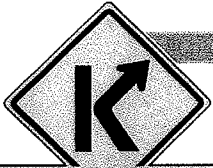


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ALTERNATIVES STUDY



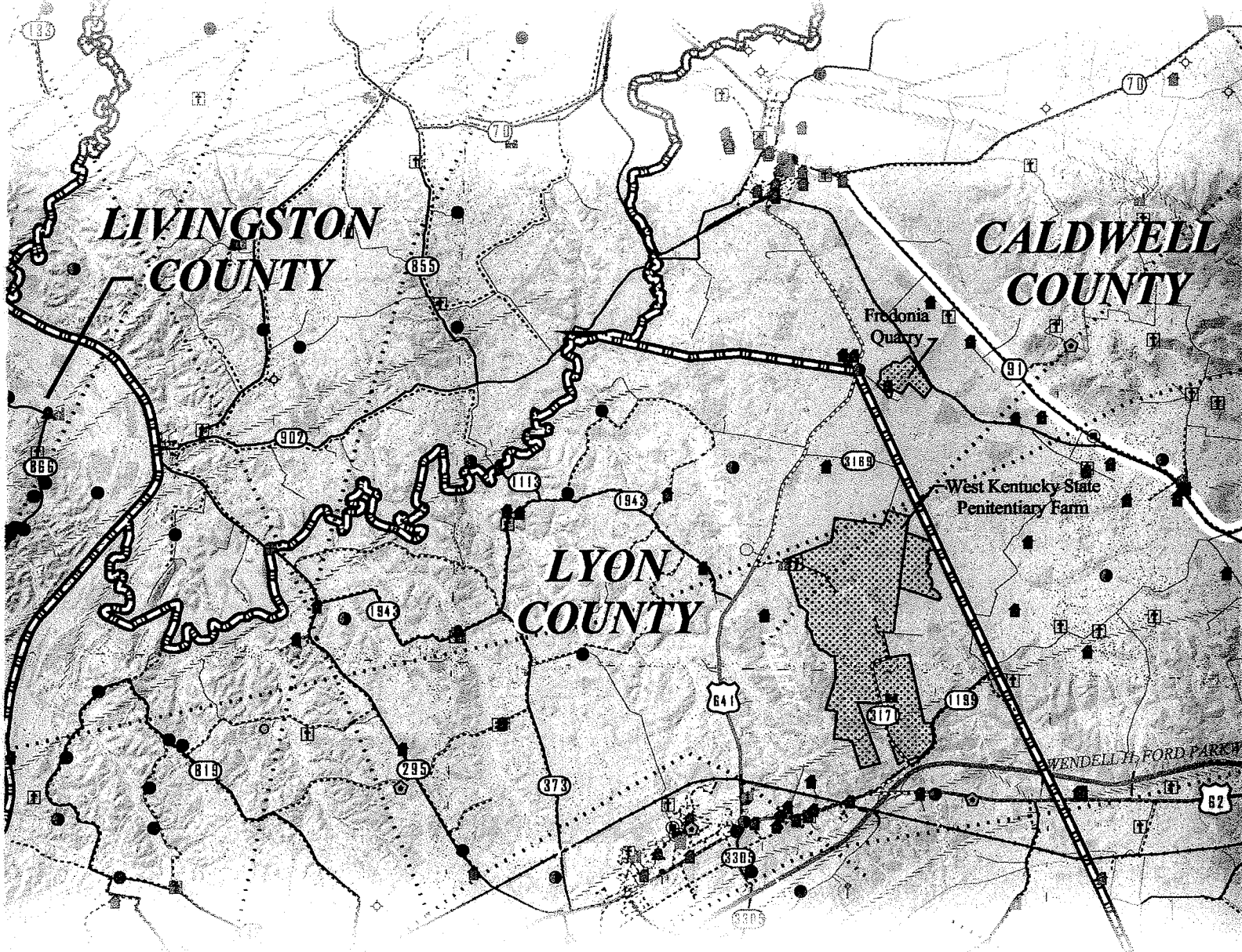
# Reconstruction/Relocation of

From Eddyville to Fredonia

## LYON & CALDWELL COUNTIES

KENTUCKY  
TRANSPORTATION  
CABINET

# FINAL



JULY 2005



Wesley Glass  
C-5



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**TO:** Edward Merryman, P.E.  
Chief District Engineer  
District 1 – Paducah  
District 2 – Madisonville

**FROM:** Annette Coffey, P.E.  
Director  
Division of Planning *asc*

**DATE:** July 20, 2005

**SUBJECT:** US 641  
Eddyville to Fredonia  
Lyon and Caldwell Counties  
Final Alternatives Study

The Division of Planning, using the consultant services of Wilbur Smith Associates, has completed an Alternatives Study for the subject project. Enclosed for your information and use are two paper copies and two electronic copies of the final report. Also enclosed are 25 copies of the Executive Summary that could be distributed if you get requests for information on this study.

The report recommends Alternate 4 – Revised which starts at the US 62 interchange with the Wendell H. Ford Western Kentucky Parkway east of Eddyville, generally follows the existing US 641 corridor, and goes west of Fredonia to tie into the recently-designed segment from Fredonia to Marion.

Copies of the report have also been sent to your Design staff, Planning staff, and Environmental Coordinator. The final report can also be found on the Division of Planning's web site under the "Planning Projects" link at <http://transportation.ky.gov/planning/index2.asp>.

Edward Merryman

Page 2

July 20, 2005

We appreciate your assistance in this planning effort. If you need additional information or copies, please contact Jim Wilson or Daryl Greer of this Division at (502) 564-7183.

Enclosures

AC/JW/BG

c: Anthony Goodman, FHWA (w/report)  
Mary Murray, FHWA (w/report)  
Dan Bozarth, Pennyrile ADD (w/CD)  
Craig Morris, Pennyrile ADD (w/report)  
Mike Hancock, (w/CD)  
David Kratt, (w/report)  
David Waldner, (w/report)  
Ron Rigney, (w/report)  
Wesley Glass, (w/report)  
Allen Thomas, (w/CD)  
Kevin McClean, (w/report)  
Tim Choate, (w/report)  
Everett Green, (w/report)  
Richard Davis, (w/report)  
C. D. Palmer, (w/report)

**APPENDIX H**  
**GEOTECHNICAL OVERVIEW REPORT**

Prepared For

Wilbur Smith Associates  
465 East High Street, Suite 100  
Lexington, KY 40507-1938

Prepared by

QORE™, Inc.  
422 Codell Drive  
Lexington, Kentucky 40509

**GEOTECHNICAL ISSUES FOR US 641**

From Eddyville to North of Fredonia  
Lyon and Caldwell Counties, Kentucky  
QORE Project No. 24302831  
July 19, 2004

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July 19, 2004

Wilbur Smith Associates  
465 East High Street, Suite 100  
Lexington, KY 40507-1938

Attention: Mr. Carl Dixon, P.E.

Reference: **Geotechnical Issues for US 641**  
From Eddyville to North of Fredonia  
Lyon and Caldwell Counties, Kentucky  
QORE Project No. 24302831

Dear Mr. Dixon:

QORE, Inc. reviewed the eight proposed corridors for the section of US 641 from Eddyville to North of Fredonia. This report explains our understanding of the project, documents our findings, and presents our conclusions and engineering recommendations.

QORE appreciates the opportunity to be of service to you. We look forward to helping you through project completion. If you have any questions, please call.

Respectfully submitted,  
**QORE, Inc.**

Bruce L. Hatcher, P.E.  
Senior Geotechnical Engineer  
Licensed KY 14527

Craig S. Lee, P.E.  
Senior Engineer

24302831 GEO Report

Attachments: Index Map  
Proposed Corridors (Sheets A - D)  
Geology Column (2 Sheets)  
Geology Explanation  
Proposed Corridors Geology (Sheets A - D)

# GEOTECHNICAL ISSUES FOR US 641

From Eddyville to North of Fredonia  
Lyon and Caldwell Counties, Kentucky  
QORE Project No. 24302831

## Introduction

QORE, Inc. reviewed the proposed corridors for US 641 between Eddyville and north-northwest of Fredonia in Lyon and Caldwell Counties. The West Kentucky State Penitentiary Farm is located near the southeastern corner of the project area.

The project begins near Eddyville and heads northerly to a terminus point about 1.5 miles north-northwest of Fredonia. At present, there are eight proposed corridors (Alternates 1 through 4 and Alternates 1A through 4A). Each of the eight corridors terminates at the same point. However, there are four different beginning points. Alternates 1 and 1A begin at the Wendell H. Ford Parkway (Western Kentucky Parkway) where it crosses the Caldwell/Lyon County line. Alternates 2 and 2A begin at the intersection of US Highways 62 and 641 in the community of Fairview. Alternates 3 and 3A begin at Interstate 24 about 2 ¼ miles west of its intersection with US Highway 62. Alternates 4 and 4A begin where US Highway 62 intersects the Wendell H. Ford Parkway (Western Kentucky Parkway).

The eight corridors consist of various sections, some of which overlap with other corridors. As such, the eight corridors are color coded on the attached drawings. The following list of corridors indicates the applicable color coding for each proposed corridor

<u>Corridor Identification</u>	<u>Color Coding</u>
Alternate 1 Alternate 1A	Gold Gold-Yellow-Green
Alternate 2 Alternate 2A	Pink-Green Pink-Blue-Gold
Alternate 3 Alternate 3A	Green Green-Blue-Gold
Alternate 4 Alternate 4A	Yellow-Pink-Green Yellow-Blue-Gold

Due to the large scale of the project and the overlapping nature of the proposed corridors, four base maps (Sheets A through D) are needed to cover the project area. Please reference the attached Index Map for details of the four base maps.

## General Topography

All eight proposed corridors lie within Lyon and Caldwell Counties. The proposed corridors (or corridor sections) which lie along the eastern side of the project area will be located within the Fredonia Valley. The Fredonia Valley is characterized by gently rolling hills. The majority of the Fredonia Valley is comprised of farmland, pastures, or forest. The proposed corridors (or corridor sections) which lie along the western side of the project area will be located in

moderately sloping terrain with narrow valleys. The terrain is steeper and more hilly west and directly north of Eddyville. Depending upon the selected corridor, the project could be constructed across four USGS (United States Geologic Survey) quadrangle maps. General location and topographic information about the proposed corridors across each quadrangle is listed below. Elevation ranges are within the potential construction areas only.

<u>Quadrangle</u>	<u>Location on Quadrangle</u>	<u>Elevation Ranges</u>
Fredonia	Majority	375 to 530 feet
Eddyville	Northern portion	400 to 610 feet
Grand Rivers	Northeast corner	450 to 520 feet
Princeton West	Northwest corner (barely)	570 to 620 feet

### General Geology

We reviewed the geologic information along the proposed corridors from the four USGS Geologic Quadrangles. The major rock formations encountered are discussed separately in the following paragraphs.

**Rosiclare Sandstone and Fredonia Limestone Members of the Saint Genevieve Limestone** – The majority of the Fredonia Valley is underlain by the Rosiclare Sandstone and Fredonia Limestone Members of the Saint Genevieve Limestone. The Rosiclare Sandstone Member is comprised of 5 to 10 feet of sandstone and shale. The Fredonia Limestone member is comprised of limestone and shale. The Fredonia Limestone member is prone to sinkholes.

**The Upper and Lower Members of the Saint Louis Limestone** - To the west and south of the Fredonia Valley, the project area is underlain by the Upper and Lower Members of the Saint Louis Limestone. These rocks are comprised of medium to light gray limestone.

**Gravel** – Gravel is noted in the southwestern portion of the project area near the beginning of Alternates 3 and 3A along the north side of Interstate 24. The gravel is mostly pebbles with cobbles as large as 5 inches.

**Alluvium** – The valley bottoms are typically comprised of alluvium (i.e. – water transported soils). The alluvium is typically thicker along the banks of the larger streams and rivers, and less thick along the minor creeks or streams. Alluvium in this general area is comprised of varying combinations of sand, silt, clay, and gravel.

**Tuscaloosa Formation** - A small area of the Tuscaloosa Formation is present within the eastern edge of Alternates 1 and 1A corridors near the intersection with the Western Kentucky Parkway (Wendell H. Ford Parkway). However, it is unlikely that this formation will be encountered during construction.

The local geology changes drastically north of Fredonia as each of the eight proposed corridors crosses the Tabb Fault System within the final 3500 to 5000 feet. North of the Tabb Fault System, there are several types of bedrock encountered. These rock types are discussed briefly in the following paragraph.

The **Hardinsburg Sandstone** is comprised of sandstone and shale. As much as 2 feet of coal occurs near the middle of the formation. The **Saint Genevieve Limestone** is mapped as one



unit in the fault area. However, it is likely that the lower portion of the Fredonia Limestone Member will be encountered in this area. The **Menard Limestone** is comprised of limestone and shale. The **Palestine Sandstone** is comprised of sandstone and shale. The **Kinkaïd Limestone, Degonia Sandstone** and **Clore Limestone** are mapped as one unit within this area. However, it is likely that the Clore Limestone will be encountered since it lies directly on top of the Palestine Sandstone. The Clore Limestone is comprised of limestone and shale. A small area of **Waltersburg Sandstone** and **Vienna Limestone** occurs west of centerline along the northwestern leg of some of the corridors. The Waltersburg Sandstone is comprised of sandstone, siltstone, and shale. The Vienna Limestone is comprised of limestone and shale.

Please reference the attached Sheets A through D, US 641 – Proposed Corridors Geology. Also, please reference the attached Geology Column drawings for descriptions of the applicable geologic units.

The local dip varies by quadrangle and generalized dips within the project areas are listed below:

<u>Quadrangle</u>	<u>Dip Direction</u>	<u>Dip (percent)</u>	<u>Dip (feet per mile)</u>
Fredonia - South of Tabb Fault System	Northeast or East	0.6-2	30-100
Fredonia - North of Tabb Fault System	Southwest	3-5	150-280
Eddyville	North	2	120
Grand Rivers	North-Northwest	1	60
Princeton West	North	2	120

Typically, groundwater flow is in the dip direction until it reaches daylight where it would then flow downhill to the valley bottoms and creeks. However, in Karst areas the groundwater system consists of underground conduits, caves, and underground streams.

Closed depressions (sinkholes), caves, and other underground indications of Karst topography are common in areas underlain by potentially soluble bedrock such as limestone and dolomite. According to a generalized Karst map of Kentucky published by the Kentucky Geological Survey, the project area is characterized as an area of high potential for Karst. The map indicates that the project area is underlain by pure limestone in which Karst is well developed. No detailed maps of Karst activity are available for this specific area.

Numerous closed depressions are noted on the Fredonia topographic and geologic quadrangle maps. It appears that they are highly concentrated within the Fredonia Valley area. A few closed depressions were noted near the northwest corner of the Eddyville topographic and geologic quadrangle maps. The closed depressions occurred at elevations ranging from 380 to 460 feet MSL, with the majority occurring in the 410 to 450 feet range. No closed depressions are noted within the project areas on the Grand Rivers or Princeton West topographic or geologic quadrangle maps.

