

Final Report  
October, 2012

# KY 44 Corridor Study

US 31E to KY 1633  
Bullitt & Spencer Counties

Item No. 5-396.00

A Summary of  
Findings &  
Recommendations



Prepared by:  
Division of Planning & KYTC District 5  
Kentucky Transportation Cabinet

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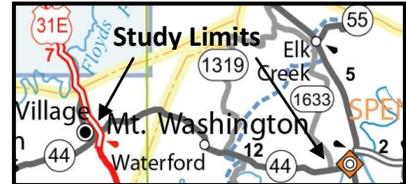
Appendix I. Photos

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# EXECUTIVE SUMMARY

## KY 44 CORRIDOR STUDY US 31E to KY 1633 (Bullitt & Spencer Counties)

The KY 44 Corridor Study was conducted as a continuation to the planning studies undertaken by the Kentucky Transportation Cabinet (KYTC) from Shepherdsville in Bullitt County (Item 5-150.00) and extending eastward. The current planning study (Item 5-396.00) investigated the roadway conditions from US 31E in Mt. Washington to KY 1633 just west of Taylorsville.



KY 44 is a major highway corridor in Bullitt and Spencer counties. These counties have seen a notable growth in population (23% in Bullitt County and 45% in Spencer County) as well as traffic in the period 2000-2010. The goal of the planning study was to identify improvements to provide a safe roadway to this growing corridor.

### PROJECT SCENARIO

US 31E, at the west end of the study corridor, connects to Gene Snyder Freeway to the north which leads to the City of Louisville. A traffic volume of 10,000 Average Daily Traffic (ADT) is noticed near US 31E on KY 44 (2009 data) and is projected to increase to 24,500 ADT in 2035. A Level of Service F indicating breakdown flow, is projected in 2035 if the current road conditions remain



same in that section. To the east of the study corridor, KY 44 leads to Taylorsville Lake State Park which is a major recreational attraction with a 1,200 acres park and sits on 3,050 acre lake. There has been notable growth in recreational traffic on KY 44 in the study area due to the State Park.

### EXISTING CONDITIONS

KY 44 is a 2-lane roadway with narrow shoulders in the study area. The west end of the study near US 31E has an elementary school, a high school, businesses and residences in Mt. Washington. Rear end crashes are high on KY 44 near US 31E. The terrain is fairly level between US 31E and KY 1319.

From KY 1319 going eastward, the terrain is rolling with several sharp curves and steep grades. There are no passing or climbing lanes. Intersections at the highway crossings at KY 1060, KY 1251 and KY 623 have inadequate sight distance, poor intersection geometry and some steep grades. There are multiple span concrete tee beam bridges east of the intersections at KY 1060 (on Plum Creek) and KY 1251 (on Elk Creek). Both the bridges are functionally deficient. There is a two span concrete culvert at Dutchman Creek which is also designated as a bridge. The bridges are not structurally deficient. The narrow width at the bridges is a concern particularly with recreational vehicles, trucks and farm equipment. There are several locations with high crash history. The common types of crashes from KY 1319 to KY 1633 are roadway departure crashes.



## **THE STUDY METHODOLOGY**

Existing roadway information was collected from the KYTC's Division of Planning, Highway Information Systems (HIS) data. Additional project information was derived from archived plans and site visits. The study was divided into three segments, considering ongoing design projects in Segment 1 & 3. Segment 1 was defined between US 31E and KY 1319 where Item 5-347.50 has completed Phase I Design. Segment 2 was studied from KY 1319 to the beginning of the three lane section in front of Spencer County Elementary School. Segment 3 was defined from the end of Segment 2 to KY 1633 where Item 5-395.00 has completed Phase I and Phase II Design. Segment 2 falls in between Segments 1 & 3 which are in various stages of design as mentioned above. For consistency of design along the corridor, recommendations for Segment 2 will take into consideration, the proposed design in Segment 1 and Segment 3 on either sides of the segment. Therefore, all the three segments were included in a combined planning study under Item No. 5-396.00.

## **THE PROJECT TEAM**

The project team consisted of KYTC Division of Planning Central Office staff, KYTC District 5 staff and KIPDA Transportation Planning staff. The project team's tasks were to evaluate the roadway conditions, analyze the current and future traffic, conduct periodic meetings to share information, gather input, develop a Draft Purpose and Need statement and to propose recommendations. The project team developed alternates with input from local Officials, stakeholders, and the public. The team had three meetings during the course of the study.

## **PUBLIC INVOLVEMENT**

The project team considered public opinion to be very important, as the public are the users of the roadway on a daily basis and are best informed about the roadway conditions. Public input was requested during the study. Two Public Meetings were conducted which are documented separately in Public Meeting folders. The project team met the local Officials and stakeholders two times in formal meetings, initially to inform about the proposed study and later when the

alternates were developed. Public, Senators, Judge Executives, Mayors and stakeholders such as representatives of the schools, police, and fire departments of Bullitt and Spencer counties participated in the study and provided feedback.

### DRAFT PURPOSE AND NEED STATEMENT

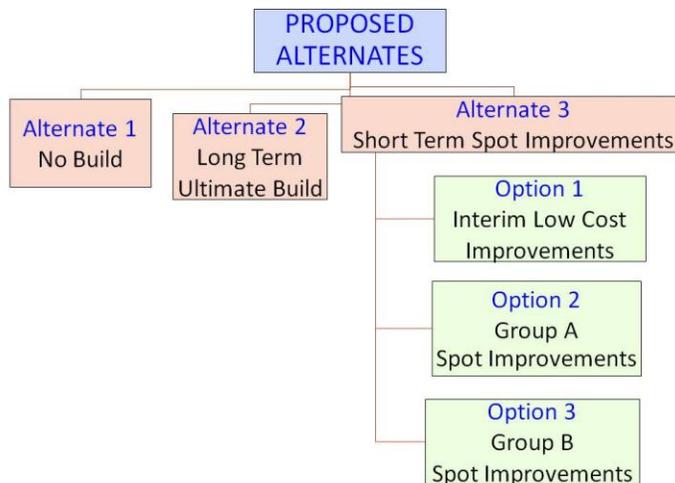
The purpose of the project is to improve the safety of the road and to provide adequate transportation linkage between the Cities of Mt. Washington and Taylorsville. Improvements to the study corridor were considered because of crash concerns, less than standard roadway geometry, and the need to provide an adequate transportation system for schools, commuters, emergency services and recreational traffic traveling to Taylorsville Lake State Park.

### ENVIRONMENTAL OVERVIEW, GEOTECHNICAL REVIEW AND RESOURCE AGENCY INPUT

The Environmental Overview, which included addressing potential Environmental Justice issues, was completed by HMB Consultants Inc., as a separate study for the KYTC. The KYTC Division of Structural Design, Geotechnical Branch conducted a geotechnical review for the project. Selected State and Federal agencies were contacted to derive their input for the planning study.

### ALTERNATES CONSIDERED

Alternates were developed considering the study purpose and need to improve the safety of the corridor. Three types of alternates were developed and presented to the public.



#### A. Alternate 1 - No Build Alternate

This alternate assumes that no new roadway improvements are undertaken. The benefits of this alternate are that the property, the environment and cost will be preserved. The disadvantage of selecting this alternate is that the safety issues identified by the study will not be addressed.

## **B. Alternate 2 - Long Term Ultimate Build Alternate**

This alternate proposes a long term ultimate solution to KY 44 by upgrading the roadway to current geometric standards. Exhibit ES-1 shows the proposed Long Term Ultimate Build alternate. For Segment 1, recommendations outlined in the Phase I Design of Item 5-347.50 will be followed. Typical sections and alignment were defined in 5-347.50. A five-lane curb-and-gutter section is proposed from US 31E for 0.6 mile, then a three lane curb-and-gutter section for 0.3 mile. From that point to the end of the segment, a 2-lane rural section is proposed. Proposed speed varies from 45-55 mph.

In Segment 2, the project team proposed that the roadway will remain on the existing alignment where feasible. Realignment will be necessary at some locations to improve geometry. The proposed typical section consists of two 11 foot lanes and 8 foot shoulders (6 foot paved). Proposed design speed is 55 mph. Intersections will be improved. Climbing lanes & passing lanes may be added as needed depending on the proposed grades and turn lanes will be added. In Segment 3, recommendations of Item 5-395.00 will be followed. Alignment and typical section (22 foot pavement and 6 foot shoulders) were defined in 5-395.00. The proposed design speed is 45 mph.

## **C. Alternate 3 – Short Term Spot Improvements**

No spot improvements were considered for Segment 1 as roadway improvements for this segment were identified in the Phase 1 Design under Item 5-347.50. Segment 3 is scheduled for construction in the near future and therefore, no spot improvements were considered. Three types of Short Term Spot Improvements were proposed for Segment 2 and are described below.

### ***a. Alternate 3, Option 1 – Interim Low Cost Improvements***

Some cost effective solutions that can improve safety are the interim low cost improvements such as center line and edge line rumble strips, chevrons around curves, reflectors on guardrails to improve night time visibility, cutting back slopes and installing high friction surfaces. District funds and highway safety improvement funds such as HSIP can be used to implement interim low cost improvements. Exhibit ES-2 shows some possible interim low cost improvements.

### ***b. Alternate 3, Option 2 – Group A Spot Improvements***

There are some locations in Segment 2 where the geometry does not meet the current design standards. There are several vertical grades that are substandard. Upon analysis of the crashes, many crashes were identified where roadway geometry does not meet current standards. Six of these locations were identified as Group A spot improvements. They are defined as projects in locations where roadway geometry is below current design standards and crash rate is higher (close to and more than 1.0). See Exhibit ES-3 for Group A projects.

### ***c. Alternate 3, Option 3 – Group B Spot Improvements***

At the public meetings and in the completed surveys, other locations that had driving concerns were discussed. The project team investigated the locations for the cause of

the concerns. The project team identified six locations with geometry problems and crash history and named them as Group B Spot Improvements. The crash and geometry concerns were less severe than Group A project locations. See Exhibit ES-4 for Group B projects. Cost estimates for all alternates are summarized in Table ES-1.

## **RECOMMENDATIONS**

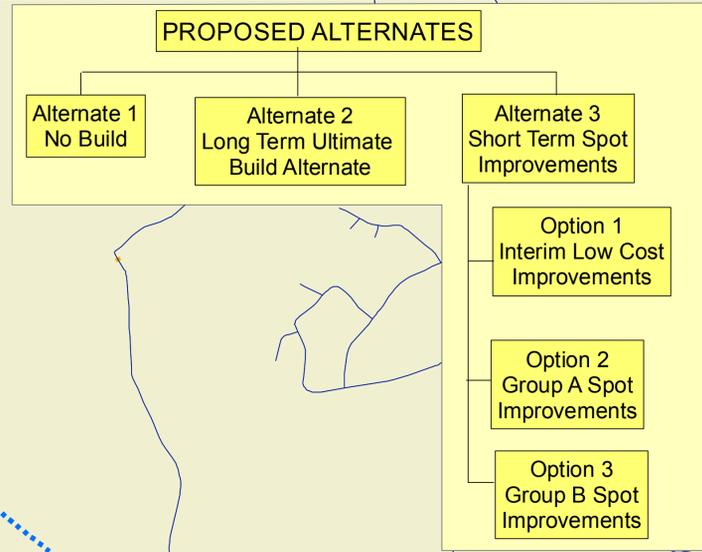
The Phase I Design for Segment 1 between US 31E and KY 1319 has recommended a five lane curb and gutter section at the west end of the study changing over to a three lane typical section ending just east of Parkland Trace. Considering the high traffic volumes and the large number of rear end crashes that currently occur and increase in projected traffic volume, these typical sections are appropriate for this section and are recommended. The Phase I Design also recommends an improved two lane section starting near Parkland Trace and ending at KY 1319 which will further improve safety in that section. It is recommended that Segment 1 continue with the advancement into Final Design.

Estimated cost to construct the Ultimate Build roadway for the 7.5 mile long Segment 2 from KY 1319 to the Spencer Elementary School is nearly \$71 million. As this is a significant amount to obtain funding, it is recommended that the roadway improvements should be phased. The most immediate and cost effective solution that can improve the safety of this segment is the interim low cost improvements. As identified, improving safety around sharp curves and installing edge rumble strips are some recommendations which are low cost and are effective in reducing crashes and in most cases can be completed using available maintenance and HSIP funds.

The next recommendation for Segment 2 is to undertake some of the spot improvement projects. The projects were grouped in two categories and their ranking was decided considering their geometry, crash history and public input. It is recommended these improvements should be designed keeping in mind the ultimate roadway section proposed in this study. In some cases, two spot improvement projects may be combined if they are close to each other and it may be desirable to design them at the same time. Combining two projects in this way will be more cost effective. When Segment 2 is programmed to build the ultimate build section, the typical section proposed in this study is recommended. The typical section proposes a two lane roadway with shoulders considering the truck and recreational traffic on this segment and also can accommodate bike traffic.

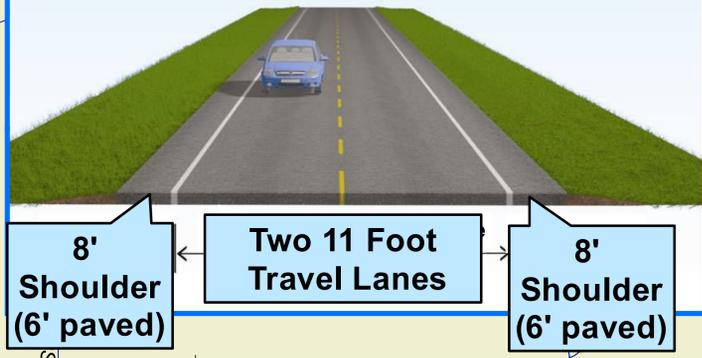
For Segment 3, the recommendations identified in Item 5-395.00 may be followed. Segment 3, which is from the east end of the three lane roadway in front of Spencer County Elementary School to KY 1633 was in the right-of-way acquisition stage at the time this study was conducted. The two lane roadway follows a new alignment and would improve the safety in this section with the new roadway geometry.

**EXHIBIT ES-1: ALTERNATE 2 - LONG TERM ULTIMATE BUILD ALTERNATE**



**SEGMENT 2  
KY 1319 TO SPENCER COUNTY ELEMENTARY SCHOOL**

**2-LANE RURAL TYPICAL SECTION**



**Segment 2 - Proposed Ultimate Build Alternate**

- Rebuild on existing alignment
- Realign at some locations
- Bridge Replacements to match new roadway
- Intersections, Turn Lanes, Climbing Lanes

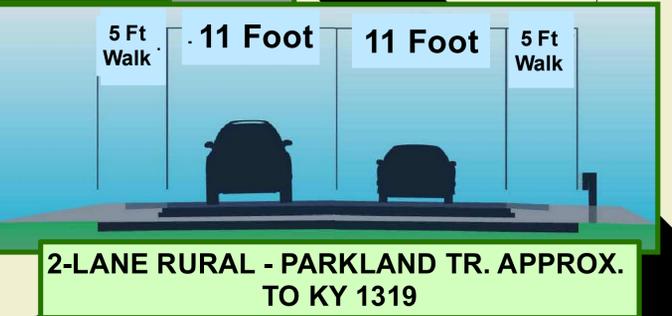
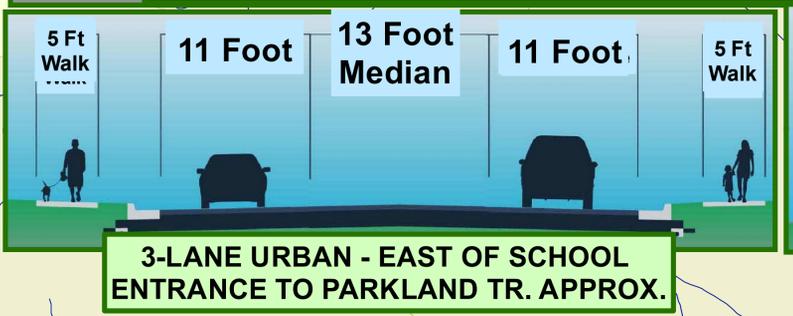
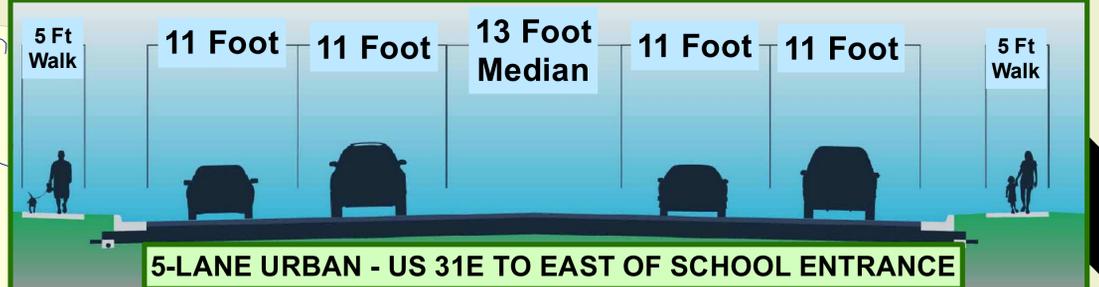
**Possible Realignment Areas**

**SEGMENT 1  
US 31E TO KY 1319**

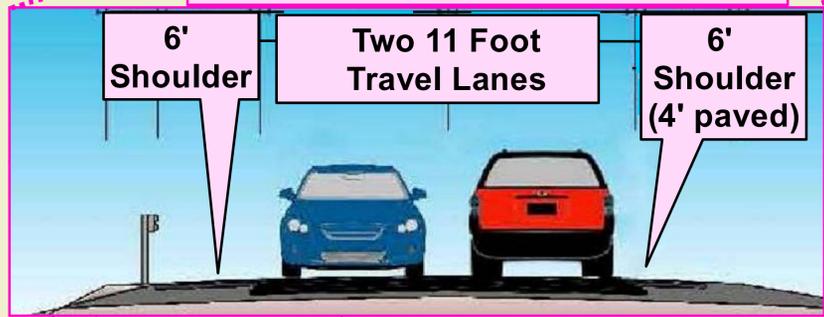
**2-LANE RURAL  
PARKLAND TR. APPROX  
TO KY 1319**

**5-LANE URBAN  
US 31E TO EAST  
OF SCHOOL ENT.**

**3-LANE URBAN  
EAST OF SCHOOL ENT. TO  
PARKLAND TR. APPROX.**



**SEGMENT 3  
2-LANE RURAL TYPICAL SECTION**



**SUMMARY OF ESTIMATED COSTS**

SEGMENT 1	\$17,706,000
SEGMENT 2	\$70,550,000
SEGMENT 3	\$5,755,000
<b>TOTAL COST</b>	<b>\$94,011,000</b>



**EXHIBIT ES-2: ALTERNATE 3, OPTION 1 - INTERIM LOW COST IMPROVEMENTS**

PROPOSED ALTERNATES

- Alternate 1 No Build
- Alternate 2 Long Term Ultimate Build Alternate
- Alternate 3 Short Term Spot Improvements

**Option 1 Interim Low Cost Improvements**

Option 2 Group A Spot Improvements

Option 3 Group B Spot Improvements

ESTIMATED COST - \$500,000

INTERIM LOW COST IMPROVEMENTS  
(Possible Treatment locations are shown here)

- \* Edge Line Rumble Strips
- \* Chevrons on posts
- \* Cutback Hills
- \* Tree Trimming/Removal
- \* High Friction Surfaces
- \* Reflectors on guardrail

**LOW COST IMPROVEMENTS**

- Rumble Strips
- Chevrons
- Reflectors on guardrails



TREE TRIMMING



CUTBACK HILL



CHEVRONS AROUND CURVES



REFLECTORS ON GUARDRAIL



CHEVRONS AROUND CURVES  
(based on standards as needed)



HIGH FRICTION SURFACE  
(Hunters Trace Curve)

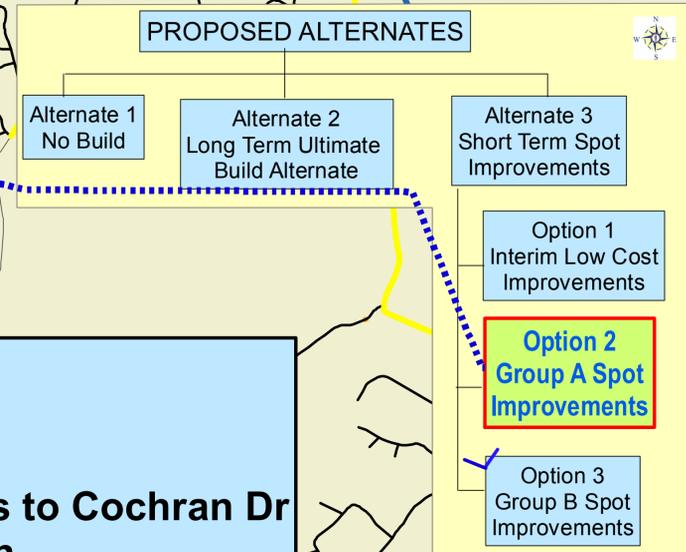


TREE TRIMMING  
CUTBACK HILL

- Interstate
- Parkway
- US Highway
- State Road
- Local Road
- Bridge (Line)

NOT TO SCALE

**EXHIBIT ES-3: ALTERNATE 3, OPTION 2 - GROUP A SPOT IMPROVEMENTS**



**Estimated Cost - \$3,830,000**

**Spot A1**  
 East of Cedar Lake Dr to County Line  
 - Roadway Geometry Improvements



**Estimated Cost - \$1,480,000**

**Spot A2 (Dutchman Creek Area)**  
 - Improve West Horizontal Curve  
 - Intersection Improvements (Eliminate Skew on Side Roads & Align)  
 - Replace Bridge at Dutchman Creek



**Estimated Cost - \$4,760,000**

**Spot A3 (Cochran Dr and East)**  
 Intersection Improvements at Cochran Dr/Julia Ct  
 - Add Left & Right Turn Lanes to Cochran Dr  
 East of Cochran Dr Intersection  
 - Roadway Geometry Improvements

**Estimated Cost - \$2,380,000**

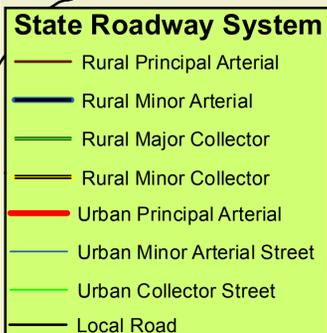
**Spot A4 (Junction KY 623 and East)**  
 Jct KY 623 - Intersection Improvements  
 - Improve Turning Radius, Sight Distance etc.  
 Other Work:  
 - Replace Box Culvert (Possible Left Turn Lane to KY 623)  
 - Improve East Horizontal Curve

**Estimated Cost - \$4,760,000**

**Spot A5**  
 (Jct KY 1251 to Curve after Hunter's Trace Rd.)  
 Jct KY 1251- Intersection Improvements  
 - Improve Turning Radii, Sight Distance etc.  
 - Add Truck Climbing Lane West of KY 1251  
 East of Bridge at KY 1251  
 - Roadway Geometry Improvements

**Estimated Cost - \$18,800,000**

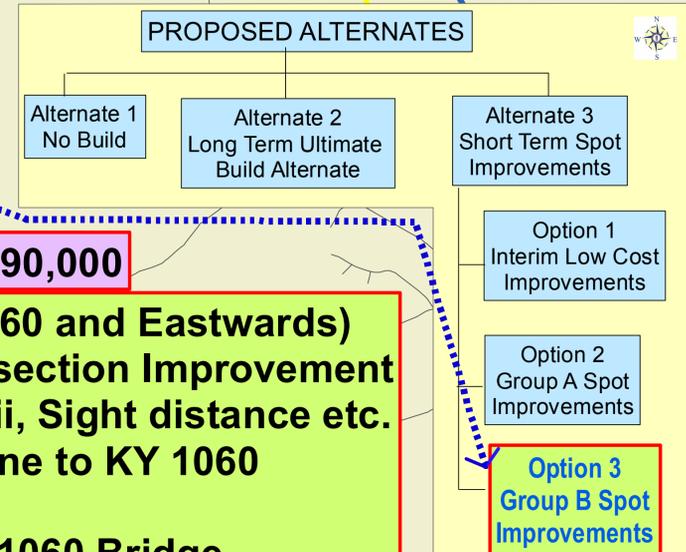
**Spot A6 (Stumps Lane to Turnpike Ave.)**  
 Minor Widening and Rumble Strips  
 - Widen pavement by 5 feet  
 - Install Center Line & Edge Line Rumble Strips



NOT TO SCALE



**EXHIBIT ES-4: ALTERNATE 3, OPTION 3 - GROUP B SPOT IMPROVEMENTS**



**ESTIMATED COST - \$2,040,000**  
**Spot B1 (MP 0.70 to 0.95 Approx.)**  
 - Roadway Geometry Improvements  
 - Add Truck Climbing Lane based on grade

**ESTIMATED COST - \$2,380,000**  
**Spot B2 (Village Dr/Hickory Woods Dr area)**  
 Curve East of Village Dr  
 - Roadway Geometry Improvements  
 - Village Dr Realignment  
 Hickory Woods Dr Intersection  
 - Add Left Turn Lane at Hickory Woods Dr

**ESTIMATED COST - \$4,890,000**  
**Spot B3 (Junction KY 1060 and Eastwards)**  
 Junction KY 1060 - Intersection Improvement  
 - Improve Turning Radii, Sight distance etc.  
 - Possible Left Turn Lane to KY 1060  
 Waterford Park after KY 1060 Bridge  
 - Add Left Turn Lane to the Park  
 - Add Truck Climbing Lane after Waterford Park Entrance going East

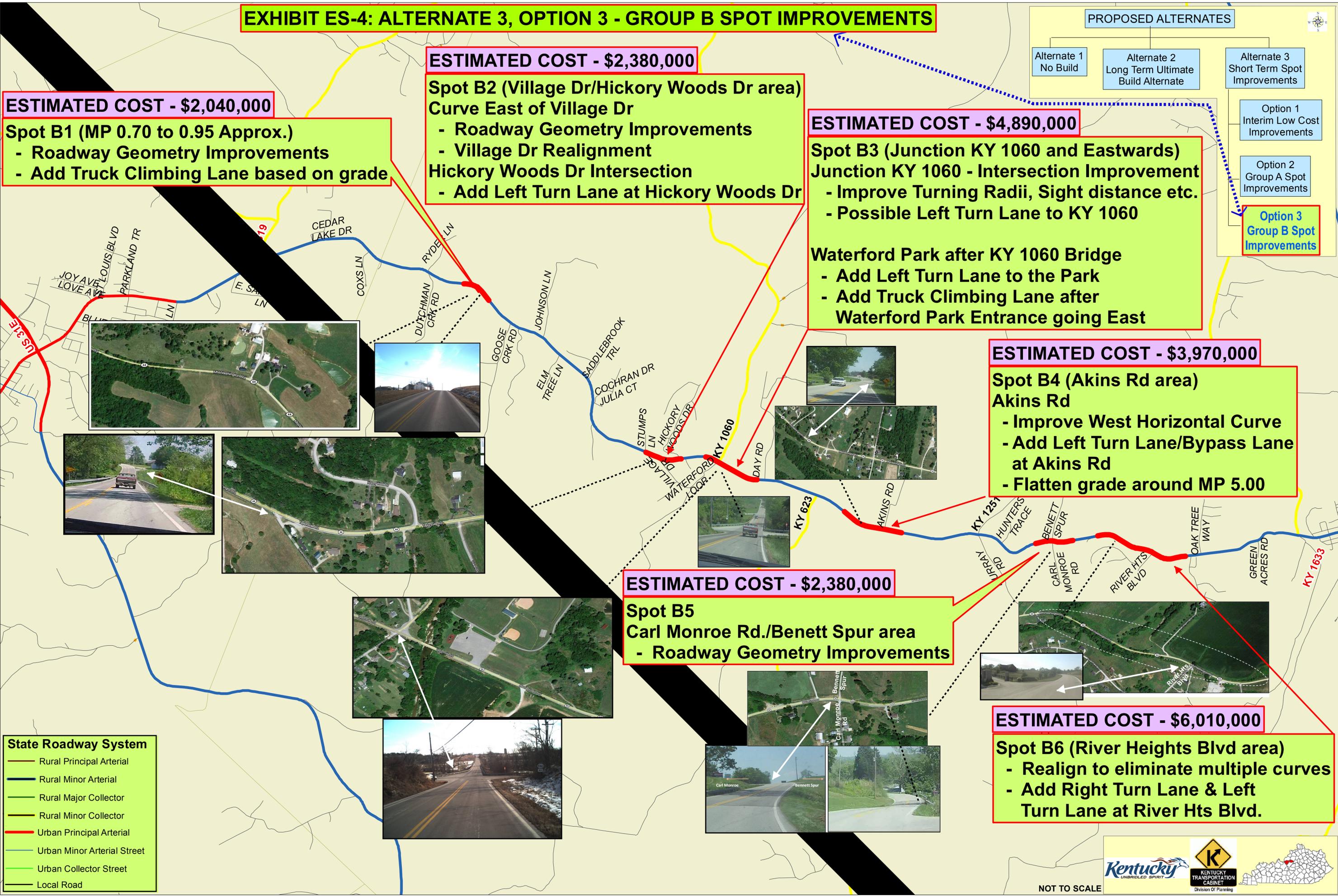
**ESTIMATED COST - \$3,970,000**  
**Spot B4 (Akins Rd area)**  
 Akins Rd  
 - Improve West Horizontal Curve  
 - Add Left Turn Lane/Bypass Lane at Akins Rd  
 - Flatten grade around MP 5.00

**ESTIMATED COST - \$2,380,000**  
**Spot B5**  
 Carl Monroe Rd./Benett Spur area  
 - Roadway Geometry Improvements

**ESTIMATED COST - \$6,010,000**  
**Spot B6 (River Heights Blvd area)**  
 - Realign to eliminate multiple curves  
 - Add Right Turn Lane & Left Turn Lane at River Hts Blvd.

**State Roadway System**

	Rural Principal Arterial
	Rural Minor Arterial
	Rural Major Collector
	Rural Minor Collector
	Urban Principal Arterial
	Urban Minor Arterial Street
	Urban Collector Street
	Local Road



NOT TO SCALE



**Table ES-1: Summary of Cost Estimates**

<b>ALTERNATE 1: No Build Alternate - \$0</b>						
<b>ALTERNATE 2: Long Term Ultimate Build Alternate</b>						
Segment	Brief Description	Phase Cost (\$)				Total Cost (\$)
		Design	Right-of-Way	Utilities	Constr	
1	US 31E to KY 1319	\$3,000,000	\$2,300,000	\$1,606,000	\$10,800,000	\$17,706,000
2	KY 1319 to Spencer Co. Elem. School	\$10,150,000	\$8,270,000	\$7,020,000	\$45,110,000	\$70,550,000
3	Spencer Co. Elem. School to KY 1633	\$700,000	\$355,000	\$700,000	\$4,000,000	\$5,755,000
<b>Total</b>		\$13,850,000	\$10,925,000	\$9,326,000	\$59,910,000	\$94,011,000
<b>ALTERNATE 3: Short Term Spot Improvements</b>						
<b>Option 1 : Interim Low Cost Spot Improvements</b>						
Shoulder layback, tyregrip, cutback trees, reflectors on guardrail, chevrons, edge line rumble strips						\$500,000
<b>Option 2: Group A Spot Improvements</b>						
Spot	Location	Phase Cost (\$)				Total Cost (\$)
		Design	Right-of-Way	Utilities	Constr	
A1	East of Cedar Lake to County Line	\$560,000	\$460,000	\$410,000	\$2,400,000	\$3,830,000
A2	Dutchman Creek Area	\$220,000	\$160,000	\$150,000	\$950,000	\$1,480,000
A3	Cochran Dr and East	\$690,000	\$570,000	\$500,000	\$3,000,000	\$4,760,000
A4	KY 623 and East	\$350,000	\$280,000	\$250,000	\$1,500,000	\$2,380,000
A5	KY 1251 and Hunter's Trace Area	\$690,000	\$570,000	\$500,000	\$3,000,000	\$4,760,000
A6	Stumps Lane to Turnpike Ave.	\$2,700,000	\$2,200,000	\$2,000,000	\$11,900,000	\$18,800,000
<b>Total</b>		\$5,210,000	\$4,240,000	\$3,810,000	\$22,750,000	\$36,010,000
<b>Option 3: Group B Spot Improvements</b>						
Spot	Location	Phase Cost (\$)				Total Cost (\$)
		Design	Right-of-Way	Utilities	Constr	
B1	MP 0.70 to MP 0.95	\$290,000	\$240,000	\$210,000	\$1,300,000	\$2,040,000
B2	Waterford Loop to Hickory Woods Dr	\$350,000	\$280,000	\$250,000	\$1,500,000	\$2,380,000
B3	KY 1060 and East	\$760,000	\$460,000	\$410,000	\$3,260,000	\$4,890,000
B4	Akins Rd area	\$580,000	\$470,000	\$420,000	\$2,500,000	\$3,970,000
B5	Carl Monroe Rd/Bennett Spur Area	\$350,000	\$280,000	\$250,000	\$1,500,000	\$2,380,000
B6	River Heights Blvd Area	\$870,000	\$710,000	\$630,000	\$3,800,000	\$6,010,000
<b>Total</b>		\$3,200,000	\$2,440,000	\$2,170,000	\$13,860,000	\$21,670,000

## I INTRODUCTION

The Kentucky State Data Center at the University of Louisville reports that Spencer County has grown 45% in the period from 2000-2010 and Bullitt County has grown 21% in the same period. Within the study limits, KY 44 connects the City of Mt. Washington in Bullitt County to the City of Taylorsville in Spencer County. KY 44 is also known by other names such as Old Mill Rd., Mt. Washington Rd. and Taylorsville Rd in the study area. KY 44 is a major highway corridor leading to Taylorsville Lake State Park just east of the study area. The Park is a prime recreational attraction spread over 1,200 acres and sits on 3,050 acre Taylorsville Lake.

Major growth in residential development has spread along the corridor. Along with the



population growth, traffic volumes have also increased. The Traffic Forecast report conducted for the study area by the Division of Planning, Kentucky Transportation Cabinet (KYTC) used an exponential annual growth rate ranging from 3.5% to 5% to forecast future traffic on KY 44.

There has been notable growth in recreational traffic traveling on KY 44 towards Taylorsville Lake State park. Truck traffic has also grown according

to the traveling public. The current roadway, which was built in 1932, has several horizontal and vertical curve deficiencies. There are many locations with a high crash history.

In June 2005, the Kentucky Transportation Cabinet, Division of Planning completed a study on the KY 44 highway, west of US 31E in Mt. Washington to Shepherdsville (Item 5-150.00). As a continuation, the current planning study investigates improvements east of Mt. Washington at US 31E to KY 1633, just west of Taylorsville.

### A. Study Objectives

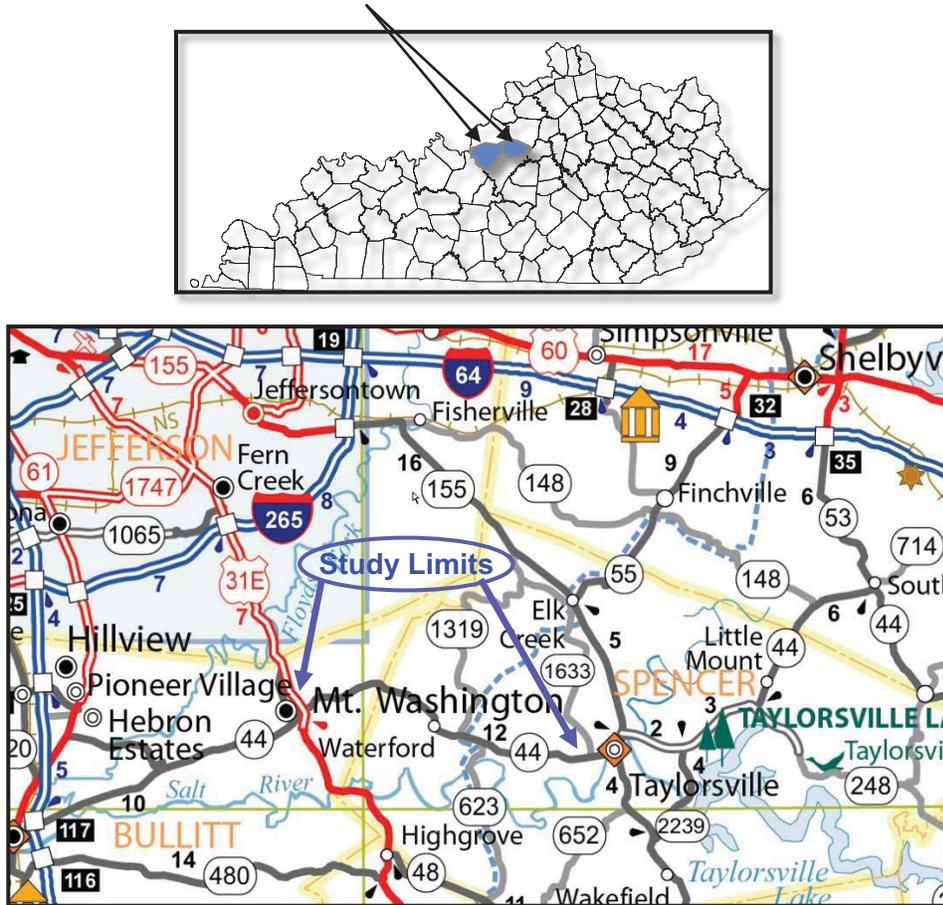
The objectives of the planning study were to analyze the existing conditions and transportation problems, to estimate future travel conditions and to identify and evaluate improvement alternatives for KY 44 from Mt. Washington to Taylorsville. The goals of the study were to improve the safety of the roadway and to provide adequate transportation linkage between the two cities.

The study was established to investigate roadway improvements ranging from short term solutions to an ultimate build alternative for the corridor. It was decided by the project team to involve the public, stakeholders and local officials to gather their input in developing the alternates for the study. Other resource agencies' input was also solicited.

### B. Study Location and Length

The study area is located just outside the limits of the Louisville Urban Area boundary. The west end of the corridor begins at US 31E in Bullitt County. US 31E connects to Interstate 265 (Gene Snyder Freeway) to the north which leads to the City of Louisville. The east end of the study terminates at KY 1633 in Spencer County. Figure 1 below shows the study area location. Exhibit 1 in Appendix A shows the study corridor and major highway crossings.

**Study area location  
Bullitt & Spencer Counties**



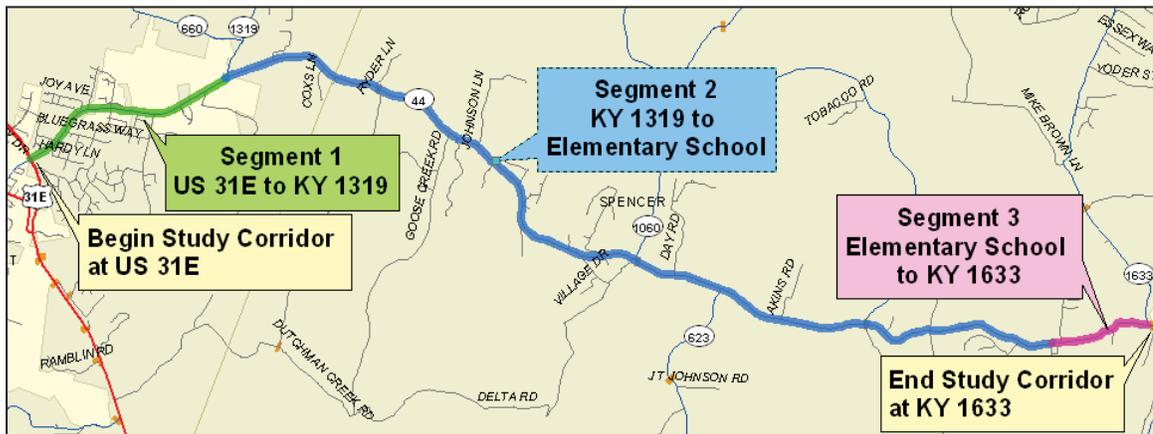
**Figure 1: Study area location**

The length of the project is 11.5 miles. Approximately 3.1 miles of the 11.5 miles of the study corridor is in Bullitt County and 8.4 miles is in Spencer County.

### C. Study Limits and Segments

The study was limited to the section of KY 44 highway from US 31E in Mt. Washington to KY 1633 just west of Taylorsville. Figure 2 below shows the study limits and segments. Exhibit 2 in Appendix A shows the study limits and segments in greater detail. The following is a brief description of the limits of each segment:

- *Segment 1:* This segment extends from US 31E to KY 1319 (also known as King's Church Road) and has a project Item No. 5-347.50. At the time of this study, Phase I Design was completed for this segment. No funds are available for future phases for this segment. Only, funding for the planning study is available.
- *Segment 2:* This segment extends from KY 1319 to the beginning of the three lane section at Spencer County Elementary School. No funds are available for future phases for this segment at the time of this report. Only funding for the planning study is available.
- *Segment 3:* This segment extends from the three lane section at Spencer County Elementary School to KY 1633. Item 5-395.00 is a KYTC project covering this segment. The project has completed Phase I and Phase II Design. At the time of the study, the project was in the right-of-way acquisition stage.



**Figure 2: Study Limits and Segments**

Segment 2 falls in between Segments 1 & 3 which are in various stages of design as mentioned above. For consistency of design along the corridor, recommendations for Segment 2 will take into consideration, the proposed design in Segment 1 and Segment 3 on either sides of the segment. Therefore, all the three segments were included in a combined planning study under Item No. 5-396.00. Also, an Environmental Overview was completed for future improvements to KY 44 for the corridor in October 2008 and is available separately. The route log for KY 44 for study limits is shown in Appendix B.

## D. Programmed Highway Improvements

Funds for the current planning study from US 31E to KY 1633 were authorized in 2007 under Item No. 5-396.00. Funding for the Design phase for Segment 1 was authorized in 2007 and a Phase 1 Design has been completed under Item #5-347.50. There is no funding authorized for any other phases of Segment 1 & 2. Funding for the Design phase of Segment 3 was authorized in 2007 under Item #5-395.00. Right of Way and utility phases were funded in 2011. Table 1 shows the funding for all segments.

**Table 1: Funding for all segments (P–Planning, D–Design, U–Utilities, R–Right of Way)**

<b>Funds for the Planning Study Item 5-396.00 (all segments)</b>						
District	Item Number	Phase	Route	County	Requested Amount	Authorization Date
5	396	P	KY 44	SPENCER BULLITT	\$300,000.00	6/11/2007

<b>Funds for the Design phase of Segment 1 (US 31E to KY 1319)</b>						
District	Item Number	Phase	Route	County	Requested Amount	Authorization Date
5	347.5	D	KY-44	BULLITT	\$1,200,000.00	3/21/2007

<b>Funds for the phases of Segment 3 (Spencer Co. Elementary School to KY 1633)</b>						
District	Item Number	Phase	Route	County	Requested Amount	Authorization Date
5	395	D	KY-44	SPENCER	\$500,000.00	1/8/2007
5	395	U	KY-44	SPENCER	\$695,000.00	6/23/2011
5	395	R	KY-44	SPENCER	\$355,000.00	5/9/2011
5	395	D	KY-44	SPENCER	\$200,000.00	3/1/2011

## II EXISTING CONDITIONS

Exhibit 3 in Appendix A is an aerial map of the study area. Some existing roadway conditions of KY 44 in the study area are identified in the following sections. Included are roadway data and characteristics, bridge data, traffic volumes, Level of Service, composite adequacy rating, volume to service flow ratio, and crash analysis.

## A. Roadway Data

Data for the existing roadway characteristics was obtained from the Division of Planning’s Highway Information System (HIS) database. Archived old plans were also studied for existing conditions. The KY 44 study corridor is a two lane undivided highway for the major part. A segment in front of Spencer County Elementary School towards the east end of the study has three lanes. The following is a summary of information derived from available sources:

### *State System:*

State-maintained roads in Kentucky are classified into six types under the State System, ranging from Supplemental Road to State Primary. In the study area, KY 44 is classified as a State Secondary route.

### *The National Truck Network (NTN):*

The roads in the NTN are those roads specifically designated for use by commercial trucks with increased dimensions (102 inches wide; 13 feet, six (6) inches high; semi-trailers up to 53 feet long; trailers up to 28 feet long – not to exceed two (2) trailers per truck). In the study area, KY 44 is not on the NTN network.

### *The National Highway System (NHS):*

The NHS includes the Interstate highway system and other significant principal arterial roads. In the study area, KY 44 is not on the NHS.

### *Truck Weight Classification:*

The KYTC, Division of Motor Carriers specifies three weight classification limits: 1) AAA – 80,000 lbs. gross vehicle weight; 2) AA – 62,000 lbs. gross vehicle weight; and 3) A – 44,000 lbs. gross vehicle weight. In the study area, the weight classification limit on KY 44 is AAA.

### *Functional Class:*

The functional class of the three segments on KY 44 are listed in the Table 2 below. Exhibit 4 in Appendix A shows the mile point locations within the study area.

**Table 2: Study mile points and Functional Class**

	<b>Segment 1</b>	<b>Segment 2</b>		<b>Segment 3</b>
<b>Mile Point</b>	23.255-25.276	25.276-26.286	0 - 7.500	7.500 - 8.451
<b>County</b>	Bullitt	Bullitt	Spencer	Spencer
<b>Functional Class</b>	Urban principal arterial ends 24.550, then rural minor arterial	Rural minor arterial	Rural minor arterial	Rural minor arterial

KY 44 is not on a Scenic Highway and is also not on a Coal Haul Route in the study area.

## B. Roadway Characteristics

KY 44 is a two lane undivided roadway with narrow shoulders. Some areas are level while other areas are rolling. The roadway was originally built in 1932. The roadway is characterized by several horizontal curves and vertical grades. Sight distance, both horizontal and vertical, is limited at several locations.

The roadway is bituminous pavement and has the following characteristics:

**Table 3: Roadway Characteristics**

	<b>Segment 1 (US 31E to KY 1319)</b>	<b>Segment 2 (KY 1319 to Spencer Co. Elem. School)</b>	<b>Segment 3 (Spencer Co. Elem School to KY 1633)</b>
<b>County</b>	Bullitt	Bullitt & Spencer	Spencer
<b>Mile Point</b>	23.255-25.276	25.276-26.286 (Bullitt) 0 - 7.500 (Spencer)	7.500 - 8.451
<b>Total Lanes</b>	2	2	2-3
<b>Lane Width</b>	10 ft - 12 ft	10 ft	10 ft
<b>Shoulder Width</b>	4 ft	3 ft	3 ft
<b>Posted Speed</b>	35 - 55 mph	55 mph	35 - 45 mph

### *Horizontal and Vertical Curves:*

The roadway was built in 1932. The present day design standards places several horizontal curves (18) in grade class C (5.5-8.4 degrees) or worse as shown in Table 4.



Photo No. 2 – Horizontal curve east of Hunters Trace Rd

vicinity of the poor vertical grade does not meet the current standards which compounds the driving problems in these areas. Exhibit 5 in Appendix A shows the locations where horizontal curves and vertical grades are below current standards. Exhibit 6 in Appendix A is a topographic map of the study area.

Several vertical curves (16) in the study area are at or below grade class D (4.5-6.4%) as seen in Table 5 below. The vertical curves do not meet the current standards for the sight distance for the design speed of the roadway. In some cases, the horizontal curvature in the



Photo No. 3 – Vertical grade just west of Coxs Lane

**Table 4: Horizontal curves in the study area**

Route	County	Begin MP	End MP	Grade Class	Degree of Curvature
KY 0044	Bullitt	25.216	25.306	A	2.6
KY 0044	Bullitt	25.306	25.678	A	0.1
KY 0044	Bullitt	25.678	25.776	A	3
KY 0044	Bullitt	25.776	25.98	A	0.2
KY 0044	Bullitt	25.98	26.081	D	9.8
KY 0044	Bullitt	26.081	26.168	A	0
KY 0044	Bullitt	26.168	26.286	B	4.1
KY 0044	Spencer	0	0.137	A	0.4
KY 0044	Spencer	0.137	0.275	A	2
KY 0044	Spencer	0.275	0.322	A	0
KY 0044	Spencer	0.322	0.398	C	7.8
KY 0044	Spencer	0.398	0.472	A	0.3
KY 0044	Spencer	0.472	0.614	A	3.1
KY 0044	Spencer	0.614	0.717	A	0
KY 0044	Spencer	0.717	0.884	C	6.8
KY 0044	Spencer	0.884	1.067	A	0
KY 0044	Spencer	1.067	1.119	B	3.9
KY 0044	Spencer	1.119	1.207	A	0
KY 0044	Spencer	1.207	1.32	B	4.4
KY 0044	Spencer	1.32	1.386	A	0
KY 0044	Spencer	1.386	1.521	B	3.7
KY 0044	Spencer	1.521	1.588	A	0
KY 0044	Spencer	1.588	1.684	A	1.7
KY 0044	Spencer	1.684	1.935	A	0
KY 0044	Spencer	1.935	2.038	C	5.7
KY 0044	Spencer	2.038	2.091	A	0
KY 0044	Spencer	2.091	2.198	B	3.9
KY 0044	Spencer	2.198	2.237	A	0
KY 0044	Spencer	2.237	2.422	C	6
KY 0044	Spencer	2.422	2.499	A	0.9
KY 0044	Spencer	2.499	2.57	D	8.8
KY 0044	Spencer	2.57	2.634	B	4.2
KY 0044	Spencer	2.634	2.962	A	0.1
KY 0044	Spencer	2.962	3.115	B	4.3
KY 0044	Spencer	3.115	3.265	A	0
KY 0044	Spencer	3.265	3.437	B	4.4
KY 0044	Spencer	3.437	3.671	A	0.1
KY 0044	Spencer	3.671	3.834	B	3.8

Grade Class	Degree of Curvature (degrees)
C	5.5-8.4
D	8.5-13.9
E	14.0-27.9
F	28+

*Highlighted in red are grade class C or greater horizontal curves. For rural arterial roads, at 55 mph speed, assuming 6% superelevation, grade class C or higher is not recommended for new construction.*

Continued... Table 4: Horizontal curves

Route	County	Begin MP	End MP	Grade Class	Degree of Curvature
KY 0044	Spencer	3.834	4.01	A	2.5
KY 0044	Spencer	4.01	4.281	A	0
KY 0044	Spencer	4.281	4.342	A	0
KY 0044	Spencer	4.342	4.458	A	3.4
KY 0044	Spencer	4.458	4.634	A	0.5
KY 0044	Spencer	4.634	4.776	B	4.6
KY 0044	Spencer	4.776	5.286	A	0
KY 0044	Spencer	5.286	5.388	B	4.2
KY 0044	Spencer	5.388	5.564	A	0
KY 0044	Spencer	5.564	5.63	B	4.1
KY 0044	Spencer	5.63	5.666	A	0
KY 0044	Spencer	5.666	5.742	A	0
KY 0044	Spencer	5.742	5.869	C	6.4
KY 0044	Spencer	5.869	5.929	A	0
KY 0044	Spencer	5.929	6.04	E	14
KY 0044	Spencer	6.04	6.09	A	0
KY 0044	Spencer	6.09	6.204	B	3.6
KY 0044	Spencer	6.204	6.271	A	0
KY 0044	Spencer	6.271	6.327	C	6.2
KY 0044	Spencer	6.327	6.382	A	0
KY 0044	Spencer	6.382	6.433	C	6.1
KY 0044	Spencer	6.433	6.728	A	0.1
KY 0044	Spencer	6.728	6.838	C	7.4
KY 0044	Spencer	6.838	6.973	A	0.3
KY 0044	Spencer	6.973	7.04	C	5.7
KY 0044	Spencer	7.04	7.093	A	0
KY 0044	Spencer	7.093	7.172	B	5.4
KY 0044	Spencer	7.172	7.234	A	0
KY 0044	Spencer	7.234	7.338	C	7.8
KY 0044	Spencer	7.338	7.445	A	1.8
KY 0044	Spencer	7.445	7.835	A	0.1
KY 0044	Spencer	7.835	7.909	C	7.5
KY 0044	Spencer	7.909	7.957	A	0
KY 0044	Spencer	7.957	8.032	C	7
KY 0044	Spencer	8.032	8.103	D	13.7
KY 0044	Spencer	8.103	8.17	E	21
KY 0044	Spencer	8.17	8.245	C	6.4
KY 0044	Spencer	8.245	8.318	B	5.4
KY 0044	Spencer	8.318	8.397	A	0
KY 0044	Spencer	8.397	8.496	A	0

**Table 5: Vertical grades in the study area**

Route	County	Begin	End	Grade Class
KY 0044	Bullitt	23.195	23.255	A
KY 0044	Bullitt	23.255	23.335	A
KY 0044	Bullitt	23.335	23.545	B
KY 0044	Bullitt	23.545	23.705	B
KY 0044	Bullitt	23.705	24.205	B
KY 0044	Bullitt	24.205	24.385	A
KY 0044	Bullitt	24.385	24.615	B
KY 0044	Bullitt	24.615	24.765	B
KY 0044	Spencer	0	0.073	B
KY 0044	Spencer	0.073	0.12	E
KY 0044	Spencer	0.12	0.48	D
KY 0044	Spencer	0.48	0.82	E
KY 0044	Spencer	0.82	1.18	C
KY 0044	Spencer	1.18	1.31	D
KY 0044	Spencer	1.31	1.41	E
KY 0044	Spencer	1.41	1.73	C
KY 0044	Spencer	1.73	1.85	B
KY 0044	Spencer	1.85	2.18	C
KY 0044	Spencer	2.18	2.39	B
KY 0044	Spencer	2.39	2.67	E
KY 0044	Spencer	2.67	2.85	C
KY 0044	Spencer	2.85	2.94	B
KY 0044	Spencer	2.94	3.09	E
KY 0044	Spencer	3.09	3.21	C
KY 0044	Spencer	3.21	3.32	B
KY 0044	Spencer	3.32	3.41	C
KY 0044	Spencer	3.41	3.51	E
KY 0044	Spencer	3.51	3.62	A
KY 0044	Spencer	3.62	3.79	E
KY 0044	Spencer	3.79	3.95	B
KY 0044	Spencer	3.95	4.09	B
KY 0044	Spencer	4.09	4.18	B
KY 0044	Spencer	4.18	4.38	C
KY 0044	Spencer	4.38	4.502	B
KY 0044	Spencer	4.502	4.68	B
KY 0044	Spencer	4.68	4.99	C
KY 0044	Spencer	4.99	5.1	C
KY 0044	Spencer	5.1	5.27	C

Route	County	Begin	End	Grade Class
KY 0044	Spencer	5.1	5.27	C
KY 0044	Spencer	5.27	5.34	B
KY 0044	Spencer	5.34	5.43	C
KY 0044	Spencer	5.43	5.73	E
KY 0044	Spencer	5.73	5.8	B
KY 0044	Spencer	5.8	6.23	D
KY 0044	Spencer	6.23	6.35	B
KY 0044	Spencer	6.35	6.42	E
KY 0044	Spencer	6.42	6.49	D
KY 0044	Spencer	6.49	6.62	E
KY 0044	Spencer	6.62	6.69	E
KY 0044	Spencer	6.69	6.88	B
KY 0044	Spencer	6.88	7.06	B
KY 0044	Spencer	7.06	7.21	C
KY 0044	Spencer	7.21	7.3	B
KY 0044	Spencer	7.3	7.46	D
KY 0044	Spencer	7.46	7.65	C
KY 0044	Spencer	7.65	7.7	B
KY 0044	Spencer	7.7	7.8	C
KY 0044	Spencer	7.8	7.88	C
KY 0044	Spencer	7.88	8.05	D
KY 0044	Spencer	8.05	8.14	B
KY 0044	Spencer	8.14	8.19	C
KY 0044	Spencer	8.19	8.27	B
KY 0044	Spencer	8.27	8.54	B

Grade Class	Grade
D	4.5 to 6.4%
E	6.5 to 8.4%
F	8.5 +

*Highlighted in red are grade class D or higher grades. For rural arterial roads, maximum recommended vertical percent grade on rolling terrain is 5% for a speed of 55 mph.*

### C. Bridges

There are three structures within the study limits that are classified as bridges. These are located approximately at MP 0.4, Dutchman Creek; at MP 3.5, Plum Creek and at MP 5.7, Elk Creek in Spencer County. All three creeks are classified as Blueline streams. Wetland impacts are likely at two locations along the streams at Plum Creek and Elk Creek. Table 6 is a summary of these bridges derived from Bridge Inspection Reports. The bridge at Dutchman Creek is not structurally deficient or functionally obsolete. The bridges at Plum Creek and Elk Creek are not structurally deficient, however, they are functionally obsolete. A bridge structure with a Sufficiency Rating below 50.0 is considered for possible replacement by the Transportation Cabinet using federal bridge funds. Based on this, none of the bridges are eligible for replacement at this time.

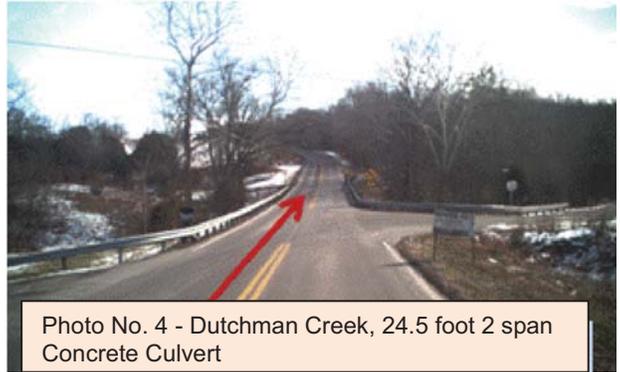


Photo No. 4 - Dutchman Creek, 24.5 foot 2 span Concrete Culvert

A fatal crash was recorded at the Dutchman Creek culvert in 2007. The narrow bridge, the geometry of the roadway in this section combined with intersecting roadways (one of them being at a skew) are some of the contributing factors for crashes in this area.

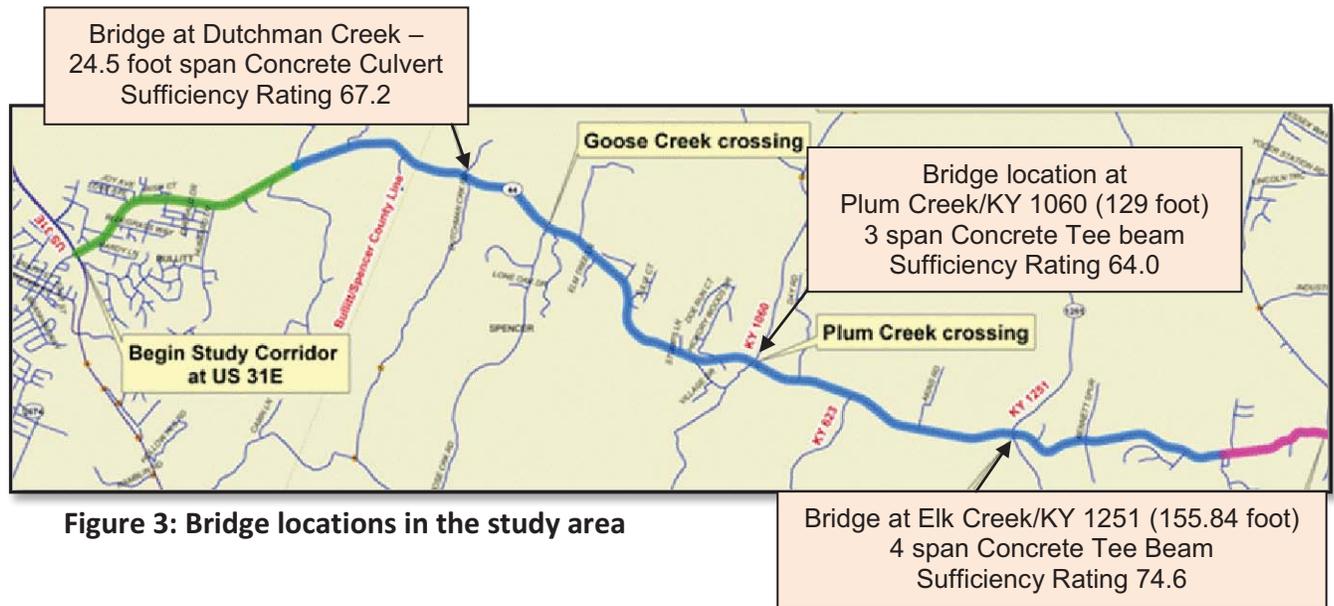


Figure 3: Bridge locations in the study area

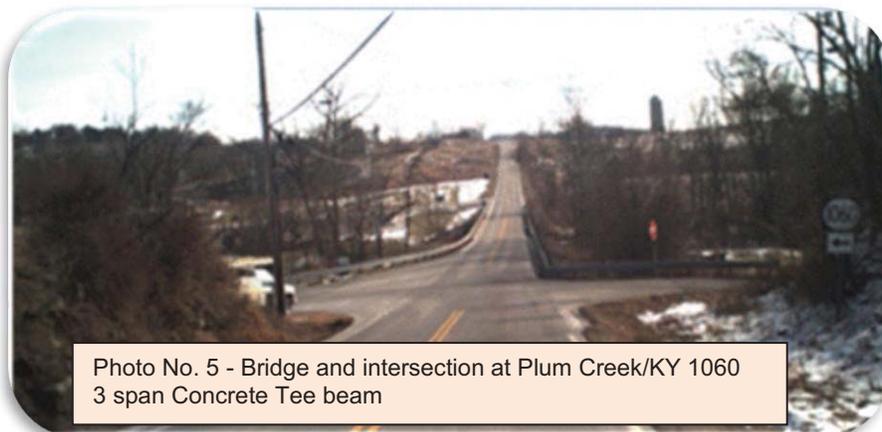


Photo No. 5 - Bridge and intersection at Plum Creek/KY 1060 3 span Concrete Tee beam



**Table 6: KY 44 study area bridge structures**

Bridge	Structure #	Structure	Mile Point*	Sufficiency Rating	Functionally Obsolete	Structurally Deficient
Dutchman Creek	108B00009N	Concrete Culvert	0.418	67.20	No	No
KY 1060, Plum Creek	108B00008N	3 span Concrete Tee Beam	3.532	64.60	Yes	
KY 1251, Elk Creek	108B00007N	4 span Concrete Tee Beam	5.732	74.60	Yes	

\* mile points are in Spencer county

The common concern expressed by some of the drivers about the bridges was that they are too narrow. With an increase in recreational traffic and heavy vehicles, the narrow bridges are a concern. The right turn from Waterford Loop to KY 44 going east was mentioned as a problem by drivers. Similar problems exist at the Elk Creek bridge. The turning maneuver from Murray Road onto KY 44 (where Elk Creek bridge exists) traveling east is very difficult. The turning radius and sight distance are inadequate at these locations.

Another concern is the steep grades at some of the bridge locations. There are steep grades (Class E) on either sides of the Plum Creek bridge. There are no climbing lanes currently. Also, there is a park entrance to Waterford Park immediately at the east end of the bridge which has seen some crashes. Waterford Park is classified as a 4(f) and a 6(f) resource. Plum Creek is in a floodplain in the project area. A small area at Elk Creek is in a floodplain. Bridge inventory and inspection reports for the three bridges are attached in Appendix C.

#### D. Traffic Volumes and Level of Service

**Traffic Volumes:** A traffic forecast report was developed for the study corridor by the Division of Planning, KYTC in December 2009. The forecast report provided current year traffic volumes in 2009, predicted growth rates for future traffic and also provided truck traffic percentages for the corridor. 2009 traffic volumes and projected 2035 traffic volumes are shown in Exhibit 7 in Appendix A. Forecasted traffic volume growth rates varied from 3.5% to 5%.

The traffic volumes are the highest at the beginning of the study area in Mt. Washington between US 31E and Hubbard Lane. 2009 Average Daily Traffic (ADT) in this segment is in the range of 10,000-12,000. This segment has businesses, residences, Bullitt East High School and Old Mill Elementary School. US 31E at the west end of this segment connects to Gene Snyder Freeway to the north. The forecasted 2035 ADT in this segment is in the range of 24,500-29,400. The next segment from Hubbard Lane to KY 1319 has a 2009 ADT volume of 7000. The traffic volume falls eastwards on KY 44 from KY 1319. Between KY 1319 and KY 1633, 2009 traffic volumes are in the range of 3150-4700.

**Truck Volumes:** Based on the traffic forecast report, 2009 truck percentages varied from 8.6% to 11.9%. Truck percent growth rates varied from 1% to 1.5%. The truck growth rates correspond to 4% to 6.1% truck volume rates along KY 44.

**Level of Service:** 2009 traffic volumes and projected 2035 traffic volumes were used to determine Levels of Service. The Highway Capacity Software (HCS) 2000 was used to compute Levels of Service (LOS). According to the methodology there are two classes of roadways: Class I highways include higher speed primary arterials while Class II highways are lower speed that serve as access routes to Class I facilities. KY 44 in the study area is a Class I highway. LOS D is considered acceptable in urban areas and LOS C is considered acceptable in rural areas.

Level of Service is a qualitative measure of highway traffic conditions. Level of Service is based on speeds, travel time and roadway geometry among other parameters. There are six (6) levels of service from A to F. LOS F is a breakdown in flow conditions while LOS A is a free flow condition.

LOS analysis for 2009 traffic volumes and projected LOS for 2035 traffic, assuming no roadway improvements, was performed. Exhibit 7 in Appendix A shows the current and 2035 LOS along different sections. Appendix D contains the HCS analysis for various segments.

In Mt. Washington, between US 31E and KY 1319, all segments were operating at LOS D in 2009. If no roadway improvements are made, a LOS F can be expected between US 31E and Hubbard Lane in 2035. The high traffic volumes seen currently and forecasted traffic growth will degrade the traffic conditions to breakdown flow if no improvements

are made in this segment. From Hubbard Lane to KY 1319, if no roadway improvements are in place, in 2035, a LOS E is expected.

Between KY 1319 and KY 1633, for 2009 traffic, a LOS C was calculated. If no improvements are undertaken, LOS D can be expected by 2035 in this segment.

**E. Composite Adequacy Rating**

Composite Adequacy Rating compares a particular roadway section to other Kentucky roads in the same functional class. Exhibit 8 in Appendix A shows the rating for various segments of KY 44 in the study area. Based on these ratings, it can be noted that the roadway in the study area falls in the lower 25% of roads of similar functional class in the state.

Composite Adequacy Rating is calculated by individual functional class and based upon three roadway components (safety, service, and condition) with each component comprised of several measures. The rating scores 100 as a perfect, or near perfect, highway. For example, a road section with a composite adequacy percentile of 75.0 means that 25% of the roads are rated better in that functional class.

**Table 7: Composite Adequacy Rating Percentile**

From Mile Point	To Mile Point	County	Composite Adequacy Rating Percentile
23.255	24.55	Bullitt	12.58
24.55	26.286/County line	Bullitt	19.51
0	8.451	Spencer	23.40

**F. Volume to Service Flow Ratio**

Volume to Service Flow (VSF) ratio is a measure of congestion. Exhibit 9 in Appendix A shows the VSF values for various segments of KY 44 in the study area. VSF for the roadway in the study corridor does not exceed 0.39. There are currently no congestion issues.

VSF is the ratio of a facility’s actual vehicular traffic volume to its theoretical maximum potential vehicular traffic volume. The closer the VSF ratio is to 1.0, the closer the roadway is to capacity. Generally, a ratio higher than 0.70 indicates traffic volumes are approaching congested conditions.

## G. Crash Analysis

Safety on KY 44 in the project study area was investigated by conducting a crash analysis. The crash analysis is helpful in identifying roadway sections with abnormally high crash rates. Crash data was obtained from Kentucky State Police database and analyzed. Historical crash data was collected for a period from 2006 to 2010.

The CRF is the ratio of the actual crash rate on a segment of highway for a given time period as compared to the average crash rate for other similar roads in Kentucky. A CRF greater than 1.00 indicates the segment of roadway has a statistically significant number of crashes and they may not be occurring at random.

The Critical Rate Factor (CRF) methodology procedure of Kentucky Transportation Center was utilized. The CRF is the ratio of the actual crash rate compared to the critical crash rate for roads of similar functional class in Kentucky. The critical crash rate is determined by a statistical calculation based on the average crash rate for roads of similar functional class in Kentucky. A CRF greater than or equal to 1.00 indicates a segment or spot where crashes may not be occurring randomly, with a probability of 0.995. Crash rates were computed for various sections on KY 44 in the study corridor. As seen in Table 8, there are four segments with CRF close to or exceeding 1.00. Exhibit 10 in Appendix A shows the CRF of Sections on KY 44.

**Table 8: Critical Rate Factor of Sections**

County	Mile point	AADT	Functional Class Rate	Total No. Accidents	Section Length (miles)	Critical Accident Rate	Total Accident Rate	Critical Rate Factor
Bullitt	23.255-23.280	12000	314	16	0.025	1263	4871	3.86
Bullitt	23.280-23.385	12000	314	9	0.105	739	652	0.88
Bullitt	23.385-24.135	11000	314	42	0.75	471	465	0.99
Bullitt	24.135-24.550	11000	314	1	0.415	528	20	0.04
Bullitt	24.550-25.276	7000	213	10	0.726	381	180	0.47
Bullitt	25.276-26.286	4000	213	18	1.01	403	407	1.01
Spencer	0.000-3.510	4000	213	38	3.51	312	247	0.79
Spencer	3.510-4.335	3500	213	3	0.825	440	95	0.22
Spencer	4.335-7.440	3150	213	30	3.105	333	280	0.84
Spencer	7.440-7.740	3150	213	3	0.3	631	290	0.46
Spencer	7.740-8.400	4700	213	16	0.66	432	471	1.09
Spencer	8.400-8.451	4700	213	1	0.051	1137	381	0.33

A tenth mile crash analysis was conducted. There were several locations with CRF more than 1. These are shown in Exhibit 11 in Appendix A. One spot in Mt. Washington near US 31E had a CRF over 2.0. The curve at Green Acre Dr. at the east end of the study area had also a CRF over 2.0. Exhibit 12, 13, 14 shows the crashes in the study area in different formats. Figures 4 & 5 show the crash type by percentage in both the counties in the study area.

*Some Crash Observations:*

Rear end crashes were the majority of crashes at the west end of the study area between US 31E and the County line. From the County line to the east end of the study area, the majority of crashes were single vehicle crashes. There were two fatal crashes in the study area located at MP 0.418 at Dutchman Creek bridge and MP 8.417 at the east end of the study. More details of the crashes are discussed in the project descriptions in Section IX.

**III THE STUDY METHODOLOGY**

Data collection and its identification was the first step in the study for the corridor. Existing data was collected from Division of Planning Highway Information Systems (HIS) data. Additional project information was derived from old plans. Project video was obtained by driving the project in both directions. A project team was assembled. Study feedback was derived from local Officials, stakeholders and the public.

**A. Project Team and Study Goals**

The project team included the KYTC Division of Planning staff, KYTC District 5 staff and KIPDA Transportation Planning staff. All project team meetings were held at the KYTC District 5 Office in Louisville. The project team’s tasks were to evaluate the roadway conditions, analyze the current and future traffic, conduct periodic meetings and propose recommendations. The project team developed a Draft Purpose and Need which is outlined in Section IV. The project team identified a number of alternates with the input of local Officials, stakeholders, and the public by conducting meetings with them at the preliminary study stage and later when the alternates were developed.

The goals for the KY 44 study were as follows:

- Improve safety along the KY 44 Corridor.

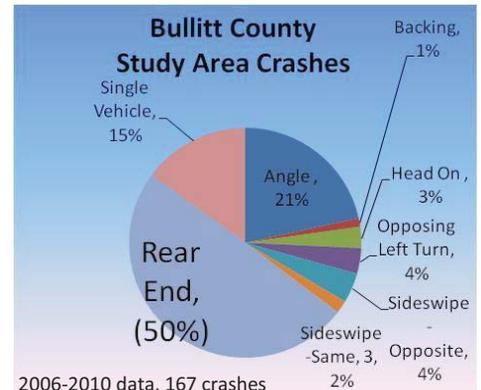


Figure 4: US 31E to County line crashes

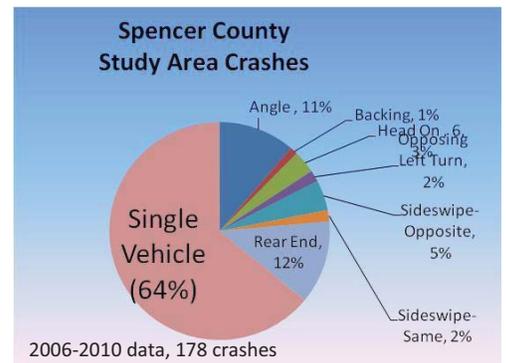


Figure 5: County line to KY 1633 crashes

- Provide alternatives to improve the geometrics of the roadway to current design standards meeting current and future traffic growth and providing opportunities to pass.
- Provide a roadway that can accommodate recreational vehicles and commercial vehicles.

## **B. Public Involvement**

Public opinion was considered very critical in developing roadway improvements to the KY 44 corridor. The project team decided to involve the public as they are the users of the roadway on a daily basis and are best informed of the roadway conditions.

Public input was requested throughout the study process. Project information was posted on the KYTC Division of Planning website. Project feedback was also solicited by mail.

### ***Public Meetings and Local Officials and Stakeholders Meetings:***

Local Officials, stakeholders and the public were engaged throughout the study. The project team met the local Officials and stakeholders in formal meetings initially to inform about the proposed study and later when the alternates were developed. As the study is in two counties, Senators, County Judge Executives, Mayors of Bullitt and Spencer counties were some of the public Officials who participated. Stakeholders such as representatives from schools, police and fire departments and other local government agencies such as County Economic Development, County Road Department participated in meetings and provided input. Attendees at these meetings and meeting minutes are attached in Appendix E.

Closely following the local Officials and Stakeholders Meetings, Public Meetings were conducted. The meetings were advertised in local newspapers of both counties and posted on the KYTC website. Variable message signs were placed at strategic locations along KY 44 for the first meeting, informing the public about the meeting. However, variable message signs were not available for the second meeting. At the first Public Meeting, survey forms were provided and several completed surveys were received at the meeting and following the meeting. After the alternates were developed, a second Public Meeting was conducted. The public was given an opportunity to prioritize the short term alternates. Section III.C below lists the dates these meetings were held with a brief description of these meetings. Public Meeting folders were developed for the two public meetings and are available separately.

## **C. Study Meetings**

Three types of meetings were conducted as part of the study – Project Team meetings, Local Officials and Stakeholders Meetings and Public Meetings. The study involved three Project Team meetings, two Local Officials and Stakeholders meetings and two Public Meetings. Meeting minutes can be seen in Appendix E. A summary of the major topics discussed at each meeting follows:

*March 2, 2010, 1<sup>st</sup> Project Team Meeting:*

After initial project information was collected and exhibits developed, a project team meeting was conducted. The team decided that the study limits would extend from US 31E to KY 1633. Existing conditions were discussed. Project scope was discussed and a purpose and need statement was drafted. The Environmental Overview report completed in 2008 by HMB Consultants was discussed. Public involvement, proposed geometry standards and project schedule were discussed.

*May 7, 2010, 1<sup>st</sup> Local Officials and Stakeholders Meeting:*

Judge Executives, Mayors of both the counties, Magistrates, City Commissioners, some land owners, representative from schools, KIPDA planning and KYTC staff participated. The study and the project team were introduced. Existing conditions, project scope and the Draft Purpose and Need statement of the study were presented. Suggestions for roadway improvements were taken. Questions about forthcoming projects were answered. Several locations with driving concerns were identified and brought to the attention of the project team at this meeting.

*August 19, 2010, 1<sup>st</sup> Public Information Meeting:*

This meeting was held to inform public of the planning study and request their input for improving the KY 44 Corridor within the project limits. Survey forms were completed by the public. The project team interacted with the public and their suggestions for improvements were documented.

*September 7, 2011, 2<sup>nd</sup> Project Team Meeting:*

Using the input gathered from Local Officials' and Stakeholders' Meeting and Public Meetings, possible improvement alternates to the corridor were developed and were discussed at a second project team meeting by the project team. A no build alternate, Long Term Ultimate Build alternate and Short Term Spot Improvements were discussed. Interim Low Cost Improvements and Spot Improvements were discussed. At the end of the meeting, it was decided that the proposed alternates should be presented to local Officials and stakeholders and the public.

*November 14, 2011, 2<sup>nd</sup> Local Officials and Stakeholders Meeting and 2<sup>nd</sup> Public Meeting:*

These meetings were conducted on the same day at two different times. At these meetings, the proposed improvement alternates were presented. Ranking sheets for Short Term Spot Improvements were distributed. All attendees were requested to prioritize the projects and provide their feedback.

*December 16, 2011, 3<sup>rd</sup> Project Team Meeting:*

The project team met for a third time after the 2<sup>nd</sup> Local Officials & Stakeholders meeting and 2<sup>nd</sup> Public Meeting to review prioritization from those meetings. That information was combined with other factors such as roadway geometric

deficiencies and crashes. Final project prioritization was chosen by the project team considering all the above factors.

#### **IV DRAFT PURPOSE AND NEED STATEMENT**

The project team drafted a Purpose and Need statement at the 1<sup>st</sup> Project Team meeting. The purpose of the project is to improve the safety of the road and to provide adequate transportation linkage between the Cities of Mt. Washington and Taylorsville.

Improvements to the study corridor were considered because of crash concerns, less than standard roadway geometry, and the need to provide an adequate transportation system for schools, commuters, emergency services and recreational traffic traveling to Taylorsville Lake State Park.

#### **V ENVIRONMENTAL OVERVIEW**

##### *Environmental Overview*

An Environmental Overview was prepared for the Transportation Cabinet by HMB Consultants. The findings were summarized in a report titled “Environmental Overview for Future Improvements to KY 44”, October 2008 and is attached to this report as Appendix F. Potential environmental impacts to farmland, Section 6(f) and 4(f) resources, Cultural and Historic sites, Aquatic and Terrestrial resources were covered in the report. Environmental Justice was covered under socioeconomic impacts. Responses from some State agencies commenting on proposed improvements were attached in the report.

**Land Use:** Agricultural land use is widespread; however, residential development is ongoing and replacing farming activities. Some commercial land use change is occurring, but is located primarily in the area just east of Mt. Washington.

**Farmland:** Half of the comprehensive project corridor is situated on land that is classified as prime and unique farmland.

**Economic Data:** Some major manufacturers are present in Bullitt County. No major manufacturers are identified in Spencer County.

**Social Institutions:** Cemeteries, Churches and Schools exist within the study corridor.

**Section 6(f) Resources:** Waterford Community Park is the only possible site that has received Land and Water Conservation Fund monies that could be affected.

**Section 4(f) Resources:** Waterford Community Park is a Public park in Spencer County. Any right of way acquisition of the property will be considered a Section 4(f) impact.

**Cultural/Historic Resources:** The potential for eighteen sites that are eligible for the National Register of Historic places exists throughout the corridor.

**Archaeological Resources:** A total of two previously identified archaeological surveys and 52 potentially historic sites are located within this project area.

**Floodplain Encroachment:** Two Zone A floodplain areas along Plum Creek and Elk Creek exists just west of the City of Taylorsville.

**Stream Crossings:** The project has potential to cross approximately six perennial streams. These are Little Dutchman Creek, Dutchman Creek, Goose Creek, Plum Creek, Elk Creek and Pond Creek.

**Wetlands:** It appears that 20 - 24 wetlands classified as PUBHh are located within or adjacent to the project corridor.

**Threatened and Endangered Species:** The federally listed endangered Indiana bat is identified as occurring in both counties within the project area. Potential summer roosting and foraging habitat occurs throughout the corridor within forested habitats. The Gray bat is also listed as occurring in both counties in the project area. Potential summer foraging habitat exists in the project area especially along the perennial stream corridors. No caves were identified within the project area. It is unlikely that freshwater mussels would be found in the area streams due to lack of suitable habitat. The area streams lack depth, riffles and pools and other features that typically support freshwater mussel populations. Running Buffalo Clover is listed as potentially occurring in Spencer County only. The Glade Cress has been found in areas near US 31E in the westernmost portion of the corridor and was observed historically in Spencer County.

**Karst Features/Sinkholes:** The project areas are located in low to moderate risk areas for Karst features. An area in the middle of the project corridor features a large sinkhole just south of existing KY 44.

**Hazardous Materials and Underground Storage Tanks (UST's):** An active gasoline/convenience store with three UST's exists near the western terminus. One possible site might exist in the Spencer County. There were some 55 gallon

drums found at two residences. The drums carried a product “Line X” at one of the residences.

**Air Quality:** Bullitt County is located within the Louisville Air Quality Control Region, and has been designated as a non-attainment area for the Ozone 8-hour standard and for PM-2.5. Spencer County is considered in attainment for all transportation-related pollutants.

**Traffic Noise:** Future traffic noise levels in the study area could approach or exceed regulatory thresholds for which noise abatement considerations are appropriate at individual receivers. A traffic noise analysis, including a cost analysis of noise barriers and other forms of abatement considerations for impacted receivers could be necessary for residential and church facilities in the project area.

**Environmental Justice:** Low income neighborhoods, family clusters or evidence of socially interdependent communities might exist within two areas of the project corridor. One area is located within the Waterford Loop and the other is the Stumps Mobile Home Park on Stumps Lane. Site visits indicated that between 50 and 60 homes exist south of KY 44 within and surrounding the Waterford Loop and an estimated 25% to 30% of these homes appear to be occupied by low-income residents.

## VI GEOTECHNICAL OVERVIEW

The KYTC Division of Structural Design, Geotechnical Branch conducted a geotechnical review. The complete review is attached in Appendix G. A summary of the review follows.

The study area is within the Outer Blue Grass Physiographic Region of Kentucky. This Region is known to contain carbonate units able to produce sinkholes, caves, sinking streams and springs. Geologic mapping indicates the project traverses across multiple rock formations including the Laurel Dolomite; Osgood and Brassfield Formations; Saluda Dolomite, Bardstown Member, and Rowland Member of the Drakes Formation; Grant Lake Limestone; Calloway Creek Limestone and Clays Ferry Formation. These rock formations range in composition from limestone/dolomite with minor amounts of shale, interbedded limestone and clay shale varying from 40% to 90% limestone, to highly erodible clay shale with minor dolomite.

Geotechnical Concerns:

1) Alluvium and lacustrine deposits consisting of silt, clay, gravel and sand are found in valleys along the creeks and rivers. Lacustrine deposits are considered highly erodible and may require slope protection for cut sections and around any

structures. Due to anticipated depths of these deposits (0-70'+), bridge piers located in these areas may need to be founded on drilled shafts or piles.

2) The Osgood Formation, found west of the Bullitt/Spencer County Line, consists of erodible clay shale. This shale has very poor engineering characteristics and may result in flatter than normal cut slopes and fills. Osgood Formation shale is not desirable for embankment construction and embankments should be constructed out of durable material if available.

3) The project is located in an area of low to moderate karst potential. Numerous sinkholes in the Laurel Dolomite Formation have been identified on the geologic map. Sinkholes, caves and variable rocklines are also common in the upper part of the Calloway Creek Limestone, the upper part of the Saluda Dolomite Member and near the contact of the Bardstown and Rowland Members of the Drakes Formation. Springs and wet hillside conditions may be encountered at the base of the Laurel Dolomite. Springs and seeps are likely in the lower parts of the Saluda Dolomite and Rowland Members.

4) Abandoned and operating quarries may be found in the Calloway Creek Limestone and Saluda Dolomite and Rowland Members of the Drakes Formation.

5) This project is in a classified seismic zone 2, which is defined as an area of moderate earthquake damage due to earthquake activity.

## **VII RESOURCE AGENCY INPUT COORDINATION**

Selected federal, state and local agencies were contacted as part of the planning study to derive their input on the proposed improvements. Each of the agencies received a set of maps showing the project limits, some existing conditions and proposed improvements. Responses from agencies are attached in Appendix H. The following is a summary of responses received from some agencies:

### **Cabinet for Economic Development, Commonwealth of Kentucky, February 17, 2012**

The Cabinet did not see any negative impact on the industrial sites in both the counties. In fact, they see potential positive impacts by improving safety and functionality of the roadway as it will improve truck access to both communities.

### **Division for Air Quality, Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Commonwealth of Kentucky, March 6, 2012**

Kentucky Division for Air Quality Regulations 401 KAR 63:010 and 401 KAR 63:005 apply to the proposed project.

The project must meet the conformity requirements of the Clean Air Act as amended and the transportation planning provisions of Title 40 of United States Code and be compliant with applicable local government regulations.

**Kentucky Department of Fish & Wildlife Resources (KDFWR), Tourism, Arts, and Heritage Cabinet, February 20, 2012**

Federally endangered Indiana bat (*Myotis sodalis*), Fanshell (*Cyprogenia stegaria*), Clubshell (*Pleurobema clava*), and Pink Mucket (*Lampsilis abrupta*) are known to occur within close proximity to the project site. Additionally, both the western and eastern ends of the project (from the beginning of the study corridor to Goose Creek Rd and Bennett Spur to the end of the study corridor) fall within known maternity summer habitat for the Indiana bat according to the U.S. Fish and Wildlife Service Kentucky Field Office (USFWS KFO). The proposed project has the potential to impact wetland habitats. If impacts cannot be avoided, mitigation should be properly designed and proposed to offset the losses. KDFWR will recommend, at a minimum, a 2: 1 mitigation ratio for any permanent loss or degradation of wetland habitats.

Additionally, the KDFWR recommends measures for any work that may occur within a stream to help reduce impacts to the aquatic environment. To minimize indirect impacts to aquatic resources, strict erosion control measures should be developed and implemented prior to construction to minimize siltation into streams and storm water drainage systems located within the project area.

**Kentucky Geological Survey, University of Kentucky, March 12, 2012**

There is a low to medium probability of karst developments along the corridor with greater potential at each end of the route and lesser potential in the center. They are not aware of any site specific issues in the area, such as caves. The Silurian Osgood Formation is exposed near the intersection of KY-1319. This shale-rich unit may contain low-durability material that is susceptible to slides.

**Kentucky State Nature Preserves Commission, February 28, 2012**

The Commission is concerned about possible impacts to a rare plant that is known to occur along the proposed construction corridor. Kentucky gladegrass (*Leaveriworthia exigua* var. *laciniata*) is a globally rare plant and one of only two plants endemic to the state and recorded from this area.

**United States Department of Agriculture, Natural Resources Conservation Service (NRCS), March 14, 2012**

Based upon the information provided, Kentucky NRCS does not anticipate the proposed actions will affect WRP easements, GRP easements or PL-566 watershed structures. NRCS is not aware of any plans or activities related to our agency in the defined project area. The current defined project area may impact prime farmland soils and farmlands of statewide importance. NRCS recommends further investigation into the impacts on the soils.

**Tourism, Arts and Heritage Cabinet, Kentucky Heritage Council, The State Historic Preservation Office, March 9, 2012**

Ensure compliance with relevant state and federal regulations regarding cultural resources. These may include any or all of the following: the Advisory Council on Historic Preservation's Rules and regulations for the Protection of Historic and Cultural Properties (36CRF, Part 800) pursuant to the National Historic Preservation Act of 1966; the National Environmental Policy Act of 1969; Executive Order 11593, Kentucky Antiquities Act; Kentucky Cave Protection Act; and graves protection legislation. Need to determine if properties eligible for listing in the National Register of Historic Places are affected by this project, need to determine the area of potential effect (APE) for both archaeological and cultural historic resources, coordinate with the Division of Environmental Analysis at KYTC.

**Department of the Army, U.S. Army Engineer District, Louisville, Corps of Engineers, March 21, 2012**

The following "waters of the U.S." may be located within the project area: Pond Run Creek, Elk Creek, Plum Creek, Goose Creek, Dutchman Creek, Little Dutchman Creek and any other stream channels (perennial, intermittent ephemeral) and/or hydrologically connected lakes exhibiting an OHWM and any adjacent wetlands within the proposed project area. A delineation of "waters of the U.S." should be completed if the proposed project would impact "waters of the U.S.," including wetlands.

This project may necessitate the discharge of dredged or fill material into "waters of the U.S.," including jurisdictional wetlands, and a DA permit application should be submitted for review.

**Kentucky State Police (KSP), February 13, 2012**

KSP does not perceive any problems as it pertains to commercial vehicle enforcement.

**Kentucky Energy and Environment Cabinet, Department for Environmental Protection, March 14, 2012**

The Energy and Environment Cabinet serves as the state clearinghouse for review of environmental documents generated pursuant to the National Environmental Policy Act (NEPA). Within the Cabinet, the Commissioner's Office in the Department for Environmental Protection coordinates the review for Kentucky state agencies. They distributed copies to various offices and the following comments were received from the Division of Water, the Division of Air Quality and the Division of Waste Management.

**Division of Water comments:**

Compliance & Technical Assistance Branch: No comments

Water Quality Branch: Best management practices shall be utilized to reduce runoff from the project area into adjacent surface waters.

Watershed Management: The contractor(s) constructing the project may need a groundwater protection plan depending on the onsite activities. Any water well or monitoring well in the construction area will need to be properly abandoned by a certified water well or monitoring well driller before any construction occurs on the well location.

No comments from Water Withdrawal Permitting, Floodplain Section or Water Management Planning.

Enforcement Branch: No objection.

**Division of Waste Management comments:**

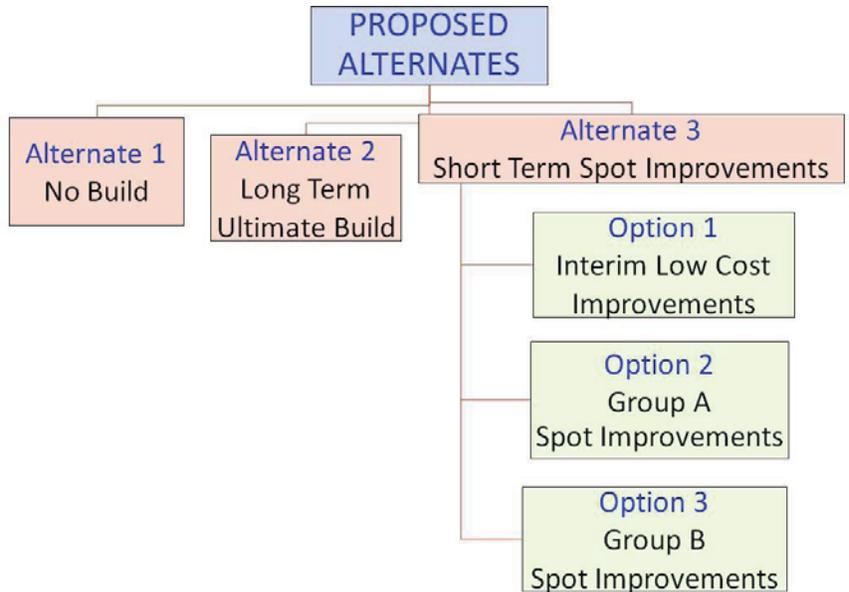
All solid waste generated by this project must be disposed at a permitted facility. If underground storage tanks are encountered, they must be properly addressed. If asbestos, lead paint or other contaminants are encountered during this project, they must be properly addressed.

**VIII ALTERNATE DEVELOPMENT**

As mentioned earlier, public input was received on the roadway conditions of KY 44. The roadway geometry was analyzed for conformity to current standards. Crash history was obtained and analyzed. Alternates were developed by the project team. After discussions, the team presented the alternates to the public and local Officials. The public were given an opportunity to rank the spot improvement projects. The project team met for a third time and discussed the rankings and combined the rankings with the technical data to finalize the priorities.

**IX ALTERNATES CONSIDERED**

Three types of alternates were developed by the project team and presented to the public. These are shown in the following flow chart.



## **A. Alternate 1 - No Build Alternate**

This alternate assumes that no new improvements are made to KY 44 in the study area. The current roadway will remain in place with no changes. The benefits of this alternate are that the property, environment and cost will be preserved. The disadvantage of choosing this alternate is that the safety issues identified by the study will not be addressed.

## **B. Alternate 2 - Long Term Ultimate Build Alternate**

This alternate proposes a long term solution by upgrading the roadway to current geometric standards. Figure 6 shows the Long Term Ultimate Build Alternate for KY 44 with the proposed typical sections. The Environmental Overview report, the geotechnical review and resource agencies input detail elements along the corridor to be considered during the design of this alternate. They were summarized in Section V-VII in this report; complete reports are attached in the Appendix. The ultimate build for all the three sections is explained here:

### ***Segment 1:***

Segment 1 of the study extends from US 31E in Mt. Washington to KY 1319. The preferred alignment for this segment was selected in the Phase 1 Design under Item 5-347.50. The project team proposed to retain the design recommended by Item 5-347.50 as the Long Term Ultimate Build for Segment 1. The following is the partial description of the selected typical section according to the Design Executive Summary of Item 5-347.50:

*Three typical sections are utilized on this project. A 5-lane curb-and-gutter section is implemented from the beginning of the project to just east of the entrances to Bullitt East High School and Old Mill Elementary School, where it narrows to a 3-lane curb-and-gutter section that runs to the church entrance east of Parkland Trace. From this point, until the end of the project, a 2-lane rural section is implemented with widening for turning lanes at crossroads.*

The proposed design speed is 45 mph in the 5-lane/3-lane urban section and is 55 mph in the 2-lane rural section.

### ***Segment 2:***

Segment 2 of the study extends from KY 1319 in Bullitt County to the beginning of the new roadway section of KY 44 at the Spencer County Elementary School in Spencer County. As Segment 2 is forecasted to carry significant truck traffic and recreation traffic and also considering accommodation for bike lanes, it is proposed that the typical section should have two 11 foot lanes and 8 foot shoulders (6 foot paved) for this segment. Segment 2 is proposed to be designed for a 55 mph design speed. The

roadway is proposed to be rebuilt on the existing alignment where feasible. Realignments will be necessary at some locations to improve geometry (See Figure 6).

As part of the ultimate build, horizontal curves and vertical grades are proposed to be improved. Intersections at KY 1060, KY 623, and KY 1251 will be improved. Climbing lanes will be added where required depending on the proposed final grades and after analysis based on KYTC Highway Design Manual and AASHTO guidelines. Preliminary analysis of the existing grades shows that critical length of grade is exceeded at several locations. Turn lanes will be added. Providing sidewalks where necessary will be considered as part of this alternate.

Segment 2 has three bridges located at Dutchman Creek Road, at Plum Creek near KY 1060 and at Elk Creek near KY 1251. The bridges are not structurally deficient. The Plum Creek and Elk Creek bridges are functionally deficient. It was proposed that all the bridges will be replaced and not widened as part of the Ultimate Build Alternate. Widening of the bridges was not recommended considering the age of the structures which were built in 1932. The bridge typical section will match the roadway.

The Environmental Overview, the geotechnical review and resource agencies input attached in the appendix, discuss possible impacts during the roadway realignment. For example: realignment in the area between the County line and Dutchman Creek area may encounter two locations that have some form of hazardous materials requiring environmental investigation. There are abandoned oil/gas wells along KY 44 just east of Cochran Dr. to be considered during the roadway realignment in that area. Realignment in the area of Stumps Lane and Waterford Loop should be aware of the Environmental Justice concerns and address negative impact to low-income population groups.

Plum Creek crosses KY 44 just east of KY 1060. Plum Creek is in the flood plain. Bridge replacement at this location to provide a wider bridge with shoulders should consider this impact during design. At the east end of the bridge, there is Waterford Park which is an 18 acre park with amenities that include picnic shelters, soccer and softball fields and a 0.45 mile walking track. It is a designated 4(f) and 6(f) resource. Roadway widening and adding a left turn lane to the park may require acquisition of the Park property. However, any impacts to the property should follow the rules defined by federal 4(f) and 6(f) statutes.

There is a large sinkhole area just east of Plum Creek on KY 44. There are several sites along the corridor that have the potential to be eligible for the National Register of Historic places. The Environmental Overview document lists some of these locations.

The streams at Little Dutchman Creek, Dutchman Creek, Goose Creek, Plum Creek, Elk Creek and Pond Creek are Blueline streams, perennial in nature. When bridges and culverts at these locations are widened or the roadway realigned, impacts to water

quality, channel changes, plant and animal habitat are possible. Permits will be required to perform work in the streams.

Wetlands exist along the study corridor. There are two wetlands that occur at Plum Creek and Elk Creek that could be impacted by bridge and roadway widening in those areas. Impacts to the wetlands would require mitigation. Displacement of residential homes and impacts to farmland can be anticipated at each of the locations where realignment of the roadway is proposed. There are churches, schools and cemeteries along the corridor that could be impacted.

***Segment 3:***

Segment 3 extends from the beginning of the new roadway section at Spencer County Elementary School to KY 1633. This segment was in the Right-of-Way acquisition stage (Item 5-395.00) at the time this study was conducted. The project team proposed to retain the design recommended by Item 5-395.00 as the Long Term Ultimate Build for Segment 3. The design speed on Segment 3 is 45 mph. The typical section for this segment is 22 foot pavement and 6 foot shoulders.

**C. Alternate 3 – Short Term Spot Improvements**

Roadway improvements for Segment 1 were identified in Phase I Design under Item 5-347.50. Spot improvements were not proposed for Segment 1. Segment 3 is scheduled for construction in the near future. Therefore, no spot improvements were considered for Segment 3. Short term spot improvements for Segment 2 are described below.

**a. Alternate 3, Option 1 – Interim Low Cost Improvements**

Roadway departure crashes, “cross-over lane” type crashes and crashes in low light conditions are some of the major type of crashes in Segment 2. Low cost roadway improvements can be helpful in the interim, until major improvements are implemented. Edge line and center line rumble strips and chevrons around sharp curves may be helpful in reducing some of the roadway departure and “cross-over lane” type crashes. Edge line rumble strips will be considered for installation when resurfacing is scheduled. The current roadway does not have the width required to provide center line rumble strips. Reflectors on guardrail can improve night time visibility and may improve safety on narrow bridges. Where sight distance is obstructed by slopes and trees, cutting back slopes and tree trimming/removal are proposed as interim solutions. KYTC District 5 will identify the locations for these improvements and undertake them with District funds. Some low cost improvements will also be eligible for Highway Safety funds such as HSIP. For example: A high friction surface treatment is scheduled to be applied to the sharp curve east of Hunters Trace Rd which is one of the high crash locations within the study area using HSIP funds. Figure 7 shows some locations and possible low cost treatments.

**b. Alternate 3, Option 2 – Group A Spot Improvements**

As mentioned earlier in this report, there are several locations where the horizontal geometry does not meet current roadway design standards. There are several vertical grades that are steep in grade exceeding recommended limits of geometric standards. Upon analysis of the crashes, roadway with less than standard roadway geometry recorded many crashes. The majority of the crashes studied were roadway departure crashes. One of the reasons is due to the driver losing vehicle control around sharp curves. In some cases, the driver was avoiding a vehicle in the opposite direction that had encroached into the lane. Six locations in Segment 2 had a high crash rate (CRF  $\geq 1$ ). These were identified as Group A spot improvements. Group A spot improvements are defined as projects in locations where roadway geometry is below current design standards and the crash rate is high (CRF  $\geq 1$ ). Figure 8 shows the projects identified as Group A Spot Improvements. Group A Improvements are described in detail in Figure 9.

**c. Alternate 3, Option 3 – Group B Spot Improvements**

At the public meetings and in the completed surveys, the public, local Officials and stakeholders mentioned other locations not covered by the Group A Spot Improvements that are areas of concern. The project team investigated the locations for the cause. Roadway geometry and crash history were analyzed. The project team identified six locations with geometry problems and crash history and named them as Group B Spot Improvements. Compared to Group A Spot Improvements, projects identified as Group B Spot Improvements had less severe crash history and geometry concerns. Figure 10 shows the projects identified as Group B Spot Improvements. Each of the Group B Spot Improvements is described in Figure 11. During design, a Group B Spot Improvement may be combined with an adjacent Group A Spot Improvement.

If the spot improvements receive funding to move forward, they will be designed keeping the ultimate roadway section in consideration. These improvements will have environmental impacts mentioned earlier in Section IXB and covered in greater detail in the Environmental Overview document. Geotechnical review and other agencies' input are attached in the Appendix of this report.

**X COST ESTIMATION**

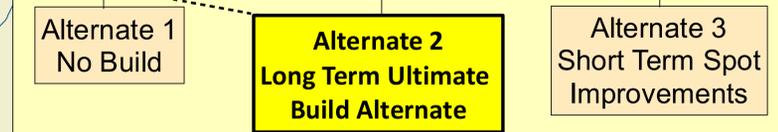
After the alternates were identified, preliminary cost estimates were developed. For Segment 1, cost estimates for Design, Right of Way, Utility relocation and Construction were developed in Item 5-347.50 which were used in this study to get a combined estimate. For Segment 2, preliminary cost estimate was developed for all the alternates and for all the phases. For Segment 3, cost estimates were developed under Item 5-395.00. The estimate was used to get a combined estimate for all the segments. A summary of cost estimates can be seen in Table 9.

**Table 9: Summary of Cost Estimates**

<b>ALTERNATE 1: No Build Alternate - \$0</b>						
<b>ALTERNATE 2: Long Term Ultimate Build Alternate</b>						
Segment	Brief Description	Phase Cost (\$)				Total Cost (\$)
		Design	Right-of-Way	Utilities	Constr	
1	US 31E to KY 1319	\$3,000,000	\$2,300,000	\$1,606,000	\$10,800,000	\$17,706,000
2	KY 1319 to Spencer Co. Elem. School	\$10,150,000	\$8,270,000	\$7,020,000	\$45,110,000	\$70,550,000
3	Spencer Co. Elem. School to KY 1633	\$700,000	\$355,000	\$700,000	\$4,000,000	\$5,755,000
<b>Total</b>		\$13,850,000	\$10,925,000	\$9,326,000	\$59,910,000	\$94,011,000
<b>ALTERNATE 3: Short Term Spot Improvements</b>						
<b>Option 1 : Interim Low Cost Spot Improvements</b>						
Shoulder layback, tyregrip, cutback trees, reflectors on guardrail, chevrons, edge line rumble strips						\$500,000
<b>Option 2: Group A Spot Improvements</b>						
Spot	Location	Phase Cost (\$)				Total Cost (\$)
		Design	Right-of-Way	Utilities	Constr	
A1	East of Cedar Lake to County Line	\$560,000	\$460,000	\$410,000	\$2,400,000	\$3,830,000
A2	Dutchman Creek Area	\$220,000	\$160,000	\$150,000	\$950,000	\$1,480,000
A3	Cochran Dr and East	\$690,000	\$570,000	\$500,000	\$3,000,000	\$4,760,000
A4	KY 623 and East	\$350,000	\$280,000	\$250,000	\$1,500,000	\$2,380,000
A5	KY 1251 and Hunter's Trace Area	\$690,000	\$570,000	\$500,000	\$3,000,000	\$4,760,000
A6	Stumps Lane to Turnpike Ave.	\$2,700,000	\$2,200,000	\$2,000,000	\$11,900,000	\$18,800,000
<b>Total</b>		\$5,210,000	\$4,240,000	\$3,810,000	\$22,750,000	\$36,010,000
<b>Option 3: Group B Spot Improvements</b>						
Spot	Location	Phase Cost (\$)				Total Cost (\$)
		Design	Right-of-Way	Utilities	Constr	
B1	MP 0.70 to MP 0.95	\$290,000	\$240,000	\$210,000	\$1,300,000	\$2,040,000
B2	Waterford Loop to Hickory Woods Dr	\$350,000	\$280,000	\$250,000	\$1,500,000	\$2,380,000
B3	KY 1060 and East	\$760,000	\$460,000	\$410,000	\$3,260,000	\$4,890,000
B4	Akins Rd area	\$580,000	\$470,000	\$420,000	\$2,500,000	\$3,970,000
B5	Carl Monroe Rd/Bennett Spur Area	\$350,000	\$280,000	\$250,000	\$1,500,000	\$2,380,000
B6	River Heights Blvd Area	\$870,000	\$710,000	\$630,000	\$3,800,000	\$6,010,000
<b>Total</b>		\$3,200,000	\$2,440,000	\$2,170,000	\$13,860,000	\$21,670,000

# ALTERNATE 2 - LONG TERM ULTIMATE BUILD ALTERNATE

PROPOSED ALTERNATES

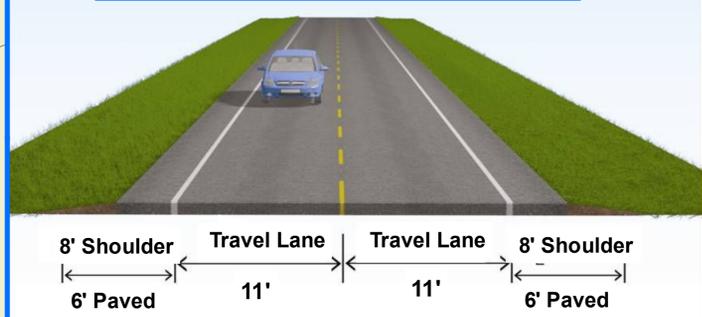


**SUMMARY OF ESTIMATED COSTS**

SEGMENT 1	- \$17,706,000
SEGMENT 2	- \$70,550,000
SEGMENT 3	- \$5,755,000
<b>TOTAL COST</b>	<b>- \$94,011,000</b>

## SEGMENT 2 KY 1319 TO SPENCER COUNTY ELEMENTARY SCHOOL

### 2-LANE RURAL TYPICAL SECTION



**SEGMENT 2 - ESTIMATED COST - \$70,550,000**

Design	\$10,150,000	Right of Way	\$8,270,000
Utilities	\$7,020,000	Construction	\$45,110,000

- Segment 2 - Proposed Ultimate Build Alternate**
- Rebuild on existing alignment, Realign at some locations
  - 11 foot lanes, 8 foot shoulders (6 foot paved)
  - Bridge Replacements to match new roadway
  - Intersection Improvements, Turn Lanes, Climbing Lanes

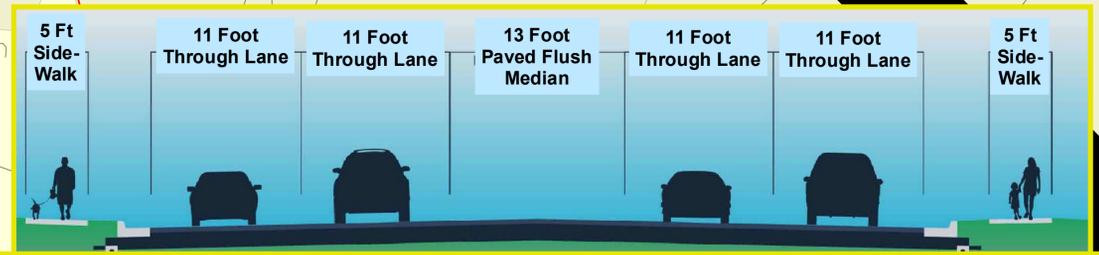
Possible Realignment Areas

## SEGMENT 1 US 31E TO KY 1319

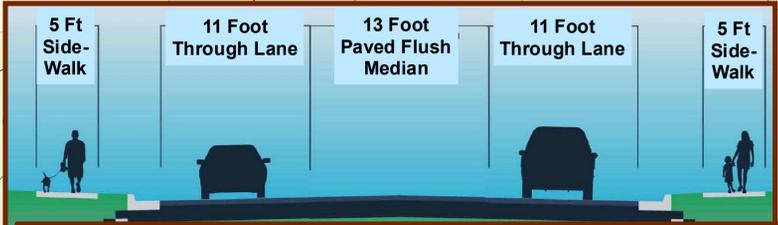
### 2-LANE RURAL PARKLAND TR. APPROX. TO KY 1319

### 5-LANE URBAN US 31E TO EAST OF ELEM. SCHOOL ENTRANCE

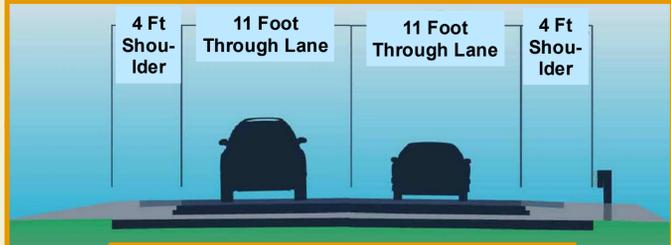
### 3-LANE URBAN EAST OF ELEM. SCHOOL ENTRANCE TO PARKLAND TR. APPROX.



5-LANE URBAN TYPICAL SECTION - US 31E TO EAST OF ELEM. SCHOOL ENTRANCE



3-LANE URBAN - EAST OF ELEM. SCHOOL ENTRANCE TO PARKLAND TR. APPROX.

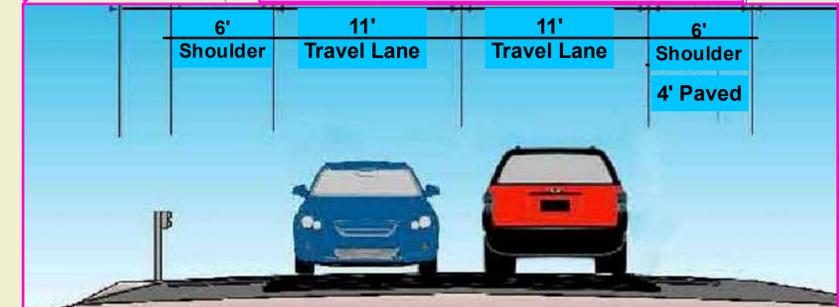


2-LANE RURAL - PARKLAND TR. APPROX. TO KY 1319

**SEGMENT 1 - ESTIMATED COST - \$17,706,000**

Design	\$3,000,000	Right of Way	\$2,300,000
Utilities	\$1,606,000	Construction	\$10,800,000

## SEGMENT 3 2-LANE RURAL TYPICAL SECTION



**SEGMENT 3 - ESTIMATED COST - \$5,755,000**

Design	\$700,000	Right of Way	\$355,000
Utilities	\$700,000	Construction	\$4,000,000

**FIGURE 6  
ALTERNATE 2  
LONG TERM ULTIMATE  
BUILD ALTERNATE**

NOT TO SCALE



# ALTERNATE 3, OPTION 1 - INTERIM LOW COST IMPROVEMENTS

PROPOSED ALTERNATES

- Alternate 1 No Build
- Alternate 2 Long Term Ultimate Build Alternate
- Alternate 3 Short Term Spot Improvements

**Option 1**  
Interim Low Cost Improvements

Option 2  
Group A Spot Improvements

Option 3  
Group B Spot Improvements

ESTIMATED COST - \$500,000

INTERIM LOW COST IMPROVEMENTS  
(Possible Treatment locations are shown here)

- \* Edge Line Rumble Strips
- \* Chevrons on posts
- \* Cutback Hills
- \* Tree Trimming/Removal
- \* High Friction Surfaces
- \* Reflectors on guardrail

**LOW COST IMPROVEMENTS**

- Rumble Strips
- Chevrons
- Reflectors on guardrails



- Interstate
- Parkway
- US Highway
- State Road
- Local Road
- Bridge (Line)



**FIGURE 7**  
**ALTERNATE 3, OPTION 1**  
**INTERIM LOW COST IMPROVEMENTS**

TO SCALE

# ALTERNATE 3, OPTION 2 - GROUP A SPOT IMPROVEMENTS

PROPOSED ALTERNATES

Alternate 1  
No Build

Alternate 2  
Long Term Ultimate  
Build Alternate

Alternate 3  
Short Term Spot  
Improvements

Option 1  
Interim Low Cost  
Improvements

Option 2  
Group A Spot  
Improvements

Option 3  
Group B Spot  
Improvements

ESTIMATED COST - \$3,830,000

Spot A1  
East of Cedar Lake Dr to County Line  
- Roadway Geometry Improvements



ESTIMATED COST - \$1,480,000

Spot A2 (Dutchman Creek Area)  
- Improve West Horizontal Curve  
- Intersection Improvements (Eliminate Skew on Side Roads & Align)  
- Replace Bridge at Dutchman Creek



ESTIMATED COST - \$4,760,000

Spot A3 (Cochran Dr and East)  
Intersection Improvements at Cochran Dr/Julia Ct  
- Add Left & Right Turn Lanes to Cochran Dr East of Cochran Dr Intersection  
- Roadway Geometry Improvements



ESTIMATED COST - \$2,380,000

Spot A4 (Junction KY 623 and East)  
Jct KY 623 - Intersection Improvements  
- Improve Turning Radius, Sight Distance etc.  
Other Work:  
- Replace Box Culvert (Possible Left Turn Lane to KY 623)  
- Improve East Horizontal Curve



ESTIMATED COST - \$4,760,000

Spot A5  
(Jct KY 1251 to Curve after Hunter's Trace Rd.)  
Jct KY 1251 - Intersection Improvements  
- Improve Turning Radii, Sight Distance etc.  
- Add Truck Climbing Lane West of KY 1251 East of Bridge at KY 1251  
- Roadway Geometry Improvements



ESTIMATED COST - \$18,800,000

Spot A6 (Stumps Lane to Turnpike Ave.)  
Minor Widening and Rumble Strips  
- Widen pavement by 5 feet  
- Install Center Line & Edge Line Rumble Strips



- Interstate
- Parkway
- US Highway
- State Road
- Local Road
- Bridge (Line)

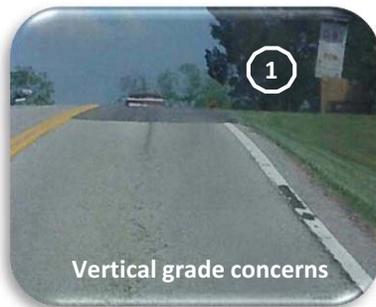
NOT TO SCALE



FIGURE 8  
ALTERNATE 3, OPTION 2  
GROUP A  
SPOT IMPROVEMENTS

Figure 9. Group A Spot Improvements – Projects and Description

## Spot A1



*all photos looking east*

### Spot A1 - East of Cedar Lake Dr. to Bullitt/Spencer County line

#### Existing Conditions and Issues:

Roadway departure crashes are the common types of crashes in this segment. There is a vertical grade with inadequate sight distance at the beginning of the project. This is followed by a 9.9 degree horizontal curve to the right, just west of Coxs Lane. Another 8 degree curvature horizontal curve to the left exists at the County line. Both the curves do not meet the current geometry standards for the design speed. There are two sections with CRF more than 1.0. The first section just before Coxs lane has a CRF of 1.09. The second high crash section is at the County line with a CRF of 1.31. The types of crashes on the segment were roadway departure crashes (7), rear end crashes (2), angle crashes (2), head - on crashes (2) recorded between Oct 2006 and Oct 2010. The Environmental Overview document mentions that there is a possibility of two hazardous materials/underground storage sites located between the County line and Dutchman Creek area.

#### Proposed Project:

The spot improvement project, Spot A1, proposes improvements to the roadway geometry for this section. Some realignment is necessary to achieve the proposed improvements. The realignment eliminates existing multiple curves and will be designed during Phase 1 Design keeping the ultimate design in consideration for this segment.

Planning Cost Estimate	
Design	\$ 560,000.00
ROW	\$ 460,000.00
Utility	\$ 410,000.00
Construction	\$ 2,400,000.00
<b>Total</b>	<b>\$ 3,830,000.00</b>



KY 44 – Dutchman Creek Rd intersection

*all photos looking east*

Spot A2 – Dutchman Creek area

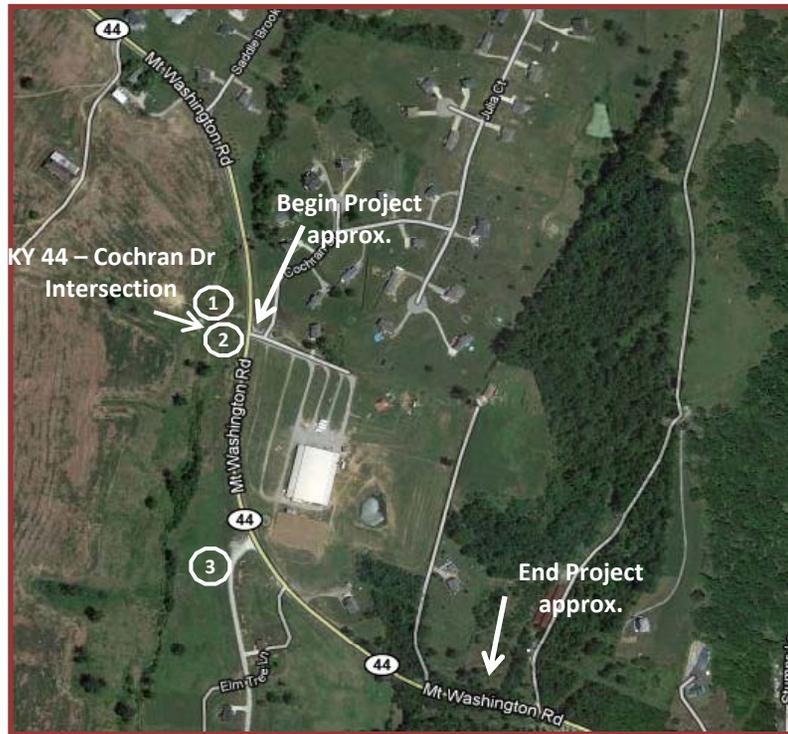
**Existing Conditions and Issues:**

One fatal crash was recorded at the bridge at Dutchman Creek in November, 2007. The head-on crash occurred at the guardrail of the bridge. The operator of the first vehicle reported having lost control while negotiating the curve on a wet roadway. The curve to the right, just west of the bridge has a 7.8 degree curvature. To the east of the horizontal curve, Ryder Lane intersects on the north side. Within 60 feet of Ryder Lane, Dutchman Creek Rd. intersects KY 44 at a skewed angle on the south side. The horizontal curve to the bridge is a high crash location with a CRF of 1.31. Six of the seven crashes recorded from October 2006-2010 were roadway departure crashes. One of the crashes was a head-on crash. The Environmental Overview document mentions a possibility of two hazardous materials/underground storage sites located between the County line and Dutchman Creek area.

**Proposed Project:**

The spot improvement project, Spot A2, recommends improvements to the geometry of the roadway by correcting the horizontal curve. The offset intersections of Ryder Lane and Dutchman Creek Rd. with KY 44 will be corrected to form a common intersection. The skewed angle of Dutchman Creek Rd. will be eliminated such that the road intersects KY 44 at a right angle. Also, the bridge at Dutchman Creek will be replaced to provide a wider bridge.

Planning Cost Estimate	
Design	\$ 220,000.00
ROW	\$ 160,000.00
Utility	\$ 150,000.00
Construction	\$ 950,000.00
<b>Total</b>	<b>\$ 1,480,000.00</b>



all photos looking east on KY 44

Spot A3 – Cochran Drive and East improvements

**Existing Conditions and Issues:**

The project begins just before Cochran Dr. at MP 2.30 approximately. Local Planning contacts mention that the Jewell Farm-Cochran Hill area located 6.7 miles west of Taylorsville is the proposed sight of 400 to 450 new residential lots in addition to 10 acres of land zoned for industrial purposes. Continuing east on KY 44 after Cochran Dr., a 4 degree curve to the right is followed by a 6 degree curve to the left with a short tangent in between. Then a 8.8 degree curve to the left follows with a very short tangent (300 ft approx.) in between. This is followed by a 4 degree curve to the right. The series of horizontal curves combined with vertical grades that do not meet current geometric standards is possibly causing many crashes, mainly roadway departure crashes. A CRF of 1.03 is noticed in this area. According to the Environmental Overview document, it appears that there are two gas wells located within the limits of this project.

**Proposed Project:**

Considering the possible business growth in the Cochran Dr. area, turn lanes are proposed at Cochran Dr. Geometry improvements are proposed for the segment to correct the existing deficiencies. Some realignment may be necessary to accommodate the new geometry.

Planning Cost Estimate	
Design	\$ 690,000.00
ROW	\$ 570,000.00
Utility	\$ 500,000.00
Construction	\$ 3,000,000.00
<b>Total</b>	<b>\$ 4,760,000.00</b>



KY 44 looking east



KY 623  
→  
KY 44 - KY 623 intersection



8' x 7' culvert location



curve east of culvert

Spot A4 – KY 623 and east curve

**Existing Conditions and Issues:**

The project begins at the junction of KY 623 and KY 44. Angle crashes have been recorded at the intersection of KY 44 and KY 623. Preliminary analysis shows that a left turn lane to KY 623 on KY 44 going west is necessary. A more detailed turn lane analysis using turning movement counts will be conducted during future phases of the project. The geometry of the intersection will be investigated for improvements for sight distance and turning radii.

To the east of the intersection, there is a 8' x 7' culvert with guardrail present on both sides making this section very narrow with no shoulders. A horizontal curve with a radius of 1400 ft approximately exists just east of the culvert. Two roadway departure crashes and two rear end crashes were recorded in the curve. The geometry of this segment should be investigated in more detail.

**Proposed Project:**

Spot Improvement project, Spot A4, proposes intersection improvements such as turning radius, sight distance, turn lanes etc. at KY 623. The box culvert will be replaced and a wider structure with provision for shoulders is proposed. The geometry of the east horizontal curve will be investigated for improvements.

Planning Cost Estimate	
Design	\$ 350,000.00
ROW	\$ 280,000.00
Utility	\$ 250,000.00
Construction	\$ 1,500,000.00
<b>Total</b>	<b>\$ 2,380,000.00</b>



KY 44 at Elk Creek bridge looking east



looking west approaching Elk Creek bridge



at KY 44 - KY 1251 intersection looking west



KY 44 at KY 1251 looking east



14 degree curve past Hunters Trace Rd looking east

Spot A5 – KY 1251 & Hunter’s Trace area

**Existing Conditions and Issues:**

The sight distance and turning radius from Murray Rd to east KY 44 was mentioned as a problem by the Public. Elk Creek runs north-south just east of the intersection. The bridge on Elk Creek is a 4-span Concrete Tee Beam. The width of the bridge is narrow without any shoulders and was also mentioned by the public as a major concern while traveling alongside trucks and recreational vehicles. The vertical grade on KY 44 going west of the bridge is 8%. A six degree horizontal curve begins at the east end of the bridge. Traveling east on KY 44, in the vicinity of Hunters Trace Rd., there is a segment with a high crash history. The CRF of this segment is 1.17. Past Hunters Trace Rd., going east on KY 44, there is a horizontal curve with a 14 degree curvature. This curve is one of highest crash locations in the study area with a CRF of 1.75. Ten crashes were recorded between October 2006 and October 2010 in the curve. Vegetation blocks sight distance of traffic flow.

**Proposed Project:**

This project proposes intersection improvements for turning radius, sight distance etc. at Murray Rd - KY 44 - KY 1251 intersection. A truck climbing lane west of KY 1251 is proposed. Recommendations include improving geometry (horizontal and vertical) east of the bridge to the curve after Hunter’s Trace Rd. Realignment of the roadway will be necessary to provide the improved geometry. A high friction surface at the Hunters Trace curve (mile point 5.6 to 6.2) is being scheduled at the time of this report until geometry improvements can be funded.

Planning Cost Estimate	
Design	\$ 690,000.00
ROW	\$ 570,000.00
Utility	\$ 500,000.00
Construction	\$ 3,000,000.00
<b>Total</b>	<b>\$ 4,760,000.00</b>



Center Line Rumble Strips



Edge Line Rumble Strips

Spot A6 – Stumps Lane to Turnpike Avenue  
Minor Widening and Rumble Strips

**Existing Conditions and Issues:**

The Roadway Departure Plan maintained by KYTC Traffic Operations has identified sections on KY 44 that have exhibited several lane departure crashes and lane crossover crashes. Edge line rumble strips will be helpful in alerting drivers and may reduce lane departure crashes. Center line rumble strips can be helpful in reducing lane crossover crashes.

Current roadway pavement width is 20 feet approximately. Edge line rumble strips can be installed on a roadway with minimum width of 20 feet. Center line rumble strips can be installed on a roadway with a minimum width of 25 feet.

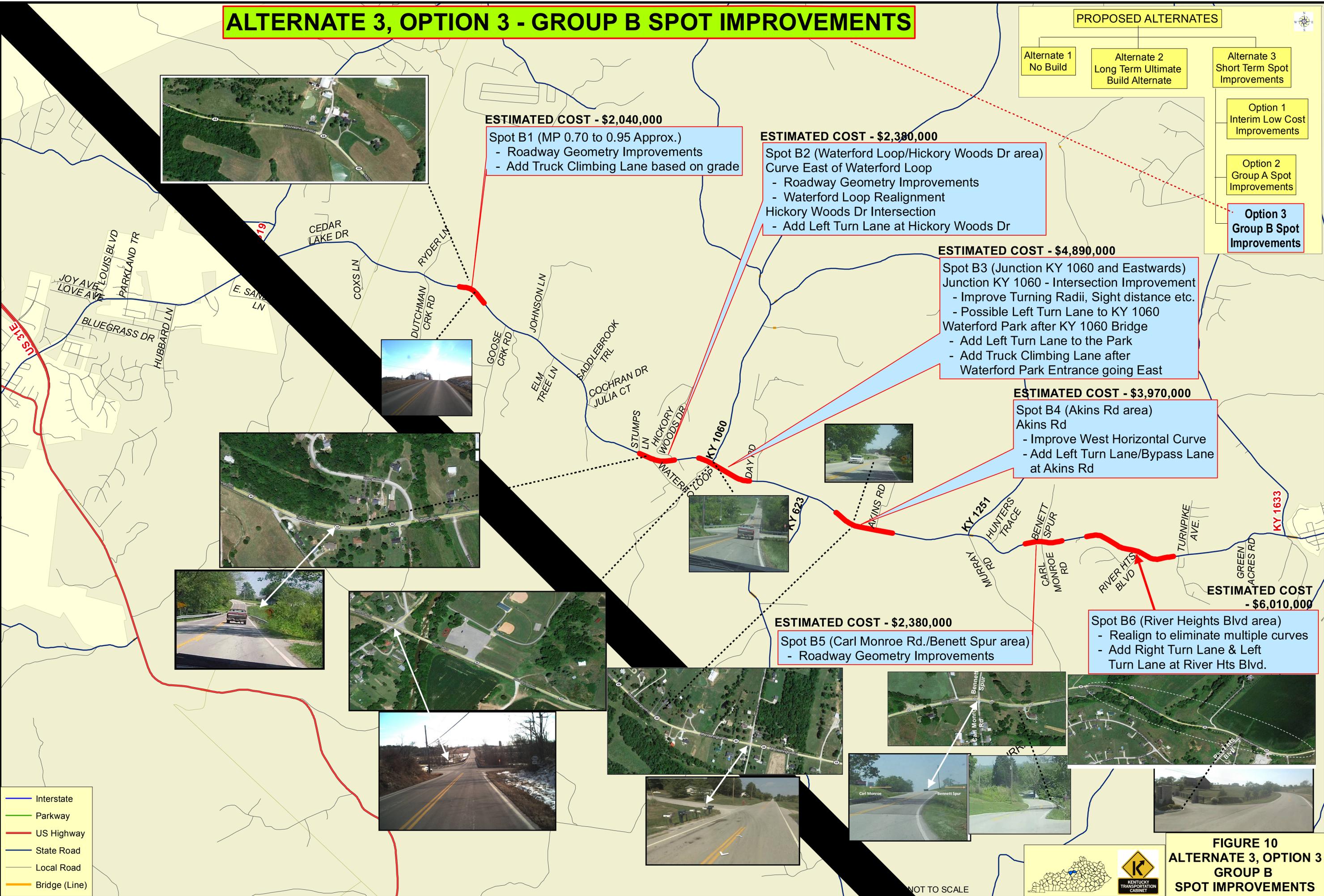
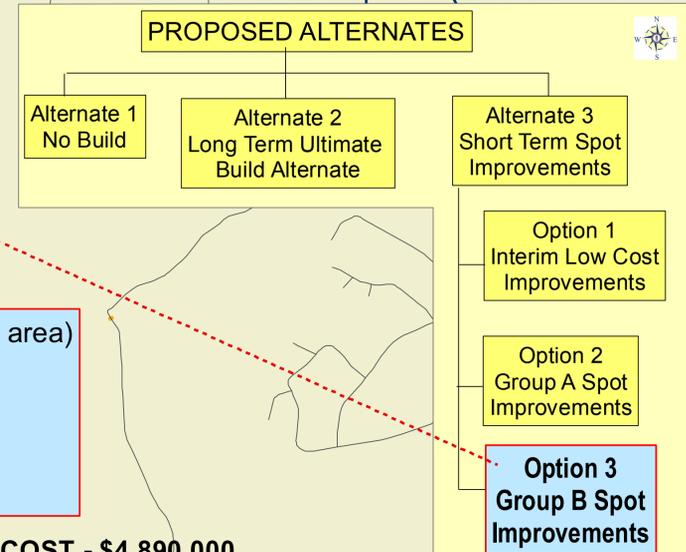
**Proposed Project:**

Spot improvement project, Spot A6, proposes minor widening to add five feet of pavement. With the additional width available, center line and edge line rumble strips can be provided. This will also require grading for a new ditch and most likely have right-of-way and utility impacts.

Planning Cost Estimate	
Design	\$ 2,700,000.00
ROW	\$ 2,200,000.00
Utility	\$ 2,000,000.00
Construction	\$ 11,900,000.00
<b>Total</b>	<b>\$ 18,800,000.00</b>

The estimated cost of the project is \$18,800,000 which is high compared to other spot improvements. If this project progresses, then other spot improvements that fall within the project limits may also be completed at the same time.

# ALTERNATE 3, OPTION 3 - GROUP B SPOT IMPROVEMENTS



**ESTIMATED COST - \$2,040,000**  
 Spot B1 (MP 0.70 to 0.95 Approx.)  
 - Roadway Geometry Improvements  
 - Add Truck Climbing Lane based on grade

**ESTIMATED COST - \$2,380,000**  
 Spot B2 (Waterford Loop/Hickory Woods Dr area)  
 Curve East of Waterford Loop  
 - Roadway Geometry Improvements  
 - Waterford Loop Realignment  
 Hickory Woods Dr Intersection  
 - Add Left Turn Lane at Hickory Woods Dr

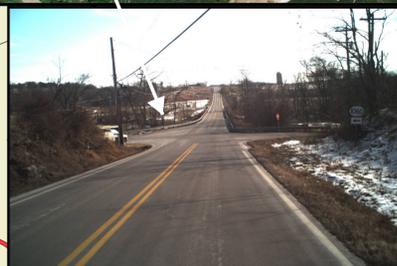
**ESTIMATED COST - \$4,890,000**  
 Spot B3 (Junction KY 1060 and Eastwards)  
 Junction KY 1060 - Intersection Improvement  
 - Improve Turning Radii, Sight distance etc.  
 - Possible Left Turn Lane to KY 1060  
 Waterford Park after KY 1060 Bridge  
 - Add Left Turn Lane to the Park  
 - Add Truck Climbing Lane after Waterford Park Entrance going East

**ESTIMATED COST - \$3,970,000**  
 Spot B4 (Akins Rd area)  
 Akins Rd  
 - Improve West Horizontal Curve  
 - Add Left Turn Lane/Bypass Lane at Akins Rd

**ESTIMATED COST - \$2,380,000**  
 Spot B5 (Carl Monroe Rd./Benett Spur area)  
 - Roadway Geometry Improvements

**ESTIMATED COST - \$6,010,000**  
 Spot B6 (River Heights Blvd area)  
 - Realign to eliminate multiple curves  
 - Add Right Turn Lane & Left Turn Lane at River Hts Blvd.

- Interstate
- Parkway
- US Highway
- State Road
- Local Road
- Bridge (Line)



**FIGURE 10**  
**ALTERNATE 3, OPTION 3**  
**GROUP B**  
**SPOT IMPROVEMENTS**

NOT TO SCALE

Figure 11. Group B Spot Improvements – Projects and Description



Spot B1 – MP 0.70 to 0.95 (Spencer Co.), east of Dutchman Creek Rd.

**Existing Conditions and Issues:**

This section is approximately midway between Dutchman Creek Rd. and Goose Creek Rd. The horizontal curve has a 6.8 degree curvature. This section has seen some roadway departure crashes. The vertical grade is approximately a 7.2% downgrade on the west side heading towards Dutchman Creek. According to the Environmental Overview document, one site in this area has the potential to be eligible for listing in the National Register for Historic places.

**Proposed Project:**

Spot improvement project, Spot B1, proposes to improve the roadway geometry in this section. The vertical grade and horizontal curvature will be improved to meet current roadway geometry standards. Preliminary analysis of existing grades approaching the curve on the east side indicate the need for a climbing lane. Depending on the final grades, a truck climbing lane may be added on the west side.

Planning Cost Estimate	
Design	\$ 290,000.00
ROW	\$ 240,000.00
Utility	\$ 210,000.00
Construction	\$ 1,300,000.00
<b>Total</b>	<b>\$ 2,040,000.00</b>



**Existing Conditions and Issues:**

The roadway has geometry concerns. The roadway has a advisory speed sign for 45 mph speed. The horizontal curve is nearly 5 degrees. The vertical grade is approximately 4.8% in the curve. Waterford Loop intersects KY 44 at a skewed angle and therefore sight distance concerns exist.

The Environmental Overview document reports that environmental justice issues for low-income populations might exist in the community of Waterford and Stumps Lane. One site in this area has the potential to be eligible for listing in the National Register for Historic places according to the Environmental Overview document.

Hickory Woods Dr. on the north side of KY 44 leads to a residential neighborhood with nearly 70 homes.

**Proposed Project:**

Spot improvement project, Spot B2, proposes to improve the roadway geometry for this segment. As part of the realignment, the environmental justice issues in the Waterford and Stumps Lane should be taken into consideration. The alignment of Waterford Loop will be improved to intersect KY 44 at a right angle. A left turn lane/bypass lane at Hickory Woods Lane is proposed.

Planning Cost Estimate	
Design	\$ 350,000.00
ROW	\$ 280,000.00
Utility	\$ 250,000.00
Construction	\$ 1,500,000.00
<b>Total</b>	<b>\$ 2,380,000.00</b>



**Existing Conditions and Issues:**

This segment begins at the intersection of KY 44 - KY 1060 - Waterford Loop. The common problem mentioned regarding this location is that the sight distance and turning radius at the intersection needs improvements.

Plum Creek crosses KY 44 within 200 feet from the intersection. The bridge at Plum Creek is a 3-span Concrete T-Beam bridge. This bridge was mentioned by the public as a narrow bridge and causes hazardous conditions to travel alongside trucks and RV's. The bridge has no shoulders and is classified as functionally deficient. Currently, the Sufficiency Rating of the bridge is 64.60. The bridge is not classified as structurally deficient.

Waterford Park is located on the north side of KY 44 within 200 feet of the east end of the bridge. The intersection at the park entrance and KY 44 has recorded rear end crashes. Traveling east, there is grade of 7.4%.

**Proposed Project:**

Intersection improvements such as turning radius, sight distance etc., are recommended at the KY 44 – KY 1060 – Waterford Loop intersection. Based on preliminary analysis, a left turn lane to KY 1060 is needed. The recommendations include adding a left turn lane to Waterford Park and a truck climbing lane after the park going east. Waterford Community Park is classified as a 6(f) resource as well as a 4(f) resource. However, the proposed improvements may not require acquisition of the park property.

Planning Cost Estimate	
Design	\$ 760,000.00
ROW	\$ 460,000.00
Utility	\$ 410,000.00
Construction	\$ 3,260,000.00
<b>Total</b>	<b>\$ 4,890,000.00</b>



Spot B4 – Akins Rd area

**Existing Conditions and Issues:**

The curve approaching Akins Rd. has a 45 mph advisory speed sign. The radius of the curve has a 5 degree curvature. Angle crashes were recorded at the intersection of KY 44 and Akins Rd.

**Proposed Project:**

Spot B4 project proposes improving the west horizontal curve. Recommendations also include adding a left turn lane/bypass lane to Akins Rd.

Planning Cost Estimate	
Design	\$ 580,000.00
ROW	\$ 470,000.00
Utility	\$ 420,000.00
Construction	\$ 2,500,000.00
<b>Total</b>	<b>\$ 3,970,000.00</b>



Spot B5 – Carl Monroe Rd/Bennett Spur area

**Existing Conditions and Issues:**

This location is just east of Hunters Trace curve which is one of the high crash areas in the study area. There are two horizontal curves on either sides of the intersection with a very short tangent in between them. Each of the curves has a 6 degree curvature. Also, the vertical grade in this area contributes to poor sight distance.

**Proposed Project:**

The proposed project will improve the roadway geometry at this location by correcting the horizontal and vertical curvature and bring them to current geometric standards.

Planning Cost Estimate	
Design	\$ 350,000.00
ROW	\$ 280,000.00
Utility	\$ 250,000.00
Construction	\$ 1,500,000.00
<b>Total</b>	<b>\$ 2,380,000.00</b>



**Existing Conditions and Issues:**

The crashes and geometry of this roadway section were investigated. There is an 8 degree curve to the right at the beginning of this segment. This is followed by a two 6 degree curves approaching River Heights Blvd. A 8 degree curve exists to the east of River Heights Blvd. Multiple curves which are in close proximity with substandard geometry are likely contributing to these crashes. The crashes recorded in this section are roadway departure crashes.

**Proposed Project:**

The proposed project will improve the roadway geometry in this area. Realigning the roadway and eliminating multiple curves is recommended. A new alignment that connects the roadway at either end by smoother geometry is proposed.

Also, considering the residential development in the River Heights Development, a right turn lane and a left turn lane at River Heights Blvd. are proposed.

Planning Cost Estimate	
Design	\$ 870,000.00
ROW	\$ 710,000.00
Utility	\$ 630,000.00
Construction	\$ 3,800,000.00
<b>Total</b>	<b>\$ 6,010,000.00</b>

## XI PROJECT PRIORITIZATION FOR SHORT TERM SPOT IMPROVEMENTS

After the project team identified the spot improvements, the projects were presented at the Public Meeting and at the Local Officials and Stakeholders Meeting. At these meetings, the public, local Officials and stakeholders were given the opportunity to rank the projects. Table 10 shows the ranking summary from the two meetings. After the meetings were conducted, the project team met to finalize the ranking for the projects. The project team considered the ranking of the public, local Officials and stakeholders. Other factors were also discussed by the project team. These include analysis of existing roadway geometry, current design standards, crash history of the location and funding possibility. The project team finalized the ranking of the Group A Spot Improvement projects which are summarized in Table 10 and Figure 12.

**Table 10: Group A Spot Improvements Ranking**

<b>Spot Improvement</b>	<b>Approximate Location</b>	<b>Rank assigned by local officials, Stakeholders &amp; Public</b>	<b>Final Ranking</b>
Spot A1	East of Cedar Lake Dr to County Line	5	3
Spot A2	Dutchman Creek area	2	2
Spot A3	Cochran Drive and east	4	4
Spot A4	KY 623 and east curve	3	5
Spot A5	KY 1251 and Hunters Trace curve	1	1
Spot A6	Stumps Lane to Turnpike Avenue	6	6

The project team agreed that Spot A5 (Hunter’s Trace Rd. area) should be ranked #1 because of poor roadway geometry and high crash rate. The ranking for Spot A5 matched the Officials and public’s ranking. Spot A2 was ranked #2 by both Groups and it is a project in the Dutchman Creek area where a fatal crash occurred. Spot A1 was ranked #3 by the project team compared to rank #5 of the other group because of higher crash history and greater roadway geometry concerns. Spot A1 and A2 are close to each other and most likely would be designed at the same time.

Spot A6 was ranked last by both the Groups. Spot A6 improvement recommends minor widening from Stumps Lane to Turnpike Avenue. If Spot A6 project is started, other spot improvement projects along this segment will be considered at the same time.

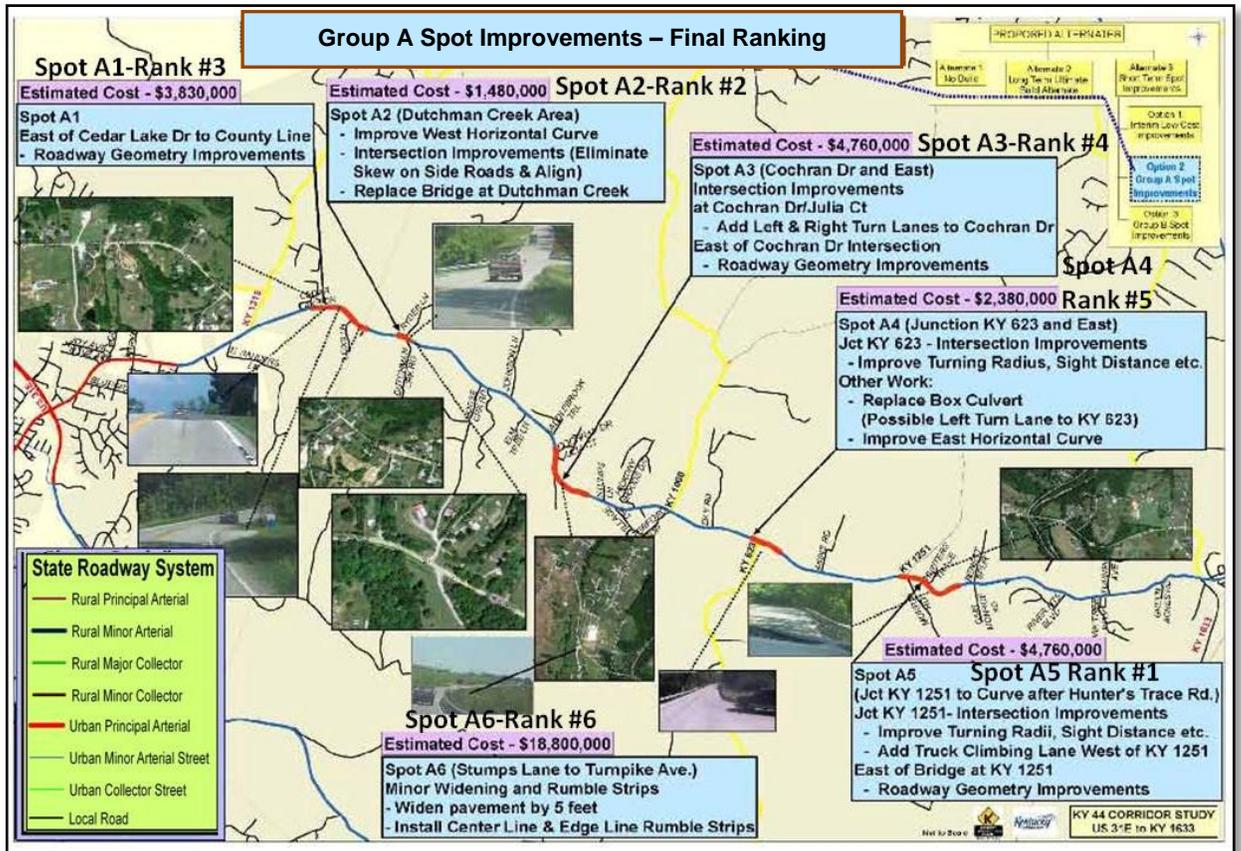


Figure 12: Group A Spot Improvements – Final Ranking

The ranking of Group B Spot Improvements are summarized in Table 11 and Figure 13.

Table 11: Group B Spot Improvements Ranking

Spot Improvement	Approximate Location	Rank assigned by local officials, Stakeholders & Public	Final Ranking
Spot B1	MP 0.70-0.95, east of Dutchman Creek	4	4
Spot B2	Waterford Loop to Hickory Woods Dr	3	2
Spot B3	KY 44 at KY 1060 and eastwards	2	3
Spot B4	Akins Road area	6	5
Spot B5	Carl Monroe Rd/Bennett Spur area	4	6
Spot B6	River Heights Blvd area	1	1



Figure 13: Group B Spot Improvements – Final Ranking

## XII RECOMMENDATIONS

The population in Bullitt & Spencer counties has been on the increase. There is growth in recreational traffic traveling to Taylorsville Lake State Park. Traffic volumes are projected to reach nearly 24,500 ADT in 2035 at the west end of the study. Truck volumes are projected to range between 12%-16% in 2035. There are several high crash areas and inadequate roadway geometry. Taking all these into consideration, KY 44 roadway improvements are recommended.

The Phase I Design for Segment 1 between US 31E and KY 1319 has recommended a five lane curb and gutter section at the west end of the study changing over to a three lane typical section ending at Parkland Trace. Considering the high traffic volumes and the large number of rear end crashes that currently occur and increase in projected traffic volume, these typical sections are appropriate for this section and are recommended. The Phase I Design also recommends an improved two lane section from Parkland Trace to KY 1319 which will further improve safety in that section. It is recommended that Segment 1 continue with the advancement into Final Design.

Estimated cost to construct the ultimate build roadway for the 7.5 mile long Segment 2 from KY 1319 to the Spencer Elementary School is nearly \$71 million. As this is a significant amount to obtain funding, it is recommended that the roadway improvements should be phased. The most immediate and cost effective solution that can improve the safety of this segment is the interim low cost improvements. The most common crashes in this segment are the roadway departure crashes occurring due to lane cross-over or drivers losing vehicle control around the curves. As identified, improving safety around sharp curves and installing edge rumble strips are some recommendations which are low cost and are effective in reducing crashes and in most cases can be completed using available maintenance and HSIP funds.

The next recommendation for Segment 2 is to consider some of the spot improvement projects. The final ranking identified in this report may be used to determine the order of priority for these projects. For example: Spot A5 is the sharp curve east of Hunters Trace Rd. It is ranked as the highest priority project to improve the roadway geometry in this high crash location. The projects and their ranking were based on a number of factors and public input as identified in the study and would improve safety in those areas. In some cases, two or more projects may be combined irrespective of the ranking or grouping for design purposes or cost effectiveness and also considering the funding priorities. For example, Spot A5 east of Hunters Trace may be combined with Spot B5 at Carl Monroe road for the above mentioned reasons.

It is recommended that spot improvement projects should be designed keeping in mind the ultimate roadway section proposed in this study. The current design standards for the lane and shoulder widths, roadway curvature, sight distance, grades etc. should be followed.

If Segment 2 is programmed for funding for the ultimate build section, the typical section proposed in Section IXB is recommended. The typical section proposes a two lane roadway with shoulders considering the truck and recreational traffic on this segment. Also, the shoulders can accommodate bike traffic. The ultimate build will include truck climbing lanes and turning lanes where needed and improve intersections. The east end of the new roadway will transition to the recently completed three lane section in front of Spencer County Elementary School.

Segment 3 from the east end of the three lane roadway in front of Spencer County Elementary School to KY 1633 was in the right-of-way acquisition stage at the time this study was conducted. The two lane roadway follows a new alignment and would improve the safety in this section with the new roadway geometry. The recommendations identified in Item 5-395.00 are appropriate for Segment 3. During the study, sidewalks were requested to be included in the upcoming construction project for Item 5-395.00. It is recommended that sidewalks should be considered when funding is available in this segment.

### **XIII ACKNOWLEDGEMENTS & CONTACTS**

Several individuals contributed to the completion of this study. The time, effort, and knowledge shared by the following participants is greatly appreciated:

- Every member of the District 5 staff who actively participated in the team meetings, Public Meetings and provided cost estimates. Their experience in various aspects of highway projects was a big asset.
- Randall Embry and Andy Rush from KIPDA for their participation in the study.
- Central Office, Division of Planning staff for their guidance and participation in the study.

Additional information regarding the KY 44 Corridor Study can be obtained by contacting the following KYTC Division of Planning staff members:

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