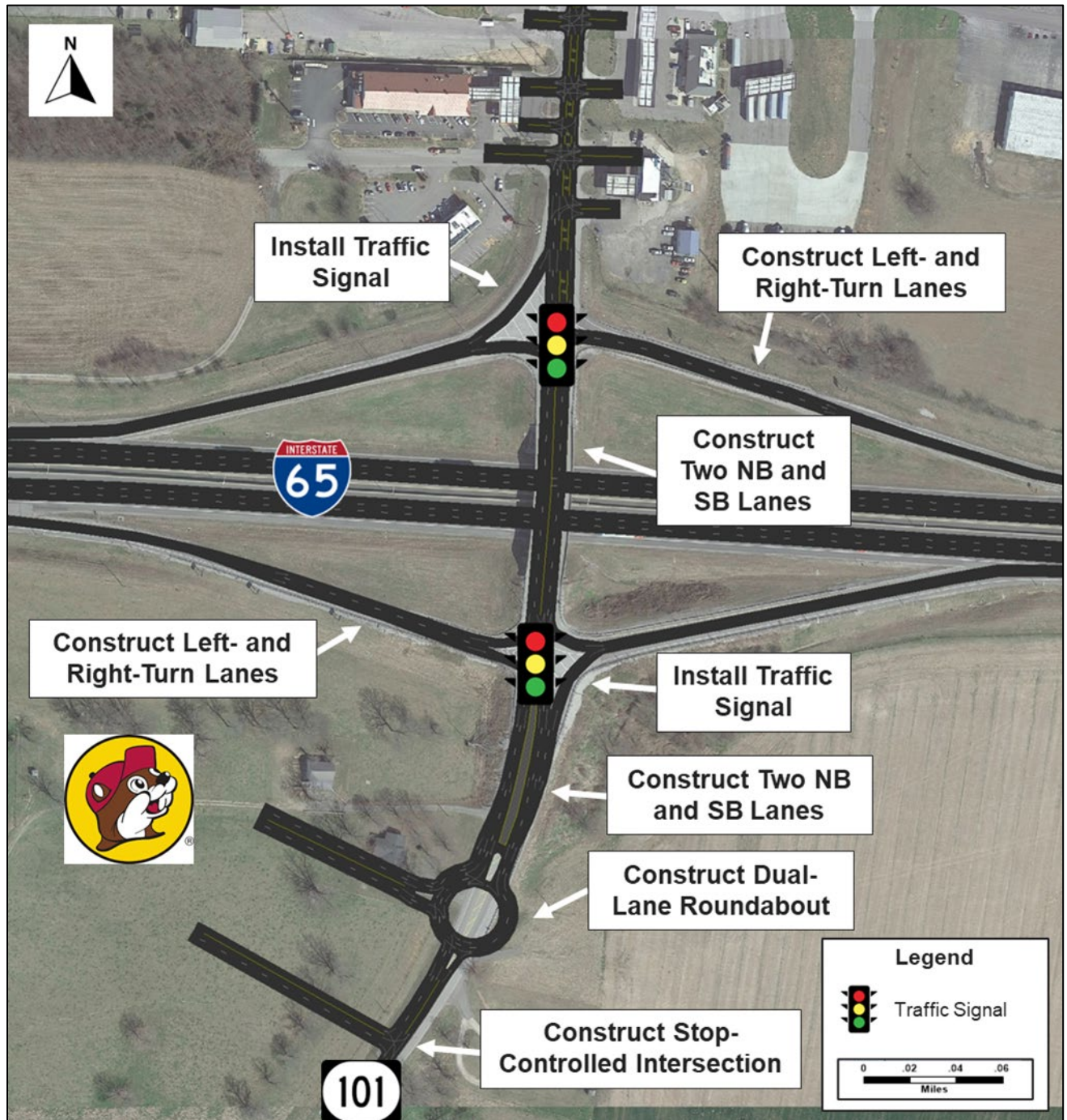


Figure 18: Committed Improvements from the Buc-ee's TIS

FINAL REPORT

Smiths Grove Traffic Operations Study

Along with the improvements to the interchange, the Buc-ee's TIS proposed a multi-lane roundabout at the northern entrance to the development, just south of the I-65 northbound exit ramp, and a stop-controlled intersection at the southern entrance. These improvements are expected to be constructed before Buc-ee's opens and are considered the Existing plus Committed (E+C) scenario. **Table 5** presents a summary of the 2032 traffic operations for the E+C scenario based on results from the microsimulation model.

Table 5: 2032 E+C microsimulation Model Summary

Intersection	Approach	AM Peak		PM Peak		Saturday Peak	
		LOS	Delay	LOS	Delay	LOS	Delay
KY 101 at I-65 SB Ramps	I-65 Off Ramp	C	30.7	C	28.6	C	23.3
	NB KY 101	B	10.2	A	8.9	B	15.8
	SB KY 101	A	9.8	B	11.3	B	18.8
	Overall	B	12.2	B	15.2	B	19.2
KY 101 at I-65 NB Ramps	I-65 Off Ramp	C	33.4	C	30.2	C	29.5
	NB KY 101	B	10.1	B	19.4	B	12.6
	SB KY 101	A	4.2	B	10.5	A	9.5
	Overall	A	8.7	B	11.3	B	10.6
KY 101 at Buc-ees North Entrance	EB Driveway	A	5.1	A	6.2	A	6.5
	NB KY 101	A	5.5	A	7.2	A	7.7
	SB KY 101	A	3.5	A	4.2	A	5.1
	Overall	A	6.3	A	6.9	A	7.1
KY 101 at Buc-ee's Boulevard	EB Driveway	A	7.5	B	10.1	A	8.8
	NB KY 101	A	0.4	A	0.0	A	1.0
	SB KY 101	A	0.0	A	0.3	A	0.0

4.8 SENSITIVITY ANALYSIS

While details of the potential developments are not currently finalized, it was necessary to determine the ability of the Buc-ee's recommended improvements (Existing plus Committed Scenario) to handle the potential increased traffic. A sensitivity analysis was performed to estimate traffic operations for a range of growth scenarios. **Table 6** presents the Institute of Transportation Engineers (ITE) Trip Generation² estimates for Saturday peak hour trips for the most likely development types and sizes that could occur in locations two and three.

² ITETripGen Web-based App Version 6.0.2



Table 6: ITE Trip Generation Estimates

Development	Units	Saturday Peak Hour		
		Trips IN	Trips OUT	Total
Single-Family Units	100	52	44	96
	200	99	85	184
	300	149	127	276
Multi-Family Units	200	44	38	82
	400	89	75	164
Retail Space	20,000 ft ²	67	64	131
	40,000 ft ²	134	129	263
Fast Food	4,000 ft ²	113	108	221
Bank	5,000 ft ²	67	65	132

A range of microsimulation modeling scenarios were then developed to replicate potential developments. The Buc-ee's recommended improvements (Existing plus Committed Scenario) are adequate to handle the potential increased traffic south of the interchange. **Table 7** presents the results of the sensitivity analysis north of I-65. Due to the proximity of Jim Burrell Lane to the I-65 interchange, adding 100 trips in and out during the Saturday peak hour increases the average delay at the approach above 100 seconds per vehicle and causes the approach to fail. The Vincent Street approach starts to see long delays after 200 trips in and out are added. In addition, the entrances at the existing businesses north of I-65 experience increased queueing and trouble pulling in and out.

Table 7: Microsimulation Sensitivity Analysis Results

Scenario	Approach	Saturday Peak	
		LOS	Delay
2032 E+C	EB Jim Burrell Ln.	A	8.1
	WB Vincent St.	A	6.2
2032 E+C (+100 trips in/out Jim Burrell & +100 trips in/out of Vincent St.)	EB Jim Burrell Ln.	F	**
	WB Vincent St.	B	12.6
2032 E+C (+150 trips in/out Jim Burrell & +150 trips in/out of Vincent St.)	EB Jim Burrell Ln.	F	**
	WB Vincent St.	C	16.9
2032 E+C (+200 trips in/out Jim Burrell & +200 trips in/out of Vincent St.)	EB Jim Burrell Ln.	F	**
	WB Vincent St.	D	26.2

**Indicates more than 100 seconds of delay per vehicle (sec/veh)



5.0 STUDY AREA NEEDS

Based on the existing and future conditions analyses, the following study area needs were identified to help inform the development of improvement concepts.

- There are 15 access points on the 0.2-mile section of KY 101 between the I-65 southbound ramps and Wendy's. Such a high number of access points increase the frequency of turning vehicles, which creates more conflict points and compromises safety. It also reduces traffic operations as vehicles are constantly slowing to turn.
- There is currently just over 100 feet between Jim Burrell Lane and the I-65 southbound ramp intersection. The KYTC Highway Design Manual recommends a minimum of 300 feet spacing between interchange ramps and access points on rural roads and a desired distance of 600 feet.
- There is a mix of cars and large trucks pulling in-and-out of businesses just north of I-65, which creates congestion and compromises safety.
- KY 101 has experienced more crashes than what is expected based on roadway characteristics. Of those crashes, more than a third of them involved trucks.
- In addition to the high number of crashes along the corridor, many of these are angle crashes, which can result in serious injury.
- Additional development is likely to occur north of I-65. Without improvement, congestion and the frequency of crashes is expected to increase.
- This study has considered the additional traffic that is expected from Buc-ee's, which will be accommodated by improvements at the interchange and to the south, constructed in conjunction with the development. Future improvement concepts should focus on the need for improvements north of Buc-ee's.



Truck turning onto KY 101

6.0 INITIAL PROJECT TEAM COORDINATION

Over the course of the study, the project team held three meetings to coordinate on key issues. The project team included representatives from KYTC Central Office, KYTC District 3, and the consultant, Stantec. Detailed summaries of each meeting are presented in **Appendix F**.

6.1 PROJECT TEAM MEETING NO. 1

The first Project Team Meeting was held at the KYTC District 3 office in Bowling Green, KY and virtually via Microsoft Teams on October 12, 2022. The purpose of the meeting was to present



FINAL REPORT

Smiths Grove Traffic Operations Study

results from the existing condition analysis and to solicit feedback on the existing and future year simulation model scenarios. The following items were discussed:

- The first Project Team Meeting was delayed until the final version of the Buc-ee's TIS was approved by KYTC in September 2022.
- Results from this study's simulation model were similar to results from the Buc-ee's TIS traffic analysis.
- There was a discussion about the traffic counts collected at the Buc-ee's in Richmond, Kentucky, which is a similar size to the expected development in Smiths Grove. The counts were collected between Thursday (9/22/2022) and Tuesday (9/27/2022), shown in 15-minute intervals in **Figure 19**. A review of the counts revealed that Buc-ee's traffic on weekends was higher than on weekdays. A weekend midday peak hour simulation model was developed to replicate Saturday conditions because the Buc-ee's TIS included a Saturday traffic analysis and trip generation volumes.

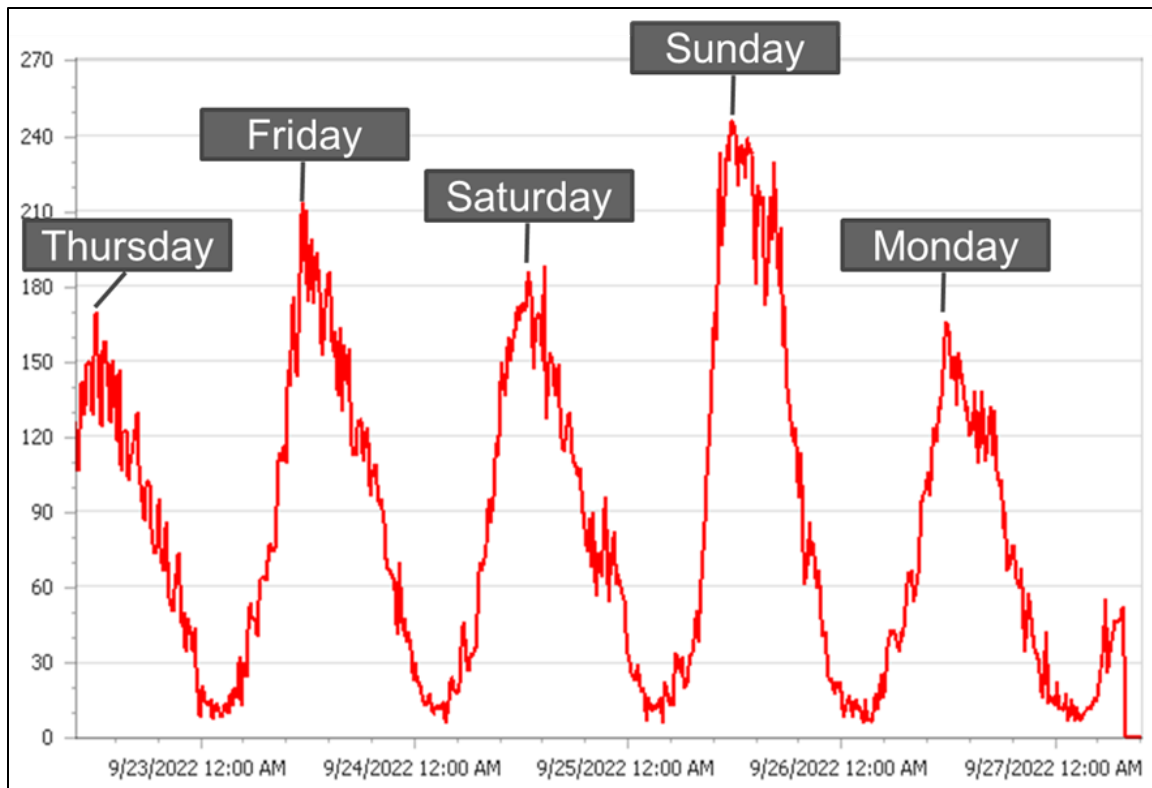


Figure 19: Richmond Buc-ee's Traffic Counts



7.0 IMPROVEMENT CONCEPT DEVELOPMENT

Improvement concepts were developed based on the study area needs summarized in **Section 5.0** and feedback from the project team.

7.1 CONCEPT A

Concept A includes maintaining the Buc-ee's improvements at the I-65 interchange along with access management improvements on the commercial section to the north. Results from the 2032 simulation model indicate that traffic at the intersections operates at LOS B or better.

The improvements, as shown in **Figure 20**, include:

KY 101 at I-65 NB and SB Ramps

- Maintain Buc-ee's improvements.

KY 101 at Jim Burrell Lane

- Convert to Right-In / Right-Out.
- Construct backage road for left turn access to KY 101.

KY 101 North of Jim Burrell Lane

- Access management at driveways to better define entrances.
- Construct sidewalk on west side of KY 101.

7.2 CONCEPT B

Concept B extends the access management improvements from Concept A north to Brown Street and includes a single-lane roundabout and extended backage road to allow for traffic circulation to and from the businesses. Results from the 2032 simulation model indicate that traffic at the intersections operates at LOS B or better. Improvements, shown in **Figure 21**, include:

KY 101 at I-65 NB and SB Ramps

- Maintain Buc-ee's improvements.

KY 101 between I-65 and Brown Street

- Construct a raised median on KY 101.
- Allow lefts in at larger intersections.
- Construct backage roads west of KY 101.
- Construct a sidewalk along west side of KY 101.
- Construct a single-lane roundabout at Brown Street.



7.3 CONCEPT C

Concept C includes the access management improvements from Concept B along with a single-lane roundabout at the I-65 SB ramp terminal intersection. Results from the 2032 simulation model show that a single-lane roundabout is not adequate to handle the traffic at the ramp and results in significant queuing on Jim Burrell Lane, southbound KY 101, and the I-65 SB off ramp. Concept C was therefore dismissed from further consideration.



FINAL REPORT
Smiths Grove Traffic Operations Study



Figure 20: Concept A



FINAL REPORT
Smiths Grove Traffic Operations Study



Figure 21: Concept B



7.4 CONCEPT D

Concept D includes the access management improvements from Concept B along with a dual-lane roundabout at the I-65 SB ramp terminal intersection. The improvements are listed below.

KY 101 at I-65 NB Ramps

- Maintain Buc-ee's improvements.

KY 101 at I-65 SB Ramps

- Construct a dual-lane roundabout.
- Construct a dual-lane off ramp.

KY 101 North of the Interchange

- Construct a raised median on KY 101.
- Allow lefts in at larger intersections.
- Construct a single-lane roundabout at Brown Street.
- Construct a sidewalk on the west side of KY 101

Results from the 2032 weekday PM and Saturday midday simulation model scenarios are shown in **Figure 22**. During the 2032 weekday PM peak hour, traffic flows smoothly and only minor queues are expected on the off ramp. During the 2032 Saturday midday peak hour, traffic is expected to queue on southbound KY 101 and on the southbound off ramp, but the queues are not expected to reach mainline I-65. Concept D was dismissed from further consideration.

7.5 CONCEPT E

Concept E includes the access management improvements on KY 101 along with a “dogbone” roundabout at the I-65 interchange. The improvements are listed below.

KY 101 at I-65 Interchange

- Construct a “dogbone” roundabout.
- Construct dual-lane off ramps.

KY 101 North of the Interchange

- Construct a raised median on KY 101.
- Allow lefts in at larger intersections.
- Construct a single-lane roundabout at Brown Street.
- Construct a sidewalk on the west side of KY 101.

Results from the 2032 Saturday midday peak hour simulation model indicate that traffic on the southbound off ramp queues on the ramp but does not reach mainline I-65. To reduce the queue lengths on the off ramp, additional improvements were developed as part of Concept F.



FINAL REPORT

Smiths Grove Traffic Operations Study



Figure 22: 2032 Simulation Model Results (Concept D)

7.6 CONCEPT F

Concept F includes the improvements from Concept E along with an additional circulating lane at the northern roundabout and a three-lane southbound off ramp, as shown in **Figure 23**. The additional lanes allow the roundabouts to flow smoothly with minimal queues for all 2032 simulation scenarios. North of the interchange, this concept includes a raised median and allows lefts into the major intersections, including Jim Burrell Lane. Results from the 2032 simulation model indicate that the additional capacity reduces the queues on the southbound off ramp and allows traffic to flow smoothly. Improvements include:

KY 101 at I-65 Interchange

- Construct a “dogbone” roundabout.
- Construct three circulating lanes at northern interchange.
- Construct three lanes on SB off ramp.

KY 101 North of the Interchange

- Construct a raised median on KY 101.
- Allow lefts in at larger intersections including Jim Burrell Lane.
- Construct a single-lane roundabout at Brown Street.
- Construct a sidewalk on the west side of KY 101.



FINAL REPORT
Smiths Grove Traffic Operations Study



Figure 23: Concept F



7.7 CONCEPT G

Concept G includes the improvements from Concept F but does not allow left turn access into Jim Burrell Lane, as shown in **Figure 24**. Access will instead be moved north to a new access road to avoid queues backing up into the roundabout. Results from the 2032 simulation model indicate that the additional capacity reduces the queues on the southbound off ramp and allows traffic to flow smoothly. Improvements include:

KY 101 at I-65 Interchange

- Construct a “dogbone” roundabout.
- Construct three circulating lanes at northern interchange.
- Construct three lanes on SB off ramp.

KY 101 North of the Interchange

- Construct a raised median on KY 101.
- Allow lefts in at larger intersections.
- New access road to provide connection to Jim Burrell Lane.
- Construct a sidewalk along west side of KY 101.
- Construct a single-lane roundabout at Brown Street.

8.0 PROJECT TEAM MEETING NO. 2

The second Project Team Meeting was held at the KYTC District 3 office in Bowling Green, KY and virtually via Microsoft Teams on May 4, 2023, at 1:45 p.m. CDT. The purpose of the meeting was to get feedback from the Project Team on preliminary improvement concepts before presenting refined improvement concepts and cost estimates to the local officials and the public. The following items were discussed:

- Based on the approved TIS, Buc-ee's is expected to attract the most trips during the Saturday midday peak hour, with 788 trips in and 835 trips out.
- There is a significant amount of turning truck traffic in the study area. All improvement concepts will accommodate trucks.
- It was noted that the western backage road could be placed behind the truck parking lot at the Smiths Grove Travel Center.
- The seven initial improvement concepts were consolidated into four concepts:
 - Concept A was changed into Concept 1.
 - Concept B with the backage road moved north of the truck parking lot was changed to Concept 2.
 - Concept F was changed to Concept 3.
 - Concept G with the backage road moved north of the truck parking lot was changed to Concept 4.



FINAL REPORT
Smiths Grove Traffic Operations Study



Figure 24: Concept G



9.0 REFINED IMPROVEMENT CONCEPTS

After the second Project Team Meeting, Concepts A, B, F, and G were moved forward for further analysis and were renamed Concepts 1, 2, 3, and 4, respectively. The refined improvement concepts are listed below.

9.1 CONCEPT 1

Concept 1 includes maintaining the Buc-ee's improvements at the I-65 interchange, converting the Jim Burrell Lane intersection to right-in / right-out and constructing a backage road for left-turn access onto KY 101, consolidating entrances along KY 101 north of I-65, and constructing sidewalks on the west side of KY 101.

9.2 CONCEPT 2

Concept 2 includes maintaining the Buc-ee's improvements at the I-65 interchange, constructing a raised median on KY 101 north of I-65 to Brown Street, allowing left-turns in at larger intersections, constructing a single-lane roundabout at Brown Street, and constructing a sidewalk along the west side of KY 101. In the future if anticipated development occurs, backage roads should be constructed.

9.3 CONCEPT 3

Concept 3 includes constructing a "dogbone" roundabout at the I-65 interchange with three circulating lanes at the northern interchange. This roundabout would also include three lanes on the southbound off ramp. North of the interchange, a raised median would be constructed on KY 101, allowing left-turns in only at the larger intersections including Jim Burrell Lane. A single-lane roundabout would be constructed at Brown Street and a sidewalk would be constructed on the west side of KY 101. Backage roads should be constructed in the future if anticipated development occurs.

9.4 CONCEPT 4

Concept 4 includes constructing a "dogbone" roundabout at the I-65 interchange with three circulating lanes at the northern interchange. This roundabout would also include three lanes on the southbound off ramp. North of the interchange, a raised median would be constructed on KY 101, allowing left-turns in only at the larger intersections not including Jim Burrell Lane. A single-lane roundabout would be constructed at Brown Street and a sidewalk would be constructed on the west side of KY 101. Backage roads should be constructed in the future if anticipated development occurs.



10.0 LOCAL OFFICIALS/ STAKEHOLDER AND PUBLIC MEETING

10.1 LOCAL OFFICIALS / STAKEHOLDER MEETING

The Local Officials / Stakeholder meeting was held at the Smiths Grove Fire Department on July 27, 2023. In addition to the project team, individuals / representatives from the City of Smiths Grove, Smiths Grove Emergency Management, Smiths Grove County Chamber of Commerce, Kentucky Legislature and Warren County Public Schools were in attendance. The purpose of the meeting was to share information about the Smiths Grove Traffic Operations Study and to solicit feedback on the improvement concepts under consideration. Key discussion items from the meeting include:

- There was a discussion of the Richmond, KY Buc-ee's. Improvements proposed for Smiths Grove are similar to what was constructed in Richmond, however, the Richmond site does not have traffic signals at the ramp terminal intersections.
- The roundabouts will be designed to accommodate large trucks and farm equipment.
- It was noted that the traffic signal at the northbound I-65 off ramp will improve safety by providing left-turning vehicles with a protected movement.

10.1.1 Local Officials / Stakeholder Survey

Surveys were distributed to attendees to solicit feedback on the need for improvements, transportation issues in the study area, and proposed improvement concepts. There were five participants who completed the survey, three of which indicated they travel on KY 101 daily, with three participants owning property in the study area and one leasing.

Participants were asked to rank transportation issues on KY 101 (#1 – #3) with #1 being the highest rating. A point system was used to summarize the results, with three points given to a first-place ranking, two points to a second place, and one point to a third place. Congestion was the highest ranked issue followed closely by safety, as shown in **Figure 25**

All respondents agreed that improvements along KY 101 are needed, with two indicating Concept 3 is their preferred choice, two choosing Concept 4, and one respondent choosing Concept 1, as shown in **Figure 26**. Additionally, three of the respondents believe that sidewalks are needed along KY 101.



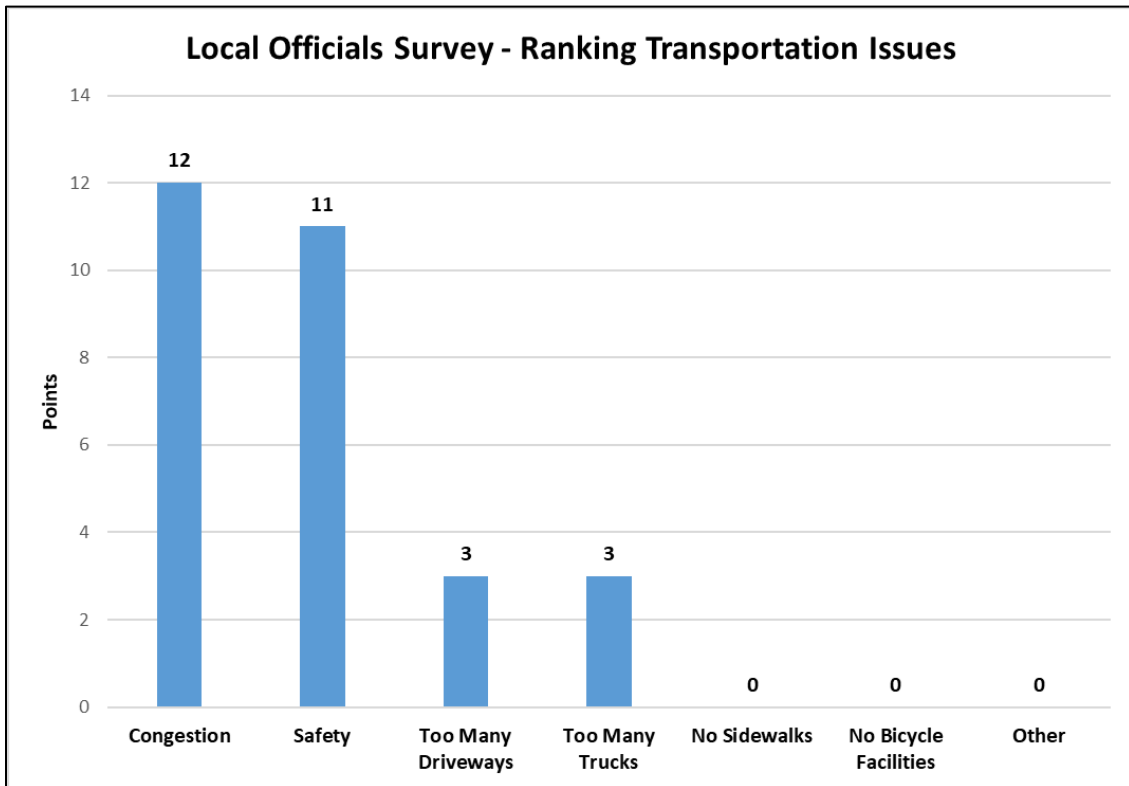


Figure 25: Local Officials Survey - Ranking Transportation Issues

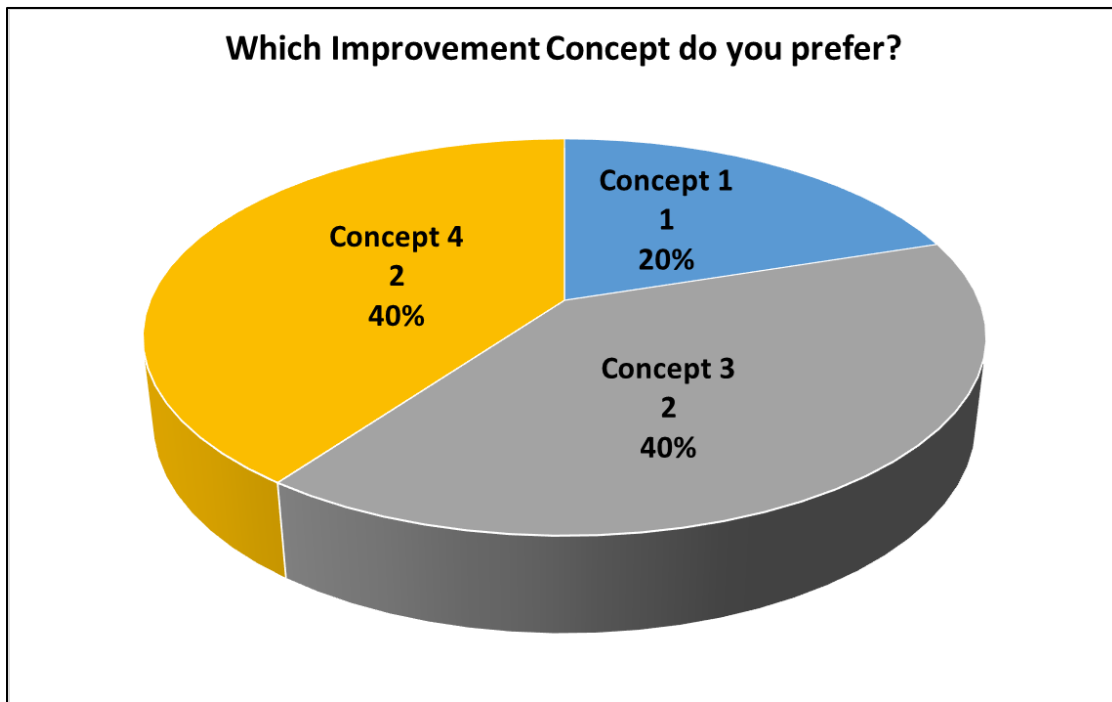


Figure 26: Local Officials Survey - Improvement Concepts



10.2 PUBLIC MEETING

A Public Meeting was held at the Smiths Grove Fire Department on July 27, 2023. The purpose of the meeting was to share information about the Smiths Grove Traffic Operations Study and to solicit feedback from the public regarding improvement concepts under consideration. Exhibits were displayed depicting existing and future traffic, crash history, the four improvement concepts, and an evaluation matrix. The project team delivered a brief presentation giving an overview of the study and encouraging the 122 attendees to fill out the survey. A summary of the public meeting can be found in **Appendix F**.

10.2.1 Public Meeting Survey

Surveys were distributed to attendees to solicit feedback on transportation issues in the study area and proposed improvement concepts.

Of the 71 respondents, 49 (69 percent) indicated that they drive KY 101 daily and 17 (24 percent) drive it two to three times per week. Over half of the respondents own property in the study area.

Respondents were then asked to rank transportation issues on KY 101 (#1 – #3) with #1 being the highest rating. A point system was used to summarize the results, with three points given to a first-place ranking, two points to a second place, and one point to a third place. Similar to the local officials / stakeholder survey, congestion was the highest ranked issue followed closely by safety, as shown in **Figure 27**.

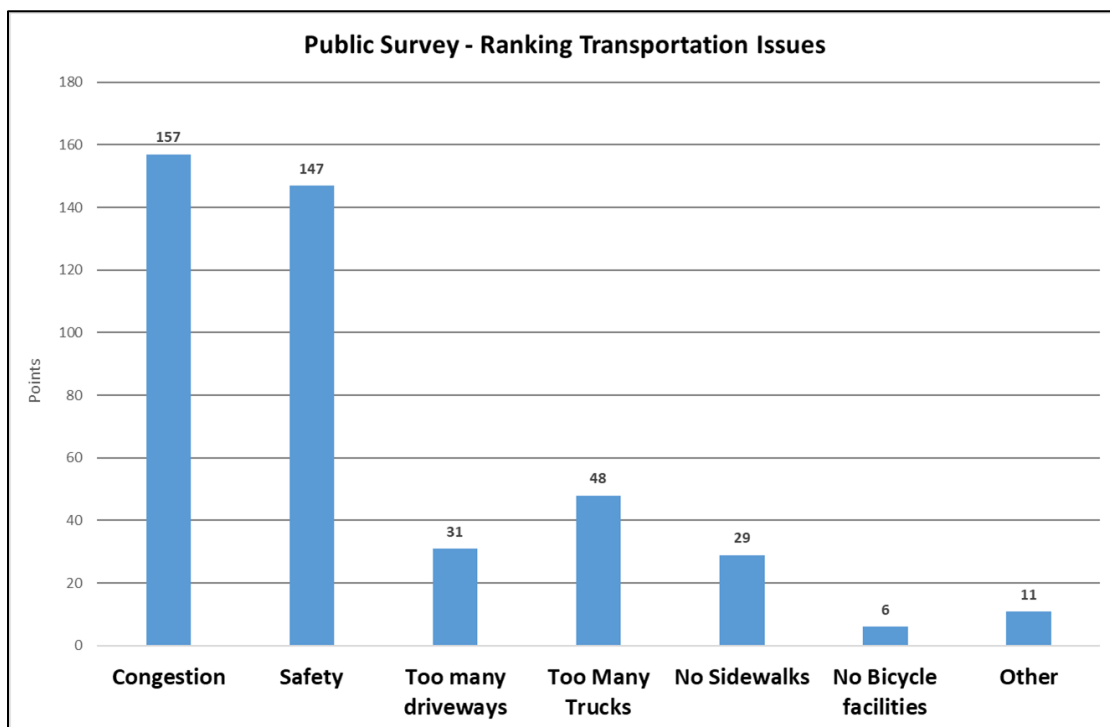


Figure 27: Public Survey - Ranking Transportation Issues



FINAL REPORT

Smiths Grove Traffic Operations Study

Ninety four percent of respondents indicated that improvements along KY 101 are needed, with three indicating they were unsure and one indicating that improvements are not needed. When asked which concept they prefer, the leading response was Concept 3 with 24 votes (37 percent) followed by Concept 4 with 22 votes (34 percent), as shown in **Figure 28**.

Of the 69 respondents, 44 (64 percent) believe that sidewalks are needed along KY 101, 14 (20 percent) were unsure, and 11 (16 percent) do not think sidewalks are needed.

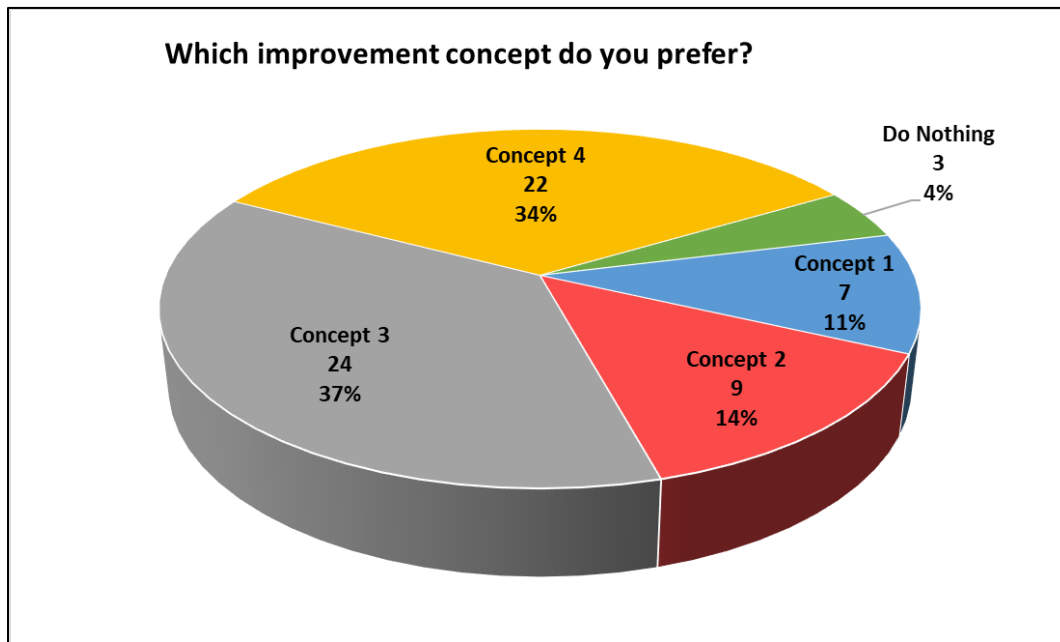


Figure 28: Public Survey - Improvement Concepts

11.0 STUDY RECOMMENDATIONS

Based on the existing and future conditions analyses, input from the Local Officials / Stakeholders, and input from the Public, the following study area goals were identified as part of the Smiths Grove Operations Study:

- Improve safety by reducing conflict points.
- Improve congestion by decreasing access density.
- Provide truck access.
- Accommodate future development.
- Provide sidewalks.
- Reduce right-of-way impacts.
- Reduce utility impacts.



11.1 BENEFIT-COST ANALYSIS

To assist in prioritizing improvement concepts, the project team conducted a benefit-cost analysis (BCA). This analysis provided a means for determining which improvements have the greatest benefit and are the most economical. The BCA was conducted based on crash reduction and travel time savings.

Concepts were assigned a 10-year congestion relief savings based on the vehicle hours traveled (VHT) saved from the peak hour traffic simulation model and the average hourly wage in Warren County, Kentucky³. Crash modification factors were used to quantify crash reduction savings by estimating the number of crashes that would be reduced by implementing the improvement.

The total benefit was then divided by the total cost to produce a benefit-to-cost ratio (BCR), as shown in **Table 8**.

Table 8: Benefit-Cost Analysis Summary

Concept	Total Cost (2023 Dollars)	10-Year Crash Savings	10-Year Travel Time Savings	Benefit-to-Cost Ratio
Concept 1	\$2,600,000	\$400,000	\$0	0.2
Concept 2	\$6,000,000	\$500,000	\$0	0.1
Concept 3	\$10,400,000	\$5,100,000	\$10,100,000	1.5
Concept 4	\$10,900,000	\$4,400,000	\$15,500,000	1.8

11.2 PROJECT TEAM MEETING NO. 3

The third Project Team Meeting was held virtually via Microsoft Teams on September 15, 2023. The purpose of the meeting was to present the results from the Local Officials / Stakeholder and public surveys and to discuss improvement concept recommendations.

Based on results from the safety analyses, traffic forecasts, benefit-cost-analysis, feedback from the Local Officials / Stakeholders, and feedback from the public, it was determined that Concept 3 and Concept 4 best meet the project goals. Three sidewalk options were considered for each of the concepts: Option A includes a sidewalk on the west side of KY 101 from McDonald's to Brown Street, Option B includes a sidewalk on the west side of KY 101 from Buc-ee's to Brown Street, and Option C includes a sidewalk on both sides of the KY 101 from Buc-ee's to Brown Street.

³ https://www.bls.gov/regions/southeast/news-release/occupationalemploymentandwages_bowlinggreen.htm



FINAL REPORT

Smiths Grove Traffic Operations Study

The following sidewalk options are recommended to move forward for consideration in Phase 1 Design:

- **Concept 3A** (shown in **Figure 29**): Sidewalk along the west side of KY 101 beginning at McDonald's and continuing north to the roundabout at Brown Street.
- **Concept 3B** (shown in **Figure 30**): Sidewalk along the west side of KY 101 beginning at Buc-ee's and continuing north to the roundabout at Brown Street.
- **Concept 3C** (shown in **Figure 31**): Sidewalks along both sides of KY 101 beginning at Buc-ee's and continuing north to the roundabout at Brown Street. The I-65 bridge will be widened to accommodate two KY 101 northbound lanes.
- **Concept 4A** (shown in **Figure 32**): Sidewalk along the west side of KY 101 beginning at McDonald's and continuing north to the roundabout at Brown Street.
- **Concept 4B** (shown in **Figure 33**): Sidewalk along the west side of KY 101 beginning at Buc-ee's and continuing north to the roundabout at Brown Street.
- **Concept 4C** (shown in **Figure 34**): Sidewalks along both sides of KY 101 beginning at Buc-ee's and continuing north to the roundabout at Brown Street. The I-65 bridge will be widened to accommodate two KY 101 northbound lanes.

Private developers, local planning staff, and local officials play a role in implementing the backage road recommendations from this study. The location of the new backage roadways should be considered as part of rezoning applications, development plan applications, and plats. As the larger area continues to develop over time, these connections will be critical in providing alternative routes which will improve safety and reduce congestion along KY 101.

Table 9 presents the cost estimates for the recommended improvement concepts.

Table 9: Cost Estimates (2023 Dollars)

Concept	Design	Right-of-Way	Utility	Construction	Total
Concept 3A	\$900,000	\$1,500,000	\$2,000,000	\$6,000,000	\$10,400,000
Concept 3B	\$1,000,000	\$1,800,000	\$2,300,000	\$6,800,000	\$11,900,000
Concept 3C	\$1,300,000	\$2,000,000	\$2,500,000	\$8,400,000	\$14,200,000
Concept 4A	\$900,000	\$2,300,000	\$2,000,000	\$5,700,000	\$10,900,000
Concept 4B	\$1,000,000	\$2,500,000	\$2,300,000	\$6,400,000	\$12,200,000
Concept 4C	\$1,200,000	\$2,800,000	\$2,500,000	\$8,000,000	\$14,500,000





Figure 29
Improvement Concept 3A



Figure 30
Improvement Concept 3B



Figure 31
Improvement Concept 3C



Figure 32
Improvement Concept 4A



Figure 33
Improvement Concept 4B



Figure 34
Improvement Concept 4C

FINAL REPORT

Smiths Grove Traffic Operations Study

11.3 NEXT STEPS

The next step following this study for any potential improvement would be Phase 1 Design (Preliminary Engineering and Environmental Analysis).

12.0 CONTACTS/ADDITIONAL INFORMATION

Written requests for additional information should be sent to Mikael Pelfrey, Director, KYTC Division of Planning, 200 Mero Street, Frankfort, KY 40622. Additional information regarding this study can also be obtained from the KYTC District 3 Project Manager, Ben Hunt, at (270) 746-7898 (email at benjamin.hunt@ky.gov).

