

HARRODSBURG NORTHWEST BYPASS

MERCER COUNTY

Item Number: 07-8344.00

FINAL REPORT

JULY 2009

ALTERNATIVES PLANNING STUDY



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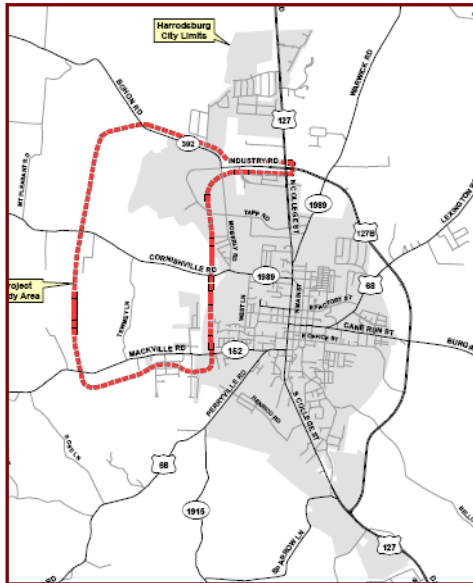
Harrodsburg

Northwest Bypass Alternatives Study

Final Report

Item No. 7-8344.00

Mercer County, Kentucky



Prepared for:

Kentucky Transportation Cabinet

Division of Planning

and

District-7, Lexington, Kentucky



Prepared by:



July 2009

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Figure ES-1: Study Area Scenes:

- Harrodsburg Water Tower and Mercer County High School.
- Cornishville Road at Norfolk-Southern RR Crossing.
- KY 1989 Westbound.
- US 68/KY 152 Intersection.

EXECUTIVE SUMMARY

Study Background and Purpose

The initial purpose of the *Harrodsburg Northwest Bypass Alternatives Study* was to examine possible corridors for a new northwest Harrodsburg bypass in Mercer County, Kentucky. The potential northwest bypass was to extend from US 127 at its northern junction with the existing eastern Harrodsburg bypass (US 127B) to KY 152 west of the city. During the development of this study, alternatives to the bypass were identified that, unlike the bypass concept, had substantial public support. The options were refined through a comprehensive stakeholder/public involvement effort, and now form the basis for the course of action recommended herein. The evolution of the initial bypass study and the recommendations resulting from the advancement of alternative concepts are the subject of this document.

In 1991, the Kentucky Transportation Cabinet (KYTC) completed a *Harrodsburg Bypass Advanced Planning Study* that recommended constructing a bypass on the east side of the city. In 2001 a bypass was constructed on the east side of Harrodsburg (from US 127 south of Harrodsburg to US 127 north of Harrodsburg). Presently, KYTC is considering the west side, and focusing on the northwest quadrant because of the perceived lack of roadway connectivity in this area of Harrodsburg.

There is a mix of land uses in the area, and several industries and school facilities in the northwest generate and attract large volumes of traffic, including heavy trucks and school busses. The Salt River and a Norfolk-Southern (NS) rail line bisect the area and would be crossed by any proposed alignment. The Mercer County-Harrodsburg 2004 *Comprehensive Plan* designated this portion of the county as a growth area, and the proximity to the railroad could encourage future industrial growth in this designated area.

Figure ES-1 shows examples of land uses in the project area. Figure ES-2 shows the project location and study area boundaries.

A new road in this area could offer several travel benefits, including the following:

- Facilitating travel from the western portion of Mercer County to US 127 north (toward Lawrenceburg and the Martha Layne Collins Bluegrass Parkway) by providing an alternative to the congested US 127 through Harrodsburg.
- Avoiding the at-grade Norfolk-Southern railroad crossing on US 127, where 26 trains per day contribute to congestion and delay.
- Improving access to/from industrial areas and schools in the northern part.

Study Location and Limits

The Northwest Bypass study area, shown in Figure ES-2, includes the northwestern quadrant of Harrodsburg, beginning at KY 152 in the south and extending north and then east to US 127, a distance of about 3.0 miles. The study area ends at the existing northern US 127/US 127 Bypass intersection. The study area is approximately 1.4 miles wide and about 3.6 square miles in size.

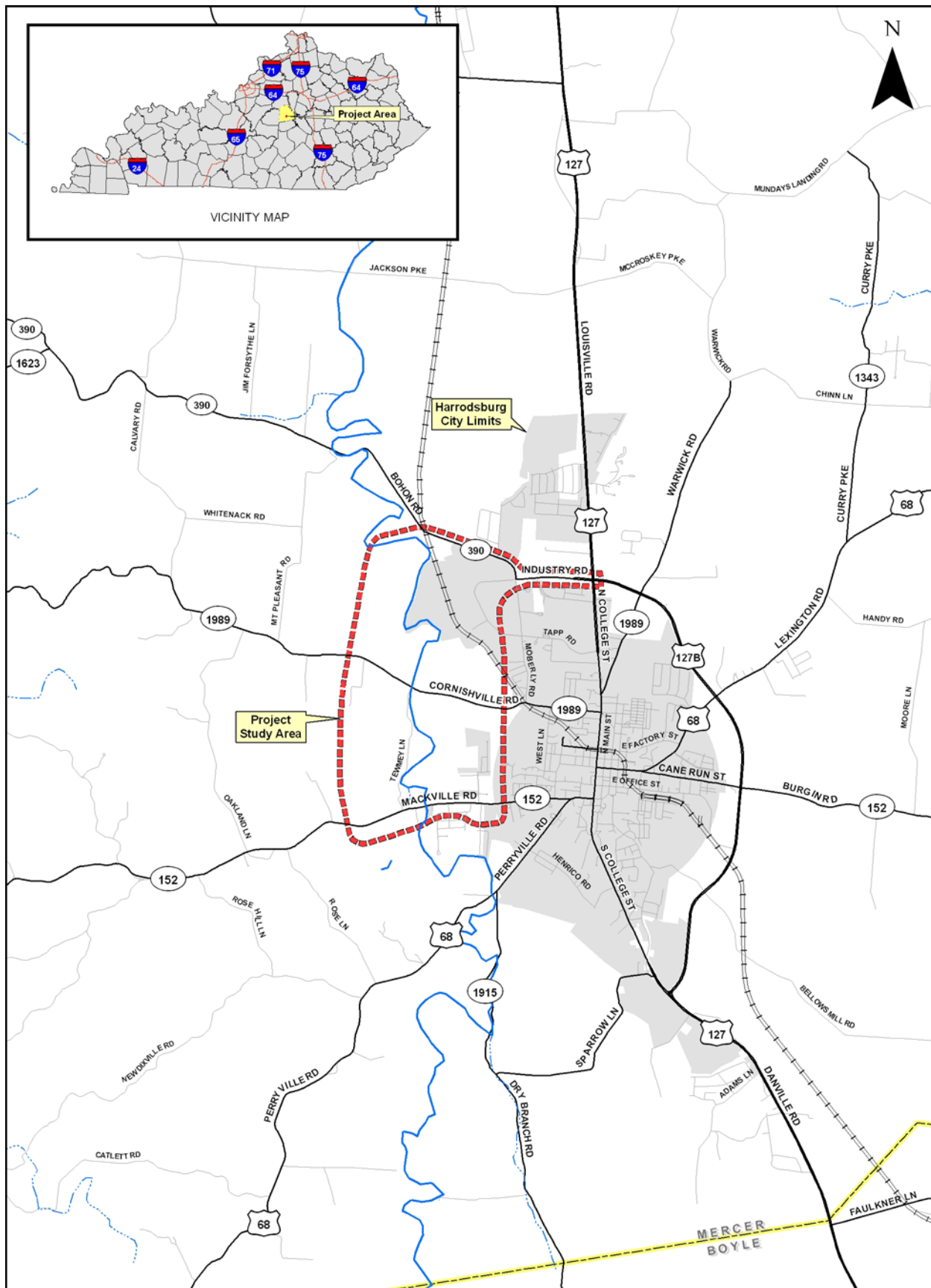


Figure ES-2: Project Location—City of Harrodsburg, Mercer County, Kentucky.

Conditions Analysis¹

Year 2008 traffic data for the study area reveals that College Street is the most heavily travelled of these facilities with a traffic volume of approximately 20,800 vehicles per day (vpd) between Mooreland Avenue and Lexington Street—more than double the average daily traffic volume (ADT) on the existing Eastern Bypass, US 127B (9,700 vpd). On US 127 between KY 1989 and KY 390, the traffic volume was approximately 13,500 vpd, while the section of US 127 between US 68 (Lexington Street) and KY 1989 carried approximately 14,700 vpd. KY 152 carried 5,200 vpd east of Tewmeyer Lane and approximately 2,470 vpd west of that point. KY 390 served nearly 4,660 vpd between Moberly Road and US 127; while west of Moberly Road it carried 1,430 vpd. KY 1989 carried 1,680 vpd from Moberly Road westward and 3,500 vpd from Moberly Road eastward to US 127. KY 152 westward from approximately 0.3 mile west of its intersection with US 68 (see Figure ES-3), KY 1989, and KY 390 west of Moberly Road do not have adequate roadway widths to handle the existing traffic volumes. Exhibit 1 shows the existing traffic counts on these and other sections of roads within the study area.



Figure ES-3: Looking East Toward US 127 at the Junction of US 68 (Perryville Street) and KY 152 (Mooreland Avenue).

KYTC provided crash data for a five-year period from January 1, 2004, through December 31, 2008. US 127 (N. College Street) from US 68 (W. Lexington Street) north to the KY 390 (Industry Road)/US 127B intersection) has a critically high crash rate. The Critical Crash Rate Factors (CCRF) range from 1.10 to 4.72, with the worst section extending from the US 127/US 68 (W. Lexington Street) intersection northward approximately 0.3 mile.

As summarized in Table ES-1, below, two segments and a total of twelve spot locations within the segments analyzed are high crash locations.

¹ Through Harrodsburg, all U.S. and state highways have local names and, among these, several have more than one name/route designation. The following road names are referenced in this study: **US 127** is *South College Street* south of US 68 (Mooreland Avenue) and *North College Street* north of Lexington Street; between Mooreland Avenue and Lexington Street, College Street is officially US 68 for data purposes, not US 127, in accordance with KYTC route numbering conventions; **KY 390** is *Bobon Road* from the intersection of Industry Road and Moberly Road west, and is *Industry Road* from that intersection eastward; **KY 152** is *Mackville Road* from Shewmaker Lane southwestward and *Mooreland Avenue* eastward to US 68. At its juncture with US 68 (see below), Mooreland Avenue becomes US 68. **KY 1989** is *Cornishville Road* west of Moberly Road and *Cornishville Street* east of that road to US 127 (N. College Street); and **US 68** has several names, as follows:

- From the southwest heading northeast: *Perryville Street* from Henrico Road to Mooreland Avenue (KY 152); and *Mooreland Avenue* to US 127 (S. College Street).
- Turning northward: *South College Street* to West Lexington Street.
- Turning eastward: *West Lexington Street* from College Street to North Main Street; *East Lexington Street* beyond.

For ease of reference, U.S. and state highways are identified by their route numbers only, herein, except where use of both route number and local name would provide more precise locational information (e.g., because of its several name and directional changes, US 68 is usually identified by both its route number and a local name).

Table ES-1: High Crash Segments and Spots

Segment & Spot	Route	Begin MP	End MP	Length (Miles)	Number Lanes	Rural / Urban	ACCIDENTS				Critical Crash Rate Factor
							Fatal	Injury	PDO	Total	
Segment	US 127	4.402	6.071	1.669	3-4	U	0	29	125	154	1.76
Spot	US 127	4.400	4.700	0.300	3	U	0	17	68	85	4.21
Spot	US 127	4.500	4.800	0.300	3	U	0	1	22	23	1.10
Spot	US 127	4.600	4.900	0.300	3	U	0	3	19	22	1.05
Spot	US 127	4.700	5.000	0.300	3-4	U	0	5	23	28	1.30
Spot	US 127	4.800	5.100	0.300	3-4	U	0	6	25	31	1.43
Spot	US 68	6.500	6.800	0.300	3	U	0	2	18	20	1.23
Segment	KY 1989	6.837	9.848	3.011	2	R	0	7	11	18	1.14
Spot	KY 1989	6.800	7.100	0.300	2	R	0	5	4	9	3.23
Spot	KY 1989	6.900	7.200	0.300	2	R	0	3	1	4	1.43
Spot	KY 1989	7.000	7.300	0.300	2	R	0	1	2	3	1.08
Spot	KY 1989	7.600	7.900	0.300	2	R	0	0	3	3	1.04
Spot	KY 1989	8.900	9.200	0.300	2	R	0	2	1	3	1.09
Spot	KY 1989	9.000	9.300	0.300	2	R	0	2	1	3	1.09

	High Crash Locations: Segment
	High Crash Locations: Spot

Source: KYTC crash data, 2005-2007

Project Issues and Goals

The following issues and concerns within the study area were identified for consideration in examining the potential purpose of and need for a bypass facility in northwestern Harrodsburg.

- Several schools and industries are located in the northwest quadrant of Harrodsburg. A new Mercer County High School (shown on Figure ES-4) is now open southwest of the KY 390/Moberly Road junction, approximately one-half mile from the former high school campus that is being renovated as a middle school. This concentration of trip origins and destinations at similar times of the day contributes to traffic congestion in the vicinity.



Figure ES-4: New Mercer County High School Seen From Moberly Road.

- Emergency response travel times to the James B. Haggin Memorial Hospital and to other locations are lengthened by congestion along and west of US 127 (S. College Street) in the vicinity of the hospital). The hospital is located on Linden Avenue, which intersects US 68 (KY 152) just west of US 127.
- The Norfolk Southern railroad runs through Harrodsburg from northwest to southeast. At-grade railroad crossings carry up to 26 trains daily. The unique “diagonal” routing of this rail line results in multi-directional street blockages during passage of these trains.
- Location of any northwest bypass in Harrodsburg should be compatible with possible future extension south of KY 152 and connecting with US 127.

Several project goals were identified, including:

- Improve transportation system connectivity
 - Separate school and industry traffic
 - Reduce emergency response travel time
- Provide grade-separated railroad crossings
- Reduce congestion on area roadways
- Facilitate compatibility with future bypass extension to the south

Alternatives Development and Evaluation

A project team approach was used, consisting of representatives from the KYTC Central Office and District 7, the Bluegrass Area Development District (BGADD), and Qk4. Public involvement activities included Project Team meetings, resource agency coordination, meetings with a Project Advisory Committee consisting of local officials and stakeholders, and public information meetings.

At the first public meeting, held on November 19, 2007, attendees were given large maps and invited to draw conceptual corridors for a northwest bypass. This activity produced seventeen alternatives, many of which overlapped or, for various reasons, were not feasible. (Figure ES-5 shows the conceptual corridors and alternatives developed from them.)

Subsequently, the Project Team consolidated these into four northwest bypass corridor options. However, the public expressed little enthusiasm for a northwest bypass option. Therefore, the Project Team produced several “other” options for possible advancement in lieu of a bypass option. At the second public meeting, on May 12, 2008, the final four bypass options as well as the “other” options were presented to the public. Again, all northwest bypass options were exceedingly unpopular with the public, while much enthusiasm was expressed for some of the other, less expansive options.

Recommendations

In consideration of the existing and projected future transportation system conditions in the northwest quadrant of Harrodsburg; the project goals; the preferences of the KYTC Project Team, the Project Advisory Committee, other local project stakeholders, and the general public; and the desire for a set of fiscally responsible recommendations that would result in the greatest chance of implementation, the following projects are recommended in each of three time-periods.

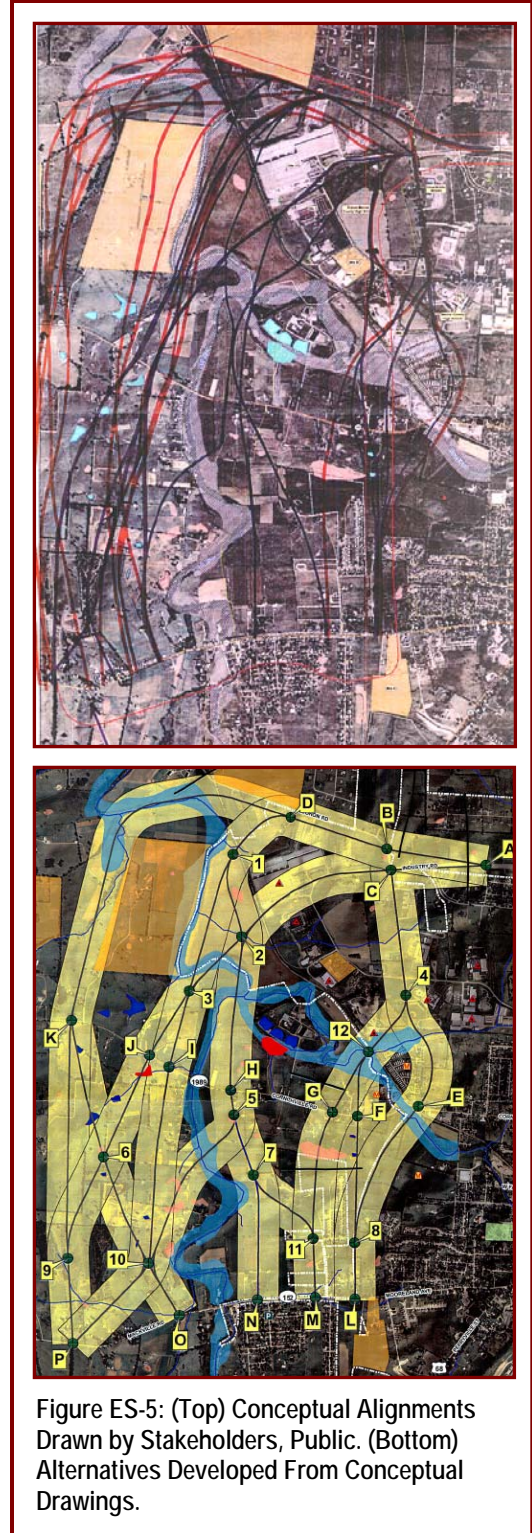


Figure ES-5: (Top) Conceptual Alignments Drawn by Stakeholders, Public. (Bottom) Alternatives Developed From Conceptual Drawings.

SHORT-TERM RECOMMENDATIONS—

Priority 1—Conduct a Small Urban Area (SUA) Study for Harrodsburg.

A SUA study is applicable for municipalities that range in population from 5,000 to 50,000 with the goal of maximizing the current transportation assets on the existing state-controlled route system in and around the municipality.

Priority 2—Intersection Spot Improvements

- Improve Intersections on Moberly Road at KY 390 (Mile Point [MP] 12.844), Tapp Road, and KY 1989 (MP 9.185) to include signal warrant analyses, signage, and striping. If signals are warranted, evaluate synchronization. (See Figure ES-6, Project ID #1)

Cost estimate: \$ 245,000

- Reconstruct the intersection of US 68 (MP 6.550)/KY 152 (MP 10.099), to include signal warrant analyses, signage, and striping. If signals are warranted, evaluate synchronization. (See Figure ES-6, Project ID #2)

Cost estimate: \$ 1,500,000

(Design \$50,000; ROW \$850,000; Utilities \$100,000; Construction \$500,000)

LONG-TERM (NEXT 5-TO-10 YEAR) RECOMMENDATIONS —

Priority 3—Reconstruct and Extend the Moberly Road Corridor:

- Reconstruct the intersection of Moberly Road/ KY 1989 (MP 9.168–9.185) with an overpass of the Norfolk-Southern RR track. (See Figure ES-6, Project ID #3A)

Cost estimate: \$10,600,000

(Design \$700,000; ROW \$2,200,000; Utilities \$400,000; Construction \$7,300,000)

- Widen Moberly Road between KY 1989 (MP 9.168) and KY 390 (MP 12.844). (See Figure ES-6, Project ID #3B)

Cost estimate: \$ 1,500,000

(Design \$200,000; ROW \$0; Utilities \$100,000; Construction \$1,200,000)

- Construct the Moberly Road extension (on new alignment) to the south from KY 1989 (MP 9.110* to KY 152 (MP 9.553*), and include an east-west connector to West Broadway Street. (See Figure ES-6, Project ID #3C)

Cost estimate: \$ 4,800,000

(Design \$300,000; ROW \$1,650,000; Utilities \$150,000; Construction \$2,700,000)

Total Priority 3 project cost estimate: \$ 16,900,000 (*Note: Exact locations await final design.)

OTHER FUTURE RECOMMENDATIONS —

- Upon implementation of the short- and long-term projects, consider conducting a planning study to re-examine the purpose and need for a western Harrodsburg bypass to complete the loop around the city and provide connectivity with the existing eastern bypass.
- Conduct a railroad relocation study that would focus on relocation sites and financing options.

The total estimated cost of recommended construction—Priorities 2 and 3— is approximately \$18.70 million. Figure ES-6 shows the locations of the improvement options.

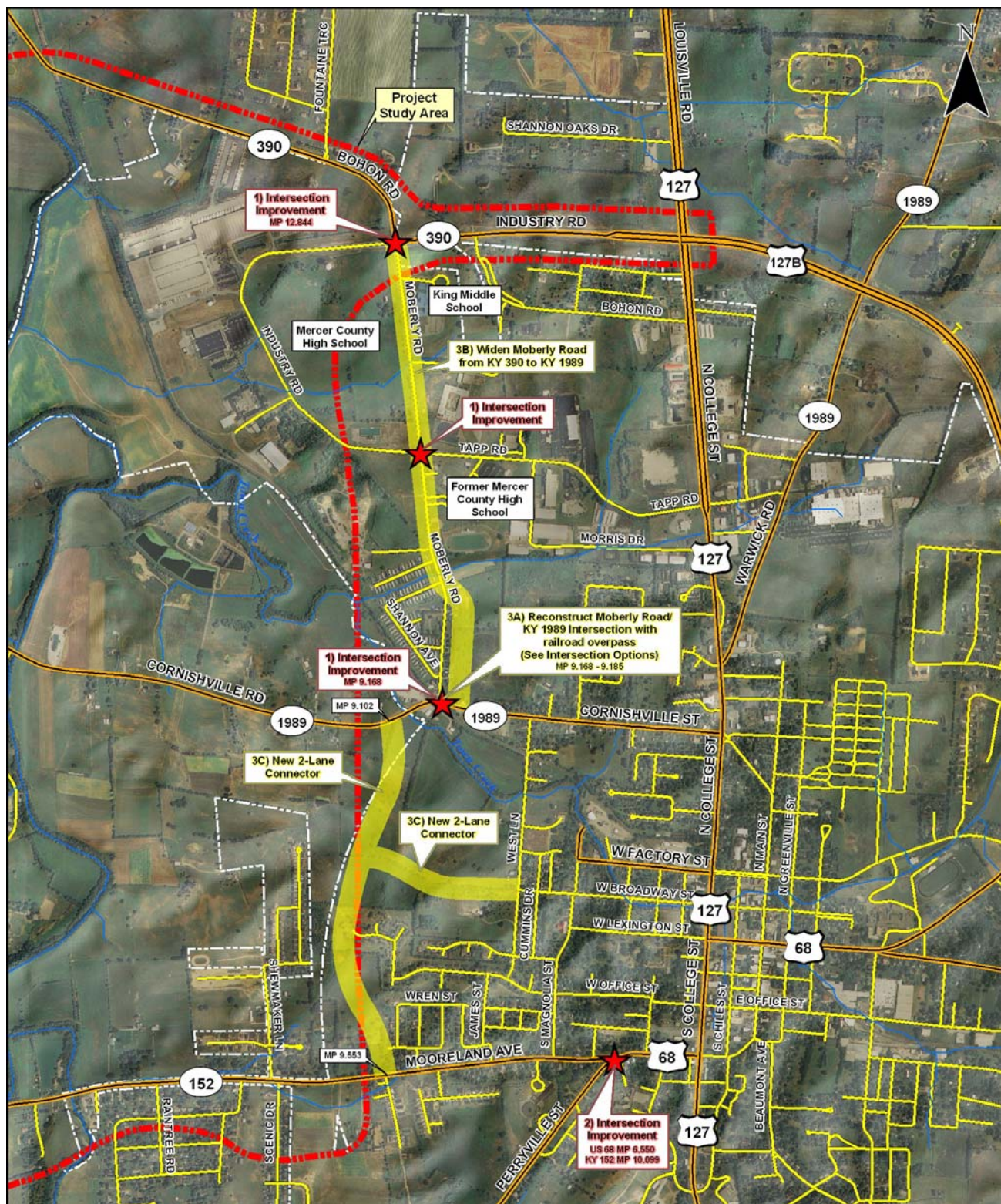


Figure ES-6: Recommended Projects

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1.0 INTRODUCTION

The initial purpose of the *Harrodsburg Northwest Bypass Alternatives Study* was to examine possible corridors for a new northwest Harrodsburg bypass in Mercer County, Kentucky. The potential northwest bypass was to extend from US 127 at its northern junction with the existing Eastern Harrodsburg Bypass (US 127B) to KY 152 west of the city. During the development of this study, alternatives to the bypass were identified that, unlike the bypass concept, had substantial public support. The alternatives were refined through a comprehensive stakeholder/public involvement effort, and now form the basis for the course of action recommended herein. The evolution of the initial bypass study and the recommendations resulting from the advancement of alternative concepts are the subject of this document.

1.1 Background

In 1991, the Kentucky Transportation Cabinet (KYTC) completed a *Harrodsburg Bypass Advanced Planning Study* that recommended constructing a bypass on the east of the city. In 2001 a bypass was constructed on the east side of Harrodsburg (from US 127 south of Harrodsburg to US 127 north of Harrodsburg). Presently, KYTC is considering the west side, and focusing on the northwest quadrant because of the perceived lack of roadway connectivity in this area of Harrodsburg.

There is a mix of land uses in the area, and several industries and school facilities in the northwest generate and attract large volumes of traffic, including heavy trucks and school busses. The Salt River and a Norfolk-Southern (NS) railroad (see Figure 1) bisect the area and would be crossed by any proposed alignment.

The Mercer County-Harrodsburg 2003 *Comprehensive Plan* designated this portion of the county as a growth area, and the proximity to the railroad could encourage future industrial growth in this designated area. A new road in this area could offer several travel benefits, including:

- Facilitating travel from the western portion of Mercer County to US 127 north (toward Lawrenceburg and the Martha Layne Collins Bluegrass Parkway) by providing an alternative to the congested US 127 through Harrodsburg.
- Avoiding the at-grade Norfolk-Southern railroad crossing on US 127, where 26 trains per day contribute to congestion and delay.
- Improving access to/from industrial areas and schools in the northern portion of the study area.



Figure 1: (Top) Salt River Bridge.
(Bottom) Norfolk-Southern Railroad Track.

1.2 Project Location and Study Area

The study area, shown in Figure 2, includes the northwestern quadrant of Harrodsburg, beginning at KY 152 in the south and extending north and then east to US 127, a distance of about 3.0 miles. The study area ends at the existing northern US 127/US 127 Bypass intersection. The study area is approximately 1.4 miles wide and about 3.6 square miles in size.

1.3 Study Process

The *Harrodsburg Northwest Bypass Alternatives Study* has consisted of four major steps:

- Define the project goals using input from a KYTC Project Team, an advisory committee consisting of local citizens and stakeholders, and the general public.
- For identified transportation deficiencies, develop alternative solutions that reflect the project goals.
- Evaluate the alternative solutions through discussions with the KYTC Project Team, the Project Advisory Committee, and the general public.
- Recommend alternative solutions.

The following exhibits depict the results of the various analyses described in the study and the recommend alternative solutions identified herein. The exhibits are located in Appendix A.

- Existing and No-Build traffic data and crash data (Exhibit 1)
- Existing conditions: area transportation system, land uses, and environmental and cultural (historic) features on both aerial photography and USGS mapping (Exhibits 2 and 3, respectively)
- Northwest quadrant options (Exhibit 4)
- Projected (year 2030) traffic data for the recommended projects (Exhibit 5)
- Recommended Projects (Exhibit 6)

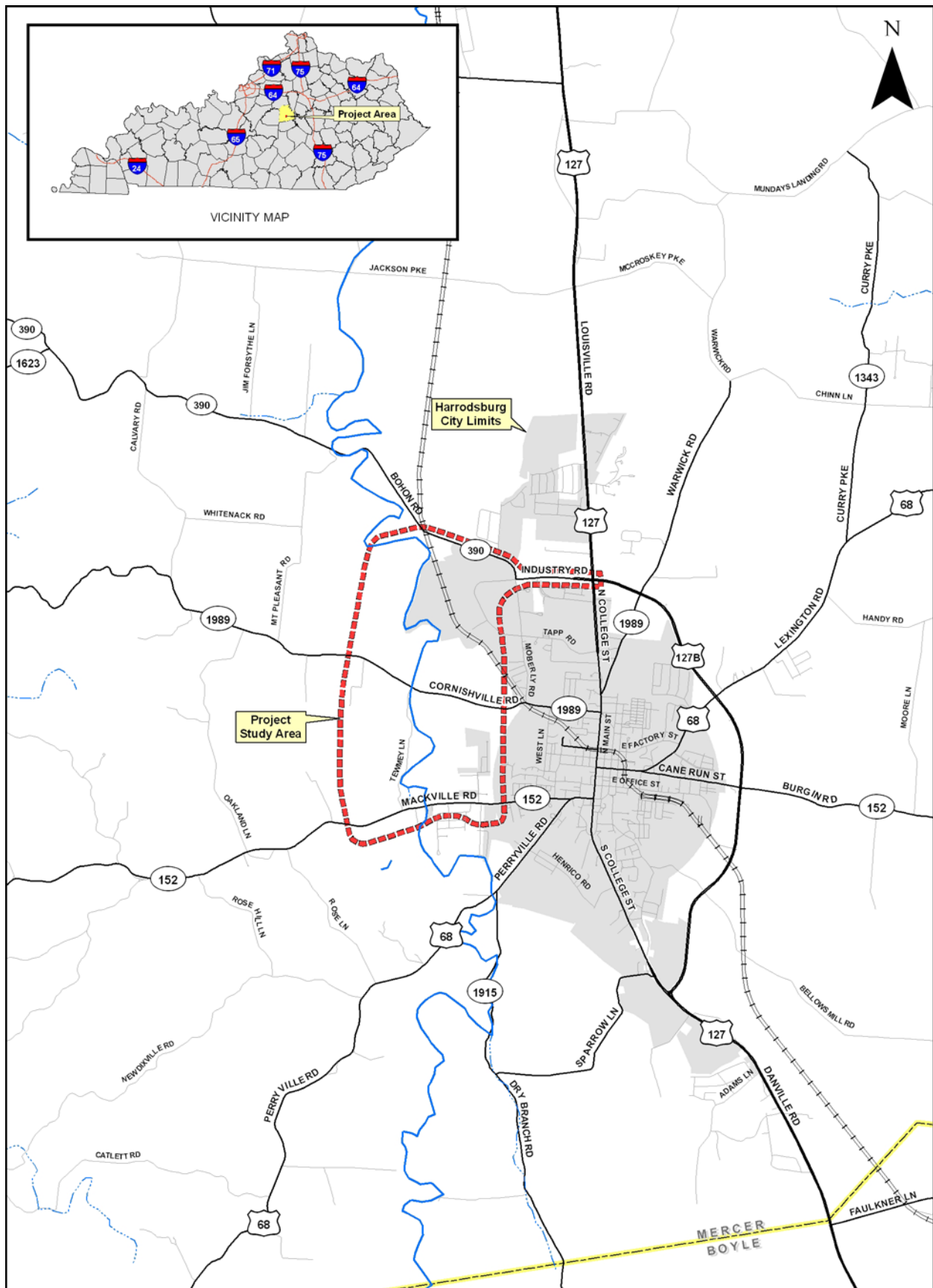


Figure 2: Project Location—City of Harrodsburg, Mercer County, Kentucky.

2.0 STUDY ISSUES AND GOALS

2.1 Project Issues

Discussions were held with the KYTC Project Team, the local Project Advisory Committee, and other interested project stakeholders in the Harrodsburg area during which a number of important issues were identified for consideration in examining the potential purpose of and need for a bypass facility in northwestern Harrodsburg. A summary of the identified issues follows:

- Several schools and industries are located in the northwest quadrant of Harrodsburg. A new Mercer County High School is now open near the corner of KY 390 (Industry Road) and Moberly Road, approximately one-half mile from the former high school campus that is being renovated as a middle school. This concentration of trip origins and destinations at similar times of the day contributes to traffic congestion in the vicinity.
- Emergency response travel times to the James B. Haggin Memorial Hospital and to other locations are lengthened by congestion along and west of S. College Street in the vicinity of the hospital. The hospital is located on Linden Avenue, which intersects US 68 (KY 152/Mooreland Avenue) just west of US 127 (S. College Street). Figure 3 shows the US 68 (Perryville Street)/KY 152 (Mooreland Avenue) junction, approximately one block west of Linden Avenue.
- At-grade railroad crossings of the Norfolk Southern railroad track, which runs through Harrodsburg from northwest to southeast, carry up to 26 trains daily. The unique “diagonal” routing of this rail line results in multi-directional street blockages during passage of these trains.
- Location of any northwest bypass in Harrodsburg should be compatible with possible future extension south of KY 152 and connecting with US 127.



Figure 3: Looking East Toward US 127 at the Junction of US 68 (Perryville Street) and KY 152 (Mooreland Avenue).

2.2 Project Goals

Several project goals were identified, including:

- Improve transportation system connectivity
 - Separate school and industry traffic
 - Reduce emergency response travel time
- Provide grade-separated railroad crossings
- Reduce congestion on area roadways
- Facilitate compatibility with future bypass extension to the south

3.0 EXISTING AND FUTURE NO-BUILD CONDITIONS

3.1 Highway and Traffic Characteristics

To evaluate the purpose of and need for additional highway facilities in northwest Harrodsburg, existing conditions on facilities in the area were compiled from the KYTC Highway Information System (HIS) database and from KYTC crash records. US 68/US 127 (N. and S. College Street), the existing US 127B eastern bypass of Harrodsburg, KY 152 (Mackville Road/Mooreland Avenue), KY 390 (Bohon Road/Industry Road), and KY 1989 (Cornishville Road/Street) were reviewed to identify physical and traffic characteristics.

The following should be noted regarding U.S. and state designated roadways in the Harrodsburg area: Through Harrodsburg, all U.S. and state highways have local names, and among these several have more than one name. The following road names and route numbers are referenced herein:

- **US 127** is *South College Street* south of Lexington Street and *North College Street* north of Lexington Street; between Mooreland Avenue and Lexington Street, College Street is officially US 68 for data purposes, not US 127, in accordance with KYTC route numbering conventions.
- **KY 390** is *Bohon Road* from the intersection of Industry Road and Moberly Road west, and is *Industry Road* from that intersection eastward.
- **KY 152** is *Mackville Road* from Shewmaker Lane southwestward and *Mooreland Avenue* from Shewmaker Lane eastward to US 68. At its juncture with US 68 (see below), Mooreland Avenue becomes US 68.
- **KY 1989** is *Cornishville Road* west of Moberly Road and *Cornishville Street* from east of that road to US 127 (N. College Street).
- **US 68** has several names, as follows:
 - From the southwest heading northeast: *Perryville Street* from Henrico Road to KY 152 (Mooreland Avenue); and *Moreland Avenue* to US 127 (S. College Street).
 - Turning northward: *South College Street* to West Lexington Street.
 - Turning eastward: *West Lexington Street* from College Street to North Main Street; *East Lexington Street* beyond.

For ease of reference, U.S. and state highways are identified by their route numbers herein except where use of both route number and local name would provide more precise locational information (e.g., because of its several name and directional changes, US 68. is usually identified by its route number and local name). Exhibit 1 includes the names and locations of roads in the study area.

Table 1 summarizes significant roadway characteristics for existing streets and highways in northwestern Harrodsburg.

Table 1: Northwest Harrodsburg Roadway Characteristics

Roadway Characteristics	US 127 (N./S. College St.)	US 127B (E. Harrodsburg Bypass)	US 68 (Mooreland Ave. & S. College St. from Mooreland Ave. to Lexington St.)	KY 152 (Mackville Rd. & Mooreland Ave., W. of US 68)	KY 390 (Bohon Rd. & Industry Rd.)	KY 1989 (Cornishville Rd. & St.)
Driving Lanes	2/3/4	4	2/3/4	2	2 / 3 / 4	2
Lane Width	12'	12'	11'	10'/11'/12'/13'	10'/11'/12'/13'	7'/8'/9'/10'
Shoulder Type	Curbed/Paved	Paved	Curbed	Paved	Combination	Earth
Shoulder Width	2'/8'/12'	10'	-	1'	3'/8'/10'	3'
2008 ADT	13,500-14,700	9,700	5,810-20,800	4,900 – 5,200	1,430 – 4,660	1,680-3,850
Posted Speed Limit	35/45 mph	55 mph	35 mph	35/45/55 mph	35/45/55 mph	35/55 mph
Type Road	Median Divided/Undivided	Median Divided	Undivided Highway	Undivided Highway	Undivided Highway	Undivided Highway
Median	Flush/Raised	Depressed	None	None	None	None
Functional Class	Urban Principal Arterial Street	Rural Principal Arterial	College St. is Urban Principal Arterial; Mooreland Ave. is Urban Minor Arterial	Urban Collector Street (E. of Salt River Bridge)	Urban Minor Arterial (E. of NS railroad crossing)	Urban Collector Street (E. of Moberly Rd.)
State Primary Rd System	State Primary	State Primary	College St. is State Primary; Mooreland Ave. is State Secondary	State Secondary	Rural Secondary	Rural Secondary
National Hwy System	YES (N & S of bypass)	YES	NO	NO	NO	NO
National Truck Network	YES (N & S of bypass)	YES	NO	NO	NO	NO
Truck Weight Class	AAA	AAA	AAA	AA	AA	A
Terrain	Rolling	Rolling	Rolling	Rolling	Rolling	Rolling
Pavement Type	High Flexible	High Flexible	High Flexible	High Flexible	High Flexible	Mixed Bituminous
Designated Bike Rt.	NO	NO	YES	NO	NO	NO

Section 3.2 discusses the existing (year 2008) and projected (year 2030) No-Build scenario traffic volumes on the local roadway network. Section 3.3 provides crash data for a five-year period from January 1, 2004, through December 31, 2008. Exhibit 1 in Appendix A shows existing traffic and crash data; and Appendix B provides photographs of many of the existing transportation facilities in and surrounding the study area, including several of the high crash locations.

3.2 Existing and Projected No-Build Traffic Data

Existing (Year 2008) Traffic Data—Year 2008 traffic data for the study area reveals that College Street is the most heavily travelled of these facilities with a traffic volume of approximately 20,800 vehicles per day (vpd) between Mooreland Avenue and Lexington Street—more than double the average daily traffic volume (ADT) on the existing Eastern Bypass, US 127B (9,700 vpd). On US 127 between KY 1989 and KY 390, the traffic volume was approximately 13,500 vpd, while the section of US 127 between US 68 (Lexington Street) and KY 1989 carried approximately 14,700 vpd. KY 152 carried 5,200 vpd east of Tewmeyer Lane and approximately 2,470 vpd west of that point. KY 390 served 4,660 vpd between Moberly Road and US 127; while west of Moberly Road it carried 1,430 vpd. KY 1989 carried 1,680 vpd from Moberly Road westward and 3,850 vpd from that road eastward to US 127. KY 152 westward from approximately 0.3 mile west of its intersection

with US 68, KY 1989, and KY 390 west of Moberly Road do not have adequate roadway widths to handle the existing traffic volumes. Exhibit 1 shows the existing traffic counts on these and other sections of roads within the study area.

Projected (Year 2030) Traffic Data—No Build Scenario—Traffic volumes were projected for the year 2030 to determine how the road network would function if no improvements (beyond normal maintenance) were made during that time period. This scenario is referred to as the No-Build scenario. The traffic volumes were projected to 2030 using a 2% annual growth rate. With the construction of the Eastern Bypass affecting traffic volumes and relatively little to no growth in traffic numbers on study area roadways in recent years, it was decided to use a conservative growth rate which also happens to correspond to the average growth rate of all Mercer County roadways (2%).

The 2030 No-Build traffic volumes project that College Street would remain the most heavily travelled roadway in the study area, with traffic volumes from approximately 32,000 vpd between Mooreland Avenue and Lexington Street; 23,700 vpd between Lexington Street and KY 1989; and 27,100 vpd between KY 1989 and KY 390. KY 152 is projected to carry from 7,600 vpd east of its junction with Tewmeyer Lane and approximately 4,900 vpd west of that point. KY 390 is projected to carry 6,300 vpd between Moberly Road and US 127 and 2,300 vpd west of the intersection with Moberly Road. KY 1989 is projected to carry 2,400 vpd west of its junction with Moberly Road and 7,600 vpd east of that point.

Exhibit 1 in Appendix A and Table 2, below, show traffic volumes on selected roadways for existing conditions (year 2008) and for the projected (year 2030) No-Build scenario.

Table 2: Existing and Projected No-Build Traffic Volume Comparison

Roadway	Segment	2008 ADT	Projected 2030 ADT – No Build
US 127 (N. College St.)	US 68 (W. Lexington St.) to KY 1989 (Cornishville St.)	14,700	23,700
US 127 (N. College St.)	KY 1989 (Cornishville St.) to KY 390 (Industry Rd.)	13,500	27,100
KY 390 (Bohon/Industry Rds.)	East of Moberly Rd.	4,660	6,300
Moberly Rd.	North of Tapp Rd.	2,100	3,300
Moberly Rd.	Between Tapp Rd. and KY 1989 (Cornishville St.)	2,540	4,100
KY 1989 (Cornishville St.)	East of Moberly Rd.	4,810	7,600
KY 1989 (Cornishville Rd.)	West of Moberly Rd.	1,680	2,400
US 68 (KY 152/ Mooreland Ave.)	West of US 127 (S. College St.) Intersection	5,810	16,600
US 68/US 127 (S. College St.)	Mooreland Ave. to W. Lexington St.	20,800	32,000
KY 152 (Mooreland Ave.)	West of US 68 / KY 152 Intersection	5,200	7,600

3.3 Crash Analysis

KYTC provided crash data for a five-year period from January 1, 2004, through December 31, 2008. Crash analysis procedures involve assigning reported crashes to roadway locations by mile point (MP). The crashes are classified into one of three categories: fatal, injury, or property damage only (PDO). Then, the average crash rate for roadway sections of various lengths is determined. This includes analyzing the entire roadway length under study, followed by analyzing successively smaller roadway sections, especially those containing higher concentrations of crashes.

Roadway sections are classified as either spots or segments depending on their length— sections 0.30 mile or less in length are classified as a spot location, and sections over 0.30 mile are classified as a segment. Roadway section crash rates were normalized for comparison by either hundred-million-vehicle-miles traveled (HMVM) for segments, or millions-of-vehicles (MV) for spots. Using the average crash rate, the critical crash rate was obtained from Kentucky Transportation Center's *Analysis of Traffic Crash Data in Kentucky (2004-2008)*. The critical crash rate is the maximum crash rate expected to randomly occur on a roadway section, given the statewide average crash rate for that road's functional class, the average daily traffic (ADT) volume, and the roadway section length. The ratio of these two rates (*i.e.*, the actual crash rate to the critical crash rate) produces a critical crash rate factor (CCRF). If the roadway section's actual crash rate exceeds the critical rate (*i.e.*, the CCRF is greater than 1.0), then that section is classified as a high crash location. In other words, if the CCRF exceeds 1.0, then that highway section has more crashes occurring than is statistically probable. If the CCRF is 0.9 or greater, that section is considered as a potential high crash location.

Crash problems, as measured by the CCRF in the KYTC crash program, appear to exist on US 127 (N. College Street) between MP 4.40 (US 68/W. Lexington Street) and MP 5.10 (near Veteran's Park Drive); on KY 1989 (Cornishville Road/Street) between MP 6.84 and MP 9.85 (including the vicinity of Norfolk-Southern railroad crossing and intersection with Moberly Drive); and along US 68 (Mooreland Avenue) between MP 6.5 and 6.8 (at the intersection with S. College Street). Results of the crash analysis are provided on Table 3 and the locations are depicted on Exhibit 1. As summarized below and shown on the table, two segments and a total twelve spot locations within the segments analyzed are high crash locations.

US 127	1.7-mile segment (MP 4.40-6.07)	CCRF 1.76 (154 crashes, 29 resulting in injuries)
	5 spots	CCRF ranges 1.05 – 4.21*
US 68	1 spot (MP 6.5-6.8)	CCRF 1.23
KY 1989	3.0-mile segment (MP 6.84-9.85)	CCRF 1.14 (18 crashes, 7 resulting in injuries)
	6 spots	CCRF ranges 1.04 – 3.23

* Sections of some spot locations overlap; therefore, crash totals provided in the table apply to each spot location, only, and are not cumulative.

Table 3: Corridor / Segment Crash Analysis

	Segment or Spot	Begin MP	End MP	Length (Miles)	Number Lanes	Rural / Urban	ACCIDENTS				Critical Rate Factor
							Fatal	Injury	PDO	Total	
US 127	Segment	4.402	6.071	1.669	4	U	0	29	125	154	1.76
	Spot	4.400	4.700	0.300	4	U	0	17	68	85	4.21
	Spot	4.500	4.800	0.300	4	U	0	1	22	23	1.10
	Spot	4.600	4.900	0.300	4	U	0	3	19	22	1.05
	Spot	4.700	5.000	0.300	4	U	0	5	23	28	1.30
	Spot	4.800	5.100	0.300	4	U	0	6	25	31	1.43
	Spot	4.900	5.200	0.300	4	U	0	4	18	22	0.58
	Spot	5.000	5.300	0.300	4	U	0	4	12	16	0.42
	Spot	5.100	5.400	0.300	4	U	0	2	10	12	0.31
	Spot	5.200	5.500	0.300	4	U	0	3	9	12	0.31
	Spot	5.300	5.600	0.300	4	U	0	3	11	14	0.36
	Spot	5.400	5.700	0.300	4	U	0	2	10	12	0.31
	Spot	5.500	5.800	0.300	4	U	0	1	6	7	0.18
	Spot	5.600	5.900	0.300	4	U	0	2	10	12	0.31
	Spot	5.700	6.000	0.300	4	U	0	2	10	12	0.31
	Spot	5.800	6.100	0.300	4	U	1	8	16	24	0.65
US 127 B	Segment	4.000	4.483	0.483	4	U	0	2	1	3	0.02
	Spot	4.000	4.300	0.300	4	U	0	2	1	3	0.02
	Spot	4.100	4.400	0.300	4	U	0	0	0	0	0.00
	Spot	4.200	4.500	0.300	4	U	0	0	0	0	0.00
US 68	Segment	6.550	7.031	0.481	4	U	0	3	17	20	0.77
	Spot	6.500	6.800	0.300	4	U	0	2	18	20	1.23
	Spot	6.600	6.900	0.300	4	U	0	0	12	12	0.67
	Spot	6.700	7.000	0.300	4	U	0	0	10	10	0.51
	Spot	6.800	7.100	0.300	4	U	0	1	3	4	0.18
KY 152	Segment	7.947	10.099	2.152	2	U	1	11	11	23	0.75
	Spot	8.000	8.300	0.300	2	R	0	2	0	2	0.47
	Spot	8.100	8.400	0.300	2	R	0	1	0	1	0.24
	Spot	8.200	8.500	0.300	2	R	0	1	0	1	0.24
	Spot	8.300	8.600	0.300	2	R	0	3	0	3	0.71
	Spot	8.400	8.700	0.300	2	R	0	2	0	2	0.47
	Spot	8.500	8.800	0.300	2	R	0	2	0	2	0.47
	Spot	8.600	8.900	0.300	2	U	0	1	0	1	0.24
	Spot	8.700	9.000	0.300	2	U	0	0	0	0	0.00
	Spot	8.800	9.100	0.300	2	U	0	0	0	0	0.00
	Spot	8.900	9.200	0.300	2	U	0	0	1	1	0.11
	Spot	9.000	9.300	0.300	2	U	0	1	2	3	0.33
	Spot	9.100	9.400	0.300	2	U	0	3	2	5	0.55
	Spot	9.200	9.500	0.300	2	U	0	3	1	4	0.44
	Spot	9.300	9.600	0.300	2	U	0	2	0	2	0.22
	Spot	9.400	9.700	0.300	2	U	0	1	1	2	0.21
	Spot	9.500	9.800	0.300	2	U	0	0	1	1	0.10
	Spot	9.600	9.900	0.300	2	U	0	0	2	2	0.21
	Spot	9.700	10.000	0.300	2	U	1	0	3	4	0.42
	Spot	9.800	10.100	0.300	2	U	1	2	4	7	0.75

Table 3: Corridor / Segment Crash Analysis (Continued)

	Segment or Spot	Begin MP	End MP	Length (Miles)	Number Lanes	Rural / Urban	ACCIDENTS				Critical Rate Factor
							Fatal	Fatal	Fatal	Fatal	
KY 390	Segment	11.890	13.512	1.622	2	U	0	2	3	5	0.24
	Spot	11.900	12.200	0.300	2	R	0	0	1	1	0.26
	Spot	12.000	12.300	0.300	2	R	0	0	1	1	0.26
	Spot	12.100	12.400	0.300	2	R	0	0	0	0	0.00
	Spot	12.200	12.500	0.300	2	R	0	0	1	1	0.26
	Spot	12.300	12.600	0.300	2	R	0	0	1	1	0.26
	Spot	12.400	12.700	0.300	2	R	0	0	0	0	0.00
	Spot	12.500	12.800	0.300	2	R	0	0	0	0	0.00
	Spot	12.600	12.900	0.300	2	R	0	0	1	1	0.16
	Spot	12.700	13.000	0.300	2	R	0	1	0	1	0.16
	Spot	12.800	13.100	0.300	2	U	0	2	0	2	0.28
	Spot	12.900	13.200	0.300	2	U	0	1	1	2	0.15
	Spot	13.000	13.300	0.300	2	U	0	1	1	2	0.15
	Spot	13.100	13.400	0.300	2	U	0	0	0	0	0.00
	Spot	13.200	13.500	0.300	2	U	0	0	0	0	0.00
KY1989	Segment	6.837	9.848	3.011	2	R	0	7	11	18	1.14
	Spot	6.800	7.100	0.300	2	R	0	5	4	9	3.23
	Spot	6.900	7.200	0.300	2	R	0	3	1	4	1.43
	Spot	7.000	7.300	0.300	2	R	0	1	2	3	1.08
	Spot	7.100	7.400	0.300	2	R	0	0	1	1	0.37
	Spot	7.200	7.500	0.300	2	R	0	0	1	1	0.37
	Spot	7.300	7.600	0.300	2	R	0	0	0	0	0.00
	Spot	7.400	7.700	0.300	2	R	0	0	2	2	0.70
	Spot	7.500	7.800	0.300	2	R	0	0	2	2	0.70
	Spot	7.600	7.900	0.300	2	R	0	0	3	3	1.04
	Spot	7.700	8.000	0.300	2	R	0	0	1	1	0.34
	Spot	7.800	8.100	0.300	2	R	0	0	1	1	0.34
	Spot	7.900	8.200	0.300	2	R	0	0	1	1	0.36
	Spot	8.000	8.300	0.300	2	R	0	0	1	1	0.36
	Spot	8.100	8.400	0.300	2	R	0	0	1	1	0.36
	Spot	8.200	8.500	0.300	2	R	0	0	0	0	0.00
	Spot	8.300	8.600	0.300	2	R	0	0	0	0	0.00
	Spot	8.400	8.700	0.300	2	R	0	0	0	0	0.00
	Spot	8.500	8.800	0.300	2	R	0	1	0	1	0.36
	Spot	8.600	8.900	0.300	2	R	0	1	0	1	0.36
	Spot	8.700	9.000	0.300	2	R	0	2	0	2	0.72
	Spot	8.800	9.100	0.300	2	R	0	2	0	2	0.73
	Spot	8.900	9.200	0.300	2	R	0	2	1	3	1.09
	Spot	9.000	9.300	0.300	2	R	0	2	1	3	1.09
	Spot	9.100	9.400	0.300	2	R	0	0	1	1	0.36
	Spot	9.200	9.500	0.300	2	R	0	0	1	1	0.11
	Spot	9.300	9.600	0.300	2	R	0	0	0	0	0.00
	Spot	9.400	9.700	0.300	2	R	0	0	0	0	0.00
	Spot	9.500	9.800	0.300	2	R	0	0	0	0	0.00

	High Crash Locations: Segment		High Crash Locations: Spot
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Source: KYTC crash data, 2005-2007

Table 4 compares the crash patterns on these spots and segments with the patterns for all crashes recorded in Mercer County during the same time period. Some of the differences in these patterns can be attributed to the urban nature of the segments and spots highlighted in Table 4. The high percentage of angle crashes on US 68 between KY 152 and US 127 is likely caused both by the unusual arrangement of the US 68/KY 152 intersection and the tight turning radii at the US 68/US 127 intersection. The extraordinarily high percentage of both “head-on” and “opposing left-turn” crashes on US 68 reflect crashes at the US 68/KY 152 intersection. The high percentage of rear-end crashes along College Street likely was one of the reasons for the recent two-way-left-turn-lane conversion; however, it is too early to measure the effect of this change. The high percentage of single-vehicle crashes on KY 1989 likely reflects the geometric restrictions of that route, e.g., ten-foot-wide lanes, three-foot-wide shoulders, etc.

Table 4: Crash Patterns for Problem Spots and Segments in Study Area

Spot or Segment	US 68	US 127	KY 1989	Mercer County
From Mile Point	6.500	4.402	6.837	--
To Mile Point	6.800	6.071	9.848	--
Length (miles)	0.3	1.669	3.011	184
Daylight Crashes	96%	83%	69%	72%
Crashes on Dry Roadway	88%	83%	80%	72%
Angle Crashes	48%	36%	11%	20%
Backing Up Crashes	0%	4%	3%	6%
Head On Crashes	8%	2%	0%	3%
Opposing Left-Turn Crashes	8%	7%	3%	3%
Rear End Crashes	36%	37%	17%	17%
Sideswipe, Opposite Direction	0%	1%	9%	6%
Sideswipe, Same Direction	0%	9%	0%	7%
Rear-to-Rear Crashes	0%	0%	0%	7%
Single Vehicle Crashes	0%	4%	60%	38%

4.0 HUMAN ENVIRONMENT OVERVIEW

4.1 Environmental Justice

An *Environmental Justice and Community Impact Report (EJ Report)* was prepared for the *Harrodsburg Northwest Bypass Study* by the BGADD. The full report is included in Appendix C and is summarized in this chapter.

An *EJ Report* is an assessment of community demographics within the project study area and a comparison of these demographics with those of the surrounding area, particularly regarding low income, minority, and elderly populations. The goal of such an effort is to ascertain if any of these populations might be disproportionately impacted by potential transportation system improvements in the northwest Harrodsburg area.

Census data for four Block Groups (Block Groups 1, 3, and 4 in Census Tract 9602 and Block Group 2 in Census Tract 9603) represented the study area. The demographic characteristics of the Block Groups representing the study area compared to Mercer County, state, and national averages are summarized in Table 5.

BGADD concluded that Census Tract 9602, Block 3 should be monitored and reviewed in more detail during future development phases, if any, for projects in the study area.

Table 5: Demographic Characteristics of Study Area

Percent of..	Tract 9602 Block 1	Tract 9602 Block 3	Tract 9602 Block 4	Tract 9603 Block 2	Mercer County	Kentucky	United States
Black Population	3.49%	11.57%	0.86%	1.31%	3.69%	7.32%	12.38%
Hispanic Population	1.27%	1.78%	0.31%	0.58%	1.27%	1.48%	14.78%
Asian Population	1.18%	0.46%	0.49%	0.09%	0.47%	0.74%	4.38%
Native American Population	0.14%	0.23%	0.00%	0.15%	0.21%	0.21%	0.79%
Population Below Poverty Level	11.87%	29.48%	7.86%	10.41%	12.97%	15.37%	12.05%
Population Age 65 & Older	12.33%	10.71%	9.81%	14.10%	14.59%	12.49%	12.43%

4.2 Hazardous Waste

A report identifying hazardous materials sites within/near the project study area was prepared for this study. Although 16 reported sites were identified in the report, it is anticipated that no sites would be affected by the project. Appendix D contains the report, which includes maps locating all sites identified therein. The report's mapped sites correspond with those identified on Exhibits 2 and 3, in Appendix A.

The Kentucky Division of Waste Management (KDWM) reports a hazardous waste facility site, known as the "Kidde-Fenwal" site (formerly known as the "Hallmack-Nutone" or "Hallmack" site) is a source for groundwater contamination of trichloroethylene (TCE) at levels above the drinking water standards. The site is located in the southwest quadrant of the US 127/Tapp Road intersection, and the contaminated groundwater surfaces farther west, at Humane Spring (see Site 15 and the spring location on Exhibits 2 and 3). Humane Spring, although a large spring, is currently

not used for any purpose. Based on the flow lines of both groundwater and surface water, KDWM does not believe that any activity in the project study area would directly impact the flow of contaminated groundwater to Humane Spring. Nonetheless, KDWM recommends that steps be taken to avoid any disturbance that would, in any way, affect Humane Spring, itself.

4.3 Previously Documented Cultural Historic and Archeological Sites

Archaeological Resources—AMEC Earth & Environmental Consultants prepared a letter report detailing an archaeological resource overview for the *Harrodsburg Northwest Bypass Alternatives Study* area. A copy of that letter report is included in Appendix E.² In summary, AMEC identified several potential historic and/or prehistoric sites in or near the study area and concluded that the study area had a moderate to high potential to contain significant historic and prehistoric archaeological sites. AMEC reiterated the need for a Phase 1 archaeological survey in future development phases, if any, for projects in the study area to comply with Section 106 of the *National Historic Preservation Act of 1966* (NRHP) (as amended), 16 U.S.C. 470(f), and Presidential Executive Order 11593, *Protection and Enhancement of the Cultural Environment*. Further, AMEC recommended that a Section 4(f) evaluation³ be conducted and avoidance options be considered if the right-of-way in any future development phase overlaps an NRHP-listed or -eligible archaeological site requiring preservation in place (e.g., a burial site or areas of a Civil War battlefield).

Cultural Historic Resources—The *Cultural Historic Resource Overview* prepared for this study identified four sites—identified as Sites A, D, E, and H in the report and on Exhibits 2 and 3—as being on, or potentially eligible for, the NRHP. Appendix E includes the complete report. Properties in northwest Harrodsburg that appear to be eligible for listing on the NRHP are:

- Fountain Blue/Hite’s Station, Site A
- Francis Kirby House, Site D
- Daniel Stagg House, Site E
- Trapnell House/Martindale, Site H

One historic resource in northwest Harrodsburg is listed on the NRHP: Joseph Morgan House/Round Ridge, Site B. This property was listed on the National Register in 1990. (Note: The location of this resource is shown in the *Overview* in Appendix E, but it not depicted on Exhibits 2 and 3 because it is outside the coverage area of these exhibits.)

² KYTC policy limits the publication of archaeological site locations to preserve and protect each site’s integrity. Therefore, maps depicting site locations have been removed from the report

³ Section 4(f) of the Department of Transportation Act of 1966, 49 USC 303(c), requires that, prior to the use of a publicly owned park, recreation area, or wildlife/waterfowl refuge; a historic property that is on or eligible for inclusion in the NRHP; or archaeological sites where preservation in place provides important value, it must be determined that there are no prudent and feasible alternatives that avoid such use, and that the project includes all possible planning to minimize harm to such resources.

4.4 Land Use and Zoning

The Greater Harrodsburg/Mercer County Planning and Zoning Commission was created in 1972 to assist in the planned growth of the city and county. The Commission's 2004 *Comprehensive Plan* guides the development of the city and county.

Mercer County is in central Kentucky in the Outer Bluegrass physiographic region. The city of Harrodsburg is the county seat and is the most intensively developed area within the county. Whereas the majority of land in Mercer County is agricultural, most of the agricultural land in the city limits of Harrodsburg has been converted to commercial, industrial, residential, and institutional uses commensurate with the availability of suitable infrastructure. Appendix B contains photographs showing roadways and land uses within the study corridor.

Originally, because a bypass option was being evaluated, the project study area extended from within the city limits westward into an unincorporated, primarily agricultural/rural residential area of the county. However, the study area has been expanded eastward, to US 127, into an urban corridor containing uses that are primarily institutional, residential subdivision, and industrial/commercial, with some agricultural land also present. The *Comprehensive Plan* projects that the agricultural land will continue to transition into urban uses. Much of the development has occurred along US 127, and the lack of frontage roads and access management techniques contributes to heavy congestion along that roadway. Exhibit 2, in Appendix A, shows an aerial view of the project area and identifies the Harrodsburg city limits; the study area; the transportation network including the U.S., state, and local roads and the Norfolk-Southern railroad corridor; natural features such as wetlands and major streams; and selected community facilities such as schools and parks.

Future land use plans within/adjacent to the project corridor in Harrodsburg include industrial and commercial development east and west of Moberly Road south of KY 390 and the US 127B (Eastern Bypass); a large industrial area in the northwest part of the city, extending southward from KY 390 along either side of the railroad to KY 1989; and industrial use continuing south of KY 1989 following the railroad to West Factory Street. Also included within these areas are primarily low density residential development in currently agricultural/undeveloped areas, and further development in existing high/low density residential areas and institutional/recreational areas.

Figure 4 (Exhibit 2 in the *Comprehensive Plan*) shows the proposed future land uses in Harrodsburg. As Figure 4 shows, the greatest overall concentration of proposed development would take place in the north and northwestern sections of Harrodsburg—areas where several commercial, industrial, institutional, and residential uses already exist. It should be noted that the new Mercer County High School occupies land that was identified in the *Comprehensive Plan* for future industrial use.

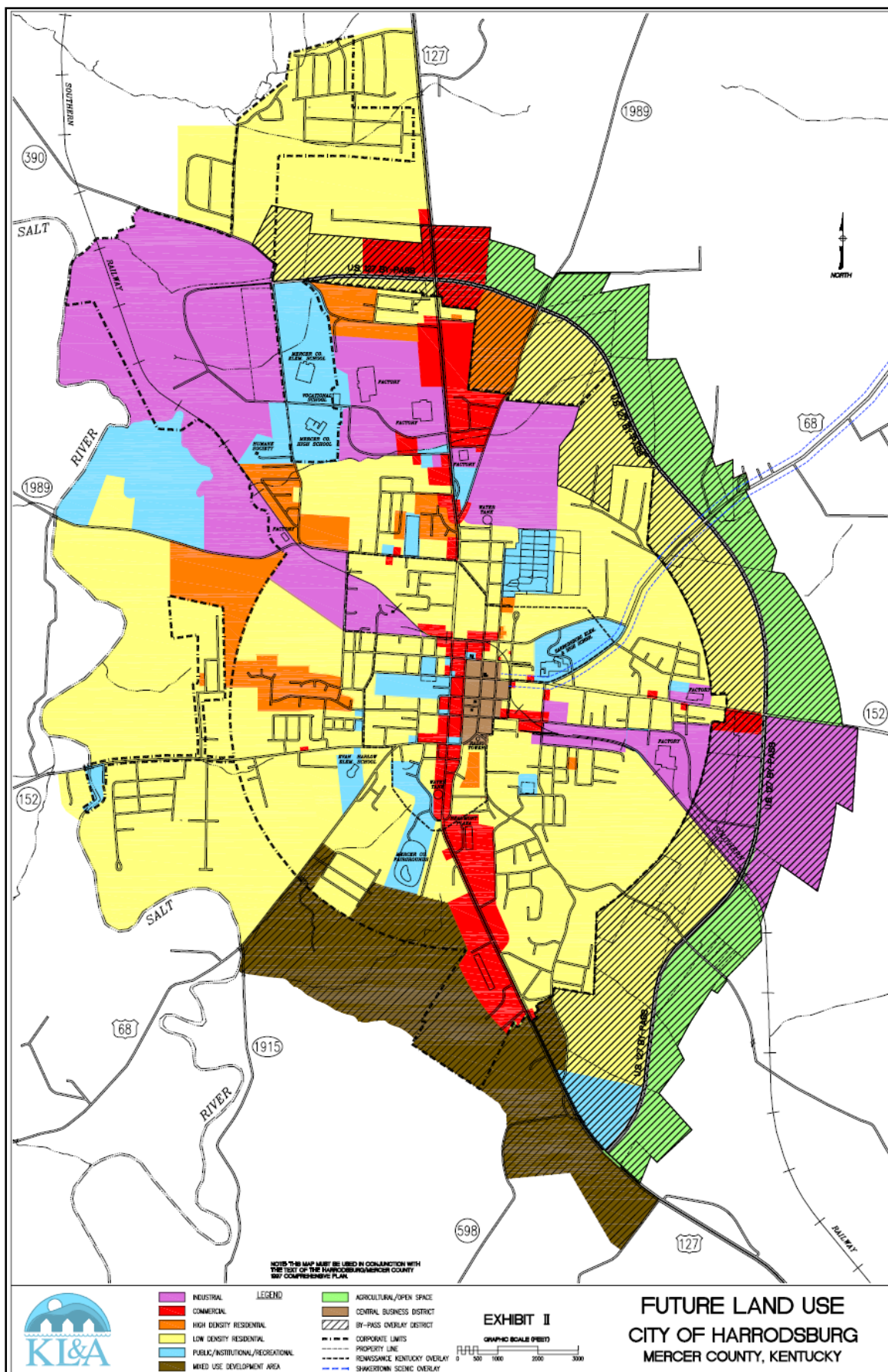


Figure 4: Future Land Use Plan, City of Harrodsburg, Kentucky.

5.0 NATURAL ENVIRONMENT OVERVIEW

An *Ecological Overview* conducted for this study in August 2007 provided a broad review of existing environmental conditions in the study area, potential impacts to the aquatic and terrestrial ecology including threatened and endangered species, and measures to minimize the impacts. A copy of the *Ecological Overview* and related agency coordination correspondence are included in Appendix F. Highlights of that report follow. Environmental features such as streams, wetlands, and ponds are shown on Exhibits 2 and 3. Figures 5 and 6, at right, show Salt River and Town Creek.



Figure 5: Salt River Near Confluence With Town Creek.

5.1 Aquatic Ecology

Streams—Jurisdictional waters, as defined by the U.S. Army Corps of Engineers (USACE), are located within the study area. This includes a section of the Salt River and its associated Federal Environmental Management Agency (FEMA) 100-year floodplain. Streams were located and field verified using the Cornishville and Harrodsburg U. S. Geologic Survey (USGS) quadrangle maps. Nine intermittent and/or perennial streams were identified within the study area on USGS mapping. These include the Salt River with seven unnamed tributaries, and Town Creek. However, field



Figure 6: Town Creek West of Water Treatment Facility.

verification only identified five intermittent and perennial streams within the study area—the Salt River and three unnamed tributaries and Town Creek. Although ephemeral streams may also be considered jurisdictional, their evaluation did not fall within the scope of the overview. All streams totally or partially located within the study area may be impacted by any proposed road construction or improvements associated with this project.

Aquatic Species—No aquatic macro invertebrate, fish, or water quality sampling was completed for the *Ecological Overview*. However, the Water Quality Branch of the Kentucky Division of Water (KDOW) provided stream and fish data for the Mercer County area and indicated there are no Outstanding State Resource Waters or Wild Rivers within the study area. Aquatic species in or near

the study area are sensitive to increased turbidity, sediment, and other adverse influences on water quality. The Kentucky State Nature Preserves Commission (KSNPC) recommended that, should any recommended improvement be implemented, an erosion control plan be developed with stringent erosion control methods. Streams that may be impacted should be surveyed by a qualified biologist prior to in-stream disturbance.

Wetlands and Ponds—A review of National Wetlands Inventory (NWI) mapping revealed one forested wetland and several palustrine unconsolidated bottom (PUB) ponds within the study area. However, field surveys determined that the mapped forested “wetland” did not possess wetland hydrology. These same field surveys identified two depressional areas near KY 1989 that may be wetlands (see *Ecological Overview*, Figure 2, in Appendix F, herein). Nine farm ponds were determined to have no connectivity to jurisdictional wetlands.

Regulatory Issues—Any stream channelization, culverting, and/or filling of jurisdictional waters may require notification and/or permitting with the USACE and certification from the KDOW. USACE, Louisville Regulatory District, Louisville, Kentucky, is the agency responsible for regulating waters, waterways, and wetlands (“Waters of the United States”).

- U.S. Army Corps of Engineers (USACE): Depending on the specific roadway construction design, this project may be permitted under Nationwide Permit 14 (NWP 14), “Linear Transportation Crossings”. However, the use of NWP 14 is limited to crossings that result in a filled area no larger than one-half acre. The permittee must notify the District Engineer in accordance with General Condition 27 if the work involves discharges of dredged or fill material into wetlands and/or results in the loss of greater than 0.1 acre of Waters of the United States. This permit does not authorize stream channelization, and the authorized activities must not cause more than minimal changes to the hydraulic flow characteristics of the stream, increase flooding, or cause more than minimal degradation of water quality of any stream in accordance with General Conditions 9 and 21. This nationwide permit only authorizes activities with minimal adverse effects on the aquatic environment.
- Kentucky Division of Water (KDOW): Projects involving work in a stream, such as bank stabilization, road culverts, utility line crossings, and stream alteration will require a Water Quality Certification and a Floodplain Construction Permit from the KDOW. Projects that involve filling in the 100-year floodplain will also require a Floodplain Construction Permit. KDOW also requires a Groundwater Protection Plan for all construction activities. Any area disturbed due to construction should be managed for stream siltation from storm water runoff. Construction sites greater than 5 acres will require the filing of a Notice of Intent to be covered under the Kentucky Pollution Discharge Elimination System’s General Storm Water Permit. This permit requires the creation of an Erosion Control Plan.

5.2 Terrestrial Ecology, and Threatened and Endangered Species

U.S. Fish and Wildlife Service (USFWS)—USFWS’s July 30, 2008 list of endangered, threatened, and candidate species for Mercer County identifies two federally endangered mammal species, four endangered mussel species, one endangered plant species and one candidate plant species that are

known to occur or have the potential to occur within the county. The list is provided in Appendix F (p.57)⁴. USFWS was notified of the proposed project but did not submit comments. USFWS typically expresses concern over erosion and sedimentation control, stream bank stabilization, and maintaining water quality for this and other highway projects during and post-construction. The agency typically recommends reducing impacts to aquatic resources and endangered species and habitat; and if the recommendations cannot be followed, the agency suggests that surveys be conducted for the federally listed species in the project vicinity.

Kentucky Division of Forestry (KDOF)—KDOF indicated there are no current state forests or champion trees located within the study area. KDOF recommended protection of trees that will remain after completion of any proposed construction. Heavy equipment should not come into contact with the base of trees to prevent harm to the trunk and surface roots. Construction traffic should also stay away from the drip lines of trees to reduce the amount of soil compaction around trees that are to remain. Soil compaction leads to a reduction in the amount of available water for the trees, which can lead to increased stress. Stressed trees are more susceptible to disease and insect infestation. KDOF also recommends that additional trees be planted after construction. Any proposed planting should be selected according to trees already existing within the site.

Kentucky Department of Fish and Wildlife Resources (KDFWR)—Coordination with the Kentucky Department of Fish and Wildlife Resources (KDFWR) indicated no federally endangered species within the study area. However, KDFWR did list two state threatened species and three additional species of special concern. The *Ecological Overview's* Table 2 identifies these species.

Kentucky State Nature Preserves Commission (KSNPC)—KSNPC reviewed its Natural Heritage Program Database to determine if any endangered, threatened, or special concern plants and animals or exceptional communities monitored by the KSNPC occurred within or near the project area. KSNPC applied three buffers to analyze the project area:

1. 1-mile buffer for all records
2. 5-mile buffer for aquatic records and federally listed species
3. 10-mile buffer for monitored mammals and birds

Four historic records were found within the 1-mile buffer. Within the 5-mile buffer, one federally listed species was identified. Twelve records for mammals and birds were found within the 10-mile buffer. The *Ecological Overview's* Table 3 summarizes KSNPC data with respect to the records of species within these buffers.

Details of the USFWS, KDFWR, and KSNPC findings are included in Appendix F.

5.3 Karst Areas

According to the KDOW, the study area is composed of soluble rocks of the Clays Ferry Foundation on hilltops and Lexington limestones in the valleys. These karst aquifers are

⁴ The July 2008 list updates the data in the *Ecological Overview's* Table 1 and associated text.

groundwater recharge areas comprising most of the surface terrain of the study area. No spring or wellhead protection areas occur within the study area. More karst springs in addition to Humane Spring and Votah Spring may exist in the study area, especially along the Salt River and Town Creek.

5.4 Special Designation Lands

No state nature preserves or wildlife management areas are present within the study area, nor are any state or national parks or forests.

6.0 PUBLIC INVOLVEMENT AND AGENCY COORDINATION

6.1 Public Involvement Program Summary

Project Team—A KYTC Project Team was created for the *Harrodsburg Northwest Bypass Alternatives Study*. Representatives of the Planning, Design, Environmental Analysis, Traffic, and Construction functions of KYTC and the Transportation Planning staff of the BGADD met with the project consultant on three occasions to provide guidance and decision-making. Minutes of these meetings are included in Appendix G.

Meetings with Local Officials and Other Project Stakeholders—A Project Advisory Committee, whose membership included local officials and other project stakeholders, met three times during the course of the study. The first meeting was held to introduce local officials to the study, inform them regarding the study process, and solicit their suggestions for the location of a bypass in northwestern Harrodsburg. The second meeting was held to review preliminary improvement options. The third meeting was to discuss KYTC and consultant recommendations. Minutes of these meeting are also included in Appendix G.

Public Meetings—Two public meetings were held. The first public meeting was to offer participants the opportunity to comment on project goals and issues, and to offer suggestions for the location of a bypass in northwestern Harrodsburg. The second public meeting included a summary of all suggested locations for a bypass in northwestern Harrodsburg, four alternatives recommended by the KYTC Project Team, a presentation of other preliminary improvement alternatives, and a solicitation of public feedback on those proposals. One hundred fourteen people signed in at the first public meeting, while forty-four people attended the second public meeting. Questionnaires were distributed to those in attendance. Thirty-seven completed surveys were returned either at the first public meeting or by mail in the following weeks; twenty-seven completed surveys were returned either at the second public meeting or by mail in the following weeks. A summary of the meetings and questionnaire results is included in Appendix G.

6.2 Agency Coordination

Two agency mailings were prepared during this study. The first (dated November 30, 2007) was prepared and distributed after base information had been collected and the second (dated May 29, 2008) was prepared and distributed after preliminary improvement options had been identified and presented to the public at the second public meeting. A copy of the mailings and the list of recipients are included in Appendix H for reference.

Responses were received from a variety of agencies. Many of the responses indicated that their agency did not anticipate any significant project-related issues in the study area. Others outlined standard requirements and guidance related to project planning, design, and construction. A third set of agencies expressed specific concerns or identified issues to be considered in the study. A summary of the substantive responses received is provided below. A summary of all agency comments and copies of all agency correspondence received are included in Appendix H.

First Mailing—

- Department of Military Affairs indicated that a bypass facility in northwest Harrodsburg would facilitate access to the Kentucky National Guard Armory located at 500 Tapp Road.
- Permits Branch of KYTC Division of Maintenance preferred that a bypass facility in northwest Harrodsburg, if constructed, have partial or full control of access.
- Natural Resources Conservation Service of the U.S. Department of Agriculture provided an electronic database of prime farmlands and of farmlands of statewide importance.
- Federal Aviation Administration foresaw no problems assuming no ultimate construction activities, *e.g.*, construction cranes, exceeded 200 feet in height above ground level.
- Mercer County Emergency Management endorsed the concept of a bypass facility in northwest Harrodsburg, but expressed concern about the intersections of US 68 with KY 152 and of US 68 west with US 127 south.
- Kentucky Department of Fish and Wildlife Resources (KDFWR) knew of no federal and/or state threatened and/or endangered species in the project area, but did express a concern about potential impacts to wetland habitats and streams.
- Kentucky Cabinet for Health and Family Services urged involvement in project planning by the Mercer County Health Department (Note: A member of the Mercer County Health Board of Directors is a member of the Project Advisory Committee.)
- Kentucky Geological Survey (KGS) at the University of Kentucky expressed concern about karst topography and fault potential, the latter in the northern portion of the project study area.
- Geotechnical Branch of the KYTC Division of Structural Design expressed similar concerns to those of KGS.
- Center for Disease Control and Prevention of the U.S. Department of Health and Human Services advocated adequate provision for bicyclists and pedestrians.
- Division of Conservation, in the Kentucky Energy and Environment Cabinet (formerly Environmental and Public Protection Cabinet), identified one agricultural district and four agricultural easements located just north and west of the project study area.
- Water Quality Branch of the KDOW of the Kentucky Department for Environmental Protection urged that no water quality degradation impact Johnson Creek during construction.
- Division of Wastewater Management, in the Kentucky Department for Environmental Protection, urged that steps be taken to avoid any disturbance of Humane Spring.

Second Mailing—

- The Geotechnical Branch of the KYTC Division of Structural Design expressed a preference for Alternate E among the bypass alternatives and had no concerns with any of the other improvements.

- The Kentucky State Police stress the need for proper signage, signals, and lighting to accommodate inexperienced drivers and commercial vehicles operating in the project area.
- The Kentucky Department of Fish and Wildlife Resources (KDFWR) would not prefer Alternate H. Further, KDFWR prefers that any bridge crossing the Salt River be a clear span structure, i.e. no bridge piers within the river, and that possible stream mitigation sites be identified during future project development phases.
- The Kentucky Heritage Council urged that future project development phases include separate surveys of archaeological and historic sites to ascertain potential eligibility for listing in the NRHP.

7.0 ALTERNATIVES DEVELOPMENT AND EVALUATION

7.1 Alternative Development

The stated project goals include:

- Improving transportation system connectivity.
- Separating school and industry traffic.
- Reducing emergency response travel time.
- Providing grade-separated railroad crossings.
- Reducing congestion on area roadways.
- Compatibility with a possible future bypass extension to the south.

No-Build Alternative—The No-Build Alternative was considered and determined to be inadequate to address the project goals and long-term needs of the community. This alternative results in unacceptable traffic volumes and poor LOS on existing roadways in 2030. Consequently, it was not advanced and attention was turned toward a Build Alternative.

Northwest Bypass Alternatives—

With the aforementioned project goals in mind, the KYTC Project Team met with the Project Advisory Committee (October 22, 2007) and members of the public (November 19, 2007), to solicit their suggestions for the location of a bypass in northwestern Harrodsburg (see suggested corridors, Figure 7). After accounting for minor differences in the suggested concepts, seventeen possible locations were developed as a result of these suggestions. Conceptual location mapping and descriptions of these seventeen alternatives, as well as some of the more significant metrics associated with each alternative and a subjective scoring of each alternative against project goals, are included in Appendix I. The KYTC Project Team reviewed this information and identified **Alternatives E, F, H, and J** as the most promising concepts to be presented to the Project Advisory Committee at its second meeting on April 14, 2008. Figure 8 shows these four alternatives.

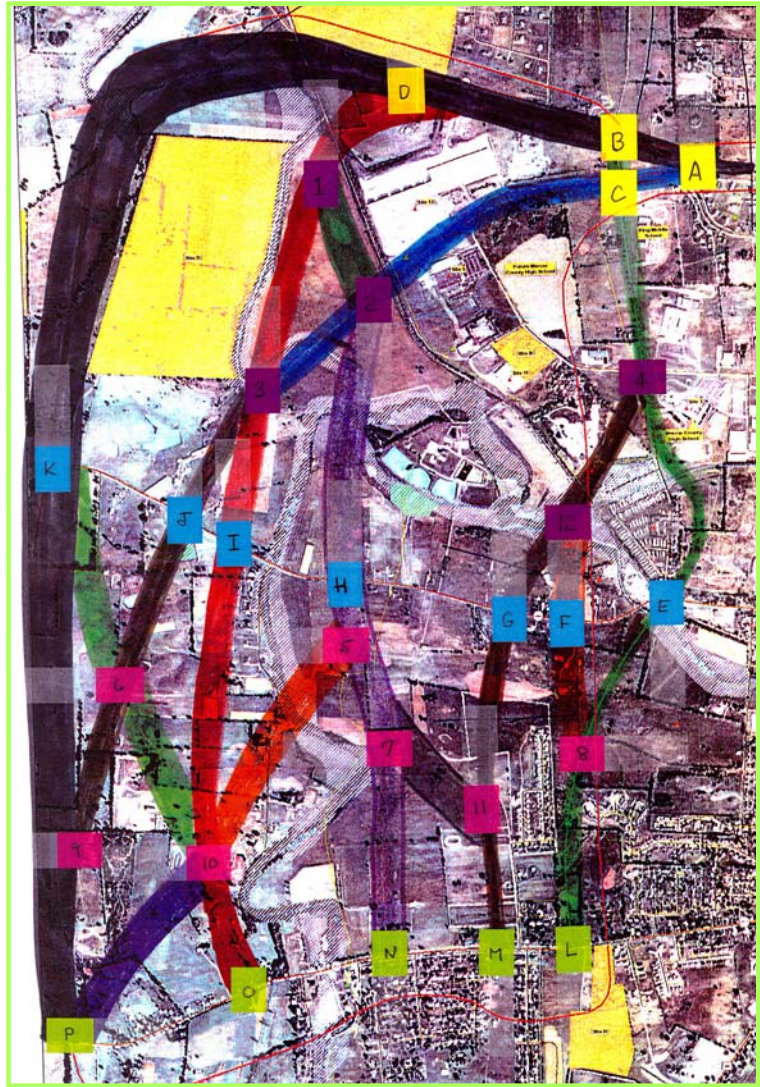


Figure 7: Bypass Corridors Suggested by the Public.

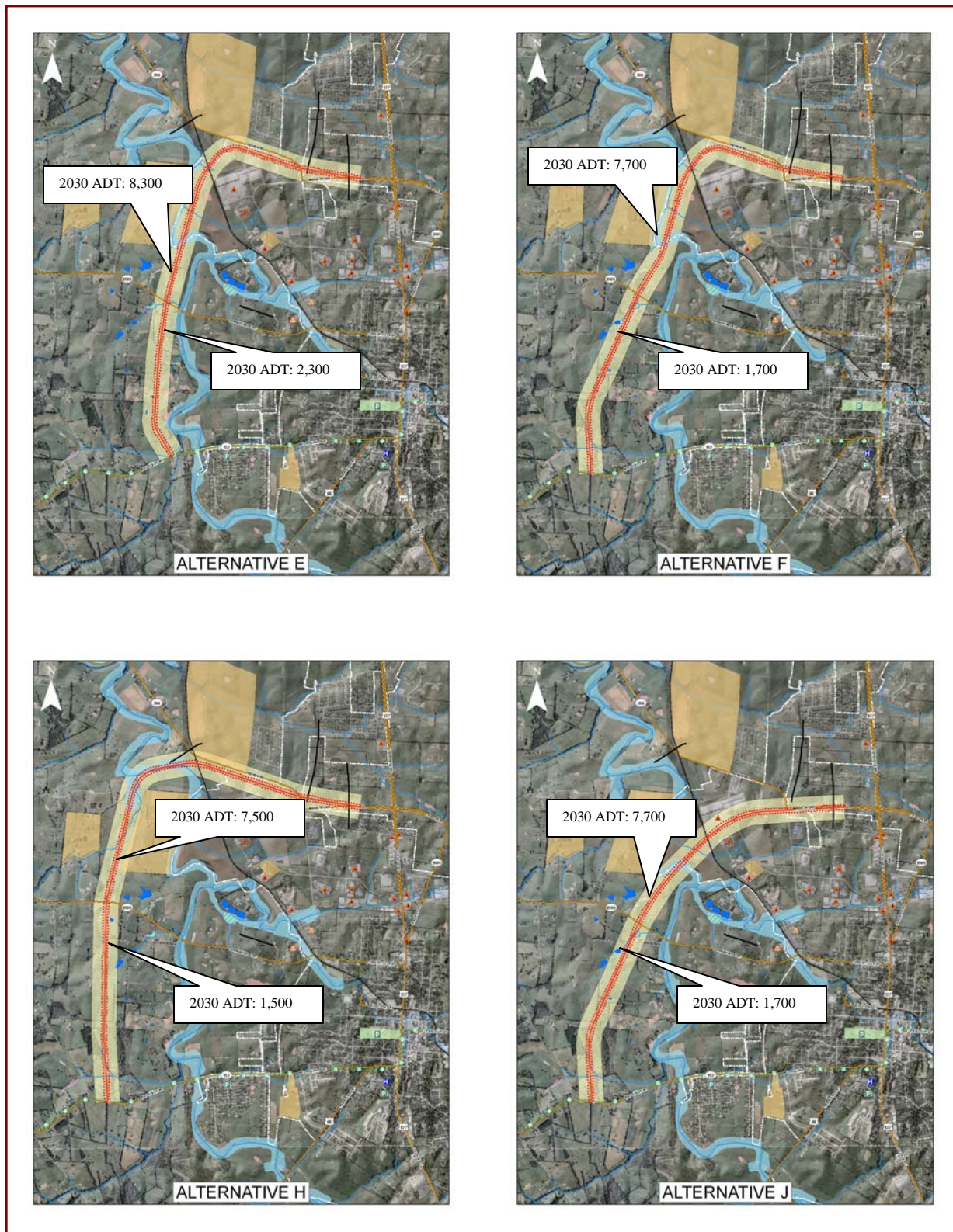


Figure 8: Bypass Alternatives Recommended for Consideration, With Projected (Year 2030) Average Daily Traffic North and South of KY 1989 (Cornishville Road).

The four bypass alternatives would attract between 7,500 vpd and 8,300 vpd on the section north of KY 1989 and between 1,500 vpd and 2,300 vpd south of KY 1989 in 2030 (see Figure 8). These scenarios would not satisfy the primary purpose of the proposed bypass, i.e., a significant reduction in traffic volumes on US 127; and the estimated cost of the bypass would range from \$29 million to \$37 million. The KYTC 2008 Highway Plan reflects a budget squeeze that does not portend well for the inclusion of additional projects requiring major investments—projects such as a Northwest Harrodsburg Bypass. Therefore, alternative transportation improvements within the study area were also conceived with emphasis on addressing project goals in a more fiscally constrained manner in what has come to be known as “practical solutions”. These alternatives were referred to as the *Other Northwest Quadrant Options (Other Options)*.

Other Northwest Quadrant Options—The following *Other Options* were presented—together with bypass Alternatives E, F, H, and J—at the April 2008 Project Advisory Committee meeting and at the second public meeting, held on May 12, 2008:

- Widen Moberly Road from KY 1989 to KY 390
- Reconstruct the Moberly Road/KY 1989 intersection—with and without railroad overpass
- Improve KY 1989 from the railroad east to College Street
- Improve KY 1989 from the railroad west to Tewmeyer Lane
- Improve access from KY 1989 near or west of Tewmeyer Lane to Wausau Paper, Trim Masters, and US 127 north
- Improve KY 152 from Tewmeyer Lane to US 127
- Construct a new 2-lane connector from KY 1989 / Moberly Road south to KY 152, and extend Broadway west to new connector
- Rebuild Tewmeyer Lane as an improved 2-lane road.
- Consider additional signalization at the following locations:
 - KY 390 and Moberly Road
 - Moberly Road and Tapp Road (city project)
 - KY 1989 and Moberly Road

Exhibit 4 shows the *Other Options* presented at the May 2008 meeting. Exhibit 5 shows projected (year 2030) traffic volumes for the non-bypass alternatives.

Forty-four persons attended the second public meeting. Twenty-seven completed comment forms were returned at the meeting or within two weeks thereafter. In addition, a petition against any northwest bypass alternative was signed by thirteen residents along Tewmeyer Lane and was submitted to KYTC. Four of these thirteen signatories also filled out public survey forms. Hence, at most, nine of the signatories represented unduplicated comments and are counted that way.

Including only the unduplicated signatories on the petition, thirty-one of the thirty-six commenters were opposed to a northwest bypass. Of the five persons who favored a northwest bypass, Alternative H was the preferred option followed in order by Alternatives J, F, and E. Of the four alternative options presented to the public, Alternative H would require the largest acreage of right-of-way, including the most acreage of both prime and state importance farmland; would cross the

largest acreage of floodplains; would impact the greatest length of streams; and would have the highest estimated cost. Because of its environmental impacts, the alternative was viewed negatively by KDFWR. In addition, although Alternative H would provide the greatest separation of school and industry traffic, it would do the least to reduce congestion on existing area roadways. These metrics are each generally associated with the fact that Alternative H is the alternative option located farthest from the heart of the Harrodsburg community. Table 6, below, provides a comparison of the estimated design, right-of-way, utility, and construction costs that are associated with each of these four alternative bypass concepts.

Table 6: Cost Estimates—Alternative Bypass Concepts

Alternative Concept – Bypass	Cost Estimates (in Millions)				
	Design	R/W	Utility	Construction	Total
Alternative E	\$ 2.1	\$ 5.4	\$ 0.7	\$ 21.0	\$ 29.2
Alternative F	\$ 2.2	\$ 5.7	\$ 0.7	\$ 22.5	\$ 31.1
Alternative H	\$ 2.7	\$ 6.6	\$ 0.7	\$ 27.0	\$ 37.0
Alternative J	\$ 2.1	\$ 5.2	\$ 1.4	\$ 20.9	\$ 29.6

The twenty-seven completed comment forms also included expressions of preference among the additional alternative transportation improvements within the project study area that were conceived with emphasis on addressing project goals in a more fiscally constrained manner. Figures 9 through 13 show the current conditions at the locations of the five options mentioned more frequently or ranked much higher than the remaining options:

1. Extend Moberly Road from (KY 1989) Cornishville Road south to KY 152 (Mooreland Avenue).



Figure 9:
Possible Location, Moberly Road Extension.

2. Reconstruct Moberly Road from KY 390 (Bohon Road) to KY 1989 (Cornishville Street).

Figure 10:
Existing Moberly Road Between
KY 390 and KY 1989.



3. Extend Broadway west to proposed Moberly Road extension (new KY 152-KY 1989 connector).

Figure 11:
Broadway Looking West from Hill Street



4. Reconstruct Moberly Road/ KY 1989 (Cornishville Street) intersection with railroad overpass.

Figure 12:
Moberly Road / KY 1989 Intersection



5. Install traffic signal at Moberly Road and Industry Road.

Figure 13:
Moberly Road / Industry Road Intersection, Looking
East



Conversely, there was relatively little interest in, or support for, the following alternative transportation improvements:

1. Improve KY 1989 from the railroad east to College Street
2. Improve KY 152 from Tewmeyer Lane to US 127
3. Install traffic signal at Moberly Road and Tapp Road
4. Rebuild Tewmeyer Lane as an improved 2-lane road
5. Improve KY 1989 from the railroad west to Tewmeyer Lane
6. Reconstruct Moberly Road/Cornishville Road intersection without railroad overpass
7. Construct a new street from Cornishville Road near or west of Tewmeyer Lane to Wausau Paper, Trim-Masters, and Bohon Road
8. Install traffic signal at Moberly Road and Cornishville Road

Table 7, below, provides a comparison of the estimated design, right-of-way, utility, and construction costs that are associated with each of these other improvement concepts.

Table 7: Cost Estimates—Other Improvement Concepts

Alternative Concept—Other	Cost Estimates (in Millions)				
	Design	R/W	Utility	Construction	Total
Extend Moberly Road from KY 1989 south to KY 152	\$ 0.2	\$ 1.1	\$ 0.1	\$ 1.8	\$ 3.2
Urbanize and reconstruct Moberly Road from KY 1989 to KY 390	\$ 0.2	\$ 0	\$ 0.1	\$ 1.2	\$ 1.5
Extend Broadway west to new KY 1989 /KY 152 connector	\$ 0.1	\$ 0.55	\$ 0.05	\$ 0.9	\$ 1.6
Reconstruct Moberly Road /KY 1989 intersection with railroad overpass	\$ 0.7	\$ 2.2	\$ 0.4	\$ 7.3	\$ 10.6
Install traffic signal at Moberly Road and Industry Road	\$ 0.005	-	-	\$ 0.075	\$ 0.08
Improve KY 1989 from the railroad east to US 127	\$0.1	\$0.0	\$0.0	\$1.0	\$1.1
Improve KY 152 from Tewmeyer Lane to US 127	\$0.2	\$0.0	\$0.0	\$1.7	\$1.9
Install traffic signal at Moberly Road and Tapp Road	\$ 0.005	-	-	\$ 0.075	\$ 0.08
Rebuild Tewmeyer Lane as an improved 2-lane road	\$0.1	\$0.0	\$0.0	\$1.3	\$1.4
Improve KY 1989 from the railroad west to Tewmeyer Lane	\$0.14	\$0.0	\$0.0	\$1.42	\$1.6
Reconstruct Moberly Road/KY 1989 intersection without railroad overpass	\$ 0.4	\$ 1.4	\$ 0.4	\$ 4.1	\$ 6.3
Construct a new street from KY 1989 near or west of Tewmeyer Lane to Wausau Paper, Trim-Masters, and KY 390 (Bohon Road)	\$ 1.0	\$ 3.5	\$ 0.6	\$ 9.4	\$ 14.5
Install traffic signal at the Moberly Road / KY 1989 intersection	\$ 0.005	-	-	\$ 0.075	\$ 0.08

7.2 Identification of Recommendations

The Project Team met on June 18, 2008, to review the public comments and identify options to present as recommendations to the Project Advisory Committee at a scheduled July 28, 2008, meeting.

At the July 28, 2008, meeting, the Project Team presented the Project Advisory Committee with a review of the May 12, 2008, public meeting results, noting that the comments received indicated strong opposition to a northwest bypass and to improvements to Tewmeyer Lane, but substantial support for other improvements. The presentation proceeded with an examination of the four bypass alternatives in terms of satisfaction of project goals, cost, traffic volumes, and public support. A list of short-term, long-term, and other future recommendations then were presented to the committee, as follows:

First recommendation: A northwest bypass is currently not recommended for the following reasons:

- High estimated costs (\$29 million to \$37 million).
- Low traffic forecasts (ADT ranging from 8,300 vpd to 1,500 vpd in 2030, as shown on Figure 8).
- Lack of public support.
- Marginally satisfies the project goals.

Second Recommendation: Advance the following short-term projects:

- 1) Consider intersection improvements at Moberly Road/KY 390, Moberly Road/Tapp Road, and Moberly Road/KY 1989. These improvements may include, but are not limited to, signal warrant analyses, signage, and striping. If signals are warranted at these intersections, then consider synchronization.
- 2) Due to need and public support, the KY 152/US 68 intersection should be considered as a spot improvement.

Third Recommendation: Advance the following long-term projects:

- 3) Reconstruct and extend the Moberly Road corridor:
 - a. Reconstruct intersection of Moberly Road/KY 1989 with a railroad overpass.
 - b. Widen Moberly Road between KY 1989 and KY 390.
 - c. Extend Moberly Road (on new alignment) south, from KY 1989 to KY 152, and construct a connector to West Broadway Street.

Other Future Recommendations:

- 4) Conduct a Small Urban Area (SUA) Study for Harrodsburg.
- 5) Upon implementation of the short and long term projects, conduct a planning study for a Western Harrodsburg Bypass to complete the loop around the city and provide connectivity with the existing eastern bypass.
- 6) Conduct a railroad relocation study.

The locations of these short- and long-term projects (recommendations 1 through 3, above) were presented to the Project Advisory Committee on a display map, a copy of which is included with the July 28 meeting minutes in Appendix G. Minutes or summaries of all meetings referenced herein are provided in Appendix G.

It was generally accepted that the non-bypass alternatives would effectively address the project goals and respond to KYTC's emphasis on practical solutions and fiscally feasible improvement alternatives. Therefore, the recommendations identified above are incorporated into this report as the *Recommended Northwest Quadrant Options*. These recommendations are shown on Exhibit 6. Section 8.0 provides additional details about the options, including cost and order of priority ranking.

7.3 Projected Traffic Volumes and Levels of Service With Recommended Projects

Traffic volumes and levels of service (LOS) were projected for the year 2030 for both the No-Build and the Build scenarios based on the recommended projects identified in Section 8.0, herein. Table 8 compares current traffic volumes, projected traffic volumes under the No-Build scenario, and projected 2030 traffic volumes assuming the completion of the recommended projects. Exhibit 5 in Appendix A also shows this data.

If the projects recommended in Section 8.0 are developed, future year growth on College Street is projected to decline by between 10% and 15%. An extension of Moberly Road south of KY 1989 to KY 152 could be expected to carry between 1,700 and 3,500 vpd. An extension of West Broadway westward to the Moberly Road extension would carry about 1,700 vpd.

Level of service (LOS) is a qualitative measure of expected traffic conflicts, delay, driver discomfort, and congestion. Levels of service are described according to a letter rating system (similar to school grades) ranging from LOS A (free flow, minimal or no delays – best conditions) to LOS F (stop and go conditions, very long delays – worst conditions). For intersections the Highway Capacity Manual defines levels of service based on the average delay due to the signal or stop control. For 2-lane roadways such as Moberly Road or the Moberly Road extension, level of service is a function of the average percent of time a vehicle spends following another vehicle. LOS C is often considered the threshold for desirable traffic conditions in cities such as Harrodsburg. LOS C corresponds to less than 35 seconds of delay per vehicle at a signalized intersection and less than 25 seconds of delay at an unsignalized intersection. For two-lane roadways, LOS C is achieved when one vehicle is following another one less than 70% percent of the time.

For purposes of comparison, Table 8 displays the current (year 2008) and projected Year 2030 LOS for various streets in the expanded study area. Exhibit 1 shows both the current and projected No-Build scenario traffic volumes and levels of service. Exhibit 5 shows projected traffic volumes and levels of service with the Build scenario.

Table 8: Current and Projected (Year 2030) Traffic Volume and Level of Service Comparison

Roadway	Segment	Existing 2008		Projected 2030 No-Build		Projected 2030 With Recommended Projects	
		ADT	LOS	ADT	LOS	ADT	LOS
US 127 (N. College St.)	US 68 (W. Lexington St.) to KY 1989 (Cornishville St.)	14,700	D	23,700	D	20,200	D
US 127 (N. College St.)	KY 1989 (Cornishville St.) to KY 390 (Industry Rd.)	13,500	D	27,100	D	24,600	D
KY 390 (Bohon/Industry Rds.)	East of Moberly Rd.	4,660	B	6,300	C	8,000	C
Moberly Rd.	North of Tapp Rd.	2,100	C	3,300	C	7,300	C
Moberly Rd.	Between Tapp Rd. and KY 1989 (Cornishville St.)	2,540	B	4,100	B	8,000	C
Moberly Rd. (Extension)	Between KY 1989 (Cornishville St.) and W. Broadway	N/A	--	N/A	--	3,500	B
Moberly Rd. (Extension)	Between W. Broadway and KY 152 (Mooreland Ave.)	N/A	--	N/A	--	1,700	A
KY 1989 (Cornishville St.)	East of Moberly Rd.	4,810	B	7,600	C	5,000	B
KY 1989 (Cornishville Rd.)	West of Moberly Rd.	1,680	B	2,400	B	2,400	B
W. Broadway (Extension)	Western Extension to New Moberly Rd. Extension	N/A	--	N/A	--	1,700	A
US 68 (KY 152/ Mooreland Ave.)	West of US 127 (S. College St.) Intersection	5,810	C	16,600	D	4,800	C
US 68 (S. College St.)	Mooreland Ave. to W. Lexington St.	20,800	D	32,000	E	28,500	D
KY 152 (Mooreland Ave.)	West of US 68/ KY 152 Intersection	5,200	B	7,600	C	5,800	B
KY152 (Mooreland Ave. & Mackville Rd.)	West of Moberly Rd. Extended	N/A	--	N/A	--	7,600	C

8.0 RECOMMENDATIONS

In consideration of the existing and projected future transportation system conditions in the northwest quadrant of Harrodsburg; the project goals; the preferences of the KYTC Project Team and the Project Advisory Committee and other local project stakeholders, and the general public; the alternative concepts; and the desire for a set of fiscally responsible recommendations that would result in the greatest chance of implementation, the projects listed below are recommended in three time-periods—short term, long term (five to ten years), and other future. The recommended projects involving construction are shown on Exhibit 6. Table 9 provides a comparison of the estimated design, right-of-way, utility, and construction costs, that are associated with each of these recommended improvement concepts. Table 10 evaluates the degree to which each alternative improvement option satisfies the goals for this project. Table 11 provides some additional metrics for each alternative improvement option.

SHORT-TERM RECOMMENDATIONS—

Priority 1—Conduct a Small Urban Area (SUA) Study for Harrodsburg.

A SUA study is applicable for municipalities that range in population from 5,000 to 50,000 with the goal of maximizing the current transportation assets on the existing state-controlled route system in and around the municipality.

Priority 2—Intersection Spot Improvements

- Improve Intersections on Moberly Road at KY 390, Tapp Road, and KY 1989 to include signal warrant analyses, signage, and striping. If signals are warranted, evaluate synchronization. (See Exhibit 6, Project ID #1)
- Reconstruct the US 68/KY 152 intersection, to include signal warrant analyses, signage, and striping. If signals are warranted, evaluate synchronization. (See Exhibit 6, Project ID #2)

LONG-TERM (NEXT 5-TO-10 YEAR) RECOMMENDATIONS—

Priority 3—Reconstruct and Extend the Moberly Road Corridor:

- Reconstruct the intersection of Moberly Road/ KY 1989 with an overpass of the Norfolk-Southern railroad track. (See Exhibit 6, Project ID #3A)
- Widen Moberly Road between KY 1989 and KY 390. (See Exhibit 6, Project ID #3B)
- Extend Moberly Road (on new alignment) to the south from KY 1989 to KY 152, and include an east-west connector to West Broadway Street. (See Exhibit 6, Project ID #3C)

OTHER FUTURE RECOMMENDATIONS—

- Upon implementation of the short- and long-term projects, consider conducting a planning study to re-examine the purpose and need for a western Harrodsburg bypass to complete the loop around the city and provide connectivity with the existing eastern bypass.
- Conduct a railroad relocation study that would focus on relocation sites and financing options.

Table 9: Cost Estimates—Recommended Improvements

Improvement Type	Alternative Concept	Cost Estimates (in Millions)				
		Design	R/W	Utility	Construction	Total
Short-Term Recommendations	Conduct a Small Urban Area (SUA) Study for Harrodsburg	\$ 0.05	N/A	N/A	N/A	\$ 0.05
	Improve all Intersections on Moberly Road: Improvements to include signal warrant analyses, signage, and striping. If signals are warranted, evaluate synchronization.	\$ 0.02	N/A	N/A	\$ 0.225	\$ 0.245
	Reconstruct Intersection at KY 152 and US 68, to include signal warrant analyses, signage, and striping. If signals are warranted, evaluate synchronization.	\$ 0.05	\$ 0.85	\$ 0.1	\$ 0.5	\$ 1.5
Next 5 to 10 Years	Reconstruct Moberly Road /KY 1989 intersection with railroad overpass.	\$ 0.7	\$ 2.2	\$ 0.4	\$ 7.3	\$ 10.6
	Widen Moberly Road between KY 1989 and KY 390.	\$ 0.2	\$ 0	\$ 0.1	\$ 1.2	\$ 1.5
	Extend Moberly Road from KY 1989 to KY 152.	\$ 0.2	\$ 1.1	\$ 0.1	\$ 1.8	\$ 3.2
	Extend Broadway West to new KY 1989-KY 152 connector (Moberly Road extension).	\$ 0.1	\$ 0.55	\$ 0.05	\$ 0.9	\$ 1.6
Other Future Recommendations	Upon implementation of the short- and long-term projects, conduct a planning study for a western Harrodsburg bypass to complete the loop around the city and provide connectivity with the existing eastern bypass.	\$ 0.3	N/A	N/A	N/A	\$ 0.3
	Conduct a rail relocation study that would focus on relocation sites and financing options.	\$ 0.5	N/A	N/A	N/A	\$ 0.5
Total Estimated Cost						\$19.5

Table 10: Goal Satisfaction of Improvements Considered

Improvement Option	Separate School and Industry Traffic	Emergency Response Time to Haggin Hospital	Grade Separated RR Crossing	Reduce Congestion on Existing Area Roadways	Compatible with Future Possible Southwest Extension
Bypass Alternative E	Good	Poor	Excellent	Fair to Poor	Excellent
Bypass Alternative F	Good	Poor	Excellent	Fair to Poor	Excellent
Bypass Alternative H	Excellent	Poor	Excellent	Poor	Excellent
Bypass Alternative J	Good	Poor	Excellent	Fair to Poor	Excellent
Extend Moberly Road from KY 1989 to KY 152	Fair	Good	N/A	Excellent	Good
Urbanize and Reconstruct Moberly Road from KY 1989 to KY 390	Poor	Fair	N/A	Good	Good
Extend Broadway west to new KY 1989-KY 152 connector (Moberly Road extension)	Fair	Fair	N/A	Good	Good
Reconstruct Moberly Road/KY 1989 intersection <u>with</u> railroad overpass	Fair	Good	Excellent	Excellent	Good
Install traffic signal at Moberly Road and KY 390	Fair	N/A	N/A	Fair	N/A
Reconstruct Moberly Road/KY 1989 intersection <u>without</u> railroad overpass	Poor	Poor	Poor	Poor	Fair
Construct a new street from KY 1989 near Tewmeyer Lane to Wausau Paper, Trim-Masters, and KY 390 (Bohon Road)	Good	Fair	Poor	Poor	Good
Install traffic signal at Moberly Road and KY 1989	Fair	Fair	Poor	Fair	Good
Conduct a Small Urban Area Study for Harrodsburg	N/A	N/A	N/A	N/A	N/A
Improve all intersections on Moberly Road, including signal warrant analyses, signage, and striping	Fair	Fair	Poor	Good	Fair
After implementation of short- and long-term projects, conduct a revised planning study for a western Harrodsburg Bypass to complete the loop around the city	N/A	N/A	N/A	N/A	N/A
Conduct a rail relocation study that would focus on relocation sites and financing options	N/A	N/A	N/A	N/A	N/A
Reconstruct Intersection at KY 152 and US 68, to include signal warrant analyses, signage, and striping. If signals are warranted, evaluate synchronization.	N/A	Good	N/A	Good	N/A

Table 11: Other Metrics of Improvements Considered

Improvement Option	Historic Sites Potentially Impacted	School Property Potentially Disturbed	Potential HAZMAT or Landfill Impact	Number of Streams Potentially Crossed	Estimated Cost (Millions)
Bypass Alternative E	2	No	No	5	\$30.0
Bypass Alternative F	2	No	No	6	\$30.9
Bypass Alternative H	2	No	No	6	\$37.0
Bypass Alternative J	1	Yes	No	5	\$29.3
Extend Moberly Road from KY 1989 to KY 152	1	No	Yes	1	\$3.2
Urbanize and Reconstruct Moberly Road from KY 1989 to KY 390	0	Yes	Yes	0	\$1.5
Extend Broadway West to new KY 1989-KY 152 connector (Moberly Road extension)	0	No	Yes	0	\$1.6
Reconstruct Moberly Road/KY 1989 intersection <u>with</u> railroad overpass	0	No	Yes	1	\$10.6
Install traffic signal at Moberly Road and KY 390	0	No	No	0	\$0.08
Reconstruct Moberly Road/KY 1989 intersection <u>without</u> railroad overpass	0	No	No	1	\$6.3
Construct a new street from KY 1989 near Tewmeyer Lane to Wausau Paper, Trim-Masters, and KY 390 (Bohon Road)	2	Yes	Yes	1	\$14.5
Install traffic signal at Moberly Road and KY 1989	0	No	No	0	\$0.08
Conduct a Small Urban Area Study for Harrodsburg	N/A	N/A	N/A	N/A	\$0.05
Improve all intersections on Moberly Road, including signal warrant analyses, signage, and striping.	0	Yes	No	0	\$0.245
After implementation of short- and long-term projects, conduct a revised planning study for a western Harrodsburg Bypass to complete the loop around the city	N/A	N/A	N/A	N/A	\$0.3
Conduct a rail relocation study that would focus on relocation sites and financing options	N/A	N/A	N/A	N/A	\$0.5
Reconstruct Intersection at KY 152 and US 68, to include signal warrant analyses, signage, and striping. If signals are warranted, evaluate synchronization.	N/A	N/A	N/A	N/A	\$1.5