

CHAPTER 8 • AFFECTED ENVIRONMENT

A natural environment overview was completed to describe the general features of the region, and to identify known terrestrial and aquatic resources within the study area. This overview is primarily based on review of secondary literature and was conducted to identify potential wetland areas; habitats or occurrences of threatened, endangered, or special concern species; locations of 100-year floodplains; and general physiographic and ecological characteristics of the study area. This information will be used to determine the possible applicability of various environmental regulations and will be considered during the transportation planning process.

The information presented below represents a summary of the resources within the region and study area. Potential resources affected by project alternatives are presented in detail in Section 2 of the technical document entitled North South Transportation Initiative: Environmental Working Paper.

8.1 Methods

Secondary data collection for the natural environment overview was completed generally following the procedures in the Ohio Department of Transportation's (ODOT) Ecological Guidelines (ODOT 2001). State and federal agencies and secondary sources were consulted to obtain the necessary information. The Ohio Department of Natural Resources, Division of Natural Areas and Preserves (ODNR-DNAP) supplied the information on documented state and federally listed threatened, endangered, and special interest (T & E) species in Ohio, and the Kentucky State Nature Preserves Commission (KSNPC) supplied information on documented state and federally listed T & E species in Kentucky. The US Fish and Wildlife Service (USFWS) supplemented information on federally listed T & E species. The Federal Emergency Management Agency (FEMA) and the Ohio Department of Natural Resources, Division of Water (ODNR-DW) provided information concerning the location of 100-year floodplain areas. The National Wetland Inventory (NWI) maps for the following Ohio quadrangles were reviewed to locate possible wetland locations in the study area:

Cincinnati East	Greenhills	Springboro
Cincinnati West	Hamilton	Tipp City
Dayton North	Mason	Trenton
Dayton South	Miamisburg	Trotwood
Fairborn	Middletown	Troy
Franklin	Monroe	West Milton
Glendale	Piqua East	

The following Kentucky quadrangles were reviewed:

Burlington	Newport	Walton
Covington	Union	
Independence	Verona	

Information was also obtained from the following agency internet sites:

- US Environmental Protection Agency (US EPA) – Region 5
- Kentucky State Nature Preserves Commission (KSNPC)
- Ohio Environmental Protection Agency (Ohio EPA)
- US Army Corps of Engineers (USACE) – Louisville District
- US Geological Survey (USGS)

8.2 General Project Setting

The study area is located in Boone and Kenton counties, Kentucky, and Hamilton, Butler, Warren, Montgomery and Miami counties, Ohio. The study area is located within three physiographic regions: the Southern Ohio Loamy Till Plain, the Illinoian Till Plain, and the Outer Bluegrass Region (Brockman 1998, KSNPC 2002a).

The Southern Ohio Loamy Till Plain and Illinoian Till Plain are regions within the Till Plains Section. The boundaries of the Till Plains Section roughly coincide with the boundaries of the Eastern Corn Belt Plains Ecoregion discussed below. The Outer Bluegrass Region is within the Bluegrass Section. The boundaries of the Bluegrass Section roughly coincide with the boundaries of the Interior Plateau Ecoregion (discussed below).

The Southern Ohio Loamy Till Plain is characterized by moderate relief, end and recessional moraines, with loamy, high-lime Wisconsin-age till, outwash, and loess over carbonate rocks and shales. It is characterized by extensive agriculture, particularly corn, soybean and livestock production.

The Illinoian Till Plain is characterized by rolling ground moraine of older till generally lacking glacial features, with many buried valleys and moderately low relief. Its major land use is agriculture, particularly corn, soybeans, and livestock production. The Outer Bluegrass Region is characterized as a moderately high relief dissected plateau of carbonate rocks. Major land uses are livestock production and woodland.

The study area is located in the Eastern Corn Belt Plains and Interior Plateau Ecoregion (Woods et al. 1998). The Eastern Corn Belt Plains is an ecoregion consisting mainly of rolling till plains with local end moraines. The Interior Plateau Ecoregion consists of rolling, deeply dissected, rugged terrain with areas of karst topography.

Historically, two general forest types occupied the general study area: the Beech-Maple Forest Region, which occurred generally north of Cincinnati, and the Mixed Mesophytic Forest Region in the Cincinnati area and southward. The Mixed Mesophytic Forest Region occurred generally in the unglaciated portion of Ohio and Kentucky, and was comprised of sugar maple, beech, yellow buckeye, tulip tree, white oak, red oak, shagbark hickory, bitternut hickory, basswood, and white ash. The Beech-Maple Forest Region occurred north of the Mixed Mesophytic Forest Region and was dominated by beech, sugar maple, red oak, white ash and white oak, with scattered individuals of basswood, shagbark hickory, and black cherry (Braun 1950).

Much of the study area has been converted from agricultural and forestry uses to urban uses. Each county features major metropolitan areas that include residential, commercial, and industrial areas. Urbanization is expanding along the interstate highways and major state routes. Major cities in the study area are Covington, Kentucky, and Cincinnati and Dayton, Ohio. Additional urban areas are Florence, Erlanger, and Walton, Kentucky, and Hamilton, Middletown, and Piqua, Ohio.

8.3 Threatened & Endangered Species

Ten federally endangered species, one federally threatened species, one federal candidate species, and two federal species of management concern have ranges that include the study area (Table 8A; USFWS 2001a, USFWS 2001b, USFWS 2002). Eight 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). The other two federally endangered species whose ranges include the study area are the Indiana bat (*Myotis sodalis*) and running buffalo clover (*Trifolium stoloniferum*). The Indiana bat's range includes the entire study area. Running buffalo clover occurs in Warren and Hamilton counties in Ohio and Boone and Kenton counties in Kentucky. The federally threatened bald eagle (*Haliaeetus leucocephalus*) has wintering sites in Hamilton County, and the federal candidate species eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*) occurs in Montgomery and Warren counties. The Bachman's sparrow (*Aimophila aestivalis*) and Henslow's sparrow (*Ammodramus henslowii*) are two federal species of



Indiana Bat
(*Myotis sodalis*)



Running Buffalo Clover
(*Trifolium stoloniferum*)

management concern that could potentially occur in the study area. Species of management concern are being evaluated for potential federal listing.

Several state threatened, endangered, or special interest species also have been documented within the study area (Table 4.0-2; ODNR 2001a, ODNR 2001b, KSNPC 2001, KSNPC 2002b). These include one Ohio endangered plant, the Bur-head (*Echinodorus rostratus*), several Ohio endangered and Ohio threatened mollusk species in the Ohio River, and the following Ohio threatened species: the Kirtland's snake (*Clonophis kirtlandii*), the Maypop (*Passiflora incarnata*), the pondhorn mussel (*Unio merus tetralasmus*), and the black-crowned night heron (*Nycticorax nycticorax*), which has a breeding colony in the study area.

Figure 8A
Federal Threatened, Endangered, and Candidate Species
Whose Ranges Include the Study Area

County	State	Common name	Scientific name	Federal Status*	State Status*	Preferred habitat
Miami, Montgomery, Butler, Warren, Hamilton, Boone, Kenton	Ohio, Kentucky	Indiana bat	<i>Myotis sodalis</i>	E	E	Trees with shedding bark or cavities, riparian corridors
Warren, Hamilton, Boone, Kenton	Ohio, Kentucky	Running buffalo clover	<i>Trifolium stoloniferum</i>	E	E (OH) T (KY)	Areas of rich soils in the transition between open forest and prairie, usually in areas disturbed by grazing and mowing
Boone, Kenton	Kentucky	Pink mucket (mussel)	<i>Lampsilis abrupta</i>	E	E	Lower Ohio River and its larger tributaries in sand and gravel
Boone, Kenton	Kentucky	Ring pink (mussel)	<i>Obovaria retusa</i>	E	E	Large rivers in gravel or sand
Kenton	Kentucky	Fanshell (mussel)	<i>Cyprogenia stegaria</i>	E	E	Medium to large rivers in gravel riffles
Kenton	Kentucky	Purple catspaw (mussel)	<i>Epioblasma obliquata obliquata</i>	E	E	Medium to large rivers in gravel riffles
Kenton	Kentucky	Northern riffleshell (mussel)	<i>Epioblasma torulosa rangiana</i>	E	E	Medium to large rivers in gravel riffles
Kenton	Kentucky	Orangefoot pimpleback (mussel)	<i>Plethobasus cooperianus</i>	E	E	Large rivers in gravel or mixed sand and gravel
Kenton	Kentucky	Clubshell (mussel)	<i>Pleurobema clava</i>	E	E	Medium to large rivers in gravel or mixed gravel and sand
Kenton	Kentucky	Rough pigtoe (mussel)	<i>Pleurobema plenum</i>	E	E	Medium to large rivers in sand or gravel
Montgomery, Warren	Ohio	Eastern massasauga rattlesnake	<i>Sistrurus catenatus catenatus</i>	C	E	In or near wet habitats, including dry goldenrod meadows and nearby dry areas
Hamilton	Ohio	Bald eagle (wintering)	<i>Haliaeetus leucocephalus</i>	T	E	Mature trees near water
Miami, Montgomery, Butler, Warren, Hamilton, Boone, Kenton	Ohio, Kentucky	Bachman's sparrow	<i>Aimophila aestivalis</i>	MC	SI (OH) E (KY)	Open woods and bushy pastures
Miami, Montgomery, Butler, Warren, Hamilton, Boone, Kenton	Ohio, Kentucky	Henslow's sparrow	<i>Ammodramus henslowii</i>	MC	SI (OH) SC (KY)	Weedy fields

*Key:
T=threatened
E=endangered
C=candidate species
MC=species of management concern
SI=special interest species
SC=special concern species.

There are many records of T & E species occurring in the Ohio River, including the Ohio and Kentucky endangered lake sturgeon (*Acipenser fulvescens*), the Ohio threatened paddlefish (*Polyodon spathula*), and several state and federal endangered mussel species. According to the KSNPC, “the vast majority of occurrences for organisms in [the Ohio River and Licking River] are historic records.” Due to pollution, “many if not all of these organisms apparently have been extirpated from the area” (KSNPC 2001).

**8.4
Nature
Preserves &
Other
Ecological
Features**

The study area contains several nature preserves, including Englewood Reserve, Sharon Woods Gorge State Nature Preserve in Sharon Woods Park, and Wyoming Nature Preserve, (Table 8B). In addition, two Ohio Champion Big Trees are located within or immediately adjacent to the study area: the rock elm (*Ulmus thomasii*) in Mt. Storm Park, Cincinnati, and the scarlet oak (*Quercus coccinea*) in Lindner Park, Cincinnati. Portions of Mt. Storm Park and Lindner Park are located within the study area, but it is unclear whether the champion trees are located within the study area.

**Table 8B
Known Ecological Resources within the Study Area**

County	Common name	Scientific name	Ohio Status	Kentucky Status
Butler	Bur-head	<i>Echinodorus rostratus</i>	Endangered	Threatened
Butler	Black-crowned night heron colony	<i>Nycticorax nycticorax</i>	Threatened	Threatened
Butler	Sora	<i>Porzana carolina</i>	Special Interest	No Status
Hamilton	Kirtland's snake	<i>Clonophis kirtlandii</i>	Threatened	Threatened
Hamilton	Mooneye (fish)	<i>Hiodon tergisus</i>	Special Interest	No Status
Hamilton	Riverbank Paspalum	<i>Paspalum fluitans</i>	Potentially Threatened	No Status
Hamilton	Maypop	<i>Passiflora incarnata</i>	Threatened	No Status
Hamilton	Virginia Mallow	<i>Sida hermaphrodita</i>	Potentially Threatened	Special Concern
Hamilton	Smooth Buttonweed	<i>Spermacoce glabra</i>	Potentially Threatened	No Status
Montgomery	Pondhorn (mussel)	<i>Unio merus tetralasmus</i>	Threatened	No Status
Licking River	Paddlefish	<i>Polyodon spathula</i>	Threatened	No Status
Ohio River	Butterfly (mussel)	<i>Ellipsaria lineolata</i>	Endangered	No Status
Ohio River	Elephant-ear (mussel)	<i>Elliptio crassidens crassidens</i>	Endangered	No Status
Ohio River	Threehorn Wartyback (mussel)	<i>Obliquaria reflexa</i>	Threatened	No Status
Ohio River	Ohio Pigtoe (mussel)	<i>Pleurobema cordatum</i>	Endangered	No Status
Ohio River	Monkeyface (mussel)	<i>Quadrula metanevra</i>	Endangered	No Status
Ohio River	Lake Sturgeon	<i>Acipenser fulvescens</i>	Endangered	Endangered
Ohio River	Burbot (fish)	<i>Lota lota</i>	Special Interest	Special Concern
Hamilton	Rock elm	<i>Ulmus thomasii</i>	Ohio Champion Big Tree	Not Applicable
Hamilton	Scarlet oak	<i>Quercus coccinea</i>	Ohio Champion Big Tree	Not Applicable
Hamilton	Lindner Park	--	Metro Park, Norwood	Not Applicable
Hamilton	Mt. Storm Park	--	Metro Park, Cincinnati	Not Applicable
Hamilton	Sharon Woods Gorge State Nature Preserve	--	State Nature Preserve	Not Applicable
Hamilton	Sharon Woods Park	--	Hamilton County Park	Not Applicable
Hamilton	Wyoming Nature Preserve	--	Private Nature Preserve	Not Applicable
Montgomery	Englewood Reserve	--	Metro Park, Dayton	Not Applicable
Montgomery	Stillwater State Scenic River	--	State Scenic River, Dayton	Not Applicable

Ohio data from the Ohio Department of Natural Resources, Division of Natural Areas and Preserves, January 31, 2001 and October 30, 2001. Kentucky data from the Kentucky State Nature Preserve Commission, February 9, 2001 and January 25, 2002.

8.5
Aquatic
Ecology

Watersheds

Six major watersheds of the Ohio River occur within the study area (Table 8C; USGS 2002): The Upper Great Miami Watershed occupies 12,756 acres, and includes the Great Miami, Mad, and Stillwater rivers, as well as smaller streams. The Lower Great Miami Watershed occupies 2,905 acres, and includes the Great Miami River and smaller streams. The Little Miami Watershed occupies 7,658 acres, and includes portions of the Little Miami River and smaller streams. The Ohio Brush-White Oak Watershed occupies 1,384 acres, and includes portions of the Little Miami River and smaller streams. The Middle Ohio-Laughery Watershed occupies 1,763 acres, and includes the Great Miami, Kentucky, and Licking Rivers, Mill Creek, and smaller streams. The Licking Watershed occupies 10,505 acres, and includes the Licking River as well as smaller streams. All of the watersheds drain directly into the Ohio River, except the Upper Great Miami watershed, which drains into the Lower Great Miami Watershed.

Table 8C
USGS Watersheds within the Project Area

Watershed Name	Total Area, (acres)	IWI Rating	Descriptive IWI Rating	Major rivers within watershed	# of Rivers and Streams within watershed	River miles within watershed	Perennial river miles within watershed
Upper Great Miami	12,756	5	more serious problems, low vulnerability	Great Miami River, Mad River, Stillwater River	29	2,890	1,372
Lower Great Miami	2,905	4	less serious problems, high vulnerability	Great Miami River	18	1,794	794
Little Miami	7,658	4	less serious problems, high vulnerability	Little Miami River	22	2,465	1,205
Ohio Brush-Whiteoak	1,384	6	more serious problems, high vulnerability	Little Miami River	41	2,924	1,589
Middle Ohio-Laughery	1,763	6	more serious problems, high vulnerability	Great Miami River, Kentucky River, Licking River, Mill Creek	13	1,305	919
Licking	10,505	1	better quality, low vulnerability	Licking River	23	3,718	2,594

IWI = Index of Watershed Indicators, a measure of the health of the aquatic ecosystem and its vulnerability to stressors such as pollution (1 is best rating, 6 is worst rating).

Rivers and Streams

The study area includes numerous named streams and rivers, including the Ohio River, Great Miami River, Stillwater River (designated a State Scenic River), Mad River, and Mill Creek in Ohio; and the Ohio River and Licking River in Kentucky. No Scenic or Wild Rivers are present within the Kentucky study area. In addition, there are numerous smaller permanent and intermittent streams and tributaries that drain into the larger rivers previously referenced. The typical Aquatic Life Use designation of rivers and streams in the study area is Warmwater Habitat (WWH). According to the Ohio EPA (2002), Warmwater Habitat is “the typical warmwater assemblage of aquatic organisms for Ohio rivers and streams.” The Ohio River, Mad River,



Mill Creek, Licking River, and portions of the Great Miami River are classified as Warmwater Habitat in the study area (Table 8D; USACE 2002).

Within Montgomery and Miami counties, the Stillwater River and portions of the Great Miami River are classified as Exceptional Warmwater Habitat (EWH). Exceptional Warmwater Habitat is defined as habitat that supports “unusual and exceptional assemblages of aquatic organisms, which are characterized by a high diversity of species, particularly those which are highly intolerant and / or rare, threatened, endangered, or special status” (Ohio EPA 2002). Water quality standards for EWH are more stringent than for WWH, and the likelihood of encountering T & E species is usually greater in EWH areas.

**Table 8D
Major Rivers within the Project Area**

County	River Name	Habitat Designation in Study Area	USACE Designation in Study Area	Other Designations
Miami, Montgomery, Warren, Butler, Hamilton	Great Miami River	EWH, WWH	Navigable	
Miami, Montgomery	Stillwater River	EWH	Not designated	State Scenic River
Hamilton, Boone, Kenton	Ohio River	WWH	Navigable	
Montgomery	Mad River	WWH	Not designated	
Kenton	Licking River	WWH	Navigable	
Butler, Hamilton	Mill Creek	WWH	Navigable	

EWH = Exceptional Warmwater Habitat, WWH = Warmwater Habitat

The smaller streams within the study area are generally WWH, but some have other designations, such as Modified Warmwater Habitat and Limited Resource Water. Modified Warmwater Habitat is the designation used for “streams with extensive and irretrievable physical habitat modifications” that consist of pollution-tolerant species. “The ammonia and dissolved oxygen standards are less stringent than warmwater habitat.” Limited Resource Water is the designation used for “streams that have drainage areas of less than three square miles and may either lack water on a recurring annual basis, or have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported” (Ohio EPA 2002).

Portions of the study area lie within designated 100-year floodplains. These areas generally include low-lying and flat areas near rivers and streams. A 100-year floodplain is an area that has a one percent probability of flooding during any given year.

According to National Wetland Inventory maps, numerous wetlands occur within the study area. These generally occur near rivers, streams, and other water bodies. The most common types of wetlands depicted in the study area are open water areas, which are typically excavated ponds, emergent marshes, and forested wetlands. NWI maps are based on analysis of aerial photographs without ground verification.

Groundwater Resources

The study area is located over two types of carbonate-rock aquifers: Ordovician and Silurian-Devonian aquifers (USGS 2002). The northern portion of the study area includes portions of the Greater Miami Buried Valley Aquifer System, which was designated a Sole Source Aquifer by the US EPA. According to the US EPA (2002a), “a Sole Source Aquifer is an aquifer designated by EPA as the sole or principal source of drinking water for a given aquifer service area.”

8.6 Floodplains & Wetlands

8.7 Cultural Resources Overview

A cultural resource overview was conducted to determine whether the study area contains resources that could be adversely affected by the proposed alternatives and to identify resources that, if impacted, would be considered a fatal flaw for a preferred project alternative. The overview consulted literature sources to identify known or documented resources that are on or eligible for inclusion in the National Register of Historic Places (NRHP). The NRHP is the Nation's official list of cultural resources worthy of preservation and includes districts, sites, buildings, structures, and objects that are important in American or local history, architecture, archaeology, engineering, and culture.

The information presented below represents a summary of the resources within the region and study area. Potential resources affected by project alternatives are presented in detail in Section 5 of the technical document entitled North South Transportation Initiative: Environmental Working Paper.

8.7.1 Methods

Background research of literary and cartographic sources was used to develop a cultural context (early history, patterns of development, important themes) of the general study area. The literature review also was used to identify any previously documented cultural resources in the study area. The literature review was conducted at the Ohio Historic Preservation Office and the Kentucky Heritage Council. Additionally, city records of local landmarks and districts were consulted for Covington, Kentucky and Cincinnati and Dayton, Ohio.

The Ohio and Kentucky state files of inventoried archaeological sites and the Archeological Atlas of Ohio (Mills 1914) were consulted for information on documented archaeological sites. Documented architectural resources in the study area were located by reviewing the Ohio and Kentucky files of inventoried architectural properties and bridges, National Register of Historic Places (NRHP) properties, National Historic Landmarks (NHL), and Determination of Eligibility (DOE) properties. DOE properties are resources that have been formally designated as eligible for inclusion in the NRHP by the Keeper of the NRHP or by a consensus determination between the State Historic Preservation Office and the lead agency sponsoring an undertaking that could affect the historic resource. A resource that has been formally determined eligible must be treated as if it is listed in the NRHP.

Prehistoric Setting

Occupation of southwestern Ohio and Northern Kentucky would have been possible approximately 11,000 to 11,500 B.C., when the glacial front that had once covered Ohio retreated northward. Paleoindians, the first known prehistoric population to occupy the Ohio area, were highly mobile, small band hunters moving on a seasonal basis in order to fully exploit the available natural resources (Dragoo 1976). Known Paleoindian sites from the area are rare, but the database of sites has been steadily growing over the past 30 years. Seeman and Prufer (1982) studied a large sample of fluted points from Ohio and concluded that: 1) fluted points are frequently found in major stream valleys and confluences; 2) sites tend to occur close to quality flint resources; and 3) fluted points are rarely found in extensive swampy lowlands or in rugged highlands.

Climatic changes resulting from the retreating glaciers mark the beginning of a phase of occupation known as the Archaic period. The Archaic period is divided into three distinct episodes: Early (9,000 B.C. to 6,000 B.C.), Middle (6,000 B.C. to 3,000 B.C.), and Late (3,000 B.C. to 900 B.C.) Archaic. During the Archaic period, small mobile groups gradually became more geographically restricted as seasonally oriented hunting-and-gathering activities were focused on smaller, well-exploited territories (Chapman 1975). Known Archaic sites are generally small and can be located in all geographic settings, although larger sites are located along major rivers.

Like the Archaic period, the Woodland period that follows is divided into Early (900 B.C. to 100 B.C.), Middle (100 B.C. to A.D. 500), and Late (A.D. 450 and A.D. 800) Woodland periods. The Early Woodland period was characterized by a greater tendency toward territorial permanence and increasing elaboration of ceremonial exchange and mortuary rituals, which included the construction of conical burial mounds (Webb and Baby 1957, Webb and Snow 1945).

The predominant Middle Woodland manifestation in Ohio was the Hopewell culture. This culture was characterized by elaborate geometric earthworks, enclosures, and mounds, which were often associated with multiple burials and a diverse assemblage of exotic ceremonial artifacts (Brose and Greber 1979).

The Late Woodland period has been poorly defined for most of Ohio. To date, much of the definition for central and southern Ohio has been based on ceramics (Prufer and McKenzie 1966). Known Woodland sites for all periods are generally located along major watercourses.

Between A.D. 960 and A.D. 100, the Fort Ancient culture emerged from the Late Woodland culture in southern Ohio. The appearance of Fort Ancient was stimulated by greater reliance on maize agriculture, increased sedentism, and an influx of southern Mississippian influences (Essenpreis 1978). Ceramic attributes were probably the earliest Mississippian influences to enter the Ohio Valley. New architectural styles, beans, and Mississippian ceremonialism were introduced after this time. Fort Ancient sites are generally located on floodplains and terraces along major waterways.

Very little is known about the protohistoric Native Americans of the Ohio River Valley. Protohistoric sites are generally defined solely by the presence of European trade goods (beads, metals, etc.). Prior to the Treaty of Greenville in 1795, the Miami Indians occupied the area. According to Little Turtle's account at the treaty signing, the Miami previously lived in an area from Detroit to the Scioto River, south to the Ohio River, then westward to Wabash and Chicago.

Historic Setting

The first permanent settlement in northern Kentucky occurred in 1789, more than a decade later than the first settlement in central Kentucky. The settlement was located along the Ohio River in present day Boone County (Boone County Kentucky 2002). Although European American exploration started ca. 1750, the first permanent settlements in Ohio did not begin until a few decades later. Settlement in Ohio began ca. 1790, also along the Ohio River, and moved towards the interior of the state after 1794. Following the signing of the Treaty of Greenville in 1795, much of Ohio was open for European American settlement. Southwestern Ohio was surveyed for sale under two different systems, the Symmes Purchase and the Congressional Lands surveys. John Cleves Symmes' land company purchased over 311,682 acres of land between the Great and Little Miami rivers. Symmes hired 13 surveyors to survey the land and set up the townships (Burke 1997, Crout 1983). The Congressional Lands survey followed a township and range system, dividing land into equally sized sections for sale by the Federal government (Burke 1997).

Hamilton County was established in 1790 and its final boundaries were established in 1808. When Ohio became a state in 1803, Butler, Warren, and Montgomery counties were formed from Hamilton County (Ford and Ford 1881). Miami County was created in 1807 from a reduction of Montgomery County (L. H. Everts & Company 1875). Boone County, the thirteenth county organized in Kentucky, was formed in 1798 from a portion of Campbell County (Perrin et al. 1888). Kenton County was officially established in 1840 from Campbell County (Kenton County Public Library 2002).

Upon settling in the region most pioneers supported themselves through agricultural endeavors. Crop production dominated into the mid-nineteenth century with corn, wheat, oats, rye, and barley becoming the primary crops in the Miami Valley region. In addition, the region was a major producer of cattle and hogs. In fact, by the 1840s Butler County was the top producer of hogs in the state, shipping them via the Miami & Erie Canal to Cincinnati (Crout 1983, Jones 1983).

The earliest industries in the region were linked to settlement and agricultural production. Powered by the abundance of water from the numerous rivers and streams, saw and paper mills processed lumber, grist mills processed crops, and woolen mills produced yarn.

Industrialization of the late-nineteenth century brought factories to the region's major cities. These included steel foundries, breweries, cotton factories, rubber manufacturers, and appliance manufacturers (Bartlow et al. 1905, Ford and Ford 1881, Miller 1991). In contrast to southwestern Ohio's major urban centers, Northern Kentucky's communities had industries that served the Ohio River ferry and boat traffic and the rural areas to the south. The most common industrial enterprises included saw and gristmills, distilleries, and steamboat manufactories (Boone County Kentucky 2002).

The first population boom in the area began in 1800, with settlers primarily from the Mid-Atlantic as well as from the southern state of Virginia. In addition, immigrants who initially came to work on the roads, canals, and railroads remained and settled the area. These groups included German, Irish, Scots, and French settlers (Wilhelm 1982, Boone County Kentucky 2002, Kenton County Public Library 2002). A second boom began ca. 1860 and was associated with the beginning of industrialization in southwest Ohio. The most significant increase came between 1890 and 1930 and was associated with the maturation of the region's industries.

Transportation played a key role in the development of both population and industry. The region benefited from its proximity to the Ohio River as well as its connection to the National Road that passed through northern Butler County by 1829. The National Road connected the region with Columbus and the eastern United States, and brought freight traffic and passenger and mail coaches through the area.

Trade and development of the Miami River Valley expanded substantially with the completion of the Miami & Erie Canal in 1845. The Miami & Erie Canal ran from Toledo to Cincinnati; within west central and southwestern Ohio, the canal ran through Piqua, Troy, Dayton, Middletown, and Hamilton. The portion of the canal between Dayton and the northern end of Cincinnati was completed in 1828; connection to the Ohio River occurred in 1834 (Gieck 1988). The canal reinforced the existing southward orientation of the Miami River Valley's markets and trade. The canal locks provided excellent sources of waterpower that were conveniently located along a transportation corridor; mill production expanded accordingly. The canal, in essence, laid the basis for the industrialization of the area (Woods 1980).

The later development of railroad lines through the region opened up even more markets for agricultural products than the canal. Additionally, this transportation network spawned the growth of manufacturing. In fact, the development of the railroad system spurred the largest growth in population and industry in the region between 1893 and 1930. The railroads, and later state roads and turnpikes, increased the importance of manufacturing, especially to urban centers like Cincinnati, and created growth in new places (Noble 1982). Throughout the nineteenth century, Cincinnati was the "chief metropolitan focus for the central Ohio River Valley." In contrast, towns in Boone and Kenton counties were specialized centers for the surrounding rural population and for the cross-river ferry traffic (Boone County Kentucky 2002).

Today, the landscape of the Ohio River and Miami Valley regions is changing rapidly. Suburban growth that began in the 1950s accelerated after the completion of Interstate 75 in the late 1960s, and continues rapidly today. Rural land is steadily decreasing, in favor of residential, commercial, and industrial development.

An Environmental Site Assessment (ESA) Screening was completed to locate and identify major areas of environmental concern that could be considered a fatal flaw for alternatives identified in the preferred program of projects. This overview was based on review of secondary literature. Historic and recent land-use information and federal and state regulatory databases were searched in an effort to identify areas of concern. On-site verification of potential areas of concern was not included in the ESA screening. This information was used to determine the possible applicability of various environmental regulations.

The information presented below represents a summary of the sources used in the ESA. Potential areas of concern affected by project alternatives are presented in detail in Section

8.8 Hazardous Materials

**8.8.1
Methods**

5 of the technical document entitled *North South Transportation Initiative: Environmental Working Paper*.

Available mapping was reviewed to assist in identifying areas or activities that might be of concern, including 7.5-minute series topographic maps, and city and county road maps.

The ESA Screening examined all areas of concern within the study area. However, at this stage of the project the screening focused on sites and areas of concern that could present a fatal flaw to a potential alternative. These sites or areas of concern should be identified early in subsequent environmental analyses to determine specific impacts to the alternatives under consideration. The environmental databases that list sites that are of special concern include the National Priority List, the Comprehensive Environmental Response, Compensation, and Liability Information System, the Corrective Action Report, the Resource Conservation and Recovery Information System, and the Emergency Response Notification System. As alternatives are further evaluated, additional environmental databases will be examined for potential impacts to the alignments.

The American Society for Tests and Measurements (ASTM) has identified federal and state standard and supplemental environmental databases that provide information regarding potential areas of concern. The standard and supplemental databases are listed and described in Table 8E. Environmental Data Resources, Inc. (EDR) and FirstSearch Technology Corporation (FirstSearch) provided environmental database information for the study area.

**Table 8E
Environmental Databases Searched within the Study Area**

Federal Standard Databases	
National Priority List (NPL)	The US Environmental Protection Agency's (EPA) list that identifies sites for priority cleanup under the Superfund Program.
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)	Provides data on potentially hazardous waste sites that have been reported to the US EPA by states, cities, private companies, and the public. These sites are either on the NPL, proposed for inclusion in the NPL, or are in the screening and assessment phase for possible inclusion in the NPL.
No Further Remedial Action Planned (CERC-NFRAP)	This US EPA database contains sites that have been removed from CERCLIS. Sites are removed when it has been determined that no contamination was found, contamination was removed quickly, or the contamination was not serious enough to require federal action.
Corrective Action Report (CORRACTS)	This US EPA database identifies hazardous waste handlers with Resource Conservation and Recovery Act (RCRA) corrective action activity.
Resource Conservation and Recovery Information System (RCRIS)	This US EPA database contains information on sites that transport, store, treat and/or dispose of hazardous waste as defined by RCRA. The database has three listings: Large Quantity Generator (LQG), Small Quantity Generator (SQG), and Treatment, Storage, Disposal (TSD).
Emergency Response Notification System (ERNS)	This US EPA database contains information on reported releases of oil and hazardous substances.
Federal Supplemental Databases	
Superfund Consent Decrees (CONSENT)	This US EPA regional database contains information regarding responsibility and cleanup standards at NPL sites.
Records of Decision (ROD)	This US EPA database maintains Record of Decision documents that mandate a permanent remedy at NPL sites.
Delisted NPL	This US EPA database contains sites that have been removed from the NPL where no further response is appropriate based on criteria established by the National Oil and Hazardous Substances Pollution Contingency Plan.
Facility Index System (FINDS)	This US EPA index contains additional databases that provide facility information and pointers to other sources that contain additional information and detail. The following databases included in the Facility Index System relate to sites identified within the study area. Permit Compliance System (PCS), Enforcement Docket on civil enforcement cases (DOCKET), National Compliance Database (NCDB) and Aerometric Information Retrieval System (AIRS).
Hazardous Material Information Reporting System (HMIRS)	This US Department of Transportation (DOT) database contains hazardous material spill incidents reported to DOT.

Federal Supplemental Databases (continued)	
Material Licensing Tracking System (MLTS)	This Nuclear Regulatory Commission database contains information on sites that possess or use radioactive materials and are subject to commission licensing requirements.
Mines Master Index File (MINES)	This database is maintained by the Department of Labor, Mine Safety and Health Administration.
Federal Superfund Liens (NPL Liens)	This US EPA database contains records of liens filed against real property in order to recover remedial action expenditures or liens against property owners who have received notification of potential liability.
PCB Activity Database System (PADS)	This database identifies generators, storers, transporters, brokers, or disposers of PCBs.
RCRA Administrative Tracking Systems (RAATS)	This discontinued US EPA database contains records of enforcement actions issued and administrative and civil actions brought by the US EPA.
Toxic Chemical Release Inventory System (TRIS)	This US EPA database contains information on facilities that release toxic chemicals to the air, water, and land in reportable quantities as established under SARA Title III.
Toxic Substances Control Act (TSCA)	This US EPA database contains manufacturers and importers of chemicals included in the TSCA Chemical Substances Inventory.

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