Kentucky Transportation Cabinet
US 431 Programming Study for Safety Improvements
Logan, Muhlenberg, McLean, and Daviess Counties
Item No. 02-8106.00
September 2008

The Kentucky Transportation Cabinet (KYTC) has undertaken this Programming Study to recommend safety improvements along the US 431 corridor from the Tennessee state line to the US 60 Owensboro Bypass. The study area passes through the Kentucky counties of Logan, Muhlenberg, McLean, and Daviess. The purpose of this study is to identify, develop, and prioritize solutions for safety problems existing along the route.

US 431 south of Muhlenberg South Elementary School

Study Area Conditions

The study area runs north-south along the existing US 431 corridor. The route is primarily a two-lane rural facility passing through a number of small communities. Larger towns include Russellville, Central City, and Owensboro. Communities throughout the region rely on the US 431 corridor as an economic link to cities such as Owensboro to the north and Nashville to the south.

The segment of the corridor in Muhlenberg County was included in the Kentucky 2006 Five Percent report. It is identified as one of the top 5% of state-maintained roadways with the most fatalities and severe injuries.

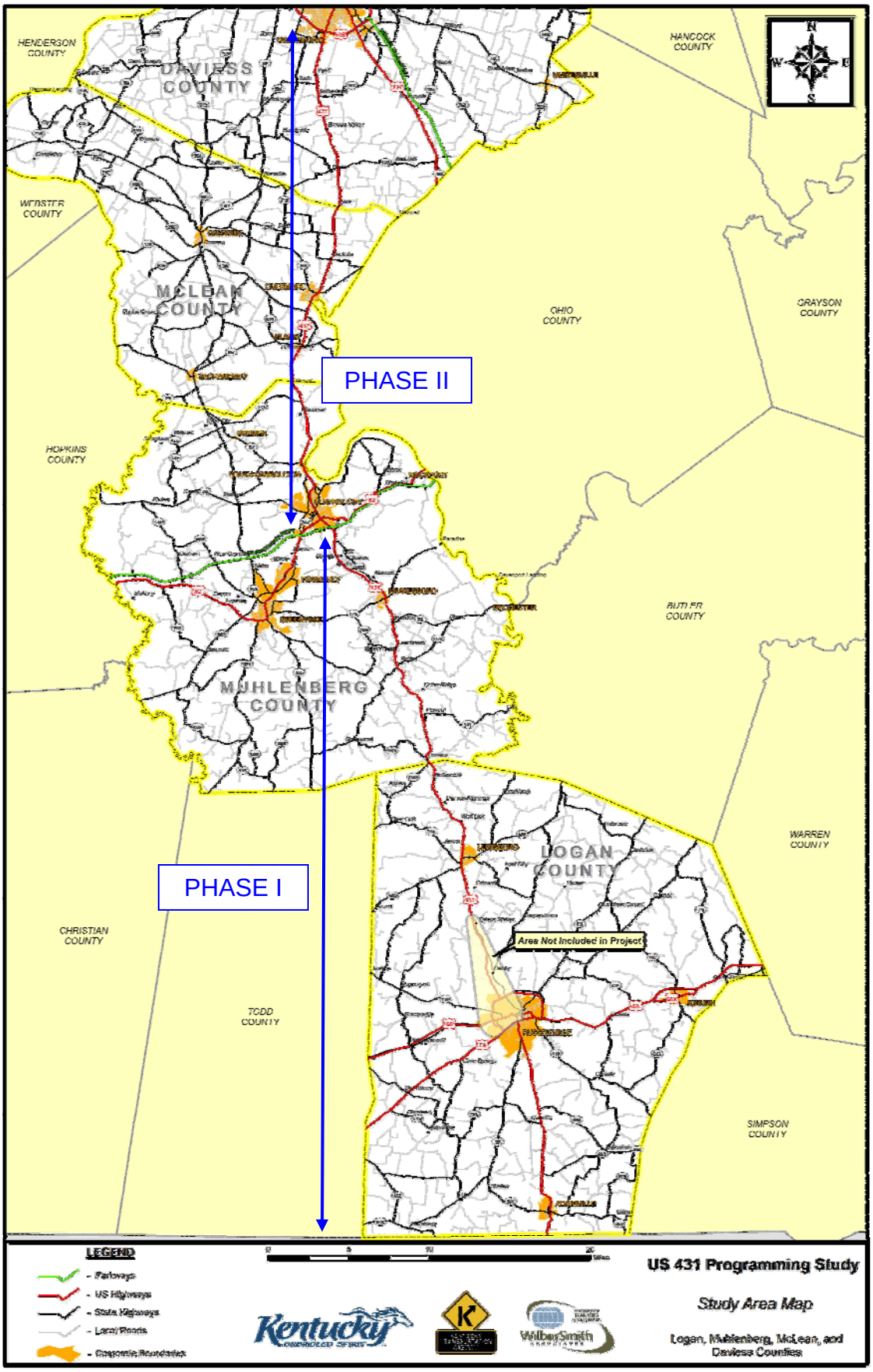
Traffic and Safety Characteristics

Traffic volumes on US 431 range from 2,580 vehicles per day (vpd) near the Logan/Muhlenberg County line to 29,900 vpd in Owensboro. A large number of heavy trucks were observed in Muhlenberg County due to coal mining operations. According to 2005 data from the KYTC Coal Haul Highway System, as much as 3 million tons of coal is hauled by truck along segments of US 431 south of the Ford Parkway in Muhlenberg County.

On US 431, the level of service (LOS) throughout rural portions of the corridor is restricted by limited passing opportunities and the frequency of access points. Generally, LOS drops to lower levels within the towns and small developed areas along the roadway. Most undeveloped sections function at a LOS D or better.

The historic annual growth rate used for projecting future traffic was 1.45%, resulting in 2030 traffic volumes ranging from 3,600 vpd in undeveloped rural areas to 41,600 vpd in Owensboro. For future year 2030 traffic projections, most of the route is anticipated to function at a LOS D or E.

Reported crashes occurring during 2003-2006 defined multiple spots and segments with high crash tendencies. In the four year analysis period, there were 583 reported crashes in the Phase I portion (Tennessee border to Western Kentucky Parkway) of the route, including 11 fatality crashes and 165 injury crashes. For Phase II (Western Kentucky Parkway to US 60 Owensboro Bypass), there were 611 reported crashes during the same period, including 9 fatality crashes and 191 injury crashes. ”High crash” locations included 4 segments and 26 spots with a critical rate factor (CRF) above 1.00 in Phase I; and 4 segments and 14 spots with a CRF above 1.00 in Phase II.


HENDERSON COUNTY
DAVIESS COUNTY
HANCOCK COUNTY
WEBSTER COUNTY
MCLEAN COUNTY
OHIO COUNTY
GRAYSON COUNTY
PHASE II
HOPKINS COUNTY
BUTLER COUNTY
MUHLENBERG COUNTY
LOGAN COUNTY
WARREN COUNTY
PHASE I
CHRISTIAN COUNTY
Area Not Included in Project
TODD COUNTY
SIMPSON COUNTY
LEGEND
- Parkways
- US Highways
- State Highways
- Local Roads
- Proposed Roundabout
US 431 Programming Study
Study Area Map
Logan, Muhlenberg, McLean, and Daviess Counties

Project Purpose

The general purpose of this study is to improve highway safety along US 431 in Kentucky. As a secondary goal, increasing access and connectivity for this regional corridor is also desirable. Projects were identified as part of this study to address these needs.

Improve Safety

For the most part, US 431 is a two-lane undivided highway with 9 to 12 foot lanes and narrow shoulders. Especially in rural areas, numerous horizontal and vertical curves restrict sight distances which create potential safety problems along the existing alignment.

In urban areas such as Central City and Owensboro, the cross-section expands to 3 or 4 lanes with turning bays, curb-and-gutter, and sidewalks in select areas. Concentrations of access points increase conflict potential in the developed portions of the corridor, which is reflected in an increased number of rear end and angle type crashes as driveway densities and traffic volumes increase.

View along US 431 of southern bridge over Rocky Creek

Increase Access and Connectivity

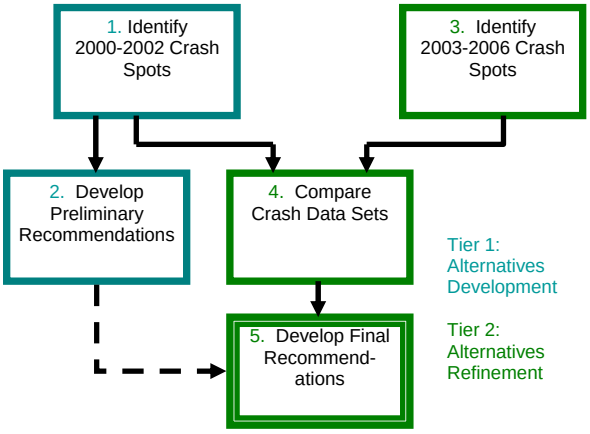
Improvements to the roadway should not only improve safety, but also increase access and connectivity between highways and communities located within and around the project corridor. US 431 is strategically located between the William H. Natcher Green River Parkway and the Edward T. Breathitt Pennyrile Parkway to provide regional north-south connectivity between Tennessee and Indiana, with access to several cities and numerous small communities along the corridor.

Frequent stops and limited passing opportunities increase travel times between destinations. On this regionally significant route, individual bottlenecks create a negative perception of the route overall and deter long distance trips. Addressing existing geometric deficiencies will have a positive impact on access at both local and regional levels. It may also improve the economic development potential throughout this corridor.

Alternatives Development

Safety improvement recommendations evolved over a two-tiered process. Initially, 2000-2002 crash data was analyzed and coupled with resource agency input to develop a preliminary set of prioritized recommendations. In a later stage, crash data for 2003-2006 was collected, then compared to the 2000-2002 data. A set of final recommendations were developed, based on the reported crashes in both data sets and incorporating elements from the preliminary recommendations. This process is illustrated below.

Alternatives Development and Refinement Process



Recommendations

Based on resource agency input, technical analysis, and project team concurrence, the following recommendations were made.

Specific Recommendations and Priorities

A total of 20 specific spot improvements are recommended to address safety issues identified as a result of this study. These 20 locations where chosen because of detailed analysis of the entire 75-mile route. In making final determinations, the stated goal of "increased safety" was paramount; therefore, crash data was the major factor in determining whether a geometric alternation was to be considered. After detailed review of seven years of crash data, field review of the entire route, analysis of documented planning data, and interdisciplinary team meetings, it was decided that geometric fixes could substantially improve safety at 20 different locations along the route. These recommended modifications will improve not only the safety of the entire corridor, but also the comfort level of the traveler and thus, the attractiveness of this roadway as a legitimate north/south choice for longer travel. The 20 recommendations fall into the following four categories:

1. Widening Segments,
2. Realigning Curves,
3. Improving Roadside Features, and
4. Improving Intersections.

Each of the 20 proposed projects were ranked as high, medium, or low priority for Phase I and Phase II. The table on the following page briefly describes each of the projects and lists their implementation costs.

The improvements were weighted by the crash Critical Rate Factor (CRF), crash severity, and estimated cost to fix. Cost estimates were developed for each recommended spot improvement by KYTC District personnel. Each of the prioritized projects are described in greater detail in Appendix H of the report. In this section, the reader can find out more specific data on each project location and a written description of the recommended fix and corresponding costs along with a picture of the location.

US 431 at KY 81 in South Carrollton

Additional Recommendations

General Recommendations – A number of trends appeared along the corridor length that impact overall safety along the study corridor. These factors include access control, roadside features, and heavy truck volumes. These should be taken into consideration during development phases for recommended projects. If more immediate lower-cost improvements are desired for any particular location or locations along the US 431 Corridor which have experienced a significant crash history, a Roadway Safety Audit for those locations can be an option. A Roadway Safety Audit utilizes an interdisciplinary team to identify possible low-cost improvements including more or modified signing, shoulder work, clearing right-of-way, rumble strips, etc. Such low-cost improvements could possibly be implemented in the interim with dedicated federal funding prior to execution of the "recommended build" projects. These low-cost improvements should not be considered as replacements for those "recommended build" projects.

Continued Monitoring – Statistical crash investigations and field observations suggested potential mitigations at most sites; however, three locations did not satisfactorily reveal causal features which a project should address. These locations are recommended for continued monitoring by transportation officials. More details on these three locations can be found in Chapter IX of the Final Report.

Cost Estimate by Phase and Priority

Location	Project Description	Design Cost	ROW Cost	Utility Cost	Const Cost	Total Cost
Phase I						
	High Priority					
1-I	Intersection Improvements at KY 973	$20,000	$0	$0	$50,000	$70,000
1-J	Widen Bridges at Penrod	$120,000	$150,000	$130,000	$1,200,000	$1,600,000
1-K	Realign segment near Union Ridge	$560,000	$1,000,000	$900,000	$5,600,000	$8,060,000
1-Q	Intersection Improvements at KY 70	$25,000	$0	$0	$100,000	$125,000
1-R	Intersection Improvements at KY 176	$100,000	$390,000	$350,000	$820,000	$1,660,000
1-U	Widen Segment at Parkway Interchange	$50,000	$50,000	$25,000	$275,000	$400,000
High Priority Totals		$875,000	$1,590,000	$1,405,000	$8,045,000	$11,915,000
	Medium Priority					
1-G	Realign Segment at Hollow Bill, north Logan County	$400,000	$600,000	$360,000	$4,040,000	$5,400,000
1-M	Intersection Improvements at KY 2270	$20,000	$0	$0	$50,000	$70,000
1-O	Intersection Improvements at KY 246	$50,000	$50,000	$0	$250,000	$350,000
Medium Priority Totals		$470,000	$650,000	$360,000	$4,340,000	$5,820,000
	Low Priority					
1-D	Intersection Improvements at US 79	$100,000	$500,000	$200,000	$500,000	$1,300,000
1-H	Intersection Improvements at KY 1293	$225,000	$570,000	$160,000	$2,270,000	$3,225,000
1-J	Realign segment at Penrod	$100,000	$220,000	$180,000	$750,000	$1,250,000
1-R	Intersection Improvements at KY 2107	$100,000	$180,000	$100,000	$350,000	$730,000
1-T	Intersection Improvements at Cleaton Road	$100,000	$140,000	$145,000	$520,000	$905,000
Low Priority Totals		$625,000	$1,610,000	$785,000	$4,390,000	$7,410,000
Phase I Totals		$1,970,000	$3,850,000	$2,550,000	$16,775,000	$25,145,000
Phase II						
	High Priority					
2-D	Realign Segment at KY 81	$75,000	$200,000	$125,000	$300,000	$700,000
High Priority Totals		$75,000	$200,000	$125,000	$300,000	$700,000
	Medium Priority					
2-A	Widen Segment at Parkway Interchange	$115,000	$200,000	$460,000	$950,000	$1,725,000
2-L	Intersection Improvements at Harmons Ferry Road	$100,000	$150,000	$200,000	$500,000	$950,000
2-M	Improve Roadside Geometry at Mill Street	$20,000	$0	$0	$75,000	$95,000
2-N	Intersection Improvements at KY 140	$100,000	$200,000	$200,000	$750,000	$1,250,000
Medium Priority Totals		$335,000	$550,000	$860,000	$2,275,000	$4,020,000
	Low Priority					
2-K	Intersection Improvements at KY 250	$100,000	$200,000	$180,000	$500,000	$980,000
Low Priority Totals		$100,000	$200,000	$180,000	$500,000	$980,000
Phase II Totals		$510,000	$950,000	$1,165,000	$3,075,000	$5,700,000
Total for Phase I & Phase II		**$2,480,000**	**$4,800,000**	**$3,715,000**	**$19,850,000**	**$30,845,000**


US 431 Programming Study
Roadway Spot and Segment Improvements
Logan, Muhlenberg, McLean, and Daviess Counties
LEGEND
Roadway Improvements Priorites:
High
Medium
Low
Project Type Codes:
Roadside = Improve Roadside Geometry
Int Imp. = Intersection Improvements
Realign = Realign Segment
Widen = Widen Segment
2-N / MP 2.599 / Int Imp.
2-M / MP 1.985 / Roadside
2-L / MP 0.000 - 0.100 / Int Imp.
2-K / MP 9.800 - 9.950 / Int Imp.
2-D / MP 22.298 - 22.498 / Realign
2-A / MP 17.900 - 18.200 / Widen
1-U / MP 17.300 - 17.584 / Widen
1-T / MP 15.184 / Int Imp.
1-R / MP 11.982 / Int Imp.
1-R / MP 11.467 / Int Imp.
1-Q / MP 9.834 / Int Imp.
1-O / MP 8.020 / Int Imp.
1-M / MP 6.964 / Int Imp.
1-K / MP 4.600 - 5.100 / Realign
1-J / MP 3.900 - 4.200 / Realign
1-J / MP 3.454 - 3.634 / Widen
1-I / MP 0.487 / Int Imp.
1-H / MP 30.900 - 0.260 / Int Imp.
1-G / MP 29.700 - 30.600 / Realign
1-D / MP 13.896 / Int Imp.
DAVIESS COUNTY
MCLEAN COUNTY
MUHLENBERG COUNTY
OHIO COUNTY
LOGAN COUNTY
TODD COUNTY
BUTLER COUNTY
TENNESSEE
OWENSBORO
LIVERMORE
ISLAND
SOUTH CARROLLTON
CENTRAL CITY
BREMEN
DRAKESBORO
POWDERLY
LEWISBURG
RUSSELLVILLE
ADAIRVILLE
Miles