

Brent Spence Bridge Replacement/Rehabilitation Project



Red Flag Summary

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PB PARSONS
BRINCKERHOFF

In Association with:
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Red Flag Summary Form

Appendix – *Geotechnical Red Flag Summary and Overview* (by H.C Nutting Company)

1.0 INTRODUCTION

This document is intended to identify “Red Flags” for the Brent Spence Bridge Rehabilitation/Replacement Project. The Red Flag information contained in this document identifies potentially sensitive locations that may require additional coordination activities. Red Flags may also affect the anticipated project design, estimated project budget, construction schedule or scope of work for any proposed transportation project associated with this study.

2.0 PROJECT HISTORY AND SETTING

Originally opened in 1963, The Brent Spence Bridge (BSB) and its approaches are key elements of the nation’s Interstate Highway System. This facility carries both I-75 and I-71 traffic through the Greater Cincinnati/Northern Kentucky area. This important river crossing is vital to long-distance state and national commerce, as well as being a major thoroughfare for local and regional mobility.

Interstate 75 connects the Greater Cincinnati/Northern Kentucky region with Detroit, Michigan to the north and Miami, Florida to the south. It also connects with I-74 and US 50 to the east and west. I-75 and the railroads that run parallel to it through this region are among the nations busiest. This transportation system is the backbone of commerce and travel through the region. According to Federal Highway Administration (FHWA) estimates, I-75 is one of the busiest trucking routes in North America with truck traffic approaching six billion miles annually. In addition, more than 250 freight trains per day pass through or have destinations within the I-75 corridor. The interstate portions of this transportation system are nearly 50 years old and significant safety and capacity problems exist.

Cincinnati, Ohio and Covington, Kentucky were originally settled in the late 1700’s. The built environment surrounding I-75 and the BSB is characterized by highly disturbed, dense urban development with historic districts and properties nearby. Interstate 75 in Cincinnati is a typical downtown freeway with closely spaced ramps and poor roadway geometry. Improvements to several of the downtown streets were made during the Fort Washington Way reconstruction. Improvements to the connections in Covington were built during the I-75 “Cut in the Hill” project. Within the past few years, several rehabilitation projects were performed in addition to painting the I-471 Bridge.

3.0 STUDY AREA

The project study area is located along a 6.5 mile segment of I-75 within the Commonwealth of Kentucky and the State of Ohio. The southern limit of the project is 2,800 feet south of the midpoint of the interchange of I-75 and Kyles Lane in Kentucky (Exit 189). The northern limit of the project is 1,500 feet north of the midpoint of the interchange of I-75 and the Western Hills Viaduct in Ohio (Exit 2B).

The eastern and western limits of the study area follow the existing alignment of I-75. In Kentucky, the study area is a 1,500-foot wide corridor centered on I-75 south of the City of Covington. At Covington, the eastern and western study area boundaries widen and follow city streets as described below.

The eastern limit of the project:

- In the City of Covington, the eastern boundary follows Philadelphia Street to its intersection with 5th Street.
- The eastern boundary follows 5th Street to its intersection with Main Street and then follows Main Street to the Ohio River.
- The eastern boundary parallels the Clay Wade Bailey Bridge across the Ohio River to Pete Rose Way in the City of Cincinnati.
- Through downtown Cincinnati, the eastern boundary follows Second Street and US Route 50 eastbound to approximately I-471 (Daniel Carter Beard Bridge) and Eggleston Avenue, then Third Street, Pike Street and Fourth Street to Elm Street and then northward to west Court Street.
- From west of Court Street, the eastern boundary extends west to Linn Street, where it follows Linn Street to Central Parkway.
- The boundary extends north paralleling Central Parkway to Linn Street.
- From Linn Street, the eastern boundary extends westerly to Bank Street.
- From Bank Street, the eastern limits extend in the northerly direction with a consistent 750-foot offset from the I-75 centerline.

The western limit of the project:

- At 5th Street in the City of Covington, the western boundary extends in the northwesterly direction across the Ohio River to State Route 50, approximately 1,000 feet west of the Freeman Avenue interchange.
- The western limit extends north parallel to Dalton Avenue to Hopkins Street.
- The western limit extends westerly along Hopkins Street to the western limits of Union Terminal, where it then extends northerly along the western limits of Union Terminal to Kenner Street.
- The western limit follows easterly along Kenner Street until the intersection with Dalton Avenue.
- The western limit parallels Dalton Avenue to north of Findlay Street, where it follows in the northerly direction with a consistent 750-foot offset from the I-75 centerline.

4.0 PROJECT GOALS AND OBJECTIVES

The National Bridge Inventory lists the Brent Spence Bridge as functionally obsolete due to the capacity, sight distance, and safety concerns associated with its current configuration. These concerns have led to this project being considered a top priority by the Kentucky Transportation Cabinet (KYTC), the Ohio Department of Transportation (ODOT), the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) and the cities of Covington, Kentucky and Cincinnati, Ohio.

Specific goals of the Brent Spence Bridge Rehabilitation/Replacement Project, including the entire corridor study area between the Kyles Lane Interchange in Kentucky to the Western Hills Viaduct in Ohio, are as follows:

- Improve safety
- Correct substandard design features
- Adequately address current and future traffic volumes through design and capacity improvements
- Minimize impacts to local communities, i.e., access, R/W, and user's costs, and maximize potential economic development opportunities
- Minimize environmental conflicts
- Minimize R/W and Construction costs
- Provide safe, efficient, and cost effective Maintenance of Traffic

This project has not yet reached a point in the project development process where specific transportation alternatives are analyzed. A No Build alternative will be developed and carried throughout the study as one possible study outcome. In addition, passenger rail alternatives developed by the North South Transportation Initiative and the *MetroMoves* Regional Rail Plan are known and will not be precluded by any alternatives developed as part of the Brent Spence Bridge Replacement/Rehabilitation project in this study corridor.

5.0 GEOTECHNICAL INFORMATION

A literature review consisting of compiling and reviewing existing geologic data within the study area was performed. Numerous documents and sources were reviewed for this effort, including:

- Historical topographic maps including 1912 maps and Hamilton County, Ohio CAGIS maps.
- Topographic and geologic maps published by the United States Geological Survey (USGS), the Geological Survey of Ohio, and the Kentucky Geological Survey, including website reviews of the same organizations.
- Soil Conservation Service Soil Surveys of Kenton County, Kentucky and Hamilton County, Ohio published by the United States Department of Transportation.
- Numerous geotechnical subsurface soils boring data in both Kentucky and Ohio in the project corridor study area.
- ODOT's Geotechnical Record in the applicable areas of Hamilton County, Ohio within the project corridor.
- History of notable landslides within the project corridor study area.
- Existing Brent Spence Bridge rehabilitation/reconstruction studies and feasibility studies performed by FHWA and others.
- Information obtained from project site visits conducted on August 3, 2005 and August 18, 2005.
- Original soil borings for projects in the study area, including the I-75 "Cut-in-the-Hill" project, original Brent Spence Bridge construction, Fort Washington Way and the Mill Creek Expressway project.

This information provided an overview of available project data within the study area. More detailed study will be required as specific corridors are chosen. Please refer to Exhibit 1 – Soils shows the soil types within the study area.

5.1 Site Topography

At the Kyles Lane interchange, grades along the proposed roadway corridor generally range between about 850 and 900 feet. The topography generally slopes downward farther north to about elevation 450 to 500 feet closer to the Ohio River.

The western portion of the study area shows several areas with steep slopes. The eastern side of the study area is relatively level in comparison to the existing terrain along the western side of the study area. Existing grades from the Ohio River, northward to the Western Hills Viaduct gradually slope upward from an approximate elevation of 450 to 500 feet adjacent to the Ohio River, to an approximate elevation of 550 feet near the Western Hills Viaduct. The study area is relatively flat beyond the existing roadway footprint.

5.2 Kentucky Corridor Area Geology

Northern Kentucky has been affected by major glaciations occurring during the Pleistocene Epoch time period. These glacial advances caused profound drainage changes and were responsible for the deposition of a variety of soils lying beneath the Covington/Cincinnati area and the study area.

In the area surrounding Covington, soils generally consist of a gravelly zone topped by granular outwash deposits. Near-surface soils contain alluvial sediments, deposited by the floodwaters of both the Ohio and Licking Rivers. Area soil conditions at the site have also been affected by placement of fill, construction of buildings, construction of marina and housing developments, demolition of structures, roadway grading, etc.

Soil conditions for the remaining portion of the study area within Kentucky include valley basin sediments, together with valley wall deposits, glacial and residual clays with limestone and shale remnants of the ancient Ordovician Sea. As the corridor elevation increases to the south nearer to Kyles Lane, soil types consist of Illinoian age glacial soils, capped with windblown loessian silts. Overlying residual clays provide a soil mantle of varying thickness atop native bedrock.

The Ordovician bedrock in the study area is composed of two major rock units. The Kope Formation is typically found from approximate elevations of 510 to 690 feet. It is principally shale with relatively thick and well-spaced limestone beds. The Maysville Formation, from approximate elevations of 690 to 800 feet, is composed of limestone and shale with thicker and more closely packed beds.

The rock beds are highly fossiliferous and calcareous. The limestone distribution within the Maysville Formation often provides a formidable resistance to excavation efforts due to hardness, thickness of layers, and close packing of layers at some elevations.

There are no mapped coal mines within the study area. In this region, solutioned limestone or karst, sometimes develops in upland areas where limestone is the predominant bedrock formation. The Northern Kentucky region is within an area with limited to moderate potential for karst. Based on local experience, the development of karst in the study area may occur in isolated areas, but is not anticipated to be a significant concern.

5.3 Ohio Corridor Area Geology

Geology in the Ohio portion of the study area includes a combination of alluvium and outwash soils, with minor amount of lacustrine (lakebed) and glacial till deposits. Based on review of the Ohio Department of Natural Resources Quaternary Geology Map of Ohio (1999), the western portion of the study from the Ohio River to Western Hills Viaduct consists of alluvial deposits such as silty clays, sands, gravels, and silty sands. These soils typically are encountered approximately between elevations of 460 and 530 feet.

Geology on the eastern side of the Ohio study area consists of Late Wisconsinian Age outwash soils. These soils generally consist of sands and gravels and are found between 400 to 460 feet above sea level. This area of downtown has been heavily disturbed. Cisterns, dry wells and privies, are to be expected. Silt pipes and anomalous loose granular zones have been noted. Remnant foundation walls of buildings which formerly occupied the site can also be anticipated. Lakebed deposits consisting of clays and silts are generally found on the northern part of the study area, near the Western Hills Viaduct.

Soils on the Ohio side are also underlain by Ordovician Age shale and limestone bedrock of the Eden Formation. Bedrock is generally encountered at elevations ranging from approximately 400 to 420 feet, and as high as elevation 460 feet at the Western Hills Viaduct. Based on review of published and existing subsurface information, the bedrock surface is highly variable with relatively drastic changes in depth over relatively short distances.

5.4 Landslide Issues

Areas of the greater Cincinnati and Northern Kentucky region are prone to slope movements and landslides. Several landslides have been reported and documented along the western side of the study area and near the southern limits, predominantly within the Kentucky portion of the study area. Due to the hilly terrain in these areas, slope instability was more common. Landslides typically occurred after heavy rain events or during extended periods of wet weather. The landslides generally occurred above bedrock, or along the soil/bedrock interface.

Of particular interest is a landslide event that occurred within a few years of the original I-71/I-75 construction between Interchanges 189 and 190 in Kentucky. The outside northbound lane began to show signs of settlement and cracking, initial evidence of a landslide. The lane was closed for some time and eventually a large buttress embankment was built to stabilize the slope in this area. In this case, the roadway embankment was constructed on a substantial depth of colluvium, which in turn overlaid a sloping bedrock surface.

Few landslides have been reported in other portions of the study area. In these relatively flat areas, the greatest potential for landslide or slope instability is adjacent to the Ohio River. Detailed slope stability analyses along the Ohio River should be performed once the bridge location has been selected.

Landslide concerns generally increase along the western side of the study area, and throughout the corridor near Kyles Lane to approximately 1.5 miles north of Kyles Lane in Kentucky. Therefore, shifting the I-71/I-75 roadway west of the current location increases potential for landslides and slope instability.

6.0 ENVIRONMENTAL RESOURCES

Environmental Red Flags represent specific community resources that could be affected by any transportation project within the study corridor. A literature and data base review of existing information was performed to identify specific ecological, historic, archaeological, and community resources as well as potential hazardous material locations.

Several agencies were contacted to acquire data pertaining to the human and natural environment of the study area. These data sources are listed below.

- United States Environmental Protection Agency (EPA)
- United States Fish and Wildlife Service (USFWS) Region 3
- United States Army Corps of Engineers (USACE)
- Ohio Environmental Protection Agency (OEPA)
- Ohio Department of Natural Resources (ODNR)
- Ohio Bureau of Underground Storage Tank Regulations (BUSTR)
- Kentucky Department of Fish and Wildlife Resources (KDFWR)
- Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC)
- Kentucky Division of Waste Management (KDWM)

In addition, available environmental resource information from the North South Transportation Initiative and the Feasibility and Constructability Study for the Replacement/Rehabilitation of Brent Spence Bridge was reviewed.

This Red Flag Summary report provides an overview of this information as it specifically relates to Hazardous Materials, Ecological Resources, Architectural Resources, Archaeological Sites, Community Impacts, Environmental Justice, Noise Impacts and Air Quality.

6.1 Hazardous Materials

Federal and state agencies databases were reviewed to obtain hazardous materials information. A review of the US Environmental Protection Agency (EPA) Envirofacts Data Warehouse information resulted in the identification of 25 records for hazardous waste generators located within the study area. Underground Storage Tank (UST) data was obtained from two sources.

The Kentucky Division of Waste Management (KDWM) maintains the UST database for the Commonwealth of Kentucky. UST data for Ohio were obtained from the Ohio Bureau of Underground Storage Tank Regulations (BUSTR), which is housed in the State Fire Marshal's Office of the Ohio Department of Commerce. The data identified 121 USTs within the study area, 91 in Kentucky and 30 in Ohio.

There is a concentration of USTs in Kentucky, adjacent to the southern bridge landing area. One hazardous waste site specifically related to the Brent Spence Bridge is due to a previous painting operation. Sandblasting grit was not properly controlled and resulted in lead contamination in the soil below the bridge on the Kentucky side. The Kentucky Transportation Cabinet is currently taking actions to remediate this site.

Landfill locations were also researched during the environmental review process. The KDWM website was reviewed for the presence of any current or historically operated landfills in Kenton County. According to the list of Permitted Solid Waste Landfills, there are none present in Kenton County. The Ohio EPA Division of Solid and Infectious Waste Management website was accessed for information pertaining to possible landfills currently or historically operated landfills in the study area. According to several sources on the website, no landfills are located within the Ohio portion of the study area.

6.2 Ecological Resources

6.2.1 Wetlands

Potential wetland locations were obtained from the Kentucky Department of Fish and Wildlife Resources (KDFWR) and the Ohio Department of Natural Resources (ODNR) Geographic Information Systems (GIS). Potential wetlands were identified in both Ohio and Kentucky and are shown on Exhibit 3.

The majority of wetlands are scattered throughout the Ohio portion of the study area. The wetlands are classified as open water bodies (i.e. ponds) and palustrine emergent (i.e. shallow marsh wetlands).

6.2.2 Streams and Rivers

The Ohio River is the major water resource within the study area. Smaller streams that may exist within the study area tend to drain to storm sewers that discharge outside the project area to either the Ohio River or the Licking River. These streams are low quality streams which have been modified by development within the study area and may be considered non-jurisdictional with the absence of hydric soils and the presence of an ordinary high water mark. The locations of streams within the study area are also shown on Exhibit 3.

The Ohio River is approximately 1,300 feet wide at the existing Brent Spence Bridge location. The normal pool elevation of the Ohio River in the area of the bridge is about 455 feet and the ordinary high water mark is approximately 468.5 feet

In the Northern Kentucky/Greater Cincinnati area, the Ohio River is used as a source of drinking water for over one million people in two states and is the site of increasingly intensive recreational use. Within the region, the Ohio River receives discharges from over 100 square miles of urban watershed, and other non-point sources associated with a major metropolitan area. The river's water quality, and its suitability for contact recreation in particular, is subject to rapid changes, particularly during and after precipitation events. (Source: <http://www.orsanco.org/empact>, 2002).

There are no designated wild and scenic rivers, outstanding resource waters, high quality fishing streams or spawning areas in the study area.

6.2.3 Floodplains

Floodplains are located along the north and south banks of the Ohio River within the study area. The 100-year flood elevation is 498.5 feet. Approximately 168 acres of the 100-year floodplain are on the north side of the river and 12.5 acres of the 100-year floodplain are on the south side of the river.

6.2.4 Threatened and Endangered Species

State Listed Species

The ODNR Division of Parks and Natural Areas lists 13 plant and animal species listed state endangered (5), threatened or potentially threatened (6), and special interest (2) (Source: ODOT North/South Initiative). Three species are also receiving federal protection as well.

A preliminary literature search of the Kentucky State Nature Preserves Commission lists 32 plant and animal species listed state endangered (17), threatened (8), and special concern (7) (Source: website <http://www.naturepreserves.ky.gov>, 2004). Nine species are also receiving federal protection as well. Those species not listed but not receiving federal listing include two plants, one gastropod, 10 mussels, one insect, two fishes, three amphibians, one reptile, and three breeding birds. These species are listed in Table 6-1.

Table 6-1: State Listed Threatened and Endangered Species Within the Study Area

County, State	Group	Common Name	Scientific Name	State Status
Kenton, KY	Plant	Stemless evening-primrose	<i>Oenothera triloba</i>	Threatened
Hamilton, OH	Plant	Riverbank Paspalum	<i>Paspalum fluitans</i>	Potentially Threatened
Hamilton, OH	Plant	Maypop	<i>Passiflora incarnate</i>	Threatened
Kenton, KY	Plant	Mock Orange	<i>Philadelphus inodorus</i>	Threatened
Hamilton, OH	Plant	Virginia Mallow	<i>Sida hermaphrodita</i>	Potentially Threatened
Hamilton, OH	Plant	Smooth Buttonweed	<i>Spermacoce glabra</i>	Potentially Threatened

Table 6-1: State Listed Threatened and Endangered Species Within the Study Area

County, State	Group	Common Name	Scientific Name	State Status
Kenton, KY	Gastropods	Onyx Rocksnail	<i>Leptoxis praerosa</i>	Special Concern
Kenton, KY	Mussel	Elktoe	<i>Alasmidonta marginata</i>	Threatened
Kenton, KY	Mussel	Spectaclecase	<i>Cumberlandia monodonta</i>	Endangered
Hamilton, OH	Mussel	Butterfly	<i>Ellipsaria lineolata</i>	Endangered
Hamilton, OH	Mussel	Elephant-ear	<i>Elliptio crassidens crassidens</i>	Endangered
Kenton, KY	Mussel	Snuffbox	<i>Epioblasma triquetra</i>	Endangered
Kenton, KY	Mussel	Longsolid	<i>Fusconaia subrotunda subrotunda</i>	Special Concern
Kenton, KY	Mussel	Pocketbook	<i>Lampsilis ovata</i>	Endangered
Kenton, KY	Mussel	Creek Heelsplitter	<i>Lasmigona compressa</i>	Endangered
Hamilton, OH	Mussel	Threehorn Wartyback	<i>Obliquaria reflexa</i>	Threatened
Kenton, KY	Mussel	Sheepnose	<i>Plethobasus cyphus</i>	Endangered
Hamilton, OH	Mussel	Ohio Pigtoe	<i>Pleurobema cordatum</i>	Endangered
Kenton, KY	Mussel	Pyramid Pigtoe	<i>Pleurobema rubrum</i>	Endangered
Kenton, KY	Mussel	Rabbitsfoot	<i>Quadrula cylindrica cylindrica</i>	Threatened
Hamilton, OH	Mussel	Monkeyface	<i>Quadrula metanevra</i>	Endangered
Kenton, KY	Mussel	Salamander Mussel	<i>Simpsonaias ambigua</i>	Threatened
Kenton, KY	Insect	Sixbanded longhorn beetle	<i>Simpsonaias ambigua</i>	Threatened
Hamilton, OH; Kenton, KY	Fishes	Lake Sturgeon	<i>Acipenser fulvescens</i>	Endangered
Kenton, KY	Fishes	Alligator Gar	<i>Atractosteus spatula</i>	Endangered
Hamilton, OH	Fishes	Mooneye	<i>Hiodon tergisus</i>	Special Interest
Hamilton, OH	Fishes	Burbot	<i>Lota lota</i>	Special Interest
Kenton, KY	Amphibians	Eastern Hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>	Special Concern

Table 6-1: State Listed Threatened and Endangered Species Within the Study Area

County, State	Group	Common Name	Scientific Name	State Status
Kenton, KY	Amphibians	Redback Salamander	<i>Plethodon cinereus</i>	Special Concern
Kenton, KY	Amphibians	Northern Leopard Frog	<i>Rana pipiens</i>	Special Concern
Hamilton, OH; Kenton, KY	Reptiles	Kirtland's Snake	<i>Clonophis kirtlandii</i>	Threatened
Kenton, KY	Bird	Bachman's Sparrow	<i>Aimophila aestivalis</i>	Endangered
Kenton, KY	Bird	Bewick's Wren	<i>Thryomanes bewickii</i>	Special Concern
Kenton, KY	Bird	Barn Owl	<i>Tyto alba</i>	Special Concern

Federally listed Species

Ten federally endangered species, one federally threatened and one federal candidate species have ranges that include the study area as listed in Table 6-2. Nine of the federally endangered species are mussels whose ranges include the Ohio River and its tributaries in Kentucky. These mussel species have been extirpated from the Ohio study area, and are likely extirpated from the Kentucky study area (KSNPC 2001). Other federally endangered species whose ranges include the study area are the Indiana bat (*Myotis sodalis*) and running buffalo clover (*Trifolium stoloniferum*). The federally threatened bald eagle (*Haliaeetus leucocephalus*) has wintering sites in Hamilton County,

There are no documented populations of threatened and endangered species or critical habitat within the study area. However, potential habitat characteristics for the Indiana bat, running buffalo clover, and freshwater mussels may exist within the study area. The potential presence of endangered mussel species in the Ohio River will require further specific mussel surveys to determine impacts to any species.

Table 6-2: Federally Listed Threatened and Endangered Species

County	Group	Common Name	Scientific Name	Status
Hamilton Kenton	Mammal	Indiana Bat	<i>Myotis sodalis</i>	Endangered^
Hamilton Kenton	Plant	Running Buffalo Clover	<i>Trifolium Stoloniferum</i>	Endangered^*
Hamilton	Bird	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened^
Kenton	Mussel	Purple Catspaw Pearlymussel	<i>Epioblasma o. obliquata</i>	Endangered*
Kenton	Mussel	Clubshell	<i>Pleurobema clava</i>	Endangered*
Kenton	Mussel	Fanshell	<i>Cyprogenia stegaria</i>	Endangered*
Kenton	Mussel	Northern Riffleshell	<i>Epioblasma torulosa rangiana</i>	Endangered*

Table 6-2: Federally Listed Threatened and Endangered Species

County	Group	Common Name	Scientific Name	Status
Kenton	Mussel	Orange Pimpleback	<i>Plethobasus cooperianus</i>	Endangered*
Kenton	Mussel	Pink Mucket	<i>Lampsilis abrupta</i>	Endangered*
Kenton	Mussel	Ring Pink	<i>Obovaria retusa</i>	Endangered*
Kenton	Mussel	Rough Pigtoe	<i>Pleurobema plenum</i>	Endangered*
Kenton	Mussel	Sheepnose	<i>Plethobasus cyphus</i>	Candidate

^ Also listed threatened or endangered by ODNR

* Also listed threatened or endangered by KYSNPC

6.2.5 Habitat

No unique terrestrial habitats were observed in the highly urbanized study area. The major terrestrial communities within the study area are small scattered scrub-shrub areas. These scrub-shrub habitats typically occurred in small, fragmented areas behind buildings, between buildings and road areas, or between urban areas and the Ohio River. The woody vegetation in these habitats generally consisted of honeysuckle (*Lonicera* sp.), amur honeysuckle (*Lonicera maackii*), tree-of-heaven (*Ailanthus altissima*), and other disturbance-tolerant species.

Aquatic habitat is limited within the study area to the Ohio River and is designated a warm water habitat by the Ohio Environmental Protection Agency (OEPA). Hamilton County, Ohio and Kenton County, Kentucky lie within the central lowlands physiographic province of the Ohio River (Source: www.fws.gov/orve/). This basin is the direct result of several glaciations, which covered most of the area depositing soils that are some of the richest agricultural land in the Ohio River watershed. The flat to slightly rolling topography has significantly altered the pre-glacial conditions and in some instances, buried pre-glacial streams that provide groundwater resources today (Source: www.fws.gov/orve/).

6.3 Historical Resources

Historic resources within the study area include individual residential, commercial, institutional, religious, and industrial buildings and districts. Exhibit 4 shows the specific location of historic properties and districts within the study area.

6.3.1 Kentucky

There are two NRHP individual properties property within the study area, the Bavarian Brewing Company and Kenny's Crossing (Table 6-3). Portions of six NRHP districts are also located within the study area (Table 6-4). These districts are located on both the east and west sides of I-75 and are dominated by residential buildings.

Table 6-3: NRHP Listed Resources Within the Study Area

Property	Address
Kentucky	
Bavarian Brewing Company	522 West 12 th Street
Kenny's Crossing	1001 Highway Avenue
Ohio	
B & O Freight Terminal (Long Worth Hall)	700 Pete Rose Way
Carew Tower	West 5 th Street and Fountain Square
Lombardy Apartment Building	318-326 West 4 th Street
Derby, H.W. Building	300 West 4 th Street
Hooper Building	139-151 West 4 th Street
St Peter-in-Chains Cathedral	325 West 8 th Street
Cincinnati City Hall	801 Plum Street
Plum Street Temple	726 Plum Street
Goodall Building	324 West 9 th Street
Court Street Firehouse	311 West Court Street
Cincinnati Union Terminal	1301 Western Avenue
Our Lady of Mercy High School	1409 Western Avenue
Ohio National Guard Armory	1437-1439 Western Avenue
Police Station Number 5	1024-1026 York Street
John Church Company Building	14-16 East Fourth Street

Table 6-4: Kentucky Historic Districts Within the Study Area

District	NRHP Status	Local Historic District
Fort Mitchell Heights	Listed	N/A
Lewisburg	Listed	N/A
East Lewisburg	Eligible	N/A
Bavarian Brewing Company	Listed	N/A
West Side Neighborhood	Listed	N/A
West Side/ Mainstrasse	Listed	N/A
East Fourth Street	Listed	Yes
Lytle Park	Listed	Yes
Main and Third Street Cluster	Listed	Yes

6.3.2 Ohio

Fifteen individual properties are listed on the NRHP within the study area as listed in Table 6-3. Two properties, Union Terminal and Plum Street Temple are also designated as a National Historic Landmarks. The Court Street Firehouse, Saint Peter-in-Chains Cathedral, Plum Street Temple and Cincinnati City Hall are also listed as local landmarks.

Nine NRHP districts are entirely or partially within the study area as listed in table 6-5. These Nine districts and the Cincinnati Union Terminal are also identified as local historic districts. The districts are comprised of commercial buildings or buildings now undergoing conversion from commercial to residential uses. These districts are concentrated east of I-75 where they encompass large tracts within downtown Cincinnati.

Table 6-5: Ohio Historic Districts Within the Study Area

District	NRHP Status	Local Historic District
West Fourth Street	Listed	Yes
West Fourth Street Amended	Listed	Yes
Ninth Street	Listed	Yes
Betts-Longworth	Listed	Yes
Laurel Homes	Listed	Yes
Dayton Street	Listed	Yes

6.4 Archaeological Sites

There are six recorded archaeological sites within the study area. Five sites are listed in the Ohio Archaeological Inventory (OAI) and one site is listed in Kentucky's OSA files within the study area. These sites are listed on Table 6-6.

Table 6-6: Recorded Archaeological Sites Within the Study Area

Site	Description
15Ke122	Historic Scatter
33Ha1 (Cincinnati Tablet Mound)	Prehistoric Earthen Mound Early Woodland Period
33Ha113	Prehistoric Mound
33Ha311 (Seventh Street Mound)	Prehistoric Mound Middle Woodland Period
33Ha312 (Richmond Street Mound)	Prehistoric Mound Woodland Period
Cincinnati and Whitewater Canal	Historic Canal Early to Mid-19 th Century

6.4.1 Kentucky

There is one recorded archaeological site (15Ke122) within the Kentucky portion of the study area. This site is historic scatter with associated features.

6.4.2 Ohio

Five of the archaeological sites recorded within the study area are located in Ohio. Four of the sites are prehistoric and were disturbed in the historic period. The sites are 33Ha1 Cincinnati Tablet Mound, 33Ha113, 33Ha311 Seventh Street Mound, and 33Ha312 Richmond Street Mound. All of the sites yielded lithics, ceramics, floral and faunal remains.

Several historic archaeological sites are known to exist within the Ohio portion of the study area. The most prominent of these is the Cincinnati & White Water Canal. The canal was already abandoned between Cincinnati and Valley Junction, Ohio, when it was purchased in 1863 by the Cincinnati & Indiana Railroad Company. The Cincinnati & Indiana Railroad used the existing canal bed to construct a new rail bed. Today, the canal tow path and bed are just north of Longworth Hall between Second and Third streets.

Historic maps illustrating the study area show increasingly dense commercial and industrial buildup of the areas northeast of existing I-75 and the Brent Spence Bridge approach lanes between 1815 and 1908. Buildings dating to 1840 and after still exist in this portion of the study area. Based on excavations conducted elsewhere in the urban core of Cincinnati and along its riverfront, it is likely that building remnants and intact features such as privies, cisterns, and wells remain. During recent construction of Paul Brown Stadium and Fort Washington Way, numerous foundations and shaft features were observed.

6.5 Community Resources

According to information provided by the Departments of Neighborhood Services in both the city of Cincinnati and the city of Covington, the study area includes several well established neighborhoods and commercial properties.

- Lewisburg is located just west of I-75 in the western part of Covington, Kentucky. It is also a National Register Historic District, which is characterized by beautiful views of downtown Cincinnati. It is a pedestrian scale neighborhood that has retained a unique character.
- Mainstrasse/West Side in Covington, Kentucky is a National Register Historic District (NR November 1983). It is considered to be an extensive, intact, and homogeneous late-nineteenth century urban residential neighborhood. The 800 buildings in the district, located on Covington's west side from 5th Street south to Pike Street, were built primarily between 1840 and 1877.

The City of Cincinnati has several well established neighborhoods located near the existing I-75/I-71 corridor in the study area. These neighborhoods include Queensgate and West End. The current configuration of Interstate 71 and Interstate 75 represent the largest physical boundary between these communities and the Central Business Districts within Cincinnati and Covington.

Issues associated with community cohesion and neighborhood cohesiveness were evaluated by reviewing demographic data such as density, as well as land use inventories such as commercial and residential distinctions. Many Cincinnati and Covington neighborhoods are cohesive communities with significant history and community infrastructure.

- The Queensgate neighborhood within the project area is the exception to this. It is important to note that the city of Cincinnati recognizes Queensgate as a neighborhood. However, this area does not represent a neighborhood in terms of a cohesive, residential community. The southern portion of Queensgate is sparsely populated, with a density less than 1,000 people per square mile. It is heavily dominated by commercial buildings. All other neighborhoods in the study area have a density greater than 1,000 people per square mile.
- The West End neighborhood of Cincinnati is an urban residential community characterized by a mix of older homes, newer residential developments and multi-family dwellings. This neighborhood includes the Dayton Street, Betts-Longworth and Laurel Homes Historic Districts.

The location of parks, recreational areas and other community resources can be found on Exhibit 5 – Land Uses and Exhibit 6 – Community Resources. In addition, a complete list of the community facilities within the study area is listed below (Table 6-6).

Table 6-7: Community Facilities and Services in Study Area

Kentucky		
Attraction	Location	Description
Garden of Hope	699 Edgecliff Road, Covington	Recreation of the Garden Tomb in Jerusalem
Churches/Religious	Location	Description
St. John's Catholic Church	627 Pike Street, Covington	Catholic Church
Nursing Home	Location	Description
Baptist Life Communities	800 Highland Avenue, Covington	Nursing Home
Recreation	Location	Description
Kenney Shields Park	West 9th & Philadelphia, Covington	Small neighborhood corner lot with playground equipment - Owned by the City of Covington
Neighborhood Pool	West 8th & Dalton, Covington	Neighborhood pool - Owned by the City of Covington
Devou Park/Golf Course/Overlook	1344 Audubon Road, Covington	700-acre park and golf course - Owned by the City of Covington
Goebel Park/Mainstrasse Village District	6th Street Area of Covington	Park area and surrounding retail & restaurants - Owned by City of Covington
Neighborhood Park	West 11th & Hermes Avenue, Covington	Owned by the City of Covington
School	Location	Description
Notre Dame Academy	1699 Hilton Drive, Park Hills	Parochial College Prep High School - 594 female students
Prince of Peace Catholic School	625 Pike Street, Covington	Parochial Grade School - Grades K - 8
Ohio		
Attraction	Location	Description
Paul Brown Stadium	One Paul Brown Stadium	Pro Football Facility – Home of NFL Cincinnati Bengals
National Underground Railroad Freedom Center	50 East Freedom Way, Cincinnati	Museum
Great American Ball Park	100 Main Street, Cincinnati	Pro Baseball Facility – Home of MLB Cincinnati Reds
US Bank Arena	100 Broadway, Cincinnati	
Cinergy Center	525 Elm Street, Cincinnati	Convention and Exhibition Facility
Cincinnati Fire Museum	315 West Court Street, Cincinnati	Museum

Table 6-7: Community Facilities and Services in Study Area

Ohio		
Geier Research & Collections Museum	760 West 5 th Street, Cincinnati	
Union Terminal *	1301 Western Avenue, Cincinnati	Omnimax Theatre, Museum Center, Children's Museum, Natural History Museum, Amtrak
Churches/Religious	Location	Description
York Street United Methodist	816 York Street, Cincinnati	Methodist Church
Plum Street Temple *	726 Plum Street, Cincinnati	Jewish Temple
St. Peter in Chains Cathedral *	325 West 8 th Street, Cincinnati	Catholic Church
Jarriel Baptist Church	Wesley & Court Street, Cincinnati	Baptist Church
Fire Station	Location	Description
Fire House - Company 14	5th and Central, Cincinnati	Fire House
Fire House - Company 29, Ladder 29	564 West Liberty @ Linn Street Cincinnati	Fire House
Government Building	Location	Description
City Hall *	801 Plum Street, Cincinnati	Offices of Mayor, City Mgr, City Council, etc.
Jail - Hamilton County Queensgate Facility	516 Linn Street, Cincinnati	Correctional Facility
Library	Location	Description
Public Library of Cincinnati and Hamilton County	805 Ezzard Charles Drive, Cincinnati	Public Library
Lloyd Library and Museum	917 Plum Street, Cincinnati	Botanical, Medical, Pharmaceutical & Scientific books
Utilities	Location	Description
CG&E Substation	West Pete Rose at Mehring Way, Cincinnati	
Public Agency	Location	Description
Cincinnati Job Corp Center	1409 Western Avenue, Cincinnati	Training Facility and Dorms
Post Office	Location	Description
Main Post Office - Dalton Avenue	1623 Dalton Avenue, Cincinnati	Post Office Facility
Post Office Branch	Dalton & Gest Streets, Cincinnati	Post Office Facility-Mid City Carrier Unit
Recreation	Location	Description
Lincoln Park - Union Terminal	Freeman Avenue & Ezzard Charles Drive, Cincinnati	Owned by the City of Cincinnati - Operated by Cincinnati Park Board - Greenspace
Park at Derrick Turnbow and Linn Street	1525 Linn Street, Cincinnati	Behind apartment buildings & a strip shopping center - Owned by the City of Cincinnati
Dyer Park	Baymiller & Bank Streets, Cincinnati	Ball Field, Pool and Playground -Owned by the City of Cincinnati - Operated by Cincinnati Recreation Commission
Lincoln Community Center	1027 Linn Street, Cincinnati	Pool, playground, tennis court, basketball courts -Owned by the City of Cincinnati - Operated by Cincinnati Recreation Commission
Queensgate Playground & Ballfields	707 West Court Street, Cincinnati	Playground and ballfields – Owned by the City of Cincinnati - Operated by Cincinnati Recreation Commission
School	Location	Description
St. Joseph's Catholic School	805 Ezzard Charles Dr., Cincinnati	Parochial Elementary School
Cincinnati Hamilton County Community Action Agency	880 West Court Street, Cincinnati	Theodore M. Berry Head Start Program
Lafayette Bloom B-O-T Accelerated Middle	1941 Baymiller Street, Cincinnati	Cincinnati Public School - Grades 6-8
Heberle Elementary	2015 Freeman Avenue, Cincinnati	Cincinnati Public School - Preschool - 8

Table 6-7: Community Facilities and Services in Study Area

Ohio		
TV/Radio Station	Location	Description
WXIX - TV	635 W. 7th St., Cincinnati	Network TV Station
Churches/Religious	Location	Description
York Street United Methodist	816 York Street, Cincinnati	Methodist Church
Plum Street Temple *	726 Plum Street, Cincinnati	Jewish Temple
St. Peter in Chains Cathedral *	325 W. Eighth St. Cincinnati	Catholic Church
Jarriel Baptist Church	Wesley & Court St., Cincinnati	Baptist Church
Fire Station	Location	Description
Fire House - Company 14	5th and Central, Cincinnati	Fire House
Fire House - Company 29, Ladder 29	564 W. Liberty @ Linn St. Cincinnati	Fire House
Government Building	Location	Description
City Hall *	801 Plum Street, Cincinnati	Offices of Mayor, City Mgr, City Council, DOTE, etc.
Jail - Hamilton County Queensgate Facility	516 Linn Street, Cincinnati	Correctional Facility
Library	Location	Description
Public Library of Cinti and Hamilton Co.	805 Ezzard Charles Dr., Cincinnati	Public Library
Lloyd Library and Museum	917 Plum Street, Cincinnati	Botanical, medical, pharm. & scientific books
Utilities	Location	Description
CG&E Substation	W. Pete Rose at Mehring Way, Cincinnati	
Public Agency	Location	Description
Cincinnati Job Corp Center	1409 Western Avenue, Cincinnati	Training Facility and Dorms
Post Office	Location	Description
Main Post Office - Dalton Avenue	1623 Dalton Ave. Cincinnati	Post Office Facility
Post Office Branch	Dalton & Gest Streets, Cincinnati	Post Office Facility-Mid City Carrier Unit
Recreation	Location	Description
Lincoln Park - Union Terminal	Freeman Ave & Ezzard Charles Dr., Cincinnati	Owned by City of Cinti - Operated by Cinti Park Board - Greenspace
Park at Derrick Turnbow and Linn St.	1525 Linn Street, Cincinnati	Behind apartment bldgs & a strip shopping center - Owned by City of Cincinnati
Dyer Park	Baymiller & Bank Streets, Cincinnati	Ball Field, Pool and Playground -Owned by City of Cinti - Operated by CRC
Lincoln Community Center	1027 Linn Street, Cincinnati	Pool, playground, tennis court, basketball courts - Owned by City of Cinti- Operated by CRC
Queensgate Playground & Ballfields	707 W. Court Street, Cincinnati	Playground and ballfields - Owned by City of Cinti - Operated by CRC
School	Location	Description
St. Joseph's Catholic School	805 Ezzard Charles Dr., Cincinnati	Parochial Elementary School
Cinti. Hamilton Co. Community Action Agency	880 W. Court St., Cincinnati	Theodore M. Berry Head Start Program
Lafayette Bloom B-O-T Accelerated Middle	1941 Baymiller St. Cincinnati	Cincinnati Public School - Grades 6-8
Heberle Elementary	2015 Freeman Ave, Cincinnati	Cincinnati Public School - Preschool - 8
TV/Radio Station	Location	Description
WXIX - TV	635 W. 7th St., Cincinnati	Network TV Station
*LISTED ON NATIONAL REGISTER OF HISTORIC PLACES		

6.6 Environmental Justice

Secondary source data was assessed within the study area for potential Environmental Justice concerns. According to the Civil Right Act of 1964, Executive Order 12898 and the Federal Highway Administration's publication FHWA-EP-00-013, environmental justice has three fundamental principles:

- 1) "To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations."
- 2) "To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process."
- 3) "To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations."

The city of Cincinnati displays several census tracts of densely populated areas that include minority and low-income residents. The areas east of the existing interstate corridor in Cincinnati are diverse relative to both income and ethnicity.

A high number of census tracts report poverty levels higher than 40 percent within the study area. These tracts are primarily located within the Ohio portion of the study area. The southern part of the project area in Ohio and most of the project area in Kentucky report poverty levels below 40 percent. Please refer to Exhibit 7 – Population Below Poverty Level for more specific location information.

Census area tract data shows minority population levels more than 75 percent in the northeast part of the project area, located immediately adjacent to the existing I-75 corridor in the West End neighborhood of Cincinnati. The southern part of the project area in Cincinnati and the project area in Covington reports minority population of less than 25 percent. Please refer to Exhibit 8 – Minority Population Demographics for more specific location information.

Several significant HUD-assisted housing projects/developments exist in the study area, including large housing redevelopment projects from the federal HOPE VI program on both sides of the Ohio River.

6.7 Noise Impacts

Several traffic related factors as well as structural components can affect noise levels. Sensitive noise receivers located within the study area include residential and recreational properties, libraries, schools, hospitals, motels, and hotels along the existing and/or proposed alignments. These areas include, but are not limited to, residential properties along the northeast side of the corridor in Ohio (West End) and along the southwest and southeast side of the corridor in Kentucky (Lewisburg, Mainstrasse, and West Side). Recreational properties including Lincoln Park, Laurel Park, Lincoln Recreational Complex, Queensgate Ballfields, Albert B. Sabin Park, DeVou Park, and Goebel Park, as well as Our Lady of Mercy High School and the Stowe Adult Education Center, are also considered sensitive receivers.

A specific noise analysis was not conducted for this study. However, future studies will be required to model potential noise impacts based on FHWA's Highway Traffic Noise Prediction Model (Report No. FHWA-RD-77-108).

6.8 Air Quality

On April 15, 2004, the USEPA designated the Greater Cincinnati region (including all of Hamilton County, Ohio and Kenton County, Kentucky) as "Basic Non-attainment" for 8-hour ozone violations. This area is also designated as non-attainment for one-hour ozone violations.

The Metropolitan Planning Organization (Ohio, Kentucky, Indiana Regional Council of Governments) has received air conformity approval of their long range plan. This plan includes a placeholder for a replacement of the Brent Spence Bridge with a 10-lane facility.

No formal air quality analysis has been conducted for this project as yet. However, in order for the project to be in compliance with the Clean Air Act Amendment of 1990, future studies will need to include a micro-scale analysis of carbon monoxide (CO) using the latest USEPA approved computer models. This analysis is needed to determine whether the project would result in violations of the National Ambient Air Quality Standards (NAAQS) for CO.

7.0 GEOMETRIC DESIGN ISSUES

A number of geometric design issues were identified through a review of existing studies in the area. Additional issues were also identified on field reviews conducted on August 3 and August 17, 2005. These issues include insufficient roadway lane, bridge and shoulder widths observed on some existing crossroads that will be tied into by this project. Potential roadway improvements in these areas will need to be considerate of these issues when designing tie-ins.

Several existing horizontal and vertical curves on mainline ramps do not meet current ODOT Location and Design Manual requirements. In addition, the presence of cultural resources and utility facilities, most notably the Cinergy Sub-station just west of the existing bridge and Longworth Hall, could impact these alignments and will be considered during the alternatives analysis phase of this project.

Grade and clearance issues on the existing facility could also be a limiting factor on the analysis of alternatives. The urban nature of this project will necessitate additional review activities in this area. For instance, the effect on bridge clearance at Elm Street over Fort Washington Way should be considered when analyzing potential alignments.

The Kentucky portion of the study area experiences a crash rate higher than the statewide average. Additionally, there are high concentrations of crashes at the 12th Street/Pike Street and 5th Street exits. Along I-75, more than half of the crashes are rear-end type accidents, which is an indicator of congestion already present along the corridor.

The high incidences of crashes within the study area lead to increased congestion along the corridor; as the congestion continues to increase, the likelihood of additional accidents also increases.

On the Ohio portion of the corridor, both I-75 and I-71 sections within the study area have been identified by ODOT as safety priorities. Both corridors in the study area (I-71 and I-75) appear on ODOT's Safety Hot Spot list. In addition, many segments on these corridors also appear on the High Crash Location Identification System (HCLIS) list. The segment on I-71 from state line mile 0.50 to 1.00 ranks as the fourth most accident prone section in the state. Most of the segment crash rates for individual years as well as overall years exceed the statewide average rates.

8.0 HYDRAULIC ISSUES

It is anticipated that some additional review and analysis of existing drainage structures will be required if any are to be re-used. At this time, it is anticipated that most of these structures will be replaced by the project. This includes overland flow, curb/gutter, under-drains and culvert structures both on the mainline and existing crossroads. In addition, the age of the current facility suggests that drainage problems could exist with under-drain outlets, though no specific locations were observed.

Curb heights on many side streets were observed to be inadequate. Construction of this project may require tying into local crossroads with inadequate curb heights. The selected alternative should be developed in consideration of this issue.

9.0 PAVEMENT ISSUES

For the most part, pavement on I-71/I-75 mainline and ramps is concrete with asphalt overlay. Crossroads within the study are largely paved with concrete.

Joint repairs, pavement repairs and new pressure relief joints would be anticipated for any sections of the existing pavement that might remain in the new project. It is anticipated that any maintenance of traffic plans will require temporary pavement in various sections in the study corridor. A subgrade study will be necessary in any new pavement areas.

10.0 STRUCTURAL ISSUES

Within the Ohio portion of the study area, it is likely that structures in Ohio will need super-structure replacement at a minimum. Any re-use of sub-structures should be evaluated on a site-specific basis.

Within the Kentucky portion of the study area, a fatigue analysis on the Brent Spence Bridge structure was conducted as part of the Engineering Feasibility Study. The results of this analysis were that primary truss members have an infinite fatigue life. A decision on the need for further analysis will be necessary if the selected alternative calls for keeping the current structure.

11.0 TRAFFIC CONTROL ISSUES/MAINTENANCE OF TRAFFIC

This project contains several sections with no shoulders or very narrow shoulders. Considering the potential for traffic impact during construction of this project, a detailed and thorough Maintenance of Traffic Plan will be necessary.

Alternate routes will need to be identified, temporary pavement will likely be needed to carry traffic, and creative solutions will need to be considered.

Road closures will be necessary for crossroads and mainline traffic. Short durations will need to be specified for any mainline activities. Considerations to maintain local access for business, pedestrians and commuters will need to be included in MOT plans. Similarly, accommodations for the high percentage of truck traffic will also need to be considered.

12.0 RIGHT-OF-WAY/SURVEY ISSUES

Due to the size, scope and urban setting of this project, a significant amount of work beyond the existing right-of-way limits is expected. This work may require the acquisition of additional property for the project.

The need for easements or acquisition of property from business and/or residential property will depend on the preliminary project design. Potential areas of consideration for acquisition activity include those directly adjacent to the structure and approaches on the western portions of downtown Covington, south of 12th Street and the southwestern portion of downtown Cincinnati, west of the Clay Wade Bailey Bridge and east of Gest Street.

Depending on the alternative selected, a number of properties in the Lewisburg and Devou Park areas of Covington, Kentucky and the Queensgate area in Cincinnati could be affected.

13.0 UTILITY ISSUES

The most visible utility issue in the Kentucky portion of the study area is the Willow Run Sewer line, which runs parallel to I-75 on the east between the Cut-in-the-Hill and Covington.

The Ohio portion of the study area contains major utility issues, the most visible of these is the Cinergy Sub-station. It is located south of Pete Rose Way and west of the existing Brent Spence Bridge structure. This sub-station is a large facility located less than 100 feet west of the existing Brent Spence Bridge structure. Cinergy also operates a high pressure gas main beneath the sub-station and an oil-jacketed high voltage electric main that serves both the Queensgate and Uptown areas of Cincinnati, via Central Avenue.

Other noteworthy utility issues include a Combined Sewer Interceptor facility directly beneath the bridge on the Ohio side. This facility is operated by the Metropolitan Sewer District of Greater Cincinnati. Also in the area is a distribution water main operated by Cincinnati Water Works. This main crosses the study area on the Ohio side, at a location near Mehring Way.

In addition, subway tunnels located just east of I-75 near the Western Hills Viaduct may also contain utilities. More investigation will be necessary to determine the impact of any alternatives developed in that specific location.

13.1 Railroad Coordination

Norfolk Southern, CSX and the Indiana & Ohio (I&O) have active mainline service lines and intermodal facilities in close proximity to the roadway corridor throughout this segment. However, there is only one location (just north of the Ohio River) where potential interaction exists.

In addition, several abandoned rail facilities are present, specifically near the Western Hills Viaduct, which were at one time operated by Norfolk & Western, B&O and C&O Railroads. Throughout the project area, NS and CSX own two tracks each along with numerous intermodal facilities, including a joint facility at Queensgate (just north and south of Western Hills Viaduct) and Gest Street (adjacent to the old Union Terminal). The Queensgate Rail Yard has the capacity for 4,000 train cars, and is one of the busiest freight rail yards in the Midwest. All SB rail traffic is operated by CSX and all NB traffic is operated by NS under a unique joint operating agreement through this area. From the Gest Street Yard, CSX has two tracks that parallel the Ohio River and US 50 and pass underneath I-75/I-71 just north of the River. Once crossing under I-75/I-71, the tracks turn south just west of Paul Brown Stadium and continue across the Ohio River on a railroad-only bridge adjacent to the Clay Wade Bailey Bridge into Kentucky.

Upon initial contact with railroad companies operating within the study area, the following clearance information was obtained:

- 23 feet is the required minimum overhead clearance.
- 25 feet is the required minimum lateral clearance (from centerline of track), less would require crash walls.

On curved tracks, the lateral clearances on each side of track centerline shall be increased 1.5 inches per degree of curvature. When the fixed obstruction is on tangent track but the track is curved within 80 feet of the obstruction, the lateral clearances each side of track centerline shall be increased as shown in Table 13-1:

Table 13-1: Lateral Clearances for Active Rail Lines

Distance from Obstruction to Curved Track	Increase Per Degree of Curvature
20 feet	1 ½ inches
40 feet	1 1/8 inches
60 feet	¾ inch
80 feet	3/8 inch

14.0 PERMIT ISSUES

Preliminary contact with the United States Coast Guard (USCG) was made for purposes of early coordination. USCG indicated that greater horizontal clearance may be needed for skewed crossings as associated with any Queensgate alignments.

The U.S. Army Corps of Engineers (USACE) Section 404 Permit process would likely be required as the Ohio River and its associated tributaries (including wetlands) are considered "waters of the United States." Similarly, a state level 401 Water Quality Certification and associated permit(s) will also likely be required by Ohio and Kentucky. Such permits can not be sought and reviewed until an alternative has been selected, wetlands have been delineated and verified by USACE, and the construction limits established.