KY 1931 PLANNING STUDY

KYTC Item No. 5-480.00
Jefferson County, Kentucky
August 2014

Submitted To: Kentucky Transportation Cabinet, Division of Planning
Prepared By: CDM Smith

Final Report

KY 1931 Planning Study

Final Report
Jefferson County, Kentucky
Manslick Road/St. Andrews Church Road between US 31W and I-264
Kentucky Transportation Cabinet
Item No. 5-480.00

August 19, 2014

Submitted to:
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KY 1931 Planning Study
Executive Summary

Jefferson County, Kentucky

KYTC Item No. 5-480.00

The Kentucky Transportation Cabinet (KYTC), in partnership with CDM Smith, undertook a planning study for KY 1931, known locally as St. Andrews Church Road and Manslick Road from US 31W (Dixie Highway) to I-264 (Watterson Expressway) in Louisville. The study area is illustrated on **Figure ES-2**, found at the end of this summary.

Purpose & Need

The purpose of the proposed KY 1931 project is to improve safety and local traffic operations along this route between Dixie Highway and I-264. The need is expressed through above average crash rates, substandard geometric features, and congested traffic operations.

Other project goals include accommodating bicyclists and pedestrians, improving emergency response time, minimizing impacts to the environment, and ensuring any improvement can handle traffic from other planned improvements.

Existing Conditions

KY 1931 is classified as an Urban Minor Arterial with posted speed limits of 35 to 45 mph in the study area. It is a two lane facility from Dixie Highway to Anna Lane, a three lane facility from Anna Lane to Lance Drive, and a four lane facility for the remainder of the study area. KY 1931 contains 10 to 12 foot lanes and 2 to 10 foot shoulders. The northern portion of the route occasionally features a 7 to 14 foot raised mountable median. The route provides access to residential neighborhoods, commercial development, several schools, churches, and cemeteries.

Hillcrest Cemetery is adjacent to Manslick Road and is opposite Parkwood Baptist Church.

One bus route operated by the Transit Authority of River City travels the corridor: Express Route 54.

Existing traffic volumes range from 11,100 to 18,200 vehicles per day, with the heavier volumes in the middle section between Palatka Road and Hazelwood Avenue. Existing volume-to-capacity ranges from 0.60 to 0.96, largely controlled by signalized intersections.

Level of Service (LOS), a qualitative measure of highway traffic conditions were calculated at major study intersections. Three intersections (Blanton Lane, Palatka Road, and Hazelwood Avenue) operate at an unacceptable LOS (E or F) during the AM or PM peak hour.

The segment of the corridor between Arnoldtown Road and Blanton Lane has the highest crash frequencies; in four years, 65 total reported crashes occurred. This equates to a Critical Rate Factor of 1.92, indicating crashes are happening more often than can be attributed to random occurrence. The entire corridor south of Hazelwood Avenue exhibit CRFs over 1.00. Several 0.10-mile long

spots along the route also exhibit above average crash rates.

St. Andrews Church Road at Cardinal Oaks Drive. While this section has a sidewalk on one side, the majority of the corridor does not accommodate pedestrians.

A review of existing plans and where necessary, field observations, identified a deficient horizontal curve, several deficient vertical curves that limit headlight sight distance, and several sections where the cross-section does not meet current standards.

Manslick Road at Holly Park Drive looking to the south at one of several deficient vertical curves.

Alternatives Considered

To improve safety and local traffic operations, the project team considered a selection of potential alternates:

- No Build Alternative;
- Short-term Spot Improvement options;
- The 2 Lane Alternative, which would reconstruct the route with wider lanes and shoulders;
- The 3 Lane Widening Alternative, which would reconstruct the route with wider lanes, shoulders, and add a two way left turn lane in the center;
- The 4 Lane Widening Alternative, which would reconstruct the route with one additional lane in each direction with wider lanes and shoulders;
- The 5 Lane Widening Alternative, which would reconstruct the route with one additional lane in each direction and a two way left turn lane in the center, with wider lanes and shoulders;

The project team developed conceptual designs, planning-level cost estimates, and a high level comparison of impacts.

Throughout the study, the project team met with local officials, stakeholders, and the public to discuss alternatives and understand local perspectives on improvement concepts. During these discussions, the 4 Lane and 5 Lane Widening Alternatives were eliminated from consideration as they did not meet the purpose and need. Generally, feedback received indicated strong public support for the proposed project:

- 53 of 55 surveys indicated the route should be improved.
- 38 of 55 surveys preferred the 3 Lane Widening Alternative.
- Segments 1, 2, and 3 (US 31W to Hazelwood Ave., see **Figure ES-2** for location) were seen as the highest priority need.

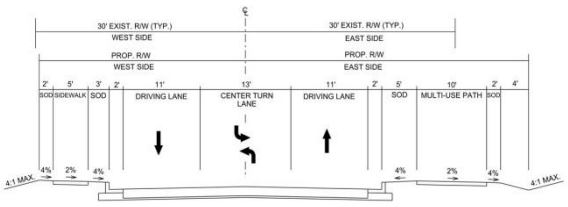
Recommendations

In light of technical analyses and local input, the project team recommends that the 3 Lane Widening Alternative advance for future project development phases. **Table ES-1** provides summary information about costs. If spot improvements are implemented in advance, as described below, this estimate would be reduced. **Figure ES-1** shows the proposed typical section for the 3 Lane Widening Alternative and **Figure ES-2** shows the recommended construction sections for the corridor.

Table ES-1: 3 Lane Widening Alternative Planning Level Cost Estimates

Project Phase	Cost (Millions)
Design	$4.3
Right-of-Way	$10.2
Utilities	$8.6
Construction	$25.8
Total	$48.9

Figure ES-1: 3 Lane Widening Typical Section



The 3 Lane Widening Alternative is recommended for the following reasons:

- Satisfies the project purpose by improving safety and local traffic operations by adding a center turn lane, fixing geometric deficiencies, and adding additional turn lanes.
- Accommodates bicyclists and pedestrians with a multi-use path.
- Improves emergency response time.
- Is sufficient to accommodate traffic for the proposed I-264/KY 1931 interchange.
- Minimizes cost.
- Improves drainage.

To provide low-cost, short-term improvements while funding is secured for the long term recommendation, spot improvement recommendations were developed. The spot improvements were developed to complement the recommended long-term improvement. The high priority spot improvements are noted below and shown in **Figure ES-2**:

- **Spot Improvement A**: Add turn lanes at KY 1931/Arnoldtown Road (estimated total cost = $1.0 million)
- **Spot Improvement B**: Add turn lanes at KY 1931/Blanton Lane (estimated total cost = $8.3 million)
- **Spot Improvement D**: Add turn lanes at Trunell Elementary School and Doss High School (estimated total cost = $1.9 million)
- **Spot Improvement H**: Realign/Widen KY 1931 from Iroquois Parkway to Stephan Lane (estimated total cost = $4.6 million)
- **Spot Improvement I**: Realign De Mel Avenue (estimated total cost = $1.9 million)
- **Spot Improvement J**: Intersection improvements at KY 1931/Hazelwood Avenue (estimated total cost = $3.7 million)

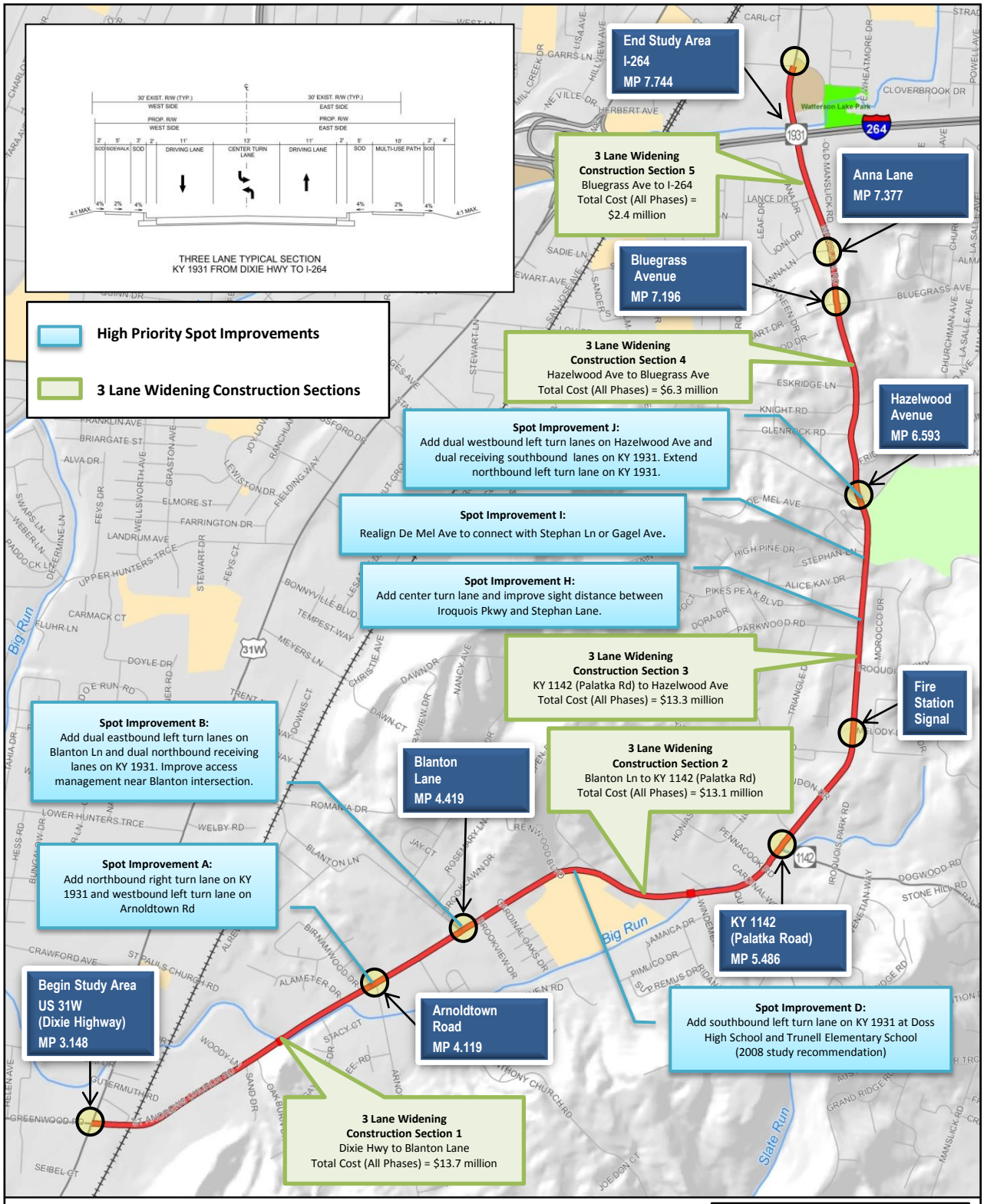


Figure ES-2: Improvement Recommendations

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1. Introduction

The Kentucky Transportation Cabinet (KYTC), in partnership with the consultant team, CDM Smith, met in November 2012 to kick off a planning study for the KY 1931 corridor. The project was identified in the Kentuckiana Regional Planning and Development Agency's (KIPDA) Horizons 2030 transportation plan for the metro Louisville area. The project was initiated and funded by KIPDA, and was given KYTC Item Number 5-480.00. Two projects relating to future development along this corridor appear in *Kentucky's Enacted FY 2014 – FY 2020 Highway Plan dated May 2014*. The programmed phases, funding sources, and allocation years are shown below in **Table 1-1**.

Table 1-1: Related FY 2014 – 2020 Highway Plan Projects

Funding Source	Phase	Year	Funding Amount
Item No. 5-8810.00: Three-lane widening of KY 1931 between Doss H.S. and Palatka Road			
STP	Design	2015	$0.5 million
STP	Right of Way	2016	$2.7 million
STP	Utilities	2017	$1.6 million
STP	Construction	2018	$4.8 million
Item No. 5-8405.00: Construct interchange at KY 1931 and I-264			
SPP	Design	2014	$3.1 million
SP	Right of Way	2016	$4.0 million
SP	Utilities	2016	$1.8 million

STP = Federal Statewide Transportation Program Funds *SPP = State Construction High Priority Projects*

SP = State Construction Funds Not Available

Beyond the projects shown above no funding is currently committed for any other future project development activities.

This project is located in southwestern Louisville, in Jefferson County, Kentucky. The scope of this study includes KY 1931 (locally St. Andrews Church Road/Manslick Road) from US 31W (Dixie Highway) to I-264 (Watterson Expressway). The project length is approximately 4.6 miles.

A. Report Summary

This report describes the activities completed under the planning phase of work, divided into eight topic areas:

- Section 1 identifies the previous planning studies completed in the area.
- Section 2 describes the existing conditions in the study area.
- Section 3 details major environmental constraints in the study area. These should be further evaluated in any future phases of project development.
- Section 4 details the purpose and need statement for the project.

- Section 5 summarizes the first round coordination and outreach activities undertaken as part of the planning phase of the project. In addition to internal project team meetings, the team coordinated with local officials and stakeholders, and members of the public.
- Section 6 describes the alternative development process: which alternatives were considered and how the range of alternatives was pared down. It also discusses the traffic analysis completed for the alternatives.
- Section 7 summarizes the final round coordination and outreach activities undertaken as part of the planning phase of the project. In addition to internal project team meetings, the team coordinated with federal, state, and local resource agencies, local officials and stakeholders, and members of the public.
- Section 8 describes the recommended alternative to advance to future phases of project development.

B. Previous Studies

Two recent studies have been completed which concern aspects of this project: the I-264/Manslick Road Interchange Feasibility Study (2007) and the 3rd Street Road/St. Andrews Church Road Area Transportation Study (2008).

The I-264/Manslick Road Interchange Feasibility Study (2007) was commissioned by the KYTC to evaluate the feasibility of providing a new interchange on I-264 (Watterson Expressway) at KY 1931 (Manslick Road), and examines four possible alternatives for the interchange configuration. That study identified project goals as:

- Improve traffic operations and safety within the study area, including Taylor Boulevard and Dixie Highway and their respective interchanges with I-264.
- Reduce congestion and congestion-induced crashes.
- Improve connectivity with the Watterson Expressway.
- Improve access to stakeholders that are heavily dependent on traffic circulation and interstate connectivity, such as Sts. Mary and Elizabeth Hospital, Jacob Elementary School, Louisville Metro Fire Station Engine #12, Park Hill industrial area, and miscellaneous residential areas.

This study assumes the widening of Manslick Road to four lanes south of I-264 in all of its alternatives, including the No Build Alternative. It recommends that a partial interchange allowing access to and from the east be advanced only after widening Manslick Road to the south. No cost estimate was calculated for the widening of Manslick Road. The components of the partial interchange decision are summarized below:

- Between 70 and 80 percent of existing and future traffic travels to/from the east on I-264 from the Dixie Highway, Taylor Boulevard, and the proposed Manslick Road interchanges.
- The full interchange, when compared to the partial interchange options, would have no appreciable benefit to traffic operations on the interstate and surface streets.
- The cost of constructing a full interchange is 7 to 9 times more than the partial interchange.

- A partial interchange would have only one right-of-way relocation and no anticipated environmental impacts.
- A partial interchange has long been recognized and included in plans prepared by the City of Louisville.

It should be noted that the Federal Highway Administration (FHWA) does not favor partial interchanges and the partial interchange recommended above was never vetted through the FHWA over the course of the study.

The 3rd Street Road / St. Andrews Church Road Area Transportation Study (2008) was commissioned to assist the KYTC, the Kentuckiana Regional Planning & Development Agency (KIPDA), and Louisville Metro to evaluate traffic conditions, identify potential short-term improvements, and prioritize major long-term projects around 3rd Street Road and St. Andrews Church Road in Louisville.

The study identified the following projects pertinent to the KY 1931 study and recommended their implementation:

- Widen St. Andrews Church Road to 3 lanes; add signal and turn lanes on St. Anthony Church Road and add turn lanes on Arnoldtown Road at an estimated cost of $9,600,000 (2008). This conflicts with the KIPDA recommendation of widening to 4 lanes at a year of expenditure cost of $31,100,000.
- Widen through curve and add middle turn lane on St. Andrews Church Road at Doss High School at an estimated cost of $233,000 (2008).
- Define shopping center entrances with better access management, striping, and signage at St. Andrews Church Road and Palatka Road at an estimated cost of $20,000 (2008).
- Sidewalk improvements along St. Andrews Church Road from Dixie Highway to Palatka Road at an estimated cost of $374,000 (2008).

These two previous studies only included portions of KY 1931 as part of a broader study. The KY 1931 Planning Study takes the broader network into consideration. The feasibility, cost, and the impacts of improvement alternatives along the entire KY 1931 corridor were examined. This was not done in the two previous studies. KYTC must have a defined project with a defined benefit and cost before the next phase can be funded. The KY 1931 Planning Study will give KYTC that information.

2. Existing Conditions

The following sections discuss the existing roadway conditions, traffic operations, and roadway safety.

A. Roadway Characteristics

KY 1931 is classified as an Urban Minor Arterial with a posted speed limit of 35 to 45 mph in the study area. It is a two lane facility from Dixie Highway to Anna Lane, a three lane facility from Anna Lane to Lance Drive, and a four lane facility for the remainder of the study area. KY 1931 contains 10 to 12 foot lanes with 2 to 10 foot shoulders along the study area. The northern portion of the route occasionally features a 7 to 14 foot raised mountable median.

As part of this study, analysts studied the route in the field and where available compared the KY 1931 as-built plans to *A Policy on Geometric Design of Highways and Streets, 6th Edition, 2011,* commonly referred to as the Green Book, design standards. The Green Book contains the current design research and practices for highway and street geometric design. Design standards from the Green Book were used to identify geometric deficiencies along KY 1931, as shown in **Figure 2-1**. This analysis identified five deficient vertical curves that limit stopping sight or headlight sight distance, one deficient horizontal curve, and several sections where the existing cross-section does not meet current standards.

The one deficient horizontal curve (near the southern limits of the project) has a 40 mph design speed, which is appropriate for the area because it approaches a signalized intersection and goes over an at-grade railroad crossing.

As-built plans were primarily available on KY 1931 between Dixie Highway and Palatka Road where there is relatively flat terrain. Thus field observations were used to determine vertical curve and sight line deficiencies north of Palatka Road where the terrain is rolling. Based on field observations five deficient vertical curves were identified that lack adequate stopping sight or headlight sight distance. KYTC typically requires a six second gap between oncoming vehicles and driveways/entrances. This allows vehicles to safely pull out of their driveway or entrance. The five locations identified all have time gaps less than six seconds. Because as-built plans were not available, these deficiencies will need to be verified in future project development phases to confirm the field observations.

Narrow shoulders are present throughout the corridor.

The majority of the corridor has deficient shoulder widths that do not meet the Green Book design standards. A minimum eight foot wide usable shoulder is recommend for this type of road where curb and gutter are not present. Most of KY 1931 has two foot paved shoulders with roadside ditches scattered throughout most of the corridor.

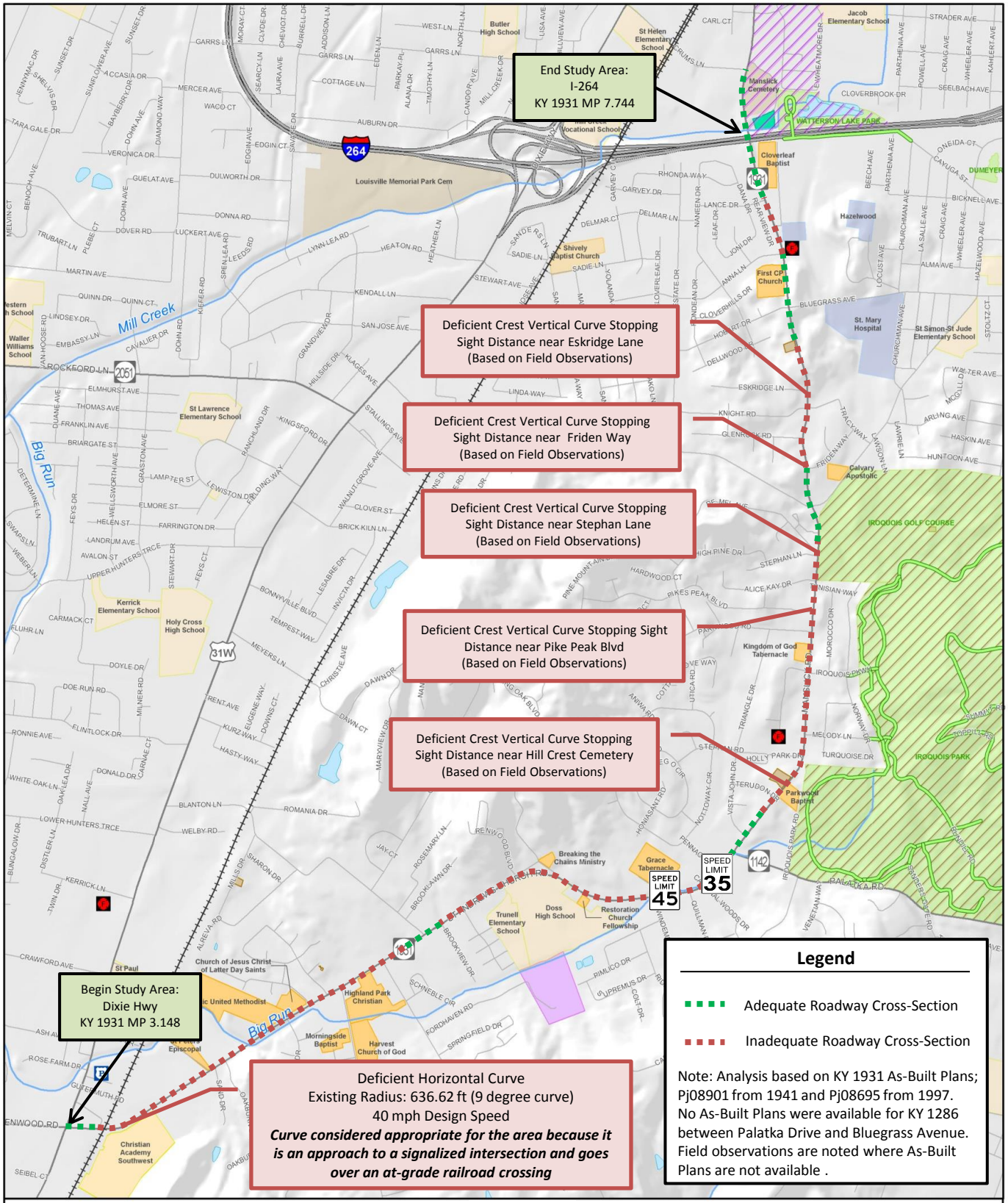

Figure 2-1:
Deficient Roadway Geometrics
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B. Other Modal Users

One bus route operated by the Transit Authority of River City (TARC) travels the study portion of KY 1931: Express Route 54. The service runs twice along the route during both the morning and afternoon rush hours; weekend and holiday service is not provided. The route also provides access to several schools; as a result, it is used by an above average concentration of school buses.

Local schools result in an above average concentration of school buses along KY 1931.

The city of Louisville has been designated as a "pedestrian safety focus city" by FHWA. KY 1931 has been designated as a Tier 2 Long Term Capital Project by the city in their 2010 Bike Master Plan. Currently, no bike lanes and limited sidewalks are provided along the corridor. Bicycle and pedestrian facilities are a high priority to stakeholders and local officials.

C. Bridges

Three structures lie along KY 1931 within the project area:

- At milepoint 3.76, a 24.5 foot culvert spans Big Run Creek. Built in 1941, the structure is functionally obsolete and received a sufficiency rating of 47.3 during its March 2012 inspection.
- At milepoint 5.20, a 24.9 foot culvert spans Big Run Creek. Constructed in 1991, the structure received a sufficiency rating of 93.6 during its March 2012 inspection.
- At milepoint 7.72, a 253 foot pre-stressed concrete box beam/girder structure spans I-264 (Watterson Expressway). Constructed in 1988, the bridge received a sufficiency rating of 95.4 during its January 2013 inspection.

D. Existing Traffic

Existing (2012) daily traffic volumes for KY 1931, shown in **Figure 2-2**, were collected from recent traffic counts conducted by KYTC and KIPDA. Within the study area, daily traffic volumes range from 11,100-18,200 vehicles per day (vpd). Turning movement counts were collected during peak traffic periods at key intersections during September 2012. The intersections of KY 1931/Blanton Lane and KY 1931/Palatka Road had been counted in 2010 and were not recounted. They were balanced to 2012 volumes. Turning movements volumes during the AM and PM peak hours are presented in **Figure 2-3**.

Based on traffic counts conducted in September 2012, passenger cars (including motorcycles, cars, and pickup trucks) represent 93 to 95 percent of the daily traffic volume using the corridor. Buses accounted for 0.6 to 1.5 percent of the total daily traffic volume using the corridor; bus volumes on individual segments ranged from 80 to 220 buses during a 24-hour period. Trucks made up the remaining 4 to 6 percent of the daily traffic volume using the corridor.

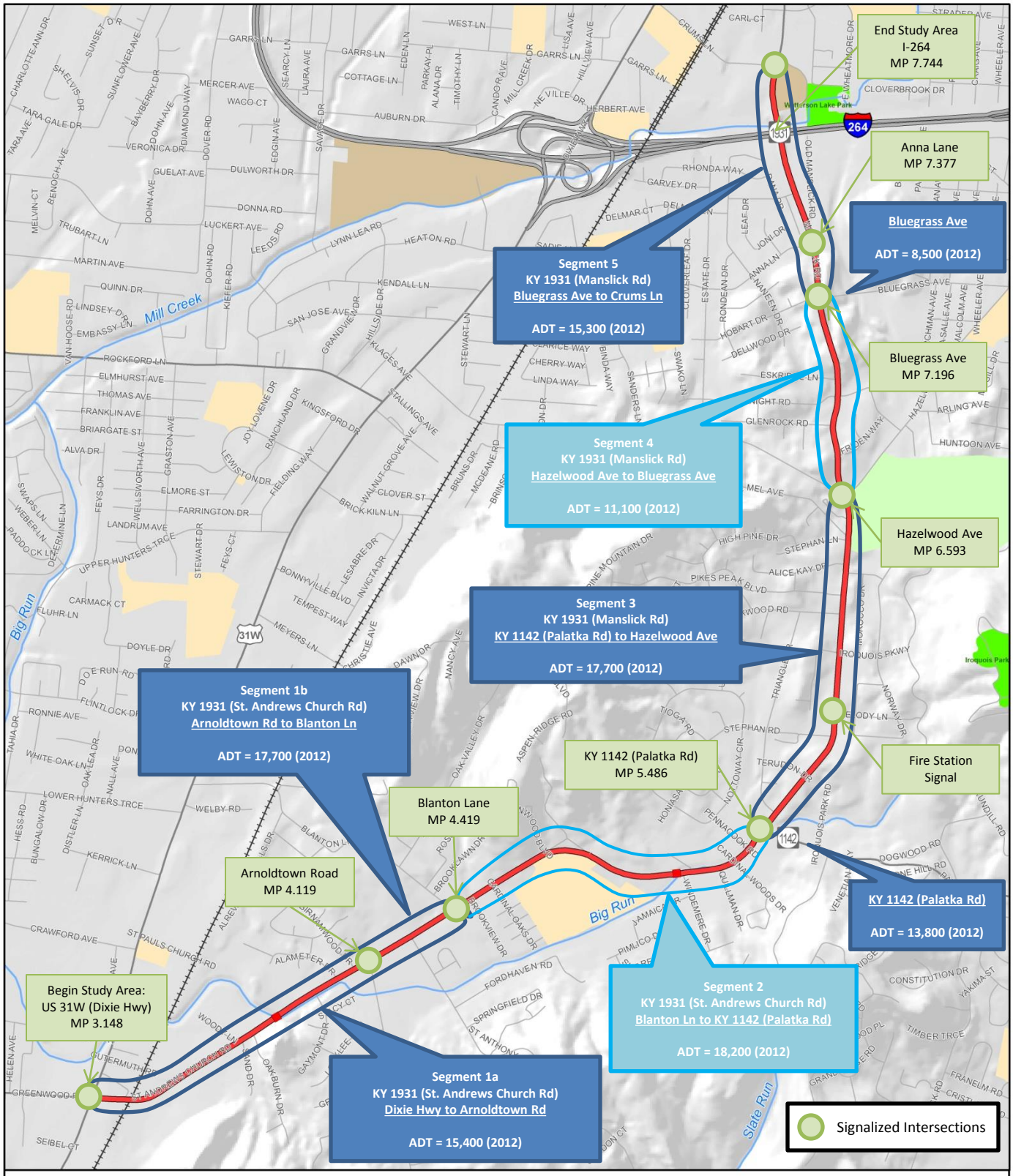

Figure 2-2:
2012 Traffic Volumes
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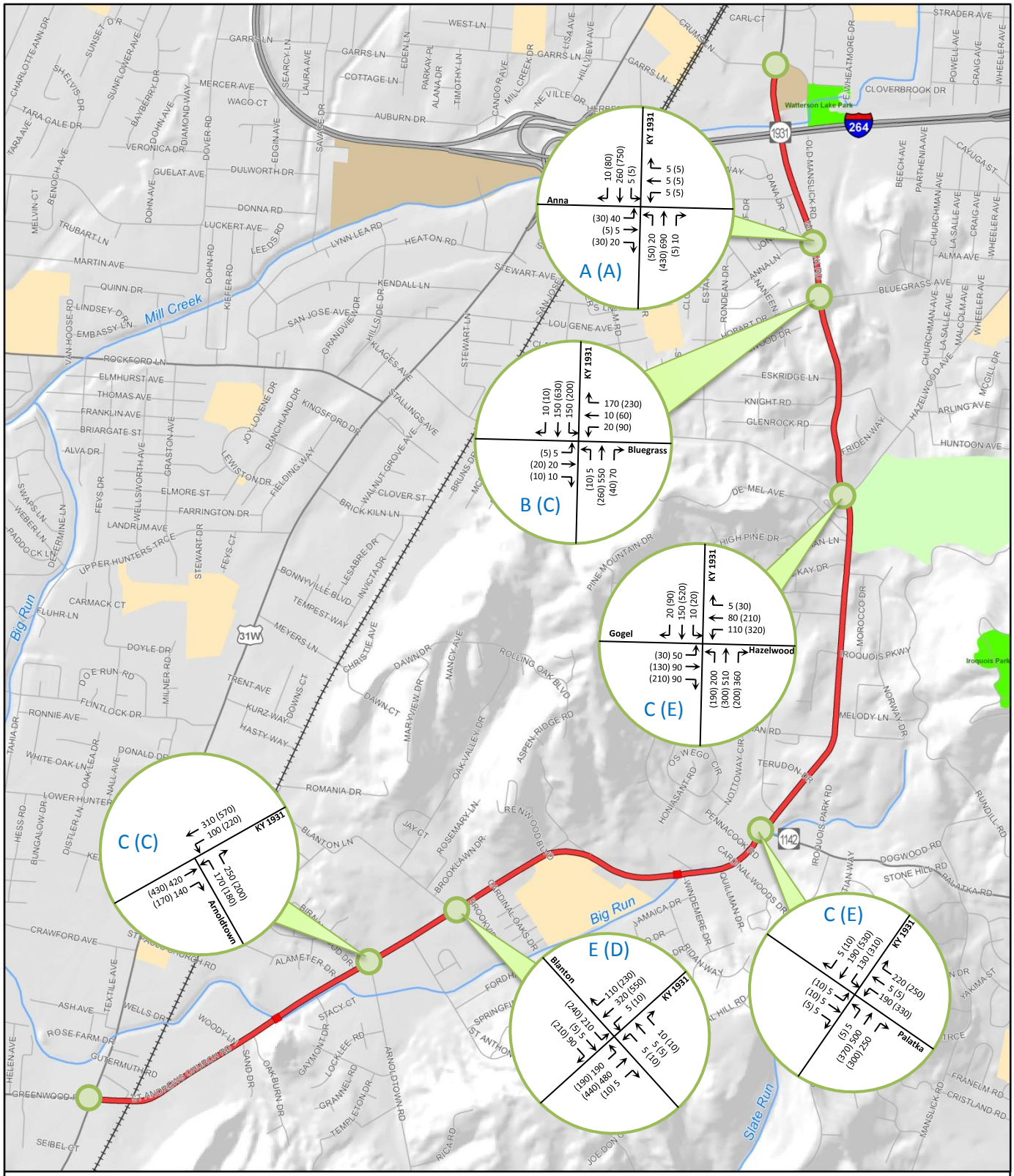

2012 AM (PM) Peak Hour LOS

N

0 2,000 4,000 Feet

0 0.5 1 Miles

Figure 2-3:
2012 Peak Hour Traffic
KY 1931 Planning Study
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E. Operational Analysis

Level of Service (LOS) is a qualitative measure of highway traffic conditions, as identified in the 2010 Highway Capacity Manual (HCM). Individual levels of service characterize these conditions in terms of speed, travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six levels of service are defined and given letter designations from A to F, with LOS A as the best condition, representing free flow conditions, and ranging to LOS F, representing severe congestion and/or time delays. Typically, a minimum LOS D is considered acceptable in urban areas and LOS C is considered acceptable in rural areas. This is the preferred KYTC methodology for analyzing the adequacy of an intersection.

LOS was calculated at the major signalized intersections along the corridor, based on the existing lane configuration, traffic controls, existing signal timing, and peak hour volumes. As shown in **Figure 2-3**, LOS varies along the corridor but is generally worse during the PM peak hour. **Table 2-1** presents detailed information about delay and LOS for individual approaches at each intersection.

Table 2-1: 2012 Signalized LOS during AM (PM) Peak Hour at Key Intersections

Intersection	LOS	Approach	LOS
KY 1931 at Arnoldtown	C (C)	Eastbound KY 1931	B (C)
		Westbound KY 1931	A (B)
		Northbound Arnoldtown	E (E)
KY 1931 at Blanton	E (D)	Eastbound KY 1931	C (C)
		Westbound KY 1931	C (C)
		Southbound Blanton	F (E)
		Northbound driveway	C (C)
KY 1931 at Palatka	C (E)	Northbound KY 1931	B (C)
		Southbound KY 1931	B (B)
		Eastbound driveway	C (C)
		Westbound Palatka	D (F)
KY 1931 at Gagel/Hazelwood	C (E)	Northbound KY 1931	C (E)
		Southbound KY 1931	B (D)
		Eastbound Gagel	D (D)
		Westbound Hazelwood	D (E)
KY 1931 at Hobart/Bluegrass	B (C)	Northbound KY 1931	C (B)
		Southbound KY 1931	B (C)
		Eastbound Hobart	B (B)
		Westbound Hazelwood	C (B)
KY 1931 at Anna	A (A)	Northbound KY 1931	A (A)
		Southbound KY 1931	A (A)
		Eastbound Anna	B (B)
		Westbound driveway	B (B)

To evaluate the adequacy of roadway segments, design volumes were compared to the roadway's theoretical capacity. This is the preferred KYTC methodology for evaluating the adequacy of roadway

segments. A volume-to-capacity ratio (V/C) represents the number of vehicles using the road in a specific time period compared to the number of vehicles the roadway was designed to be able to handle during that period. The target V/C ratio is 0.9 for rural areas and 1.0 for urban areas. A V/C greater than this indicates the road is congested, i.e. operating above its design capacity.

Table 2-2 presents the V/C for each segment along the corridor based on a theoretical directional capacity of 1,146 vehicles per hour. The theoretical capacity is derived from an ideal directional capacity of 1,900 vehicles per hour which was adjusted to accommodate the 3 percent trucks, 0.9 peak hour factor, and an average 67 percent green time for mainline movements at signalized intersections. The latter is based on the six existing signalized intersections along the corridor. V/C ranges from 0.60 to 0.96 for individual segments, which indicates that the majority of segments – particularly between Arnoldtown Road and Hazelwood Avenue – are approaching their capacity.

Table 2-2: 2012 Peak Direction Volume-to-Capacity for Corridor Segments

KY 1931 Segment	Peak Hour Volume	V/C
US 31W to Arnoldtown	880	0.77
Arnoldtown to Blanton	1010	0.88
Blanton to Palatka	1040	0.91
Palatka to Hazelwood	1100	0.96
Hazelwood to Bluegrass	690	0.60
Bluegrass to Anna	950	0.83

F. Future No Build Forecast Volumes

The Kentucky Regional Planning & Development Agency (KIPDA) provided traffic projections from their regional travel demand model for the 2020 and 2035 No Build scenario. The No Build scenario assumes no improvements to KY 1931, but other roadway improvements throughout Louisville (as listed in the KYTC Six Year Highway Plan) are assumed to have been constructed in the model. The model results show negative or 0 percent growth along most portions of KY 1931 for both the 2020 and 2035 No Build forecast. The one exception is between Palatka Rd and Hazelwood Ave which had a marginal increase from the 2013 existing traffic volumes. The reason for the little or no growth in the future No Build forecast volumes is; (1) KY 1931 is already capacity constrained, (2) the corridor is mostly built-out thus not much growth is expected along the corridor, and (3) improvements to surrounding roads in the model divert cut-through traffic away from KY 1931 to parallel facilities including Dixie Highway and Taylor Boulevard. The future build and no build forecast volumes, including a discussion of the effects of a partial interchange with I-264, can be found in **Section 6.C**.

KY 1931 and Palatka Road intersection operates at an unacceptable LOS in the PM peak hour.

Based on these model results it is assumed that the existing traffic volumes are representative of the future No Build forecast volumes.

G. Roadway Safety

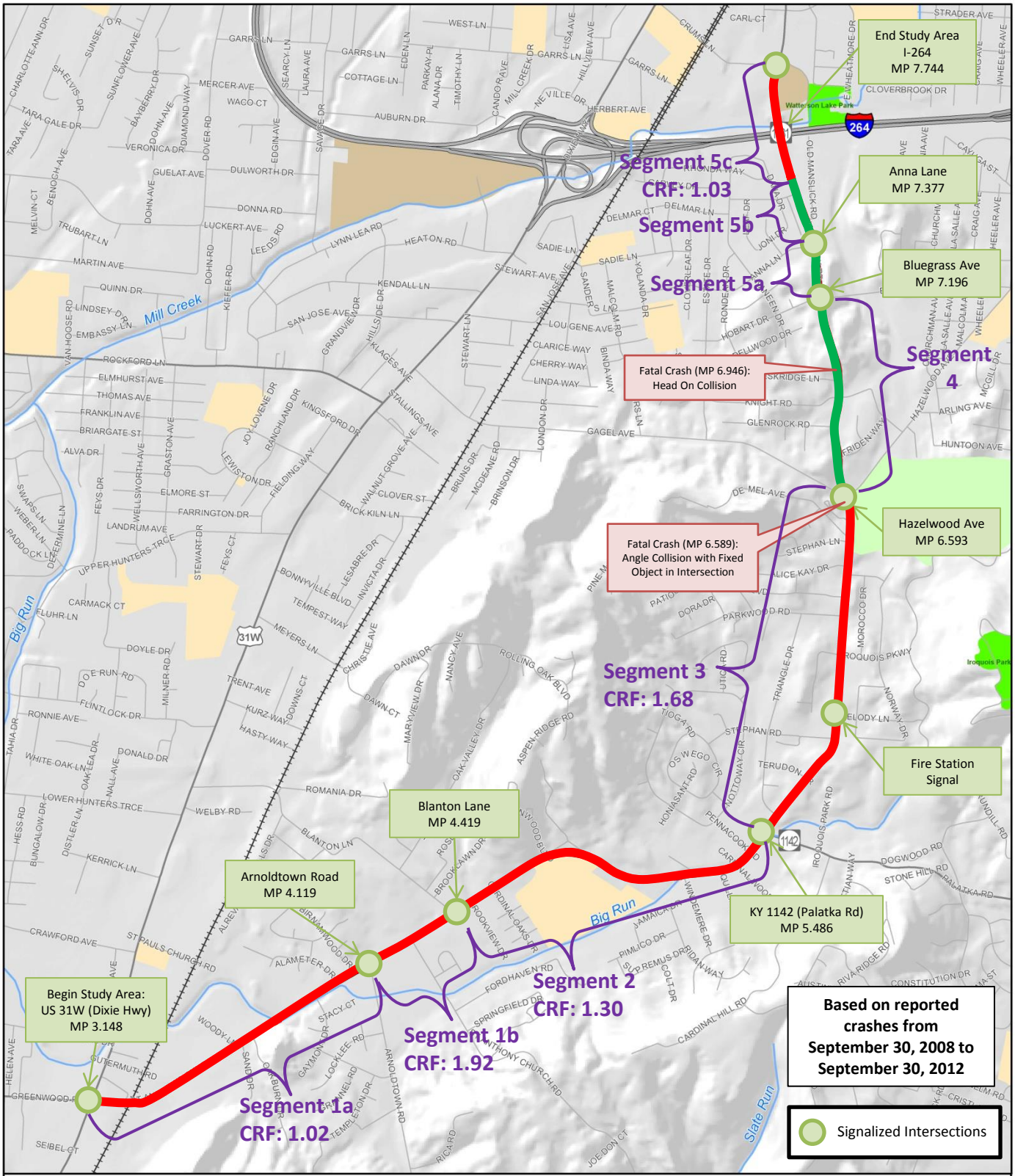
To quantify safety concerns, a crash analysis was performed for KY 1931. Crash records were collected from KYTC over a four-year period (September 30, 2008 through September 30, 2012) and are shown in **Appendix A**. Crashes were geospatially referenced and compared to statewide data to identify locations experiencing above average crash rates. The methodology is defined in the KYTC research report Analysis of Traffic Crash Data in Kentucky (Kentucky Transportation Center, 2011).

1. Segment Analysis

As defined in the methodology report, segments vary in length and are divided along roadways where geometry or traffic volumes change. For each segment, analysts looked at the number of crashes, traffic volume, rural/urban, number of lanes, and segment length to determine the critical rate factor (CRF). The CRF is one measure of the safety of a road, expressed as a ratio of the crash rate at the location compared to the average crash rate for roadways of the same functional classification throughout the state. CRF also takes into account traffic volume, area type (rural/urban), and the number of lanes. If the CRF is 1.00 or greater, it is assumed that crashes are occurring due to circumstances that cannot be attributed to random occurrence.

Figure 2-4 and **Figure 2-5** show the result of the segment analysis with statistics about each segment. Five segments of the study route exhibit CRFs over 1.00, including the entire corridor south of the intersection with Hazelwood Avenue. CRF along the corridor ranges from 0.6 to 1.9 based on collected crash data. The highest CRF portion is between Arnoldtown Road and Blanton Lane. The five high CRF segments are described briefly below.

- St. Andrews Church Road from Dixie Highway to Arnoldtown Road experienced 82 crashes in four years, resulting in a CRF of 1.02. Approximately 25 percent of these collisions resulted in injuries; there were no fatalities in this segment. Rear end collisions were the predominant type, representing 52 percent of all reported crashes.
- St. Andrews Church Road from Arnoldtown Road to Blanton Lane experienced 65 crashes in four years, resulting in a CRF of 1.92. There were eight injury collisions in this segment and no fatalities. Again, rear end collisions were the predominant type, representing 49 percent of all reported crashes.
- St. Andrews Church Road from Blanton Lane to Palatka Road experienced 134 crashes in four years, resulting in a CRF of 1.30. There were 32 injury collisions and no fatalities. Rear end collisions were the predominant type, representing 54 percent of all reported crashes in this segment.
- Manslick Road from Palatka Road to Hazlewood Avenue experienced 172 crashes in four years, including one fatality and 40 injury crashes. This results in a CRF of 1.68. Rear end collisions represent 66 percent of all reported crashes in this segment.
- Manslick Road from Lance Drive to Crums Lane experienced 30 crashes in four years, including 12 injuries and no fatalities. This results in a CRF of 1.03. Angle collisions were the predominant type, representing 33 percent of all reported crashes.



N

Critical Rate Factor

- 0.0 - 0.9
- 0.9 - 1.0
- Above 1.0

0 2,000 4,000 Feet

0 0.5 1 Miles

Figure 2-4:
Crash Segments
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Figure 2-5:
Crash Statistics by Segment

Based on reported crashes from September 30, 2008 to September 30, 2012

Segment 1a:
82 crashes (21 injury)
Length 0.97 mile
ADT = 15,400 vpd
CRF = **1.02**

By Type:
Angle = 17
Backing = 4
Head On = 1
Rear End = 43
Sideswipe = 11
Single Vehicle = 6

Segment 1b:
65 crashes (8 injury)
Length 0.30 mile
ADT = 17,700 vpd
CRF = **1.92**

By Type:
Angle = 16
Backing = 1
Head On = 1
Rear End = 32
Sideswipe = 5
Single Vehicle = 9
1 undetermined

Segment 2:
134 crashes (32 injury)
Length 1.07 miles
ADT = 18,200 vpd
CRF = **1.30**

By Type:
Angle = 29
Backing = 1
Head On = 3
Rear End = 72
Sideswipe = 14
Single Vehicle = 15

Segment 3:
172 crashes
(1 fatality, 40 injury)
Length 1.11 miles
ADT = 17,700 vpd
CRF = **1.68**

By Type:
Angle = 33
Backing = 2
Head On = 8
Rear End = 113
Sideswipe = 8
Single Vehicle = 8

Segment 4:
36 crashes
(1 fatality, 11 injury)
Length 0.60 mile
ADT = 11,100 vpd
CRF = 0.88

By Type:
Angle = 8
Backing = 1
Head On = 1
Rear End = 16
Sideswipe = 1
Single Vehicle = 9

Segment 5a:
25 crashes (7 injury)
Length 0.28 mile
ADT = 15,300 vpd
CRF = 0.87

By Type:
Angle = 6
Backing = 1
Head On = 0
Rear End = 12
Sideswipe = 3
Single Vehicle = 3

Segment 5b:
8 crashes (4 injury)
Length 0.10 miles
ADT = 15,300 vpd
CRF = 0.60

By Type:
Angle = 4
Backing = 0
Head On = 0
Rear End = 1
Sideswipe = 1
Single Vehicle = 2

Segment 5c:
30 crashes (12 injury)
Length 0.34 miles
ADT = 15,300 vpd
CRF = **1.03**

By Type:
Angle = 10
Backing = 0
Head On = 0
Rear End = 6
Sideswipe = 6
Single Vehicle = 8

The analysis looks at varying length "Segments" where crashes occur and assigns a Critical Rate Factor (CRF). A CRF greater than 1.0 (noted in red above) indicates a possible safety concern.

2. General Crash Trends

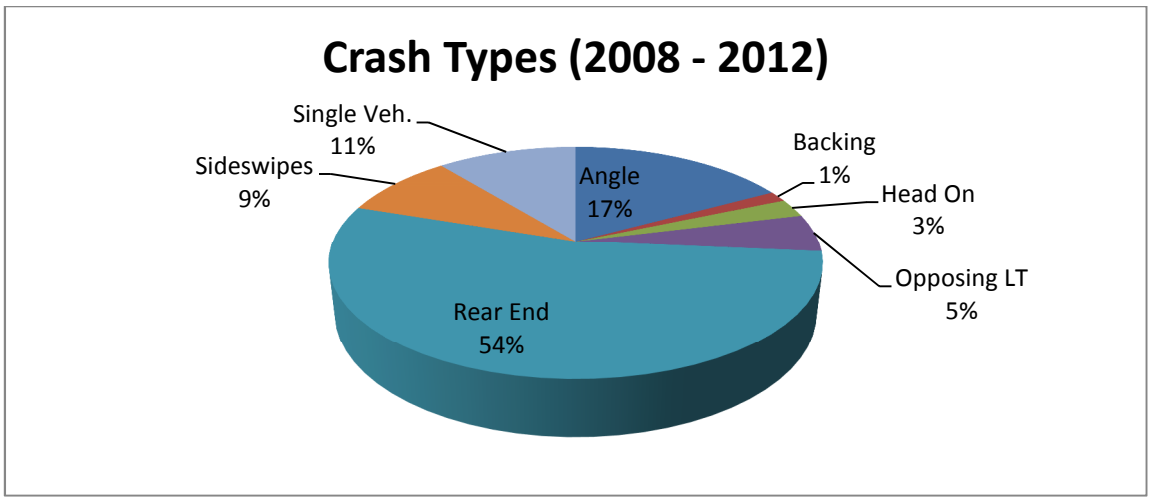
Due to the number of crashes during the analysis periods, analysts examined the severity and type of incidents to identify general trends.

Severity. Of the 552 reported crashes on KY 1931 during the four-year analysis period, there were 2 crashes that resulted in fatalities.

- A fatality event occurred at the intersection of Manslick Road and Hazelwood Avenue where a vehicle traveling north on Manslick Road at excessive speed jumped the curb, traveled across a grass turning island, and struck another vehicle which was stopped at the red signal on Hazelwood Avenue.
- A fatality event occurred on Manslick Road just north of Eskridge Lane due to a head-on collision. This crash did not occur in a segment with a CRF greater than 1.00.
- During the same period, there were 135 crashes that resulted in injuries (24.5 percent). The remaining 415 crashes (75.2 percent) only resulted in property damage.

Type. Analysts also considered the type of crashes to determine potential causation trends. Seven categories were represented: angle, backing, head on, rear end, sideswipe, single vehicle, and opposing left turn collisions. **Figure 2-6** shows the division by crash type of the 552 crashes on the study route during the four-year analysis period.

Figure 2-6: Type of Crashes on Study Route



Rear end collisions were found to be very prevalent along the corridor, accounting for 54% of all crashes. Rear end collisions are indicative of congestion where traffic has to frequently stop at signals or make turns. Installation of proper turn lanes at intersections and a two-way left turn lane throughout areas with prevalent driveway access is a potential mitigation strategy to reduce rear end collisions.

The 2010 Highway Safety Manual provides guidance on quantitative safety analyses to estimate the impacts of proposed safety improvements. Although limited data is available for urban highways at

this time, analysis of rural two-lane highway segments shows that adding a two way left turn lane results in an estimated 17 percent reduction in "driveway-related left turn crashes" along facilities with densely spaced driveways. Data available in this edition suggests that trends are similar for urban two-lane sections although the size of the reduction factor is undetermined at present. Crash records provided do not distinguish crashes where a driveway was a factor.

3. Spot Analysis

Analysts also conducted a spot analysis along the study route. Spots were defined by observing 0.1 mile sections where crashes were concentrated. Crashes were again geospatially referenced and compared to statewide data to identify locations experiencing above average crash rates. The CRF was again used as a measure of the safety of a particular spot. The methodology is defined in the KYTC research report Analysis of Traffic Crash Data in Kentucky (Kentucky Transportation Center, 2011).

Along the study corridor, 12 spots exhibit a CRF greater than 1.00. **Figure 2-7** and **Figure 2-8** show the results of the analysis that resulted in a CRF greater than 1.00. For spots, CRF ranged from 1.14 to 3.07. The highest CRF spots were at the intersection with Blanton Lane (Spot D – 45 crashes, CRF 3.07) and just south of the intersection with Hazelwood Avenue (Spot I – 45 crashes, CRF 3.07). The Blanton Lane spot experienced a higher percentage of angle and sideswipe crashes, while the large majority of the Hazelwood Avenue crashes were rear end crashes. Three spots (G, J, and L) along the corridor had a high percentage of angle collisions (over 40 percent), which, often times, can lead to more severe injuries. As spot and corridor improvements are developed, this data will be considered in order to recommend appropriate mitigation strategies, including access management and improving motorist sight lines.

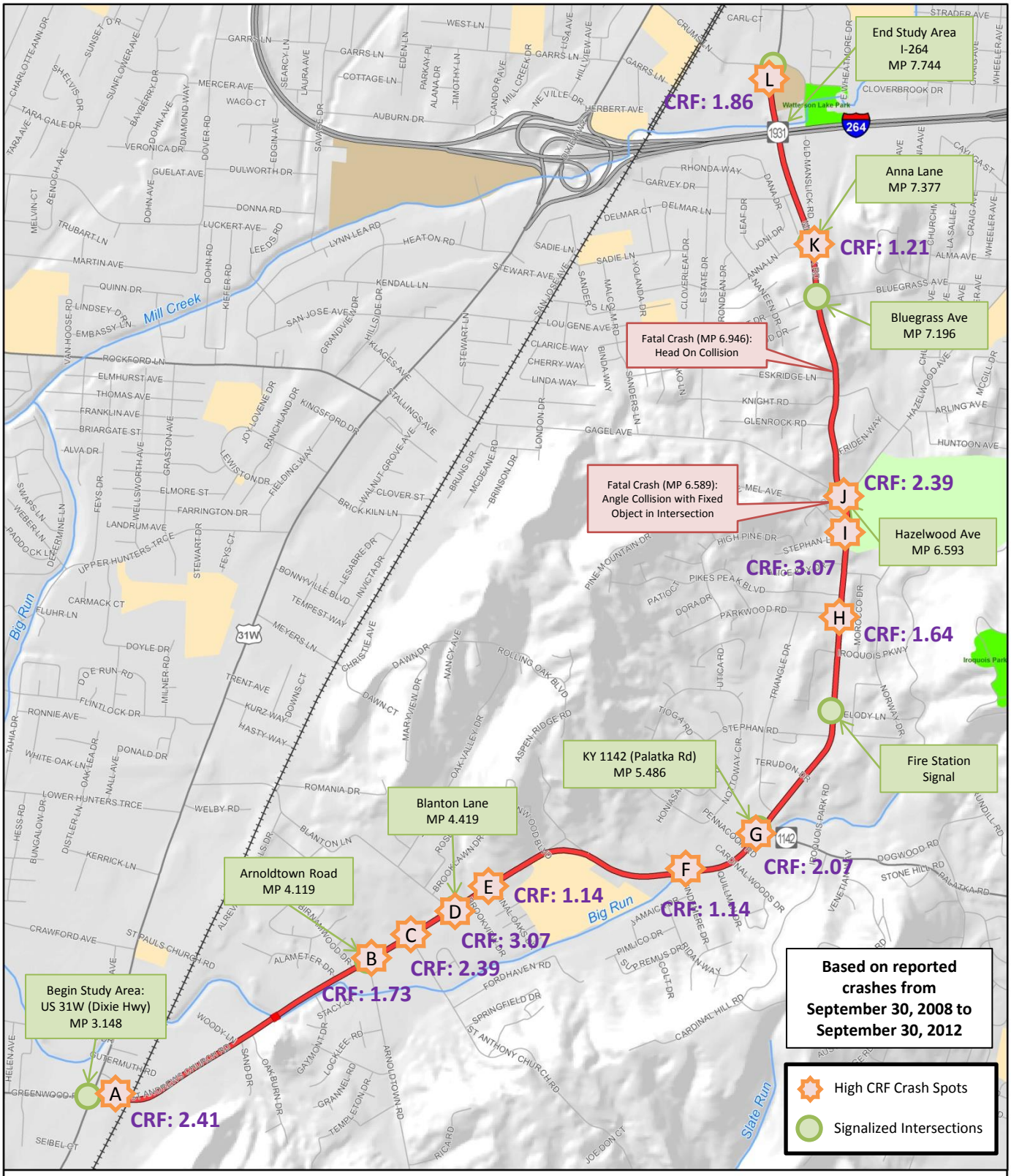


Figure 2-7:
Crash Spots

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Figure 2-8
Crash Statistics by Spot

Based on reported crashes from September 30, 2008 to September 30, 2012

Spot A: CRF = **2.41**
32 crashes (5 injury)

By Type:
Angle = 9
Backing = 2
Head On = 0
Rear End = 15
Sideswipe = 6
Single Vehicle = 0

Spot B: CRF = **1.73**
23 crashes (5 injury)

By Type:
Angle = 5
Backing = 1
Head On = 1
Rear End = 15
Sideswipe = 0
Single Vehicle = 1

Spot C: CRF = **2.39**
35 crashes (2 injury)

By Type:
Angle = 9
Backing = 1
Head On = 0
Rear End = 20
Sideswipe = 1
Single Vehicle = 3
1 undetermined

Spot D: CRF = **3.07**
45 crashes (9 injury)

By Type:
Angle = 8
Backing = 0
Head On = 0
Rear End = 26
Sideswipe = 5
Single Vehicle = 6

Spot E: CRF = **1.14**
17 crashes (6 injury)

By Type:
Angle = 3
Backing = 0
Head On = 0
Rear End = 10
Sideswipe = 0
Single Vehicle = 4

Spot F: CRF = **1.14**
17 crashes (4 injury)

By Type:
Angle = 1
Backing = 0
Head On = 0
Rear End = 13
Sideswipe = 1
Single Vehicle = 2

Spot G: CRF = **2.07**
31 crashes (8 injury)

By Type:
Angle = 13
Backing = 1
Head On = 2
Rear End = 9
Sideswipe = 4
Single Vehicle = 2

Spot H: CRF = **1.64**
24 crashes (9 injury)

By Type:
Angle = 4
Backing = 0
Head On = 1
Rear End = 18
Sideswipe = 1
Single Vehicle = 0

Spot I: CRF = **3.07**
45 crashes (13 injury)

By Type:
Angle = 3
Backing = 1
Head On = 2
Rear End = 37
Sideswipe = 1
Single Vehicle = 1

Spot J: CRF = **2.39**
35 crashes
(1 fatality, 6 injury)

By Type:
Angle = 19
Backing = 1
Head On = 1
Rear End = 13
Sideswipe = 0
Single Vehicle = 1

Spot K: CRF = **1.21**
16 crashes (4 injury)

By Type:
Angle = 5
Backing = 0
Head On = 0
Rear End = 7
Sideswipe = 3
Single Vehicle = 1

Spot L: CRF = **1.86**
22 crashes (10 injury)

By Type:
Angle = 9
Backing = 0
Head On = 0
Rear End = 6
Sideswipe = 3
Single Vehicle = 4

The analysis looks at 0.1 mile "Spots" where crashes are concentrated and assigns a Critical Rate Factor (CRF). A CRF greater than 1.0 (noted in red above) indicates a possible safety concern.

3. Environmental Overview

The following subsections present a planning-level overview of environmental resources along the study corridor. This information was assembled from readily available data sources and correspondence with resource agencies; additional, detailed investigations should be undertaken as part of any future project development phases.

A. Socioeconomic and Community Resources

A number of community resources lie along the corridor, shown in **Figure 3-1**. The corridor provides direct access to Christian Academy Southwest, Trunnell Elementary School, and Doss High School. Several other schools are located in the vicinity and rely on KY 1931 for indirect access as well.

Iroquois Park covers over 700 acres to the east of KY 1931 between Hazelwood Avenue and Palatka Road. This historic park features numerous amenities: an archery range, basketball courts, biking/walking trails, a golf course, picnic shelters, playground equipment, tennis courts, and scenic overlooks.

Sts. Mary and Elizabeth Hospital is one of many community resources along the corridor.

Sts. Mary and Elizabeth Hospital is located off KY 1931 at the intersection with Bluegrass Avenue. There are also two fire stations and numerous churches along the route. Five cemeteries lie in the vicinity, two of which abut the roadway.

July 2013 correspondence with the Natural Resources Conservation Service confirms that, as the project lies within existing highway right-of-way, on previously disturbed areas, or within city limits, there are no anticipated impacts to farmlands.

B. Demographics

KIPDA staff conducted an assessment of demographic data from the 2000 and 2010 Census, 2006-2010 American Community Survey, and consideration of information provided by local community groups, included as **Appendix B**. The analysis indicates the following:

- Minority resident populations exist throughout the study area corridor. The highest numbers and densities were found at the northern end of the KY 1931 study area corridor – immediately north and south of I-264. The average minority concentrations in these areas were greater than those expected within the general resident population for the United States, Kentucky, or Jefferson County. Of the various combinations of ethnicity and race that determine individual minority status, African-Americans comprised the largest component group.

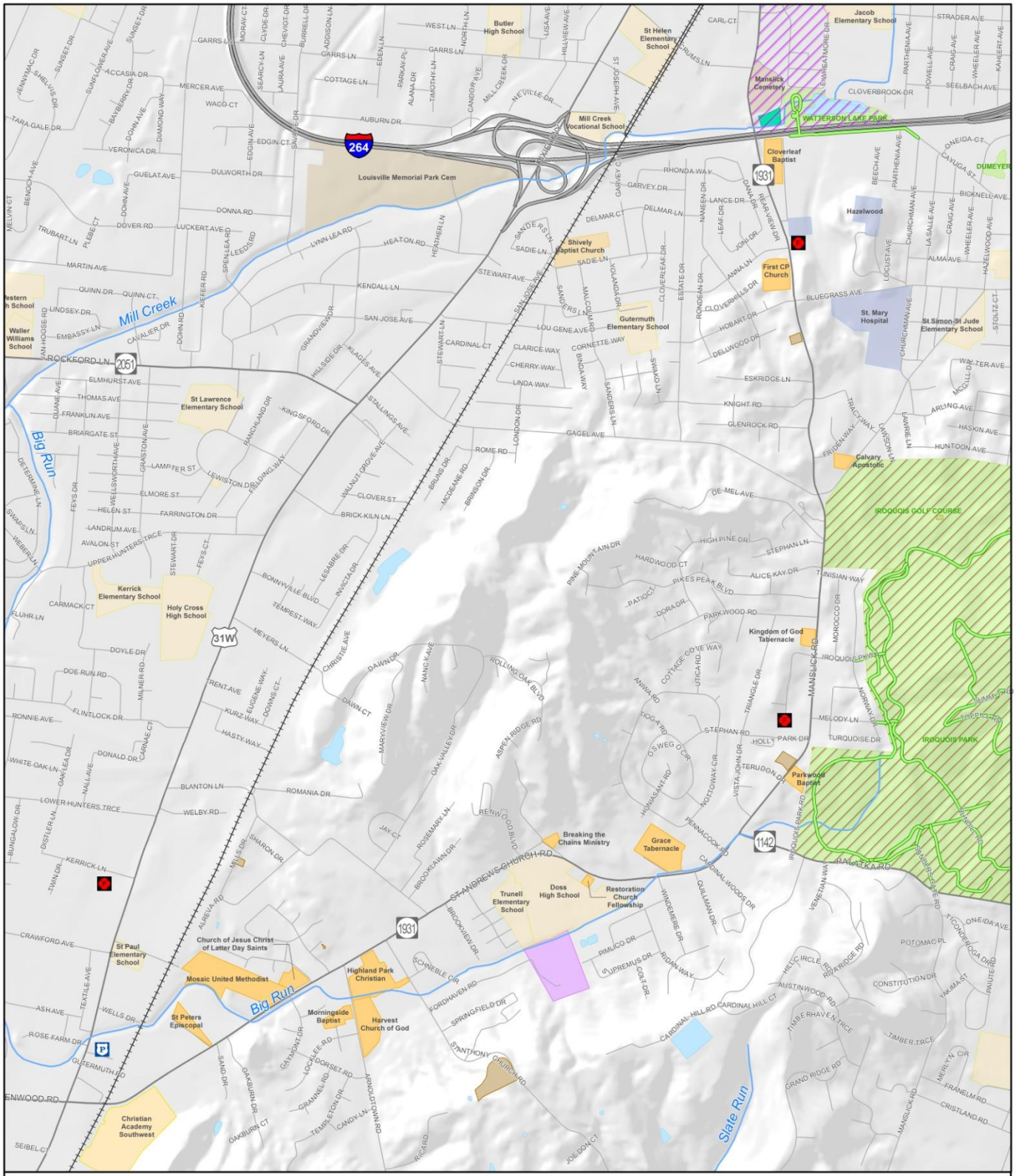

Figure 3-1:
Community Resources

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- Persons with low-income are located throughout the study area corridor. Similar to the minority population findings, higher concentrations of persons with low-income resided in the neighborhoods along the northern end of the corridor, in the vicinity of I-264. These populations were present in proportions higher than those of the nation, state, and county.
- Older persons reside throughout the study area corridor in concentrations largely similar to those found in the general populous at the national, state, and county levels. Concentrations of older persons greater than those found in the general populous were located at both ends of the study area corridor—near I-264 and near Dixie Highway.
- Persons with disabilities were found to reside within the study corridor—primarily at rates similar to those of the nation, state, and county. Higher concentrations of residents with disabilities were located at the northern end of the study area corridor—near I-264.
- A number of churches, senior centers, housing complexes, food distribution centers, and clinics which may cater to Environmental Justice populations were noted in the vicinity of the study corridor. Aside from the Kingdom of God Tabernacle at 6710 Manslick Road, which has a larger African American congregation, other facilities are not located within the study area limits.

Using information from the Census, American Community Survey, and other local sources, the community impact assessment confirmed the existence of Environmental Justice populations, older persons, and persons with disabilities both within and near the study area corridor. The neighborhoods along the northern end of the KY 1931 corridor—in the vicinity of I-264—appeared to consistently exhibit higher populations and densities of these populations of interest.

Given the existence of the Environmental Justice populations and other groups of interest within the study area corridor at levels higher than those in the general population, project-level impact determination, mitigation measures, and public involvement activities should be tailored to be most inclusive of such persons. Information gathered from local sources regarding site-specific concentrations and facilities utilized by the populations of interest may be useful in future analysis and outreach efforts as the project progresses.

C. Aquatic & Terrestrial Resources

The corridor setting is urban; however, there are forested fragments along the eastern side of the route, particularly within Iroquois Park and north of Hazelwood Avenue that could provide limited habitat for common terrestrial species.

Early coordination with the US Fish & Wildlife Service (USFWS) and the Kentucky Department of Fish & Wildlife Resources (KDFWR) identified a list of federally endangered or threatened species that could occur in the vicinity. These species are presented in **Table 3-1**. Agency coordination letters are included as **Appendix C** to this report.

Table 3-1: Federally Listed Species in Vicinity

Group	Species	Common Name	Legal Status
Mammals	*Myotis grisescens*	gray bat	Endangered
Mammals	*Myotis sodalist*	Indiana bat	Endangered
Mussels	*Pleurobema clava*	clubshell	Endangered
Mussels	*Cyprogenia stegaria*	fanshell	Endangered
Mussels	*Potamilus capax*	fat pocketbook	Endangered
Mussels	*Plethobasus cooperianus*	orange pimpleback	Endangered
Mussels	*Obovaria retusa*	ring pink	Endangered
Mussels	*Lampsilis abrupta*	pink mucket	Endangered
Mussels	*Plethobasus cyphyus*	sheepnose	Endangered
Mussels	*Pleurobema plenum*	rough pigtoe	Endangered
Plants	*Trifolium stoloniferum*	running buffalo clover	Endangered
Birds	*Sternula antillarum athalassos**	interior least tern	Endangered
Birds	*Charadrius melodus**	piping plover	Endangered
Fish	*Alosa alabamae**	Alabama shad	Endangered

* KDFWR records indicate known occurrence within 10 miles of project area but species not included in federal records

USFWS recommends surveys of the project area for caves, rock shelters, and underground mines to identify potential bat habitats. A survey for running buffalo clover is also recommended unless there is no potentially suitable habitat within the project area or the species would not be present within the study area due to site-specific factors. The study area does not fall within known Indiana bat territory according to KDFWR records.

In addition to the species identified in **Table 3-1**, two state-listed species are known to occur within one mile of the study corridor: Kirtland's snake (Clonohis kirtlandii) and Northern hairstreak (Satyrium favonius ontario).

Figure 3-2 shows water resources within the study area. Big Run Creek passes beneath KY 1931 in two culvert structures. Portions of the study route fall within the creek's floodplain. There are also scattered wetlands and water wells along the corridor. A written erosion control plan incorporating stringent erosion control methods should be developed for any future construction activities. No US Coast Guard permits would be required.

D. Air Quality

Pursuant to the Clean Air Act, the United States Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six principal pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), inhalable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), ozone (O_3), sulfur dioxide (SO_2), and lead. The study area is located within Jefferson County.

- No hotspot analysis will be required because of the low traffic volumes along the corridor; the proposed project is not likely to negatively affect regional CO concentrations.
- All areas of Kentucky are in attainment for NO_2 and this project will not cause NO_2 to exceed the NAAQS.

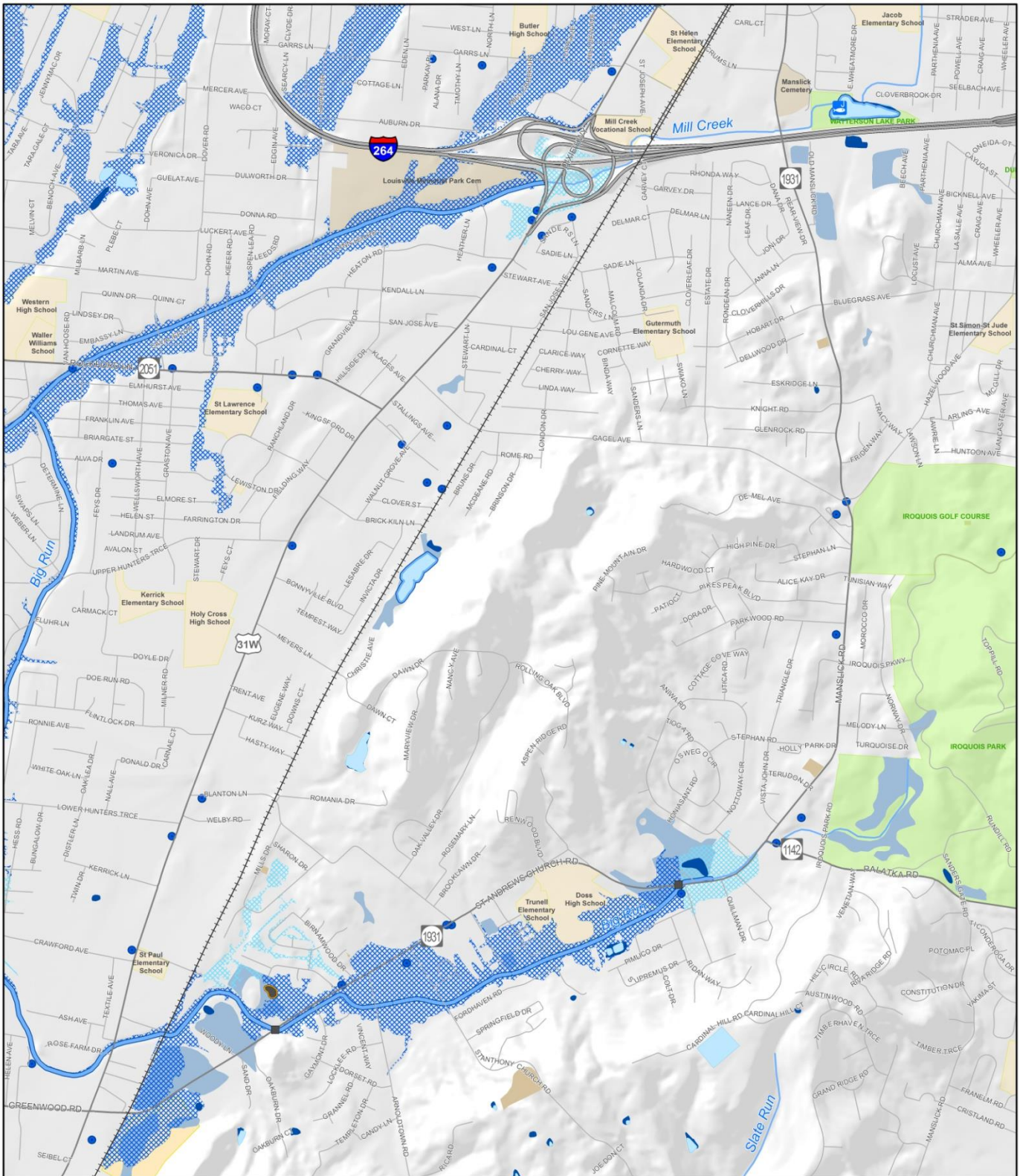

Figure 3-2:
Water Resources

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- In 2007, Jefferson County was redesignated to attainment of the 1997 8-hour O_3 standard and the maintenance plan was approved by EPA. The EPA has revised the 8-hour O_3 standard to 0.075 ppm as of March 14, 2008. This project is in an attainment area for the 2008 8-hour O_3 standard.
- SO_2 is primarily an industrial source concern and not a mobile source concern. All areas in Kentucky are in attainment for SO_2.
- It is not expected that traffic on the proposed project will cause the NAAQS for lead to be exceeded; all areas in Kentucky are in attainment for lead.
- All areas of Kentucky are in attainment of PM_{10} and the 2006 24-hour $PM_{2.5}$ NAAQS. Jefferson County is a nonattainment area for the 1997 annual $PM_{2.5}$ standard. On March 5, 2012, Kentucky Energy and Environmental Cabinet submitted a request for re-designation of the $PM_{2.5}$ nonattainment area. Kentucky's re-designation request and the maintenance plan have not been approved by EPA. EPA is currently proposing to re-designate the Indiana portion of the Louisville nonattainment area (78 FR 41735). For projects in a nonattainment area, a project level checklist must be completed to determine whether the project is exempt, not exempt, not of concern, or of concern. An interagency consultation must also be conducted.

On May 24, 2012, FHWA, FTA, and the EPA filed Amendment 6 to the 2011-2015 Transportation Improvement Program (TIP) and Amendment 6 to the 2030 Metropolitan Transportation Plan for the Louisville Area MPO to conform with the State Implementation Plan for 8-hour O_3 and $PM_{2.5}$. This version of the TIP does not include the proposed KY 1931 widening project. In March 2013, KYTC proposed to add this project to the Fiscal Year 2013-2016 Statewide TIP (Louisville Area MPO Administration Modification #27 and STIP Administrative Modification #2012.049).

The proposed project is expected to have a low potential Mobile Source Air Toxics (MSAT) effect as it serves to improve operations of highway and freight without adding substantial new capacity. In future phases of project development, a qualitative assessment of emissions projections should be conducted to compare, in narrative form, the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic, and the associated changes in MSATs for the project alternatives, based on vehicle miles traveled, vehicle mix, and speed.

E. Noise

To determine if highway noise levels are compatible with various land uses, the Federal Highway Administration (FHWA) has developed noise abatement criteria (NAC) and procedures to be used in the planning and design of highways. These abatement criteria and procedures are in accordance with Title 23 Code of Federal Regulations (CFR), Part 772, U.S. Department of Transportation, FHWA, Procedures for Noise Abatement of Highway Traffic Noise and Construction Noise. A summary of the FHWA NAC for various land uses is presented in **Table 3-2**.

Table 3-2: Noise Abatement Criteria Hourly A-Weighted Sound Level in Decibels

Activity Category	Activity Leq(h) (dBA)	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[1]	67	Exterior	Residential
C[1]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[1]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	NA	NA	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, ship yards, utilities (water resources, water treatment, electrical), and warehousing.
G	NA	NA	Undeveloped lands that are not permitted for development.

Source: 23 CFR Part 772
Note: 1 Includes undeveloped lands permitted for this activity category.

A receptor is defined as a discrete or representative location of a noise sensitive area(s), for any of the land uses listed in **Table 3-2**. Receptors are impacted if noise levels increase over the NAC as defined by FHWA and KYTC. The study area is located in a mostly residential area with a hospital, multiple religious institutions and schools. Iroquois Park is located just east of KY 1931 and has multi-use trails and a golf course. These receptors are classified as categories B or C by FHWA with a NAC of 67 dBA.

When a traffic noise impact occurs, noise abatement measures must be considered. A noise abatement measure is any positive action taken to reduce the impact of traffic noise on an activity area. For the areas where impacts are identified, methods of noise abatement will be evaluated to determine the feasibility and reasonableness of their implementation. The evaluation is based on many factors, some of which include constructability, cost, height of wall, amount of land use, and whether changes in existing land use are expected.

This project is a Type I project as designated in FHWA Regulation 23 CFR Part 772 and, in any future project development phases, a detailed noise analysis should follow the FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise and the Kentucky Transportation Cabinet Noise Analysis and Abatement Policy (July 13, 2011).

F. Hazardous Materials

GIS data from the US Environmental Protection Agency include a number of Underground Storage Tanks (USTs) and other monitored sites along the corridor. These are shown in **Figure 3-3**. Correspondence from the Kentucky Division of Waste Management indicates that all solid wastes generated by any future construction activities must be disposed of at a permitted facility.

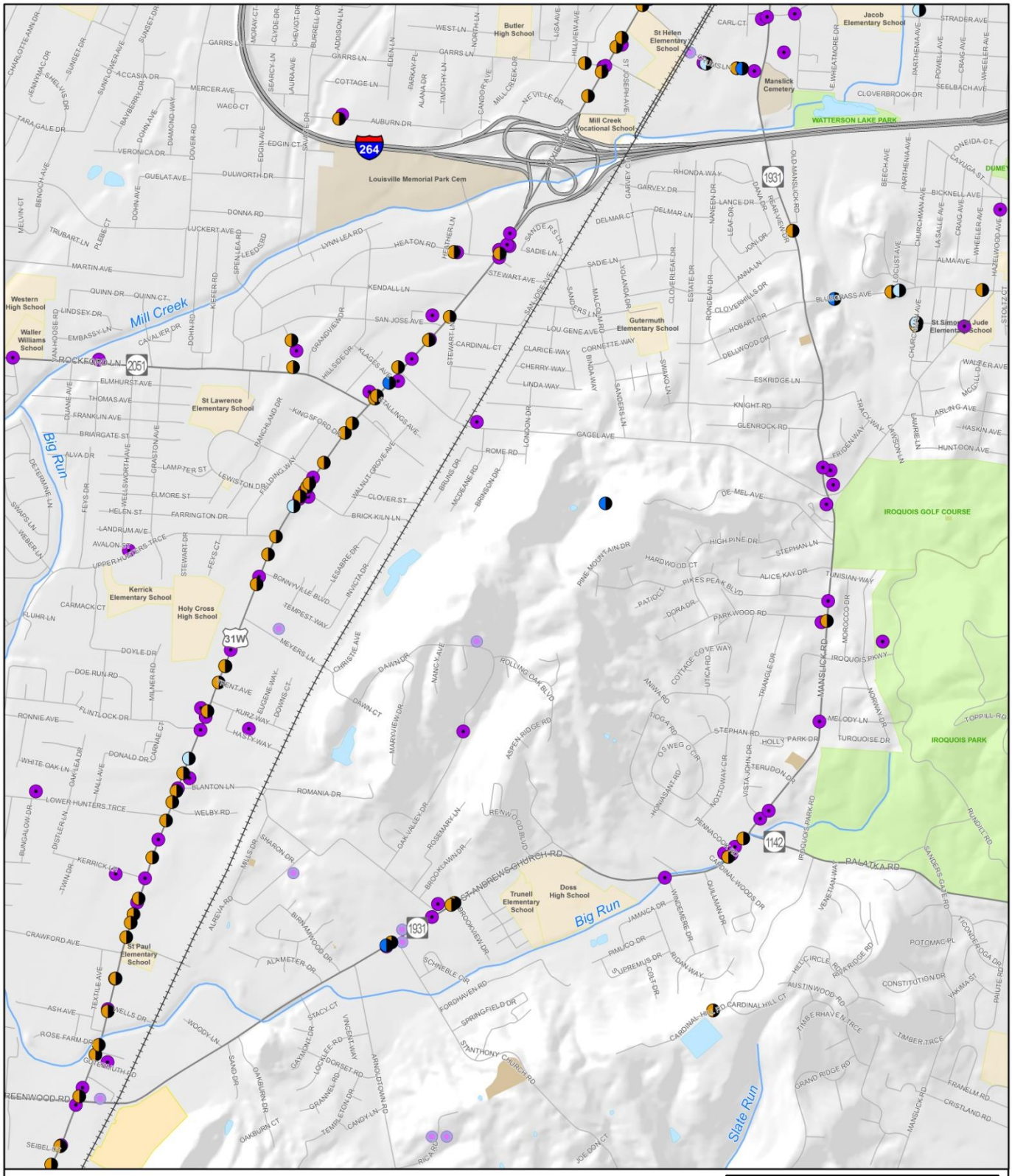

Figure 3-3:
Monitored Sites

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G. Cultural & Historic Resources

In February 2013, a records check was conducted at the Kentucky Heritage Council and at the Kentucky Office of State Archaeology. Records showed 25 aboveground resources have been surveyed surrounding the KY 1931/Palatka Road intersection but the National Register status had not been determined. Five archaeological sites have been located within 1,000 feet of the corridor but the National Register status has not been determined.

The team's architectural historian completed a field visit in June 2013 to identify any existing structures adjacent to the corridor that could meet the criteria to qualify as National Register eligible. Based on preliminary field inspections, many buildings in the vicinity are over 50 years in age but none exhibit distinguishing architectural features. A more detailed assessment of historic properties will be required should federal funds be used for the project or other federal agency involvement occur.

H. Geotechnical Overview

The study area is located in the Louisville West Geologic Quadrangle in the Outer Bluegrass Physiographic Region. Mapping indicates that the site soils are comprised of outwash, loess and eolian sand, terrace deposits, alluvium, and some artificial fill. Some of the soils in the area are considered highly erodible.

Bedrock is of the Borden Formation, which consists of shale, siltstone, and some limestone. The terrain of the study corridor is relatively flat, changing to rolling terrain approaching I-264. Mapping indicates that bedrock could be near the surface in some hillsides; borings and information from previous reports indicate that bedrock could be 50 to 80 feet deep in some locations. Drainage of the site could be problematic in some areas due to the flat topography.

Soils in the area are generally suitable for embankment construction. Suitable rock for embankment construction and rock roadbed is readily available in this area of the state. California Bearing Ratio values used in pavement design generally range from two to five for soil subgrades in the area. Chemical modification of subgrade or the use of rock roadbed is sometimes used in the area. Wet areas could require undercutting and/or rock stabilization for embankment design. Site specific geotechnical investigations are critical in this region for design. The full KYTC Geotechnical report is included as **Appendix D** to this report.

4. Purpose & Need Statement

The purpose of the proposed project is to improve safety and local traffic operations along KY 1931 between Dixie Highway and I-264.

The 4.6 mile study section of KY 1931, an urban minor arterial, is primarily comprised of two 10 to 11 foot lanes and one to two foot shoulders; north of Anna Lane, the route widens to three to four lanes. Numerous cross-streets and driveways intersect with the route, with traffic signals at nine intersections within the study portion. The route carries 11,100 to 18,200 vehicles per day. The following transportation needs have been identified along existing KY 1931:

A. Safety

From September 30, 2008 through September 30, 2012, 552 crashes were recorded by State Police along the study route. Of those, two crashes resulted in fatalities and 135 resulted in injuries.

Vehicle crashes appear more frequent than on similar type facilities. Crash analysis has identified 79 percent of the study route mileage to be "high crash segments." "High crash segments" are any section of road with a critical rate factor (CRF) over 1.0. Twelve "high crash spots" were also identified. "High crash spots" are any section of road 0.10 miles in length with a CRF over 1.0. The highest CRF spots were at the intersection with Blanton Lane (45 crashes, CRF 3.07) and just south of the intersection with Hazelwood Avenue (45 crashes, CRF 3.07).

Densely-spaced driveways and side streets present safety concerns along KY 1931.

The most common types of crashes were rear end collisions, which are common along high volume roadways that experience stop-and-go conditions. The high number of access points and limitations on stopping sight distance due to deficient vertical curves also contribute to this trend.

The study route provides access for several schools, directly and indirectly. The relatively high crash rates raise concerns about school entrances/exits and general school bus safety. Further, the city of Louisville has been designated as a "pedestrian safety focus city" by FHWA and KY 1931 has been designated as a priority bicycle corridor by the city. Safety considerations are relevant for each of these modes, beyond just motorist safety.

B. Traffic Operations

Based on the 2012 traffic volumes, the corridor experiences congestion during both the AM and PM peak hours. Level of Service is at LOS E at three of six key study intersections during one of the peak hours.

A number of issues are contributing to the capacity problem along the study route including limited passing opportunities, no bus pull offs, limited turn lanes, and poor access management. Two growth stimulants to be considered in future transportation investment are the construction of Southeast Christian Church (currently under construction) along KY 1931 near Dixie Highway and the proposed half-diamond interchange at I-264.

C. Secondary Goals & Objectives

Four secondary goals for the project were also identified, although they are not as essential as the primary project purpose described above. These include:

- Accommodate Bicyclists and Pedestrians: Mobility and safety for all modes of transportation is an important consideration, including bicycles and pedestrians. Louisville Metro has identified an improvement along the KY 1931 study corridor as priority number 11 of 21 in their 2010 Bike Master Plan.
- Improve Emergency Response Time: Any improvement that addresses safety and congestion should also positively impact emergency response time along the study route. Sts. Mary and Elizabeth Hospital, a 331-bed primary care facility, is located at the northern end of the study area (Bluegrass Avenue/Manslick Road). KY 1931 is an important link to the hospital.
- Ensure any improvement is sufficient to accommodate additional traffic from other planned improvements: Previous KYTC study efforts identified a need for an I-264/KY 1931 interchange. The projects are autonomous and would advance through project development independently. But it is important to acknowledge the link between projects and to understand how each would influence the other.
- Minimize Impacts to the Environment: Alternatives should be developed to minimize impacts to the environment, particularly sensitive resources such as parks and cemeteries adjacent to the corridor.

5. Initial Public & Stakeholder Coordination

Over the course of the study, the project team held four in-person meetings to coordinate on key issues. In addition, the project team reached out to stakeholders, local officials, the public, and resources agencies. Summaries of each meeting are presented in **Appendix E**.

The following subsections describe coordination efforts undertaken early in the planning process. The project team relied on input from these meetings to define key project issues, understand needs in the project area, and develop potential spot improvements and long-term improvements.

A. Stakeholder Meeting #1

The project team reached out to a number of local government representatives and other community groups early in the planning process. The following organizations were invited to participate as key stakeholders in the KY 1931 planning study:

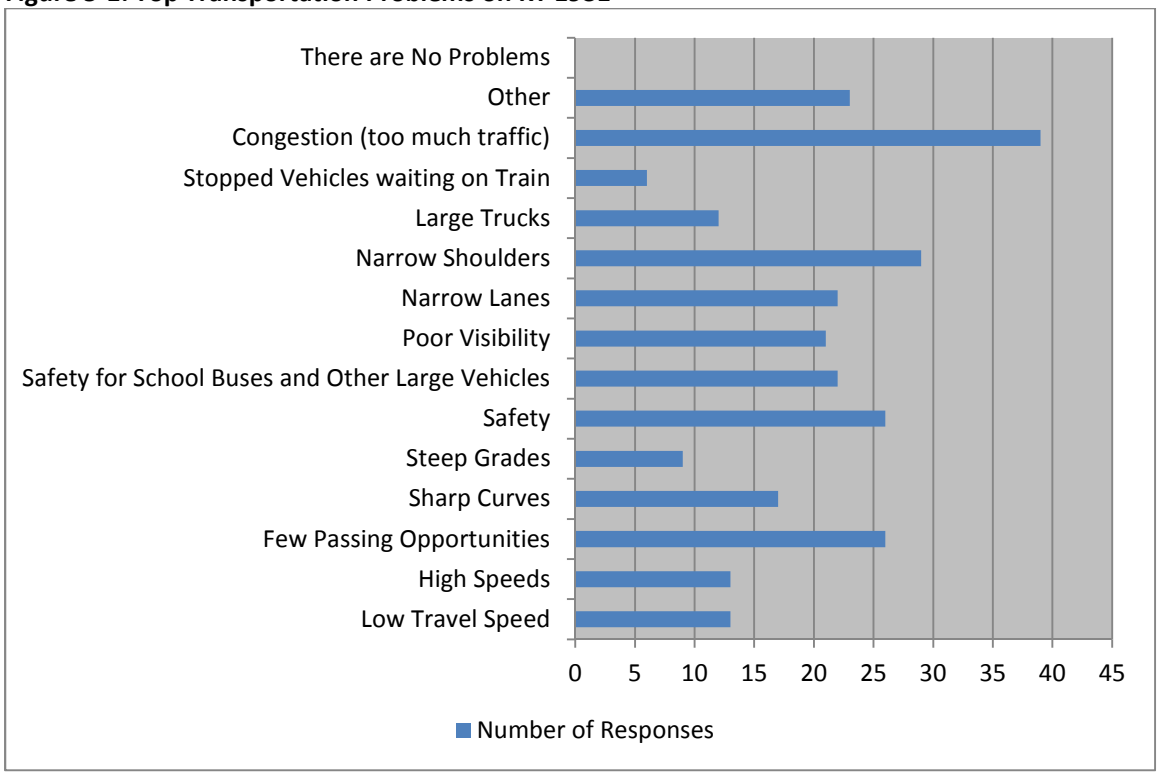
- Mayor of Louisville
- Representatives of the Louisville Metro Council
- Federal & state level Congressional representatives
- Jefferson County School District
- Transit Authority of River City (TARC)
- Louisville Metro: Parks Department, Public Works, Police, Fire
- Other county & local fire departments
- Kentuckiana Regional Planning & Development Agency (KIPDA)
- Southwest Dream Team
- Neighborhood Associations: Cloverleaf, Iroquois Heights, Cardinal Oaks Condos

The project team met with key stakeholders and local officials on February 5, 2013. In addition to the project team, representatives attended from the local fire and police departments, Louisville Metro, the Southwest Dream Team, and the Iroquois Heights subdivision. During the meeting, the project team shared existing conditions information collected to date and solicited feedback. Among other comments, attendees identified a number of spot improvements for consideration: improving the curve between Parkwood Baptist Church and Melody Lane, widening turn lanes at Pennacook Drive, adding bus pull-offs, and including the proposed I-264 interchange. Discussion also included the need for bike lanes if facilities are being provided along Greenwood Road and the expansion project at Southeast Christian Church.

B. Public Meeting #1

The project team hosted an open house style public meeting at Parkwood Baptist Church on February 5, 2013. Approximately 97 people attended the meeting. A number of exhibits were displayed around the room to present information about key roadway characteristics, existing traffic conditions, crashes, environmental features, socioeconomic demographics, and project considerations/issues. Surveys were distributed to gather input regarding the need for the project and sensitive environmental features that should be considered along the corridor. A copy of the public meeting handout and survey are included in **Appendix E**. Of the 50 surveys returned, everyone indicated that the route should be improved. In total, 84 percent of respondents indicated they travel the corridor daily. **Figure 5-1** presents a chart identifying the top transportation problems along the route. Congestion was the top issue identified.

Figure 5-1: Top Transportation Problems on KY 1931



A wide variety of improvement scenarios were suggested for consideration, including:

- Widen roadway: to 3 lanes or 4 lanes
- Do not widen the roadway – only implement spot improvements, such as improving the curve by the fire station
- Add turn lanes, a continuous two way left turn lane, and/or passing lanes

- Add traffic signals and/or optimize traffic signals with protected left turn phases
- Add a sidewalk, multi-use path, and/or bicycle lanes
- Construct the proposed interchange with I-264
- Improve access control
- Reduce the speed limit
- Improve existing drainage issues
- Add landscaping to beautify the corridor
- Restrict truck movements
- Provide improved bus service

6. Initial Alternative Development

The following sections discuss the alternative development and analysis process.

A. Alternative Options

Initially, six alternatives were considered: No Build, Spot Improvements, 2 Lane Widening, 3 Lane Widening, 4 Lane Widening, and 5 Lane Widening. Each alternative is described below.

1. No Build

The No Build Alternative assumes regular maintenance activities would be conducted but does not include widening or other construction to improve capacity. The No Build Alternative is a viable alternative and can always be recommended as the preferred alternative although it does not meet the project purpose.

2. Spot Improvements

The Spot Improvements Alternative generally includes a selection of lower cost "quick fixes" that could be implemented as short term solutions for existing safety issues. As shown in **Figure 6-1**, a number of spot improvement locations are included in this alternative. These spot improvement locations were identified where traffic or crash data suggested improvements are warranted, where previous studies identified needs, or where suggested by stakeholders or members of the public.

- Spot A: Add northbound right turn lane on KY 1931 and westbound left turn lane on Arnoldtown Road.
- Spot B: Add dual eastbound left turn lanes on Blanton Lane and dual northbound receiving lanes on KY 1931. Improve access management near the Blanton Lane intersection. This is a high crash spot with a CRF of 3.07 based on 2008-2012 reported crashes.
- Spot C: Add southbound left turn lane on KY 1931 at Cardinal Oaks Drive. This is a high crash spot with a CRF of 1.14 based on 2008-2012 crash data.
- Spot D: Add southbound left turn lane on KY 1931 at Doss High School and Trunell Elementary School.
- Spot E: Add southbound left turn lane on KY 1931 at Windemere Drive and left turn lane on Windemere Drive. This is a high crash spot with a CRF of 1.14 based on 2008-2012 crash data.
- Spot F: Add dual westbound left turn lanes on Palatka Road and dual southbound receiving lanes on KY 1931. Improve access management near the Palatka Road intersection. This is a high crash spot with a CRF of 2.07 based on 2008-2012 crash data.
- Spot G: Realign vertical curve to improve stopping sight distance near Hillcrest Cemetery and improve entrance to Hillcrest Cemetery.
- Spot H: Add center turn lane and improve sight distance on KY 1931 between Iroquois Parkway and Stephan Lane.

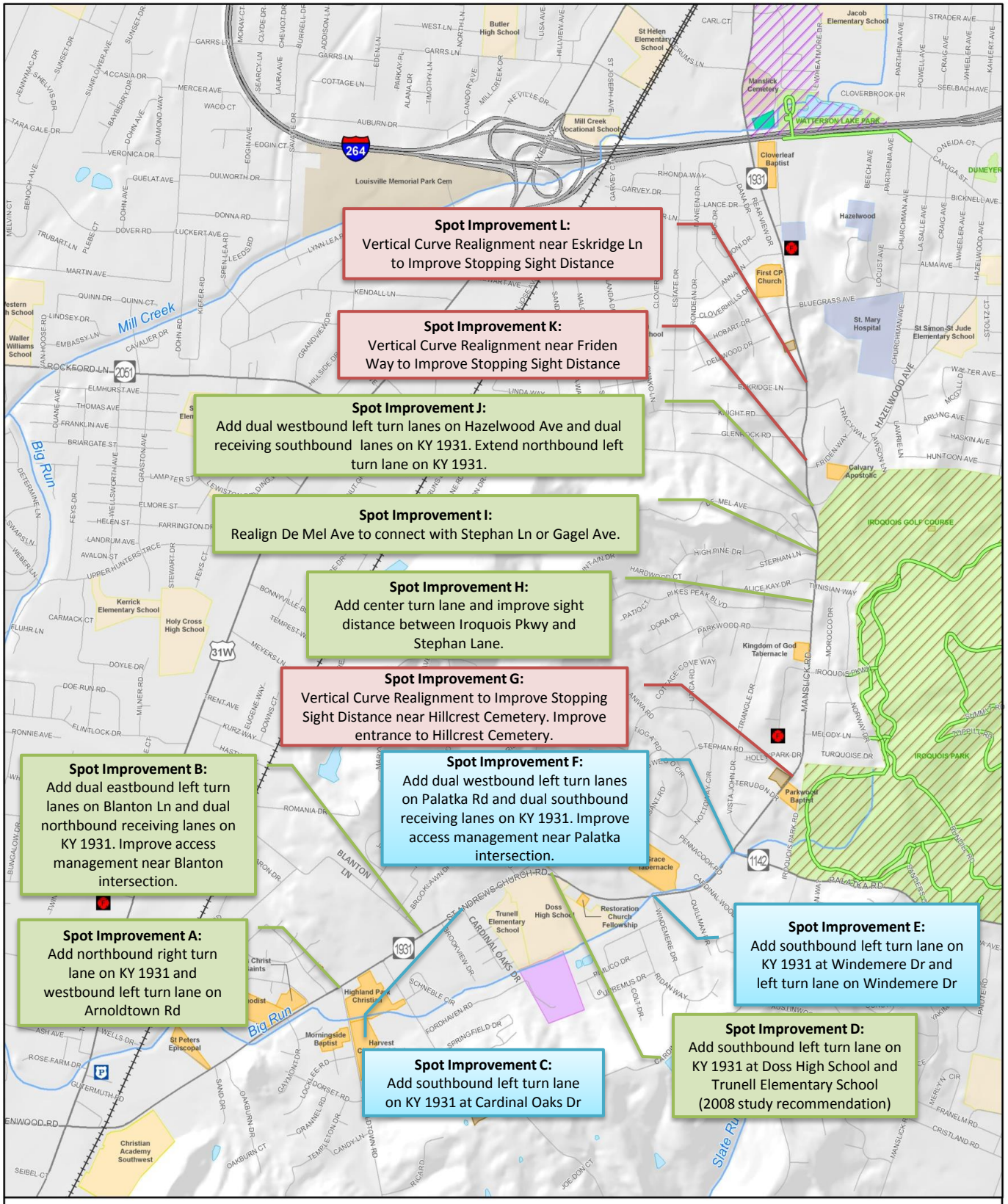


Figure 6-1:
Proposed Spot Improvements
KY 1931 Planning Study
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- Spot I: Realign De Mel Avenue to connect with Stephan Lane or Gagel Avenue. This is a high crash spot with a CRF of 3.07 based on 2008-2012 crash data.
- Spot J: Add dual westbound left turn lanes on Hazelwood Avenue and dual southbound receiving lanes on KY 1931; extend northbound left turn lane on KY 1931. This is a high crash spot with a CRF of 2.39 based on 2008-2012 crash data.
- Spot K: Realign vertical curve near Friden Way to improve stopping sight distance.
- Spot L: Realign vertical curve near Eskridge Lane to improve stopping sight distance.

3. 2 Lane Widening

The 2 Lane Widening Alternative would reconstruct KY 1931 as a two lane highway with improved roadway geometrics. The reconstructed roadway would provide 11 to 12 foot wide travel lanes with curb and gutter. Bicycle lanes and pedestrian facilities would also be provided as part of this alternative.

4. 3 Lane Widening

The 3 Lane Widening Alternative would reconstruct KY 1931 as a three lane highway with improved roadway geometrics. The reconstructed roadway would provide two 11 to 12 foot wide travel lanes with a two way left turn lane in the center and curb and gutter. Widening could occur to the east, west, or centered about the existing alignment. Bicycle lanes and pedestrian facilities would also be provided as part of this alternative.

5. 4 Lane Widening

The 4 Lane Widening Alternative would reconstruct KY 1931 as a four lane highway with improved roadway geometrics. The reconstructed roadway would provide two 11 to 12 foot wide travel lanes per direction with curb and gutter. Widening could occur to the east, west, or centered about the existing alignment. Bicycle lanes and pedestrian facilities would also be provided as part of this alternative.

6. 5 Lane Widening

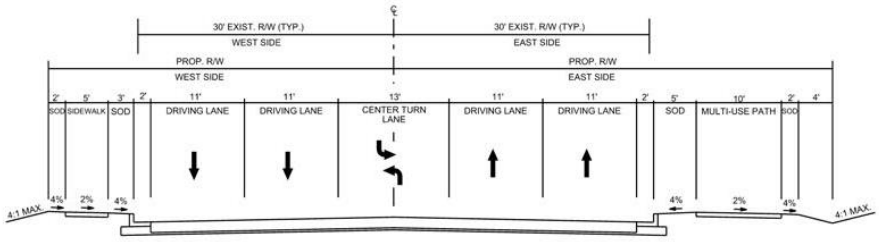
The 5 Lane Widening Alternative would reconstruct KY 1931 as a five lane highway with improved roadway geometrics. The reconstructed roadway would provide two 11 to 12 foot wide travel lanes per direction with a two way left turn lane in the center and curb and gutter. Widening could occur to the east, west, or centered about the existing alignment. Bicycle lanes and pedestrian facilities would also be provided as part of this alternative.

Potential cross-sections for each of the four widening alternatives are shown in **Figure 6-2**. The actual cross-section will be determined in future phases of the project.

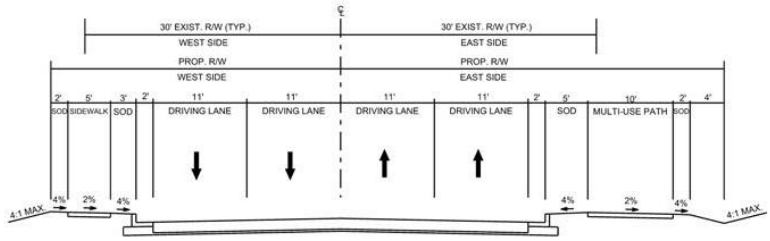
B. Project Team Meeting #2

The project team met on February 25, 2013, following the initial public and stakeholder meetings. The purpose of the meeting was to consider input from these groups in order to finalize the project purpose and to discuss the development of potential alternatives. Copies of the meeting summaries from each project team meeting are included in **Appendix F**.

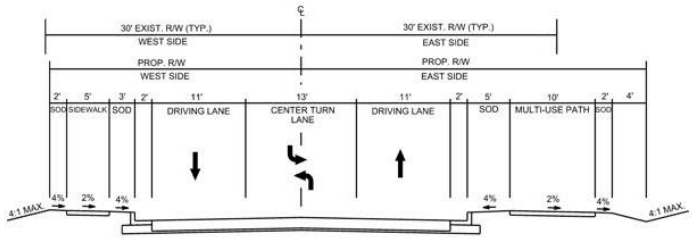
Figure 6-2:
Typical Sections for Initial Alternative Development



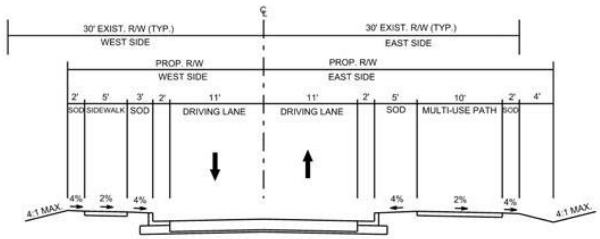
FIVE LANE TYPICAL SECTION
KY 1931 FROM DIXIE HWY TO I-264



FOUR LANE TYPICAL SECTION
KY 1931 FROM DIXIE HWY TO I-264



THREE LANE TYPICAL SECTION
KY 1931 FROM DIXIE HWY TO I-264



TWO LANE TYPICAL SECTION
KY 1931 FROM DIXIE HWY TO I-264

The 4 Lane Widening Alternative was eliminated from further consideration during Project Team Meeting #2 because it does not satisfy the project purpose. The high density of cross-streets, driveways, and other access points along the corridor correlate to high numbers of vehicles turning between signalized intersections. This contributes significantly to observed crashes, expressed as rear end collisions (54 percent of reported crashes) and angle/opposing left turn collisions (22 percent of reported crashes). Without a provision for the high volume of mid-block turning traffic (e.g. a dedicated continuous two way left turn lane), the project will not substantially improve safety or improve traffic flow.

C. Future Build Traffic Scenarios

KIPDA provided year 2035 traffic projections from their travel demand model for four build scenarios: 3 Lane Widening with an I-264 Half Interchange, 3 Lane Widening without a Half Interchange, 5 Lane Widening with a Half Interchange, and 5 Lane Widening without a Half Interchange. Since the traffic volumes for scenarios with versus without interchanges were very similar (i.e. within 12 percent for all segments) and as discussed in **Section 2.F**, the existing traffic volumes are representative of the future No Build forecast volumes, future forecasts were prepared for two scenarios: 3 Lane Widening with a Half Interchange and 5 Lane Widening with a Half Interchange. These forecasts were then compared to the 2012 existing traffic volumes. The complete model results are presented in **Appendix G** for all five scenarios.

Table 6-1 presents the forecast average daily traffic volumes for each segment along the study corridor under each scenario. Overall, widening to three lanes with an interchange is projected to increase traffic volumes an average of 17 percent compared to 2012 daily traffic volumes. Widening to five lanes with an interchange is projected to increase traffic volumes an average of 129 percent compared to 2012 daily traffic volumes.

Table 6-1: Forecast Average Daily Traffic Volumes

Segment	Existing/No Build	3 Lane/Intrchg	5 Lane/Intrchg
1a: Dixie Hwy to Arnoldtown	15,400	17,900	32,400
1b: Arnoldtown to Blanton	17,700	20,000	39,600
2: Blanton to Palatka	18,200	18,700	37,500
3: Palatka to Hazelwood	17,700	24,100	46,700
4: Hazelwood to Bluegrass	11,100	13,300	29,700
5: Bluegrass to I-264 Interchange	15,300	17,000	31,400

Based on the 2012 existing traffic volumes and V/C analysis, as discussed in **Section 2.F**, the existing two-lane facility is approaching capacity but has not yet reached the design capacity for a two-lane road. That said, congestion does occur at the signalized intersections, where the Level of Service is at LOS E at three of six key study intersections during at least one of the peak periods. This shows that additional capacity is warranted at the intersections (i.e. additional turn lanes and additional receiving lanes), but additional capacity is not necessarily needed along the entire corridor.

If capacity were added along the entire corridor (i.e. the 3 lane and 5 lane widening scenarios) the projected traffic volumes increase by as much as 129 percent compared to 2012 daily traffic volumes. Contributing to this significant increase in traffic are motorists using the newly widened road as a cut-through route to other destinations. This is indicative of a roadway "system" that is above capacity. As the V/C analysis shows in **Table 6-2**, even if KY 1931 were widened to 5 lanes, it will exceed capacity

because it will attract users from the surrounding roadways that are also at or above capacity. As stated in the **Section 4**, the purpose of this project is to improve local traffic operations, not solve regional traffic problems by diverting traffic from the surrounding major arterials onto a newly widened five lane KY 1931, which is minor arterial with many homes and driveways along the existing road.

Table 6-2: 2035 Peak Direction Volume-to-Capacity for Corridor Segments by Alternative

KY 1931 Segment	Existing	3 Lane/Intrchg	5 Lane/Intrchg
US 31W to Arnoldtown	0.77	0.89	0.81
Arnoldtown to Blanton	0.88	1.00	0.99
Blanton to Palatka	0.91	0.93	0.94
Palatka to Hazelwood	0.96	1.31	1.27
Hazelwood to Bluegrass	0.60	0.72	0.81
Bluegrass to Anna	0.83	0.93	0.86

D. Comparison of Costs & Impacts

Based on the conceptual alignments, shown in **Appendix H**, the 5 Lane Widening Alternative will result in the highest potential relocation impacts. Within the study limits (US 31W to I-264), 25 homes or businesses stand within 20 feet of the proposed curb location. If a sidewalk or shared use path is included with the alternative, 72 homes or businesses stand within 20 feet of the project footprint for the 5 Lane Widening Alternative. This is not an indication of the number of homes or businesses that would be relocated; it is a measure of the potential impacts. The 20 foot buffer also provides room for potential utility relocations. In reality, homes or business outside the 20 foot buffer may need to be relocated and others inside the buffer may not need to be relocated. Additionally as the project progresses through the design phase, avoidance measures may be taken to minimize impacts further. **Table 6-3** compares these potential impacts for the 2, 3, and 5 Lane Widening Alternatives.

Table 6-3: Potential Relocations Based on Conceptual Alignments

Alternative	Homes or Businesses within 20 ft of curb	Homes or Businesses within 20 ft of sidewalk or shared use path
2 Lane Widening	1	12
3 Lane Widening	4	22
5 Lane Widening	25	72

Other potential impacts of widening the road are listed below. Impacts are greater when the road is widened further and further.

- Traffic Operations – Maintaining proper access to the many residential driveways along the road could be an issue where larger cut and fill sections are required.

- Utilities – Most of the corridor has underground waterlines and gas lines as well as above ground power, cable, and telephone lines that lie just off the existing road. Avoiding and/or relocating these utilities will be a major factor during the design process and in future phases of project development.

Utilities are present just off KY 1931 for the majority of the corridor.

- Bridges and Culverts - Big Run Creek passes beneath KY 1931 in two culvert structures at KY 1931 mile points 3.76 and 5.20. Both culverts will likely need to be widened or replaced as part of this project.
- Cemeteries and Churches – Two cemeteries and twelve churches abut KY 1931. Minimizing impacts to these facilities should be a focus during the design process and in future phases of project development.
- Floodplain Encroachment and Wells - There are scattered wetlands and water wells along the corridor. Any effected wetlands should be delineated; impacts may require permits from the US Army Corps of Engineers and/or the Kentucky Division of Water.
- Hazardous Materials/Underground Storage Tank Sites – GIS data from the US Environmental Protection Agency include a number of Underground Storage Tanks (USTs) and other monitored sites along the corridor. Solid wastes generated by any future construction activities must be disposed of at a permitted facility.

Table 6-4 compares planning level cost estimates for the 2, 3, and 5 Lane Widening Alternative. The Total Cost estimates shown below include Design, Right-of-Way, Utilities, and Construction costs. It should be noted the cost estimate for the preferred alternative was updated based on a more detailed analysis and, therefore, differs from the cost estimate presented in **Table 8-1**.

Table 6-4: Planning Level Cost Estimates

Alternative	Design Cost (Millions)	Right-of-Way Cost (Millions)	Utilities Cost (Millions)	Construction Cost (Millions)	Total Cost (Millions)
2 Lane Widening	$1.7	$2.3	$2.8	$16.7	$23.5
3 Lane Widening	$2.6	$4.5	$4.6	$25.8	$37.5
5 Lane Widening	$4.6	$16.0	$6.8	$45.5	$72.9

E. Project Team Meeting #3

The project team met again on May 10, 2013 to review the proposed alternatives prior to presenting them to the public. A summary of the meeting is included in **Appendix F**. The team also expressed concern about the 5 Lane Widening Alternative – that a five lane cross-section would divert traffic from Dixie Highway and Taylor Boulevard, which would actually deteriorate operations for local traffic using KY 1931 today. Because it results in the highest costs and most negative impacts on the human and natural environment, the 5 Lane Widening Alternative was not recommended for further consideration. It was agreed that the 5 Lane Alternative would be discussed conceptually but no graphics would be presented during the Summer 2013 agency, stakeholder, and public outreach activities.

7. Final Agency, Stakeholder, & Public Coordination

Following the development of alternatives, the project team contacted resource agencies and again met with stakeholders and interested members of the public. At these coordination points, alternatives were presented; each group was asked to provide feedback regarding their concerns and/or preferences.

A. Agency Coordination

The project team sent letters to 70 federal, state, and local resource agencies/organizations and 13 elected officials on June 28, 2013. The letter, included as part of **Appendix C**, requested agency comments on the proposed improvement alternatives, the Purpose and Need statement, significant issues or concerns in the study area, conservation or development plans, sensitive environmental resources, and mitigation strategies.

Fourteen written responses were received, which have been included in **Appendix C**. Specific comments have been incorporated throughout this report.

B. Stakeholder Meeting #2

A stakeholder's meeting was conducted on Tuesday, July 23, 2013 at the Mosaic United Methodist Church in Louisville. During the meeting, some stakeholders expressed concern that the three lane cross-section would not be adequate to handle future traffic, particularly if an interchange at I-264 were constructed. The Project Team noted the traffic analysis shows the proposed interchange does not add a significant amount of traffic. The factor that drives up traffic projections is the number of lanes added. Both the 3 Lane and 5 Lane widening option would be at or above capacity so building the interchange alone does not have a large effect on traffic operations. Even though the 3 Lane widening option would be at capacity, it can support a new interchange.

While some stakeholders questioned the ability of the 3 Lane Widening Alternative to handle traffic, most agreed that the five lane cross-section should be dismissed because of the large amount of impacts it would have on local homes and businesses.

Attendees also discussed how the project would affect bicyclists, pedestrians, and transit riders. A copy of the meeting summary is included in **Appendix E**.

C. Public Meeting #2

A second open house style public meeting was conducted on July 23, 2013 at the Mosaic United Methodist Church in Louisville. A summary is included in **Appendix E**. Approximately 150 people attended the meeting. The purpose of the meeting was to present project findings to date, solicit public

Approximately 150 people attended the second public meeting.

input, and give the public an opportunity to ask questions of the project team. A number of exhibits were displayed around the room to present information about key roadway characteristics, existing traffic conditions, crashes, proposed spot improvements, and alternatives. Surveys were distributed to gather input regarding alternative preferences; 55 completed surveys were returned. A copy of the handout and survey are provided in **Appendix E**.

When asked whether KY 1931 should be improved, 96 percent of respondents indicated that it should. A variety of reasons were cited, including improving safety and traffic flow. As shown in **Figure 7-1**, the 3 Lane Widening Alternative was the option most preferred by the public: 69 percent of respondents preferred this alternative. As shown in **Figure 7-2**, 94 % of respondents indicated that improvements to Segments 1, 2, and 3 were higher priority segments than Segment 4 or 5. The segments are illustrated in **Section 8** on **Figure 8-10**.

Figure 7-1: Which Long Term Improvement do you Prefer?

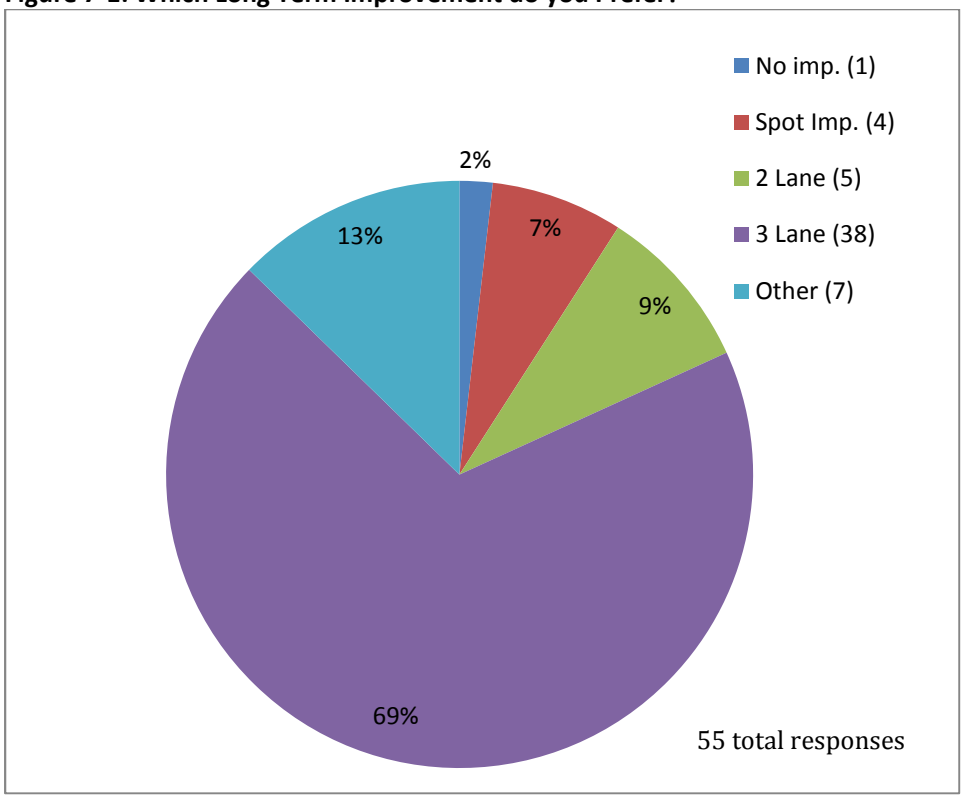
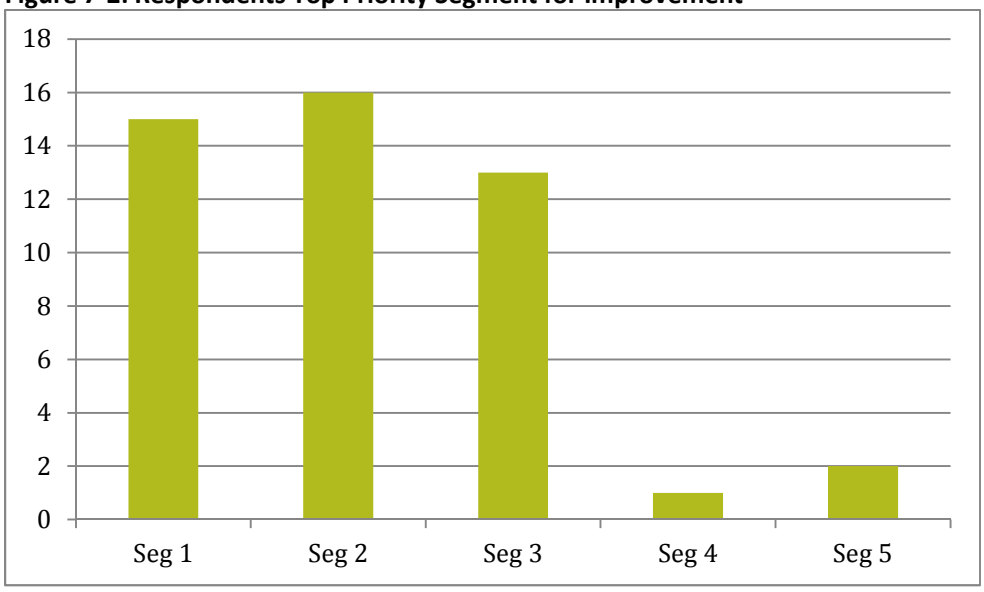
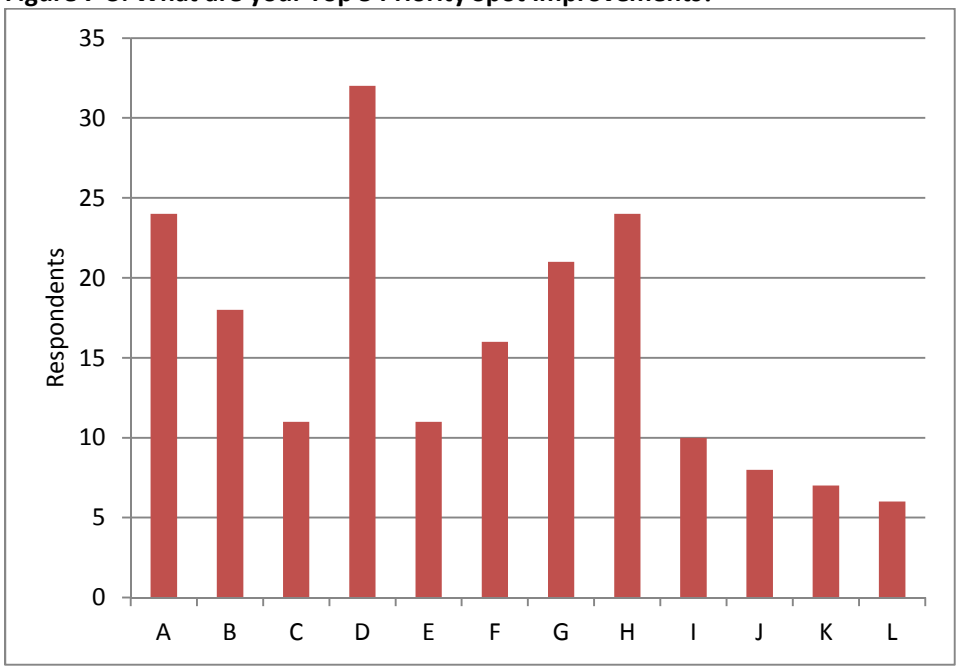


Figure 7-2: Respondents Top Priority Segment for Improvement



Respondents were asked to identify their top 5 priority spot improvements. As shown in **Figure 7-3**, Spots A, B, D, G, and H were the locations suggested most often. A description of each spot improvement is presented in **Section 6.A.2** and illustrated in **Figure 6-1**.

Figure 7-3: What are your Top 5 Priority Spot Improvements?



Other spot improvements suggested included:

- Add sidewalks and/or bike lanes
- Add turn lanes
- Realign Arnoldtown Road to line up with Birnamwood Drive

- Signalize additional intersections: Pikes Peak Boulevard, De Mel Avenue/Stephan Lane, and/or Parkwood Road
- Do not signalize any additional intersections
- Modify Spot I to exclude realignment of De Mel Avenue
- Improve drainage
- Lower the speed limit to 25-35 mph
- Straighten Segment 2 to follow the MSD storm drain easement
- Add a retaining wall in front of the cemetery
- Incorporate landscaping

The majority of respondents (75 percent) indicated the corridor should incorporate bicycle/pedestrian facilities. Responses were evenly divided whether sidewalks with on-street bike lanes or a multi-use path would be more appropriate. Segments 1 and 2 were identified as the highest priorities for incorporating bicycle/pedestrian facilities.

8. Conclusions & Recommendations

This section provides short-term and long-term recommendations for improvements to KY 1931 (locally St. Andrews Church Road/Manslick Road) from US 31W (Dixie Highway) to I-264 (Watterson Expressway).

A. Final Project Team Meeting

The project team met for the final time on August 19, 2013 at the KYTC District 5 Office in Louisville, Kentucky. The purpose of the meeting was to discuss the input from the resource agencies, the second local officials and stakeholder meeting, and the second public meeting, and to determine the spot improvement and long term improvement recommendations. Detailed discussion of Agency Coordination, Stakeholder Meeting #2, and Public Meeting #2 can be found in **Section 7**. A summary of the final project team meeting is included in **Appendix F**.

The following summary outlines the key discussions from the final project team meeting:

- The 3 Lane Widening Alternative is the recommended long-term improvement option. Bicycle and pedestrian facilities are recommended with the multi-use path being preferred. There may be limited areas where the 3-lane section may need to be reduced to 2 lanes based on right-of-way constraints.
- Question: If the interchange is built, would the existing two lane road function at an acceptable level? Answer: If no changes were made, the system would probably fail. A 3 Lane section would perform better. The Interchange Justification Study would need to check these scenarios with a more detailed traffic forecast.
- The spot improvements were identified where traffic or crash data suggested improvements are warranted and where previous studies identified needs. Recommended improvements were prioritized. The additional spot improvements recommended by the public will be considered in the long-term improvement option. Where additional turn lanes and signals are recommended, traffic counts and turn lane/signal warrants can be conducted as funding becomes available.

B. Recommended Long-Term Improvement Option

In light of the input received and the screening process detailed in this report, the 3 Lane Widening Alternative is recommended to advance for additional development. North of Bluegrass Avenue, the existing roadway configuration should be utilized as is, with the improvements consisting of repaving and installing curb and gutter where appropriate. The proposed alternative and typical section is shown in **Figure 8-1** through **Figure 8-9**. The proposed layout is a planning level drawing; additional traffic analysis and design will be needed to determine the actual dimensions. In future project development phases, designers should look at alignment and cross-section options that best fit within this corridor. In particular, vertical curve deficiencies should be checked where as-built plans are not available.

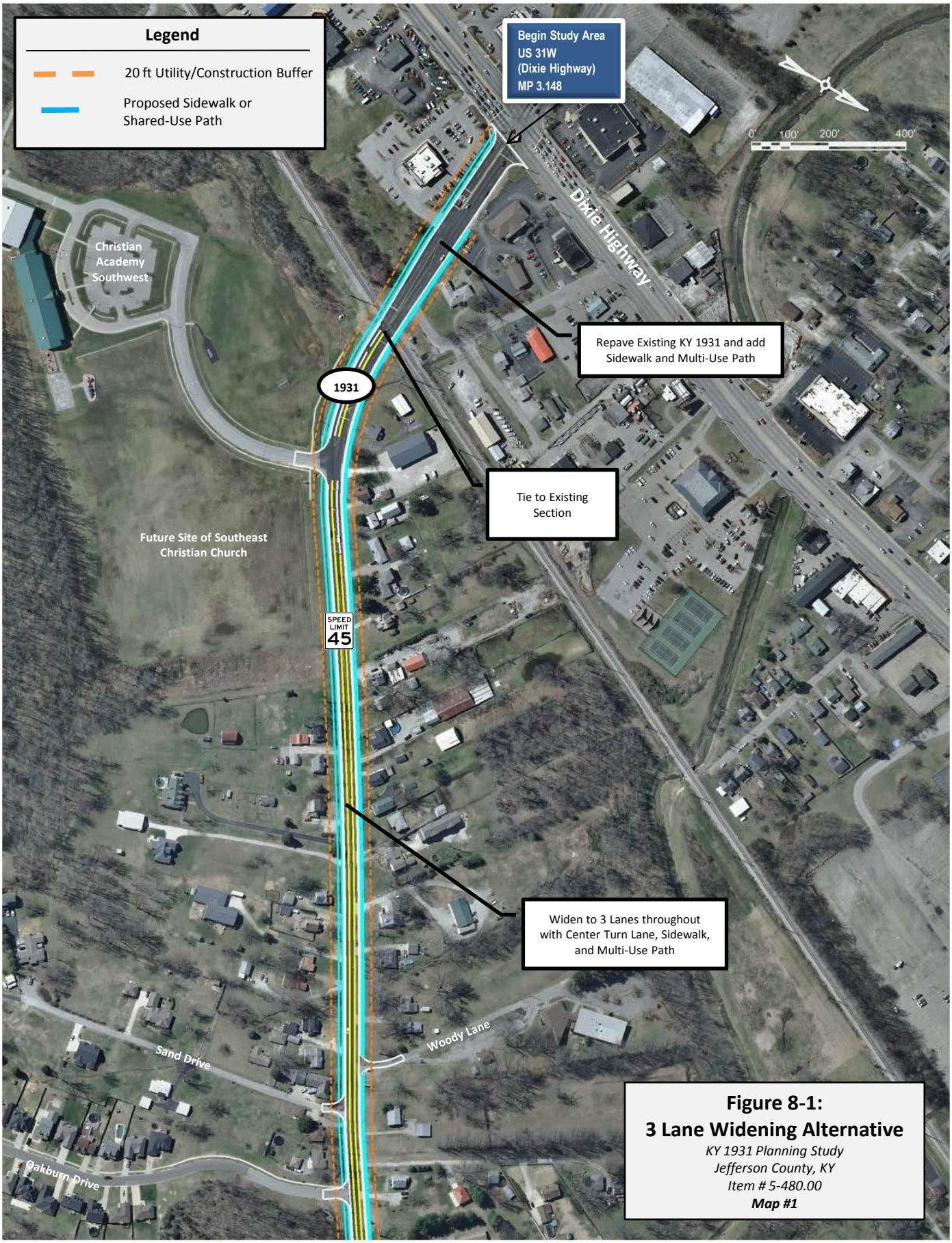


Figure 8-1:
3 Lane Widening Alternative
KY 1931 Planning Study
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Map #1

Figure 8-2:
3 Lane Widening Alternative
KY 1931 Planning Study
Jefferson County, KY
Item # 5-480.00
Map #2

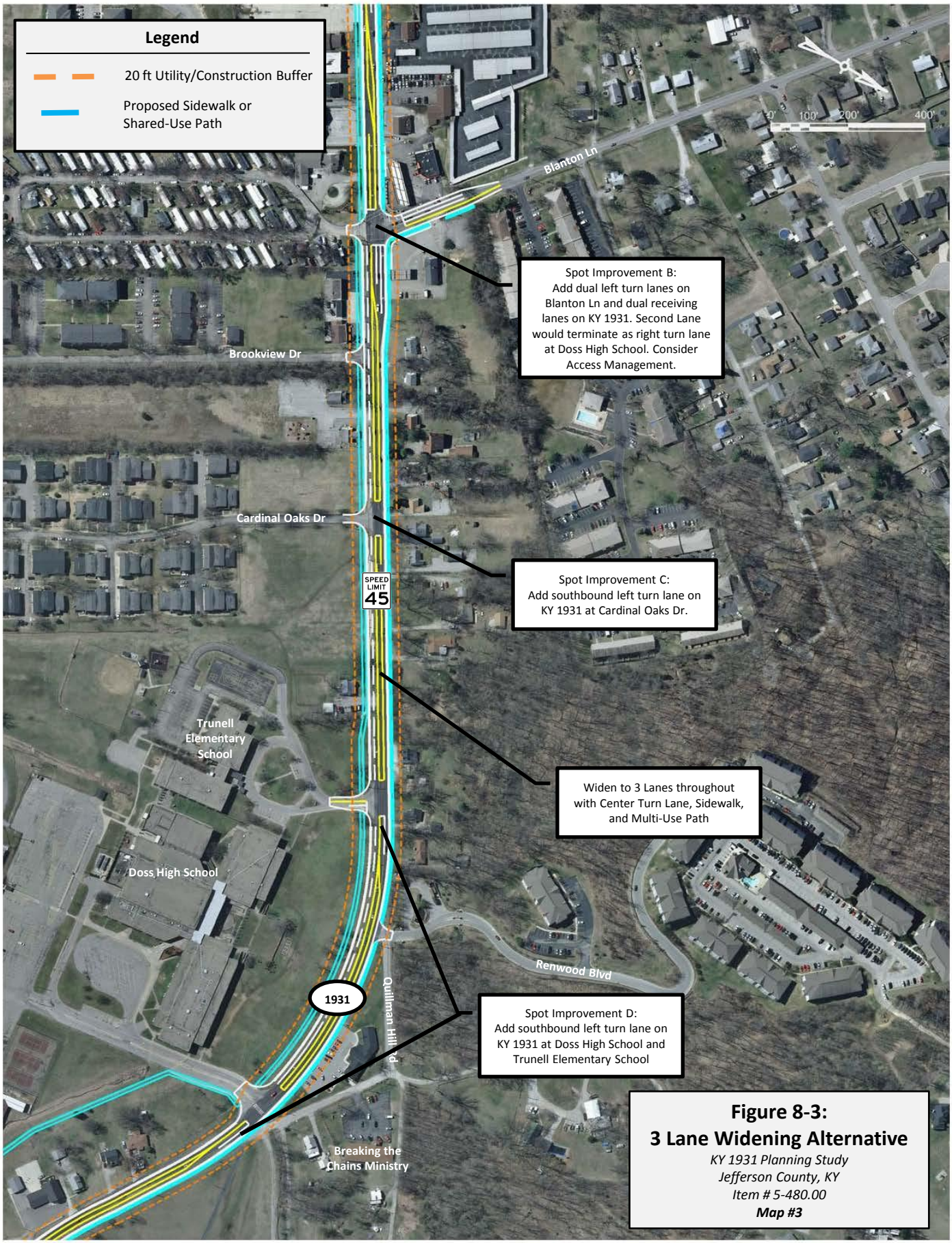

Figure 8-3:
3 Lane Widening Alternative
KY 1931 Planning Study
Jefferson County, KY
Item # 5-480.00
Map #3

Figure 8-4:
3 Lane Widening Alternative
KY 1931 Planning Study
Jefferson County, KY
Item # 5-480.00
Map #4

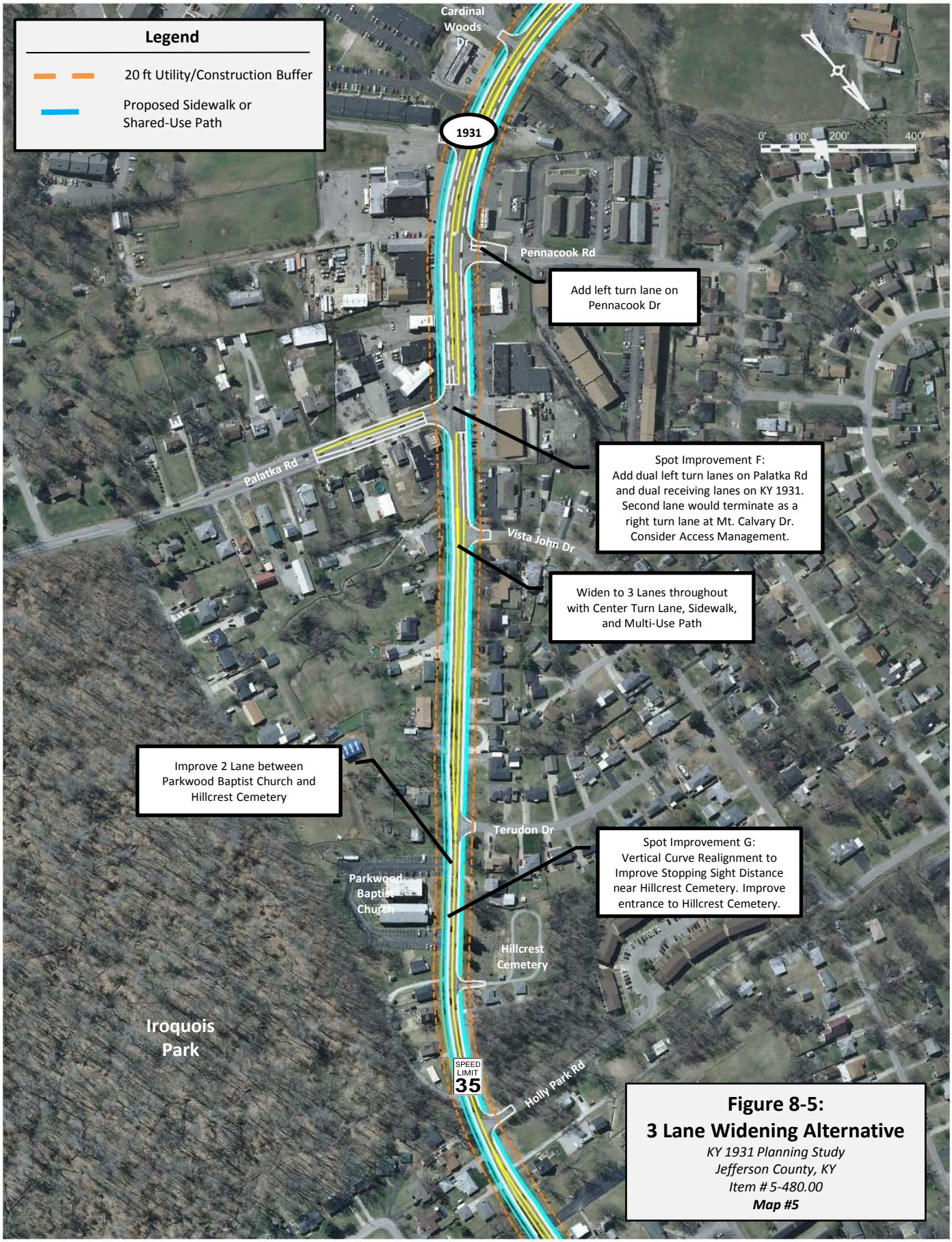

Figure 8-5:
3 Lane Widening Alternative

KY 1931 Planning Study
Jefferson County, KY
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Map #5

Figure 8-6:
3 Lane Widening Alternative
KY 1931 Planning Study
Jefferson County, KY
Item # 5-480.00
Map #6

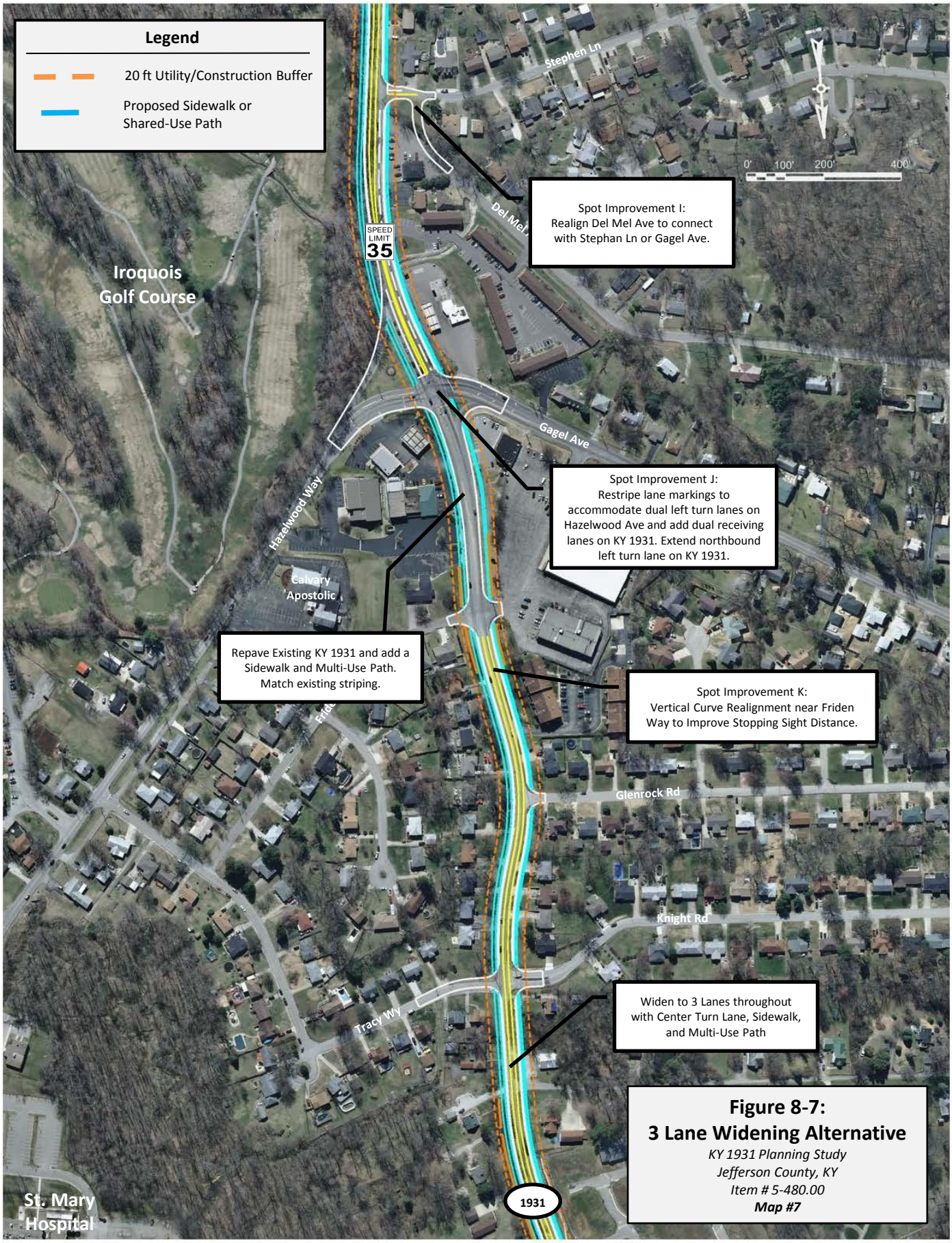

Figure 8-7:
3 Lane Widening Alternative

KY 1931 Planning Study
Jefferson County, KY
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Map #7

Figure 8-8:
3 Lane Widening Alternative
KY 1931 Planning Study
Jefferson County, KY
Item # 5-480.00
Map #8

Figure 8-9:
3 Lane Widening Alternative
KY 1931 Planning Study
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Map #9

Other improvements along KY 1931 were identified by the local officials, stakeholders, and members of the public. These improvements should be considered in future project development phases of the long-term improvement option.

- Realign Arnoldtown Road to line up with Birnamwood Drive.
- Realign Mt. Calvary Drive to line up with Windemere Drive.
- Add bus pull-offs and bus shelters.
- Provide a better entrance at Hill Crest Cemetery.
- Improve Street Lighting.
- Improve drainage by Doss High School and between Pikes Peak Blvd and Alice Kay Drive.
- Signalize additional intersections: Pikes Peak Boulevard, De Mel Avenue/Stephan Lane, and/or Parkwood Road.
- Provide right turn lanes on KY 1931at Renwood Blvd and Hill Crest Cemetery.
- Widen and lengthen the turn lanes on Pennacook Drive.

The 3 Lane Widening Alternative is recommended as the preferred alternative for the following reasons:

- Satisfies the project purpose:
  - Improves safety by adding a center turn lane and fixing geometric deficiencies.
  - Improves local traffic operations by adding a center turn lane and additional turn lanes at congested intersections.

- Satisfies secondary project goals:
  - Accommodates bicyclists and pedestrians with a 5 foot sidewalk and 10 foot multi-use path.
  - Improves emergency response time. Emergency vehicles can use the center turn lane to get by traffic.
  - Appears sufficient to accommodate traffic for the I-264/KY 1931 interchange.
  - Best minimizes impacts to the human and natural environment of the widening alternatives considered. The center turn lane can be removed where impacts become too great (i.e. between Hillcrest Cemetery and Parkwood Baptist Church, pictured above).
- Best minimizes the cost of the widening alternatives considered.

- Reduces travel times by adding capacity.
- Improves drainage by adding curb and gutter.

In addition, the 3 Lane Widening Alternative best satisfies resource agency, local official, and public concerns.

The project is approximately 4.6 miles long and the total estimated cost is $48.9 million. **Table 8-1** shows the planning level cost estimates for Design, Right-of-Way, Utilities, and Construction. This cost estimate has been updated from the initial cost estimates shown in **Table 6-4** to reflect the additional design details developed in the recommended layout (i.e. side street improvements, additional turn lanes, and additional receiving lanes).

Table 8-1: 3 Lane Widening Alternative Planning Level Cost Estimates

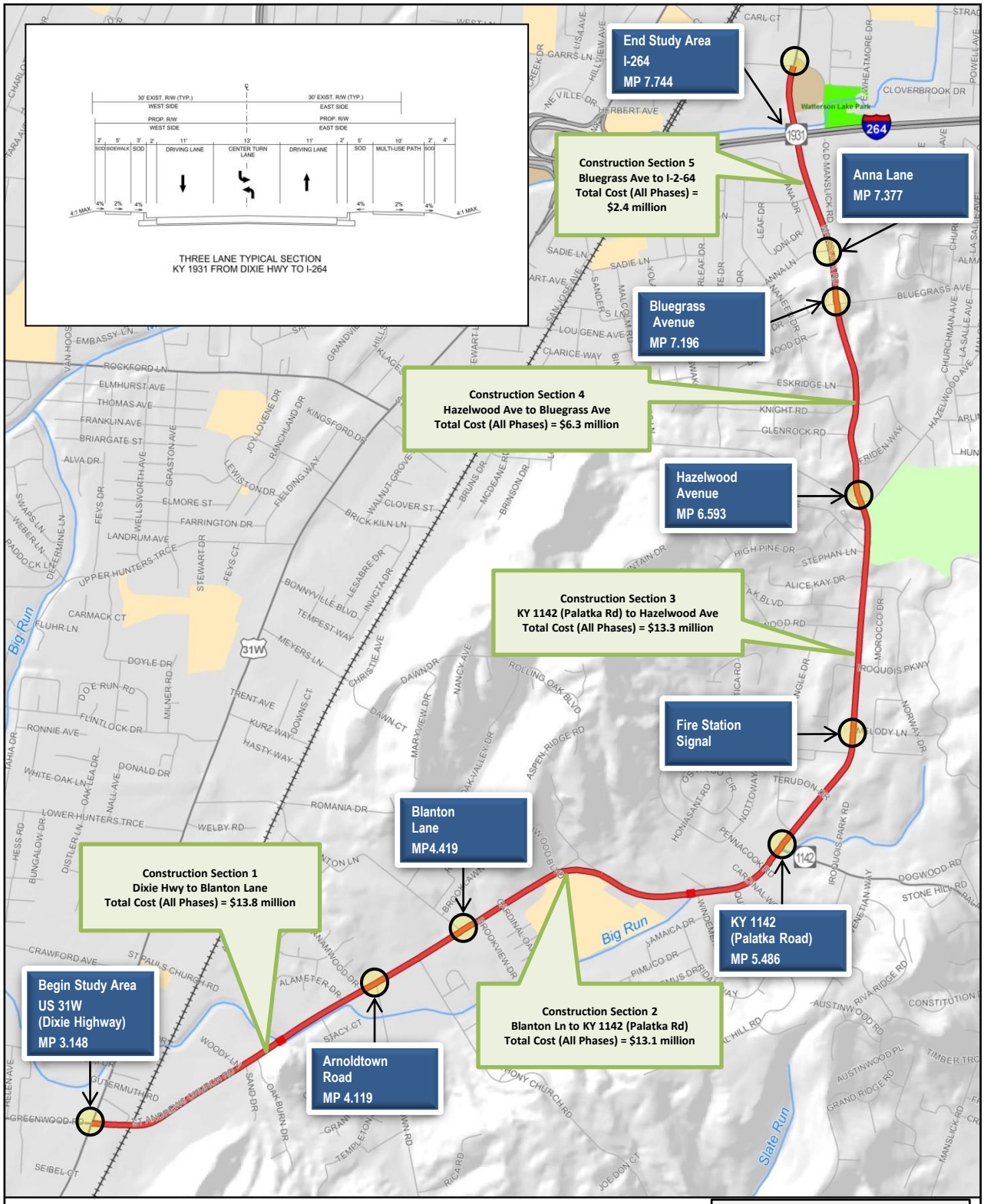
Project Phase	Cost (Millions)
Design	$4.3
Right-of-Way	$10.2
Utilities	$8.6
Construction	$25.8
Total	$48.9

Construction sections were developed for the recommended alternative in case funding is not available for the entire project. The construction sections begin and end at major intersections, creating five recommended construction sections. The project team agreed that constructing KY 1931 starting at Dixie Highway and moving north toward I-264 is recommended to address the highest priority sections first. These priorities are subject to change based on evolving needs and local/regional priorities such as construction of the proposed I-264/KY 1931 interchange. The proposed construction sections for the KY 1931 corridor are shown in **Figure 8-10**.

C. Spot Improvements

To provide low-cost, short-term improvements while funding is secured for the entire 3 Lane Widening Alternative, spot improvement recommendations were developed. These spot improvement locations were identified where traffic or crash data suggested improvements are warranted, where previous studies identified needs, or were suggested by stakeholders or members of the public. **Figure 8-11** through **Figure 8-22** identifies each Spot Improvement Project Sheet including the priority, planning level layout, and planning level cost estimate information. The Spot Improvements were developed to complement the recommended long-term improvement.

Because the proposed layouts are planning level drawings, additional traffic analysis and design will be needed to determine the actual dimensions. In particular, the vertical curve deficiencies that are noted should be checked because as-built plans were not available at these locations. These deficiencies are based on field observations, as discussed in detail in **Section 2.A**.



N

Signalized Intersections

0 2,000 4,000 Feet

0 0.5 1 Miles

Figure 8-10:
3 Lane Widening Alternative Construction Sections
KY 1931 Planning Study
Jefferson County, KY
Item # 5-480.00

Figure 8-11:
Spot Improvement Project Sheets
KY 1931 Planning Study
Jefferson County, KY
Item # 5-480.00

High Priority: Add turn lanes at KY 1931/Arnoldtown Road (Spot A)

Description:

The existing two lane segment near Arnoldtown Road has 10-foot wide travel lanes with 6-foot wide combination shoulders. The speed limit is 45 mph. The intersection is signalized. Based on 2008-2012 crash data, the KY 1931/Arnoldtown Rd intersection exhibits more frequent crashes than can be attributed to random occurrences with a CRF of 1.73. Widening KY 1931 and adding a turn lane on Arnoldtown Road was recommended in the 2008 *3rd Street Road / St. Andrews Church Road Area* study as a high priority.

Recommendation:

Turn lanes are recommended for this location: a westbound left turn lane along Arnoldtown Road and a northbound right turn lane along KY 1931.

Purpose:

Improve traffic operations & safety.

Location	KY 1931 Milepoint 4.12 Total Project Length = 0.1 miles
Traffic	15,400-17,700 ADT in 2012 Intersection LOS is C (HCM 2000)
Crashes	High crash spot (CRF = 1.73) 23 crashes including 5 injury collisions
Existing Geometry	Substandard lane width Substandard shoulder width
2013 Cost Estimate	Design = $0.1 million Right-of-Way = $0.2 million Utilities = $0.2 million Construction = $0.5 million Total Cost (All Phases) = $1.0 million
Utilities along the Corridor	Water, sewer, electric, cable, phone

Top: Looking westbound along Arnoldtown Road to KY 1931
Bottom: Looking southbound along KY 1931 to Arnoldtown Road

Figure 8-12:
Spot Improvement Project Sheets
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High Priority: Add turn lanes at KY 1931/Blanton Lane (Spot B)

Description:

The existing two lane segment near Blanton Lane has 10-foot wide travel lanes with curb & gutter at the intersection. The speed limit is 45 mph. The intersection is signalized. Today, the KY 1931/Blanton Ln intersection experiences congestion during both peak periods and, based on 2008-2012 data, the intersection exhibits more frequent crashes than can be attributed to random occurrences with a CRF of 3.07.

Recommendation:

Two potential projects are recommended at this location:

1. Improve access management on each approach.
2. Install dual eastbound left turn lanes on Blanton Lane, with dual receiving lanes heading northbound on KY 1931.

Purpose:

Improve traffic operations & safety.

Location	KY 1931 Milepoints 4.39 – 4.94 Total Project Length = 0.6 miles
Traffic	17,700-18,200 ADT in 2012 Intersection LOS is D-E during peaks
Crashes	High crash spot (CRF = 3.07) 45 crashes including 9 injury collisions
Existing Geometry	Substandard lane width
2013 Cost Estimate	Design = $0.5 million Right-of-Way = $2.4 million Utilities = $1.8 million Construction = $3.6 million Total Cost (All Phases) = $8.3 million
Utilities along the Corridor	Water, electric, cable, phone

Above: Looking northbound along KY 1931 towards Blanton Ln

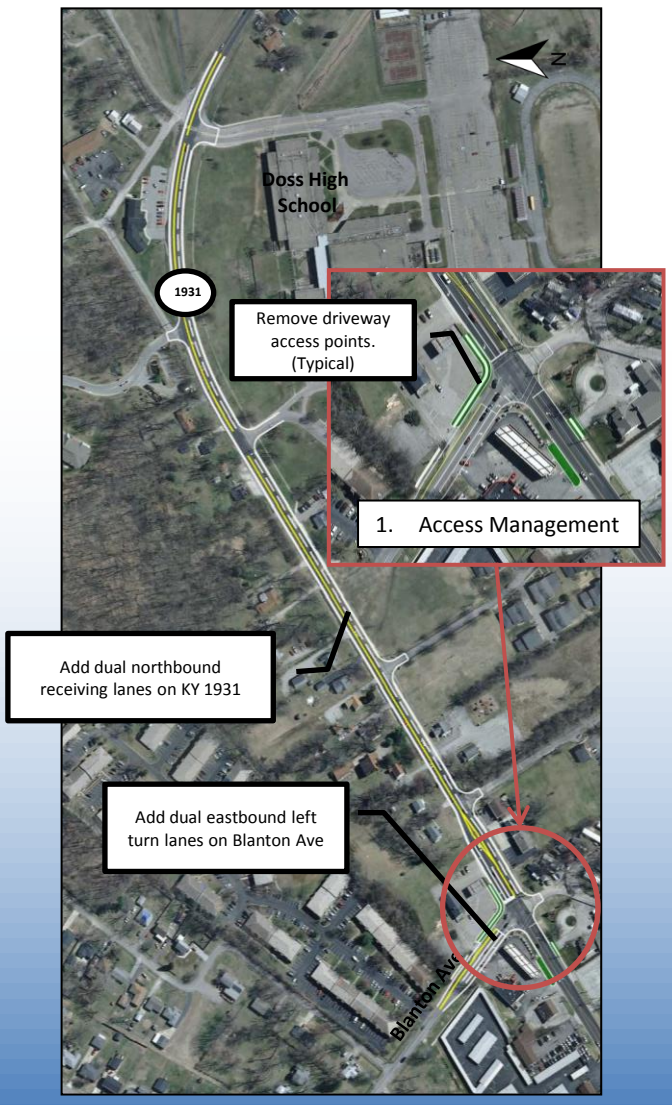

Figure 8-13:
Spot Improvement Project Sheets
KY 1931 Planning Study
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Medium Priority: Add turn lane at KY 1931/Cardinal Oaks Drive (Spot C)

Description:

The existing two lane segment near Cardinal Oaks Drive has 10-foot wide travel lanes with 6-foot wide combination shoulders. The speed limit is 35 mph. The Cardinal Oaks approach is stop-controlled while KY 1931 is a free movement. The KY 1931/Cardinal Oaks Dr intersection exhibits more frequent crashes than can be attributed to random occurrences based on 2008-2012 crash data with a CRF of 1.14. The highway segment is approaching capacity with a V/C of 0.91 based on 2012 peak hour traffic volumes.

Recommendation:

A southbound left turn lane along KY 1931 is recommended for this location.

Purpose:

Improve safety & traffic operations.

Above: Looking southbound along KY 1931 at Cardinal Oaks

Location	KY 1931 Milepoint 4.56 Total Project Length = 0.1 miles
Traffic	18,200 ADT in 2012 Segment volume approaching capacity
Crashes	High crash spot (CRF = 1.14) 17 crashes including 6 injury collisions
Existing Geometry	Substandard lane width Substandard shoulder width
2013 Cost Estimate	Design = $0.1 million Right-of-Way = $0.2 million Utilities = $0.2 million Construction = $0.5 million Total Cost (All Phases) = $1.0 million
Utilities along the Corridor	Water, electric, cable, phone

Figure 8-14:
Spot Improvement Project Sheets
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High Priority: Add turn lanes at two schools (Spot D)

Description:

The existing two lane segment near Doss High School and Trunell Elementary School has 10-foot wide travel lanes with 6-foot wide combination shoulders. The speed limit is 35 mph. Both intersections include a stop sign for the school driveways but the mainline KY 1931 movements are free flow. The highway segment is approaching capacity with a V/C of 0.91 based on 2012 peak hour traffic volumes.

Adding a turn lane at Doss High School was recommended in the 2008 *3rd Street Road / St. Andrews Church Road Area* study as a medium priority. The project was also included in the KIPDA's *Horizons 2030* Long Range Plan as a high priority.

Recommendation:

Left turn lanes are recommended along KY 1931 to provide access to the Trunell Elementary School driveway and the Doss High School driveway.

Purpose:

Improve traffic operations & safety.

Location	KY 1931 Milepoints 4.64 - 4.94 Total Project Length = 0.3 miles
Traffic	18,200 ADT in 2012 Segment volume approaching capacity
Crashes	In high crash segment (CRF = 1.3) 134 crashes including 32 injury collisions
Existing Geometry	Substandard lane width Substandard shoulder width
2013 Cost Estimate	Design = $0.2 million Right-of-Way = $0.4 million Utilities = $0.4 million Construction = $0.9 million Total Cost (All Phases) = $1.9 million
Utilities along the Corridor	Water, electric, cable, phone

Top: Looking southbound along KY 1931 from Quillman Hill Rd
Bottom: Looking northbound along KY 1931 in front of Doss High School

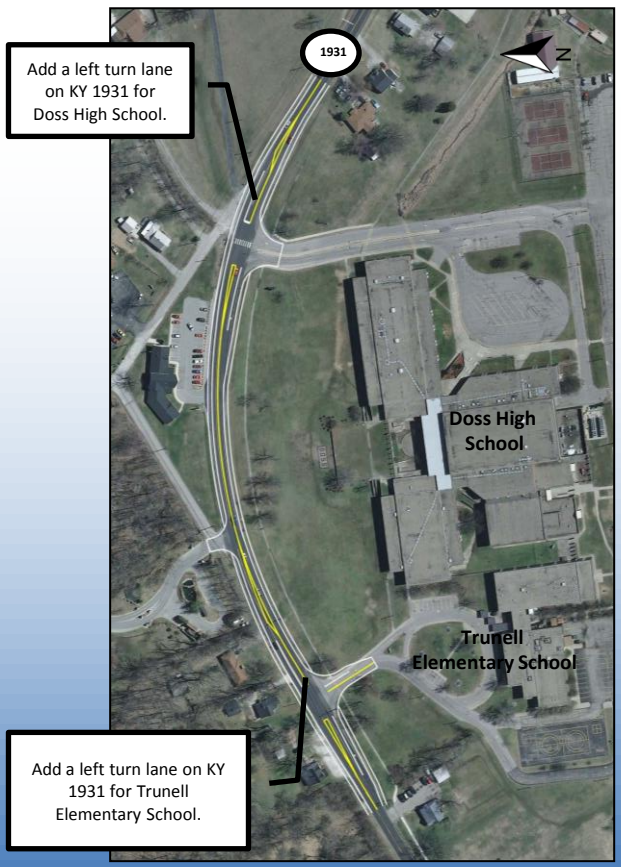

Figure 8-15:
Spot Improvement Project Sheets
KY 1931 Planning Study
Jefferson County, KY
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Medium Priority: Add turn lanes at KY 1931/Windemere Drive (Spot E)

Description:

The existing two lane segment near Windemere Drive has 10-foot wide travel lanes with 6-foot wide combination shoulders. The speed limit is 35 mph. The Windemere Drive approach is stop-controlled while KY 1931 is a free movement. With a CRF of 1.14, the KY 1931/Windemere intersection exhibits more frequent crashes than can be attributed to random occurrences based on 2008-2012 data. The highway segment is approaching capacity with a V/C of 0.91 based on 2012 peak hour traffic volumes.

Recommendation:

A southbound left turn lane along KY 1931 and a left turn lane along Windemere Drive are recommended for this location.

Purpose:

Improve safety & traffic operations.

Top: Looking southbound along KY 1931 at Windemere Dr
Bottom: Looking northbound along KY 1931 at Windemere Dr

Location	KY 1931 Milepoint 5.19 Total Project Length = 0.2 miles
Traffic	18,200 ADT in 2012 Segment volume approaching capacity
Crashes	High crash spot (CRF = 1.14) 17 crashes including 4 injury collisions
Existing Geometry	Substandard lane width Substandard shoulder width
2013 Cost Estimate	Design = $0.1 million Right-of-Way = $0.3 million Utilities = $0.3 million Construction = $0.7 million Total Cost (All Phases) = $1.4 million
Utilities along the Corridor	Water, electric, cable, phone

Figure 8-16:
Spot Improvement Project Sheets
KY 1931 Planning Study
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Medium Priority: Intersection Improvements at KY 1931/Palatka Rd (Spot F)

Description:

The existing two lane segment at Palatka Road has 12-foot wide travel lanes with curb/gutter at the intersection. The speed limit is 35 mph. The intersection is signalized. Numerous entrances to commercial properties surround the intersection on each approach. Based on 2008-2012 crash data, the KY 1931/Palatka Rd intersection exhibits more frequent crashes than can be attributed to random occurrences with a CRF of 2.07. Improving access control at this intersection was identified as a low priority recommendation as part of the 2008 *3rd Street Road / St. Andrews Church Road Area* study.

Recommendation:

Two potential projects are recommended at this location:

1. Improve access management on each approach.
2. Install dual westbound left turn lanes on Palatka Road, with dual receiving lanes on the southbound KY 1931 approach .

Purpose:

Improve safety & traffic operations.

Above: View along Palatka Road facing north

Right: Looking southbound along KY 1931 at Palatka Road

Location	KY 1931 Milepoints 5.20 – 5.54 Total Project Length = 0.4 miles
Traffic	17,700-18,200 ADT in 2012 Intersection LOS is C-E during peaks
Crashes	High crash spot (CRF = 2.07) 31 crashes including 8 injury collisions
Existing Geometry	Poor access control
2013 Cost Estimate	Design = $0.3 million Right-of-Way = $1.6 million Utilities = $1.2 million Construction = $2.4 million Total Cost (All Phases) = $5.5 million
Utilities along the Corridor	Water, electric, cable, phone, sewer

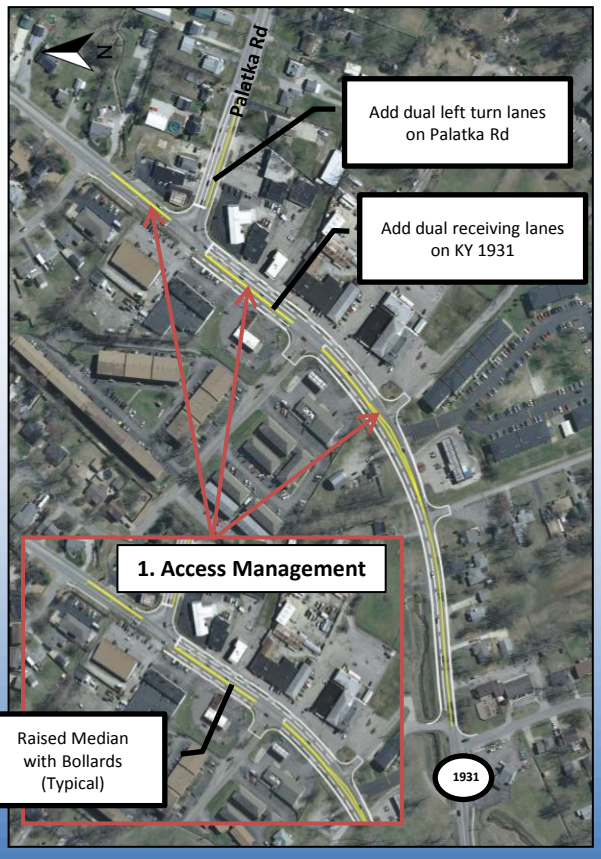

Figure 8-17:
Spot Improvement Project Sheets
KY 1931 Planning Study
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Low Priority: Improve vertical curve by Hillcrest Cemetery (Spot G)

Description:

The existing two lane segment near Hillcrest Cemetery has 12-foot wide travel lanes with 4-foot wide combination shoulders. The speed limit is 45 mph. The existing vertical alignment does not meet current design standards, resulting in substandard stopping sight distance. The highway segment is approaching capacity with a V/C of 0.96 based on 2012 peak hour traffic volumes.

Recommendation:

Realignment of this section of roadway is recommended to improve stopping sight distance. The entrance to the cemetery should be improved as part of the project.

Purpose:

Improve safety and substandard vertical curve.

Location	KY 1931 Milepoints 5.65 – 5.88 Total Project Length = 0.3 miles
Traffic	17,700 ADT in 2012 Segment volume approaching capacity
Crashes	In a high crash segment (CRF = 1.68) 172 crashes including 1 fatality and 40 injury collisions
Existing Geometry	Substandard shoulder width Substandard stopping sight distance
2013 Cost Estimate	Design = $0.2 million Right-of-Way = $0.6 million Utilities = $0.6 million Construction = $1.4 million Total Cost (All Phases) = $2.8 million
Utilities along the Corridor	Electric, cable, phone

Above: Substandard stopping sight distance at Hillcrest Cemetery (looking northbound along KY 1931)

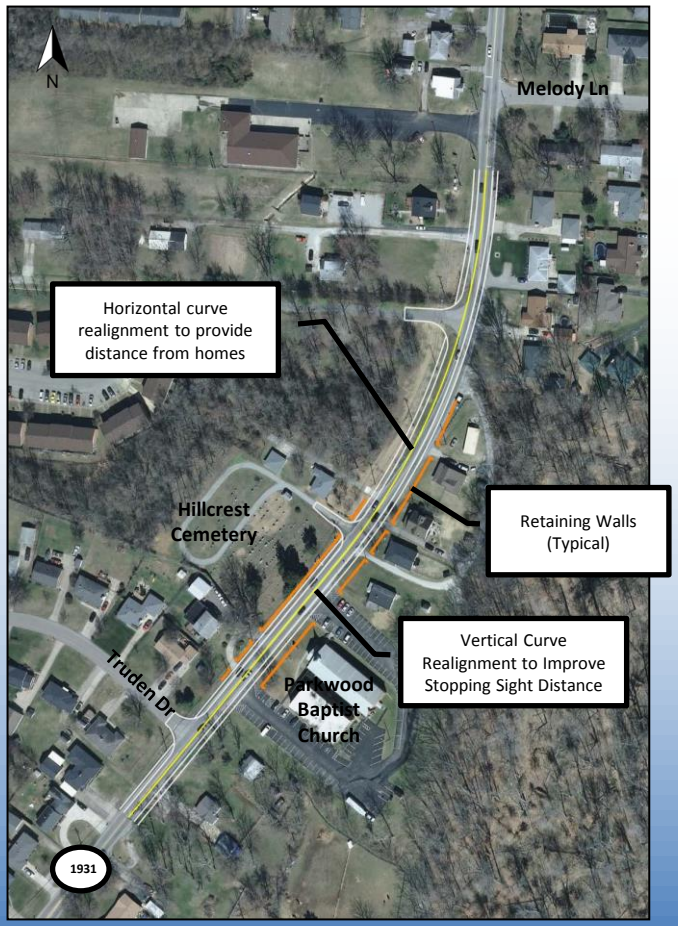

Figure 8-18:
Spot Improvement Project Sheets
KY 1931 Planning Study
Jefferson County, KY
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High Priority: Realign/Widen KY 1931 from Iroquois Pkwy to Stephan Ln (Spot H)

Description:

The existing two lane segment between Iroquois Parkway and Stephan Lane has 12-foot wide travel lanes with 4-foot wide combination shoulders. The speed limit is 45 mph. There are numerous driveways and residential cross streets in this segment of highway. Two crest vertical curves near Pikes Peak Blvd and Stephan Lane limit stopping sight distance. The highway segment is approaching capacity with a V/C of 0.96 based on 2012 peak hour traffic volumes. The KY 1931/Parkwood Road intersection has a CRF of 1.64 and the KY 1931/Stephan Lane intersection has a CRF of 3.07 based on 2008-2012 crash data.

Recommendation:

For this segment of roadway, vertical realignment is recommended to address stopping sight deficiencies near Pikes Peak Blvd and Stephan Lane. Widening is also recommended to create a center two-way left turn lane.

Purpose:

Improve safety, traffic operations, and substandard vertical curves.

Top: Looking southbound along KY 1931 from Alice Kay Dr
Bottom: Looking southbound along KY 1931 at De Mel Ave

Location	KY 1931 Milepoints 6.11 – 6.47 Total Project Length = 0.4 miles
Traffic	17,700 ADT in 2012 Segment volume approaching capacity
Crashes	High crash spots: a. CRF = 1.64 near Parkwood Blvd b. CRF = 3.07 near Stephan Ln
Existing Geometry	Substandard shoulder width Substandard stopping sight distance
2013 Cost Estimate	Design = $0.3 million Right-of-Way = $1.0 million Utilities = $1.0 million Construction = $2.3 million Total Cost (All Phases) = $4.6 million
Utilities along the Corridor	Water, electric, cable, phone

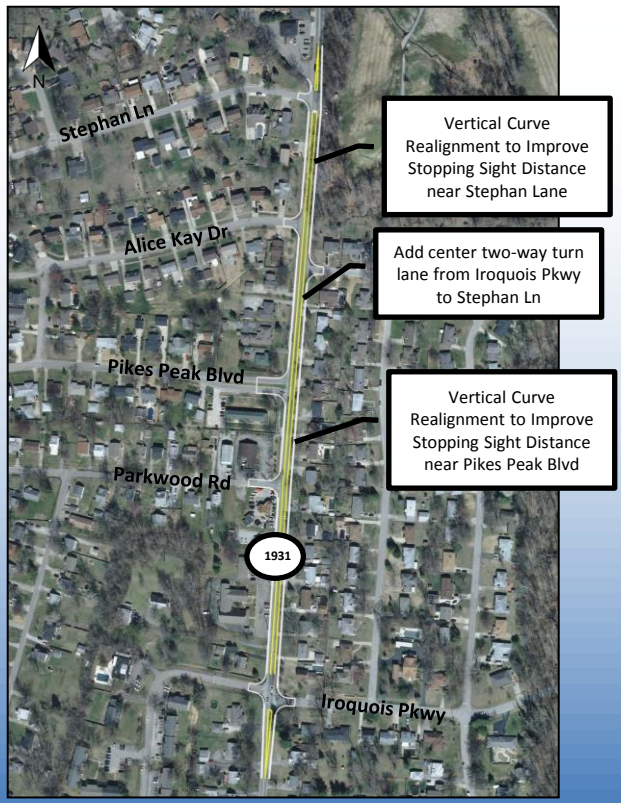

Figure 8-19:
Spot Improvement Project Sheets
KY 1931 Planning Study
Jefferson County, KY
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High Priority: Realign De Mel Avenue (Spot I)

Description:

The existing two lane segment near Stephan Lane has 12-foot wide travel lanes with 4-foot wide combination shoulders. The speed limit is 45 mph. The highway segment is approaching capacity with a V/C of 0.96 based on 2012 peak hour traffic volumes. With a CRF of 3.07, the KY 1931/Del Mel Avenue and KY 1931/Stephan Lane intersections exhibit more frequent crashes than can be attributed to random occurrences based on 2008-2012 crash data.

From centerline to centerline, residential cross streets of Stephan Lane and De Mel Drive are approximately 75 feet apart, both entering on the west side of KY 1931.

Recommendation:

To consolidate access points along KY 1931, De Mel Avenue is recommended to be realigned to tie into Stephan Lane.

Purpose:

Improve safety.

Location	KY 1931 Milepoint 6.43 Total Project Length = 0.1 miles
Traffic	17,700 ADT in 2012 Segment volume approaching capacity
Crashes	High crash spot (CRF = 3.07) 45 crashes including 13 injury collisions
Existing Geometry	Substandard shoulder width Poor access control
2013 Cost Estimate	Design = $0.2 million Right-of-Way = $0.4 million Utilities = $0.4 million Construction = $0.9 million Total Cost (All Phases) = $1.9 million
Utilities along the Corridor	Water, electric, cable, phone

Above: Looking northbound along KY 1931 at Stephan Lane/De Mel Ave

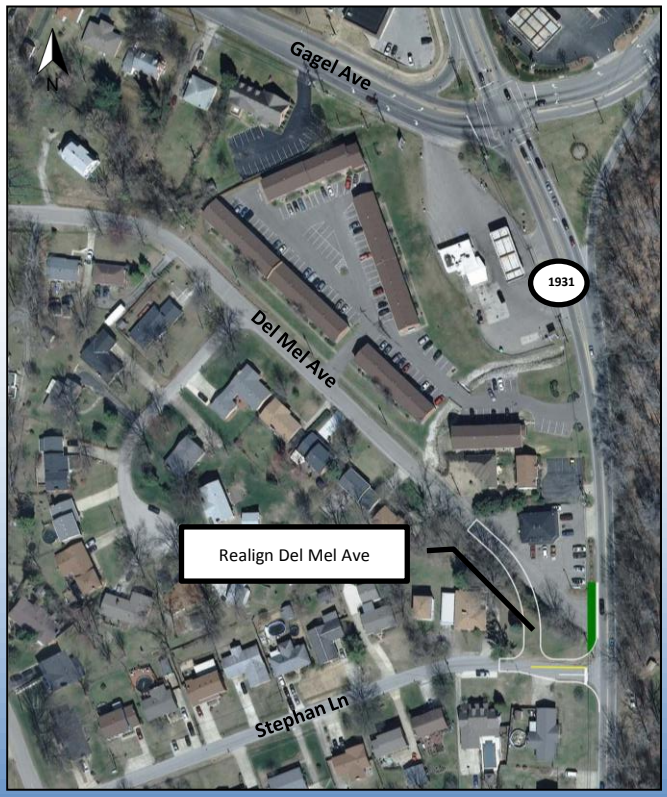

Figure 8-20:
Spot Improvement Project Sheets
KY 1931 Planning Study
Jefferson County, KY
Item # 5-480.00

High Priority: Intersection Improvements at KY 1931/Hazelwood Ave (Spot J)

Description:

The existing two lane segment at Hazelwood Avenue/Gagel Avenue has 12-foot wide travel lanes with curb/gutter at the intersection. The speed limit is 45 mph. The intersection is signalized with channelized right turn lanes from both KY 1931 approaches. Based on 2008-2012 data, the KY 1931/Hazelwood Avenue intersection exhibits more frequent crashes than can be attributed to random occurrences with a CRF of 2.39. South of the intersection, the highway segment is approaching capacity with a V/C of 0.96 based on 2012 peak hour traffic volumes.

Recommendation:

Convert the existing westbound thru lane on Hazelwood Avenue to a combined thru and left turn lane. Construct dual southbound receiving lanes on KY 1931. The northbound left turn lane on KY 1931 is also recommended to be extended.

Purpose:

Improve safety & traffic operations.

Location	KY 1931 Milepoints 6.43 – 6.62 Total Project Length = 0.3 miles
Traffic	11,100-17,700 ADT in 2012 Intersection LOS is C-E during peaks
Crashes	High crash spot (CRF = 2.39) 35 crashes, including 1 fatality and 6 injury collisions
Existing Geometry	Meets current standards
2013 Cost Estimate	Design = $0.3 million Right-of-Way = $0.8 million Utilities = $0.8 million Construction = $1.8 million Total Cost (All Phases) = $3.7 million
Utilities along the Corridor	Water, electric, cable, phone, sewer

Top: Looking southbound along KY 1931 towards the Hazelwood intersection
Bottom: Looking northbound along KY 1931 at intersection

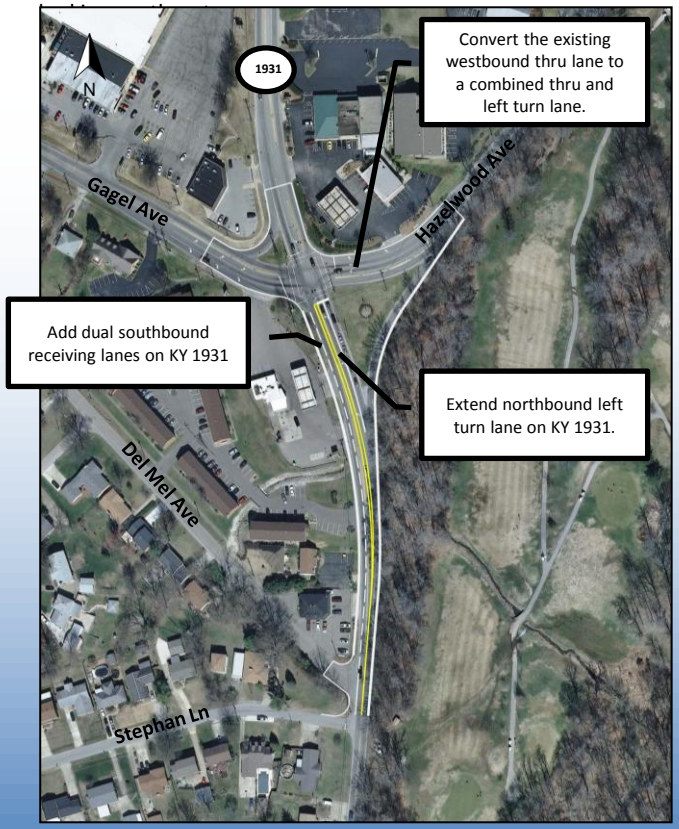

Figure 8-21:
Spot Improvement Project Sheets
KY 1931 Planning Study
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Low Priority: Realign KY 1931 near Friden Way (Spot K)

Description:

The existing two lane segment near Friden Way has 12-foot wide travel lanes with 4-foot wide combination shoulders. The speed limit is 45 mph. A crest vertical curve in this segment limits stopping sight distance. The spot improvement is adjacent to a high crash spot at the KY 1913/Hazelwood Avenue/Gagel Avenue intersection that exhibits more frequent crashes than can be attributed to random occurrences based on 2008-2012 crash data with a CRF of 2.39.

Recommendation:

Realignment is recommended for this segment of roadway to address stopping sight distance deficiencies due to a substandard vertical curve.

Purpose:

Improve substandard vertical curve.

Location	KY 1931 Milepoints 6.65 – 6.75 Total Project Length = 0.1 miles
Traffic	11,100 ADT in 2012 Adequate capacity
Crashes	Adjacent to high crash spot (CRF = 2.39)
Existing Geometry	Substandard shoulder width Substandard stopping sight distance
2013 Cost Estimate	Design = $0.2 million Right-of-Way = $0.3 million Utilities = $0.3 million Construction = $1.2 million Total Cost (All Phases) = $2.0 million
Utilities along the Corridor	Electric, cable, phone

Above: Looking northbound along KY 1931 towards Friden Way

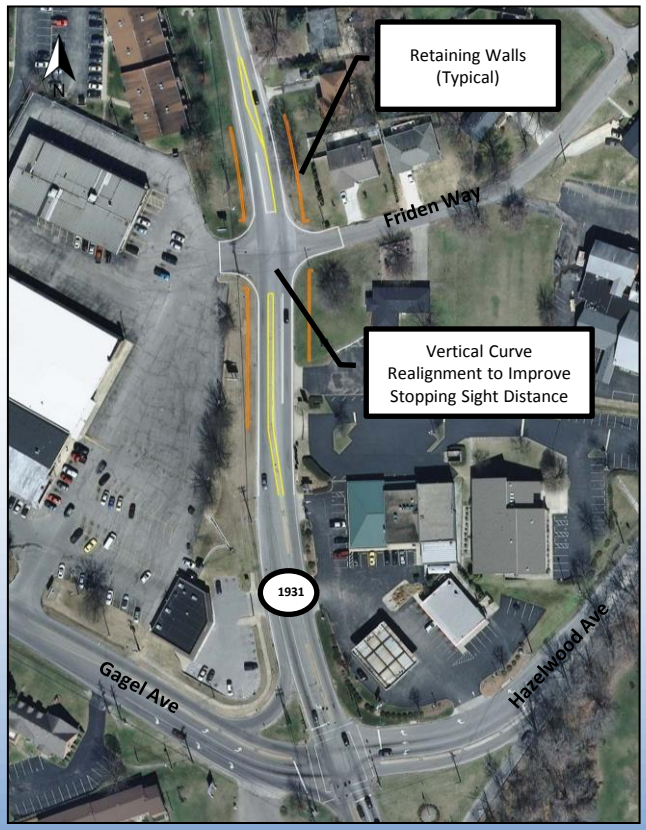

Figure 8-22:
Spot Improvement Project Sheets
KY 1931 Planning Study
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Low Priority: Realign KY 1931 near Eskridge Lane (Spot L)

Description:

The existing two-lane segment near Eskridge Lane has 12-foot wide travel lanes with 4-foot wide combination shoulders. The speed limit is 45 mph. A crest vertical curve in this segment limits stopping sight distance. There was one fatality crash at this location during the analysis period (2008-2012); the concentration of crashes did not meet the threshold to become a high crash spot or segment.

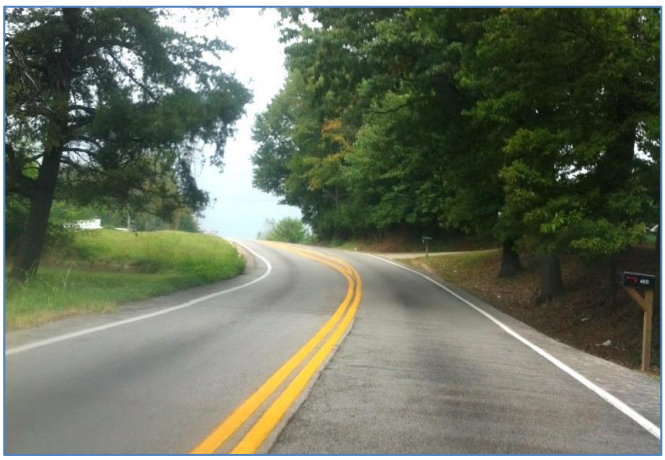
Recommendation:

Realignment is recommended for this segment of roadway to address stopping sight distance deficiencies due to a substandard vertical curve.

Purpose:

Improve substandard vertical curve.

Location	KY 1931 Milepoints 6.95 – 7.07 Total Project Length = 0.1 miles
Traffic	11,100 ADT in 2012 Adequate capacity
Crashes	Fatality crash Not a high crash spot.
Existing Geometry	Substandard shoulder width Substandard stopping sight distance
2013 Cost Estimate	Design = $0.2 million Right-of-Way = $0.3 million Utilities = $0.3 million Construction = $1.2 million Total Cost (All Phases) = $2.0 million
Utilities along the Corridor	Electric, cable, phone



Above: Looking northbound along KY 1931 near Eskridge

D. Construction and Environmental Considerations for Future Phases

Construction and Environmental related issues were also identified within the study, as discussed in previous sections. Potential major issues include:

- Air Quality – The proposed project is expected to have a low potential Mobile Source Air Toxics (MSAT) effect as it serves to improve operations of highway and freight without adding substantial new capacity. In future phases of project development, a qualitative assessment of emissions projections should be conducted to compare in narrative form, the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic, and the associated changes in MSATs for the project alternatives, based on vehicle miles traveled, vehicle mix, and speed.
- Noise – This project is a Type I project as designated in FHWA Regulation 23 CFR Part 772 and, in any future project development phases, a detailed noise analysis should follow the FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise and the Kentucky Transportation Cabinet Noise Analysis and Abatement Policy (July 13, 2011).
- Waste Management – Solid wastes occurring as part of the construction process must be disposed of at a permitted facility. Underground storage tanks and other contaminants should be properly addressed as they are encountered.
- Traffic Operations – Maintenance of traffic and residential access should be preserved throughout the construction process. Maintaining proper access to the many residential driveways along the road could be an issue where larger cut and fill sections are required. It is also important to review and update signal timing along the corridor once the construction is completed.
- Geotechnical Considerations –Soils in the area are generally suitable for embankment construction although some of the soils in the area are considered highly erodible. Suitable rock for embankment construction and rock roadbed is readily available in this area of the state. California Bearing Ratio values used in pavement design generally range from 2-5 for soil subgrades in the area. The terrain of the study corridor is relatively flat, which could cause some drainage issues.
- Utilities – Underground waterlines and gas lines as well as above ground power, cable, and telephone lines lie just off the existing road for most of the corridor. Avoiding and/or relocating these utilities will be a major factor during the design process and in future phases of project development.
- Bridges and Culverts - Big Run Creek passes beneath KY 1931 in two culvert structures at KY 1931 milepoints 3.76 and 5.20. At milepoint 3.76, a 24.5 foot culvert spans Big Run Creek. Built in 1941, the structure is functionally obsolete and received a sufficiency rating of 47.3 during its March 2012 inspection. At milepoint 5.20, a 24.9 foot culvert spans Big Run Creek. Constructed in 1991, the structure received a sufficiency rating of 93.6 during its March 2012 inspection. Both culverts will likely need to be widened or replaced as part of this project.

- Erosion and Sediment Control – Measures should be utilized to control erosion and sedimentation during and after the commencement of earth-disturbing activities. Consideration should be given to erosion control methods; a Best Management Practices for Construction Activities guide is available from the Kentucky Division of Conservation.
- Cemeteries and Churches – Two cemeteries and twelve churches abut KY 1931.
- Threatened and Endangered Species – The federally endangered gray bat, Indiana bat, clubshell, fanshell, fat pocketbook, orange pimpleback, ring pink, pink mucket, sheepnose, rough pigtoe, running buffalo clover, interior least tern, piping plover, and Alabama shad could be in the project area. In addition to the federally-listed species, two state-listed species are known to occur within one mile of the study corridor: Kirtland's snake and northern hairstreak. If species are identified, a biological assessment will be required.
- Floodplain Encroachment and Wells - There are scattered wetlands and water wells along the corridor. Any effected wetlands should be delineated; impacts may require permits from the US Army Corps of Engineers and/or the Kentucky Division of Water.