

KY 49 Planning Study

*From KY 84 near Lebanon
To KY 52 in Loretto*

KYTC Item No. 4-8707.00



FINAL REPORT
February 2014



KY 49 Planning Study

Marion County, Kentucky

KY 49 between KY 84 near Lebanon and KY 52 in Loretto

KYTC Item No. 4-8707.00

Final Report
February 25, 2014

Submitted to:

Kentucky Transportation Cabinet
Division of Planning
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EXECUTIVE SUMMARY

KY 49 Planning Study, between KY 84 near Lebanon and KY 52 in Loretto Marion County, KYTC Item No. 4-8707.00



The Kentucky Transportation Cabinet (KYTC) has undertaken a planning study to consider the improvement of KY 49 from KY 84 near Lebanon to KY 52 in Loretto.

The purpose of this study is to:

- Identify known issues, concerns, and constraints, including safety, traffic, social, environmental, and geotechnical considerations.
- Develop preliminary “purpose and need” and goals for the proposed project.
- Listen to and share information with local officials, government agencies, other interested parties, and the public.
- Develop and evaluate improvement concepts for KY 49 based on project purpose and need, including short-term “spot” improvements along the existing route.
- Make project recommendations.

Project Purpose and Need: The primary purpose of this project is to improve safety by addressing geometric deficiencies along KY 49 from KY 84 near Lebanon to KY 52 in Loretto.

KY 49 Characteristics: The study route:

- is 8.8 miles in length;
- has two narrow lanes and minimal shoulder;
- has eight 0.1-mile “spots” and one 0.5-mile “segment” with high crash rates;
- has a number of horizontal and vertical curves that do not meet current design standards;
- is predominately rural in character, with the Loretto end serving West Marion Elementary School and local businesses. Scattered homes are located along the corridor; and
- is adjacent to water resources and other environmental features.



Study Process: The project included:

- Field examination;
- Analysis of crash, traffic, geometric, environmental, and geotechnical data;
- Two meetings with local officials and stakeholders;
- One meeting with the public; and
- Three meetings of the Project Team to review analysis and input throughout the project.

After the initial meetings, potential improvement options were developed. Alternates were analyzed based on purpose and need, potential impacts, cost, and public input.

Recommendation: The planning study resulted in a recommendation to advance multiple widening options to the design phase. The recommendation is to widen largely along the existing alignment and correct substandard geometric features, but off-alignment options are also recommended for consideration in some areas. The alternates recommended for consideration in the design phase are shown in **Figure ES.1**, divided into constructible sections. The two middle sections were identified as the most important from a safety standpoint; they involved the most crash activity and include the most areas that do not meet current design standards. They were also identified as priorities from a local perspective (local officials/stakeholders and public).

The project team recommends the following construction sections as high priorities:

KY 49 from Toad Mattingly Road to KY 327 (2.76 miles), estimated \$13.7 million total cost

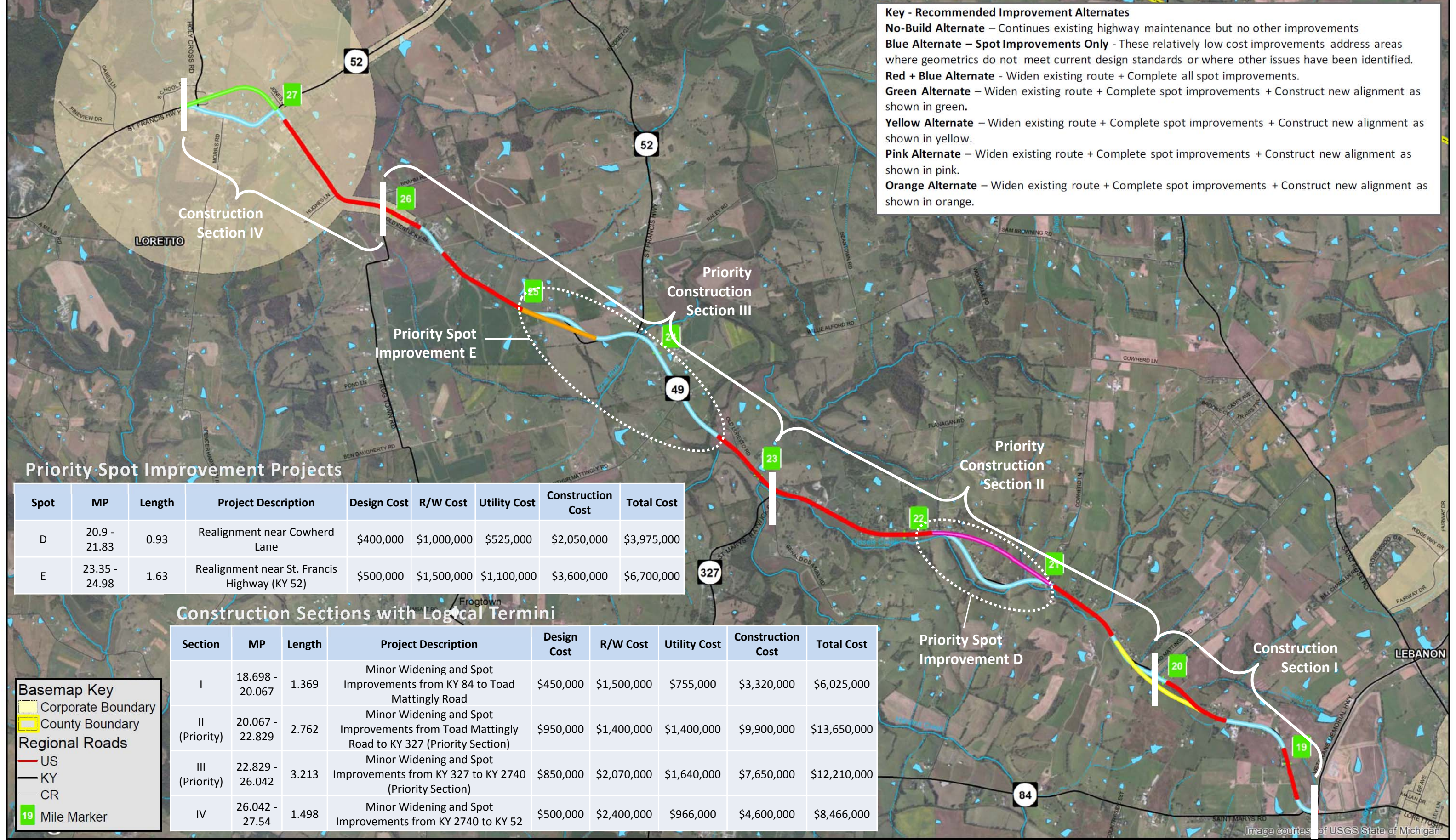
KY 49 from KY 327 to KY 2740
(3.21 miles), estimated \$12.2 million total cost

Short-term solutions may be considered if funding is not available for the recommended alternate. Of seven potential short-term spot improvement projects identified, the following two are recommended as high priorities.

High Priority Spot Improvements:

KY 49 from Cowherd Lane to Sam Browning Road, estimated \$4.0 million total cost

KY 49 near KY 52 (St. Francis Highway),
estimated \$6.7 million total cost



Key - Recommended Improvement Alternates
No-Build Alternate – Continues existing highway maintenance but no other improvements
Blue Alternate – Spot Improvements Only - These relatively low cost improvements address areas where geometrics do not meet current design standards or where other issues have been identified.
Red + Blue Alternate - Widen existing route + Complete all spot improvements.
Green Alternate – Widen existing route + Complete spot improvements + Construct new alignment as shown in green.
Yellow Alternate – Widen existing route + Complete spot improvements + Construct new alignment as shown in yellow.
Pink Alternate – Widen existing route + Complete spot improvements + Construct new alignment as shown in pink.
Orange Alternate – Widen existing route + Complete spot improvements + Construct new alignment as shown in orange.

Priority Spot Improvement Projects

Spot	MP	Length	Project Description	Design Cost	R/W Cost	Utility Cost	Construction Cost	Total Cost
D	20.9 - 21.83	0.93	Realignment near Cowherd Lane	\$400,000	\$1,000,000	\$525,000	\$2,050,000	\$3,975,000
E	23.35 - 24.98	1.63	Realignment near St. Francis Highway (KY 52)	\$500,000	\$1,500,000	\$1,100,000	\$3,600,000	\$6,700,000

Construction Sections with Logical Termini

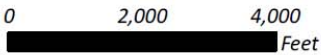
Section	MP	Length	Project Description	Design Cost	R/W Cost	Utility Cost	Construction Cost	Total Cost
I	18.698 - 20.067	1.369	Minor Widening and Spot Improvements from KY 84 to Toad Mattingly Road	\$450,000	\$1,500,000	\$755,000	\$3,320,000	\$6,025,000
II (Priority)	20.067 - 22.829	2.762	Minor Widening and Spot Improvements from Toad Mattingly Road to KY 327 (Priority Section)	\$950,000	\$1,400,000	\$1,400,000	\$9,900,000	\$13,650,000
III (Priority)	22.829 - 26.042	3.213	Minor Widening and Spot Improvements from KY 327 to KY 2740 (Priority Section)	\$850,000	\$2,070,000	\$1,640,000	\$7,650,000	\$12,210,000
IV	26.042 - 27.54	1.498	Minor Widening and Spot Improvements from KY 2740 to KY 52	\$500,000	\$2,400,000	\$966,000	\$4,600,000	\$8,466,000

Basemap Key

- Corporate Boundary
- County Boundary
- Regional Roads**
- US
- KY
- CR
- Mile Marker

Recommended Improvement Alternates

- Widen Existing
- Blue Alternate
- Green Alternate
- Yellow Alternate
- Pink Alternate
- Orange Alternate



KY 49 Planning Study
From KY 84 near Lebanon to KY 52 in Loretto
KYTC Item No. 4-8707.00

Figure ES.1: Recommended Improvement Alternates

TABLE OF CONTENTS

I. Introduction	1
A. Highway Plan Background.....	1
B. Overview of Project Location	1
II. Project Purpose and Need.....	3
A. Project Purpose	3
B. Other Desirable Goals	3
III. Existing Conditions	5
A. Highway Systems	5
B. Geometric Characteristics	7
C. Bridges	9
D. Traffic and Operational Measures	10
E. Crash Analysis.....	13
F. Adequacy Ratings.....	16
G. Programmed Highway Improvements	16
IV. Environmental Overview.....	17
A. Community Resources	17
B. Demographics.....	21
C. Aquatic & Terrestrial Resources.....	21
D. Hazardous Materials.....	22
E. Air Quality & Noise.....	22
F. Geotechnical Overview	22
V. Initial Stakeholder Involvement.....	24
A. Project Team Meeting #1.....	24
B. Stakeholder/Local Officials Meeting #1	24
VI. Conceptual Alternates	27
A. Development of Alternates	27
B. Project Team Meeting #2.....	33
C. Comparison of Costs and Impacts	34
VII. Additional Involvement	37
A. Local Officials/Stakeholders Meeting #2.....	37
B. Public Meeting	37
VIII. Recommendations.....	40
A. Purpose and Need.....	40
B. Final Project Team Meeting.....	40
C. Construction Segments & Planning Level Costs	45
D. Environmental Considerations.....	47
E. Additional Information	47

Figures

Figure 1.1: Study Area Map	2
Figure 3.1: Photo Log	6
Figure 3.2: Geometrics that Do Not Meet KYTC Common Geometric Practices.....	8
Figure 3.3: Traffic Characteristics	12
Figure 3.4: Crash Analysis.....	14
Figure 3.5: Geometric Characteristics and Crashes	15
Figure 4.1: Community Resources, EPA Program Sites, and Utilities	18
Figure 4.2: Hydrology.....	19
Figure 4.3: Farmland Classifications.....	20
Figure 5.1: Local Official and Stakeholder Input on Issues	26
Figure 6.1: Segment 1 – Potential Improvement Alternates	28
Figure 6.2: Segment 2 – Potential Improvement Alternates	29
Figure 6.3: Segment 3 – Potential Improvement Alternates	30
Figure 6.4: Segment 4 – Potential Improvement Alternates	31
Figure 7.1: What Transportation Problems exist within the Study Area?	38
Figure 8.1: Alternates Considered alongside Public Input (Segments 1-2)	41
Figure 8.2: Alternates Considered alongside Public Input (Segments 3-4)	42
Figure 8.3: Recommended Improvement Alternates	46

Tables

Table 3.1: 2013 Traffic and Level of Service	10
Table 3.2: 2040 No Build Traffic and Level of Service	11
Table 3.3: Statistics for High Crash Spots on KY 49	13
Table 6.1: Planning-Level Construction Cost Estimates for Spot Improvements.....	34
Table 6.2: Planning-Level Construction Cost Estimates by Segment & Alternate	34
Table 6.3: Potential Displacements by Segment & Alternate	35
Table 6.4: Potential Impacts by Segment & Alternate	36
Table 7.1: Preferred Improvement Alternate by Segment	38
Table 7.2: Top Priority Spot Improvements	39
Table 8.1: Summary of Long Term Recommendations	43
Table 8.2: Summary of Short Term Recommendations.....	44
Table 8.3: Summary of Costs by Construction Section	45
Table 8.4: Summary of Costs for Top Priority Spots	45

Appendices

- A. Traffic Forecast Report
- B. Environmental Justice and Community Impact Report
- C. Geotech Overview
- D. Meeting Summaries & Agency Correspondence

I. INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) has undertaken a planning study to consider the improvement and/or potential realignment of KY 49 between KY 84 near Lebanon and KY 52 in Loretto, Kentucky (Marion County).

The purpose of this study is to:

- Identify known issues, concerns, and constraints, including safety, traffic, social, environmental, and geotechnical considerations.
- Develop a preliminary “purpose and need” and goals for the proposed project.
- Listen to and share information with local officials, government agencies, other interested parties, and the public.
- Develop and evaluate improvement concepts for KY 49 based on project purpose and need, including both short-term “spot” improvements along the existing route and long-term corridor improvements.
- Make project recommendations.

A. Highway Plan Background

The current planning study evolved from Item No. 4-8707.00 in the *Kentucky FY 2012-2018 Highway Plan* (generally referred to as the Six Year Plan) and included Item No. 4-8708. Item No. 4-8707 included as the reconstruction of KY 49 from MP 18.698 to MP 22.829 and Item No. 4-8708 included a safety improvement project from MP 27.000 to 27.540.

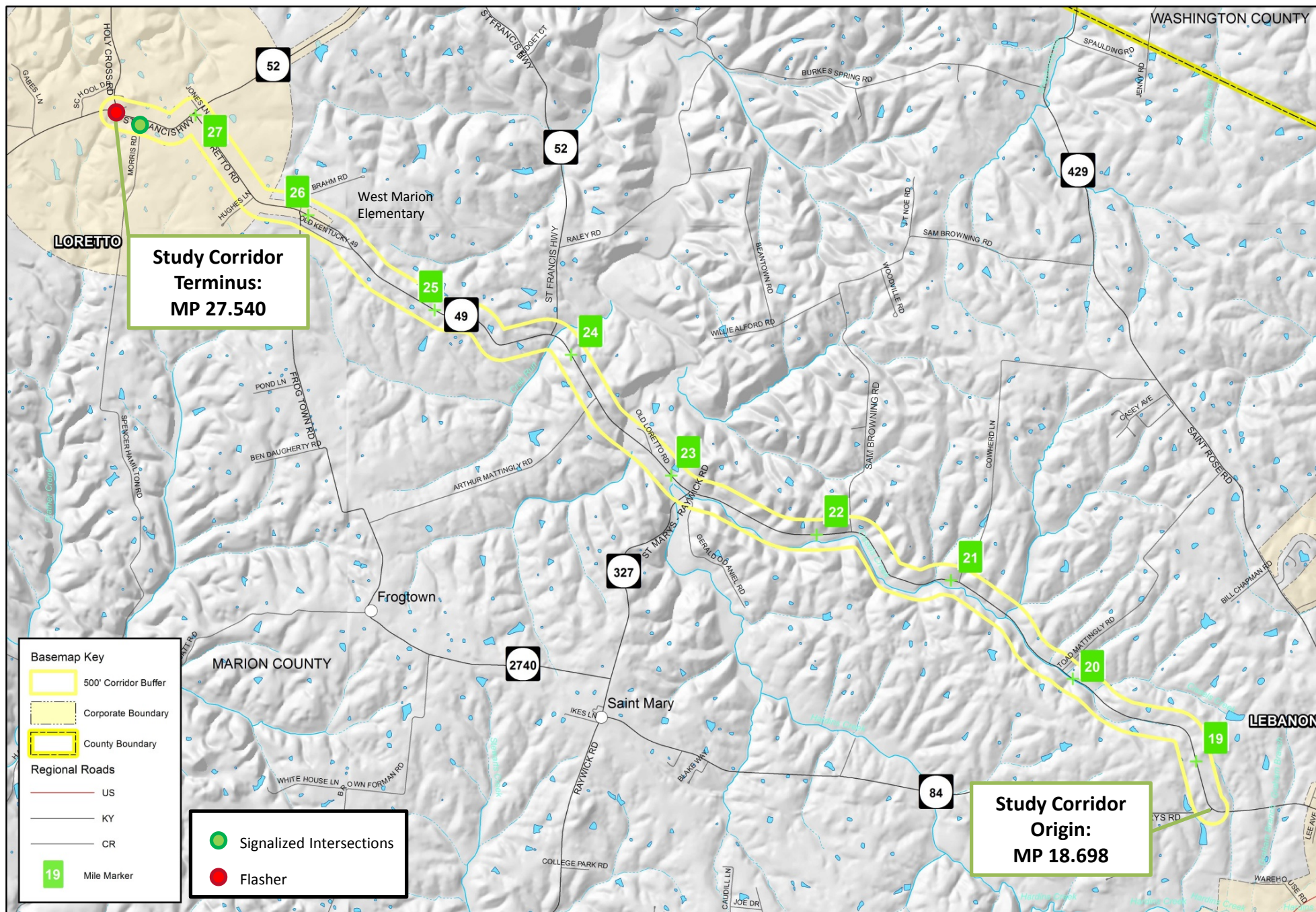
As part of the biennial update of the Six Year Plan, improvements recommended in this planning study area currently identified in the 2014-2020 Recommended Six Year Highway Plan as Item No. 4-8707.01. The Recommended Plan includes \$3.0 million in design funding (FY 2014), \$2.5 million for right-of-way (FY 2016), \$3.0 million for utilities (FY 2016), and \$31.85 million for construction (FY 2018).

B. Overview of Project Location

The study area, shown in **Figure 1.1**, lies between the communities of Lebanon and Loretto within Marion County, Kentucky. The portion of KY 49 within the study area is 8.8 miles in length.

Marion County, including the study corridor, is predominantly rural in nature. The county seat, Lebanon, lies at the southern end of the study corridor. The county is known for its Catholic founders, Maker’s Mark Distillery, and Lebanon’s annual Ham Days Festival.

According to the 2010 Census, Marion County has a total population of 19,820 persons compared to a 2000 Census population of 18,212 persons. This translates to less than a 1 percent annual growth rate for the county. The 2010 populations of Lebanon and Loretto were 5,539 and 713 persons, respectively. The median household income of the county is \$38,202 per the 2007-2011 American Community Survey estimate with an estimated 17.4 percent of its individuals falling below the poverty level. An estimated 87.6 percent of the county population is white per the 2007-2011 American Community Survey estimate.



0 2,000 4,000 Feet



KY 49 Planning Study
From KY 84 near Lebanon to KY 52 in Loretto
KYTC Item No. 4-8707.00
Figure 1.1 – Study Area

II. PROJECT PURPOSE AND NEED

The general scope of the KY 49 Planning Study is to consider the improvement and/or potential realignment of KY 49 between KY 84 near Lebanon and KY 52 in Loretto in Marion County. The Purpose and Need Statement describes why KYTC is proposing to advance a transportation improvement. The Purpose and Need Statement also drives the process for developing and evaluating improvement alternates.

A. Project Purpose

The primary purpose of the proposed project is to improve safety by addressing geometric deficiencies along KY 49 between KY 84 near Lebanon and KY 52 in Loretto.

The existing KY 49 corridor has numerous substandard geometric features, including narrow lanes, narrow shoulders, and numerous horizontal and vertical curves that do not meet current design standards.

Further, crash records identify a number of locations where crashes occur more frequently than for similar type roadways throughout the state. Based on reported crashes from June 1, 2009 through June 30, 2013, there were 93 crashes along the 8.8-mile long study corridor. This includes 2 fatalities and 21 injury collisions. Several locations exhibit higher crash concentrations than can be attributed to random occurrences. Further details are provided in **Chapter III**.

The purpose of the proposed project is to improve safety by addressing geometric deficiencies.

B. Other Desirable Goals

As transportation improvement plans are made for KY 49, other important goals should be considered alongside the primary purpose identified above. These goals were identified during the technical analysis and in consultation with local officials and the public.

- **Accommodate bicyclists and pedestrians in Loretto** – Conversations with elected officials and citizens indicate that provision of sidewalk facilities along KY 49/KY 52 in Loretto would be beneficial for the community. In particular, West Marion Elementary School was identified as a popular destination. As improvements are developed, consideration should be given to accommodating bicycles and pedestrians.
- **Improve operations, access, and safety at West Marion Elementary School** – As design plans are developed, the needs of this school (including bus drivers, parents dropping off students, and delivery trucks) should be considered.
- **Minimize impacts to the environment** - Of primary importance is balancing the need for improvements along the corridor with the protection and preservation of sensitive environmental resources – including residents, streams, and farmlands. Some improvements may involve impacts to the human and natural environment but attempts should be made to minimize any impacts.
- **Maintain the existing character of the route** – KY 49 between Lebanon and Loretto is a rural, rolling major collector route. Any future improvements should be designed to be consistent with the route's existing context and vision for the future, which is likely to remain largely rural.

- **Improve access to area attractions to enhance tourism and economic development** – Safe, reliable transportation infrastructure is key for economic development. Makers Mark Distillery, which relies on KY 49 to provide access for both visitors and trucks to its facilities, anticipates significant growth over the coming decade. Any KY 49 improvements should be designed to support economic growth both regionally and locally by increasing access to both existing and potential future development sites and improving traffic flow to and from existing facilities.
- **Provide consistency with improved KY 49 south of Lebanon** - A section south of Lebanon is currently being improved to provide two 11-foot wide lanes with 4-foot wide shoulders. Any future improvements to the north should be designed to be consistent with these improvements.

III. EXISTING CONDITIONS

Characteristics of KY 49 in the study area are identified in the sections below. Information is included about highway systems, geometric characteristics, bridges, traffic conditions, crash history, and planned highway improvements. Roadway information is summarized from the KYTC Highway Information System (HIS) database. Photographs of some features in the study area are shown as **Figure 3.1**.

It is important to note that the segment of interest for this study is KY 49 between MP 18.698 and MP 27.540. This portion is between KY 84 (St Mary Road) near Lebanon and the northernmost KY 52 intersection (at Holy Cross Road) in Loretto.

A. Highway Systems

Major highway systems information is described below, including the State Primary Road System, Functional Classification System, National Highway System (NHS), National Truck Network (NN), Designated Truck Weight Class, and others.

- State-maintained roads in Kentucky are categorized under the State Primary Road System, ranging from the highest order classification to the lowest as follows: State Primary Routes, State Secondary Routes, Rural Secondary Routes, and Supplemental Roads. State Primary Routes are those routes which are considered to be long-distance, high-volume intrastate routes that are of statewide significance. Mobility is the prime function of the routes that can be distinguished by high traffic-carrying capacity. These routes link major urban centers within the state and/or serve as major regional corridors. State Secondary Routes are shorter, regionally significant highways that provide mobility and access to adjacent land uses. These routes typically link smaller cities and county seats within a region.

The study portion of KY 49 is currently classified as a State Secondary Route.

- One of 13 functional classification categories is assigned to each state-maintained road in Kentucky, based on the function that each road provides and whether the road is an urban or rural road. These are classified from highest to lowest and by geographic designation as: Rural Interstate, Urban Interstate, Other Rural Freeways and Expressways (Principal Arterial), Other Urban Freeways and Expressways (Principal Arterial), Other Rural Principal Arterial, Other Urban Principal Arterial, Rural Minor Arterial, Urban Minor Arterial, Rural Major Collector, Rural Minor Collector, Urban Collector, Rural Local, and Urban Local.

The study portion of KY 49 is classified as a Rural Major Collector.

- The NHS was first established in 1991 by the Intermodal Surface Transportation Efficiency Act. It includes the Interstate Highway System and other significant Principal Arterial roads important to the nation's economy, defense, and mobility.

There are no NHS routes in the study area.

- The NN includes roads specifically designated for use by commercial trucks with increased dimensions (102 inches wide; 13 feet, 6 inches high; semi-trailers up to 53 feet long; and trailers up to 28 feet long – not to exceed two trailers per truck).

In the study area, there are no NN routes.

Study Corridor
Terminus:
MP 27.540

KY 49/ KY 52

WEST MARION
ELEMENTARY

Looking NB from
Bridge at MP 23.4

Looking NB along
KY 49

Looking SB along
KY 49

Looking SB along KY 49
from KY 49/KY 52

Looking NB along KY 49

Looking NB along
KY 49

Looking SB along KY 49

Looking SB
along KY 49

Looking NB along KY 49

Looking NB along
KY 49

Looking NB along
KY 49

Looking SB along KY 49

Study Corridor
Origin:
MP 18.698

Basemap Key

- 500' Corridor Buffer
- Corporate Boundary
- County Boundary

Regional Roads

- US
- KY
- CR

19 Mile Marker



0 2,000 4,000
Feet



KY 49 Planning Study
From KY 84 near Lebanon to
KY 52 in Loretto
KYTC Item No. 4-8707.00
Figure 3.1 - Photo Log

Image courtesy of USGS © 2013 Microsoft Corporation

- Kentucky Revised Statutes impose weight limits on the state-maintained highway system. There are three weight classification limits: AAA – 80,000 lbs. maximum gross vehicle weight; AA – 62,000 lbs. maximum gross vehicle weight; and A – 44,000 lbs. maximum gross vehicle weight. [NOTE: For special circumstances, occasional exceptions may be granted for over-dimensional or overweight vehicles by permits issued by the KYTC, Division of Motor Carriers.]

The study portion of KY 49 has a weight classification limit of A.

B. Geometric Characteristics

Geometric characteristics for major routes in the study area are described below, including the number of lanes, lane widths, shoulder widths, shoulder type, route speed limits, roadway type, local terrain, and pavement type. The study portion of KY 49 has the following characteristics:

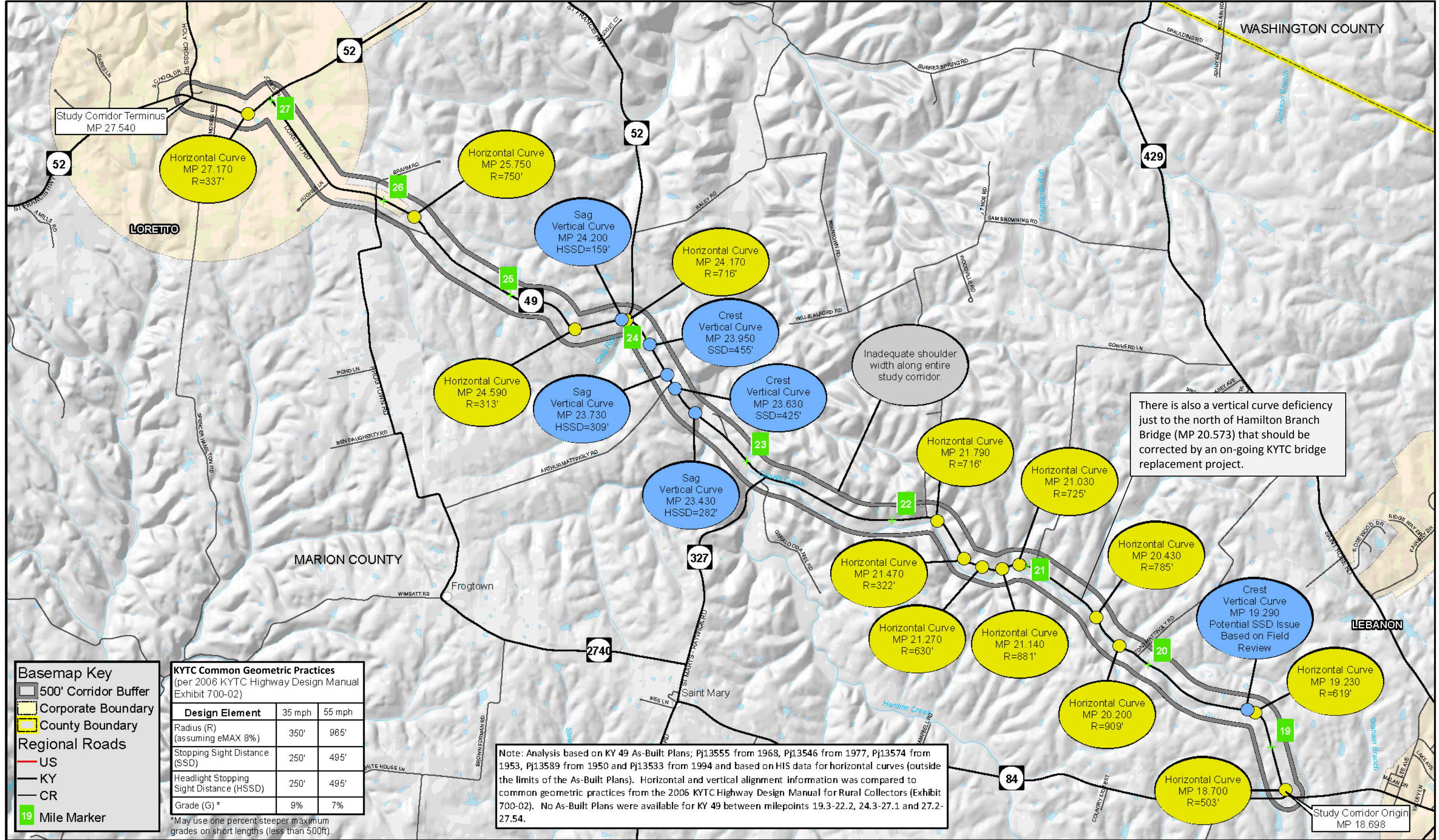
- Two 12-foot lanes according to HIS records; however, field observation suggests lanes are 10 feet wide;
- Shoulders from 3 to 6 feet of combination type according to HIS records; however, field observation suggests 1 to 3-foot wide shoulders exist for the majority of the route;
- An undivided highway cross section;
- Rolling terrain;
- Composite pavement; and
- Posted speeds limits of 35 mph in Loretto (MP 26.369 to 27.540) and 55 mph to the south (MP 18.698 to 26.369).

To further understand the geometry of the existing roadway, as-built construction plans (where available) were compared to current design standards. As shown in **Figure 3.2**, there are numerous substandard geometric features along the study corridor.



Typical view along KY 49

- Shoulder widths along the entire corridor do not meet current standards. For rural sections, the minimum graded shoulder width is 8 feet per the KYTC *Highway Design Manual* (Exhibit 700-02) and AASHTO's 2011 *Policy on Geometric Design of Highways and Streets*.
- There are 13 horizontal curves along the route that do not meet current standards. Per the KYTC *Highway Design Manual* (Exhibit 700-02), the minimum radius for a horizontal curve with 8% superelevation is 350 feet for a 35 mph design speed and 965 feet for a 55 mph design speed. Per HIS data, two of the curves in the 55 mph section have radii less than 500 feet: MP 21.44-21.51 just east of Sam Browning Road with a 322-foot radius and MP 24.55-24.64 just west of KY 52 (St Francis Highway) with a 313-foot radius.



- There are three sag vertical curves that do not meet current standards for headlight sight distance. AASHTO's 2011 *Policy on Geometric Design of Highways and Streets* defines the required length of sag vertical curves as a function of the grade differential and travel speed. Per KYTC's Highway Design Manual (Exhibit 700-02), required headlight sight distance is 250 feet at 35 mph and 495 feet at 55 mph. Although as-built plan sets were not available for the entire route, these three curves limit headlight sight distance to 159, 282, and 309 feet.
- There are three crest vertical curves that do not meet current standards for stopping sight distance. AASHTO's 2011 *Policy on Geometric Design of Highways and Streets* defines the required length of crest vertical curves as a function of the grade differential and travel speed. Per KYTC's Highway Design Manual (Exhibit 700-02), required headlight sight distance is 250 feet at 35 mph and 495 feet at 55 mph.

It should be noted that a fourth crest vertical curve just north of Hamilton Branch Bridge (MP 20.573) is expected to be addressed by an ongoing KYTC bridge replacement project.

As part of the stakeholder outreach process, several local officials and citizens also expressed concerns about water pooling in the roadway, particularly near the intersections of Toad Mattingly Road (MP 20.067), Cowherd Lane (MP 20.931), and KY 327 (MP 22.829).

C. Bridges

According to the KYTC, a bridge structure is eligible for federal rehabilitation funds when it meets two criteria: the bridge has a sufficiency rating below 50.0 and the bridge is considered either structurally deficient or functionally obsolete. Structurally deficient bridges cannot carry the weight they were originally designed to carry. Bridges are considered functionally obsolete if they do not meet geometric design standards of today. The sufficiency rating formula provides a method of evaluating the sufficiency of the bridge to remain in service on a 100-point scale; according to FHWA's *Bridge Preservation Guide* (August 2011), the formula incorporates the structural adequacy, functional obsolescence and level of service, and essentiality for public use.

There are three bridges along the study portion of KY 49:

- Bridge No. 078B00034N over Hardins Creek, located at MP 23.383, is 166 feet long with five spans of concrete tee beams. Based on its 2010 inspection report, this structure has a sufficiency rating of 77.5 and is classified as functionally obsolete. The deck, superstructure, and substructure were all rated in "Good" condition.
- A two-span concrete culvert (Bridge No. 078B00031N) over Hamilton Branch is located at MP 20.573. Per the 2010 inspection report, this structure has a sufficiency rating of 41.4 and is classified as functionally obsolete. KYTC's 2014-2020 *Recommended Highway Plan* includes \$660,000 of right-of-way, utility, and construction funding to replace this structure.
- A two-span concrete culvert (Bridge No. 078B00033N) along KY 49 is located MP 24.141 and has a sufficiency rating of 68 per its 2010 inspection. The culvert lies along Crab Run Creek.

D. Traffic and Operational Measures

Existing (Year 2013) and estimated future (Year 2040) traffic and operational conditions for KY 49 in the study area have been identified and are discussed in the following subsections.

1. Existing Traffic Volumes (Year 2013)

Existing traffic volumes for segments of the study area routes were summarized based primarily on information provided in the HIS database. Existing truck percentages were determined for the study area routes using HIS data and the KYTC traffic counts for each segment along the route. **Figure 3.3** shows average daily traffic volumes for each analysis segment alongside other related information.

Traffic volumes along existing KY 49 in the study area range between 2,300 and 4,500 vehicles per day (vpd). Existing truck percentages are approximately 7-8 percent of the total traffic along the study route.

2. Existing Level of Service (Year 2013)

The level of service (LOS) is a qualitative measure of highway traffic conditions, as defined in the *2010 Highway Capacity Manual*, published by the Transportation Research Board. Individual levels of service characterize these conditions in terms of speed, travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six levels of service are defined and given letter designations from A to F, with LOS A as the best condition, representing free flow conditions, and LOS F as the worst condition, representing severe congestion and/or time delays. Typically, a minimum of LOS D is considered acceptable in urban areas and LOS C is considered acceptable in rural areas.

As an alternative to LOS methodology, hourly volumes were also compared to the road's theoretical capacity. A volume-to-capacity ratio (V/C) represents the number of vehicles using the road in a specific time period compared to the number of vehicles the road was designed to be able to handle during that period. The target V/C ratio is 0.9 for rural areas and 1.0 for urban areas. A V/C greater than this indicates the road is congested, i.e. operating above its design capacity.

Table 3.1 shows the existing LOS and V/C calculated for highway segments in the study area. Based on existing traffic volumes, the study portion of KY 49 in Marion County operates predominately at LOS B-C during both peak hours. Calculations demonstrate that the existing capacity of the highway is adequate for existing volumes.

Table 3.1: Existing Traffic and Level of Service

Analysis Segment	Current ADT	AM (PM) LOS	AM (PM) V/C
MP 18.700 - 24.166	2,583 vpd	C (C)	0.12 (0.15)
MP 24.166 - 26.369	2,355 vpd	B (B)	0.10 (0.14)
MP 26.369 - 27.000	2,355 vpd	B (B)	0.09 (0.12)
MP 27.000 - 27.540	4,433 vpd	C (C)	0.15 (0.20)

3. Estimated Future Traffic (Year 2040) Based on Historic Growth

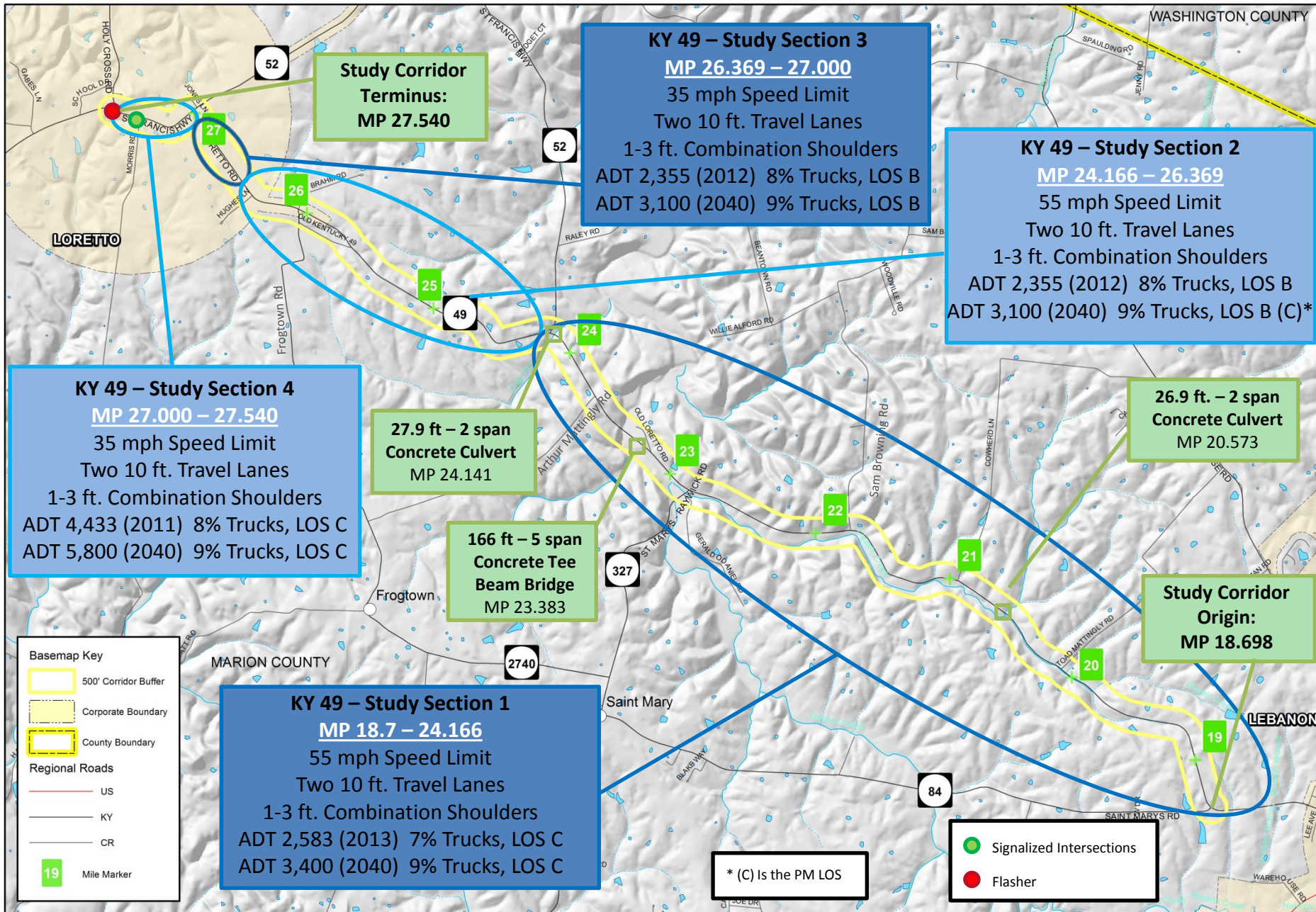
A future year traffic forecast was prepared by KYTC and is included as **Appendix A**. Year 2040 traffic was estimated using historic growth rates based on KYTC's historic traffic counts for each study area route. The replacement of the bridge over Hamilton Branch was taken into consideration. Traffic along KY 49 was forecast with an exponential annual growth rate of 1.0 percent through Year 2040. Projected future year traffic volumes are shown alongside other traffic information in **Figure 3.3** based on the forecasts prepared by the KYTC.

4. Estimated Future Level of Service (Year 2040)

Based on forecast volumes provided by the KYTC, LOS is expected to remain largely unchanged along the study portion of KY 49 through the Year 2040. The increased volumes result in slightly higher V/C for each segment. The estimated future LOS and V/C are shown for the study area in **Table 3.2**.

Table 3.2: 2040 No Build Traffic and Level of Service

Analysis Segment	2040 ADT	AM (PM) LOS	AM (PM) V/C
MP 18.700 - 24.166	3,400 vpd	C (C)	0.14 (0.18)
MP 24.166 - 26.369	3,100 vpd	B (C)	0.13 (0.17)
MP 26.369 - 27.000	3,100 vpd	B (B)	0.11 (0.15)
MP 27.000 - 27.540	5,800 vpd	C (C)	0.19 (0.25)



Note: ADT is Average Daily Traffic and is provided in Vehicles per Day.
 LOS is Level of Service, a measure of traffic conditions, such as travel time. LOS C or above is considered acceptable in rural areas, such as this.

0 2,000 4,000 Feet

CDM Smith



KY 49 Planning Study
 From KY 84 near Lebanon to KY 52 in Loretto
 KYTC Item No. 4-8707.00
 Figure 3.3 - Traffic Characteristics

E. Crash Analysis

Crash records were collected from KYTC for just over a four year period (June 1, 2009 – June 30, 2013). Crashes were geospatially referenced and compared to statewide data to identify locations experiencing above average crash rates. The methodology is defined in the KYTC research report: *Analysis of Traffic Crash Data in Kentucky* (Kentucky Transportation Center, 2011). The location of crashes with valid milepoint designations are shown in **Figure 3.4**.

As defined in the methodology report, two analysis types were examined: Segments and Spots. For each, analysts looked at the number and severity of crashes to determine the critical rate factor (CRF). The CRF is one measure of the safety of a road, expressed as a ratio of the crash rate at the location compared to the average crash rate for roadways of the same functional classification throughout the state. CRF also takes into account traffic volume, area type (rural/urban), and the number of lanes. If the CRF is 1.00 or greater, it is assumed that crashes are occurring due to circumstances that cannot be attributed to random occurrence.

- Segments vary in length and are divided along roadways where geometry or traffic volumes change.
- Spots are defined by analyzing 0.1-mile long sections where crashes are concentrated.

As part of the crash analysis process, each crash was classified into one of three categories based on the highest degree of severity: fatality, injury, or property-damage-only (PDO). During the period studied, there were two fatality, 21 injury, and 70 PDO crashes reported along the study portion of KY 49, for a total of 93 reported total crashes. The majority of crashes involved a single vehicle collision, accounting for 55 percent of reported crashes along the corridor.

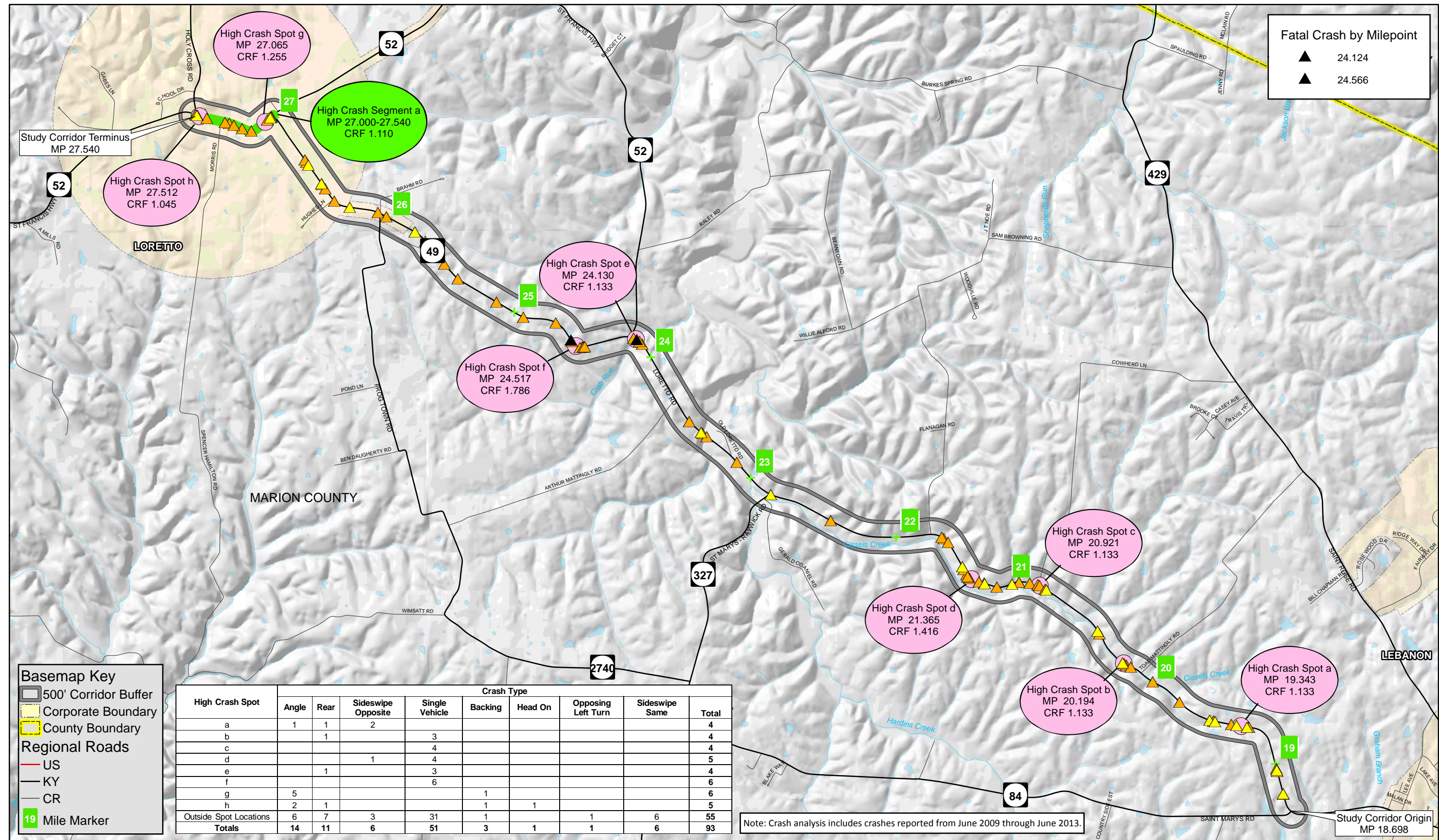
Figure 3.4 displays the severity and location of crashes along with identified high crash segments and spots (CRF > 1.0). As shown, 8 high crash spots and one high crash segment were identified along the study portion of KY 49. The high crash segment lies in Loretto (MP 27.000-27.540) and has a CRF of 1.11; 16 crashes (including two injury collisions) fall within this segment. **Table 3.3** summarizes the statistics for each high crash spot identified.

Table 3.3: Statistics for High Crash Spots on KY 49

Location*	Total Crashes	Fatal Crashes	Injury Crashes	CRF
MP 19.343	4	0	2	1.13
MP 20.194	4	0	1	1.13
MP 20.921	4	0	1	1.13
MP 21.365	5	0	0	1.42
MP 24.130	4	1	0	1.13
MP 24.517	6	1	0	1.79
MP 27.065	6	0	1	1.26
MP 27.512	5	0	1	1.05

* Location indicates centerpoint of 0.100-mile long spot

As shown in **Figure 3.5**, a correlation exists between substandard geometric features and concentrated crash locations.



F. Adequacy Ratings

The KYTC HIS database provides an adequacy rating percentile for many major routes. The composite rating is based on the condition, safety, and service component scores of the route, as described below:

- The Condition Index, based solely on the condition of the road's pavement
- The Safety Index, based on lane width, shoulder width, median widths, alignment, and critical rate factor (CRF)
- The Service Index, based on the route's volume-to-capacity (V/C) ratio (a measure of congestion) and access control

These components are given equal weight in the calculation of the Composite Adequacy Rating, based on a 100 point scale. Composite Adequacy Ratings are divided into four quadrants (Poor, Fair, Good, and Very Good). If a road or road segment falls into the lowest percentile group (Poor), this indicates that a problem may exist that merits further investigation. KY 49 is rated as Good, awarded 91.5 points out of 100 as of August 2013.

The International Roughness Index (IRI), which is a measure of pavement roughness, is 109 which indicates the pavement is somewhat rough.

G. Programmed Highway Improvements

There are nine improvements that are programmed for Marion County, including four on the study portion of KY 49. These projects are planned and programmed for Marion County in KYTC's *2014-2020 Recommended Six Year Highway Plan*. Major activities within the study portion of the route include:

- \$660,000 for right-of-way, utility and construction activities for the replacement of the bridge on KY 49 over Hamilton Branch (Item No. 04-1076.00)
- \$7.8 million for construction to reconstruct KY 49 from Lebanon to the Caney Creek Bridge (Item No. 04-8304.00)
- \$17.11 million for design, right-of-way, utilities, and construction activities for an improved KY 49 route at Bradfordsville (Item No. 04-8715.00)

In addition, the current Recommended Six Year Highway Plan includes funding to implement improvements identified in this planning study:

- \$40.35 million for design, right-of-way, utilities, and construction activities for roadway improvements to KY 49 from just south of KY 84 to KY 52 at Loretto (Item No. 04-8707.01)

IV. ENVIRONMENTAL OVERVIEW

This chapter provides a summary of environmental features located in the vicinity of the KY 49 study area. The information provided is based on readily available databases, correspondence with the US Fish & Wildlife Service (USFWS), and field observations during Fall 2013. The information is organized under the following subsections: community resources, demographics, aquatic and terrestrial resources, hazardous materials, air quality and noise, and geotechnical concerns.

Three figures depict the environmental features discussed in this chapter:

- **Figure 4.1** shows community resources, reported hazardous materials sites, and public utilities;
- **Figure 4.2** shows water resources; and
- **Figure 4.3** shows prime and statewide important farmlands based on soil types.

A. Community Resources

The study corridor is characterized by primarily agricultural fields and farms. Also scattered along KY 49 are single family dwellings. West Marion Elementary School is located on the north side of the existing route just south of Loretto. The school is one of four elementary schools in the county and serves approximately 500 students.



West Marion Elementary School

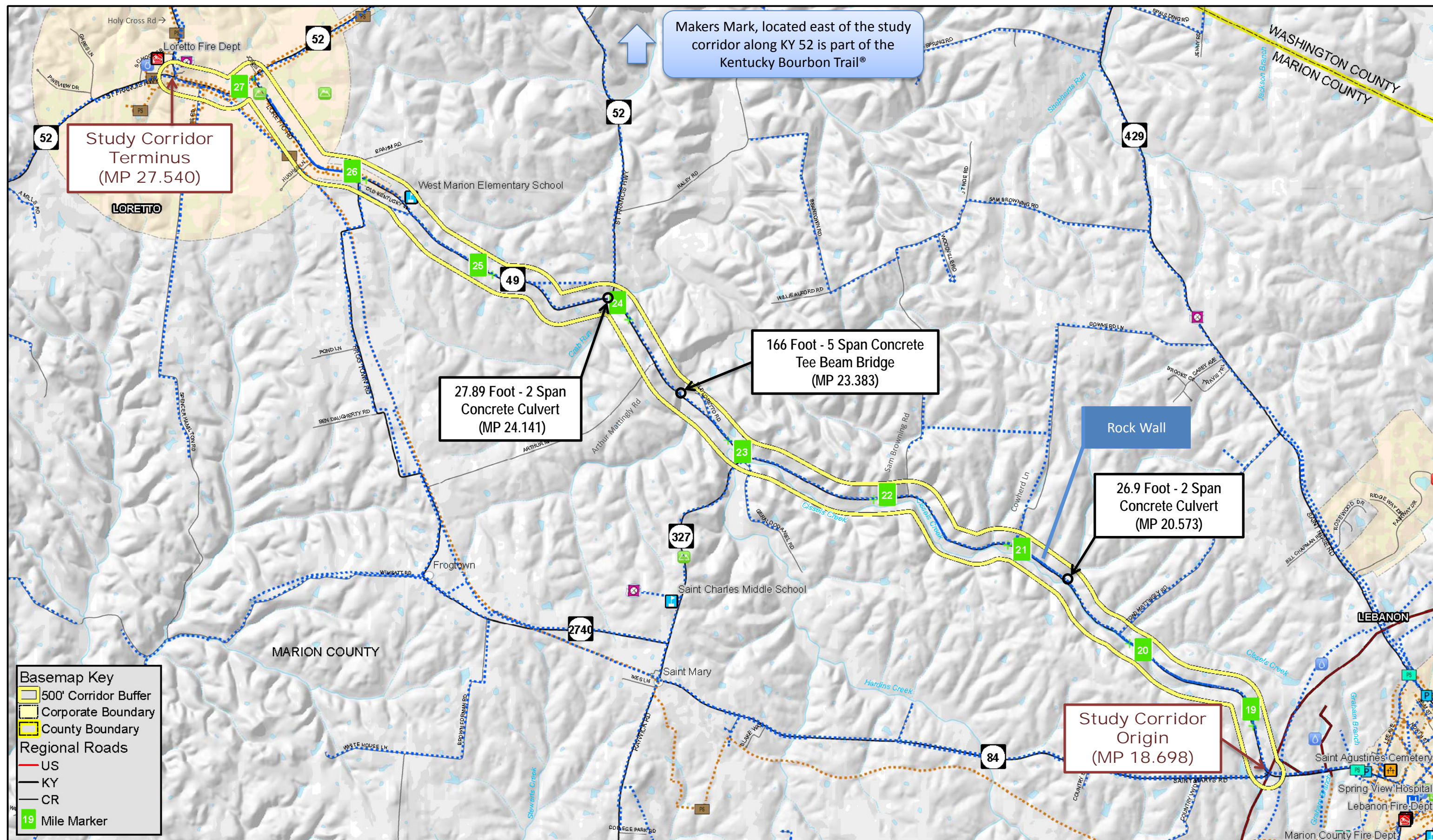
The northern terminus of the study corridor is within the City of Loretto, in close proximity to the city's administration building, fire department, local park, and local businesses. However these community resources are not anticipated to be directly affected by the proposed study alternatives.

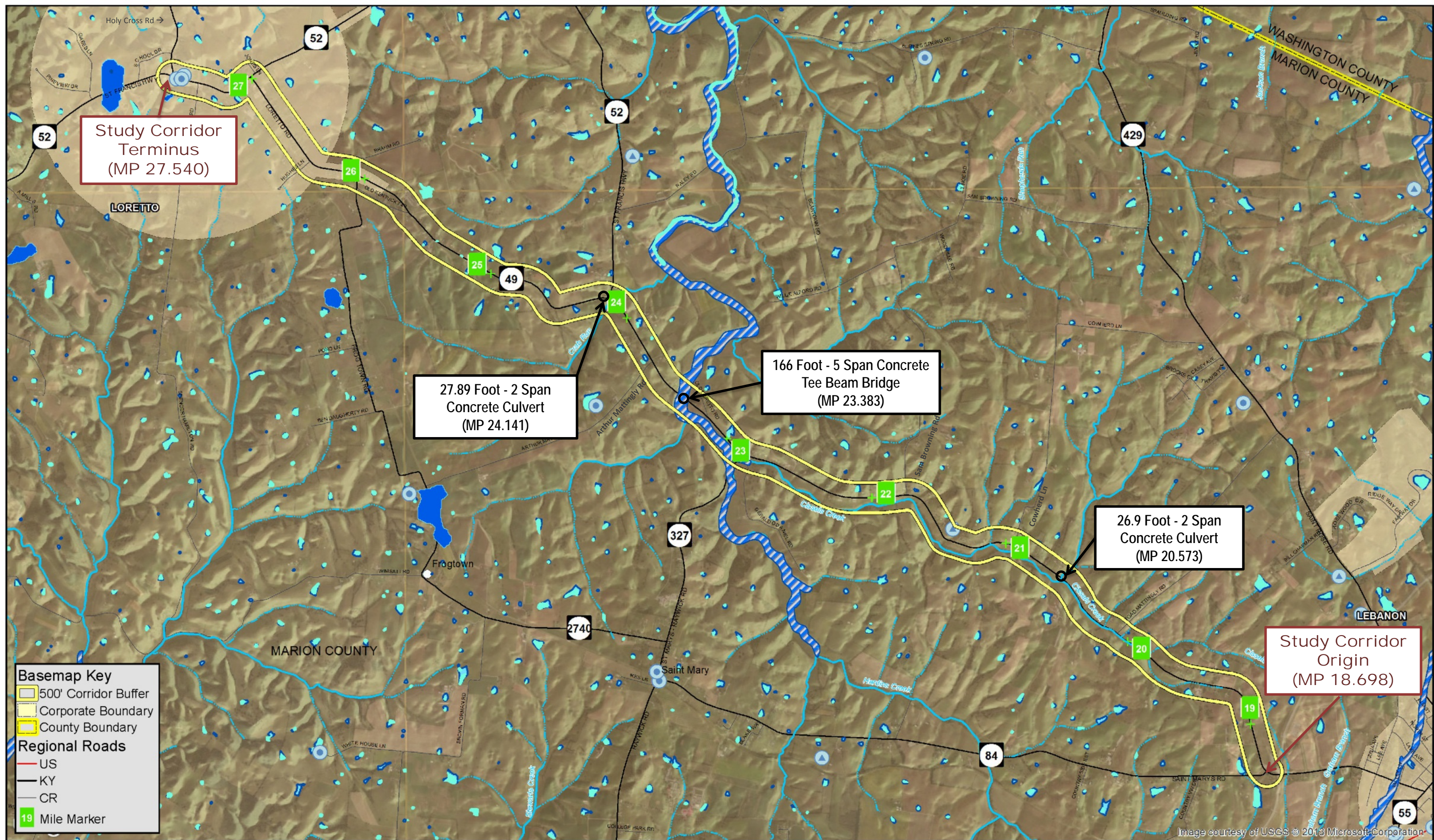
Utilities, such as water lines and overhead wires, run the length of the corridor between Lebanon and Loretto. Sewer lines and a few sewage lift stations are located near the corridor in Loretto according to available GIS sources.

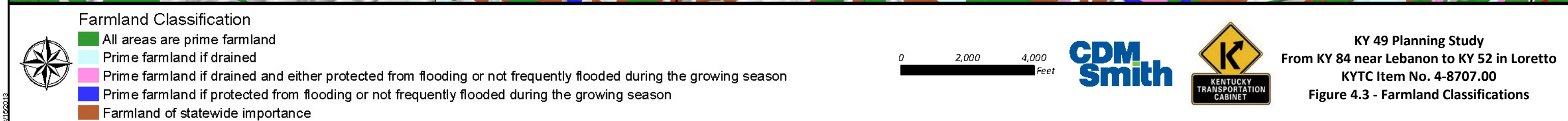
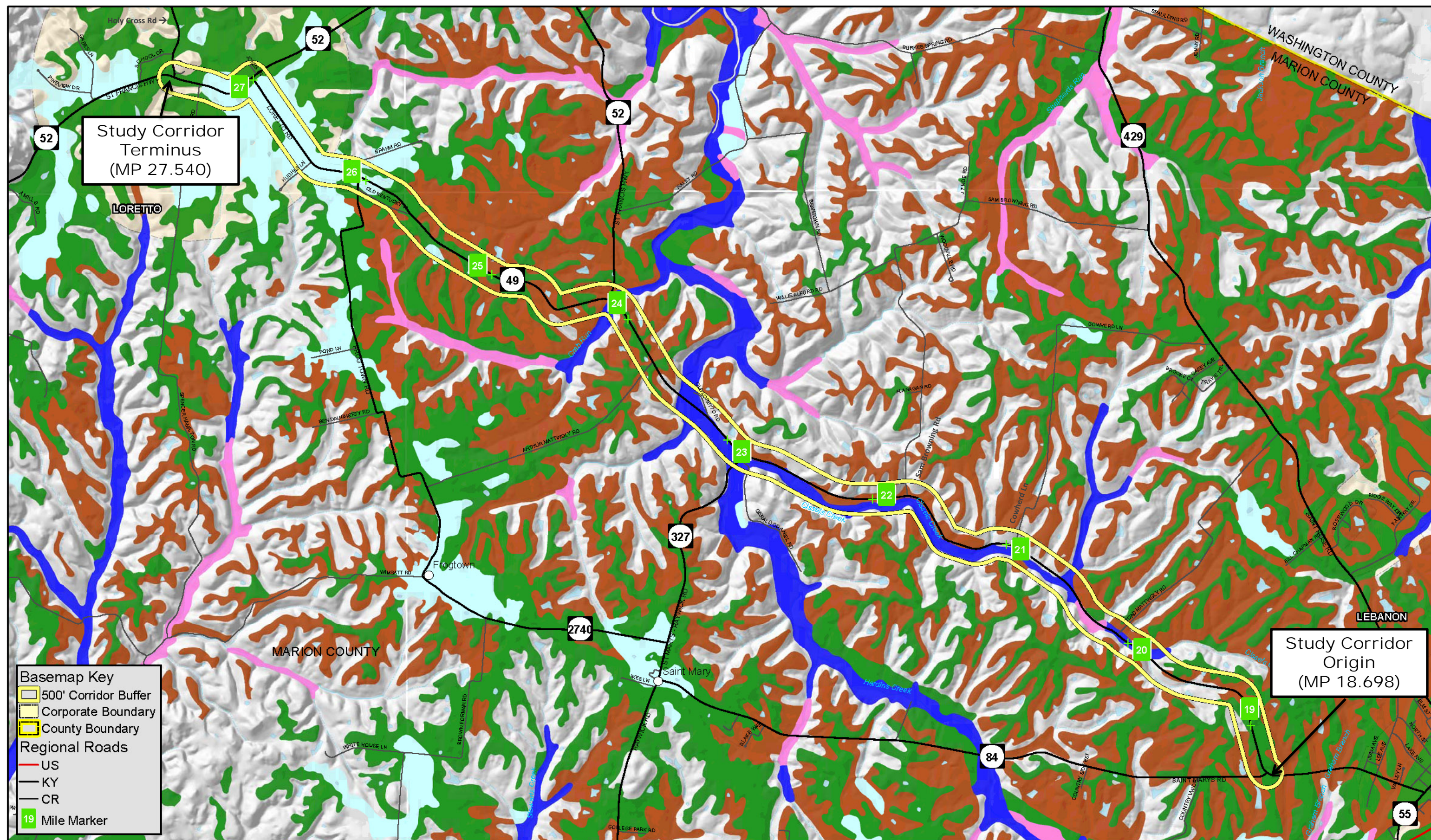
None of the structures in the vicinity of the study area are listed on the National Register of Historic Places. A review of existing structures to determine their National Register eligibility is beyond the scope of this study; however, several houses along the corridor are likely over 50 years in age and should be evaluated to determine their eligibility as part of any future project phases.



Older Home along KY 49







B. Demographics

An environmental justice assessment was prepared by the Lincoln Trail Area Development District (LTADD) and is included in **Appendix B**. This analysis examines 2010 Census data for three tracts and seven block groups that abut the project study area; the total population within these Census areas is 10,276 (compared to the total county population of 19,820).

Two block groups display minority population concentrations greater than the statewide or national averages but are below the county average. Further analysis shows that four blocks in the area stand out with possible high minority concentrations. Special consideration to the identified areas may be merited during any future project phases.

Census tracts and block groups are generally consistent with the county, statewide, and national average population concentrations of persons over 65 years in age. Six blocks along the project corridor contain an elevated aging population and a total population of at least 20 persons. Special consideration to the identified areas may be merited during any future project phases.

Available data shows elevated concentrations of persons living at or below the poverty level; however, insufficient geographic data is available for detailed analysis. Additional analysis and special consideration may be merited during any future project phases.

C. Aquatic & Terrestrial Resources

Numerous streams, farm ponds, and wetlands are scattered along the corridor, as shown in **Figure 4.2**. Hardins Creek is the primary stream in the study area, running northbound through the vicinity and passing beneath KY 49 at the bridge at MP 23.383. A tributary to Hardins Creek, Cissels Creek flows alongside KY 49 for most of the southern half of the corridor.

Land use surrounding the corridor is largely agricultural. Scattered streams and farm ponds are interspersed throughout fields in the vicinity. **Figure 4.3** shows prime and statewide important farmlands based on soil classifications, which cover the majority of the study area.

- Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. The land could be cropland, pastureland, rangeland, forestland, or other land but not urban built-up land or water.
- Statewide important farmlands are land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops, as designated by the State.

Small pockets of brush and trees lie between some fields and line stream corridors that could provide limited habitat for common terrestrial species. Early coordination with the USFWS (included in **Appendix D**) identified two federally listed species that could occur in the vicinity of the project study area:

- The proposed project is located within habitat designated as potential habitat for Indiana bat (endangered, *Myotis sodalis*). The area is located in a region with a moderate potential for karst features; therefore USFWS recommends surveys for potential habitat as part of any future project development phases. The September 6, 2012 *Indiana Bat Programmatic Agreement* will apply to any future phases.

- One freshwater mussel (Snuffbox, endangered, *Epioblasma triquetra*) is known to occur within the county. The potential of the proposed project to impact this species – either directly or indirectly as a result of siltation – should be addressed as part of any future project development phases.



Hardins Creek near KY 49/KY 327 intersection (left) and Cissels Creek near Toad Mattingly Road (right)

D. Hazardous Materials

A review of EPA records noted a number of hazardous materials generators in the vicinity of the study corridor. However, only one site falls within a 500-foot buffer of the corridor: the Corner Food Mart gas station located in Loretto.

E. Air Quality & Noise

Marion County is in attainment for all criteria pollutants.

Scattered structures along the corridor generally fall into FHWA land use category B (residential), with West Marion Elementary falling under category C. This project is a Type I project as designated in FHWA Regulation 23 CFR Part 772 and, in any future project development phases, a detailed noise analysis should follow the FHWA *Procedures for Abatement of Highway Traffic Noise and Construction Noise* and the KYTC *Noise Analysis and Abatement Policy* (July 13, 2011).

The extent of improvements associated with safety improvements are unlikely to lead to impacts on air quality or noise. Proposed alternatives would not add capacity or generate increases in traffic volumes.

F. Geotechnical Overview

A Geotechnical Overview was prepared by KYTC and is included as **Appendix C**. The overview indicated that the study area lies on the edge of the Outer Bluegrass and Mississippian Plateau region, close to the Knobs region. It also indicated that the project could potentially encounter New Albany Shale, which is known for acidic runoff and often requires remediation measures for roadway projects. The overview noted that the exposed

bedrock along Cissels Creek is thinly bedded and subject to scouring during flood events, so special measures may be required to avoid issues for structural foundations.

A review of mapping indicates that limestone has been quarried from the Bardstown and Rowland Members of the Drakes Formation. Shales in this area can be highly weatherable, but limestone – when it can be separated from shales – is suitable for embankment construction and rock roadbed. California Bearing Ratio values used in pavement design are generally low for subgrades in the area. Chemical modification of subgrade or the use of rock roadbed is common.

Hillsides in the area show some signs of instability. Springs could be present.

Bridge foundations in the study area are generally rock bearing (end bearing piles, drilled shafts, or spread foundations). Smaller structures may be founded on soil or bedrock. Soils in the area are generally suitable for embankment construction. Low lying areas may be wet and saturated, creating problems during construction. Ponds and springs may be encountered and require remediation efforts.

Two previously completed Geotechnical Investigations address projects located in the vicinity: RA-001-2012 KY 49 Reconstruction from Lebanon to Caney Creek Bridge and R-021-2013 Spot Improvements on Toad Mattingly Road and Cowherd Lane.

V. INITIAL STAKEHOLDER INVOLVEMENT

This chapter describes the early coordination and stakeholder involvement efforts undertaken over the course of this planning study. The project team held three in-person meetings to coordinate on and discuss key issues. In addition, the project team reached out to stakeholders, local officials, and the public. **Chapter VII** describes later involvement efforts, specifically related to the development of alternatives. Summaries of each meeting are presented in **Appendix D**.

A. Project Team Meeting #1

The first project team meeting was held on Friday, August 16, 2013 at the KYTC District 4 office in Elizabethtown. The purpose of the meeting was to discuss the project purpose and history, the scope of work, the preliminary data collected, relevant project issues, and public input strategies. Participants in the meeting represented the KYTC District 4 and Central Offices, the LTADD, and the consultant firms (CDM Smith and HMB).

The current project evolved from three Project Identification Forms (PIF) related to safety and geometric issues between MP 19.4-27.863. The current planning study is listed in the *2012-2018 Six Year Plan* as Item #4-8707.00 and includes Item #4-8708.00. The *2014-2020 Recommended Six Year Plan* includes additional funding (Item No. 4-8707.01) to implement improvements per the recommendations of this planning effort.

The majority of the meeting discussions focused on the existing conditions along the corridor and the upcoming local officials/stakeholder meeting.

B. Stakeholder/Local Officials Meeting #1

On September 12, 2013, the project team met with elected officials and key stakeholders at the David R. Hourigan Government Center in Lebanon. Representatives from the following organizations were invited:

- Kentucky State Legislature
- Marion County Judge Executive
- Mayors of Lebanon and Loretto
- Marion County Public Schools
- Marion County EMS
- Marion County Sheriff's Department
- Fire Departments in Lebanon and Loretto
- Maker's Mark Distillery

In addition, the County Magistrate and Director of the County Industrial Foundation attended the meeting.

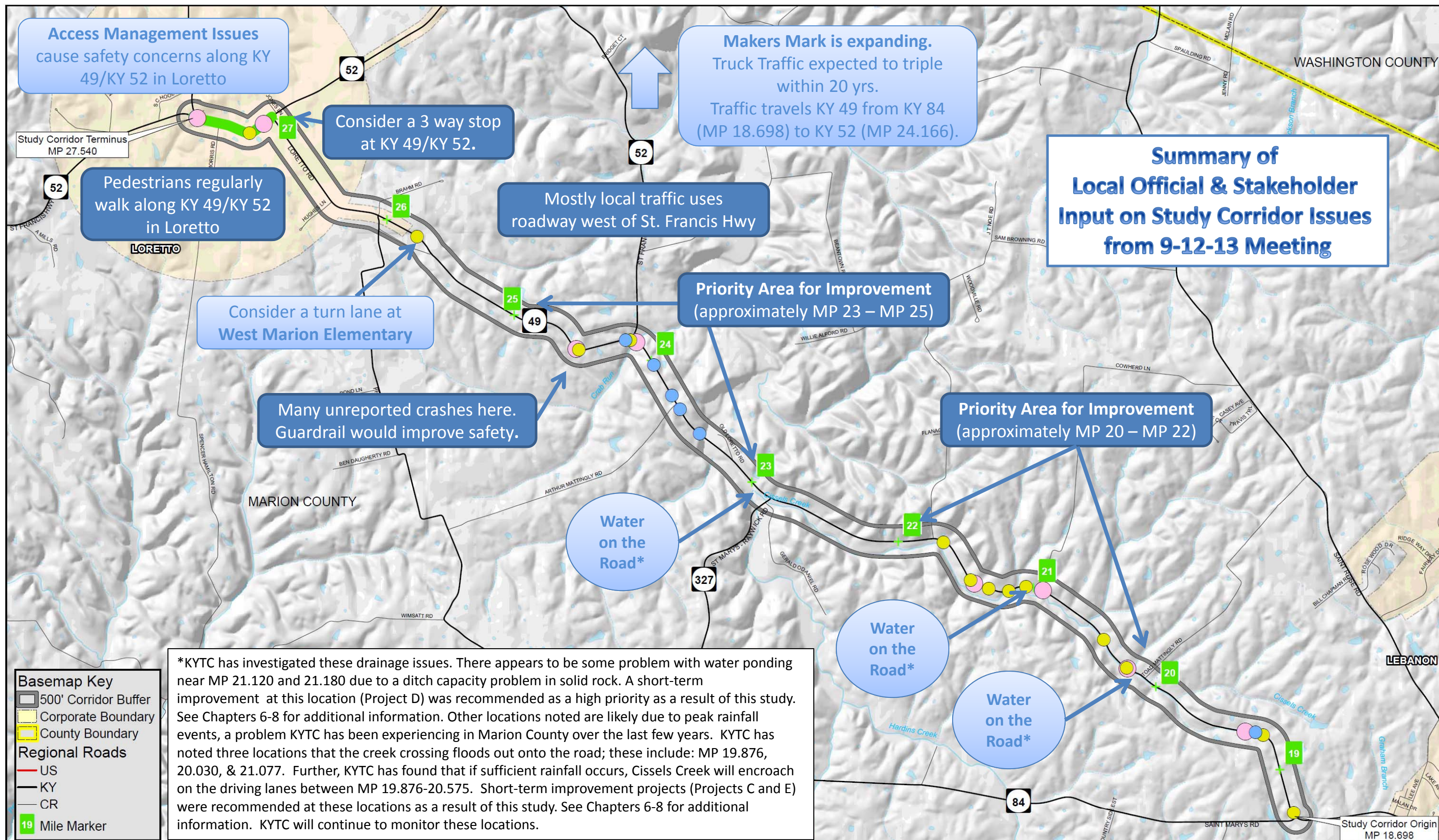
The purpose of the meeting was to discuss the project schedule, preliminary existing conditions findings, project purpose and goals, and next steps for the planning study. Input was solicited regarding issues along the corridor, sensitive environmental features, and desired improvements.

Key issues identified by stakeholders and local officials are presented in **Figure 5.1**. The following concerns were raised.

- The lack of clear zones and guardrail along the corridor were identified as contributing to crash trends.
- Three locations were identified where water pools in the roadway: near the KY 49 intersections with Toad Mattingly Road, Cowherd Lane, and KY 327.
- Some attendees asserted that the two areas most in need of improvement are between Toad Mattingly Road and Sam Browning Road (approximate MP 20-22) and just north of KY 327 to just north of KY 52 (approximate MP 23-25).
- The bridge at Hardins Creek has a cracked barrier rail. *[NOTE: The crack was noted in the most recent bridge inspection report; KYTC will investigate further, independent of the KY 49 Planning Study.]*
- Makers Mark is expanding. An estimated 45 semi-trucks access the facility each day; this volume is anticipated to double in five years and double again seven years after that. The majority of distillery traffic travels from KY 84 along KY 49 to KY 52 (St. Francis Highway). North of KY 52 (St. Francis Highway), KY 49 serves mostly local traffic.
- Trucks generally avoid KY 49; this may change if the transportation system is improved.
- Additional crashes occur along the corridor but go unreported, particularly at West Marion Elementary School. A turn lane at this location may be beneficial.
- Rumble strips around the school lead to safety concerns – drivers tend to overcorrect when they hit the strips, despite narrow lanes. *[NOTE: KYTC will investigate further, independent of the KY 49 Planning Study.]*
- The northernmost location of the two fatality crashes was identified as a higher priority need for improvement (approximate MP 24.5). A representative from the county's EMS team stated that guardrail may improve safety at this location as the fatal crash involved an overturned vehicle.
- The high crash segment in Loretto appears to be due to the open access along this developed segment, which allows drivers to back into the roadway and cut through parking lots to avoid stop signs.
- A three way stop at the KY 49/KY 52 intersection (approximate MP 27) was suggested as a potential improvement.
- The section of KY 49 in Loretto has pedestrians; there may be local interest in pursuing a Safe Routes to School project. *[NOTE: KYTC and LTADD will coordinate further, independent of the KY 49 Planning Study.]*

Key Issues Identified:

*Guardrail needs
Substandard curves
Narrow lanes/shoulders
Safety issues at school
Standing water in road
Open access in Loretto*



VI. CONCEPTUAL ALTERNATES

This chapter describes the development of proposed improvements – both long-term build options for the corridor and short term spot improvements at specific locations. It also includes a discussion of the second project team meeting and a planning level overview of alternate costs and impacts.

A. Development of Alternates

Besides the No Build Alternate, short term spot improvements and long term corridor improvement alternates were developed to address the purpose and need of the project. Each concept is described in the following subsections. **Figures 6.1** through **6.4** illustrate the conceptual alternates, divided into four segments for planning purposes. Evaluation criteria are also shown on these figures for each of the improvement options; this is explained further in **Chapter VII**.

1. No Build Alternate

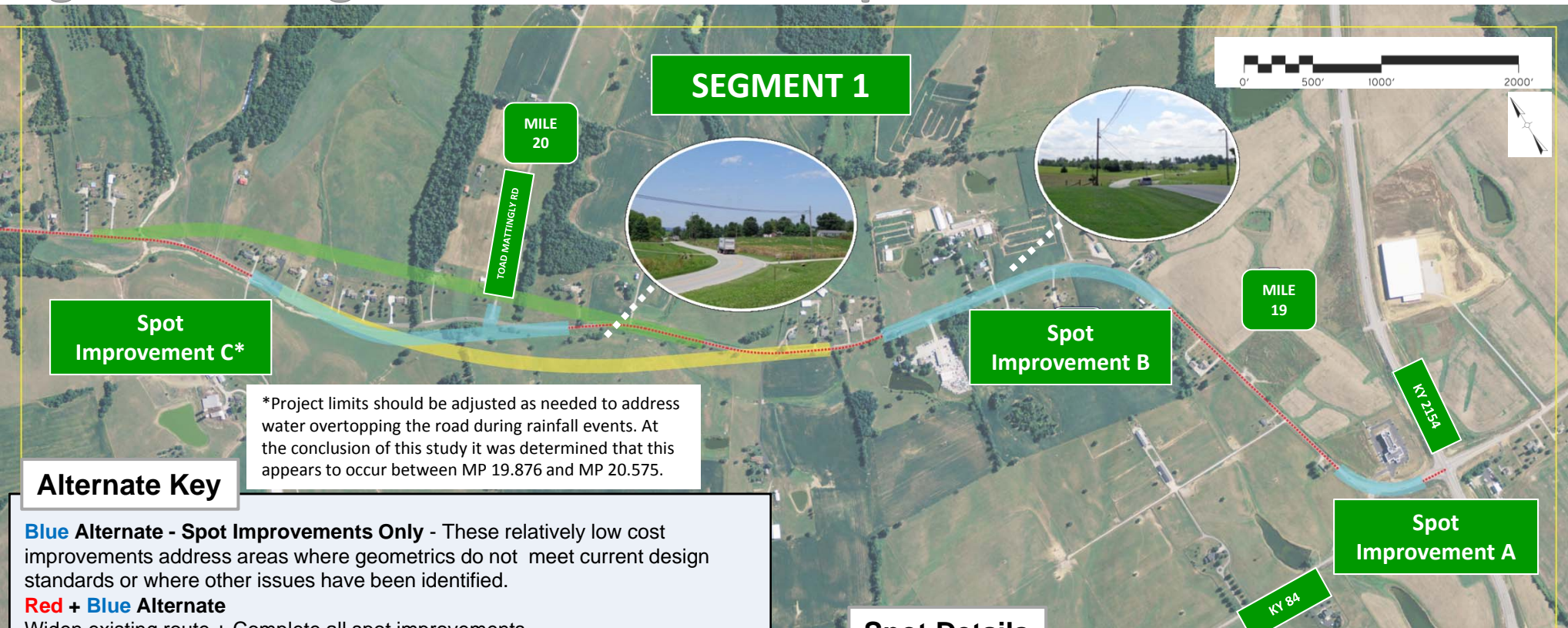
The No Build Alternate assumes regular maintenance activities would be conducted but does not include widening or other construction to improve capacity. The No Build Alternate is a viable option and can always be recommended as the preferred alternate although it does not meet the project purpose and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

2. Spot Improvements

Spot Improvements generally include a selection of lower cost “quick fixes” that could be implemented as short term solutions for existing safety issues. The spot improvement locations, identified as the “Blue Alternate” in **Figures 6.1** through **6.4**, were identified where geometrics or crash data suggested improvements may be warranted. The planning-level design evaluation involved developing improvements that would provide geometrics that meet current standards and a two lane rural cross section with 11-foot wide lanes and 4-foot wide shoulders (2-foot paved).

- Spot A includes improvements to the horizontal curve at the KY 84 intersection.
- Spot B includes improvements to the horizontal and vertical curves just north of the KY 84 intersection, at MP 19.11-19.55. A high crash spot with a CRF 1.13 occurs within the limits of Spot B.
- Spot C includes improvements to the horizontal curves at the Toad Mattingly Road intersection, shifting KY 49 slightly south of its current location. A high crash spot with a CRF 1.13 occurs within the limits of Spot C.
- Spot D includes improvements to five horizontal curves between Cowherd Lane and Sam Browning Road, shifting the alignment slightly south of its existing location. In total, 18 crashes including three injury collisions occurred in this segment during the 49-month analysis period. Two high crash spots (CRF 1.13 and 1.42) occur within Spot D.
- Spot E includes improvements to a series of horizontal and vertical curves north of Hardins Creek bridge, at MP 23.33-24.96. Two high crash spots (CRF 1.13 and 1.79) occur within Spot E.
- Spot F includes improvements to the curve in front of West Marion Elementary School and the possible addition of a turn lane.

Figure 6.1: Segment 1 - Potential Improvement Alternates



Alternate Key

Blue Alternate - Spot Improvements Only - These relatively low cost improvements address areas where geometrics do not meet current design standards or where other issues have been identified.

Red + Blue Alternate

Widen existing route + Complete all spot improvements.

Green Alternate

Widen existing route + Complete spot improvements A& B + Construct new alignment as shown in green.

Yellow Alternate

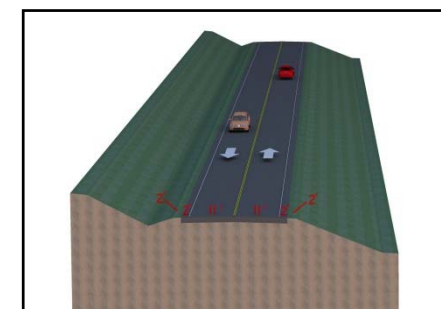
Widen existing route + Complete spot improvements A&B + Construct new alignment as shown in yellow.

Spot Details

Spot Improvement	Description	# of crashes reported June 2009 - June 2013	Estimated Construction Cost \$
A	Addresses one horizontal curve that does not meet current design standards.	2	\$250,000
B	Addresses one horizontal curve and one vertical curve that do not meet current design standards.	8	\$1,000,000
C	Addresses two horizontal curves that do not meet current design standards.	5	\$1,000,000

Alternate Evaluation

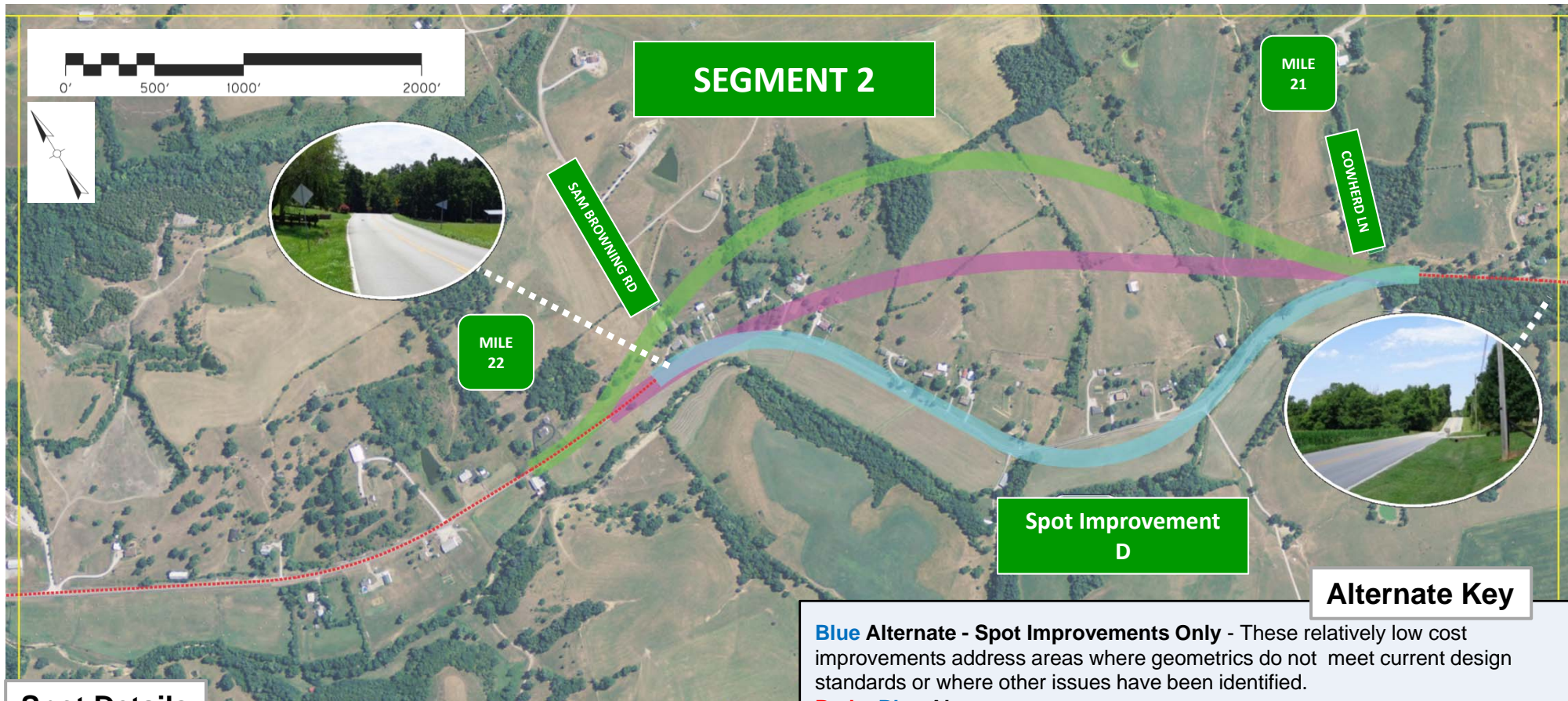
Alternates	Purpose and Need	Possible Relocations	Potential Natural Environment Impacts	Estimated Construction Cost
No Build	Does Not Meet	0	None	\$0
Blue Alternate	Somewhat Meets	0	Low	\$2,250,000 Total Construction Cost for Spot Improvements A, B, and C
Red + Blue Alternate	Meets	0	Medium	\$5.2M Total Construction Cost (includes \$2,250,000 for Spots A, B, and C + \$2.6 Million Per Mile for widening the existing alignment)
Green Alternate	Meets	0-2 homes	High	\$6.2M Total Construction Cost (includes \$3,080,000 + \$1,250,000 for Spot Improvements A and B + \$2.6 Million Per Mile for widening the existing alignment)
Yellow Alternate	Meets	0	High	\$6.1M Total Construction Cost (includes \$2,730,000 + \$1,250,000 for Spot Improvements A and B + \$2.6 Million Per Mile for widening the existing alignment)



Proposed Typical Section

Note: Study Segments (1-4) are not intended to represent construction sections.

Figure 6.2: Segment 2 - Potential Improvement Alternates



Spot Details

Spot Improvement	Description	# of crashes reported June 2009-June 2013	Estimated Construction Cost \$
D	Addresses five horizontal curves that do not meet current design standards.	19	\$2,050,000

Alternate Key

Blue Alternate - Spot Improvements Only - These relatively low cost improvements address areas where geometrics do not meet current design standards or where other issues have been identified.

Red + Blue Alternate

Widen existing route + Complete all spot improvements.

Green Alternate

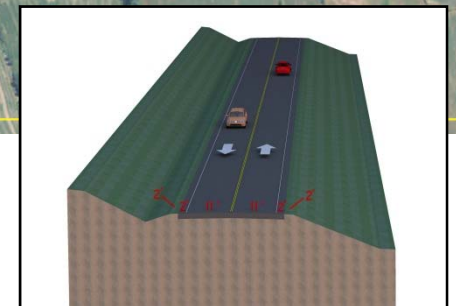
Widen existing route + Construct new alignment as shown in green.

Pink Alternate

Widen existing route + Construct new alignment as shown in pink.

Alternate Evaluation

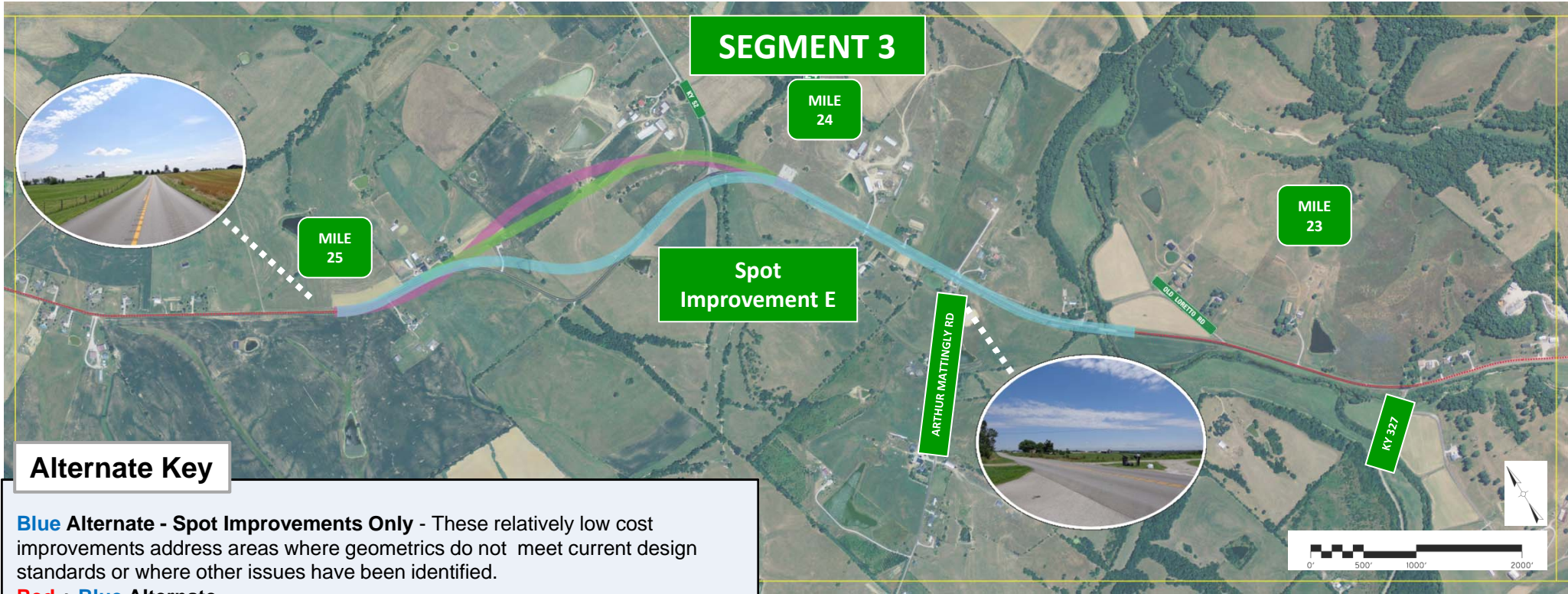
Alternates	Purpose and Need	Possible Relocations	Potential Natural Environment Impacts	Estimated Construction Cost
No Build	Does Not Meet	0	None	\$0
Blue Alternate	Somewhat Meets	0	Low	\$2,050,000 Total Construction Cost for Spot Improvement D
Red + Blue Alternate	Meets	0	Medium	\$4.35M Total Construction Cost (includes \$2,050,000 for Spot Improvement D + \$2.6 Million Per Mile for widening the existing alignment)
Green Alternate	Meets	0	High	\$5.70M Total Construction Cost (includes \$3,820,000 + \$2.6 Million Per Mile for widening the existing alignment)
Pink Alternate	Meets	0-2 homes	High	\$5.6M Total Construction Cost (includes \$3,400,000 + \$2.6 Million Per Mile for widening the existing alignment)



Proposed Typical Section

Note: Study Segments (1-4) are not intended to represent construction sections.

Figure 6.3: Segment 3 - Potential improvement Alternates



Alternate Key

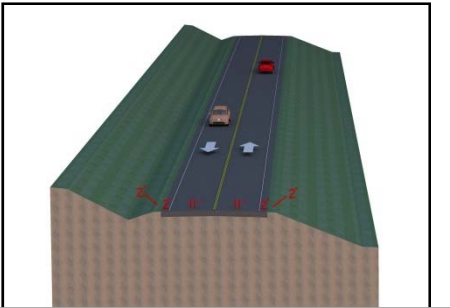
- Blue Alternate - Spot Improvements Only** - These relatively low cost improvements address areas where geometrics do not meet current design standards or where other issues have been identified.
- Red + Blue Alternate**
Widen existing route + Complete all spot improvements.
- Green Alternate**
Widen existing route + Complete partial Spot Improvement E + Construct new alignment as shown in green.
- Pink Alternate**
Widen existing route + Complete partial Spot improvement E + Construct new alignment as shown in pink.

Spot Details

Spot Improvement	Description	# of crashes reported June 2009-June 2013	Estimated Construction Cost \$
E	Addresses two horizontal curves and five vertical curves that do not meet current design standards.	17	\$3,600,000

Alternate Evaluation

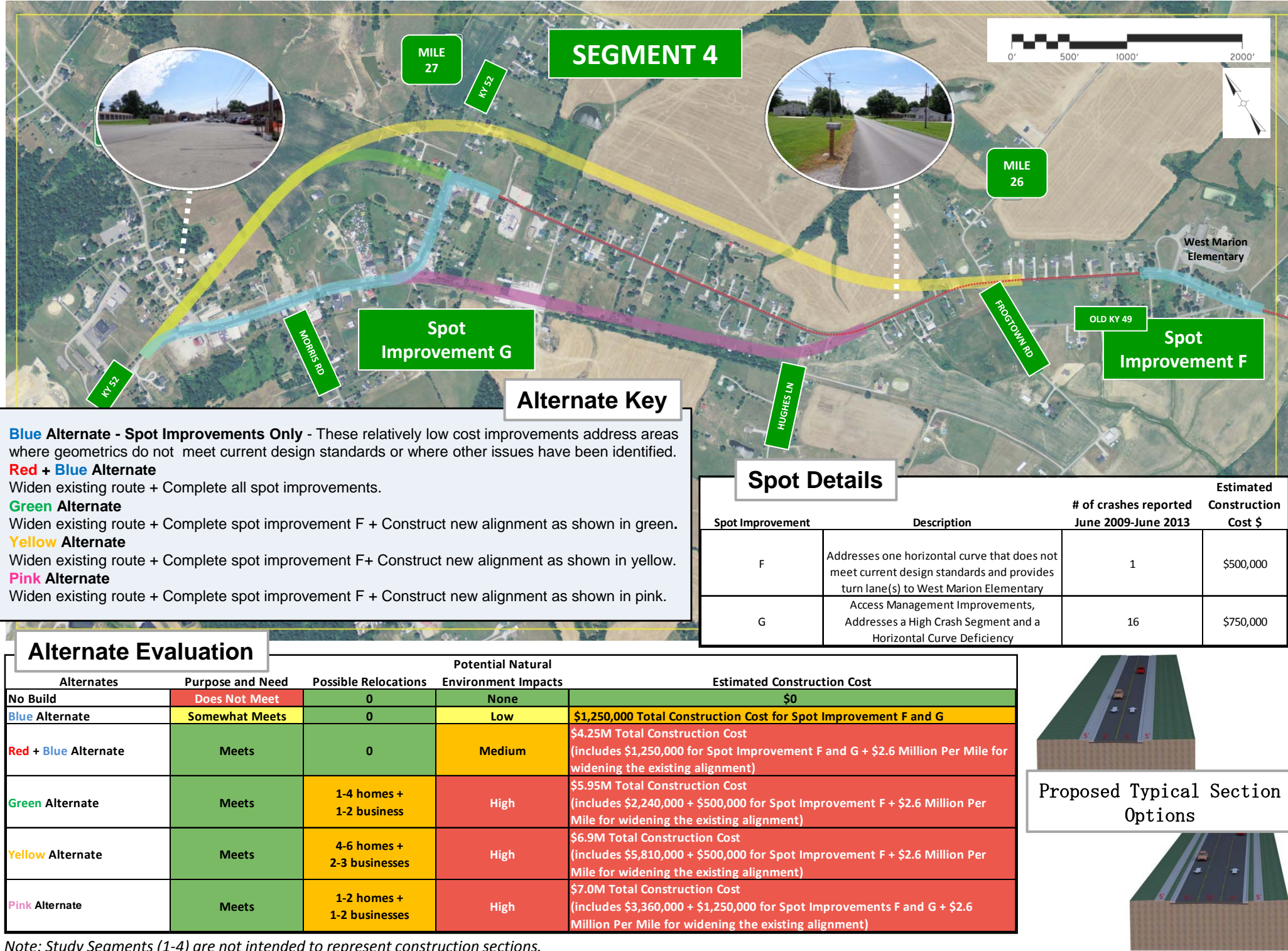
Alternates	Purpose and Need	Possible Relocations	Potential Natural Environment Impacts	Estimated Construction Cost
No Build	Does Not Meet	0	None	\$0
Blue Alternate	Somewhat Meets	0	Low	\$3,600,000 Total Construction Cost for Spot Improvement E
Red + Blue Alternate	Meets	0	Medium	\$7.15M Total Construction Cost (includes \$3,600,000 for Spot Improvement E + \$2.6 Million Per Mile for widening the existing alignment)
Green Alternate	Meets	0-1 homes	High	\$9.1M Total Construction Cost (includes \$5,110,000 + \$2.6 Million Per Mile for widening the existing alignment)
Pink Alternate	Meets	0	High	\$9.25M Total Construction Cost (includes \$5,700,000 + \$2.6 Million Per Mile for widening the existing alignment)



Proposed Typical Section

Note: Study Segments (1-4) are not intended to represent construction sections.

Figure 6.4: Segment 4 - Potential Improvement Alternates



- Spot G includes considering improved access management principles in Loretto between the Corner Food Mart and KY 52 (at the Holy Cross Road intersection).

3. Corridor Build Alternates

In addition to spot improvements, a number of long-term conceptual improvement alternates along the full KY 49 study corridor were identified. Each concept is described below and shown in **Figures 6.1** through **6.4**.

Generally, the Red + Blue Alternate involves addressing all spot improvements (blue areas) and widening the existing lanes and shoulders between each (red areas). The Green, Yellow, and Pink Alternates represent new alignments. The existing lanes and shoulders would be widened, including addressing spot improvements therein. For cost estimating purposes, two cross sections were considered. For rural portions of the route, a two lane cross section was considered with 11-foot wide lanes and 4-foot wide shoulders (2-foot paved). Within Loretto, the team also considered a two or three lane cross section with 11-foot wide lanes, curb/gutter, and 5-foot wide multi-use paths.

Segment 1

- The Red + Blue Alternate includes Spot Improvements A, B, and C; the roadway between each spot would be widened.
- The Green Alternate includes roadway widening and Spot Improvements at A and B. At Toad Mattingly Road, the alignment would be shifted to the north as shown in green in **Figure 6.1**.
- The Yellow Alternate is similar to the Green Alternate but the highway would be shifted south at Toad Mattingly Road, as shown in yellow on **Figure 6.1**. The roadway would be widened and curves at Spots A and B would be improved.

Segment 2

- The Red + Blue Alternate includes Spot Improvement D; the roadway on either side would be widened.
- The Green Alternate includes highway widening and would realign the roadway between Cowherd Lane and Sam Browning Road, shifting it to the north. This alternate is shown in green in **Figure 6.2**.
- The Pink Alternate includes realignment of the roadway north of its existing location but not as far north as the Green Alternate. While the Green Alternate would likely result in fewer impacts to homes and farmlands, the Pink Alternate would provide a smoother, shorter curve. The full segment would be widened as well. This alternate is shown in pink in **Figure 6.2**.

Segment 3

- The Red + Blue Alternate includes Spot Improvement E; the roadway on either side would be widened.
- The Green Alternate includes roadway widening and would realign KY 49 west of KY 52 (St. Francis Highway), shifting KY 49 to the north. This alternate is shown in green in **Figure 6.3**.
- The Pink Alternate is similar to the Green Alternate – the roadway would be shifted a little farther north of its existing location. The full segment would be widened as well, as shown in pink in **Figure 6.3**.

Segment 4

- The Red + Blue Alternate includes Spot Improvements F and G; the lanes and shoulders east of the Corner Food Mart would be widened.
- The Green Alternate includes widening generally along the existing alignment plus Spot Improvement F. A new alignment would be created through Loretto between the Corner Food Mart and Holy Cross Road. This alternate is shown in green in **Figure 6.4**.
- The Yellow Alternate includes widening south of Frogtown Road plus Spot Improvement F. From Frogtown Road, a new alignment would be created north of the existing route to Holy Cross Road. This alternate is shown in yellow in **Figure 6.4**.
- The Pink Alternate includes widening south of Hughes Lane plus Spot Improvement F. Near Hughes Lane, the roadway would shift south of the existing route over to just east of Spencer Hamilton Road. This alternate is shown in pink in **Figure 6.4**.

Different color alternates in each segment can be combined to form an overall build alternate for the study corridor. For example, the Green Alternate in Segment 1 can be combined with the Red + Blue Alternate in Segment 2, No Build in Segment 3, or the Pink Alternate in Segment 4. It should be noted that the divisions between segments were identified to facilitate planning-level alternate comparisons.

B. Project Team Meeting #2

A second project team meeting was held on October 16, 2013, at the KYTC District Office in Elizabethtown. The purpose of the meeting was to review the existing conditions information, initial local official and stakeholder input, draft spot improvements and alternates, and to discuss upcoming meetings. Participants in the meeting represented the KYTC District 4 and Central Offices, the Lincoln Trail ADD, and the consultant team (CDM Smith and HMB). Key discussion items included:

- Based on the year 2040 traffic volume projections provided by KYTC, future level of service is expected to be LOS B-C, which is generally considered acceptable in rural areas.
- The project team agreed that a three-way stop at KY 49/KY 52 (intersection of St. Francis Highway and Loretto Road in Loretto) does not seem warranted based on traffic volumes or vehicular crash trends. Access management solutions are considered an appropriate improvement to consider for this location.
- The ADD and KYTC District 4 will coordinate on the Safe Routes to School application.
- The transportation representative for Marion County Schools called KYTC's project manager to say that he does not see a need for a turn lane at West Marion Elementary School. His primary concerns are the curves south of Loretto.
- Some elements of the alternates were adjusted, including visual elements, naming, etc. Spot improvements, which were originally shown as Spots A-N, were

consolidated to Spots A-G described previously. Initial spots B and C were combined to form Spot B discussed in **Section VI.A.2**. The limits of initial spot D were adjusted to form Spot C. Initial spots E, F, and G were combined to form Spot D. Initial spots H, I, J, and K were combined to form Spot E. Initial spot L became Spot F. The need for initial spot M was eliminated by adjusting an existing speed limit sign. Initial spot N became Spot G.

C. Comparison of Costs and Impacts

Based on the conceptual alternates described earlier in this chapter and shown in **Figures 6.1 through 6.4**, the project team prepared planning-level cost estimates and an overview of anticipated impacts to the human and natural environment. Estimated construction costs for each Spot Improvement are summarized in **Table 6.1**; it should be noted that costs are based on per mile costs that were developed for the different scenarios (i.e., both improvements along existing roadway and cross country improvements). These costs were calibrated utilizing historic cost data from nearby projects of similar scope and complexity.

Table 6.1: Planning-Level Construction Cost Estimates for Spot Improvements

Spot Improvement	Construction Cost Estimate
A – improve curve at KY 84	\$250,000
B – improve curves north of KY 84	\$1.0 million
C – improve curves at Toad Mattingly Road	\$1.0 million
D – improve curves between Cowherd Lane & Sam Browning Road	\$2.1 million
E – improve curves north of Hardins Creek Bridge	\$3.6 million
F – improve curve at West Marion Elementary	\$500,000
G – access management in Loretto	\$750,000

Table 6.2 presents estimated construction costs for each alternate, divided between the four analysis segments. Depending on the alternate selected, total build construction costs range from a minimum \$9.3 million (Blue Alternate) for the spot improvements only to a maximum \$28.2 million (combination of Green and Pink Alternates) for improvements to the entire project corridor.

Table 6.2: Planning-Level Construction Cost Estimates by Segment & Alternate

Alternate	Seg 1 Cost	Seg 2 Cost	Seg 3 Cost	Seg 4 Cost
No Build	\$0	\$0	\$0	\$0
Blue	\$2.3 million	\$2.1 million	\$3.6 million	\$1.3 million
Red + Blue	\$5.2 million	\$4.4 million	\$7.2 million	\$4.3 million
Green	\$6.2 million	\$5.7 million	\$9.1 million	\$6.0 million
Yellow	\$6.1 million	n/a	n/a	\$6.9 million
Pink	n/a	\$5.6 million	\$9.3 million	\$7.0 million

The No Build Alternate does not satisfy the project's purpose and need. The Blue Alternate somewhat satisfies the project's purpose and need; it addresses some of the geometric deficiencies to improve safety, but not the narrow lane and shoulder widths. All other build alternates meet the project's purpose and need. However, the No Build Alternate is typically advanced as a comparison for impacts in future project development phases.

In addition to planning-level costs, analysts also considered potential high-level impacts to the human and natural environment. **Table 6.3** summarizes potential residential and business displacements associated with each corridor alternate. Generally, alternates that follow the existing alignment have fewer impacts on homes and businesses than those on a new alignment.

Table 6.3: Potential Displacements by Segment & Alternate

Alternate	Segment 1	Segment 2	Segment 3	Segment 4
No Build	0	0	0	0
Blue	0	0	0	0
Red + Blue	0	0	0	0
Green	0-2 homes	0	0-1 homes	1-4 homes + 1-2 businesses
Yellow	0	n/a	n/a	4-6 homes + 2-3 businesses
Pink	n/a	0-2 homes	0	1-2 homes + 1-2 businesses

Table 6.4 summarizes planning-level natural environmental impacts associated with each alternate. Generally, alternates that follow the existing alignment have fewer impacts than those on new alignment. High, medium, and low rankings were included to help present a comparison of alternates by segment.

Table 6.4: Potential Impacts by Segment & Alternate

Alternate	Rank	Description of Impacts
Segment 1		
No Build	None	No impacts
Blue	Low	Widen at 4 stream crossings, Channel changes, Lose scattered trees
Red + Blue	Medium	Widen at 7 stream crossings, Channel changes, Lose scattered trees
Green	High	Widen at 3 stream crossings, 2 new stream crossings, Channel changes, Lose scattered trees, Bisects farm fields, Wetland impacts
Yellow	High	Widen at 4 stream crossings, 3 new stream crossings, Channel changes, Bisects farm fields
Segment 2		
No Build	None	No impacts
Blue	Low	Widen at 5 stream crossings, Channel changes
Red + Blue	Medium	Widen at 9 stream crossings, Channel changes
Green	High	Widen at 4 stream crossings, 4 new stream crossings, Prime/Statewide Important Farmland impacts, Bisects farm fields, Wetland impacts
Pink	High	Widen at 5 stream crossings, 3 new stream crossings, Prime/Statewide Important Farmland impacts, Bisects farm fields, Wetland impacts
Segment 3		
No Build	None	No impacts
Blue	Low	Widen at 3 stream crossings, Bisects farm fields, Wetland impacts
Red + Blue	Medium	Widen at 7 stream crossings, Bisects farm fields, Wetland impacts
Green	High	Widen at 6 stream crossings, 1 new stream crossing, Channel changes, Bisects farm fields, Prime/Statewide Important Farmland impacts
Pink	High	Widen at 6 stream crossings, 1 new stream crossing, Channel changes, Bisects farm fields, Prime/Statewide Important Farmland impacts
Segment 4		
No Build	None	No impacts
Blue	Low	Minor impacts to adjacent properties
Red + Blue	Medium	Minor impacts to adjacent properties
Green	High	Bisects farm fields
Yellow	High	1 new stream crossing, Prime/Statewide Important Farmland impacts, Wetland impacts, Bisects farm fields
Pink	High	Prime/Statewide Important Farmland impacts, Wetland impacts, Bisects farm fields

VII. ADDITIONAL INVOLVEMENT

Following the development of the alternatives described in **Chapter VI**, a second meeting of local officials and stakeholders and a public meeting were held to share study findings and solicit feedback. The following subsections describe these efforts. Summaries of each meeting are located in **Appendix D**.

A. Local Officials/Stakeholders Meeting #2

A local officials/stakeholder meeting was held at the Center Square Convention Center in Lebanon on November 21, 2013. The purpose of the meeting was to discuss study findings to date, the proposed improvement options, and the public meeting later that evening. Attendees stepped through the materials that would be presented at the public meeting and discussed individual alternates and cost estimates. One attendee noted that some residents were in favor of a sidewalk project in Loretto. Each attendee was asked to complete a survey to record their preferences.

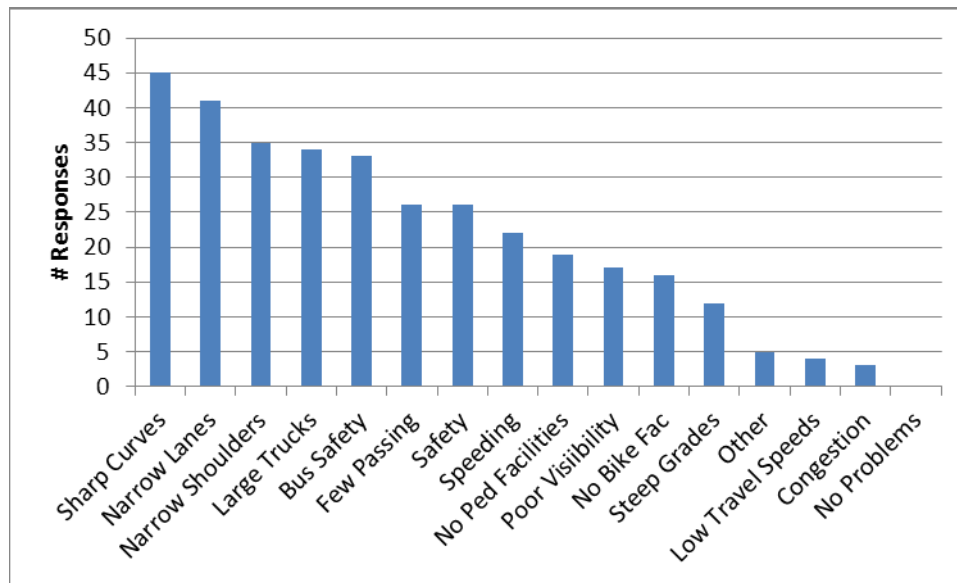
B. Public Meeting

A public meeting was held at the Center Square Convention Center in Lebanon on November 21, 2013, following the local officials/stakeholder meeting. The purpose of the meeting was to present study findings to date and the proposed improvement options. Upon signing in, attendees were provided with a survey questionnaire, study handout, and alternate maps. Next to the sign in table, a narrated presentation explained the purpose and need of the project, the purpose of the public meeting, and introduced the proposed improvement alternates. Elsewhere in the room, exhibits displayed information about the existing conditions in the area, alternates considered, and identified spot improvements. Members of the project team were available to answer questions and provide additional information.



In total, 87 people signed in at the meeting; this does not include the project team members or local officials who stayed for the public meeting after the earlier meeting of that group. Between the two meetings, 48 completed surveys were returned.

Based on the survey responses, 94% of respondents indicated the route should be improved. **Figure 7.1** shows the breakdown of responses regarding the top issues in the study area; primary concerns were sharp curves, narrow lanes, narrow shoulders, and large trucks/buses.

Figure 7.1: What Transportation Problems exist within the Study Area?

For each of the four segments, respondents were asked to select their preferred improvement scenario. For three of the four segments, the Red + Blue Alternate was selected as the most desirable. **Table 7.1** summarizes the number of survey respondents who selected each alternate as preferred for each of the four segments.

Table 7.1: Preferred Improvement Alternate by Segment

Segment 1		Segment 2	
Responses	Alternate	Responses	Alternate
4	No Build	2	No Build
7	Blue Alternate	10	Blue Alternate
17	Red + Blue Alternate	11	Red + Blue Alternate
4	Green Alternate	7	Green Alternate
13	Yellow Alternate	12	Pink Alternate
Segment 3		Segment 4	
Responses	Alternate	Responses	Alternate
2	No Build	2	No Build
10	Blue Alternate	5	Blue Alternate
17	Red + Blue Alternate	20	Red + Blue Alternate
8	Green Alternate	5	Green Alternate
6	Pink Alternate	7	Yellow Alternate
		3	Pink Alternate

During the course of the meeting, two additional alternate alignments were suggested for consideration by the project team:

- In Segment 1, consider eliminating the easternmost curves on KY 49 to create a straight connection to KY 2154 (Veterans Memorial Highway) approximately 2,000 feet north of the existing intersection.
- In Segment 3, consider a fourth alignment for Spot E that eliminates the western S-curve within the spot.

Respondents were also asked to prioritize the most important spot improvements, where 1 is the top priority. **Table 7.2** summarizes responses to this question, tabulating the average ranking received (where the lowest number is the highest priority) and the number of respondents who selected each spot improvement as their top priority. Spot D was selected as the highest priority for improvement, followed by Spot E and Spot F.

Table 7.2: Top Priority Spot Improvements based on Public Survey Responses

Spot Improvement	Average Rank	Respondents who selected as #1
A – realign curve at KY 84	5.6	1
B – realign curves north of KY 84	4.5	1
C – realign curves at Toad Mattingly Road	4.0	2
D – realign curves between Cowherd Lane & Sam Browning Road	2.0	18
E – realign curves north of Hardins Creek Bridge	2.3	13
F – realign curve at West Marion Elementary	2.6	12
G – access management in Loretto	4.0	0

When asked whether sidewalks were needed along KY 49 in Loretto, 59% (24 respondents) indicated sidewalks were needed. Of these, 11 respondents favored sidewalks on both sides of the roadway, 8 favored sidewalks on the east side of the highway, and 4 favored sidewalks on the west side. 17 respondents (41% of responses received) were not in favor of sidewalks.

The majority of survey respondents (34 responses or 77%) were in favor of a center turn lane in Loretto.

General comments from survey respondents were concerned about project costs and minimizing impacts to adjacent homeowners, farmers, and businesses. The need for a safer roadway and drainage improvements were recurring themes.

VIII. RECOMMENDATIONS

This chapter discusses project team recommendations for the study, which were developed with consideration of the input received from local officials, stakeholders, and the public.

A. Purpose and Need

To summarize, the purpose of the proposed project is to improve safety by addressing geometric deficiencies along KY 49 between KY 84 near Lebanon and KY 52 in Loretto.

Additional project goals include the following:

- Accommodate bicyclists and pedestrians in Loretto;
- Improve operations, access, and safety at West Marion Elementary School;
- Minimize impacts to the environment;
- Maintain the existing character of the route;
- Improve access to area attractions to enhance tourism and economic development; and
- Provide consistency with improved KY 49 south of Lebanon.

B. Final Project Team Meeting

The third and final project team meeting was held on December 16, 2013 at the KYTC District Office in Elizabethtown. The purpose of this meeting was to discuss public survey results, to review the study findings, and to collaboratively define the recommendations for the study. In addition to the recommendations presented below, KYTC agreed to further examine drainage problems along the route.

1. Long Term Options

During the meeting, project team members considered each long term alternate, weighing potential impacts, home/business displacements, costs, public input, and more. **Figures 8.1** and **8.2** illustrate the long term alternates alongside public input.

In Segment 1, the Red + Blue and Yellow Alternates are recommended for further consideration in future project development phases. However, the Green Alternate and the unnamed alternate are not recommended for additional study.

- The Green Alternate would have more adverse environmental impacts, including increased property impacts and impacts to wetlands.
- The unnamed alternate suggested at the public meeting (i.e. a new link to the Veteran's Memorial Highway) would create intersection spacing issues for the bypass that would degrade traffic operations.

In Segment 2, the Red + Blue and Pink Alternates are recommended for further consideration in future project development phases. The Green Alternate is not recommended for further study because Pink provides a smoother curve option north of the existing route with fewer linear feet of impacts to farmlands.

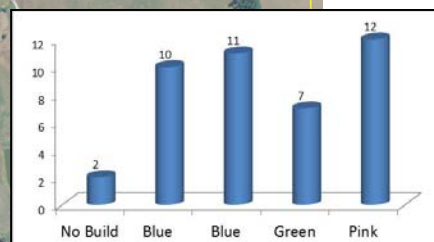
Figure 8.1: Alternates Considered alongside Public Input

Verbal comments indicated that the pink alternate in Segment 2 was generally attractive to many citizens, except those concerned with impacts to their personal property.

SEGMENT 2

Verbal comments revealed that citizens were concerned about the close proximity of the Segment 2 Blue Alternate to Cissel's Creek.

Flooding 2-3 times/year



KY 49 Planning Study Summary of Public Input (11-21-13 Public Meeting)

Comments noted by meeting attendees on maps shown in red

Verbal comments noted in blue

Graphics represent responses from 48 surveys (from local officials, stakeholders, and public)

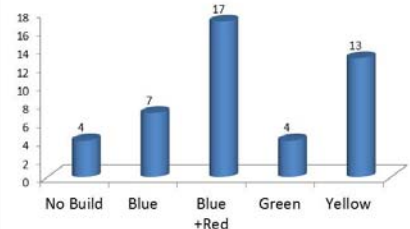
Attendees suggested that the vertical curve just to the north of Hamilton Branch bridge (MP 20.573) be lowered to improve sight distance.

SEGMENT 1

Consider new alignment

Many attendees made positive remarks about this proposed new connection to the bypass.

Flooding 2-3 times/year



Verbal comments indicated that citizens were not in favor of alternates going behind their homes as opposed to improvements to the existing route or a new route in front of their homes. Concerns were related to a perceived negative impact on their property values.

Note on Spot Improvement C: Project limits should be adjusted as needed to address water overtopping the road during rainfall events. At the conclusion of this study it was determined that this appears to occur between MP 19.876 and MP 20.575.

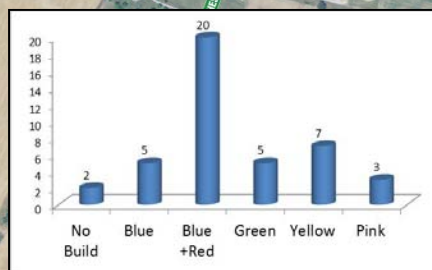
Figure 8.2: Alternates Considered alongside Public Input

Verbal Comment:
Incidents on KY 49/KY 52
cause significant delays,
there is no alternate
route.

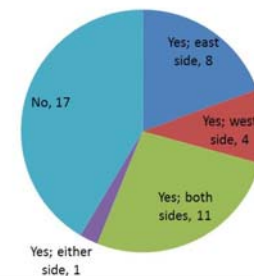
SEGMENT 4

Verbal comments
largely indicated
that citizens were
favorable of
sidewalks in Loretto.

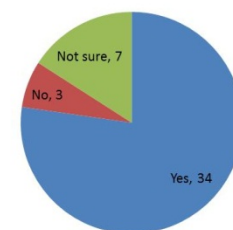
Attendees cited
frequent crashes
at this location



Are sidewalks needed in Loretto?



Is a center turn lane needed in Loretto?



SEGMENT 3

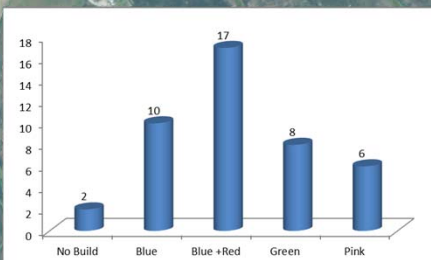
Verbal comments indicated that citizens were
not in favor of alternates going behind their
homes as opposed to improvements to the
existing route or a new route in front of their
homes. Concerns were related to a perceived
negative impact on their property values.

Verbal comments indicated that several
members of the public were concerned
that an improvement project might take
their land or home.

**Consider new
alignment**

Attendees cited
frequent
crashes at this
location

Attendees mentioned
that speeding is a
concern throughout the
corridor (all Segments)



In Segment 3, the Red + Blue Alternate and the new alternate suggested at the public meeting (i.e. eliminate S-curve at Spot E) are recommended for further consideration in future project development phases. The new alternate, shown in **Figure 8.2**, has been identified as the Orange Alternate. The Green and Pink Alternates would have higher adverse effects on the environment, including impacts to prime/statewide important farmlands. Residents were also concerned about impacts to property values. The Green and Pink Alternates were the most expensive of the alternates considered in this segment.

In Segment 4, the Red + Blue and Green Alternates are recommended for further consideration in future project development phases. Both the two and three lane cross sections should advance for future consideration; the project team supports the three lane option but impacts should be evaluated. Sidewalks should also be considered.

In Segment 4, the Yellow and Pink Alternates would result in higher impacts on the environment and would result in residential and business displacements. They also led to the highest costs.

In addition to these recommendations, the No Build and Blue (short term spot improvements) Alternates are viable options in each segment. The No Build Alternate serves as a baseline for comparing impacts between potential build alternates. **Table 8.1** summarizes recommendations for each segment.

Table 8.1: Summary of Long Term Recommendations

Alternate	Meets Purpose	Displacements	Environmental Impacts	Recommended to Advance
Segment 1				
No Build	No	None	None	No*
Red + Blue	Yes	None	Medium	Yes
Green	Yes	Low	High	No
Yellow	Yes	None	High	Yes
New from Public	Yes	None	Medium	No
Segment 2				
No Build	No	None	None	No*
Red + Blue	Yes	None	Medium	Yes
Green	Yes	None	High	No
Pink	Yes	Possible	High	Yes
Segment 3				
No Build	No	None	None	No*
Red + Blue	Yes	None	Medium	Yes
Green	Yes	Possible	High	No
Pink	Yes	None	High	No
Orange (New)	Yes	None	Medium	Yes
Segment 4				
No Build	No	None	None	No*
Red + Blue	Yes	None	Medium	Yes
Green	Yes	Some	High	Yes

Alternate	Meets Purpose	Displacements	Environmental Impacts	Recommended to Advance
Yellow	Yes	Some	High	No
Pink	Yes	Some	High	No

** Although the No Build Alternate does not satisfy the project purpose and need, it should be carried forward as a baseline for comparison in future project development phases.*

2. Short Term Options

During the meeting, project team members also considered each short term spot improvement, weighing potential impacts, home/business displacements, costs, public input, and more. Spots were prioritized as high, medium, or low priorities. **Table 8.2** summarizes the short term spot improvement recommendations.

Table 8.2: Summary of Short Term Recommendations

Spot	Safety Considerations	Stakeholder Input	Priority
A	No reported crashes	Lowest priority for officials Lowest priority for public	Low
B	7 reported crashes, including 3 injury	5 th priority for officials 6 th priority for public	Medium Low
C	5 reported crashes, including 1 injury	4 th priority for officials 4 th priority for public (tie with G)	Medium Low
D	19 reported crashes, including 3 injury	2 nd priority for officials Top priority for public	High
E	17 reported crashes, including 2 fatal and 1 injury	Top priority for officials 2 nd priority for public	High
F	2 reported crashes, including 2 injury	3 rd priority for officials 3 rd priority for public	Medium
G	16 reported crashes, including 2 injury	6 th priority for officials 4 th priority for public (tie with C)	Medium High

3. Additional Goals: Bicycle & Pedestrian Accommodation

Accommodating bicyclists and pedestrians is one of the goals identified for this project. As such, the project team agreed that:

- Sidewalks from West Marion Elementary through Loretto would adequately accommodate pedestrians; and
- A wider typical section would provide safer conditions for any bicyclists throughout the corridor.

The level of investment recommended for these modes is commensurate with the perceived need. Local officials and members of the public mentioned that it is common to see pedestrians walking along KY 49 in Loretto. And, survey respondents revealed that public meeting attendees were in favor of sidewalks in Loretto. Further, there are destinations that sidewalks would connect and serve, such as West Marion Elementary to the south and several business at the north end of town.

KY 49 in the study area is not a designated bicycle route and there are no known local plans that call for bike lanes; however one resident reportedly cycles the study area portion of the route daily.

4. Additional Goals: Consistency with KY 49 South of Lebanon

One of the goals identified for the improvement project is to provide consistency between the improved portion of KY 49 south of Lebanon and the portion of KY 49 covered in this effort, between Lebanon and Loretto. As the highway serves as a rural collector route, through trips from south of Lebanon to Loretto are likely very infrequent.

The typical section for the improvements south of Lebanon was selected to minimize costs and reduce impacts to the human and natural environment. The proposed cross-section for this planning study (11-foot lanes with 4-foot shoulders) was recommended for similar reasons: to satisfy KYTC common design practice guidelines while minimizing costs and environmental impacts.

C. Construction Sections & Planning Level Costs

Four construction sections with logical termini are recommended for the long-term build option, as shown in **Figure 8.3**. Moving from Lebanon towards Loretto, the Section I lies between KY 84 and Toad Mattingly Road; Section II lies between Toad Mattingly Road and KY 327; Section III, between KY 327 and KY 2740; and Section IV, between KY 2740 and KY 52. The middle two sections (Toad Mattingly Road to KY 2740) are the highest priorities for implementation of the long-term corridor improvement option. These sections were identified as the most important from a safety standpoint; they involved the most crash activity and include the most areas that do not meet KYTC common design practice guidelines. They were also identified as priorities from a local perspective (local officials/stakeholders and public).

Table 8.3 presents planning-level cost estimates by phase for each of the construction segments. Total costs by construction section range from \$6 - \$13.7 million.

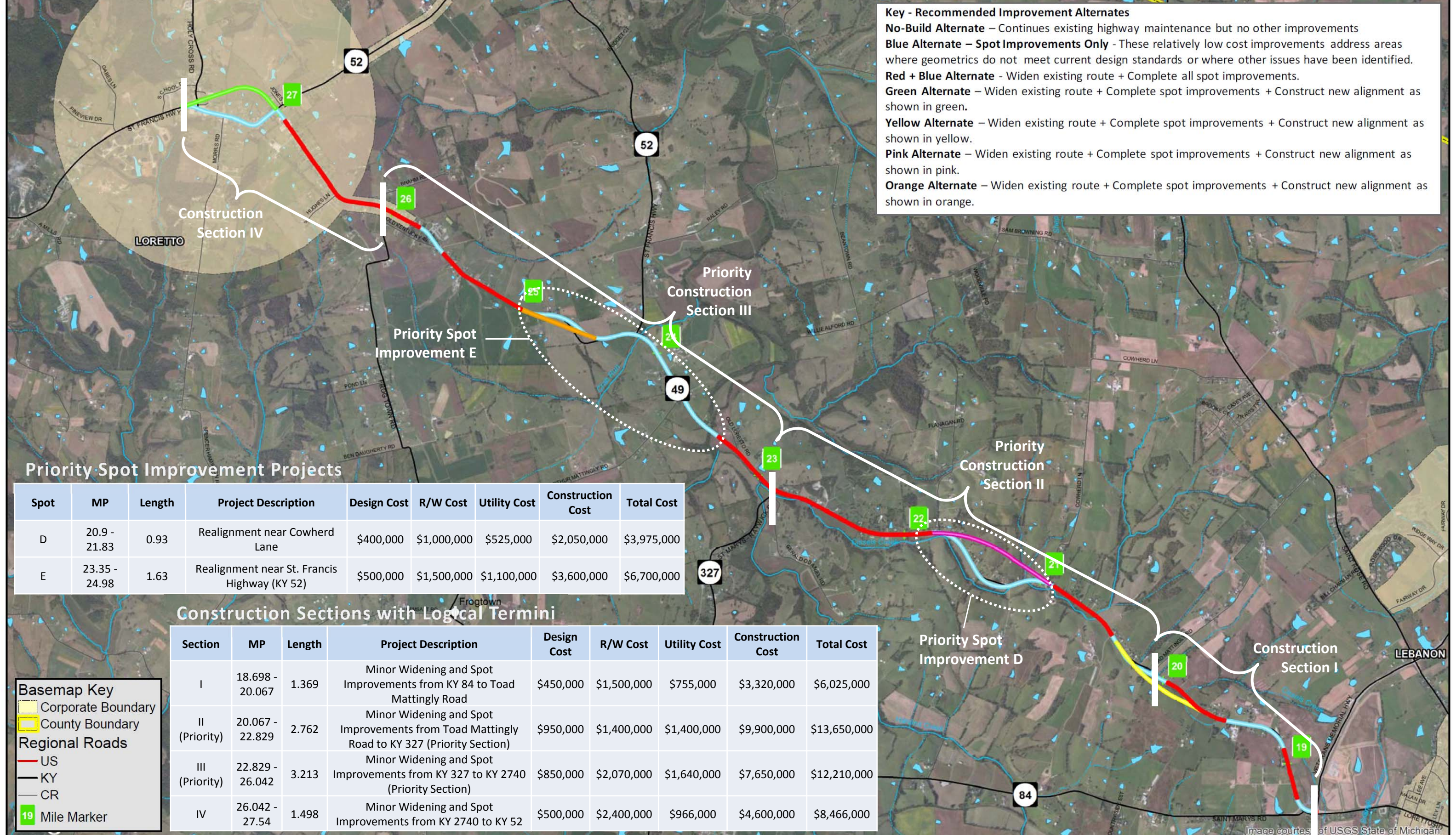
**Table 8.3: Summary of Costs by Construction Section
Costs in 2013 Dollars**

Section	Design Cost	ROW Cost	Utility Cost	Construction Cost	Total Cost
I: MP 18.698-20.67	\$450,000	\$1.5 million	\$760,000	\$3.3 million	\$6.0 million
II: MP 20.067-22.829	\$950,000	\$1.4 million	\$1.4 million	\$9.9 million	\$13.7 million
III: MP 22.829-26.042	\$850,000	\$2.1 million	\$1.6 million	\$7.7 million	\$12.2 million
IV: MP 26.042-27.540	\$500,000	\$2.4 million	\$970,000	\$4.6 million	\$8.5 million

Table 8.4 presents planning-level cost estimates by phase for the two high priority spot improvements.

**Table 8.4: Summary of Costs for Top Priority Spot Improvements
Costs in 2013 Dollars**

Spot	Length	Design Cost	ROW Cost	Utility Cost	Construction Cost	Total Cost
D	0.93 mi	\$400,000	\$1.0 million	\$530,000	\$2.1 million	\$4.0 million
E	1.63 mi	\$500,000	\$1.5 million	\$1.1 million	\$3.6 million	\$6.7 million



Priority Spot Improvement Projects

Spot	MP	Length	Project Description	Design Cost	R/W Cost	Utility Cost	Construction Cost	Total Cost
D	20.9 - 21.83	0.93	Realignment near Cowherd Lane	\$400,000	\$1,000,000	\$525,000	\$2,050,000	\$3,975,000
E	23.35 - 24.98	1.63	Realignment near St. Francis Highway (KY 52)	\$500,000	\$1,500,000	\$1,100,000	\$3,600,000	\$6,700,000

Construction Sections with Logical Termini

Section	MP	Length	Project Description	Design Cost	R/W Cost	Utility Cost	Construction Cost	Total Cost
I	18.698 - 20.067	1.369	Minor Widening and Spot Improvements from KY 84 to Toad Mattingly Road	\$450,000	\$1,500,000	\$755,000	\$3,320,000	\$6,025,000
II (Priority)	20.067 - 22.829	2.762	Minor Widening and Spot Improvements from Toad Mattingly Road to KY 327 (Priority Section)	\$950,000	\$1,400,000	\$1,400,000	\$9,900,000	\$13,650,000
III (Priority)	22.829 - 26.042	3.213	Minor Widening and Spot Improvements from KY 327 to KY 2740 (Priority Section)	\$850,000	\$2,070,000	\$1,640,000	\$7,650,000	\$12,210,000
IV	26.042 - 27.54	1.498	Minor Widening and Spot Improvements from KY 2740 to KY 52	\$500,000	\$2,400,000	\$966,000	\$4,600,000	\$8,466,000

Basemap Key

Corporate Boundary

County Boundary

Regional Roads

US

KY

CR

Mile Marker

Recommended Improvement Alternates

Widen Existing

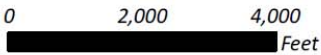
Blue Alternate

Green Alternate

Yellow Alternate

Pink Alternate

Orange Alternate



KY 49 Planning Study
From KY 84 near Lebanon to KY 52 in Loretto
KYTC Item No. 4-8707.00

Figure 8.3: Recommended Improvement Alternates

D. Environmental Considerations

Construction and environmental considerations identified throughout the study process are summarized here for further consideration in future project development phases:

- Noise – This project is a Type I project as designated in FHWA Regulation 23 CFR Part 772 and, in any future project development phases, a detailed noise analysis should follow the FHWA *Procedures for Abatement of Highway Traffic Noise and Construction Noise* and the KYTC *Noise Analysis and Abatement Policy* (July 13, 2011).
- Traffic Operations – Maintenance of traffic and residential access should be maintained throughout the construction process.
- Geotechnical Considerations – Soils in the area are generally suitable for embankment construction; suitable rock for embankment construction and rock roadbed is also readily available in this area of the state. Site specific factors include the potential for acidic runoff and/or scouring during flood events, which may require special precautions.
- Utilities – Underground waterlines as well as above ground power, cable, and telephone lines lie just off the existing road for most of the corridor. Avoiding and/or relocating these utilities will be a major factor during the design process and in future phases of project development.
- Erosion and Sediment Control – Measures should be utilized to control erosion and sedimentation during and after the commencement of earth-disturbing activities. Consideration should be given to erosion control methods; a Best Management Practices for Construction Activities guide is available from the Kentucky Division of Conservation.
- Threatened and Endangered Species – The federally endangered Indiana bat and Snuffbox mussel could be in the project area. If species are identified, a biological assessment will be required.
- Floodplain – The proximity of Hardins Creek and its tributaries will require consideration during design. There are scattered wetlands along the corridor. Any affected wetlands should be delineated; impacts may require permits from the US Army Corps of Engineers and/or the Kentucky Division of Water.
- Cultural & Historic Resources - Archaeological and cultural historic surveys of the project area to identify project-related impacts and to ensure compliance with Section 106 of the National Historic Preservation Act are recommended as part of future project phases.
- Hazardous Materials - GIS data from the US Environmental Protection Agency include a few permitted facilities/monitored sites along the corridor, particularly in Loretto. Solid wastes generated by any future construction activities must be disposed of at a permitted facility.

E. Additional information

Written requests for additional information should be sent to John Moore, Director, KYTC Division of Planning at 200 Mero Street in Frankfort, KY 40622. Additional information regarding this KY 49 Planning Study can also be obtained from the KYTC Project Manager, Charlie Allen, at (270) 766-5066 or via email at CharlieA.Allen@ky.gov. Charlie is the Planning Section Supervisor at District 4, 634 East Dixie Highway in Elizabethtown.



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