

## Introduction

Parsons Brinckerhoff was contracted by the Kentucky Transportation Cabinet (KYTC) to provide engineering services for the completion of a corridor planning study to identify and evaluate potential improvements to KY 222 and KY 84 and to develop a possible new connector route between KY 61 and I-65 in LaRue and Hardin Counties, Kentucky. This study has been listed in the KYTC Highway Plan as Item No. 04-8505.00. The study was initiated by local officials in LaRue County with the vision to provide an improved connection from Hodgenville to the Glendale Industrial site (or Glendale Megasite). The study area encompasses the area between I-65, KY 61, and KY 84 as shown in **Figure ES-1**.

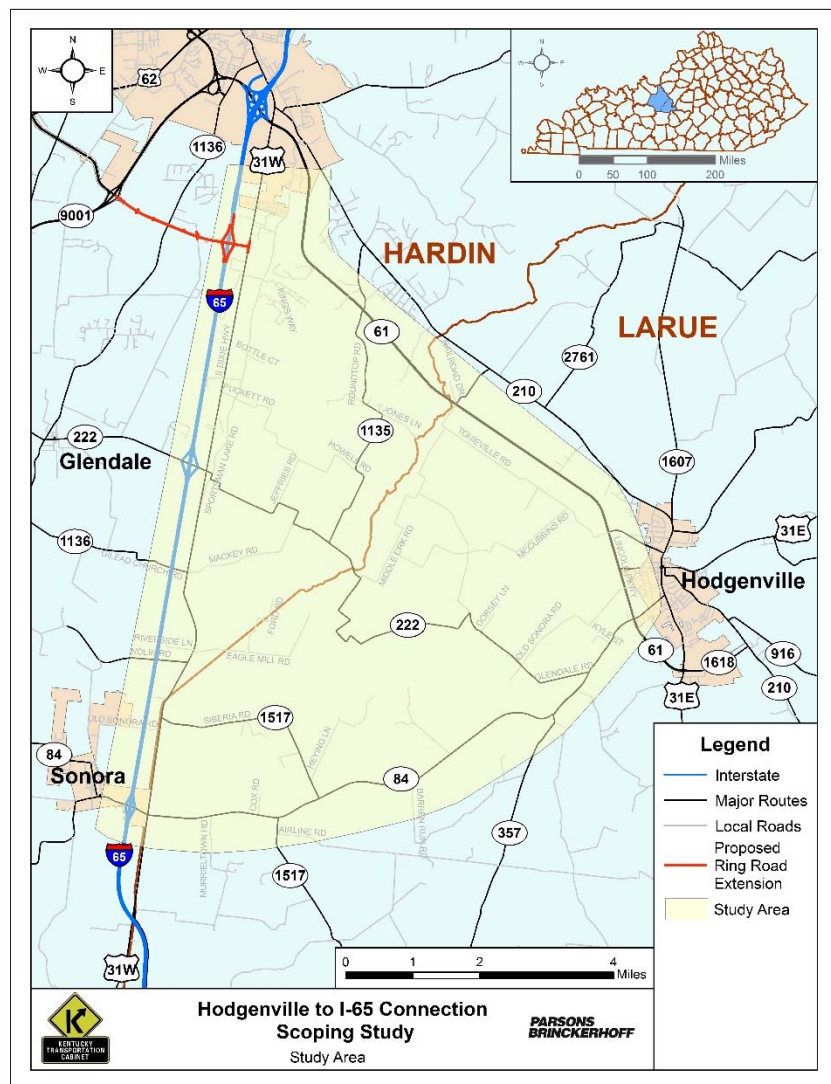
The study includes identifying short-term improvements along existing routes (KY 222 and KY 84) where feasible that can be quickly and effectively implemented. It also focuses on long-term solutions that examine corridor-wide improvements to KY 222 and KY 84, as well as new route options including a connection from KY 222 to KY 61, and a possible extension of KY 3005 (Ring Road) to connect with KY 61.

While KYTC has the ultimate responsibility for constructing and maintaining safe and efficient highways, KYTC desires to incorporate local official and stakeholder (LO/S) and public input into the evaluation and decision-making process. Therefore, this study was completed in coordination with input from the LO/S and the public.

## Purpose and Need

The purpose and need statement for this study was developed from issues identified in field reviews, through LO/S and public input, and from the technical analysis of deficiencies and operations identified in the existing roadway conditions.

**Figure ES-1: Study Area**



### Purpose

The purpose of the Improved Hodgenville to I-65 Connection Scoping Study is to identify a more reliable and safer connection between Hodgenville and I-65 / Glendale.

### Need

Several needs have been identified that support transportation improvements in the study area. The supporting need is presented below.

*Safety* - Two spot locations within the study area have a critical crash rate factor (CCRF) equal to or greater than 1.0:

- KY 84 near I-65 - (CCRF = 2.74)
- KY 222 near I-65 - (CCRF = 1.18)

In addition, three fatal crashes occurred within the study area during the time period of analysis (January 2010 to December 2014).

*Roadway Deficiencies* - KY 84 has 36 noted vertical and 5 horizontal deficiencies. Within these areas, 22 out of 59 crashes occurred (37%). KY 222 has 65 noted vertical and 25 horizontal deficiencies. Within these areas, 3 out of 5 crashes occurred (60%).

*Travel Time Reliability* - Travel time reliability refers to a desire to have consistency in travel times day to day. KY 222 and KY 84 both have a volume to capacity ratio (v/c ratio) much less than 1.0 or 0.9. A v/c ratio of 1.0 is considered capacity in urban areas while a v/c ratio of 0.9 is considered capacity in rural areas. Therefore, operations on both roadways do not result in peak hour congestion.

The issue, however, with unexpected delays along these routes is that they are two-lane roads with limited passing opportunities. As noted, both have numerous deficient horizontal and vertical curves requiring drivers to slow down. Travel times on these routes vary depending on the number of vehicles, the vehicle mix, and weather. The average estimated travel time from I-65 at Glendale via KY 222 to Hodgenville is 14.0 minutes. The average estimated travel time from I-65 at Sonora via KY 84 to Hodgenville is 11.2 minutes. If drivers end up behind a slower moving vehicle such as a tractor or horse and buggy, travel times can increase between 35 to 50 percent (dependent on the length of time the vehicle must travel before able to pass).

Comparatively, KY 61 is a four-lane route with more opportunities for passing that connects Elizabethtown to Hodgenville. The average estimated travel time from I-65 near Elizabethtown via KY 61 to Hodgenville is 10.9 minutes.

*Access* - Access to and from Hodgenville and the I-65 / Glendale area is a concern given the existing options:

- KY 84: KY 84 is a two-lane route with lane widths ranging from 9 to 11- feet and narrow or limited shoulders. This route provides access from I-65 / Sonora to Hodgenville.
- KY 222: KY 222 is also a two-lane route with 9-foot travel lanes and minimal shoulders. This route is very disjointed and requires multiple turns to travel between I-65 at Glendale to KY 61 near Hodgenville. This route also has numerous horizontal and vertical deficiencies. This route does connect the I-65 / Glendale area to Hodgenville.
- KY 61: KY 61 is a four-lane, divided, partially access-controlled route. It provides access to Hodgenville from the Elizabethtown area.

Given these three different routes, access is dependent on driver location on I-65. KY 61 is the logical choice from Elizabethtown. Drivers will most likely choose to use KY 84 to travel to the Hodgenville area if they are travelling northbound on I-65. KY 84 is also signed as the route to the Abraham Lincoln Birthplace National Historical Park and Abraham Lincoln's Boyhood Home at Knob Creek. If drivers are in the Glendale area, they can either use KY 222 with its noted issues, or choose another route. It should also be noted that depending on route choice and direction of travel, portions of I-65 may also be used in conjunction with these three routes.

*Connectivity* - Currently, there is no continuous direct route from I-65 near the Glendale area to Hodgenville. KY 222 is the current route providing a connection near I-65 / Glendale; however the deficiencies and multiple turns result in slower speeds. The existing route also does not provide direct access from I-65 near the Glendale area to the major industrial employers in the area (Cumberland Products, Inc., Lincoln Tool, Inc., and Konsei USA, Inc.) located just north of Hodgenville along KY 61. Some truck traffic may be utilizing KY 84 for local access but it is not a designated truck route per the Kentucky Designated National Truck Network. According to the most recent counts (2013), 11.6% of vehicles using KY 84 are trucks.

KY 61 is the other alternate route that does provide direct access to the industrial employers located north of Hodgenville. For southbound traffic on I-65, this is the preferred route to access the industrial park. For northbound traffic on I-65, trucks must travel north to Elizabethtown, then turn south along KY 61.

## Existing Conditions

A detailed inventory examined ongoing and identified transportation projects, existing roadway characteristics, traffic volumes, level of service (LOS), capacity, and crash rates. A summary of key points is as follows:

- In the KYTC FY 2014 – 2020 Highway Plan Item No. 4-198.00 is included. This project is to extend KY 3005 (Ring Road) from the Western Kentucky Parkway to I-65 (right-of-way and utilities costs = \$4,450,000). State construction funds were not available at this time. This project is important

to consider as it would have connectivity implications on the possible extension of Ring Road from I-65 to KY 61 being studied in this project.

- A total of 41 locations along KY 84 and 90 locations along KY 222 have geometric curves that do not meet current design standards.
- KY 84 has existing traffic volumes (average daily traffic) ranging from 4,450 near the interchange with I-65 dropping to 1,730 moving eastward from the interchange. KY 222 has existing traffic volumes (average daily traffic) of less than 200.
- All segments of KY 84 and KY 222 are under capacity (less than 1.0 in urban areas or 0.9 in rural areas). The LOS for all segments are calculated to be LOS C or better. Therefore, there does not appear to be consistent capacity or level of service issues along the existing routes.
- There are two spot locations within the study area that have a CCRF equal to or greater than 1.0. The first is on KY 84 near I-65 (CCRF = 2.74). The second is on KY 222 near I-65 (CCRF = 1.18). Three fatal crashes occurred during the time period of analysis (January 1, 2010 through December 31, 2014). Two occurred on KY 84; the third occurred on KY 61.
- The LaRue County Industrial Park is located along KY 61, north of Hodgenville. The site includes several major industries in the county and results in truck traffic travelling through the study area.
- There are several properties listed on the National Register of Historic Places (NRHP) located along the KY 84 and KY 222 corridors. There are also two archaeological sites located within the study area that could be of potential concern.

## Alternative Development and Analysis

### Preliminary Analysis

A set of alternatives were developed initially as a result of direction by KYTC on the specific needs of this study. A no-build option is the baseline for comparison and should be carried forward as a viable alternative throughout the project development process.

The four initial build alternatives are as follows:

- Route No. 1: New corridor extending KY 3005 (Ring Road) from US 31W to KY 61
- Route No. 2: New corridor near the I-65 / KY 222 interchange to KY 61
- Route No. 3: Improve existing route KY 222 from I-65 to KY 84
- Route No. 4: Improve existing route KY 84 from I-65 to KY 61

Each alternative was considered for any fatal flaws that would prohibit it from progressing as a potential feasible option for further project development. Route No. 3 (Improve existing route KY 222) was recommended for elimination at this stage of the project for the following reasons:

- Low traffic volumes (ADT currently less than 200) and low projected future year traffic volumes (ADT 250)
- Very rural roadway serving primarily local traffic
- Current route disjointed with multiple turn movements

- Cost outweighs benefits based on the number of identified geometric deficiencies (65 vertical and 25 horizontal) compared to the traffic volume potentially served

Furthermore, this was confirmed independently by the LO/S at their first meeting. The group unanimously vocally agreed to eliminate improvements to KY 222 as an option, as well as noted it on their survey forms (eleven out of eleven responses).

KY 84 was further examined at this point to determine if there were any locations where spot improvements were warranted. **Table ES-1** lists these projects.

**Table ES-1: KY 84 Spot Improvement Projects**

Spot Improvement	Location	Project
84-A	KY 84 at US 31W near MP 26.00	Improve sightlines by moving utility poles
84-B	KY 84 at KY 357 at MP 6.56	Realign intersection
84-C	KY 84 at KY 222 at MP 7.39	Realign intersection
84-D	KY 84 near Milepoint 8.00	Realign curve
84-E	KY 84 at KY 61 at MP 8.44	Flashing yellow arrow for left turns and offset left turns
84-F*	KY 84 at Barren Run Creek Bridge at MP 3.33	Replace superstructure

\*Note: 84-F was added to the list following the second LO/S meeting and public meeting.



**Detailed Analysis**

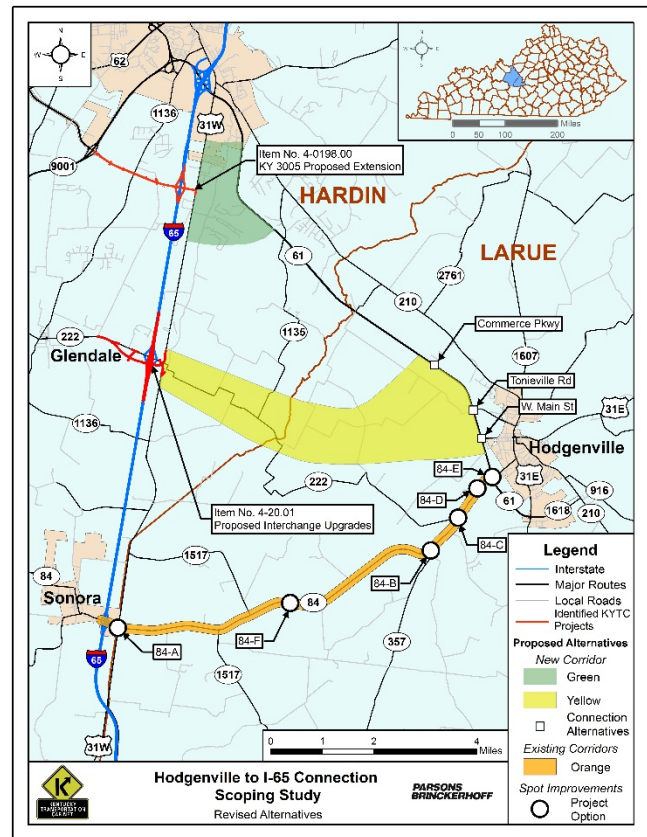
The remaining three alternatives and options were advanced to the next stage for detailed analysis and assigned a broader-based project identifier name. The naming convention became:

- Route No. 1: Ring Road Extension = Green Corridor
- Route No. 2: New Corridor to Hodgenville = Yellow Corridor
- Route No. 4: Improve Existing KY 84 = Orange Corridor

Figure ES-2 shows the revised map with the location of these corridors as well as the spot improvements. Figure ES-3 provides more detail on the spot improvements.

A more detailed evaluation was then performed with respect to traffic operations, environmental impacts, and costs. Table ES-2 provides a summary of these impacts.

**Figure ES-2: Proposed Alternatives**



**Figure ES-3: KY 84 Spot Improvements**

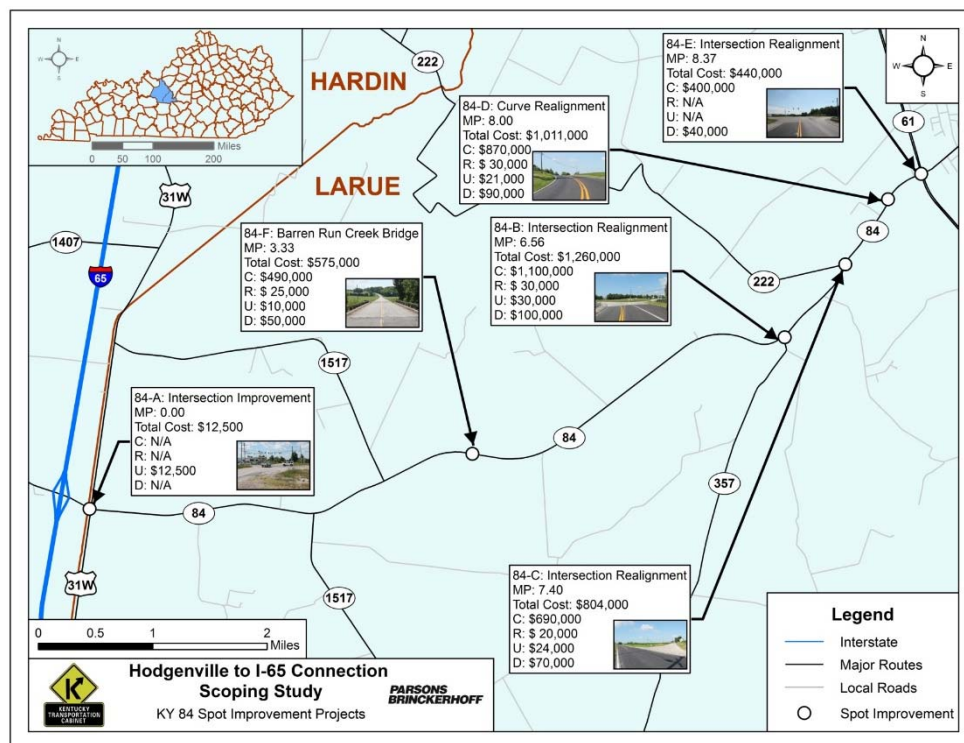


Table ES-2: Summary of Detailed Analysis

Alternative	Description	Length	2040 ADT	2040 LOS	V/C Ratio	Travel Time / Distance <sup>1</sup> (min / miles)	Farmland Impact (Acres)	Planning-Level Cost Estimate <sup>2</sup>
Green	Extension of Ring Rd (KY 3005) from US 31W to KY 61	0.8	6,000	A	0.09	12.2 / 11.9	15	\$5,040,000
Yellow	New corridor near the I-65 / KY 222 interchange to KY 61	7.2	2,300 – 4,500	C	0.15	8.9 / 8.2	115	\$33,528,000
Orange	Improve existing KY 84 route from I-65 to KY 61	8.6	4,000 – 5,500	C	0.18	16.2 / 14.8	0	\$34,420,000

**\*Note:**

<sup>1</sup>Travel time analysis is based on a start point at the Glendale interchange (I-65 and KY 222) and an end point at the center of Hodgenville. All values are calculated based on distance and the posted speed limit (or proposed limit for new routes). They do not consider additional delay related to the interchanges with I-65 or the traffic signals in Hodgenville as all three routes would experience each of these delays. Therefore, these are relative comparisons and should not be considered actual travel times.

For reference, existing travel times from the same start and end point are as follows:

- I-65/KY 61 Route: 13.8 min (13 miles)
- KY 222/KY 84 Route: 14.0 min (11.4 miles)
- I-65/KY 84 Route: 16.2 min (14.8 miles)

<sup>2</sup> Planning cost estimates are in current year dollars (2015).

## Recommendation

Based on the alternatives analysis, the project team discussion, and inputs from LO/S and the public, the corridor that best meets the purpose and need of the project is the Yellow Corridor. This recommendation however is only justifiable if and when the Glendale Industrial Site develops, increasing traffic demand for a new route beyond what is otherwise projected. All three corridors provide different benefits and have different impacts, as noted below:

- The Green Corridor, while a viable project, does not appear to fully meet the purpose and need for this study. Future development of the Green Corridor can take place independently as growth in that section of the study area warrants and completion of the roadway to the east and northeast occurs. However, should the need for direct connectivity between I-65 / Glendale and Hodgenville diminish, the Green corridor provides a cost-effective solution to the remaining needs.
- The Yellow Corridor appears to best meet the purpose and need of this project. It provides an improved connection between I-65 / Glendale and Hodgenville meeting much of the purpose and need. This is in contrast to the Green Corridor, which does not provide a more direct connection to Hodgenville from the Glendale area along I-65. At both of the LO/S meetings, all in attendance unanimously ranked this alternative as their preferred corridor in the survey form (11 out of 11 responses and 9 out of 9 responses). At the public meeting, it received the same number of responses as the Green Corridor from the response exercise. It received slightly less preference than the Orange Corridor through the survey form (25 responses compared to 35 responses).

The typical section recommended at this planning stage is two, 12-foot lanes with a 10-foot shoulder (8-foot paved). This is subject to change per future design evaluation. The specific connection point with KY 61 shall be determined during the design phase, although it is recommended to consider either a connection with Tonieville Road (KY 3204) or near the LaRue County Industrial Park per comments made during the public meeting.

Finally, considering the benefit / cost of the project, it does not appear to warrant further action until growth and development at the industrial park is realized and the requisite travel volume / traffic needed for this project takes place. The overall project cost (including all cost components) is \$33,528,000 for a projected traffic usage of 2,300 vehicles per day without full build-out of the Glendale Industrial Site. This is much too low to justify the costs.

- The Orange Corridor, which would complete a major widening of KY 84, does not fully meet the purpose and need of this project and is not recommended for further project development. While it would improve the safety and roadway deficiencies components of the purpose and need through improved geometrics, it does not provide a more reliable connection between the Hodgenville and I-65 / Glendale area as it maintains its approximate current alignment. Northbound vehicles would benefit from an upgraded KY 84. Traffic from the Glendale area and



the industry along KY 61 would not benefit from this alternative to the same degree as the Yellow Corridor. However, some of the spot improvements identified in the study are recommended as they will address the geometric deficiencies and improve the safety of the route.

Further project development is recommended for the spot improvements at this time. Of the six spot improvement projects identified along KY 84, all six are viable. From a prioritization standpoint, improvements 84-A: KY 84 at US 31W (total cost of \$12,500) and 84-D: KY 84 near Milepoint 8 (total cost of \$1,011,000) are the high priority spots. This is based on input from the LO/S group and the public, and ultimately decided upon by the project team. The following are some considerations for the remaining spot improvement projects:

- 84-B: KY 84 at KY 357 Intersection Realignment - The realignment to make KY 84 the primary route is justified by traffic volumes but may not be warranted as a stand-alone project (i.e. not warranted unless KY 84 is widened).
- 84-C: KY 84 at KY 222 Intersection Realignment - The realignment of the approach of KY 222 to provide a better connection to KY 84 is a project that could be considered a stand-alone project but is not a high priority at this time.
- 84-E: KY 84 at KY 61 Intersection Realignment - Signal timing adjustments and an offset for left turns from KY 61 could be made to improve intersection operations. At the time of this documentation, KYTC District 4 has added this project to their list of in-house projects for 2016.
- 84-F: KY 84 at Barren Run Creek Bridge - This spot improvement project has the highest cost (total cost of \$575,000) of the remaining projects not in the top two. It is possible that additional maintenance on the immediate approaches may alleviate some of the issues at a lower cost than the full bridge replacement project.

Currently, there is no funding in the 2014 KYTC Highway Plan for any future phases of project development. The 2016 KYTC Highway Plan includes \$1,000,000 for the design phase of this project listed as Item No. 04-8505.00. An additional \$675,000 (D: \$125,000, R: \$50,000, U: \$100,000, C: \$400,000) is listed for connector improvements Hodgenville to I-65 as Item No. 04-8909. Additional review in the design phase should provide the necessary evaluation (including public input) on the preferred treatment of the entire corridor, including any modifications to the typical section and specific connection points to I-65 and KY 61.